ABSTRACT BOOK

"International Conference of Plant Scientists"

[10th National Meeting of Plant Scientists]

Monday, April 21 through Thursday, April 24, 2008

The Pakistan Botanical Society

Organized by:
Department of Botany
Faculty of Sciences
University of Agriculture Faisalabad
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www.pakbs.org/ICPS/ICPS.html

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PAKISTAN BOTANICAL SOCIETY
www.pakbs.org

The idea of establishing a Botanical Society was put forth in the Summer Seminar in Botany held at Bara Gali in 1965. Among others who participated in this grand meeting were Prof. Sher Ahmed Lodhi, Prof. Majid Ahmed, Dr. Khwaja Muhammad Salim, Dr. Shah Rukh Chughtai, Dr. Mustafa Shameel and Mrs. Rukayya Khan. The idea was warmly welcomed by almost all plant scientists working in different organizations in the country.

The establishment of Pakistan Botanical Society was formerly declared in 1968 with Prof. Sher Ahmed Lodhi, Professor of Botany, University of The Punjab as the founder President. Dr. Majid Ahmed and Dr. S. I. Ali, as Vice Presidents, whereas Dr. Shaukat Ali Chowdhry was elected as a Secretary / Treasurer for the year 1968-69.

The executive council of the Society appointed Prof. A. S. Islam of the University of Sindh as Editor-in-Chief of the Pakistan Journal of Botany (PJB) in 1968-69. The first issue of the journal appeared in 1969. In 1971, Professor Islam moved to Dacca and Dr. Abdul Ghaffar took over as the Chief Editor of PJB. Since then he has been carrying out the responsibilities of editing the journal meticulously.

PJB, which used to be published biannually now, is published bimonthly. It has gained considerable international reputation. A number of foreign universities and learned bodies purchase PJB and the papers both from Pakistani and foreign scientists are published in this journal. This journal is indexed in Biological Abstracts, Chemical Abstracts and Current Contents. Recently the new website of Pakistan Journal of Botany (**http://www.pakbs.org/pjbot/pjhtmls/PJB.html**) has been developed at which full text papers starting form volume 36 issue 1, 2004 onwards has been made available for free download.

The First Regional Meeting of Plant Scientists was held in the Department of Botany, University of Karachi in 1966, and the second Regional Meeting in 1967. The third Regional Meeting was organized by the Department of Botany, University of Sindh, Jamshoro in 1968.

The Fourth Regional Meeting of Plant Scientists was again held at the Department of Botany, University of Karachi in 1974 under the auspices of PBS. Subsequently, a Regional Meeting of Plant Scientists was organized in January 1979 in the Department of Botany, University of Karachi and the same year another Regional Meeting of Plant Scientists was held at the Department of Biological Sciences, Quaid-e-Azam University, Islamabad. In September 1980, PBS sponsored a Regional Meeting at Tando Jam that was jointly organized by the Atomic Energy Agricultural Research Centre, Sindh Agriculture University and Agricultural Research Institute, Tando Jam. This paved the way for initiating the conference of plant scientists at the national level. Starting in 1982, the Society has so far held 9 national conferences of plant scientists and the 10th is being held at Faisalabad from 21-24 April 2008.

Ever since its inception in 1968, PBS has grown steadily over the years and has now membership of plant scientists working in all the four provinces of Pakistan and abroad. The aims and objectives of PBS are to cultivate, promote and disseminate the knowledge of all the branches of plant sciences; to encourage and to stimulate interest in research in all disciplines of Plant Sciences in Pakistan; to undertake such activities which are conducive to or necessary for the fulfillment of these objectives and cooperate with other organizations having similar objectives.

INTERNATIONAL CONFERENCE OF PLANT SCIENTISTS
www.pakbs.org/ICPS/ICPS.html

Pakistan Botanical Society is one of the leading societies that aim to cultivate, promote and disseminate the knowledge of all the branches of plant sciences. In addition, it also aims to undertake activities which are conducive to or necessary for the fulfillment of these objectives and cooperate with other organizations having similar objectives. PBS provides an opportunity to active research workers to present their results and to generate discussions for further planning of their research. Thus, this conference is the continuation of National Meetings of Plant Scientists organized by the Pakistan Botanical Society held after every two years. This conference will highlight the recent trends in various branches of botanical sciences.

Aims and Objectives

1. To gather leading scientists working in various disciplines of Plant Sciences all over the world to share their expertise with one another.
2. To elaborate the recent trends in Plant Sciences through oral/poster presentations, panel discussions etc.
3. To provide a forum for exchange of views and development of long-term linkages among the scientists from different countries of the world.
4. To suggest recommendations for conservation of flora and germplasm and improved crop productivity at the conclusion of the conference and put together all the information in the form of a proceedings of the conference

THE UNIVERSITY CAMPUS
www.uaf.edu.pk

The University of Agriculture, Faisalabad being the largest agricultural university of the country was emerged from the Punjab Agriculture College that was founded in 1906. Since November 1st 1961 when the college was elevated to University, this institution has carried out the responsibilities of teaching, research, extension and short courses as major areas of its academics. Today in the era of advanced technology for improving agriculture and related areas the University has broadened the width of its research activities according to the requirements of the modern world.

Being a premier central University with several faculties and constituent colleges it draws students from all over the world. The beautiful University campus spread over an area of 1,950 acres on both angles represents history and the present era. The lush green new campus which is conglomeration of monolithic blocks built in modern style. The old campus, a reminiscent of traditional Muslim architecture, reminds us the Punjab Agriculture College. It now houses the Faculty of Sciences, the second largest faculty of the university.

The University campus is located in the centre of the city at a distance of 12 km North-East of the Faisalabad International Airport, about 2 km South-West of the Faisalabad General Bus Stand and about 2 km North-West of the Faisalabad Railway Station and Government Transport Bus Stand. The city of Faisalabad with a population of 4.0 million is situated at 145 km to the West of Lahore at 184 meters elevation, 31 N latitude and 73 longitude.

DEPARTMENT OF BOTANY

Department of Botany is one of the principal departments of the faculty. Its staff comprises three Professors, three Assistant Professors, two Lecturers, and a number of research officers/associates. At the time of establishment of the University in 1961, the Department was primarily engaged in teaching undergraduate classes. In 1964, the Department started offering postgraduate courses to the students of Faculty of Agriculture and research was carried out only on a limited scale. With the initiation of Master's degree programme in Botany in 1973, the research activities of the Department increased manifold. The year 1981 was another milestone in the history of the Department when M. Phil programme was introduced, while the Ph.D. degree programme in Botany was launched in 1989. So far more than 480 M.Sc.,140 M.Phil. and 12 Ph.D. have been produced. The students after completion of their educational programme from the Department are serving in various organizations such as NIAB, NIBGE, PARC, PAF, Banks, Universities and Educational Departments of Federal and Provincial governments. At present, 75 students are enrolled in M.Sc., 28 in M.Phil. and 25 in Ph.D. programmes

The Department has a well maintained Botanical Garden and experimental area as an aid to the postgraduate and faculty research. The department is actively engaged in establishing a New Botanical Garden, which is spread over an area of 25 acres of land.

The Department initiated pioneering research work in the field of plant genetic resources for the collection, preservation and evaluation of primitive crop cultivars from the diversity rich parts of North Western Frontier Province (NWFP). The first germplasm collection expedition in collaboration with FAO/BGPR, Bangor-Layallpur Universities was carried out in 1974 in the northern areas of Pakistan. General emphasis was laid on primitive cereals like wheat and barley. Two PL-480 projects, one on the "Biology of Farm Weeds" was carried out during 1971-77 and the other titled "National Research Program on Weeds of Cereals" was initiated in 1981 and completed in 1988. In these projects, survey of wheat, rice, maize, and cotton fields of different districts of the Punjab Province was conducted to determine the extent of weed infestation. In addition, this Department has conducted a massive amount of research work on salinity and drought tolerance, growth regulators and fertilizer application to various crops so as to improve economic yield. Moreover, a project was also completed on the induction of polyembryony in citrus and mango.

This Department has five functional laboratories for conducting postgraduate research. Of them, two have been equipped with instruments supplied by Japan International Cooperation Agency (JICA), Japan. The research work being done in these laboratories includes physiological, biochemical and anatomical aspects of plant tolerance to stressful environments. Due attention is also being given to plant tissue culture and growth regulation in plants. Recently the department was renovated with the help of funds provided by the by the Govt. of Punjab and three more research laboratories are made for housing the sophisticated equipment procured with the funds provided by the Federal Ministry of Science and Technology.

Staff of the Department of Botany

Dr. Muhammad Ashraf (Professor and Dean)
Dr. Mumtaz Hussain (Professor and Chairman)
Dr. Abdul Wahid (Professor)
Dr. Mansoor Hameed (Assistant Professor)
Dr. Farrukh Javed (Assistant Professor)
Dr. Muhammad Shahbaz (Assistant Professor)
Mr. Muhammad Sajid Aqeel Ahmad (Lecturer)
Dr. Muhammad Arfan (Lecturer)

Research Groups In Department Of Botany

Different research areas have been specified keeping in view the available resources, need of the institution, and expertise of the faculty. The various research areas being pursued in the department are as follows:

1. Exploration of genetic variation in oilseed and leguminous crops.
2. Assessment of the effects of pre-sowing seed treatment with different plant growth regulators on alleviation of the effect of salt stress on wheat and other cereal crops.
3. Appraisal of hormone balance in plants rose from seeds primed with different priming agents.
4. Determination of the role of plasma membrane and tonoplast ion transporters in ion uptake in plants grown under salinity stress.
5. Industrial effluents and their impact on the productivity of important agricultural crops.
6. Identification of physiological/biochemical markers for selection for tolerance to different abiotic stresses.

Group-1 Environmental Biology

Group Leader: Dr. Mumtaz Hussain
Members:

i. Dr. Farrukh Javed
ii. Mr. Muhammad Sajid Aqeel

Research Activities:

a. Exploration of genetic diversity of different oilseed and leguminous crops and their weedy relatives.
b. "In situ" and "in vitro" screening of food and forage crops through anatomical/physiological studies.
c. Determination of the impact of environmental stresses/pollutants (industrial effluents) on the biology of plant species.
d. Application of plant growth regulators on leguminous and oilseed crops and alleviation of different stresses.
e. NaCl tolerance in wheat genotypes at whole plant and cellular level.

Group-II Stress Physiology

Group Leader: Dr. Muhammad Ashraf
Members:

i. Dr. Abdul Wahid
ii. Dr. Muhammad Shahbaz
iii. Dr. Muhammad Arfan

Research Activities:

a. Selection of stress resistant lines after rigorous screening of the local and exotic germplasm
b. Studies on the underlying physiological and biochemical attributes such as changes in ABA, ethylene, polyamines, gas exchange parameters, water use efficiency, osmotic adjustment and stress proteins responsible for stress resistance
c. Appraisal (rigorous field trials) of the selected materials for their responses and economic yield performance under increased salinity, drought and high temperature stresses
d. Recommendation of the most suitable materials for general cultivation in stressed areas of the country

Group-III Plant Taxonomy

Group Leader: Dr. Mansoor Hameed

Research Activities:

a. Establishment and maintenance of herbaria at Botany Department, University of Agriculture, Faisalabad
b. Establishment of Botanical garden by collecting plants from all over the country and of exotic nature
c. Cultivation of medicinal plants at Botanical Garden, University of Agriculture, Faisalabad and investigation of their medicinal properties
d. Revision of the flora of Faisalabad and adjacent districts
e. Exploration of economic flora of Pakistan

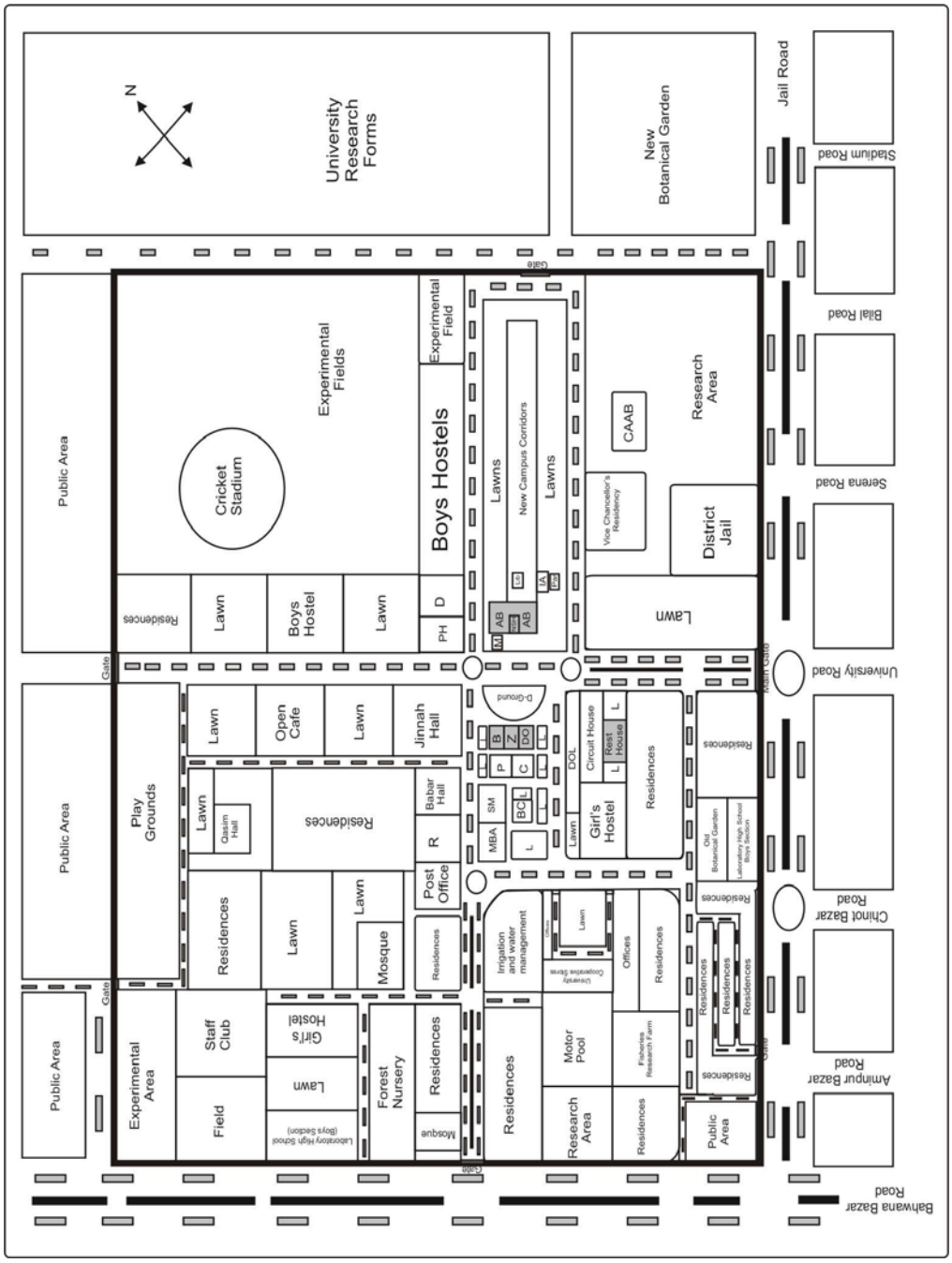
THE CITY OF FAISALABAD

A town called Lyallpur, named after Sir James B. Lyall, Governor of Punjab (1887-1892) arose in 1806. In 1977 the name of the city was changed to Faisalabad in commemoration of King Faisal Bin Abdul Aziz of Saudi Arabia who was a great lover of the Muslim world. In 1906, the Punjab Agriculture College was founded. The college was transformed into a University in 1961.

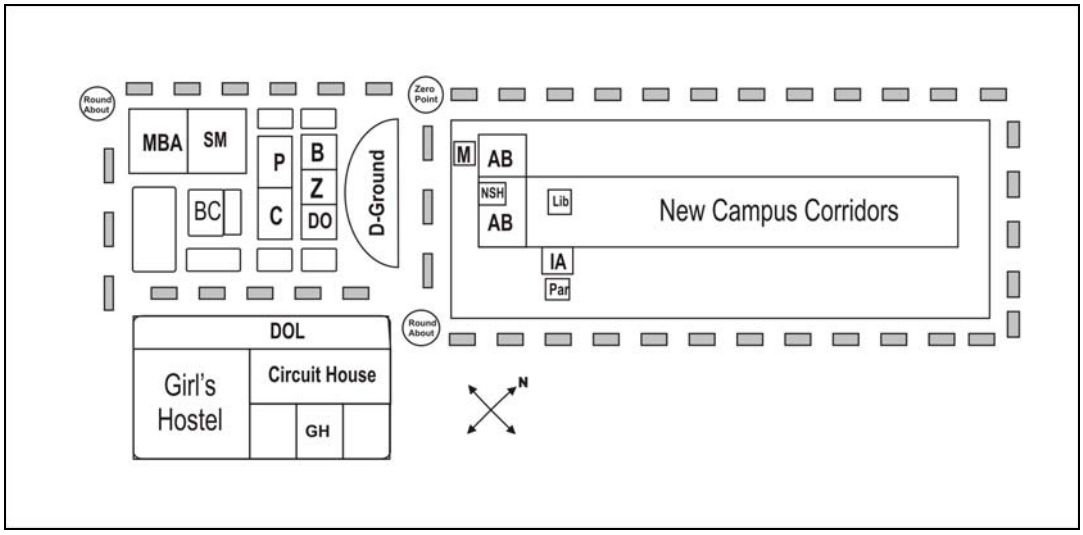
Faisalabad city has a number of world renowned research and educational institutions such as Nuclear Institute for Agriculture and Biology (NIAB), National Institute for Biotechnology and Genetic Engineering (NIBGE), University of Agriculture (UAF), Ayub Agricultural Research Institute (AARI), Punjab Forestry Research Institute (PFRI), and Punjab Medical College (PMC), etc. Faisalabad is the third largest city in Pakistan with a population of about 4 million. Faisalabad district endowed by nature with a rich soil, aided by an efficient irrigation system, has earned a name for agricultural productivity. Faisalabad, being a large cotton market, is known for its textile industry and is termed as 'Manchester of Asia'.

Faisalabad is very well connected with other cities in the country by air and road travel. For air travel, flights operate daily between Faisalabad and Karachi. Alternately, one may take international flight from Lahore or Islamabad that are at 2 ½ and 3 ½ hours drive, respectively, by motorway from Faisalabad

CAMPUS MAP


N
University Research Forms
New Botanical Garden
Jail Road
Stadium Road
Bilal Road
Serena Road
University Road
Chinot Bazar Road
Amirpur Bazar Road
Bahwana Bazar Road
Public Area
Gate
Experimental Area
Staff Club
Field
Girl's Hostel
Laboratory High School (Boys Section)
Lawn
Forest Nursery
Residences
Mosque
Play Grounds
Oasim Hall
Babar Hall
Post Office
Open Cafe
Jinnah Hall
Cricket Stadium
Experimental Fields
Experimental Field
Boys Hostels
Boys Hostel
Lawns
New Campus Corridors
P-Ground
Irrigation and water management
Motor Pool
Research Area
Fisheries Research Farm
Offices
Circuit House
Rest House
Girl's Hostel
Vice Chancellor's Residency
CAAB
Research Area
District Jail
Old Botanical Garden
Laboratory High School Boys Section
Main Gate

VENUE MAP



Abbreviations

B = Department of Botany
Z = Department of Zoology
C = Department of Chemistry
BC = Department of Biochemistry
P = Department of Physics
SM = Department of Statistics and Mathematics
MBA = Department of Business Administrations
DO = Office of the Dean, Faculty of Sciences
AB = Administration Block
NSH = New Senate Hall (Venue)
IA = Iqbal Auditorium
Lib = Main Library
GH = Guest House

ICPS-001 - GENUS *ALLIUM* L. IN THE FLORA OF CENTRAL ASIA

F. O. KHASSANOV

[Institute of Botany, Academy of Sciences, Tashkent, Uzbekistan]

Abstract: Flora of vascular plants of Central Asia is rich and consists of about 9000 species. Genus *Allium* L. has the third position within super polymorphous genera (*Astragalus* L*.* and *Cousinia* Cass.) and presented here by 224 species and 20 subspecies. According to the new classification of the genus, all the species are distributed within 9 subgenera and 46 sections. There are 1 endemic subgenus *Vvedenskya*, 13 endemic sections (*Vvedenskya, Verticillata, Aroidea, Acaule, Popovia, Miniprason, Brevicaule, Crystallina, Spathulata, Minuta, Brevidentia, Nigrimontana, Mediasia)* and 6 subendemic sections (*Regeloprason, Kopetdagia, Acmopetala, Multicaulea, Eremoprasum, Campanulata).* There are 140 endemic species and 14 endemic subspecies (63 % of all species in the region). During last 20 years 26 new *Allium* species have been described. Central Asiatic wild *Allium* species have a closed relative species in a neighboring countries (Iran, Afghanistan and Pakistan).

ICPS-002 - USEFUL WILD *ALLIUM* L. SPECIES IN UZBEKISTAN

F. O. KHASSANOV

[Institute of Botany, Academy of Sciences, Tashkent, Uzbekistan]

Abstract: Flora of vascular plants of Uzbekistan is rich and consists of about 5500 species. Genus *Allium* L. has the third position within super polymorphous genera (*Astragalus* L. and *Cousinia Cass.*) and presented here by 112 species and 4 subspecies. The use of especially tasteful *Allium* species has a long tradition in Central Asia with apparently deep historical roots. People living in desert and mountainous zones are collecting and using bulbs and leaves in order to prepare special dishes as well as for sale. People in urban areas are buying the required plant material on the local markets. Traditionally, people are cultivating in every home gardens not only *A. cepa* L.*, A. sativum* L. (rarely *A. porrum* L.*, A. ramosum* L.*)* but some wild species (*A. suworowii, A. oschaninii, A. pskemense*) as well. According to geographical position (desert or mountains) people in the country side are collecting and using as a food different wild *Allium* species. There are 30 species useful species growing in the mountains and 6 species in the desert area. Starting from 2000 a modern ethnobotanical and pharmaceutical researches of wild onions and garlics in this region have been carried out. During these fields missions unique information about traditional use by local population in desert and mountainous regions of about 100 wild species in food with medicinal purposes was revealed. High concentration of several important sulphur compounds (like methilin, aliin, isoaliin and propiin) as well as saponins and phenolic compounds in Uzbek and Tadzhik Allium species shows us a new ways of use these species or their extracts in medicinal purposes.

ICPS-003 - EFFECT OF CLIMATE ON THE DISTRIBUTION OF VEGETATION IN UPPER GEDIZ RIVER BASIN

R. EFE

[University of Balikesir, Balikesir, Turkey]

Abstract: Gediz River basin is situated in the western Anatolian part of Turkey. The river basin has an area of approximately 15.000 km^2. A large part of the area is under the influence of Mediterranean climate. However, in the higher parts of the basin an influence of continental climate is dominant. The aim of this study is to explain and assess the relationship between climate and distribution of the

natural vegetation in the upper Gediz River basin. For this purpose, 1/100.000 scaled topographical maps and 1/25000 scaled forest management maps provided by Ministry of Forestry were used. In order to determine the climatic conditions of the area, data was gathered from Simav, Gediz and Uşak Meteorological stations. Through transforming the meteorological data into tables and charts in computer-mediated process, distribution of precipitation and temperature in the area was recorded. The influence of climate on distribution of vegetation was analyzed. In order to determine the distribution of vegetation, several field studies were conducted. The plant samples were collected along linear transects. According to the findings of this study, it was observed that precipitation, temperature, wind and moisture of the area have important influence on the distribution of vegetation. As a result of influence of Mediterranean, continental and oceanic climates, plant species belonging to Black Sea, Mediterranean and Irano-Turanian phytogeographical regions occur in the area. Furthermore, it has been determined that forest, bush (scrub), garrigue and subalpin plant formations that constitute natural vegetation formations occur in different parts of the area strictly subject to the climatic conditions that prevail in the region.

ICPS-004 - INVESTIGATION OF GENETIC VARIATION OF SEED PROTEIN IN SOYBEAN (*GLYCINE MAX*) GENOTYPES

M. F. A. MALIK[1], A. S. QURESHI[1], M. ASHRAF[2], M. R. KHAN[1] AND A. JAVED[2]

[[1]Department of Biochemistry, Quaid-e-Azam University, Islamabad, [2]National Agricultural Research Centre, Islamabad, Pakistan]

Abstract: The genetic variation of seed protein was assayed by SDS-PAGE for ninety-two genotypes of soybean. The germplasm represented five different origins (Pakistan, USA, AVRDC, North Korea and Japan). To our knowledge, no studies have yet been made in Pakistan on the diversity of soybean germplasm based on protein electrophoresis. On the basis of SDS-PAGE, 26 reproducible bands were used for analysis and genetic diversity was estimated based on the number of different protein peptides. Out of total 26 bands detected, 13 polymorphic and 13 monomorphic bands were discriminated from electrophoretic profile. Ten major bands were recorded. The banding pattern revealed large variations among genotypes. Dendrogram constructed using Ward's method divided the genotypes in two main groups consisting of four clusters. The results of cluster analysis indicated that genetic diversity between Pakistani and US or AVRDC accessions is much larger that the genetic diversity between Pakistani and North Korean or Japanese accessions. Although cluster analysis completely separated most of the Pakistani accessions from USA and AVRDC accessions, but could not distinguish between the accessions from Japan and North Korea. On the basis of these results, it is clear that crosses between the Pakistani and US or AVRDC gene pools could create more genetic variability than crosses between Pakistani and Japanese or North Korean accessions. As the genotypes from various sources differed considerably, it was difficult to establish any relationship between origin and clustering pattern.

ICPS-005 - E^3 - ECOLOGY, ECONOMY, ENVIRONMENT

M. OZTURK

[Ege University, Sci. Faculty, Botany Department, Bornova, Izmir, Turkey]

Abstract: The word "Ecology" is commonly heard during the last few decades. It has immerged as a concept meaning cleaner environment and a safer life, main goal being sustenance of desired conditions on biosphere. The magnitude of natural inheritance cohabiting planet earth with us is said to lie around 30 million, which have come into being during a period of 3 billion years of evolution. Natural extinctions are taking place but the wave of extinction we are observing today is a cumulative result of

our anti-life and ad-hoc activities. The ecological crisis faced by us at present such as slimming ozone layer, climate change, shrinking of green spaces, soil, water and air pollution are essentially the backlash of modern development. The governing bodies in each country spent much effort on meeting the material needs of their population. This thinking leads them to go for rapid industrialization, mechanisation and formation of huge urban agglomerations which bring about severe changes like environmental pollution, malnutrition, intensification of stress factors together with economical disturbances. Looking at our planet from a biogeographical point of view if area of a habitat decreases by ten to one, annihilation of species diversity in this place will be around 50 percent. We are actively involved in an "ecocide" which is not an environment friendly situation. In fact, all these interfere in overcoming the real economic and social problems. Present ecological crisis is directly related to our lack of interest in ethical values. In the course of our material progress we have lost the ethical basis of our life, by leaving aside the moral values. For economic development industrialization has lead to an achievement of higher standards of living through an unethical use of natural resources. A rapid development on global level cause rapid environmental changes and an increase in material needs. But poverty and economic stagnation among the major part of earths inhabitants and over consumption by the minority are ending up with eco-disasters. Thus for a sustainable economic growth there is a need for re-evaluation of ecological values. We need to think more about the phrases "environment-friendly, anti-toxic and natural". We shall witness many new challenges to the security of our planet if steps are not taken. Presently it will be a truism to claim that environmental changes are lessening with the progress in the protection of our environment. The global community is always speaking loudly to include principles that support ecological economy with least impact on the environment, but unless these commitments are based on action success cannot be achieved. Although eco-management is a prudent path to pursue, but it looks like a dream as yet, unless priority is given to ecology and sociology rather than technology. It is necessary to plan all greater economic enterprises on the basis of their effects on our natural and social environment. This will be possible if we know our place in the ecosystem and base our economies on the principals in which cause and effect are considered also from the standpoint of ecosystem health. We as botanists can contribute to the reversing of this trend by facilitating the acquisition, dissemination and utilization of ecological knowledge and providing a biosocial model to the managers.

ICPS-006 - GERMINATION RESPONSE OF WILD BARLEY (*HORDIUM SPONTANEUM*) TO SALT AND DROUGHT STRESS IN DIFFERENT CONCENTRATION OF SODIUM CHLORIDE AND POLYETHYLENE GLYCOL 6000

G. R. ZAMANI, M. HOSSEINI AND H. B. MAHMOODI

[Department of Agronomy and Plant Breeding, Faculty of Agriculture, Birjand University, Birjand, Iran]

Abstract: In order to study the germination response seeds wild barley (*Hordium spontaneum*), to osmotic and matric potential due to sodium chloride and polyethylene glycol 6000, two separate experiments were carried out based on completely randomized design with five replications. Osmotic and matric potential were five Levels (0, -0.3, -5, -10 and -15 bars). Results indicated that germination rate, percentage and also weight of radicle, weight of plumule, weight of seedling, weight of radicle/ weight of plumule, length of radicle, length of plumule and length of radicle/ length of plumule, were decreased significantly as stress intensity increased. Drought stress had more inhibitory effects on germination rate and percentage and -15 bar caused complete failure in germination. Effect of drought stress was more pronounced on length of radicle and plumule compared with the effects of salinity. In both drought and salinity stress, percentage reduction for plumule length was higher which indicate the higher sensitivity of this trait to stress in comparison with radicle length.

ICPS-007 - GROWTH AND YIELD OF CHICKPEA AS AFFECTED BY EM, RHIZOBIUM AND PHOSPHATE SOLUBILIZING BACTERIA

S. AHMAD AND A. BANO

[Department of Plant Sciences Quaid-e-Azam, University, Islamabad]

Abstract: Chickpea seeds and seedlings were treated with *Rhizobium leguminosarum*, Phosphate solubilizing bacteria, *Pseudomonas* and Effective microorganisms (EM) and Bokashi alone and in combinations. Plants were harvested during vegetative phase to determine chlorophyll, sugar, protein and the antioxidant enzymes, catalase and peroxidase and endogenous level of phytohormones from leaves of chickpea. Treatment with EM alone and in combination with Bokashi increased the shoot biomass, number of nodules, chlorophyll content, sugar content, peroxidase and catalase activity. Rhizobium used alone and in various combinations with EM and Bokashi exhibited significant increase over control. All the treatments exhibited significant increase in IAA and GA content of leaves. Combined treatment with R and EM can be implicated for crop improvement.

ICPS-008 - ANTIHYPERGLYCEMIC ACTIVITY OF *ERUCA SATIVA* AGAINST STREPTOZOTOCIN INDUCED DIABETES IN RATS

E. BUKHSH[2], S. S. AHMAD[1] AND S. A. MALIK[2]

[[1]Sheikh Saeed Ahmad Assistant Professor, Department of Environmental Sciences, Fatima Jinnah Women University, Rawalpindi, Pakistan, [2]Department of Biochemistry, Faculty of Biological Sciences, Quaid-e-Azam University, Islamabad, Pakistan]

Abstract: Phototherapy is the use of plant, plant extract or pure chemical isolated from natural products to treat diseases. *Eruca sativa* belongs to family Cruciferrae/Brassicaceae. It is commonly used as a medicinal plant in subcontinent. Antihyperglycemic properties of *E. sativa* were investigated against streptozotocin induced diabetes in male albino rats of Sprague Dawley Strain. Hyperglycemia was induced by a single intraperitoneal dose of Streptozotocin (100mg/ kg body weight). Hyperglycemic state was confirmed on 7th day by measuring blood glucose level. Plant extract was then given as intraperitoneal injection 400 mg/kg body weight in 50% ethanol. Blood samples were collected on 31st day and analyzed for blood glucose level. Results revealed that alcoholic extracts of *E. sativa* leaves and seeds possess antihyperglycemic properties against Streptozotocin induced diabetes. Isolation and characterization of active reagent is under investigation.

ICPS-009 - STUDY OF TRACE ELEMENTS AND HEAVY METALS IN PLANTS WITH HYPOGLYCEMIC ACTIVITY

S. S. AHMAD[1], T. AYUB[2] AND E. BUKHSH[2]

[[1]Sheikh Saeed Ahmad Assistant Professor, Department of Environmental Sciences, Fatima Jinnah Women University, Rawalpindi, Pakistan, [2]Department of Biochemistry, Faculty of Biological Sciences, Quaid-e-Azam University, Islamabad, Pakistan]

Abstract: Different approaches have been adopted to treat diabetes particularly by controlling the blood glucose level. Traditionally different herbs have been used to manage the condition. In the present era many of these plants have been proved to be hypoglycemic by scientific studies. More over the role of different metal elements has also been confirmed in inducing hypoglycemia. In order to establish a relationship between the hypoglycemic activities of eight known plants with eight known hypoglycemic metal elements, the concentrations of the elements were determined in the sample

plants. The results show that the hypoglycemic metal elements are present in various amounts, with statistically significant difference ($p < 0.05$). These results suggest that the elements with higher amounts i.e. Mg and Zn may be the most prominent among other metals to confer the plants their hypoglycemic activity and also that the plants considered in this study are a good source of all the hypoglycemic metal elements except chromium and lithium.

ICPS-010 - ROLE OF PROTECTION IN REHABILITATION OF RANGELAND

M. J. DURRANI AND M. RAZAQ

[Baluchistan University, Quetta]

Abstract: A case study was conducted in Aghberg rangeland (Quetta District) during 2005 – 2006. Two protected sites (without fences) were established by community participation and with collaboration of UNDP and non-protected sites were public grazing area on the immediate vicinity. It was observed that species composition, diversity, total ground cover and dry matter were significantly increased in protected sites when compared to non-protected sites. It appears that rainfall limiting the abundance of species and biomass production during 2006. But the losses provided by local inhabitants and nomads were more severe due to uprooting all the plants for fuel wood and other purposes. It is suggested that community participation can play a key role in rangeland rehabilitation if they sustain these ranges for longer period.

ICPS-011 - EFFECT OF TEMPERATURE, WATER TREATMENT ON GERMINATION, SEEDLING GROWTH AND OIL CONTENT OF SUNFLOWER (*HELIANTHUS ANNUUS* L.) SEEDS

G. SHAHEEN, M. A. ZAIDI, M. ISMAIL AND S. LAGHARI

[Department of Botany, University of Baluchistan, Quetta]

Abstract: The study was carried out to estimate the significance of sunflower seeds germination at different temperature and water treatment. Germination percentage, seedling growth, water treatment, moisture and oil content were studied. Germination percentage at different temperatures was checked. It was observed that 25 ^{o}C – 35 ^{o}C temperature and alternate day water treatment produced better germination percentage and healthy seedlings. Maximum root, shoot length and high moisture percentage was also found at 25 ^{o}C. Maximum oil content were also found in those seeds which germinate at high temperature. Therefore it is suggested that for sunflower seeds better grow at 25 ^{o}C - 35 ^{o}C and alternate day water treatment results better yield.

ICPS-012 - COMPARATIVE PERFORMANCE OF TWO COTTON CULTIVARS UNDER PRE-SOWING TEMPERATURE STRESS TO CHECK FRUIT SHEDDING

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Abstract: The investigation to determine the effect of pre-sowing temperature stress on growth, yield and quality of two promising cotton cultivars (*Gossypium hirsutum* L.) was laid out in pots in complete randomized block design with factorial arrangement using three replicates. The seeds of two cotton cultivars *i.e.* BH-160 and MNH-93 were exposed to pre-sowing temperature stress levels of *i.e.* 55, 65, 75 and 85 C for 30 and 60 h durations, while a treatment of non-stressed seeds was also included as

control. Different pre-sowing temperature stress levels had no significant effect on plant height, number of flowers formed per plant, number of flowers dropped per plant, number of bolls formed per plant, number of bolls dropped per plant, boll weight, weight of seed cotton per plant, weight of cotton sticks per plant and fiber strength of both cultivars. However, pre-sowing temperature stress duration of 60 h significantly increased the weight of cotton sticks per plant and decreased the boll drop per plant as compared to pre-sowing temperature stress duration of 30 h in cultivar BH-160. It means cultivar BH-160 is more heat tolerant than that of MNH-93.

ICPS-013 - *IN VITRO*, POTASSIUM NUTRITION OF DIFFERENT MAIZE (*ZEA MAYS* L.) HYBRIDS

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Abstract: Application of mineral fertilizers to soil is a prevalent practice in crop production throughout the world. However, relatively low fertilizer use efficiency (FUE) is a major threat to modern agriculture. FUE for potassium (K) seldom exceeds 40%. Such a low FUE increases the potential hazards of environmental pollution. Hence bringing improvements in FUE in various crops is a substantial issue both in terms of reducing cost of agricultural production and for protecting the environment. A green house experiment was conducted in Regional Agricultural Research Institute, Bahawalpur to evaluate the KUE of different maize hybrids. Seeds of fifteen maize hybrids, viz., P-3062, P-3013, P-30Y87, P-31R88, I-984, I-11, NK-6240, NK-6661, NK-6651, X-2276, X-2287, X-2291, YHD-555, YHD-444, SHF-256 were grown in tubs as control, adequate K (3.30 m*M*) and deficient (0.3 m*M*) K level using modified Johnson 's solution, for 35 days after sowing. Significant differences were observed among hybrids for total dry weight (g/plant), total K concentration (mg/g) and total K uptake (mg/plant) at control and adequate level, but differences at deficient level were not found non-significant. Only hybrids, X-2287, X-2291 and YHD-444 exhibited normal behavior in spite of K deficient level in the growth medium, which may be due to their efficient K uptake from K deficient medium. It means these hybrids are more efficient in K utilization as compared to rest of the hybrids. It is, therefore, suggested that a sound screening program should be started to identify those maize hybrids, which could perform better in K deficient soils.

ICPS-014 - RESPONSE OF MAIZE HYBRIDS/CULTIVARS TO VARIOUS LEVELS OF POTASSIUM AND IRRIGATION FREQUENCIES

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Abstract: A field experiment was conducted during summer 2006 at Regional Agricultural Research Institute, Bahawalpur Pakistan to study the response of maize hybrids to various levels of potassium and irrigation frequencies. Different hybrids respond significantly different for all the parameters. Statistical analysis of the data revealed that potassium @ 370 kg/ha increased days to tasseling, grain weight per cob, 1000-grain weight, grain yield and biological yield. Maximum 52.05 days to tasseling, 152.9 g grain weight per cob, 321.2 g thousand grain weight and 6891 kg/ha grain yield was observed from plots irrigated weekly. However, germination percentage and emergence m^{-2} was not affected significantly by irrigation. Silking delayed by fortnightly irrigation. NK-6240 performed better than NK-

6661, NK-6651 and Sultan. Interaction between hybrid and potash showed that NK-6240 gave maximum grain yield 9079 kg/ha, with 370 kg potash per hectare. NK-6661 also obtained maximum biological yield with 370 kg K ha^{-1} and weekly irrigation.

ICPS-015 - COMPARISON OF AGRONOMIC TRAITS OF DIFFERENT COTTON VARIETIES AT BAHAWALPUR, PAKISTAN

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Abstract: The study was undertaken to evaluate the performance of different cotton varieties (*Gossypium hirsutum* L.) on the basis of their agronomic traits. The crop was planted on May 3rd, 2006 in a Randomized Complete Block with four replications having plot size 6.09m x 12.19m. Data was recorded at the time of maturity with standard procedures and was analyzed statistically using M stat-C software program. Significant difference among varieties for plant height, number of leaves, number of opened bolls, boll weight and seed cotton yield was found. Boll weight was the maximum for NIAB-111(3.31 g), while CIM- 496 had higher plant height, number of leaves, number of opened bolls and seed cotton yield as compared to other varieties. However cotton varieties CIM-496, NIAB-111, BH-160 and CIM-534 were statistically better yielder giving 124.50 g, 114.8 g, 99.62 g and 98.63 g seed cotton yield per plant respectively as compared to CIM-507 (77.00 g/plant) and CIM-506 (67.72 g/plant) varieties. Therefore the better yielding varieties are recommended to be grown in Bahawalpur region.

ICPS-016 - ALLELOPATHIC POTENTIAL OF *ACROPITILON REPENS, NEPETA PRETERVISA* AND *ZYGOPHYLLUM FABAGO*

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Abstract: Medicinally important plants *Acropitilon repens (*Asteraceae*), Nepeta preatervisa* (Laminaceae) *and Zygophyllum fabago* (Zygophyllaceae*)* collected from Balochistan, Pakistan were checked for their cytotoxicity and allelopathic potential. The ethanolic extracts of the whole plants were investigated for their effects on the development of different test species. The growth of Pennisetum and *Lemna aequinoctialis* was significantly inhibited by the ethanolic extracts. *Zygophyllum fabago* and *Acropitilon repens* significantly inhibited 70% and 65% while *Nepeta preatervisa* showed 50% at high concentration.

ICPS-017 - *IN VITRO* EVALUATION OF DIFFERENT FUNGICIDES AND PLANT EXTRACTS AGAINST *BOTRYADIPLODIA THEOBROMAE*, THE CAUSAL AGENT OF QUICK DECLINE OF MANGO

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Abstract: An *in vitro* evaluation of the effect of Topsin M, Dacomil, Copper oxychloride and Mancozeb fungicides against the mycelial growth of *Botryadiplodia theobromae*, the causal organism of quick decline of mango (*Mangifera indica* L.) revealed that effectiveness of the fungicides increased with increased dosage rate. Topsin M, and Dacomil were found to be most effective fungicide, Copper

oxychlorid was intermediate while Mancozeh was the least effective fungicide in inhibiting the mycelial growth of *B. theobromae*. Similarly *in vitro* evaluation of the effectiveness of the extract of neem (*Azadriachta indica*), garlic (*Allium sativa*), onion (*Allium pativa*) and safeda (*Eucalyptus cameldulensis*) against the mycelial growth of *B. theobromae* revealed that safeda and neem extracts were the most effective while garlic and onion extracts were comparatively and statistically less effective in inhibiting the vegetative growth of the fungus.

ICPS-018 - RESPONSE OF DIFFERENT GROWING MEDIA ON GROWTH AND FLOWERING OF *ZINNIA ELEGANS* L. CV. BLUE POINT

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Abstract: Zinnia is the cheerful summer annual and gaining popularity for its more colorful blooms. Present study was conducted to evaluate the effect of different growing media on the growth and flowering of *Zinnia elegans* L. cv. Blue Point. Different growing media including coconut compost, silt, leaf manure, manure mix (silt 1 + sand 1 + leaf manure 1) were used for growing zinnia. The experiment laid out in complete randomized design giving equal importance to treatments. The properties of each medium, including water holding capacity (saturation percentage), pH, total nitrogen, available phosphorus and available potassium were determined. Plant height, number of leaves per plant, number of side branches, days to first flower emergence and number of flowers were affected significantly when plants were grown in leaf manure mix. Size of the flowers was significantly increased in coconut compost which produced maximum size of flowers. Flower quality was found to be non significant affected with the use of various growing media. It is therefore opined that the utilization of coconut compost, silt and leaf manure is a good source of NPK. Therefore, utilization of growing media in combinations proves more effective for the good growth and flowering of zinnia.

ICPS-019 - GROWTH REGULATORS EFFECT ON CALLOGENESIS AND EMBRYOGENESIS OF AMY'S ORCHID (*DENDROBIUM* 'SABIN' HYBRID)

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Abstract: The experiment was carried out in Plant Tissue Culture Cell, Institute of Horticultural Sciences, University of Agriculture, Faisalabad during the year 2005 to explore the effect of NAA and BAP on callogenesis and embryogenesis of orchid (*Dendrobium* 'Sabin' hybrid). in this experiment culture success percentage, number of days to initiate callus, callus induction (%), callus proliferation (%), number of days for embryoids formation and embryogenesis (%) of orchid cultured on MS media containing different levels of NAA (0, 0.1, 0.2, 0.3 and 0.4 mgL^{-1}) for callogenesis and BAP alone (0. 0.1, 0.2, 0.3 and 0.4 mgL^{-1}) and combinations of both NAA and BAP for embryogenesis were observed. The results revealed that the use of different levels of NAA and BAP had a significant effect. Among the different levels of NAA and BAP, maximum culture success (83%), callus initiation (70%), callus induction (70%) and callus proliferation (70%) was obtained from 0.2 mgL^{-1} NAA and maximum embryoids formation (89%) was depicted from 0.3 mgL^{-1} BAP and somatic embryogenesis (91%) was observed at the highest level of NAA + BAP (0.4 mgL^{-1} NAA + 0.4 mgL^{-1} BAP). At the same time, the lowest culture success (50%), callus initiation (27%), callus induction (53%), callus proliferation (48%), embryoids formation (73%) and somatic embryogenesis (73%) were found in control.

ICPS-020 - MPLASM EVALUATION OF MEDICINAL AND AROMATIC PLANTS IN BALOCHISTAN, PAKISTAN

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Abstract: Studies are being initiated by the Arid Zone Research Centre, Quetta with the financial support of Ministry of Food, Agriculture and Livestock in Balochistan for cultivation potential of medicinal and aromatic plants. A medicinal herbs garden has also been established at Arid Zone Research Centre, Quetta with more than 60 potential medicinal and aromatic plants. This germplasm category includes culinary and herbal teas (*Thymus vulgaris*, *Matricaria recutita*, *Ocimum basilicum*, *Mentha piperita*, *Rosmarinus officinalis*, *Cymbopogon citrates*, *Artemisia drancunculus*, *Origanum majorana*, *Origanum vulgare*,). Aromatic plants (*Lavandula angustifolia*, *Lavandula stoechas*, *Rosmarinus officinalis*) and medicinal plants (*Tanacetum parthenium*, *Hyssopus officinalis*, *Pimpinella anisum*, *Achillea celifolium*, *Anthriscus cereifolium*, *Borago officinalis*, *Salvia officinalis*, *Oenothera biennis*, *Crocus sativus*). Available germplasm of annual sown crops like (*Foeniculum vulgare*, *Carum copticum*, *Linum usitatissimum*, *Anethunm sowa* and *Nigella sativa*, *Cuminum cyminum*) were evaluated and also characterized for morphological description and registration with the Federal Seed Registration and Certification Department. These crops have also been introduced among the farming communities in different agro-ecological zones of Balochistan. The results indicate that medicinal and aromatic plants have great potential for commercial scale cultivation in Balochistan subject to provision of better and sustainable marketing avenues.

ICPS-021 - ROVING *AGROBACTERIUM* MEDIATED TRANSFORMATION PROTOCOL FOR INTEGRATION OF *XA21* GENE IN WHEAT (*TRITICUM AESTIVUM* L.)

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Abstract: Wheat is an important food crop, improving wheat varieties via gene transformation is a prerequisite to enhance its yield. During present study embryo derived calli of three wheat varieties viz. Chakwal-97, Inqlab-91 and Tartara-2000 were infected with *Agrobacterium tumefaciens* strain EHA101 carrying genes *Xa21* for bacterial blight resistance. Hygromycin at 50 mg/L was lethal dose for the selection of transformed calli. The average GUS expression was observed when co-cultivation time period was kept for two days and normal bacterial growth was observed. Regarding to age of callus, it was observed that the highest number (15%) of GUS expression was observed from 21 days old calli. To enhance the host bacterium interaction, different acetosyringone concentrations i.e. 0 µM, 50 µM, 100 µM, 200 µM, 300 µM and 400 µM were used. Callus differentiation was not observed at 0-50 µM application, hygromycin resistant calli were obtained from the calli treated with acetosyringone with high concentrations (200-400 µM). In particular, the application of 400 µM acetosyringone promoted the production of resistant calli and GUS expression found to be higher in Inqlab-91 (90%) as compared to rest. Effect of antibiotics carbenicillin (500 mg/L) and cefotaxime (500 mg/L) or both in selection and regeneration of transformed wheat calli was investigated and result showed that both cefotaxime (500 mg/L) and carbenicillin (250 mg/L) are better than cefotaxime (500 mg/L) or carbenicillin (500 mg/L) alone for the control of bacteria. Transient GUS expression was observed in calli of all varieties. Stable GUS expression was observed in transformed leaves and roots of all varieties especially Tartara-2000 and Inqlab-91. All the transgenic plants were established in establishment room and were grown to maturity. The PCR analysis confirmed the transformed plants.

ICPS-022 - SCREENING OF LOCAL WHEAT VARIETIES AGAINST BACTERIAL LEAF STREAK CAUSED BY DIFFERENT STRAINS OF *XANTHOMONAS TRANSLUCENS* PV. UNDULOSA (XTU)

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Abstract: Wheat is one of the most important food crops of Pakistan, but its yield is adversely affected due to bacterial leaf streak disease caused by *Xanthomonas translucens* pv. undulosa (Xtu) result in 20% decrease in yield. During present investigation six wheat varieties including Chakwal-97, Inqlab-91, GA-2002, Aquab-2002, Punjnand-2000 and Tartara-2000 were screened against ten different strains of *Xanthomonas translucens* pv. undulosa (Xtu) at various stages of plant growth to check virulence against bacterial leaf streak. Wheat nursery was grown in glass house and pathogenicity of each strain/isolate was tested at seedling stage (4 weeks olds) and at tillering stage (8 week-old) wheat plants by using clipping method of artificial inoculation. The symptom development was rated by counting water-soaked lesion, number, size and progress of necrosis on leaves and the resistance of particular variety against particular strain was determined. It was evident from the results that all the six wheat varieties were susceptible to *Xanthomonas translucens* pv. undulosa (Xtu) but Aquab-2002 was highly susceptible to all the exotic/local strains/isolates of *Xanthomonas translucens* pv. undulosa (Xtu) with an average of maximum percentage(69%) of disease incidence and Inqlab-91 was least virulent (10%). The highest maximum percentage (83%) disease incidence was for *Xanthomonas* strain UPB-513 at the seedling stage of Aquab-2002. The disease incidence of all the six wheat varieties was less at maximum tillering stage (52%) as compared to that of seedling stage (83%) for Aquab-2002 as well as all other varieties. Reactions of bacterial strains were variable (10-83%) to different wheat varieties and the response of bacterial strains/isolates was also found variable (0-72%) within the same wheat varieties.

ICPS-023 - QUANTIFICATION OF PHYSIOLOGICAL AND BIOCHEMICAL CHANGES IN RICE DUE TO PLANTING MODES

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Abstract: The objectives of the research project were to evaluate the effect of planting modes based on varying moisture levels on the growth and yield of two rice cultivars viz. KS-282 (coarse cultivar) and BAS-385 (fine cultivar) under natural conditions. Two lowland rice cultivars including one coarse KS-282 and one fine BAS-385 were grown in two different planting modes i.e. beds and flat fields at Kala Shah Kaku (KSK), Lahore. The endogenous level of growth promoting hormones Gibberellic Acid (GA) and Indole Acetic Acid (IAA) as well as sugar and protein content of leaves and grain has been increased at tillering and soft dough stages but decreased at mature grain stage. The magnitude of increase was more in Flat Field (FF) as compared to Raised Beds (RB) in both the varieties. The stomatal resistance of flag and penultimate leaves was higher in flat field as compared to raised beds at tillering stage in both the cultivars. Root length, weight and plant height was significantly higher in BAS-385 as compared to KS-282 under both planting modes. It is inferred that difference in the moisture availability in the FF and RB significantly affect the physiology of plants and yield was higher in FF planting modes as compared to RB.

ICPS-024 - ROLE OF PHOSPHATE SOLUBILIZING BACTERIA, *RHIZOBIUM* AND PGPR ON THE GROWTH AND YIELD OF SOYBEAN

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Abstract: The investigation was aimed to determine the effect of inoculation of two different strains of phosphate solubilizing microorganisms (PSM I, strain CA 18 and PSM II, strain 54RB), plant growth promoting rhizobacteria (*Enterobacter* strain A) and *Rhizobium* (strain Tal 377) on yield, number and weight of nodules of soybean plant. The experiment was conducted under natural condition. Soybean seeds were coated with carrier-based inoculum of *Rhizobium* (strain Tal 377) prior to sowing while PSM I (strain CA 18), PSM II (strain 54RB) and *Enterobacter* were applied as broth culture to seedlings at two-leaf stage. The numbers of nodules were counted at flowering stage and the diameter of pink bacteroid tissue was measured. Both the strains of PSM were tested for their efficiency to solubilize the tricalcium phosphate in vitro. Colony diameter, halozone production and solubilization index of PSM II (strain 54RB) was greater than that of PSM I (strain CA 18). Beneficial effects of inoculation with *Rhizobium* (strain Tal 377), *Enterobacter* (strain A) and PSM I and II were obtained in all growth parameters on soybean. Co-inoculation with the above mentioned microbes resulted in maximum increase in plant biomass, root nodulation, number, weight and length of pods as compared to control (non-inoculated) and single. The coinoculation of PSM strain and *Enterobacter* was most effective and may be exploited in the production of biofertilizer.

ICPS-025 - PRODUCTION OF ALKALINE PROTEASE BY *BACILLUS SUBTILIS* AND ITS APPLICATION AS A DEPILATING AGENT IN LEATHER PROCESSING

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Abstract: The work describes the production of alkaline protease in shake flasks and lab scale fermentor from a mutant strain of *Bacillus subtilis* IH-72. The production of alkaline protease was enhanced by optimization of cultural conditions in shake flasks and fermentor. The alkaline protease so produced was applied to the goat skin for the removal of hair. The experiments were carried out in the Institute of Leather Technology, G. T. Road Gujranwala. The skin pieces were treated in three different ways; singly with the enzyme, in combination with the lime sulphide and singly with lime sulphide. The best results with the skin processing were obtained, when skin was treated with crude enzyme in combination with 7 % lime sulphide. The quality of pelt (color, grain, stretch, scud etc) and physical properties of the finally prepared leather (tensile strength, tear strength, bursting strength etc) were also improved with the use of proteolytic enzymes produced by *Bacillus subtilis* IH-72.

ICPS-026 - EFFECT OF DROUGHT AND ABSCISIC ACID (ABA) ON WATER STATUS AND BIOCHEMICAL CONTENTS OF FOUR WHEAT (*TRITICUM AESTIVUM* L.) ACCESSIONS

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Abstract: The response of four wheat (*Triticum aestivum* L.) accessions (011251, 011417,011320, 011393) to drought and exogenously applied ABA were determined in a pot study by measuring plant parameters such as relative water content (RWC), water potential, proline, protein, sugar and total chlorophyll content of leaves at booting and grain filling stages. Sampling of plants was done after 3, 6

and 9 days from the start of drought treatment. Recovery was studied after 48 and 72h of re-watering. Marked decreases in leaf water potential, RWC and chlorophyll content and an increase in accumulation of sugar and proline under drought stress occurred. Increase in proline content was less at grain filling than at booting stage. While the leaf protein content under drought stress treatment was variable among the accessions, an increase in protein content under drought stress remained a dominant response except for accession 011251 particularly at booting stage. Accession 011320 was found to be the most sensitive among all the accessions on the basis of greater decrease in RWC and water potential and less accumulation of proline. The inhibitory effects of water stress on plant water status and biochemical contents were ameliorated by ABA seed soaking treatment and this ameliorating effect was found to be more significant at booting stage as compared to grain filling and this effect of ABA was more pronounced in case of the sensitive accession 011320. Upon re-watering the recovery from drought stress was found to be greater in case of ABA treated plants as compared to untreated plants.

ICPS-027 - VARIABILITY OF NATIVE *RHIZOBIUM* AND *AZOSPIRILLUM* SP. ASSOCIATED WITH WHEAT AND MAIZE IN SEMIARID AREAS

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Abstract: Plant growth promoting bacteria (*Rhizobium* and *Azospirillum)* were isolated and identified from the roots and rhizosphere of wheat and maize plants collected from farmer's field of semiarid areas (Rawalpindi, Attock) and irrigated area (National Agricultural Research Center, Islamabad). The soil moisture content was found to be 10 to 20% less in semi arid areas as compared to that of irrigated area. *Rhizobium* and *Azospirillum* isolated from plants grown in irrigated areas showed higher value of colony count (as measured by log CFU/ml) as compared to that of semi arid area plants. All the isolated strains were identified with the help of physiological and biochemical tests using QTS miniatured identification system and the results were compared with those published in Bergy's manual of Bacteriology. In case of *Rhizobium,* Sodium citrate, Acid from Maltose, Tryptophan Deaminase, Indole and Acid from Melibiose tests were positive for isolates from water stressed plants. The tests result of Sodium citrate, Acid from Arabinose and Lysine decarboxylase were positive for *Azospirillum* isolates from water stressed plants. The genetic diversity among the isolates was assessed by RAPD (Randomly Amplified Polymorphic DNA Analysis) analysis. Diversity among the strains was assessed on the basis of variation of size, number and intensity of bands. Few strains which were found to be different on the basis of QTS fall into same group when analyzed by RAPD. Although RAPD is a more precise technique but a combination of QTS and RAPD is more preferable for strain differentiation. It has been demonstrated that it is possible to screen for superior *Rhizobium* and *Azospirillum* drought tolerant strains for obtaining inoculants able to give greater nitrogen fixation in crops of economic or agricultural importance.

ICPS-028 - INCREASING LEVEL OF POLLUTION IN QUETTA CITY DUE TO DUST FALL AND ITS CHEMICAL COMPOSITION

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Abstract: Rate of dust fall in urban areas of Quetta city was estimated through recommended methods using standard size and shape containers. Collection of dust fall from Quetta city was made from January 2001 to December 2002. The levels of dust fall in Quetta city during two consecutive years remained higher with high traffic density during summer and lower during winter with low traffic density. Significantly the highest values of dust fall were recorded at Shara-e-Iqbal, Jinnah road, Double

road, Sariab road and Masjid road with increasing percentage of dust fall per year 1.23 to 2.88%. Medium amount of dust fall was found at Mechangi road, Zarghoon road, Prince road and Patel road with increasing percentage of dust fall per year 1.30 to 3.62%, while lowest rate of dust fall during two year was recorded from Liaquat bazar with lowest increasing percentage of dust fall (0.60%) per year. Chemical and metallic analysis of dust fall on Quetta city was made through Atomic Absorption Spectrophotometer. This analysis indicates that the dust fall mainly contained Calcium aluminosilicate which contributed from particulate emission from automobile exhausts, construction activities, wind blown soil and sand particles of the surrounding area and road dust.

ICPS-029 - LEGUME GENETIC RESOURCES – PRESENT STATUS AND FUTURE PROSPECTS

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Abstract: Food legumes, either summer or winters have been associated with marginal inputs and interest since their domestication. Pakistan enjoys four distinguish seasons a year that favour to produce winter as well as summer legumes. Winter legumes consists of chickpea (*Cicer arietinum* L.), lentils (*Lens culinaris*), peas (*Pisum sativum*), grass pea (*Lathyrus sativus*) and faba bean (*Vicia faba*), whereas summer legumes are mungbean (*Vigna radiata*), black gram (*Vigna mungo*), cowpea (*Vigna unguiculata*) and moth bean (*Vigna oconotifolium*). Common bean (*Phaseolus vulgaris*) is confined to high mountainous region of northern areas ranging the altitude 1000 to 2400 m. These legumes have been collected and preserved in the gene bank as active collection (short duration, 10 ^{o}C, 20 years), base collection (medium term, 5 ^{o}C, 50 years) and original collection (long term,–20 ^{o}C, more than 50 years). The number preserved in the gene bank is 2243 (chickpea), 805 (lentil), 645 (peas), 99 (lathyrus), 58 (faba bean), 712 (mungbean), 647 (black gram), 192 (cowpea), 66 (moth bean) and 102 (common bean). About 90% of summer legumes and 60% winter legumes have been characterized and evaluated. The germplasm of black gram (340 accessions), mungbean (260 accessions), lentil (350 accessions), chickpea (350 accessions), wild chickpea (40 accessions), peas (345 accessions), cowpea (173 accessions) and wild Vigna spp. (one accession) have been evaluated for total seed protein profiling. Except peas and wild chickpea, a low level of genetic diversity was observed for all the material evaluated. Forty accessions of wild chickpea were evaluated for total seed proteins that indicated high level of genetic diversity as compared with cultivated chickpea. This situation lead to use of DNA markers, therefore 40 accessions of black gram, 17 of lentil and 40 of pea were analyzed for RAPD that gave higher level of genetic diversity than SDS-PAGE. It was concluded that SDS-PAGE could confidently be used for identification of various species of legumes (*Vigna radiata* vs *V. mungo*; Lens vs Vicia), whereas this technique did not prove efficient for investigating intra-specific identification and it was assumed that SDS-PAGE may define a small portion of genetic diversity in legumes. Legume genetic resources are required to be characterized and evaluated along with protein and DNA markers for predicted utilization and better gene bank management. Comprehensive data will lead to establishment of core collections and enable researchers to eliminate duplications from the collections and to minimize labor and cost involved in crop improvement program. Low genetic diversity coupled with low stability is a characteristic for most of the legumes that could be minimized by developing a sound linkage between various stakeholder including CGIAR centers for legumes development program.

ICPS-030 - ESTIMATION OF CHARACTER ASSOCIATION AND COMPONENT ANALYSIS IN SOYBEAN (*GLYCINE MAX* L.)

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Abstract: The present investigation was undertaken to assess the relationship of some morphological traits in ninety-two genotypes of soybean (including four checks) that are potential new sources of genetic variation for soybean breeding programs in Pakistan. The studies were conducted at the experimental field of National Agricultural Research Centre, Islamabad during July-Oct 2004. High variances were observed for chlorophyll content, pods plant^{-1} and plant height indicating large variations in these traits. The first three principal components with eigen value > 1 explained 65.03% of the total variance caused in the characters. Factor 1 composed of days to 50% flowering, days to pod initiation and days to maturity with positive loadings. While rest of the characters contributed with negative loadings. Factor 2 also consisted of 1st pod height, days to 50% flowering, days to maturity and grain yield with negative loadings. Plant height contributed positively while pods plant^{-1} contributed negatively to factor 3. The grain yield was positively and statistically significant correlated with chlorophyll content, pods plant^{-1} and 100-seed weight, while it was negatively and statistically significant related with days to 50% flowering, days to pod initiation. Chlorophyll content should previously be evaluated in selection to increase the grain yield in soybean breeding programs. Pods per plant should be handed together with branches per plant. Apart from the other selection criteria, the grain weight should solely be evaluated to select large grained genotypes.

ICPS-031 - RICE RESPONSE TO SOIL CONDITIONER AND MICRONUTRIENTS APPLICATION IN SALINE SODIC CONDITION

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Abstract: A collaborated field experiment was conducted by 4B fertilizers & BZU (Agriculture College Multan) at the research farms of BZU. Response of Rice (Shaheen Basmati) to soil conditioner (Polyacetate) and micronutrients (Zn, B, Cu) was studied under saline sodic condition. The experiment was laid down under RCBD with three replication and two treatments. Soil was chemically analyzed before and after application. Products of 4B fertilizers were applied at different growth stages. Different growth parameters of rice; plant height, no of tillers, earing length, no of grains per ear, 1000 grain weight and final yield were studied. STEP (Polyacetate, soil conditioner) was sprayed @ 2000 ml/acre in the field before transplanting. TROPHY (Chelated Zinc) was fertigated @ 500 ml/acre after 14 days of transplanting. When crop was in booting stage mixture of Chelated copper (IGNITE) and amino boron (BOLLFEED) @ 250 + 250 ml was fertigated. It was concluded that soil conditioner and micronutrients application increased all rice yield parameters and yield by 31 % in saline sodic condition.

ICPS-032 - EFFECT OF PLANT DENSITY ON AGRONOMIC CHARACTERISTICS, CHLOROPHYLL CONTENT AND STEM REMOBILIZATION PERCENTAGE IN FOUR GRAIN SORGHUM (*SORGHUM BICOLOR* (L.*) MOENCH)* VARIETIES

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Abstract: Determination of optimal plant density and cultivar selection is one of yield increment approaches in grain sorghum. An experiment with factorial arrangement in randomized complete block design (RCBD) with tree replications was done at Birjand in 2003. In order to evaluate the effects of plant density (100000, 180000 and 260000 plant/ha) on seed yield, yield components, and some

physiological traits 4 grain sorghum varieties (Sepideh, Saravan Local, Payam and Kimia)were used. The results showed that the density increment (from 100000 to 260000 plant/ha) had advantage for seed yield. However, the lower density, due to reduction of plant competition, resulted significant increase in single plant yield, number of seeds per panicle, remobilization percentage of different parts of stem and stem remobilzation percentage. The highest stem remobilization percentage belonged to top of stem internode. Effect of density was not-significant on traits such as chlorophyll index and 1000 kernel weight. Cultivars were significantly different in all of studied traits. Interaction between variety and density was significant on stem remobilization percentage and number of seed per panicle. There was a significant relationship between grain yield, 1000 kernel weight (r=0.73**) and number of seed per panicle (r=0.62**). It was concluded that Saravan local variety with grain yield of 12.75 ton/ha and density of 260000 plant/ha were the best combination of treatments.

ICPS-033 - EFFECT OF SOWING DATE AND PLANT DENSITY ON YIELD AND YIELD COMPONENTS OF COMMON PURSLANE *(PROTULACA OLERACEA* L.*)*

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Abstract: In order to study of sowing date and plant density effect on yield and yield components of common purslane an experiment was conducted in spring 2006 at Azad University of Birjand. The experiment was done as split plot based on completely randomized block design with 3 replications. In this study 4 sowing date including (4, 21 April, 5 and 20 May) were used as main plot and 3 levels of plant density including (5.5, 8.3 and 16.6 plant/m^2) as sub plot. In this research traits such as number of capsules per plant, number of seeds per capsule, 1000 seed weight and grain yield were studied. The results showed that effect of harvest was significant on number of capsules per plant, number of seeds per capsule and grain yield and all of traits were high in second harvest. Effect of sowing date and interaction between Sowing date and harvest were significant on all of traits. Late planting caused to decrease of traits such as number of capsules per plant, number of seeds per capsule and 1000 seed weight. Effect of plant density and interaction between plant density and harvest were significant on number of seeds per capsule and grain yield, as increase of density caused to decreased of seeds number per capsule and increased of grain yield. Interaction between sowing date and plant density was significant on number of capsules per plant and grain yield. Interaction between sowing date, plant density and harvest was significant on number of capsules per plant, number of seeds per capsule and 1000 seed weight. Late planting date caused to decreased of total grain yield. As seed yield was 2066.33, 1710.55, 1461 and 1287.1 kg/ha in planting dates treatments, respectively. Plant density had significant effect on total grain yield. As increase of plant density caused to 68.64% increment of total grain yield. Interaction between sowing date and plant density was not significant on total grain yield. According to the results of this experiment showed that sowing date of 4 April and density of 16.6 plant/m^2 is optimum for obtain of high yield for common purslane.

ICPS-034 - THE EFFECT OF PLANTING DATE AND NITROGEN ON YIELD AND YIELD COMPONENTS OF BLACK CUMIN *(NIGELLA SATIVA* L.*)*

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Abstract: In order to study the effect of planting date and nitrogen on yield and yield components of black cumin *(Nigella sativa* L.*)* an experiment was conducted in spring 2006 at Azad University of

Birjand. The experiment was done as split plot design based on completely randomized block with 3 replications. In this study 4 planting date including (21 March, 4, 21 April, 5 May) were used as main plots and 3 levels of nitrogen including (40, 80 and 120 kg/ha) were as sub plots. The results showed that late planting date decreased traits such as plant height, number of main branches, number of follicles per plant, biological yield and harvest index. However planting date had no significant effects on number of follicles in main branches, number of seed per follicles, 1000 seeds weight and seed yield. Seed yield was 732.15, 663.6, 391.8 and 483.1 kg/ha in planting date treatments, respectively. Amount of nitrogen and interaction between planting date and nitrogen with the exception of harvest index had no significant effect on other traits. Application of 40, 80 and 120 kg/ha nitrogen resulted in 521.8, 555 and 626.1 kg/ha seed yield respectively. There was no significant differences between 40, 80 and 120 kg/ha nitrogen on above traits. According to the results of this experiment amount of 40 kg/ha nitrogen is enough for black cumin.

ICPS-035 - CHARACTERIZATION OF *AZOSPIRILLUM* AND *RHIZOBIUM* SP. ISOLATED FROM KHEWRA MINES SALT RANGE AND ARID AREAS OF DISTRICT ATTOCK

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Abstract: Present investigation was aimed to isolate, identify and compare plant growth promoting rhizobacteria (*Rhizobium* and *Azospirillum*) from rhizosphere soil and roots of salt stressed plants: *Sonchus arvensis* L.*, Solanum surratense* Burm. f.*, Lactuca dissecta* D. Don and *Chrysopogon aucheri* (Boiss.) Stapf collected from Khewra mines natural salt range (altitude ranging from 313-350 m.a.s.l) and compared with *Solanum surratense* Burm. f collected from district Attock(altitude ranging from 305-1067) and was treated as control. Nutrient contents (Na^+, Ca^+, Mg^+, Cl^-, K^+ and HCO_3^{-1}) and EC value of saline soil (1800-2100 µS/cm) was higher as compared to control soil (210 µS/cm). The isolates were identified and characterized on the basis of morphological, biochemical and molecular tests including colony shape, motility, gram staining, oxidase and catalase tests, QTS-24 miniaturized identification system and Randomly Amplified Polymorphic DNA (RAPD) analysis. Colony count (CFU/ml) of *Rhizobium* and *Azospirillum* isolates from salt range were low as compared to isolates of control plant. Some QTS tests(acid from arabinose, acid from rhamnose, Acid from inositol and acid from sorbitol) were negative in case of *Rhizobium* isolates from Khewra salt range while these were positive in case of *Rhizobium* isolates from *Solanum surratense* Burm. f of Attock zone. There was no marked difference in QTS test results of normal and salt stressed *Azospirillum* isolates. The genetic diversity of strains was explored by RAPD analysis using primer OPI-06. There was marked difference in DNA banding pattern of isolates from Khewra salt range and Attock. Those strains of *Azospirillum* and *Rhizobium* which fall into same group on the basis of QTS tests markedly different on the basis of RAPD results.

ICPS-036 - ENHANCED PRODUCTION OF GLUCOSE OXIDASE USING *PENICILLIUM NOTATUM* AND RICE POLISH

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Abstract: Glucose oxidase (GOD) is an important enzyme that finds a wide range of applications in food and pharmaceutical industry. In this investigation the feasibility of using rice polish as a substrate for the production of GOD by *Penicillium notatum* in submerged fermentation (SmF) has been evaluated. The intention was to enhance total GOD activity by the selection of economical substrate,

microorganism and consecutive optimization of various cultural conditions. Maximum GOD activity of (112±5) U/mL was achieved under optimum growth conditions. The optimum growth conditions were rice polish 5 g, incubation period 72 h, buffering agent 3 % (by mass per volume) and incubation temperature (30±1) °C and pH=6.0. Addition of carbon and nitrogen additives further enhanced the enzyme yield, indicating an economically attractive process for GOD production.

ICPS-037 -PRODUCTION OF GLUCOAMYLASE BY *RHIZOPUS SP*. IN LIQUAID CULTURE

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Abstract: Isolated *Rhizopus*-RFF was cultured at liQuaid culture medium for the production of glucoamylase. Seventeen *Rhizopus* isolates were used for the production of glucoamylase. An extensive screening program was carried out to select the potential isolates. Among those, *Rhizopus*-RFF showed the 100% relative activities and for the investigations were carried out by the *Rhizopus*-RFF. To optimize the suitable environmental condition for the production of maximum activities of glucoamylase, some of their physico-chemical parameters such as temperature, range of pH, incubation period, and nitrogen sources were separately tested. 10% potato starch was used as substrate for fermentation process. The highest percentage of enzyme activity was observed at 45ºC with pH 4.5. Combined use of 0.3% polypeptone and 0.3% yeast extract was yielded 8.33 U/g the highest activities of enzyme.

ICPS-038 - FERTI-IRRIGATION OF TREATED DISTILLERY EFFLUENT (LIQUAID GOLD) AND ITS SUSTAINABLE IMPACT ON GROWTH PHYSIOLOGY OF *ORYZA SATIVA* AND SOIL FERTILITY

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Abstract: Indiscriminate disposal of treated distillery effluent as liQuaid gold (cf. Petroleum) of alcohol industry in water and on land leads to serious pollution and changes nutrient and biodiversity. However, it contains valuable macro and micro minerals, which are easily amenable by microorganism for soil fertility. A study was carried out to observe the effect of treated distillery effluent on the seed germination of *Oryza sativa* L. The study revealed that 25 % concentration of effluent promoted seed germination and seedling growth of two cultivars of *Oryza sativa* cv. Pusa-44 and Saka-4. The higher concentration of effluent has phototoxic effect on seed germination and seedling growth. Emergence index, vigor index, germination relative index, phytomass and chlorophyll content were found significantly higher in 25 % concentration than 50 % and 100 % of distillery effluent than over control. It is recommended that 25 % distillery effluent can be recycled as ferti-irrigation for sustainable agriculture. Well-designed ferti-irrigation technology has been discussed for zero pollution by reduce, reuse and recycle (3 R's) the effluent to minimize pollution of rivers and groundwater in Indian sub-continent.

ICPS-039 - BREEDING HIGH YIELDING AND DISEASE RESISTANT MUNGBEAN (*VIGNA RADIATA* (L.) WILCZEK) GENOTYPES

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Abstract: Genetic variability was created through induced mutations by irradiating two mungbean varieties NM 92 and NM 98 using ^{60}Co gamma cell, and hybridization of local i.e. NM 92 and NM 98 and exotic genotypes i.e. VC 1560D, VC 1482C and VC 3902A. The generations from M_1-M_5/F_1-F_5 were raised from kharif 2004 to summer 2006 and selections were made on the basis of seed yield, large seed size and resistant to Mungbean Yellow Mosaic Virus (MYMV) in each segregating generation. The stable and high yielding genotypes developed through continuous selections from the segregating populations were screened for MYMV during kharif 2006 and evaluated in replicated yield trials for seed yield and some important agronomic traits at NIFA, Peshawar during summer 2007. The mutants/recombinants with significantly higher seed yield than check variety showed seed yield of 2250 to 3042 kg ha^{-1}. 1000 seed weight, days to flowering and physiological maturity of all the evaluated mutants/recombinants ranged from 39 to 51g, 40 to 49 days and 79 to 84 days, respectively. The MYMV rating of the mutants/recombinants was from resistant to highly resistant. The developed high yielding and MYMV resistant mutants/recombinants will be further evaluated for adaptation and stability studies in multilocation and National Uniform Yield Trials to select the outstanding mungbean genotype for evolving as a mungbean variety for general cultivation in NWFP.

ICPS-040 - MACRO AND MICRO-MORPHOLOGICAL STUDIES IN DROUGHT TOLERANT BREAD WHEAT GENOTYPES UNDER RESIDUAL MOISTURE OF RICE CROP

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Abstract: Six drought tolerant wheat genotypes (Pasban, Rohtas, Sind-81, Lu-26-S, Chakwal-86 and DS-17 were grown during the rabi season 2005-2006 on the residual moisture of rice field, at the experimental field of NIA Tandojam. Significant differences were observed in macro- morphological and micro-morphological traits. The genotypes Pasban and Lu-26-s showed longer spike, higher grain /spike and higher grain yield under drought condition as compared to other. Pasban and Lu-26-s also showed more tolerance in micro-morphological traits such as stomatal frequency/mm^2, epidermal cell frequency/mm^2 and stomatal length in flag leaf as compared to others.

ICPS-041 - ISOLATION AND CHARACTERIZATION OF AN ACID INVERTASE FROM *SACCHARUM OFFICINARIUN* VAR. HSF-240

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Abstract: Invertase (β-D-fructofuranosidase, EC 3.2.1.26) catalysis the hydrolysis of sucrose into D-glucose and D-fructose, the main forms of carbon and energy supply in plant metabolism. Plant invertases include a variety of forms and can be classified as acid, alkaline/neutral invertases according to the optimum pH of catalysis. In the present investigation, an acid invertase was isolated from *Saccharum officinariun* var. HSF-240 and partially purified using ammonium sulphate ion exchange chromatography. The optimum pH and temperature for the enzyme were, 2.6 and 45°C. The K_m value

and energy of activation (Ea) for sucrose were, 5 m*M* and 42.23 k $Jmol^{-1}$ respectively. The activity of the enzyme was remarkably enhanced by cations like Ca^{2+}, Mg^{2+}, Cd^{2+}, Ba^{2+} etc. Kinetics of thermal inactivation of this enzyme was also investigated.

ICPS-042 - FUNGICIDAL ACTIVITY OF MANGROVE SPECIES AGAINST ROOT ROT FUNGI

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Abstract: Aqueous and ethanol extracts of mangroves species viz., *Avicennia marina*, *Rhizophora mucronata*, *Ceriops tagal* and *Aegiceras corniculatum* were used for fungicidal activity. Mangrove species plant parts showed fungicidal activity against root infecting fungi viz., *Fusarium* spp., *Rhizoctonia solani*, *Macrophomina phaseolina.* Paper disc method showed inhibition of all test fungi when used @ 1000 ppm of *A. marina* whereas *R. mucronata* and *C. tagal* inhibited the growth of *Fusarium* spp., @ 1000 ppm followed by 500 and 250 ppm. Ethanol extract of mangrove species showed maximum inhibition of root rot fungi as compared to aqueous extract. Of the four mangrove species plant parts used, *A. marina* was found most effective followed by *R. mucronata*, *A. corniculatum* and *C. tagal*.

ICPS-043 - EFFECT OF *RHIZOBIUM,* PHOSPHATE SOLUBILIZING BACTERIA AND PHOSPHATIC FERTILIZER ON WHEAT (*TRITICUM AESTIVUM* L.)

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Abstract: The phosphorus (P) availability is low in soils because of its fixation as insoluble phosphates of iron, aluminum and calcium. Soluble forms of P fertilizer used are easily precipitated as insoluble forms. P supply through biological means such as phosphate solubilizing bacteria (PSB) is a viable alternative. Wheat experiments were conducted in potted soil during two consecutive years under natural conditions of Islamabad. Rhizobial strain (Thal 8) and a P solubilizer strain (54RB) were applied in broth culture at seedling stage. Fertilizer in the form of P_2O_5 was an additional treatment applied at sowing time. The results of wheat experiments revealed that co-inoculation of *Rhizobium* and PSB along with P_2O_5 was best treatment combination for improving Nitrogen and Phosphorus uptake; yield attributes and ultimately yield of wheat. Single inoculation of either *Rhizobium* or PSB with P_2O_5 was better than inoculation without P_2O_5. Phytohormones; indole acetic acid (IAA) and gibberellic acid (GA) production by *Rhizobium* and phosphate solubilizing bacteria and P-solubilizing ability by phosphate solubilizing bacteria were also substantial. It is inferred that co-inoculation in presence of P_2O_5 is not only environment friendly but also economical to save almost 50% P fertilizer.

ICPS-044 - HYPERACCUMULATORS OF HEAVY METALS OF INDUSTRIAL AREAS OF ISLAMABAD AND RAWALPINDI

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Abstract: Contamination of heavy metals is one of major threat to water and soil as well as human health. Phytoremediation have been used to remediate metal-contaminated sites. This study evaluated the potential of 23 plant species growing on contaminated sites in Industrial areas of the Islamabad and Rawalpindi. Plant root, shoot and the soil samples were collected and analyzed for selected metal

concentration values. To evaluate the potential of plant species for phytoremediation: Bioconcentration Factor (BCF), Biological Accumulation Coefficient (BAC) and Biological Transfer Coefficient (BCF) were calculated. The concentration of Pb in soils varied from 2-29 mg/kg, Zn from 28.82-172.56 mg/ kg, Cu from 8.88-306 mg/kg, respectively. The concentration of Pb in plant shoots varied from 1.0 to 39 mg/kg, Zn from 17.25 to 194.03 mg/kg, Cu from 0.65 to 171.83 mg/kg. The concentration of Pb in roots of plant varied 1-43 mg/kg, Zn from 3.34-116.16 mg/kg, Cu from 3.35- 416.89 mg/kg. *Brachiaria rapens* and *Malvestrum coromandialinum* were found most suitable for phytostabilization of sites contaminated with Pb and Cu (BCF= 18 and 9.12). Considering the BAC values, fifteen species for Pb, two species for Cu, five species for Zn possessed the characteristics of hyperaccumulator. None of the plant species was found as hyperaccumulator; however plants with high BCF (metal concentration ratio of plant root to soil) and low BTC (metal concentration ratio of plants shoots to roots) have the potential for phytostabilization and phytoextraction. The results of this study can be used for management and decontamination of soils with heavy metals using plant species having with phytoremediation potential/characteristics.

ICPS-045 - FIRST REPORT OF WHITE RUST OF *ERYSIMUM CRASSICAULE* BOISS. CAUSED BY *ALBUGO CANDIDA* FROM IRAN

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Abstract: *Albugo candida,* cause of white rust, is reported to occur on *Erysimum crassicaule* (Brassicaceae). In july 2007, diseased *E. crassicaule* (a biennial, 20-60 cm tall plant, distribution: Iran and Pakistan) leaves were brought from a rangeland in the Birjand region, eastern Iran. Disease symptoms included white to cream colored, blister-like sori on leaves. Sori mostly formed on abaxial surfaces but also were present on adaxial surfaces. Sori initially were whitish and enlarged to two mm. Sori contained palisades of sporangiophores. Sporangia were produced in chains, spherical to angular in outline, subhyaline, vacuolate, exhibited finely punctate walls and measured 15.5-19*14.3-16.3µm. The causal agent was determined to be *A. candida* on the basis of the morphology of sori, sporangiophores, sporangial chains and sporangia, as well as host family. This is thought to be the first report of *A. candida* on *E. crassicaule* in the world.

ICPS-046 - DETECTION OF QTLS FOR BLIGHT RESISTANCE IN CHICKPEA GENOTYPES WITH DNA BASED MARKERS

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Abstract: Chickpea blight caused by *Ascochyta rabiei* is one of the major diseases in Pakistan and other chickpea growing regions of the world. Different QTLs for resistance against the fungus has been identified in both inter and intraspecific crosses and are located on Linkage group 2 and 4. So far no resistance genes have been identified in Pakistan against blight through molecular markers and the objective of the present study was to screen local genotypes for the QTLs involved in resistance against blight. For this screening SSR, SCAR, ISSR and RAPD techniques were tried to detect the reported QTLs. The phenotypic evaluation of these genotypes is carried out in the Ascochyta blight screening nursery every year. The results predicted that QTL linked with STMS marker GAA47 in linkage group 4a is not involved in conferring resistance in local genotypes. Another important QTL on linkage group 4b is saturated with RAPD, SCAR and STMS markers and our studies of local genotypes show strong linkage of STMS and SCAR markers, on this linkage group, with blight resistance. Involvement of QTL located on linkage group 2 is still to be confirmed.

ICPS-047 - GENOTYPE X ENVIRONMENT INTERACTION FOR SEED YIELD IN KABULI CHICKPEA (*CICER ARIETINUM* L.) GENOTYPES DEVELOPED THROUGH MUTATION BREEDING

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Abstract: Elite lines of kabuli chickpea developed through mutation breeding at Nuclear Institute for Agriculture and Biology (NIAB), Faisalabad were evaluated for stability of grain yield at four diverse locations in the Punjab province during 2003-04, 2004-05 and 2005-06. The genotype yield, regression coefficient (bi), deviations from regression (S^2d) with sustainability index was used to identify the stable genotypes. Analysis of variance showed highly significant differences for environment (location, year), genotype and their interactions. Genotype x environment interaction (G x E) was of crossover in type. Mean seed yield performance of twelve environments indicated the superiority of mutant CM256/99 by producing the highest seed yield of 1349 kg ha^{-1} followed by CM305/99 (1344 kg ha^{-1}). CM256/99 and CM305/99 were having non-significant high bi and S^2d values coupled with high sustainability index. This showed that both mutants were better responsive to the favorable environments. CM315/99 produced above average yield with non-significant unit regression and deviations from regression with highest sustainability index (75.41%). This mutant was also adapted to high performing environments. Pb.1 and CM2000 (Checks) contradict with respect to the stability parameters and the sustainability index. According to the Eberhart and Russell model of stability analysis, Pb.1 was a stable genotype but had only moderate (53.55%) sustainability index and vice versa for CM2000. So, both the Eberhart and Russell model and sustainability index cannot be considered simultaneously for predicting the stable genotypes. CM102/99 had low and non-significant bi and S^2d values indicated its better response to poor environment. Pb.1, CM2000 and CM102/99 produced below average yield. The mutants CM256/99, CM305/99 and CM315/99 had shown stable performance under different locations by having above average seed yield, non-significant unit regression co-efficient along with the non significant variance due to deviation from regression.

ICPS-048 - SCREENING OF CHICKPEA MUTANTS TO *FUSARIUM* WILT

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Abstract: Genetic variability was induced in two desi (Pb2000 and C44), one kabuli (Pb-1) and one desi x kabuli recombinant genotype (CH40/91) through gamma irradiation and ethyl methane sulphonate (EMS) and 249 morphological mutants were selected. In M_4, these mutants along with their respective parents were screened for resistance to *Fusarium* wilt in natural wilt sick plot during 2003-2004 rabi season. All the four parent genotypes showed highly susceptible reaction to *Fusarium* wilt. Out of total 249 morphological mutants of four genotypes, 75 mutants exhibited highly resistant reaction (less than 10 %) followed by 31 mutants resistant (11 to 20%), 34 mutants moderately resistant / tolerant (21 to 30%), 35 mutants susceptible (31 to 50%) and 75 mutants were highly susceptible (50 to 100%). The mutagenic treatments were effective in producing morphological mutants and screening results revealed that these mutants also showed improved tolerance to *Fusarium* wilt. The mutants with resistant to tolerant reaction for *Fusarium* wilt could be used in hybridization program for transferring of resistance genes into high yielding elite cultivars.

ICPS-049 - SOME NEW APPROACHES ON INCREASING FORAGE PRODUCTION IN DRY REGIONS OF IRAN

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Abstract: Human demands for animal products are increasing rapidly, due to population increment and improvement of human welfare. Shortage of forage is the main constraint in arid and semi-arid regions for meat and dairy production including Iran, because of low precipitation and unequal rainfall distribution, depletion of underground waters and gradually increasing salinity of waters and soils. To provide more availability of forage for grazing animals, we have done some investigations in different aspects of halophyte and non halophyte plants. To increase productivity of rangelands, some promised plants identified, cultivated for adaptability and selected for range reclamation and also establishment of pure stand as pasture. Species such as *Agropron desertorum*, *A. elengatum*, *Bromus tomentellus*, *Kochia prostrata*, *Onobrychis sativa* and *Medicago sativa* for semi-arid region, and *Panicum antidotale* and *Atriplex Spp* for arid region are amongst the adapted species. By introducing the above mentioned plants to rangelands forage production was increased to about two to three times compared to native rangelands. *Alhagi pseudoalhagi* is a widespread species and accounted as weed and invader species in range and crop lands. This plant shows high tolerance to aridity and salinity. Production of this plant was measured to about 1 to 8 tone per hectare in different growth conditions. The hay of this plant was harvested and used for feeding goats and sheep in a mixed ration. The results showed that it can be used as a forage resource for feeding sheep and goats. The aridity and salinity dictated to use more salt and drought tolerance species in arid regions. For producing more forage in a harsh environment we found that barley, sugar beet, sorghum (*Sorghum bicolor*), *Panicum antidotal,* and *Atriplex* Spp. are all have medium to high tolerance to salinity and aridity and are suitable candidate species for this purpose. Improving quality and feed value of forage resources should be considered for improving animal productivity. For example, mixed ration of *Panicum* and *Atriplex* improved feed digestability. We believe that using more halophyetes as feed resources, needs to raise more adapted animals. Sheep, goat and camel may have high priority in dry regions in the future. The above subjects are discussed in detail in the text.

ICPS-050 - EFFECTS OF POLYPLOIDIZATION ON MORPHOLOGICAL AND CHEMICAL CHARACTERS OF *TRIGONELLA MARITIMA* L.

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Abstract: This work tends to evaluate the effect of the increase in the genic load by polyploidization on the morphological and chemical characters of *Trigonella maritima*. The polyploidization was induced by treatment with colchicine: immersion of germinated seeds in a solution of colchicine at 0.05%. We started with a comparison of the germinatif potential of the two types of seeds. At the fructification of the plants a number of morphological characters was measured for a discrimination of the polyploid plants. A hydrodistillation and cold extraction were carried out to extract the chemical compounds from the various types of plants. The extracts were analyzed by CG/MS. The results show that polyploidy induced significant variation on a certain number of characters. Polyploidy strongly improved the percentage of germination of seeds of *T maritime,* this percentage was, respectively, of 90.52% and 41.67% for polyploid and diploids seeds. Concerning the characters of development, we recorded a total increase length of the branches and that of the leaflets, whereas the number of branches to flowering and the width of the leaflets did not show significant variations. In addition, polyploidy

induced a lowering of the number of flowers and pods by inflorescence, the number and the mass of seeds by pod. Whereas the length of the ovary and the individual mass of seeds were not affected. On the other hand, protective floral parts, as well as the size of the style, the diameter of the ovary and the width of the pods, they have undergoes an increase in their size. According to the ACP analysis, polyploidy would be defined by the length of the leaflets, the size of the corolla and the diameters of the ovary and the pod. Moreover, the polyploidization influenced the chemical composition of the various types of extracts. Thus, we recorded variations in the chromatograms and the proportions of some compounds. The polyploidization involved a stimulation of the production for the ones and an inhibition for the others. Two majority compounds, coumarin and medicarpin presented a spectacular stimulation of their production by the polyploid individuals (80.62% and 80.13% against 47.73% and 16.24%, respectively). Polyploidy could be a way for improvement of the synthesis of these substances and consequently a means for production of coumarin and medicarpin quantity much more significant.

ICPS-051 - GENETIC IMPROVEMENT IN GRAIN YIELD AND ASSOCIATED TRAITS IN IMPROVED BARLEY (*HORDEUM VULGARE* L.) CULTIVARS

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Abstract: To evaluate the genetic changes in local and exotic barley cultivars in Iran, 10 cultivars that were grown widely between 1956-1998, were used in a complete block design with three replication in three locations (Badjgah and Kushkak in Fars, and Birjand in Southern Khorasan) during 2001-2002 growing season. Biological yield, grain yield, harvest index, spike number per m^2, number of seeds per spike, 1000- grain weight, days to flowering and physiological maturity, and lodging were recorded. Genetic changes in cultivars relative to Shirin (the oldest cultivar as check), for all characters were calculated. Results indicated that main stem height was negatively and significantly correlated with the year of release. Lodging was decreased in modern cultivars. Based on linear regression analysis, the average of annual increase of grain yield in this period was 23.75 kg ha^{-1}. Harvest index was a significant trait during this period and increase in grain yield was due to increase in harvest index. In general, number of grain/m^2 was positive and significant associated with increased yield. Modern cultivars had longer grain-filling duration. The correlation coefficients between biological yield and 1000-grain weight with year of release were not significant.

ICPS-052 - ECOLOGICAL STUDY OF VEGETATION IN TOMBAK & AKHTAR REGION FROM BUSHEHR PROVINCE

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Abstract: The regions Tombak and Akhtar are sectors of Kangan city in Bushehr province. This study was done in two time, summer and winter to recognize the vegetation ability based on ecological condition in 2005-2006. In order to vegetation studies at first limited boarders of regions were determined on topographic map (1:13400), then by using of satellite photo and physiographical unit, the border of vegetation was determined on basic map. After determined the main vegetation unit on base map, recognized all formation of plant by physiognomic- floristic method by walking and each formation was typology based on dominance plants. In Tombak 12 and in Akhtar 6 unit types of vegetation were recognized. The plants of Kangan were belonged to Saharo- Sindian world region. At all 109 species from 41 family determined, which 6 family with 18 species were from monocotyledon and others belonging to dicotyledon.

ICPS-053 - EFFECT OF CHICKPEA DISEASE COMPLEX FUNGI ON GROWTH AND DISEASE DEVELOPMENT OF CHICKPEA PLANTS

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Abstract: Three chickpea disease complex fungi isolated from infected roots and seeds with highest frequency were *Fusarium oxysoprum* f. sp. *ciceris* (27.00 – 57.00 and 20.00 – 40.00%), *Macrophomina phaseolina* (24.00 – 45.00 and 12.00 - 20.00%) and *Sclerotium rolfsii* (20.00 – 35.00 and 8.00 – 15.00%) as compared to *Alternaria alternata* (5.00 – 15.00 and 15.00 – 22.00%) and *Rhizoctonia solani* (6.00 – 10.00 and 5.00 – 10.00%) respectively. Seed germination in Sanyasi variety inoculated with *F. oxysporum* f. sp. *ciceris* was 52.00% and with 92.30% wilted chickpea seedlings followed by Rabat (60.00%) with 66.66% wilted plants. Seed germination in ICC-32 was increased by 88.00% and wilting occurred to 13.63%. Plant growth i.e. length (cm) and weight (mg) of root and shoot was significantly reduced in Sanyasi (6.00 and 17.38 cm), (68.00 and 277.33 mg) followed by Rabat (7.50 and 19.30cm) and (72.00 and 318.33 mg) as compared to D.G. 92 and ICC-32 varieties and control. Seed germination in Sanyasi inoculated with *M. phaseolina* was 48.00% with 78.57% foot rot disease followed by Rabat (64.00%) showing 56.25% foot rot as compared to D.G.92 (72.00%) having 38.88% foot rot, whereas it was increased in ICC-32 (80.00%) and with low rotting (30.00%). Root and shoot length were also significantly decreased in Sanyasi (7.36 and 19.11 cm), Rabat (7.98 and 21.33 cm) as compared to D.G. 92 (8.75 and 23.58 cm) and ICC-32 (10.05 and 25.42 cm). Significant reduction in root and shoot weight was also obtained in Sanyasi (72.30 and 287.00 mg) followed by Rabat (74.91 and 328.33 mg) as compared to other chickpea varieties and uninoculated seedlings of four chickpea varieties. *Sclerotium rolfsii* also reduced the seed germination in Sanyasi (60.00%) with 66.66% collar rot as compared to Rabat (68.00%), seedlings showing collar rot (47.05%) and D.G.92 (80.00%) with 25.00% collar rot infection. Seed germination was significantly increased in ICC-32 (92.00%) and infection decreased to 8.69% only. Root and shoot length as well as weight were significantly reduced in Sanyasi (7.70 and 16.16 cm) and (74.82 and 297.33 mg) followed by Rabat (8.43 and 22.52 cm) and (76.50 and 331.00 mg), D.G.92 (9.18 and 24.65 cm) and (78.45 and 381.33 mg) and ICC-32 (10.22 and 26.75 cm) and (80.45 and 423.60 mg) respectively. *F. oxysporum* f. sp. *ciceris* inoculated in combination with *M. phaseolina* gave seed germination (52.00%) and developed greater number of wilted plants by 92.30%, reduced whole plant growth and reduction percent was 38.64 – 39.85 over control. The fungus when inoculated with *S. rolfsii* gave 60.00% seed germination with disease complex of 66.66% and reduction in plant growth was 28.77 – 35.24% as compared to *S. rolfsii* inoculated with *M. phaseolina* (19.94 – 29.92%).

ICPS-054- EFFECTS OF SOWING DATE AND SEEDING RATE ON YIELD AND YIELD COMPONENTS OF ELITES LINES OF BARLEY

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Abstract: In addition to genotype, plant yield depend to management and environment conditions, planting date and seeding rate are the most important factors effective on plant yield. Our objective was determination of sowing date and seeding rate effects in three elite lines and one variety karoon ***** kavir of barley. The experiment was done as split plot factorial design base on randomized completely block design with three replications. The experiment was performed during two years from 2002-2004 growing season, using three sowing date including (D_1= Oct.12, D_2=Nov.1 and D3= Nov.21) were as main plots and combinations of cultivars (M-80-4, M-80-7, M-80-15 and karoon ***** kavir) and seeding rate (300, 450 and 600 kernels/m^2) as sub plots. The results showed that density levels were

significantly different only about plant number /m^2 at %1 level and number of spike/m^2 at %5 probability level. Varieties were significantly different about all of traits with the exception of number of spike/m^2 and harvest index. In spite of sowing date had no significant effect on grain yield, but D2 with 3.75 ton/ha grain yield was better that the other. Karoon * kavir cultivar than elite lines (M-80-7) with 3.46 and 3.22 ton/ha grain yield were better than the other. There was a positive significant correlation at o.o1 level between yield and grains/ear, ears/m^2 length of ear, biological yield and harvest index. According to the results sowing date from Nov. 1 to Nov. 21 and karoon * kavir cultivar than elite line M-80-7 with 300 kernels/m^2 recommended for this region and regions with same weather conditions.

ICPS-055 - AZADIRACHTIN PRODUCTION THROUGH IN VITRO CULTURE OF NEEM (AZADIRACHTA INDICA A. JUSS)

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Abstract: Neem originated *azadirachtin* is widely used as a natural biopesticide due to its non-toxic and eco-friendly nature. Currently *azadirachtin* is extracted from seeds of wild and cultivated plants because their chemical synthesis is either extremely difficult or economically infeasible and its availability is dependent upon a reliable supply of quality seeds. The biotechnological production of valuable secondary metabolites through plant cell or organ cultures is an attractive alternative for the extraction of whole plant material. Plant cell culture can provide a potential production of azadirachtin alternative to traditional cultivation methods or chemical synthesis routes. In order to establish neem callus and suspension cultures for azadirachtin production, different concentrations and combinations of plant growth regulators (2, 4-D, NAA and BAP) were studied using immature flowers, nodular shoots and seeds as explants. The highest callus development was observed when immature flowers were inoculated on MS basal medium with addition of 1.0 mg/L 2,4-D, 1.0 mg/L BAP, 0.2 mg/L NAA and 10% sucrose solidified with 0.4% phytagel incubated at 25$\pm$2°C. The highest neem cell suspensions were obtained by using immature flower derived callus on MS medium with addition of 1.0 mg/L 2,4-D, 0.2 mg/L BAP and 3% sucrose in 50ml containing 250ml flasks, placing at shaking incubator at 25$\pm$2°C in 24h dark photoperiod. The biomass fresh and dry weights as well as azadirachtin contents of sample cell cultures were determined.

ICPS-056 - ANALYSIS OF ESSENTIAL FATTY ACIDS COMPOSITION AMONG MUTANT LINES OF CANOLA (*BRASSICA NAPUS* L.) THROUGH HIGH-PRESSURE LIQUAID CHROMATOGRAPHY

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Abstract: This study aimed to quantify the methyl esters of Lenoleic Acid (L.A.), γ-Lenolenic acid (LNA) and oleic acid (OL) in the oil of *Brassica napus* mutants. After thoroughly breeding selection in successive generation, five stable mutants (ROO-75/1, ROO-100/6, ROO-125/12, ROO-125/14, and ROO-125/17) of Rainbow (P) and three mutants (W97-95/16, W97-0.75/11 and W97-.075/13) of Westar (P) at M6 stage exhibiting better yield and yield components were analyzed for essential fatty acids. HPLC analysis of the fatty acids in the seed oil of mutants showed that oleic acid (C18: 1) was the most dominant fatty acid, ranging between 42.54% and 52.1%, lenolenic acid (C18:3) was the second most dominant fatty acid and ranged between (18.5%-27%) while the lenoleic acid and saturated fatty acid ranged between 18.5%-22.7% and 5%-11% respectively. From this study, it has been observed that mutant ROO-125/14 showed the highest oleic acid contents as compared to parent, which may make crop resistant to shattering and more stable oil. So, these results are quite

encouraging and will be helpful for the approval of this mutant as a variety in future while among the Westar mutants, mutant W-97-75/16 which is in advanced yield trial exhibited good quality having the highest percentage of oleic acid and lenolenic acid against parent. Both fatty acids are very important for stability of oil and healthier oil. Hopefully, these results of W-97-75/16 will support this mutant in National Uniform Varietal Yield Trial (NUVYT).

ICPS-057 - EFFECT OF DEFICIT IRRIGATION ON YIELD, WUE AND SOME MORPHOLOGICAL AND PHONOLOGICAL TRAITS OF THREE MILLETS SPECIES

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Abstract: Selection of drought adapted genotypes and efficient use of water are among the most important goals in the breeding programs. In order to study drought tolerance of three important species of millet, proso millet (*Panicum miliaceum*), foxtail millet (*Setaria italica*) and pearl millet (*Pennisetum americanum*) were prepared and planted in a split-plot design with two irrigation treatments (well watered and 50% of irrigation requirement) and four replications in Birjand Agricultural Research Station. Deficit irrigation declined yield by reduction of seed number per ear and ear number per plant. This reduction was greater in proso millet than the other two species. In addition, although drought stress caused a reduction in WUE of proso millet, it increased WUE in the other ones. Harvest index also was reduced in the presence of drought stress because of both seed per ear and per plant. Starting of tillering was earlier in proso millet than the other millets. Although, starting of stem elongation was earlier in foxtail millet than the other millets, but that's ear was emerged very late. Water stress caused reduction in the number of tiller and ear, peduncle and ear length and plant height. On the whole, foxtail millet had the greatest yield in both stress and non-stress conditions.

ICPS-058 - EFFECT OF DROUGHT STRESS AT DIFFERENT GROWTH STAGES ON YIELD AND WATER USE EFFICIENCY OF FIVE PROSO MILLET (*PANICUM MILIACEUM*) GENOTYPES

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Abstract: In order to examine the responses of proso millet (*Panicum miliaceum*) to drought stress in different growth stages, four breeded genotypes and a local one of proso millet were selected and planted in a split-plot design with five irrigation treatments and three replications. This experiment was conducted in two locations, Birjand and Sarbisheh. Irrigation treatments included well-watered, drought stress at vegetative stage, ear emergence stage, seed filling stage and vegetative and seed filling stages were considered as main-plots. The first five mentioned genotypes were considered as sub-plots. Drought stress caused a great reduction in grain yield and WUE at ear emergence stage. This reduction represented itself in the number of seed per ear and the weight of seeds, but it didn't have any effects on the number of ear. At ear emergence stage, the drought stress increased the floret death and loss of weight of seeds which resulted in the reduction in the harvest index of both ear per plant and seed per plant. Comparison of genotypes indicated that K-C-M.4 had a greater number of ears and K-C-M.9 had heavier seeds that had higher grain yield. These two genotypes had the highest WUE and their harvest indices were relatively higher. Due to the salinity of water and infertility of soil in

Birjand, the grain yield was lower compared with Sarbisheh. In summary, it can be said that genotype K-C-M.4 proved to be more suitable for both areas.

ICPS-059 - EFFECT OF DROUGHT STRESS ON LEAF SOLUBLE SUGAR CONTENT, ROLLING INDEX AND RELATIVE WATER CONTENT OF PROSO MILLET (*PANICUM MILIACEUM* L.) GENOTYPES

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Abstract: With respect to water shortage in arid and semi- arid regions, the study about drought stress effects on crop plants and selection of resistance cultivars, are among the most important goals in the agricultural researches. In order to examine drought stress effects on millet, an experiment was conducted in Birjand and Sarbisheh, simultaneously. In this experiment, five irrigation treatments (well-watered, drought stress at vegetative stage, ear emergence stage, seed filling stage and vegetative and seed filling stages) and five proso millet genotypes (Native, K-C-M.2, K-C-M.4, K-C-M.6 and K-C-M.9) were compared in a split plot design along with three replications. Drought stress increased grain protein content, leaf rolling index and soluble sugars concentration and decreased seed germination and leaf RWC. Although seed protein content and germination percentage of genotypes were not significantly different, there were some differences among leaf rolling index, RWC and soluble sugar content of these genotypes. The results of this study indicated that leaf sugar content, RWC and leaf rolling index can not be considered as the only parameters for selection of high yield genotypes. Therefore, it is recommended that some other factors should also be used apart from the above mentioned ones.

ICPS-060 - SCREENING OF CANDIDATE VARIETIES IN NCVT (2007-08) FOR COTTON LEAF CURL VIRUS BY A MODIFIED DISEASE SCORING SCALE

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Abstract: Twenty advanced lines of cotton in the National Cotton Yield Trail were screened for CLCuD at NIAB experimental area in the year 2007-08. The experiment was laid out according to RCB design in four replicates. All the cultural operations and plant protection measures were adopted in optimal fashion. Among these one line showed traces of disease (Rating 2) and was highly resistant. Nine lines were resistant (Rating 3) and six were tolerant (Rating 4) while three were rated 5 (moderately tolerant) and one line was found to be susceptible with a rating of 6. A rapid and convenient modified scale for disease rating was developed for screening the material in the field for large population and also for single plants.

ICPS-061 - THE INFLUENCE OF CD AND CR ON THE BIOMASS PRODUCTION OF SHISHAM (*DALBERGIA SISSOO* ROXB.) SEEDLINGS

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Abstract: The present study investigated the effects of Cadmium (Cd) and Chromium (Cr) on the growth of Shisham (*Dalbergia sissoo Roxb.*) seedlings. Metal elements were applied in the form of

$Cd(SO_4)_2$ and K_2CrO_4 at variegated concentrations of 0, 10, 20, 40 and 80 mg l^{-1} under controlled conditions of light and temperature for four weeks. Response of the seedlings was monitored in terms of number of leaves, shoot and root length, leaves, root and shoot weight (fresh and oven dry) and chlorophyll contents. Decline in growth was recorded after 10 mg l^{-1} and 40 mg l^{-1} for Cr and Cd application respectively. Similarly, combined application of Cd and Cr showed growth reduction beyond 20 mg l^{-1} dose, which indicated that Cr was more toxic to *Dalbergia sissoo* as compared to Cd at seedling stage.

ICPS-062 - INFLUENCE OF INOCULATION WITH *ASCOCHYTA RABIEI* ON THE MINERAL CONTENTS OF RESISTANT AND SUSCEPTIBLE CULTIVARS OF CHICKPEA

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Abstract: The determination of mineral contents of healthy as well as *Ascochyta rabiei* inoculated resistant, moderately resistant, moderately susceptible and susceptible cultivars revealed that the amount of N, P, Zn, and Fe did not vary much in healthy plants of the resistant and susceptible cultivars. The amount of K and S was more in the susceptible cultivars as compared to the resistant cultivars while the reverse was true for Cu and Mn. Barring the recovery of Cu and Fe, the amount of all other elements (N, P, K, S, Zn and Mn) enhanced upon inoculation of resistant, moderately resistant, moderately susceptible and susceptible cultivars. There was noticeable increase in the amount of K in the resistant cultivars and reverse was true for P, S, and Mg content after inoculation.

ICPS-063 - EFFICACY OF VARIOUS FUNGICIDES AGAINST *IN VITRO* COLONY GROWTH OF *TILLETIA INDICA* AND *IN VIVO* CONTROL OF KARNAL BUNT DISEASE OF WHEAT

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Abstract: An *in vitro* evaluation of ten fungicides, amended in simple blank agar medium, against colony growth *of Tilletia indica* (Mitra) Mundkur revealed that Dolomite 58 WP at 100 mg/ml dosage was the most effective fungicides in inhibiting the growth of the colony of the fungus, while Crest 50 WP, Shelter 80 WP, Antracol 75 WP and Alert plus 70 WP, at 100 mg/ml dosage rate were les effective than Dolomite. However, there was no statistical difference among the effectiveness of Crest, Shelter, Antracol and Alert plus. Raconil M 70 WP was the least effectiveness while Agrohit 50 WP, Allite 80 WP, Protocol Precombi 50 WP and Thiomil 70 WP were ineffective in inhibiting colony growth of *T. indica*. The in vivo evaluation of effectiveness of the 10 test fungicides, as protective spray (i.e., spray before inoculation) and as eradicative spray (i.e., spray after inoculation) revealed that the protective sprays were more effective than eradicative sprays in controlling Karmal bunt disease of field grown wheat plants. The protective spray of Dolomite and Shelter, though statistically equally effective were the most effective and caused 62.45 and 63.90 percent reduction in occurrence of Karnal bunt disease respectively, while the eradicative spray of Dolomite and Shelter reduced 38.84 and 40.48 percent disease respectively on wheat grain,, and there was no statistically difference between the effectiveness of both fungicides. The protective sprays of Crest, Agrohit, Aleret plus and Antracol were intermediate in their effectiveness and respectively caused 33.79, 34.65, 18.933 and 41.19 percent reduction in Karnel bunt infection of wheat grains. Antracol being comparatively less affective caused 24.07 percent decrease in wheat kernel infection by its eradicative spray as compared to 41.9 percent decrease in kernel infection by its protective spray. The eradicative sprays of Crest, Agrohit and Alert plus were ineffectiveness in controlling wheat kernel infection. The protective as well as eradicative sprays of

Recomil M., Allite, Protocol pre-cambi and Thiomil were ineffective in the control of wheat kernel infection by *T. indica*.

ICPS-064 - STUDY OF INDIGENOUS USES OF MEDICINAL PLANTS IN SELECTED VILLAGES OF NATHIAGALLI, PAKISTAN

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Abstract: Present study is an effort to review and compile all information about the indigenous uses of medicinal plants in different villages of Nathiagalli, NWFP, Pakistan. The local people of the area have always used surrounding natural resources that are wild plants for medicinal purposes and have for a long time dependent on the surrounding plants for their food, shelter, fodder, timber, fuel and health care. A wide variety of plants were present in villages (Dounga Gully, Kanisan, Kalaband, Mallachh and Kalapani) of Nathiagalli but this study mainly focused on the information regarding indigenous uses of plants for medicinal purposes by the native people of the area. From the questionnaire survey it was found that the ethnobotanical data consisted of 43 plant species with 26 families, which were locally used for different body ailments. The results showed that the most commonly used species are *Berginia ciliata, Swertia chirata, Morchella esculenta, Althaea rosea, Paeonia emodi, Valeriana jatamansi, Skimia laureola* etc, and women are actively participating than men, in the collection and processing of medicinal plants for the relief of different body ailments. It is concluded that most of the species are also exploited due to unawareness of local villagers. Community attitude towards conservation and sustainability of medicinal plants was found to be harmonious.

ICPS-065 - VARIABILITY AMONG THE ISOLATES OF *SCLEROTIUM ROLFSII* OF CHICKPEA IN PAKISTAN

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Abstract: Twelve isolates of *Sclerotium rolfsii* Sacc collected from different locations of Pakistan were studied for variation on the basis of morphological and biochemical traits. On the basis of morphological characters, three isolates (AT-1, AT-2, RW-2) were fast growing, three (SR-1, CH-1, DL-2) intermediate and others exhibited slow radial colony growth. The isolates CH-1 and RW-1 ranked as high producer of sclerotia, whereas SRL-1, CH-2, DL-1 and RW-2 were intermediate and the others showed least number of sclerotial formation. The isolates RW-2, AT-3 and SR-1 produced bigger sclerotia and isolates CH-1, CH-3, and AT-1 produced intermediate while others gave the smallest sclerotia. Pathogenic variability of isolates was determined using five chickpea cultivars; ILC-263, C-727, Dasht, CM-2000 and Pb-1. On the basis of pathogenic variability all the isolates showed almost same intensity of infection except AT-3 in pre emergence mortality while in post emergence mortality all cultivars showed resistant response for the isolate of AT-2. Variation in infection was observed in all the isolates. Isolates DL-1, DL-2, CH-2, AT-1 and AT-2 were more aggressive and most of the cultivars were susceptible to these isolates. ILC-263, Dasht, CM-2000 and Pb-1 were resistant to CH-1, CH-3 and AT-3 isolates. The genotype ILC-263 was tolerant to all isolates except CH-3, AT-2 and AT-3.Results of biochemical analysis in *S. rolfsii* using slab apparatus Polyacrylamide Gel Electrophoresis provided a powerful tool for discrimination based genetic diversity in fungus proteins. A total of 14 bands were observed and all bands showed variation except 7, 9, and 13.

ICPS-066 - THE INFLUENCE OF ENVIRONMENT AND LOG DIAMETER ON FORCING AND ESTABLISHMENT OF SOFTWOOD SHOOTS FROM LARGE STEM SEGMENTS OF *ARAUCARIA HETEROPHYLLA*

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Abstract: Micropropagation of *Araucaria heterophylla* (Araucariaceae) is generally a slow and hard to please process. Even seeds present less germination percentages if not especially treated. The objective of this study was to force softwood shoots from 40 cm long stem segments from a lawn-grown *Araucaria* tree by placing them horizontally in flats containing different media and to get sufficient plant material for subsequent rooting process. The effect of three different environmental conditions and diameter of stem segments on shoot forcing potential was also determined. The experiment was set in a complete randomized design with six flats in each environment having four logs per flat. Depending upon diameter, logs were categorized as small, medium or intermediate and large. The experiment was repeated twice. The maximum shoot forcing potential was observed in logs with intermediate size from greenhouse environment followed by logs grown in climatic room and being least for controlled indoor conditions of laboratory. The harvested softwood shoots from the first batch were subjected to *in vitro* establishment on MS, DKW and WPM media supplemented with growth regulators with ten shoots per treatment. Softwood shoots obtained during second experimental run were, however, subjected to *ex vitro* establishment in perlite, small grain vermiculite, garden-grade vermiculite and perlite plus small grain vermiculite. This demonstrates for the first time that it is possible to force softwood shoots of *Araucaria* under different environmental conditions; however establishment of the regenerated shoots is a task of future.

ICPS-067 - LACK OF RESISTANCE IN INDIAN MUSTARD CULTIVARS AGAINST TWO APHID SPECIES IN SOUTHERN PUNJAB

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Abstract: Cabbage aphid (*Brevicoryne brassicae* L.) and mustard aphid (*Lipaphis erysimi* Kalt.) are reported to be important pests of brassicas. Both species can cause heavy losses to these crops. Use of resistant varieties is considered as a logical and economical approach for pest management because it does not involve any additional cost. We evaluated some cultivars of Indian Mustard (*Brassica juncea* L.) for comparative resistance against two species of aphids at Multan and Bahawalpur during 2002-2003 and 2003 -2004 crop seasons. Cultivars BARD-1, BRS-3, PIIR-1, P63R5, RC-280, UCD-6/10 and UCD-44/4P-37 were planted during 2002-2003 season. Two additional lines, i. e. 95101/163 and 95102/51 were included in the trial during 2003-2004. The experiment was laid out in a Randomized Complete Block Design having four replications. Population of both aphid species was recorded weekly from top 10 cm of inflorescence of 12 randomly selected plants from each plot. Observations were recorded for six to ten weeks. Mean seasonal population of *B. brassicae* was significantly different on different cultivars during 2002-2003 crop season at Multan. Lowest number of aphids (9.65 per 10 cm inflorescence) was recorded on BRS-3 and highest population (28.16 aphids) was found on UCD-636, whereas during 2003-2004 the difference in mean seasonal population was non-significant among cultivars. The difference in population among cultivars was non-significant at both locations during 2003-2004 crop seasons. Population of *L. erysimi* among cultivars was also non-significantly different at both locations during both years. Based on the results none of the cultivars tested could be declared as resistant. Options for management of aphids in southern Punjab are also discussed in the paper.

ICPS-068 - STUDY ON THE ACCUMULATION OF OSMOTICA IN HEXAPLOID WHEAT UNDER THE INFLUENCE OF DROUGHT STRESS AND APPLICATION OF GROWTH HORMONES

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Abstract: A greenhouse experiment was conducted during three consecutive years at Ayub Agricultural Research Institute, Faisalabad (Pakistan) to find out the effect of drought stress at crown root development and application of Ethephon, Paclobutrazol, Succinic Acid and Triadimefon @ 400, 300, 2000 and 200 mg l^{-1}, respectively as pre sowing seed soaking and foliar spray at crown root development, heading and grain filling on the accumulation of Proline, Abcisic Acid, Ethylene and Gibberellic Acid in wheat variety Inqilab-91. Moisture stress enhanced accumulation of Proline, Ethylene and Abscisic Acid to manifolds whereas, it significantly reduced concentration of Gibberellic Acid. Application of all the above said growth hormones further promoted synthesis of Proline, Ethylene and Abscisic Acid whereas, reduced Gibberellic Acid concentration to the significant extent. Effects of Ethephon application on the accumulation of osomotica in wheat under water stress were more pronounced as compared with other growth substances. Similarly, pre-sowing seed soaking in solutions of growth hormones exhibited significant results in comparison with foliar spray at different ontogenesis.

ICPS-069 - EFFECT OF CADMIUM ON THE GROWTH AND PROTEIN PROFILE OF FEMALES OF THE ROOT-KNOT NEMATODE *MELOIDOGYNE INCOGNITA* ON TOMATO

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Abstract: The growth and protein profile of females of the root-knot nematode *Meloidogyne incognita* was assessed in the presence of an important soil pollutant, cadmium. Cadmium was found to be highly injurious to the growth and development of females of the root-knot nematode, *M. incognita* (Kofoid and White) Chitwood. All the doses (7.5, 15.0, 30.0 and 60.0 ppm) of the test heavy metal had a toxic effect on the growth of the females. The average cross-sectional area of the nematode females in the untreated control was highest, while it was the minimum in the test plants receiving the highest dose of the heavy metal. It not only caused retardation in the growth of females but also caused aberration in their shapes. However, the degree of retardation and aberration was increased with an increase in the concentration of the heavy metal. The protein profile of the females of *M. incognita* was also influenced in the presence of cadmium. It was observed that the number of polypeptides gradually decreased with an increase in the concentration of heavy metal. However, the number of polypeptides was highest in the untreated control. It was interesting to note that the number of polypeptides of both higher and low molecular weight was reduced at lower concentration of the heavy metal, while it completely disappeared at higher concentration. Some additional polypeptides of relatively low molecular weight appeared in the presence of heavy metal as compared with those present in the untreated control. Fragmentation of polypeptides of higher molecular weight may be the plausible explanation for the appearance of low molecular weight polypeptides.

ICPS-070 - GENETICS OF DIFFERENT ECONOMIC TRAITS OF COTTON *GOSSYPIUM HIRSUTUM* L.

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Abstract: A 4-parent complete diallel cross, including CRIS-134, Marvi, N-74-666/108 and DPL-14 of *Gossypium hirsutum* L. of diverse origin, was used for assessing the magnitude of gene action for four important traits viz. number of sympodial branches, number of bolls, seed cotton yield per plant and micronaire value. All the traits were conditioned by additive and non-additive type of gene action except micronaire value, which was governed by additive genes only. The parental lines CRIS-134 and Marvi proved good general combiners more or less for all the characters studied. The hybrid CRIS-134 x N-74-666/108 proved best specific combiner for number of bolls per plant, seed cotton yield per plant and micronaire value. While, Marvi x DPL-14 proved best specific combiner for number of bolls per plant and seed cotton yield per plant. The meaningful reciprocal effects were manifested by N-74-666/108 for almost all the traits, which suggested that N-74-666/108 be used as seed parent in further hybridization program.

ICPS-071 - PHYSIOLOGICAL ASSESSMENT OF DROUGHT TOLERANCE IN COMMERCIAL WHEAT (*TRITICUM AESTIVUM* L.) VARIETIES UNDER MOISTURE STRESS CONDITIONS

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Abstract: Drought is one of the major limiting factors to wheat production in Pakistan. Five commercial wheat varieties; Chakwal-97, Inqlab-91, Margalla-99, NR-234 and Wafaq-2001 were grown in pots in glasshouse. Plants were subjected to three consecutive drought cycles at tillering, pre-anthesis and milky growth stages by withholding water till leaf rolling started. Measurements of physiological response to the drought stress included changes in proline, protein, membrane stability yield and yield components were made. Significant reduction in grain yield was observed in all the test varieties when drought was imposed at any growth stage. The reduction was highest (39-64%) when stress was imposed at pre-anthesis followed by tillering growth stage. The wheat variety Wafaq-2001 performed better by producing greater numbers of spikelets and filled seeds per spike as compared to other varieties. Under water stress protein and proline contents were higher in the drought-tolerant cultivar Wafaq-2001. The same variety showed higher membrane stability index, relative water contents and antioxidant enzymes (SOD and POD) activity under drought stress conditions.

ICPS-072 - SALICYLIC ACID INDUCED PHYSIOLOGICAL AND BIOCHEMICAL CHANGES IN WHEAT UNDER DROUGHT STRESS CONDITIONS

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Abstract: A pot experiment was conducted in glasshouse to test the hypothesis that seed pre-soaking with salicylic acid (SA) aqueous solution improves the drought tolerance of wheat. Three wheat (*Triticum aestivum* L.) varieties viz Chakwal-97, Wafaq-2001 and Punjab-96, were pre-soaked in aqueous solution of salicylic acid and drought stress was imposed at tillering, pre-anthesis and milky stage by withholding water till signs of wilting/rolling started. The effect of Salicylic acid pre-soaking on total biomass, proline, protein, chlorophyll a and b, soluble sugars, relative water content, membrane stability index (MSI), activity of superoxide dismutase (SOD) and peroxidase (POD) was studied in all the test varieties. Salicylic acid seed pre- treatment improved the grain yield per plant in Chakwal-97, Wafaq-2001 and Punjab-96 by 12 %, 16 % and 10 % respectively as compared to control. It increased number of florets per spike, awn length, number of filled seeds per plant and 100 seed weight. SA treatment enhanced the activity of antioxidant enzymes (SOD and POD) and decreased the oxidative stress. SA treatment also increased chlorophyll a and b, relative water content and membrane stability

index over control plants. Results signify the role of SA in regulating the drought response of wheat and suggest that SA seed pre-soaking could be used as a potential growth regulator under drought stress conditions.

ICPS-073 - MECHANISMS OF NEEM FORMULATIONS OPERATING AGAINST ROOT KNOT NEMATODES

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Abstract: Bioactive products from the neem tree, *Azadirachta indica* A. Juss (Family Meliaceae) have been found effective in managing the populations of plant parasitic nematodes. The bioactivity of neem materials against nematodes is attributed to the presence of an array of complex compounds, triterpenes, or more specifically limonoids. The plant roots absorb the contents of neem formulations including cake, seeds, leaves and aza, and then released against the recognized invading nematodes. The effectiveness of neem products has been found against second stage juvenile (J2) of root knot nematode, *Meloidogyne javanica* invasion at root-tip or during J2 development after they had established the feeding sites or by suppressing reproduction of adult females. The roots of plants treated with neem products acquire the ability to act antagonistically against invading J2. Although the penetration of tomato roots by J2 was differentially influenced by neem treatments yet the numbers of J2 in tomato roots drenched with neem formulations had statistically less than that of in plant roots drenched with water. Three neem formulations including Aza and cake significantly arrested the development of J2 over that of water check. The tomato plants grown in the neem amended soil produced significantly less number of root galls and reduced the fecundity of adult female of root knot nematode. Our findings provide important information for understanding the stages in the life cycles of nematodes to be targeted by neem formulations to mange the nematode populations.

ICPS-074 - MECHANISMS OF RESISTANCE TO ROOT KNOT NEMATODES

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Abstract: Root knot nematodes, *Meloidogyne* spp. the sedentary endoparasites have evolved very specialized and complex relationship with their hosts. A series of biochemical and physiology reactions occur in plant in response to second stage juvenile [J2] infection of roots. As a consequence of pant-J2-interactions if plant fails to halt the penetration and development of J2 then disease ensures, and if development of J2 is arrested by the plant then disease development is limited. Natural nematode resistance mechanisms [RM] occurring in plant can be classified into preformed resistance mechanisms [PRM] and induced resistance mechanisms [IRM]. PRM are broken down into morphological and pre-existing factors, which prevent or suppress penetration and infection of host tissues. Post infection RM involves physiological processes within roots resulting in J2 re-emergence from resistant roots or dying within resistant roots or limiting J2 development and reproduction. IRM are active, energy-requiring systems, induced against the recognized invading nematode that leads to activation of defense mechanisms by the production of proteins or metabolites antagonistic to invaders. Such active RM is referred to as the plant-hypersensitive reaction [PHR]. PHR induced by the nematode leads to systemic resistance termed as systemic acquired resistance [SAR]. SAR to virulent *M. hapla* was obtained in tomato and pyrethrum by prior infection with avirulent *M. incognita*. Prior infection by avirulent *M. incognita* provided cross protection to virulent *M. arenaria* on split root system of resistant grape cv. Harmony. We have also demonstrated that prior infection of resistant tomato cv. Favorita with virulent

or avirulent populations of *M. incognta* could induce systemic resistance or susceptibility to subsequent infections on separate portions of split-root-system of tomato plants. Our findings provide great aid to plant breeders in breeding for cultivars resistant to root knot nematode.

ICPS-075 - ETHNO-RELIGIOUS STATUS OF THE SELECTED FLORAL BIO-DIVERSITY IN DIFFERENT AGRO-CLMIATIC ZONES OF AZAD JAMMU & KASHMIR

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Abstract: Azad State of the Jammu & Kashmir (AJ&K) is the gem in the crown of Himalayas where diversity of flora and faunal are forming the bio-wealth of the State. AJ&K in the South East Asia where majority of the population consists of Muslims (Muhammadans) and minorities of them are Hindus, Sikh etc. There has always been a strong correlation between the floral bio-diversity and human population of the area. During the present investigation a survey has been conducted in AJ&K almost all Muslims have regarded all floral bio-diversity important and very important but attached highest importance with those plants (trees and shrubs) whose significance has been revealed in the Holy Quran and Ahadis-e-Pak (teaching's of Hazrat Muhammad (P.B.U.H) (e.g. Olea (Zaitoon), Kashmiri Jangli Zatoon) Phugwara, Dhussa, Rumbal, Punica, Vitis, Phoenix etc.) According to the survey results people living in the State 60 years ago were Hindus Sikhs etc. have been interested in *in situ* or *ex situ* conservation of *Ficus religiosa*, *Ficus bengalensis*, *Terminalia aujuna*, *Terminalia belerica*, *Dendrocalamu strictus*, *Morus indica*, *Morus alba*, *Morus nigra*, *Morus laevigata*, *Morus serrata*, etc. The data has been arranged under the headings i.e. important, very important, most important, religions, plants species etc. It is further suggested to preserve these gene banks for future use before they become extinct. Systematic collection for proper evaluation of the ethno-religiously significant materials are necessary and are of immediate concern. It is further suggested to conduct ethno-pharmaceutical investigation on ethno-religious flora so as to extract the both benefits out of the conserved material.

ICPS-076 - THE ALIEN FLORA OF AZAD STATE JAMMU & KASHMIR (AJ&K)

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Abstract: Azad State of the Jammu & Kashmir (AJ&K) lies in the lower Himalayas, the variation in altitude, aspect, slope, soil and topography are responsible for the unique floral bio-diversity of the State. During the present investigation a survey of exotic plants species (Khuroo et al 2007) in Azad Jammu and Kashmir has been conducted keeping in view the following parameters i.e. name of the plants species, it origins that is the micro genetic centers etc., purpose of introduction, invasive status, naturalized etc., an authorized publication (Stewart 1972, Lambert, 1933 etc). During the investigation *Olea europeae*, *Ficus carica*, *Phoenix dactylifera*, *Phoenix sylvestris*, *Cupressus spp*, Thuja spp, *Xanthium* sp, *Casuarina* sp, *Jacaranda* sp, *Paulownia* sp, *Euphorbia pulcherrima*, *Ficus elastica*, *Araucaria*, *Broussonetia* sp, *Eucalyptus* spp, *Platanus* sp etc. This investigation was conducted first time in the history of Azad Jammu & Kashmir so that an inventory of the exotics or aliens be developed as a base line data because future of the State flora will have serious impact out of the exotics introduced for the purpose of fodder, food, fuel, timber, fiber etc. It is also suggested to establish an Executive Committee on the introduction and utilization of the aliens in the State which should be comprised of a plant taxonomist, plant physiologist, environmental biologist, plant breeding and genetic experts etc. which should develop a strategy to utilize the already introduced plants and should not cut them down without any strong foundation.

ICPS-077 - CONSERVATION STATUS OF THE SELECTED FLORAL BIO-DIVERSITY IN DIFFERENT AGRO-CLMIATIC ZONES OF AZAD JAMMU & KASHMIR

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Abstract: Azad State of the Jammu & Kashmir (AJ&K) is the phyto-geographically distinct region of south east Asia where floral biodiversity is unique which increases the conservation value of the State. During the present investigation IUCN criterian has been followed and threatened flora has been inventorized under the vulnerable, endangered, critically endangered, rare and extinct. *Neolitsea chinesis* is the species present at Jhawara which is a mid point between hot water spring and Hijeera in District Poonch, other threndtended flora included *Cedrus deodara*, *Abies pindrow*, *Buxus papillosa*, *Berberis lycium*, *Albizzia procera*, *Ulmus laevigata*, *Salix*, *Ficus religiosa*, *Ficus bengalensis*, *F. lacor*, *Pyrus pashia*, *Pyrus communis*, *Prunus armeniaca*, *Prunus persica*, *Pyrus malus*, *Diospyros lotus*, *Morus levigata*, *Phyllanthis emblica*, *Albizzia lebbek*, *Dalblergia sissoo* etc. It is suggested to the international agencies working on conservation may take urgent steps to conserve the threatened flora in different agro-climatic zones and Kashmiri communities/natural resources managers may be involved to take concrete steps to restore the previous conservation status as per reports by Stewart 1972, and Lambert, 1933.

ICPS-078 - A FIRST REPORT OF A NEW CV OF *VITEX NEGUNDO* L. COLLECTED FROM AZAD JAMMU & KASHMIR

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Abstract: During the present investigation *Vitex negundo* L. species samples have been collected from Hollar, Sehnsa, Kotli, Tattapani, Jhawara Hajira Tararkhel, Dothan, Chak, Chehr Soon Topa, Mahmood Gali and Kohala. All the samples collected were preserved (Stewart 1972). Floral character were almost the same except some variation in blue colour of the petals. During the investigation an innovative observation in leaf morphology i.e serration/dentation was observed throughout the samples collected from different zones and locations. The serration/dentition in the leaves of *Vitex negundo* collected from almost all the zones strongly proved that it is not a plastic character but a permanent character found everywhere in the States nook and corner. Although there were samples collected with whole/entire leaves from the different zones of the State which are already placed in the herbarium of Quaid-e-Azam University, Islamabad after comparisons and identifications it was strongly recommended to name this new sample of *Vitex negundo* L. with serrations/dentations as a cultivar kashmiriana i.e. *Vitex negundo* L. CV. kashamirian. It is also recommended to study the new CV on the basis of palynology and molecular biology for further investigations.

ICPS-079 - A NEW CULTIVAR OF *RICININUS COMMUNIS* L. FIRST TIME IDENTIFIED FROM AZAD JAMMU & KASHMIR

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Abstract: Azad Jammu & Kashmir lies at the collision zone of Eurasian and South East Asian tectonic plates with unique bio-diversity. During the present investigation a new cultivar of *Ricinus communis* L. with red leaves, red stem, red fruit, simultaneously from sub-tropical and temperate zones of Azad

Jammu & Kashmir which is a new one because *Ricinus communis* generally have green leaves. This new red coloured sample specimen is different from the commonly collected specimen with common floral colour and character. This new cultivar may be recognized as *Ricinus communis L* cv: kashmariana. It is further suggested to conduct a palynological study so as to further justify the present determination.

ICPS-080 - CULTIVAR DIFFERENCE OF CANOLA ON DRY WEIGHT GROWTH BASIS IN SENSITIVITY TO OZONE

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Abstract: The cultivars differences in the sensitivity of canola to ozone based on the dry weight was investigated using eight cultivars. On the 10^{th} and 14^{th} days after sowing, eight cultivars were exposed to 120 ± 8 ppb ozone for 5h per day (10:00 to 15:00) at 24 ±1.0 °C, 72 ± 9% relative humidity and 300 µmol m^{-2} s^{-1}PPFD. The control plants were exposed to charcoal filtered air under the same climatic conditions. After two weeks of treatment i.e., 28 das, all the plants were harvested to determine leaf area and dry weight. The sensitivity of eight canola cultivars to ozone determined on the %age reduction in the total dry weight per plant compared to control was grading as Cyclon > Con-II > Con-I > Rainbow > Oscar > Dunkeld. This ranking could not be explained by the degree of ozone induce visible foliar injuries, whole plant growth rate and stomatal density. However, the reduction in the photosynthetic CO_2 uptake per unit amount of ozone absorbed by the leaf was significantly different among the three cultivars, and was ranked as Cyclon > Rainbow > Dunkeld. This grading coincided with that in the sensitivity of whole plant dry weight growth and or net photosynthetic rate to ozone. Therefore, the cultivars difference of canola in the sensitivity to ozone is generally considered to depend on the physiological detoxification capacity of cultivar for ozone in their leaves.

ICPS-081 - EFFECTS OF TROPOSPHERIC OZONE ON POTATO PLANTS PROTECTED BY THE ANTIOXIDANT ETHYLENE DIUREA (EDU)

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Abstract: Experiments were conduct to examine the effects of the antioxidant Ethylenediurea (EDU) on yield and some biochemical parameters of potatoes. EDU and non-EDU treated plants were exposed to ambient air at a rural site in Lahore, Pakistan. The plants were treated with 0, 50, 150 and 250 ppm active ingredient of EDU as a soil drench. The concentrations of ozone were high at this rural site. EDU treated plants have shown significant effects on pigments including chlorophyll and caretonoides as compared to non-EDU. Significant protective effects of EDU were seen in all treatments in all the parameters. But the plants treated with 150 ppm EDU shown a much significant increased in the fresh weight and number of potato plants as compared to other EDU treatments. Changes in the activity of antioxidant enzymes Guaiacol peroxidase (GPX) and Glutathione reducatase (GR) in the leaves were determined in control and EDU treated plants. The GPX activity in the leaves was significantly lower in EDU treated plant in all treatments as compared to non-EDU treated plants. However, the GR was also low, but not significantly, in treated plants. This is the first report demonstrating markedly enhanced yield and reduction of peroxides of potentially harmful ozone by EDU as a mechanism for protecting plants against noxious oxidative stress from the atmospheric environment.

ICPS-082 - OPTIMIZATION OF SUBMERGED CULTURE CONDITION FOR THE PRODUCTION OF MYCELIAL BIOMASS AND POLYSACCHARIDES BY *CORIOLUS VERSICOLOR*

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Abstract: The effects of medium components and environmental factors on the production of mycelial biomass and polysaccharides by *Coriolus versicolor* were investigated in submerged cultural conditions. The optimal temperature and initial pH for the production of both mycelial biomass and exopolysaccharides in flask cultures were found to be 25°C and pH 5, respectively. Sucrose and soybean meal were the most suitable carbon and nitrogen sources for the mycelial growth and polysaccharides production. Under the optimal culture condition, the maximum polysaccharides achieved in a 5-l stirred-tank bioreactor indicated 3.32 g/l, which is about three times higher than that at the basal medium. The initial carbon concentration was found to be the most important factor in polysaccharides production and also cell growth.

ICPS-083 - PROTEASE PRODUCTION FROM ALKALOPHILIC *BACILLUS* SP. ISOLATED FROM NATURAL HABITATS OF LAHORE

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Abstract: *Bacillus* strains isolated from different polluted habitats were screened and identified for high alkaline protease activity. Strains with high protease yields were optimized with respect to inoculum concentration, temperature, agitation speed and initial medium pH. Two *Bacillus* strains coded as MPPL-1 and MPPL-2 showed high potential, for alkaline protease activity (153-216 U/ml) among identified isolates. The specific growth rates were estimated from the growth curves as 0.51 h^{-1} and 0.68 h^{-1} for MPPL-1 and MPPL-2, respectively. The optimum temperatures were determined as 32 ◦C for strain MPPL-1 and 36 ◦C for the strains MPPL-2. Similarly, the optimum agitation speeds were 110 rpm for MPPL-1 and 170 rpm MPPL-2. *Bacillus* sp. MPPL-2 with the highest specific protease activity (63 U/mg protein) and a broader pH range was chosen for further study. The crude enzyme of this strain was further characterized and was determined as a bleach stable, serine alkaline protease with an optimum temperature of 70 ◦C and a pH of 11, with a potential to be a candidate for the applications in the detergent industry.

ICPS-084 - MECHANISM OF IONIC BALANCE IN SOME POTENTIAL SALT TOLERANT GRASSES UNDER SALT STRESS FROM THE SALT RANGE PAKISTAN

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Abstract: Three potential salt tolerant forage grasses (*Cynodon dactylon*, *Imperata cylindrica* and *Sporobolus arabicus*) were collected from the salt affected soils of the Salt Range to assess their mechanism of adaptation to saline stress by determining ion relation and related anatomical modifications. Since the ecotypes of these three grasses must have evolved the salt tolerance trait in view of a sufficient length of time the high selection pressure of the habitat has been operating on them. These salt tolerant ecotypes from the Salt Range were compared in a hydroponic system with

those from the Faisalabad region, a non-saline habitat. In general, the ecotypes from the Salt Range of all three grasses, performed better under high salinities than their counterparts from the Faisalabad region. The ecotype of *S. arabicus* from the Salt Range was the most perfectly adapted as it tended to modify the tolerance mechanism with increasing salinity. At low salinities it preferred succulence, i.e., accumulation of salts in plant body, but at moderate salinities, it shifted to salt excretion via vasicular or bladder hairs. At the highest salt level, salt excretion was very much developed by forming air chambers (aerenchyma) along with the development of vesicular hairs. The ecotype of *C. dactylon* from the Salt Range depended on salt excretion to some extent but the major mechanism for its tolerance to high salinities was the avoidance of water loss through transpiration and other stem and leaf tissues. The ecotype of *I. cylindrica*, however, mainly depended on succulence for tolerating high salt content in the leaf tissue.

ICPS-085 - ECO-ANATOMICAL ADAPTATIONS OF SOME SEDGE SPECIES FROM VARYING HABITATS IN THE FAISALABAD REGION

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Abstract: Family Cyperaceae inhabiting a variety of habitat types in the Faisalabad region including polluted and brackish wetlands, desert and semi-desert habitats, river and canal banks, waste lands, agricultural fields as a weed, and. as ornamentals. Ten sedge species (*Cyperus alternifolia, C. rotundus*, *C. esculantus*, *C. compressus*, *C. arenarius*, *Carex fedia*, *Fimbristylis miliacea*, *F. dichotoma*, *Scirpus littoralis*, *S. maritimus*), representative of each habitat type, were studied to investigate specific anatomical adaptations to withstand different environmental stresses. *Carex fedia* was a species of slightly cooler habitat in the Soan valley, the Salt Range. *Cyperus alternifolia* was the only cultivated species of the Faisalabad region. *Cyperus compressus* was collected from the sandy habtat along the river banks. *C. esculentus* was collected from brackish Kalar Kahar Lake, the Salt Range and from the industrial wastes. *Cyperus rotundus* was a dryland species that was widespread throughout the region on a variety of habitats like water channels, lawns, as a weed of several crops, along road sides, desert and semi-desert areas. *Fimbristylis dichotoma, F. miliacea* and *Scirpus maritimus* were recorded in water logged area throughout the plains. *Scirpus littoralis* was recorded from the Punjab plains and the brackish Kalar Kahar Lake. Thick roots in *C. alternifolia* were truly indication of the wide spread distribution and cultivation of this species throughout tropical and subtropical regions of the world. Thick epidermis is in dryland species, *C. alternifolia, C. arenarius* and *C. compressus* were expected to be adapted to harsh water limited environments. *Carex fedia, C. rotundus* and *F. dichotoma* with thick endodermis, a characteristic feature of halophytic and drought tolerant species supported their wide distribution in a variety of habitats. Large cortical cells in *C. arenarius* and *C. compressus* were the indication of better adaptation to drought stress.

ICPS-086 - COMPARATIVE ANATOMY OF SOME NATURALIZED AND EXOTIC SPECIES OF FAMILY AGAVACEAE

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Abstract: Family Agavaceae is worldwide in distribution, however, most of them are native to Africa. In Pakistan, all the species are of ornamental nature but very few species of *Agave* are naturalized. Detailed anatomical studies were conducted to assess the structural modification in ten *Agave* and *Yucca* species (*Agave americana, A. americana* var. *marginata, A. decipiens, A.* x *leopoldii, A. sisalana,*

A. vera-cruz, Y. aloifolia, Y. aloifolia cv. Marginata, *Y. elephantipes,* and *Y. gloriosa*) responsible for their distribution in the Faisalabad region. *Agave Americana, A. americana* var. *marginata* and *A. vera-cruz* were found escaped in the foothill region of the Punjab. *Agave sisalana, A. decipiens, Y. aloifolia* and its cv. Marginata and *Y. gloriosa* were common cultivated species in the region, however, *A. x leopoldii* and *Y. elephantipes* were relatively rare. Thick cuticle and epidermis, large cortical cells and large vascular bundles of *Agave americana* and its cultivar *A. americana* var. *marginata* were the indication of their successful adaptation to adverse foreign environments and hence, their widespread distribution. Endodermis and sclerenchyma, metaxylem vessels and phloem were relatively more developed in *Yucca* species than in *Agave* species. Stomatal density was relatively higher in *Yucca* species and cultivars, but the area was in *Agave* species. On the basis anatomical characteristics, *Agave americana* and its cultivar *A. americana* var. *marginata*, and *Yucca aloifolia* and its cultivar *Y. aloifolia* cv. Marginata were more adaptable to a variety of environments, as was confirmed by their large scale distribution throughout the world. These species had greater values for root epidermis thickness and its cell area, root endodermis thickness and cell area, root cortical cell area, root vascular region area, leaf parenchyma cell area, leaf vascular bundle area, and leaf metaxylem area. Multivariate analysis of anatomical characteristics did not completely support the morphological features, since most of the anatomical characteristics were adaptive in nature to various environmental conditions. However some clusters for morphology and anatomy were closely related and it was suggested that some of the anatomical characteristics were species specific and can be used as a tool for taxonomic studies.

ICPS-087 - PHYTOECOLOGY, ORDINATION AND ASSOCIATION OF SOME HALOPHYTIC SPECIES IN CHOLISTAN DESERT PAKISTAN

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Abstract: The plants inhabiting desert environments have developed, over the ages, certain features which help them to thrive under multiple stresses like extreme drought, high temperature and in some cases salt stress. Phytoecological studies were conducted to evaluate ordination and association of some halophytic species (*Aeluropus lagopoides, Cymbopogon jwarancusa, Lasiurus scindicus Ochthochloa compressa, Sporobolus ioclados, Cressa cretica, Haloxylon recurvum, H. salicornicum, Suaeda fruticosa* and *Salsola baryosma*) in slat affected habitats in the Cholistan desert. Five salt affected sites were selected including Derawar Fort (least affected and control), Traway Wala Toba and Bailah Wala Dahar (moderately affected), and Ladam Sir and Pati Sir (heavily salt-affected sites). CCA ordination biplot showed differential response of species at each habitat type. At least salt-affected site, TSS, ECe and OP strongly related to *C. jwarancusa,* soil K^+ with *H. recurvum* and *O. compressa* and soil Na^+ and Cl^- with *H. salicornicum*, *S. baryosma*, *C. cretica* and *A. lagopoides*. At moderately saline sites, TSS, ECe, OP and soil K^+ correlated with *C. jwarancusa* and *S. baryosma*, SAR with *S. ioclados* and *H. salicornicum*, and pH and soil Cl^-, Ca^+ and Na^+ with *O. compressa* and *C. cretica*. At highly salt-affected sites, TSS, OP and ECe correlated with *S. ioclados*, *S. baryosma*, and *H. salicornicum*, and pH with *A. lagopoides*. Derawar Fort inhabiting relatively less salt tolerant species like *O. compressa, L. scindicus,* and *C. jwarancusa,* Bailal Wala Dahar inhabiting *S. fruticosa*, Ladam Sir inhabiting *S. baryosma*, and Pati Sir inhabiting *C. cretica*. *Aeluropus lagopoides* and *S. ioclados*, the most salt tolerant species, distributed evenly at all salt-affected habitats.

ICPS-088 - EFFECT OF DROUGHT STRESS ON FOLIAR ANATOMY OF *PANICUM ANTIDOTALE* RETZ. ECOTYPES

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Abstract: The experiment was conducted to evaluate the morpho-anatomical adaptations of *Panicum antidotale* Retz. ecotypes to drought stress. Different ecotypes of potential drought tolerant grass, the blue panic grass (*Panicum antidotale* Retz.) were collected from Faisalabad and its surroundings. This species was found to be well established in a variety of habitat types like drought, salinity, ion toxicity, etc. Six ecotypes were selected, including three from disposal water channel and along road-side at Rajawala near the university campus, one from forest plantation at Punjab Forest Research Institute, Gatwala, and two inside the university campus, one of them from agricultural field and was regarded as the control. The experiment was conducted in Completely Randomized Design (CRD) with two factor–factorial arrangement. Three moisture regimes were maintained till the maturity of grass species, namely 100% field capacity (control), 75% field capacity, and 50% field capacity. Drought stress negatively affects the growth and development of plants, but to survive under extreme water stress conditions, plants developed various anatomical adaptations. A prominent decreasing trend was noted in ecotypes from Khadeja Hall (extremely drought-affected site) and Forest plantation (salt-affected site). Ecotype from sludge of disposal channel (moderately polluted soil) showed very little decrease in leaf thickness at 75% FC but a sharp decrease at 50% FC. Ecotype from along roadside (moderately drought-affected site) and inside disposal channel (highly polluted site) showed a slight increase. Ecotype from agricultural field depicted increase at severe drought level (50% FC). All ecotypes depicted an increasing trend towards upper epidermis thickness. A sharp increase in sclerenchyma thickness was observed at 75% FC in ecotypes from inside disposal channel and sludge of disposal channel. Almost same increasing response was noted at both drought levels for ecotype along roadside. Ecotype from agricultural field showed increase in sclerenchyma at severe drought level. Both mesophyll thickness and mesophyll cell area showed similar pattern of increase and decrease with a prominent decrease at 50% FC in ecotypes from Khadeja Hall and forest plantation. In case of vascular tissue area, all ecotypes exhibited a decreasing behaviour, however, ecotype from agricultural field showed increase at 50% FC. The prominent increase in adaxial stomatal density was found in ecotype from Khadeja Hall at both 75% and 50% FC. A pronounced increase in abaxial stomatal density was noted in ecotype from inside disposal channel, sludge of disposal channel and Khadeja Hall at 75% FC. In case of number of hair/trichomes, ecotypes from inside disposal channel showed almost no change at both drought levels. Ecotype from agricultural field showed no change at 75% FC but a little reduction at 50% FC. Ecotype from Khadeja Hall also showed no change at 75% FC and at 50% FC hair/trichomes were completely absent. A gradual decrease was observed in ecotypes from forest plantation and along roadside. Ecotype from sludge of disposal channel showed a very slight increase at mild drought level but a very sharp decrease at severe drought level.

ICPS-089 - EFFECT OF DIFFERENT pH VALUES AND LACTOSE CONCENTRATIONS ON THE INDUCTION OF MICROTUBER AND PHYSIOCHEMICAL ASPECTS OF POTATO *(SOLANUM TUBEROSUM* L.) CV. CARDINAL

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Abstract: A study was carried out to produce virus free microtubers from different sources of explants and the effect of different concentrations of lactose and pH on the growth, induction of microtubers and

physio-chemical aspects of potato (*Solanum tuberosum* L.) cv. Cardinal, which were taken from test tubes grown shoots in collaboration with Potato Tissue Culture Laboratory, Punjab Seed Corporation, Sahiwal and Stress Physiology Laboratory, Nuclear Institute for Agriculture and Biology (NIAB), Faisalabad. Among the different sources of explants, test tube grown shoots were found better for microtuber induction. Different concentrations of lactose, 8% lactose concentration was better for shoot length (16.4cm), root length (7.4cm), number of leaves (13.6), nitrate reductase activity (83.822μ mol NO_2 g^{-1} fresh weight/h), α-amylase activity (20.9 mg g^{-1} fresh weight/h), total soluble proteins (3.9 mg g^{-1} fresh weight), total soluble sugars (23.9 mg g-^{1} fresh weight). α-amalyse showed optimum activity at 1.0% substrate concentration and Km value determined was $2.3x10^{-3}$ g ml^{-1}. Total free amino acids number decreased at 8% lactose concentration however microtuberization did occur in the 5th week of growth. However, pH 5.7 was found the best for better shoot length (12.8cm), root length (5.1cm), number of leaves (9.6), nitrate reductase activity, α-amylase activity, total soluble proteins and total soluble sugars after 5 weeks of treatment. Microtuberization occurred in 'Cardinal' at 5, 5.7, 6, 8 pH during fifth week. At pH 3.5 and 4.5 the media did not solidify and remained in liQuaid condition, hence not support growth of potato. On the whole, it was observed that lactose accelerates the growth up to the maximum of 8% concentration and after this it had inhibitory effect on growth. Media pH 5.7 was found the best for 'Cardinal' growth, but pH values less than or more than 5.7 have inhibitory effect on growth.

ICPS-090 - ECOTYPIC ADAPTATIONS OF FOLIAR ANATOMY OF TRIBE FESTUCEAE, ERAGROSTEAE, SPOROBOLEAE, AND CHLORIDEAE (FAMILY POACEAE)

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Abstract: Comparative anatomy of seven species of family Poaceae representing tribes Festuceae, Eragrosteae, Sporoboleae, and Chlorideae were conducted in the Faisalabad region to investigate foliar anatomical adaptations in relation to varying ecological conditions. *Aeluropus lagopoides* is an indicator species of the salt affected soils, while *Poa annua* and *Dactyloctenium aegyptium* were the weedy species and widespread throughout the region. *Ochthochloa compressa* is one of the commonest species of desert and semi-desert regions. *Leptochloa paniceae* a common species of waterlogged area, but restricted to less saline habitats, however, a closely related *Diplachne fusca* is highly tolerant to saline waterlogged conditions. *Cynodon dactylon* is a widespread species throughout the region tolerant to a variety of environmental stresses. Great variations were recorded among foliar anatomical characteristics in all the species. Multiple stress tolerant species (drought and salt stress) like *Sporobulus arabicus*, *O. compressa* and *Desmostachya bipinnata* had thick epidermis layers. Endodermis thickness was considerably high in *O. compressa* as compared to other species. Large cortical cells in *O. compressa* and *D. aegyptium* were the indication of the wide distribution in a variety of different environmental conditions. Larger vascular tissue in *Sporobolus arabicus* was the indication of better adaptation of this species to a variety of environment types and hence, the wider distributional range as compared to other species. Modifications in the foliar anatomy were species and habitat specific supported significantly morphological features and, therefore, may contribute considerably towards taxonomic studies of the family.

ICPS-091 - EFFECT OF WATER STRESS ON ANATOMY OF *CYNODON DACTYLON* L. ECOTYPE FROM THE SALT RANGE

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Abstract: The Salt Range, Punjab, Pakistan is of unique geographic importance in relation to its geology and biodiversity. Several environmental stresses, especially salinity, drought and nutrient are

the major environmental threats of the region. Bermuda grass (*Cynodon dactylon* L.) was collected from the drought affected habitats of the Salt Range, Pakistan. Ecotype of this grass was collected from the normal soil of university campus, University of Agriculture, Faisalabad for the comparison. The experiment was laid out in completely randomized design by maintaining three drought stress level (100%, 75% and 50% field capacity) and three repeats. A study was conducted to evaluate the effect of water stress on morpho-anatomical characteristics and structural modification of this species to withstand under severe drought stress condition. The ecotype from the Salt range adapted better to moderate and high drought levels. This showed some specific morpho-anatomical variations to different water deficit conditions. Both the ecotypes showed decreased growth with increase in drought levels. Root length was promoted by increasing the drought level, more in the ecotype from the Salt Range, and that may be very important for the water conduction from deeper layers under limited moisture availability during severe droughts. Plant height, root and shoot fresh weights decreased by increasing the drought levels but more severely in the Faisalabad population. The ecotype from the Salt Range tolerated severe drought stress by specific anatomical changes like increased leaf vascular bundle area and stomata density on both leaf surfaces, but decreased stomatal area, and increased bulliform cell area, bundle sheath area, mesophyll area, metaxylem area, cortex area, sclerenchymatous cell area, pith area and stem area. It was concluded that anatomical characteristics may provide excellent tool for assessing drought tolerance in this grass species.

ICPS-092 - LEAF ANATOMICAL ADAPTATIONS IN *CENCHRUS SETIGERUS* AND *SPOROBOLUS ARABICUS* FROM THE SALT RANGE, PAKISTAN UNDER DROUGHT STRESS

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Abstract: Plants inhabiting the Salt Range, Punjab, Pakistan facing various environmental hazards like drought stress, salinity and nutrient stress. The Salt Range, originating in the Cambrian era, is of unique geographic importance in relation to its geology and biodiversity, therefore, native flora is expected to be well adaptive to environmental constraints. Two grass species, *Cenchrus setigerus* and *Sporobolus arabicus*, were collected from the drought affected habitats of the Salt Range. Ecotypes of both the grasses were collected from Faisalabad. The material was subjected to drought stress by maintaining three moisture regimes, viz., 100%, 75% and 50% field capacity in completely randomized design with three repeats. Various morph-anatomical parameters were studied during the investigation to assess adaptive mechanism for drought tolerance/resistance. *Cenchrus setigerus* from the Faisalabad region under drought stress showed decrease in morphological characteristics, indicates its drought sensitive nature due to which it had stunted growth at the highest drought level. All the morphological characteristics in the ecotypes of both grasses from the Salt Range were relatively less affected as compared to those recorded in the ecotypes of the Faisalabad region. *Cenchrus setigerus* from Faisalabad (relatively sensitive to drought stress) survived extreme droughts by enlarged protoxylem vessels, bulliform cells, increased cuticle, epidermis, sclerenchyma, and bundle sheath. Reduction in leaf anatomical parameters in *C. setigerus* from the Salt Range with the increase in drought level was observed but enhanced mechanical or protective tissues (sclerenchyma cell area, cuticle), bulliform and bundle sheath ultimately make it drought resistant. *Sporobolus arabicus* from the Salt Range tolerated drought stress via increased development of all the leaf anatomical characteristics, and this was more pronounced at the highest drought level. A mixed behaviour was recorded in all the leaf anatomical characteristics in *S. arabicus* from the Faisalabad region and this may relate this species as less tolerant.

ICPS-093 - ORDINATION AND DISTRIBUTIONAL PATTERN OF CHOLISTAN FLORA IN RELATION TO SOIL CHARACTERISTICS

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Abstract: A thorough survey of the Cholistan Desert (lesser part) was carried out to investigate the species distributional pattern and species ordination in relation to soil characteristics. Vegetation was surveyed suing quadrat method by laying 10 quadrats (10 x 10m each) along a transect separating by 20 km at 20 different sites. Soil characteristics like total soluble salts (TSS), soil pH, soil organic matter, available P, available K, snd saturation percentage. Relative cover of some potential salinity tolerant species (*Suaeda fruticosa*, *Salsola baryosma*, and *Sporobolus ioclados*) correlated significantly and positively with TSS, more drought tolerant species like *Ochthochloa compressa* and *Chorchorus depressus* with soil pH, highly drought tolerant *Paniocum antidotale* with organic matter and available K. Relative frequency of *Aristida adscensionis* and *Dipterigium glaucum* strongly negatively correlated with TSS, but *S. baryosma* showed positive correlation. *Aeluropus lagopoides, P. antidotale*, and *Trianthema triquetra* correlated positively and significantly with organic matter, *Haloxylon recurvum* negatively correlated. It was concluded that some soil characteristics are responsible for the distributional pattern of some specific species in the Cholistan desert.

ICPS-094 - CONTRIBUTION OF ANATOMICAL PARAMETERS IN TAXONOMY AND DISTRIBUTION OF *ASPARAGUS* SPECIES AND CULTIVARS IN THE FAISALABAD REGION

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Abstract: Detailed surveys was conducted in Faisalabad district and its adjoining district, namely Sheikhupura, Hafizabad, Sargodha, Khushab, Jhang, Toba Tek Singh, Okara, Lahore and Kasur for the distribution of native and exotic flora of genus Asparagus (family Asparagaceae). Leaf, root, stem and cladode anatomical studied had been conducted for their contribution in taxonomy and distribution pattern in the Faisalabad region. *Asparagus adscendens* was the only native species of the region that is distributed widely in Punjab plains and sub-mountainous region. It is characterized by relatively thick cuticle and epidermis and thick endodermis. Asparagus densiflorus and A. setaceous were the widely cultivated species in the region and adapted to a variety of environmental conditions had thicker roots, larger parenchymatous cells, and well developed vascular tissue than the other species and cultivars. On the whole, all the species and cultivars showed very specific anatomical features and multivariate analysis showed strong relation to the descriptive feature, and therefore, can be used as a tool for the taxonomy of the genus *Asparagus*. In addition, by using these anatomical modifications their tolerance to environmental stresses can be assessed relatively easily.

ICPS-095 - NEW APOPTOTIC EFFECT OF D-MANNOSE IN WHEAT ROOTS

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Abstract: Effect of D-mannose on antioxidant defense response, apoptotic internucleosomal nDNA degradation, and protease activity was studied in roots of wheat seedlings during early growth. Mannose (1%) induced apoptotic internucleosomal nDNA fragmentation after 96 h of treatment when it

was not observed in control. Superoxide dismutase activity was down regulated parallel to induction of apoptosis. Protease activity was enhanced prior to induction of apoptosis which shows involvement of proteolysis in apoptotic induction process. More over a sharp increase in membrane lipid peroxidation (MDA content) was also observed during apoptosis induction. Catalase and peroxidase activities were increased 24 h before apoptotic induction while turned down at time of induction. Total phenolic content was down regulated 48 h before induction of apoptosis. Collectivity antioxidant defense was down regulated and proteases activities and lipid peroxidation were enhanced during induction of apoptosis and thus play a key role in controlling D-mannose induced apoptotic process. New apoptotic effect of D-mannose in wheat roots in connection with antioxidant and proteases activities is discussed in detail.

ICPS-096 - COMPARATIVE SEED STORAGE PROTEIN PROFILING OF KABULI CHICKPEA GENOTYPES

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Abstract: Seed storage protein profiles of eight kabuli (white seeded) genotypes were compared by sodium dodecyl sulphate polyacrylamide gel electrophoresis (SDS-PAGE). Total soluble proteins were resolved on 10% SDS polyacrylamide gels. Low variability in tested germplasm based on seed storage proteins was observed. Dendrogram based on electrophoretic data clustered the genotypes in 4 groups. Three genotypes ILC-195, CM-2000 and CM-98/99 were clustered in three separate groups showing a considerable variation in seed storage protein among these genotypes. All other genotypes clustered in fourth group showing high degree of homology in seed storage proteins and thus low genetic variability. In conclusion electrophoresis (SDS-PAGE) of seed storage proteins can be economically used to assess genetic variation and relation in germplasm. Moreover genotypes, ILC-195, CM-2000 and CM-98/99, can be identified from seed storage protein profiles.

ICPS-097 - EFFECT OF L-ASCORBIC ACID ON GROWTH, WATER RELATIONS AND PHOTOSYNTHESIS OF *UROCHONDRA SETULOSA* (TRIN.) C.E. HUBBARD UNDER SALINE STRESS

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Abstract: *Urochondra setulosa* (a perennial coastal grass) was grown in different NaCl concentrations (0, 200, 400, 600 and 800 m*M*) to study the effect of L-Ascorbic acid on growth, water relations and photosynthesis under salinity stress. Following seedling establishment, control plants were sprayed with distilled water and treatment plants with 20 m*M* Ascorbic acid twice a week for about a month after which plants were harvested. Optimum growth was obtained at 200 m*M* NaCl and declined with further increases in salinity, whereas, a significant growth promotion was observed in plants treated with ASA in all salinities. Plant height was increased in ASA treated plants but, little difference was observed for number of leaves in control as well as ASA treatments. Although, growth, net photosynthesis, stomatal conductance and transpiration optimized in ASA treated plants at 200 m*M* NaCl, a progressive decrease in all parameters was observed with a further increase in salinity. Values for water potential and ions remain unchanged while a slight increase in osmotic potential and turgor was observed in plants treated with ASA. Our data indicates that ASA could contribute in alleviating salinity stress which enables *U. setulosa* to grow in hypersaline coastal environments.

ICPS-098 - INFLUENCE OF UREA ON GROWTH AND YIELD OF MAIZE (*ZEA MAYS* L.) CULTIVARS DIFFERING IN YIELD PRODUCTION

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Abstract: In order to assess the beneficial effect of urea on maize cultivars differing in yield production, pot experiment was conducted in a wire net house. Four week-old maize plants were subjected to varying levels of urea (0, 50, 100, 175, 225 kg/ha urea) for eight weeks (mid-season harvest) and fifteen weeks (final harvest). Plants growth, yield and mineral nutrient status of the two maize cultivars was assessed both at the time of mid-season harvest and final harvest. Addition of varying levels of urea enhanced the growth and yield of both the maize cultivars. However, 175 kg/ha urea was found to be more effective in enhancing growth and yield of both maize cultivars (C-20 & C-79). Furthermore, the maize cv. C-20 was performed better growth regarding yield under both normal growth conditions and higher level of urea. However, it has been observed the greater beneficial effect of 175 kg/ha urea on cv. C-20 was due to its enhanced effect on mineral nutrient accumulation such as N, P, K, Cu, Fe, Mn and Zn.

ICPS-099 - APPRAISAL OF EXOGENOUSLY APPLIED BEET EXTRACT FOR INDUCING SALT TOLERANCE IN SUNFLOWER

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Abstract: Salt stress reduces agricultural productivity in most crop species worldwide. However, some crop plants can successfully grow on salt affected land because they can accumulate a variety of organic and inorganic solutes. Sugar beet also accumulates these organic and inorganic osmotica that contribute in salt tolerance of sugar beet. Any practical way to enhance these organic or inorganic osmotica can enhance the crop salt tolerance. Thus in the present study, sugar beet extract containing these organic and inorganic osmotica applied as foliar spray to examine whether enhancement in organic or inorganic osmotica by foliar application of beet extract can improve the salt tolerance in sunflower. Results of the present study showed that salt stress reduced the growth of sunflower. However, exogenous foliar application of beet extract could not alleviate adverse effect of salt stress on sunflower. Salt stress also reduced the leaf water potential, soluble protein and free amino acids. However, foliar application of beet extract did not change these physiological and biochemical attributes. In conclusion, organic and inorganic osmotica present in sugar beet extract used in the present study were significantly lower to that level which could modulate plant osmotic adjustment capacity and plant salt tolerance in sunflower.

ICPS-100 - INTERACTIVE EFFECTS OF VARYING DOSES OF NITROGEN FERTILIZER AND WATER STRESS ON GROWTH AND YIELD OF BARLEY (*HORDEUM VULGARE* L.)

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Abstract: Water stress due to shortage of water or low rainfall is one most prevalent abiotic stresses in Pakistan. Water stress reduces uptake of water and mineral nutrients resulting in reduced growth and

yield. Thus, addition of nutrients might have improved growth and yield under drought stress. In view of this, an experiment was conducted assess as to whether addition of N fertilizer up to what extent improved the growth and yield of barley. Four week old plants of two varieties of barley (B-93101 and B-94057) were grown under normal or water stressed conditions till maturity. Varying doses of nitrogen (0, 23, 46, and 69 kg ha^{-1}) as urea applied to barley varieties grown under normal or water stress conditions. Drought stress reduced the growth and yield of both barley varieties. Furthermore, this adverse effect was more in variety B-93101 as compared with variety B-94057. However, adverse effects of water stress were alleviated in both barley varieties by addition of nitrogen fertilizer. This ameliorative effect of N fertilizer was more pronounced at 69 kg ha^{-1} in variety B-94057 as compared with variety B-93101. Thus, growth and yield of barley in water limited areas can be improved by applying specific dose of N fertilizer and specific barley cultivar.

ICPS-101 - SCREENING OF ADVANCED LINES AND COMMERCIAL VARIETIES AGAINST KARNAL BUNT DISEASE (*TILLETIA INDICA* (MITRA) MUNDKAR) OF WHEAT

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Abstract: Two hundred and forty four germplasm advanced lines and commercial varieties of wheat received from Wheat Research Institute, Faisalabad were screened for the sources of resistance against Karnal Bunt disease (*Tilletia Indica* (Mitra) Mundkar) by artificially inoculating the germplasm with sporodial suspension of the fungus. The screening revealed 16, 10, 16, 33, 58, and 111 lines / varieties to be highly resistant, resistant, moderately resistant, moderately susceptible, susceptible and highly susceptible respectively. The sixteen highly resistant advanced lines were V-02192, V-03079, V-04022, V-04178, V-05011, V-05020, V-05023, V-05025, V-05039, V-05136, V-05144,V-05150, V-06122, V-06126, V-06127, V-06138. The ten resistant lines were V-01078, v-03138, v-04048, v-04076, V-04171, V-04183, V-05132, V-05152, V-08794 and Mexi Pak-65, while the sixteen moderately resistant lines were V-02154, V-04157, V-04189, V-04611, V-05010, V-05097, V-05610, V-06121, V-06123, V-06125, V-06131, V-06133, WL-711, SA-42, SH-2002 and Shafaq 06.

ICPS-102 - RESPONSE OF ADVANCED LINES OF CHICKPEA AGAINST CHICKPEA BLIGHT DISEASE

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Abstract: Two hundred and seventy seven germplam advanced lines of chickpea received from various research organizations were screened during rabi 2006-07. for the sources of resistance against chickpea blight disease (*Ascochyta rabiei* (Pass.) Labr.) by artificially inoculating the germplam with pycniosproe suspension of the pathogens. The screening revealed 02, 39, 38, 52 and146 lines to be highly resistant (immune), resistant, moderately resistant, susceptible and highly susceptible. Out of 126 lines received from Pulses Research Institute, Faisalabad, none of the lines responded resistant while, twelve lines such as 06025, 06026, 06027, 06031, 06035, 06040, 06041, 06056, Vinhar, Bittle-98, Pb-2000 and Paidar-91 responded to be moderately resistant. The remaining lines responded susceptible to highly susceptible. Out of 83 lines received from NIAB, Faisalabad seven lines viz., 06223, 06224, 06270, 06271, 06272, 06277and 06278 displayed resistant response while other seven lines such as 06214, 06217, 06218, 06220, 06225, 06237, and 06279 exhibited moderately resistant response. Out of 36 advanced lines of NARC, Islamabad thirteen lines viz., CMC 70T, CMC 55D, NCS-0510, CMC-59S, NCS-0516, NCS-0602, NCS-0612, NCS-0613, NCS-0614, NCS-0616, NCS-0621, NCS-0623 and NCS-0526 responded to be resistant while fourteen lines such as NCS-0518,NCS-0513, NCS-

0512, NCS-0610, NCS-0603, CMC-186M, NCS-0617,, NCS-0619, NCS-0620, NCS-0625, NCS-0527, NCS-0529, NCS-0531 and Pb-2000 responded to be moderately resistant. Out of 32 advanced lines received from ICARDA, Syria two lines such as EC-516792, ICCV-98815 were found to be highly resistant (asymptomatic). Eighteen lines such as EC-516709, EC 516729, EC-516771, EC-516793, EC-516878, EC 516895, EC-516934, EC-516957, EC-516967, EC-516974, EC- 517003, EC-517011, EC-517039, EC-517073, ICC-6304, ICC-6945, ICCV-04537 and ICCV-98818 exhibited moderately resistant response. Thus the germplasm of NARC, Islamabad and that of ICARDA, Syria consisted of greater number of resistant lines as compared to that of NIAB, Faisalabad and PRI, Faisalabad.

ICPS-103 - DEVELOPMENT OF *IN VITRO* AXILLARY AND *DE-NOVO* SHOOTS IN TEAK (*TECTONA GRANDIS* L.): EFFECT OF INDOLE-3-BUTYRIC ACID AND NAPHTHALENE ACETIC ACID

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Abstract: Indole-3-butyric acid (IBA) and naphthalene acetic acid (NAA) were compared for in vitro shoot development of teak (*Tectona grandis* L.). In vitro shoot tips (2-3 cm long) were inoculated in MS basal medium supplemented with 1, 2, 4, 6, 8 or 10 µM of either IBA or NAA at 25 ± 2 ºC in 16 h photoperiod (35 µmol m^{-2} s^{-1}). Cultures were shifted to respective fresh medium every 15 days and maintained for 45 days. The data for axillary and de-novo shoots were collected at day 15, 30 and 45, i.e., after each subculture and at the end of the experiment. After 15 days, a maximum 4.53 mean number of de-novo shoots was produced as compared to axillary shoots (1.14). It was also observed that both axillary and de-novo shoot formation decreased during each passage in fresh medium. After 45 days, the highest mean number of de-novo (5.06) and axillary shoots (2.85) were recorded by using 10 µM NAA and 8 µM IBA, respectively. In vitro-derived shoots were rooted in half-strength MS basal medium supplemented with combination of both IBA and NAA (4+4 or 6+6 µM). Highest rooting (60 %) with mean number of roots (10) and root length (3 cm) was observed at 6+6 µM of IBA and NAA after 36 days of initial culture. The *in vitro* rooted plants were then successfully acclimatized under glasshouse conditions.

ICPS-104 - EFFECT OF DIFFERENT GROWTH CONDITIONS ON UPTAKS OF NITRATE AND AMMONIUM IN CELL SUSPENSION CULTURE OF *JATROPHA CURCAS* L.

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Abstract: The ability of Mixotrophic cell suspension cultures of *Jatropha curcas* L. to regulate NO_3^- and NH_4^+ uptake was studied in different inorganic and organic and organic carbon sources and under the different growth conditions. The Jatropha cells exhibited a marked preference for absorbing NO_3^- and NH_4^+ when all the Nitrogen and Carbon sources were present in the culture medium. Presence of NH_4^+ was essential for the optimal uptake of NO_3^-. Conversely, NH_4^+ uptake was not affected by presence or absence of NO_3^- in the medium. While in the absence of sucrose in the medium, cumulative uptake of NO_3^- and NH_4^+ was decreased. Decrease in uptake of $NO_3^-$was more pronounced as compared to that of NH_4^+. When glycine and glycine and NH_4^+respectively were omitted from the medium the uptake of NO_3^- and NH_4^+ was also decreased. The maximum uptake of NO_3^- and NH_4^+ was recorded between temp 25°C to 30°C. The culture was placed at reduced temp: i.e. 15°C, a decrease in uptake of NO_3^- and NH_4^+ was recorded. There was a difference in pH optima for NO_3^- and NH_4^+. Maximum uptake of NO_3^- was recorded in the medium with alkaline pH (7.5), however, maximum uptake of NH_4^+ was recorded at neutral pH (7.0). It was observed that NH_4^+ absorption was more sensitive to the pH of the

medium than NO_3^-. Light intensities of 10 Wm^{-2} and 20 Wm^{-2} did not affect significant decrease in uptake of NO_3^- and NH_4^+ from the medium. This ability of the cells to regulate NO_3^- and NH_4^+ appear to more relate to over all levels of nutrition in the medium rather than absence of Nitrogen and Carbon sources. Transfer of the cells to different growth conditions also exhibited the expected uptake pattern of NO_3^- and NH_4^+.

ICPS-105 - CURATIVE PROPERTIES OF *ACHYRANTHES ASPERA* LINN. IN LOCAL POPULATION OF DISTRICT KHAIRPUR, SINDH, PAKISTAN

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Abstract: Prickly Chafflower *(Achyranthes aspera* Linn.*)* whole plant is widely used as medicine form ancient times for treating various diseases. Different parts of the plant have been used in different ways with different formulation such as fresh extract, powder of root & stem, paste, decoction etc. Inhabitants of Khairpur District use this plant as, astringent, anti-periodic, anti-bilious, expectorant, to stop bleeding, anti-venom, and gynecological problems, etc. The report and results discussed here is related to the general ethno-botanical status of the plant.

ICPS-106 - EVOLUTION OF HOST SPECIFICITY AND VIRULENCE IN PLANT PATHOGENIC FUNGI

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Abstract: The fungi are a diverse group of highly versatile organisms whose beneficial and detrimental effects have a major impact on human affairs. They are proven to be the fertile grounds for the emergence of plant pathogens. Billion of dollars of crop losses are annually attributed to diseases and post-harvest food spoilage caused by fungi. Crop devastation by fungi has led to starvation of large populations and to major social displacements, as during the potato famine in Ireland. However, there are fungi that are non pathogenic towards plants. These plant pathogenic fungal species are not evenly distributed phylogenetically across the fungal kingdom, which shows that their ability to cause disease in plants appears to have arisen multiple times during evolution. This pathogenic ability depends on some highly specific genes which distinguish them from their closely related non-pathogenic relatives. The encoding of the host determining "virulence factors" has also been carried out by these fungi. These virulence factors have been identified as small secreted proteins and enzymes involved in the synthesis of toxins and play a significant role in plant pathogenic interactions. This paper briefly reviews the current knowledge of these virulence factors from several fungal species in terms of function, phylogenetic distribution sequence variation and genomic location. It would also briefly address the evolution of virulence in fungi with relevance to plants.

ICPS-107 - **PROSPECTS OF GENE MANIPULATION IN FILAMENTOUS FUNGI**

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Abstract: Filamentous fungi are extremely important to humankind. They have been employed in medicine, industry, agriculture and basic biological research. For instance, some of these fungi are pathogenic to humans, plants and other animals, where as others produce metabolites of utmost

importance like penicillin and cephalosporin. Upregulation of genes in many of the industrial strains for the production of glucosamylase, proteases, citric acid and a number of other metabolites has largely been exploited all over the world. The largest and most economically important group of plant pathogens is fungi. More than 80% of plant diseases are caused by these organisms. There are fungi like the ones forming mycorrhizae with crops and forest trees which affect plant productivity in a positive way. These fungi increase the ability of plant roots to obtain limiting nutrients. Genetic engineering provides an opportunity to study mechanism regulating symbiosis and pathogenicity-related genes. It may even be possible to study the regulation and activities of agriculturally important genes in laboratory models. Several fungal species have biological properties and genetic systems that make them ideally suited for basic biological research. This paper reviews the techniques for genetic manipulation of these fungi developed during the last couple of decades which has made it possible to alter their detrimental and beneficial activities in novel ways.

ICPS-108 - EXOGENOUS GLYCINEBETAINE AND SALICYLIC ACID APPLICATIONS IMPROVES PLANT WATER RELATIONS AND BIOLOGICAL YIELD IN SUNFLOWER UNDER WATER STRESS

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Abstract: Water shortage is a severe threat to the sustainability of crop production. Exogenous application of glycinebetaine (GB) and salicylic acid (SA) has been found very effective in reducing the adverse affects of water scarcity. This study was conducted to examine the possible role of exogenous application of GB and SA in improving the plant water relations, plant height and biological yield of hybrid sunflower *(Helianthus annuus* L.) under different irrigation regimes. Three levels of irrigation, viz. control (normal irrigations), water stress at vegetative stage (irrigation missing at vegetative stage) and water stress at flowering stage (irrigation missing at flowering stage) and five levels of exogenous applications of GB and SA, viz. (0 m*M*, 100 m*M* (11800 ppm) and 0.724 m*M* (100 ppm) of GB and SA at vegetative and flowering stage respectively) were applied. Water relations of crop, plant height at maturity and biological yield reduced due to water stress. However, significant improvement due to exogenous applications of GB and SA was recorded in relative water contents, water potential, osmotic potential, turgor potential, plant height and biological yield. The effects of foliar application of GB in water stress condition was more pronounced when applied at flowering stage than at the vegetative stage. Moreover, exogenous GB application was only advantageous under stress conditions.

ICPS-109 - INFLUENCE OF TREATED TEXTILE EFFLUENT ON GERMINATION AND EARLY GROWTH OF SOME WINTER VEGETABLE CROPS

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Abstract: In order to assess as to whether treated textile effluent could be safely used to irrigate some winter vegetables, a growth room experiment was conducted. Varying levels of treated and untreated textiles effluent were applied to germinating seeds of some winter vegetables and their effect was evaluated on germination and early growth stage using seed germination, growth, and biochemical attributes. Analysis for heavy metals from industrial effluent as well as in leaves and roots of vegetables was also carried out. From the results, it was obvious that textile effluent reduced seed germination

and early growth of all vegetables. However, this effect was more pronounced at the highest concentration of textile effluent. Furthermore, treated textile effluent did not show any inhibitory effect on seed germination of all vegetables. Photosynthetic pigments such as chlorophyll a & b, and protein contents were higher in the leaves of all vegetable plants irrigated with treated textile effluent than those of supplied with untreated textile effluents. It has been observed that heavy metals were lower in concentration in treated textile effluent as compared with untreated textile effluent. Thus application of treated textile effluent resulted in lower accumulation of heavy metals in plants of all vegetables than those supplied with untreated textile effluent. Lower accumulation of heavy metals in plants of all these vegetables supplied with treated textile effluents might have caused lower toxic effects on photosynthetic machinery and protein synthesis which in turn resulted in higher germination and growth responses. However, germination and growth responses of all three vegetables were different to treated or untreated textile effluents. Furthermore, the *Raphanus sativus* ranked as tolerant followed by *Brassica campastris* and *Brassica napus* based on germination and growth responses. In conclusion, in view of shortage of water, textile effluent could safely be used for irrigation to vegetables after proper processing. However, due care should be taken since growth responses of winter vegetable were species specific.

ICPS-110 - SCREENING FOR SALT TOLERANCE IN MAIZE (*ZEA MAYS* L.) HYBRIDS AT AN EARLY SEEDLING STAGE

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Abstract: An efficient and simple mass screening technique for selection of maize hybrids of salt tolerance has been developed. Genetic variation for salt tolerance was assessed in hybrid maize (*Zea mays* L.) using solution-culture technique. The study was conducted in solution culture exposed to four salinity levels (0, 40, 80 and 120 m*M* NaCl). Seven days old maize seedlings were transplanted in themopol sheet in iron tubs containing ½ strength Hogland nutrient solutions and salinized with common salt (NaCl). The experiment was conducted in the rain protected wire house of Stress Physiology Laboratory of NIAB Faisalabad, Pakistan. Ten maize hybrids were used for screening against four salinity levels. Seedling of each hybrid was compared for their growth under saline conditions as a percentage of the control values. Considerable variations were observed in the root, shoot length and biomass of different cultivars at different salinity levels. The leaf sample analyzed for inorganic osmolytes (sodium and potassium) showed that genotype Pioneer 32B33 and Pioneer 30Y87 have high biomass, root shoot fresh weight and high K^+/Na^+ ratio and showed best salt tolerance performance at all salinity levels on overall basis.

ICPS-111 - HORMONAL PRIMING FOR IMPROVED VIGOR AND SALT (NaCl) STRESS TOLERANCE IN HOT PEPPER

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Abstract: Germination and seedling establishment are critical stages in the life cycle of plants especially under stress conditions where situation becomes adverse particularly for non-halophytes. Pepper is one of the plants most susceptible to salinity stress, as salinity renders germination and emergence slow and non-uniform. Different methodologies have been adopted by plant physiologists in different crops to alleviate salt stress. Seed priming has proven beneficial in this regard in many important agricultural crops. We evaluated the effect of salicylic acid (SA) and acetylsalicylic acid (ASA)

at different doses (0.2, 0.4, 0.6, 0.8 and 1.0 m*M*) in improving seed vigor and salt tolerance in seedlings of hot pepper. Both the priming agents significantly enhanced seed vigor in terms of decrease in time taken to 50% germination and increased final germination percentage, root and shoot length, seedling fresh and dry weight and seedling vigour in comparison to control. The best doses of priming agents were 0.8 m*M* and 0.2 m*M* for salicylic acid and acetylsalicylic acid, respectively. Concentrations over 1.0 m*M* of ASA or SA showed adverse effects. Overall, acetylsalicylic acid exhibited superiority over salicylic acid. In another experiment, seeds primed with selected doses of SA (0.8 m*M*) and ASA (0.2 m*M*) were tested at different salinity levels [0, 3, 6 and 9 dS m^{-1}] for salt tolerance. In accordance with the results of first experiment, both the treatments showed significantly better results over the control by improvement in time taken to 50% germination, final germination percentage, root and shoot length, seedling fresh and dry weight and seedling vigour. Our results indicate that hormonal priming, especially with acetylsalicylic acid, can be a good treatment for hot pepper to enhance germination and seedling establishment under normal as well as saline conditions.

ICPS-112 - SEED GERMINATION OF SALT PLAYA HALOPHYTES FROM PAKISTAN: SALINITY, TEMPERATURE AND LIGHT RESPONSES

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Abstract: Seed germination responses of *Halogeton glomeratus*, *Lepidium latifolium* and *Peganum harmala*, economically important species of temperate playas in the Upper Hunza, Pakistan, were investigated in different salinity, temperature and light regimes. Maximum germination and the rate of germination (*H. glomeratus* 100%, 48; *L. latifolium* 100%, 45 and *P. harmala* 80%, 33) were obtained in non-saline control at 20:30°C, however, increase in salinity progressively inhibited both germination and its rate. Few seeds of *H. glomeratus*, an annual could germinate at 500 mmol L^{-1} NaCl, while the other two perennials failed to germinate even at $\geq$300 mmol L^{-1} NaCl. Seed germination of any test species did not occur at 5:15°C and 20:30°C appeared to be an optimum temperature regime at all salinity levels. Germination of all three species declined with further increase in temperature (25:35°C) although, this inhibition was non-significant in *H. glomeratus* and *P. harmala* under control. Seed germination was substantially inhibited in dark and inclusion of salinity had synergistic effect on both *H. glomeratus* and *P. harmala*, however, seeds of *L. latifolium* could not germinate under complete darkness.

ICPS-113 - ASSOCIATION ANALYSIS FOR YIELD AND YIELD COMPONENTS IN MUNGBEAN (*VIGNA RADIATA* (L.) WILCZEK) GERMPLASM

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Abstract: Fifty eight exotic/indigenous mungbean genotypes having diverse origin were evaluated in the experimental field of NIAB, Faisalabad, during March 2006, spring season for different genetic parameters like, genotypic and phenotypic variances, genotypic co-efficient of variability (GCV), phenotypic co-efficient of variability (PCV), heritability, genetic advance, correlation and path coefficients. Characters studied were days to maturity, plant height, clusters per plant, pods per plant, 100-seed weight, biological yield, seed yield and harvest index. The estimates of GCV and PCV were high for biomass yield, harvest index and seed yield. High values of heritability were recorded for all the traits except days to maturity and clusters per plant. High heritability along with high values of genetic advance were observed for biomass yield, seed yield and harvest index. These traits are more likely to be controlled by additive type of genes. Positive and highly significant genotypic correlation of biomass

yield with seed yield was observed. The traits i.e. clusters per plant, pods per plant and harvest index also had positive and significant genotypic correlation with seed yield. At the phenotypic levels biomass yield and harvest index had positive and significant correlation with seed yield. The traits like clusters per plant, pods per plant, biomass yield and harvest index had high direct and indirect effects along with significant genotypic correlation with grain yield. Hence these traits must be given preference in selecting superior mungbean genotypes. The cluster analysis grouped fifty-eight mungbean genotypes into four clusters. Clustering pattern did not show any relation to the geographic origin. Cluster I with three genotypes (Thailand 2, Sri Lanka 1) and cluster II with seventeen genotypes (Thailand 12, Pakistan 3, India 2) showed highest values for yield and yield contributing traits. These genotypes could be considered for their direct release as a variety(s) or as parents in hybridization programmes to develop high-yielding mungbean varieties.

ICPS-114 - EFFECT OF NICKEL TOXICITY ON RELATIVE GROWTH RATE, PROTEIN CONTENTS, ION ACCUMULATION AND METAL CONTENTS IN WHEAT CALLUS TISSUE (*TRITICUM AESTIVUM*)

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Abstract: Phytotoxicity of the heavy metals is a problem of global concern. Heavy metals alter the plant metabolic activities by interfering with their physiological and biochemical processes. Ni is present in effluents of ghee/oil industry which is being used for crop cultivation and ultimately entered the food chain. Studies were conducted to examine the effect of Ni toxicity induced changes on different physiological attributes of callus tissue in two wheat genotypes, i.e., Durum and S-24. The proliferated calli of two wheat genotypes, raised from mature embryos, were tested *in vitro* for their relative tolerance to nickel toxicity. After culturing the explants, calli of both wheat genotypes (Durum and S-24) were initiated on LS basal medium supplemented with 5 mg L^{-1} of 2, 4-D (2,4 dichlorophenoxy acetic acid). To study the effect of nickel toxicity on the above mentioned metabolic activities, one month old calli were than shifted in liQuaid medium containing four different Ni treatments including control (0, 0.05, 0.10, 0.15 m*M*, Nickel sulphate). Results revealed that calli showed entirely different behavior as compare to whole plant towards heavy metal stress. A reduction in callus fresh weight was noted with more pronounced decline in S-24 than in Durum at all Ni treatments. Calli responded to the nickel induced stress by reducing uptake of nutrients like Mn^+, Fe^+, Ca^+, Co^+ and K^+ and increasing Mg^+, Na^+ and Ni^+ contents. However, total soluble proteins of calli increased with elevated levels of Ni in growth medium. Overall results showed that Nickel toxicity adversely affect the plant metabolism, which leads to a decrease in relative growth and other physiological attributes of both wheat calli. Moreover callus tissue of Durum showed much better response than S-24 in all tested attributes under different levels of Nickel toxicity.

ICPS-115 - STUDY OF INDIGENOUS USES OF MEDICINAL PLANTS IN SELECTED VILLAGES OF NATHIAGALLI, PAKISTAN

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Abstract: Present study is an effort to review and compile all information about the indigenous uses of medicinal plants in different villages of Nathiagalli, NWFP, Pakistan. The local people of the area have always used surrounding natural resources that are wild plants for medicinal purposes and have for a long time dependent on the surrounding plants for their food, shelter, fodder, timber, fuel and health care. A wide variety of plants were present in villages (Dounga Gully, Kanisan, Kalaband, Mallachh and

Kalapani) of Nathiagalli but this study mainly focused on the information regarding indigenous uses of plants for medicinal purposes by the native people of the area. From the questionnaire survey it was found that the ethnobotanical data consisted of 43 plant species with 26 families, which were locally used for different body ailments. The results showed that the most commonly used species are *Berginia ciliata, Swertia chirata, Morchella esculenta, Althaea rosea, Paeonia emodi, Valeriana jatamansi, Skimia laureola* etc, and women are actively participating than men, in the collection and processing of medicinal plants for the relief of different body ailments. It is concluded that most of the species are also exploited due to unawareness of local villagers. Community attitude towards conservation and sustainability of medicinal plants was found to be harmonious.

ICPS-116 - COMPARATIVE EFFECIENCY OF AUXIN AND ITS PRE-CURSURE APPLIED THROUGH COMPOST FOR IMPROVING GROWTH AND YIELD OF MAIZE

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Abstract: Significant improvement in growth and yield of plants has been reported by applying L-tryptophan (L-TRP) directly to soil, but its effectiveness through compost has yet not been reported. In the present study compost was prepared from waste fruit and vegetables and enriched with 25% (44 kg ha^{-1}) of full dose (175 kg ha^{-1}) of N fertilizer for maize. Pure auxin, indole 3-acetic acid (IAA) and L-TRP (precursor), were blended with respective batches @ 10 mg kg^{-1} compost for the value addition of N-enriched compost. Comparative effectiveness of IAA or L-TRP-blended N-enriched compost was studied, in the presence or absence of 50% (88 kg N ha^{-1}) of full dose of N fertilizer, through pot and field trials. Compost treatments were applied @ 300 kg ha^{-1}, and compared with full dose of N fertilizer. Results indicated that N-enriched compost with or without IAA supplemented with half dose of N fertilizer was as effective as full dose of N fertilizer in improving growth and yield of maize, saving 25% N fertilizer. However, precursor (L-TRP)-blended compost was found better than pure auxin (IAA)-blended, when both were compared with full dose of N fertilizer. It significantly improved growth, yield and nutrient uptakes (up to 8.5, 10.2 and 21% respectively) of maize over full dose of N fertilizer. The technology bears its promise not only to improve crop yield on sustainable basis but also reduce huge piles of organic wastes causing environmental pollution.

ICPS-117 - CHARACTERIZATION OF TEMPERATURE INDUCED STRESS RESPONSE IN *OCHROBACTRUM* AND *MESORHIZOBIUM*

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Abstract: Chickpea is a winter crop and nodulation in chickpea is sensitive to temperature fluctuations. We aim to characterize the temperature induced stress response in chickpea nodulating *Mesorhizobium* strain IC-94 and *Ochrobactrum* strain Ca-34. Bacteria were grown at normal temperature 28±2°C overnight and then shifted to temperature stress at 37 ±2°C, 45±2°C, 18±2°C, and 10±2°C for 3 h. Total cell proteins were extracted and were separated on 12% SDS- PAGE. Protein profiling show many bands that has been induced by temperature stress. The characterization of these temperature induced proteins will be important to see the response of bacteria under natural stress conditions and the possible reason behind nodulation instability in these bacteria.

Mesorhizobium and *Ochrobactrum* strains have been grown at normal temperature The condition for total RNA and whole cell protein extraction has been optimized. Whole cell protein isolations at different temperatures have been completed.

ICPS-118 - GROWTH AND YIELD OF TWO MAIZE CULTIVARS AS AFFECTED BY DIFFERENT LEVELS OF NPK

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Abstract: Yield potential of a crop is mainly dependent upon its genetic make up as well as the environment in which it is grown. Improved cultivar is an important input, which geared revolution in many countries of the world. Among other limiting factors, proper level of nitrogen, phosphorous and potash are of prime importance because balanced and optimum use of NPK fertilizers play a pivotal role in increasing the yield of cereals. For this purpose an investigation for ascertaining the effects of 0-0-0, 150-100-50, 200-125-75 and 250-150-100 kg N, P_2O_5 and K_2O ha^{-1} on the growth and yield of two maize cultivars namely SL-2002 and EV-5098 were carried out at Agronomic Research Area, University of Agriculture, Faisalabad during 2004.The experiment was laid out in randomized complete block design with factorial arrangements measuring plot size 3m*6m. The results obtained indicated that application of increasing rates of NPK delayed the number of days taken to tasseling, silking and maturity of the crop. Too low and too high NPK levels discouraged the yield and yield parameters of the maize crop. Treatment 200-125-75 kg/ha seemed to be the most appropriate level to get increased grain yield under the prevailing conditions. Going beyond this level was found to be uneconomical and wasteful practices. Varieties were having similar production potential under uniform and similar growing conditions.

ICPS-119 - DIFFERENTIAL RESPONSE OF ETIOLATED PEA AND MAIZE SEEDLINGS TO INOCULATION WITH RHIZOBACTERIA CAPABLE OF UTILIZING 1-AMINOCYCLOPROPANE-1-CARBOXYLATE UNDER SALT-STRESSED CONDITIONS

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Abstract: Certain plant growth promoting rhizobacteria (PGPR) regulate the production of ethylene in plants by hydrolyzing 1-aminocyclopropane-1-carboxylic acid (ACC, the immediate precursor of ethylene), through the action of ACC-deaminase. Five selected rhizobacterial strains (S5, S9, S10, S14, S15, S20) having ACC-deaminase activity were used in a highly ethylene specific bioassay of classical "triple" response. A series of experiments were conducted to investigate the comparative effect of inoculation with rhizobacteria on etiolated pea and maize seedlings in the presence of ACC or salinity stress. In general, the exogenous application of ACC or salinity stress had a concentration/level-dependent effect on etiolated pea and maize seedlings in creating the classical "triple" response. Results revealed that inoculation with strain S20 and S15 (*Pseudomonas fluorescens* and *Flavobacterium ferrugineum*) partially diluted the effect of ACC in etiolated pea and maize seedlings, which was most likely due to its ACC-deaminase activity. Salinity stress produced a stronger classical "triple" response both in pea and maize. However, the inoculation of maize/pea seedlings with S20 in the presence of salinity stress reduced classical "triple" response, most likely by lowering ACC level produced by high salinity. This ameliorative effect was more pronounced in maize than pea. Similarly, the application of Co^{2+} (a chemical inhibitor of ethylene) reduced the ACC/salinity-imposed effect on etiolated pea and maize seedlings. This is the first study, to the best of our knowledge, reporting the comparative effect of rhizobacteria containing ACC-deaminase on etiolated pea and maize seedlings under salinity stress.

ICPS-120 - EFFECT OF AUXIN (IAA) AND ITS PRECURSOR (L-TRYPTOPHAN) ON UPTAKE OF LEAD IN INDIAN MUSTARD (*BRASSICA JUNCEA)*

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Abstract: Phytoremediation is the recent and most successful technology for the removal of contaminants from polluted waters and soils. In this technique, the plant uptake capability and the availability of the pollutant in the media are important. Hyper-accumulators (plants) have capability to extract considerable amounts of pollutants from shallow soil surfaces and water. *Brassica juncea* is the most efficient hyper-accumulator of Pb from soils. A sand culture experiment was conducted at constant temperature (26±1 ºC) conditions in growth room to see the effect of auxins and its precursor (L-Tryptophan) at different concentrations, on growth and lead uptake in *Brassica juncea.* The IAA and L-TRP were applied at 0, 1, 2 and 3 ppm. Half strength Hoagland solution was applied to meet nutritional requirements of the plants. Results revealed that IAA application at 2 ppm increased root length, shoot length, root fresh weight, shoot fresh weight, root dry weight and shoot dry weight up to 26, 15, 8, 6, 10 and 20, respectively over untreated control. Results revealed that application of phytohormone (IAA) could be helpful in ameliorating the hazardous effect of Pb in plants.

ICPS-121 - IMPROVING GROWTH AND NODULATION IN LENTIL THROUGH CO-INOCULATION WITH RHIZOBIUM AND ACC-DEAMINASE CONTAINING PLANT GROWTH PROMOTING RHIZOBACTERIA

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Abstract: Nodulation and subsequent nitrogen fixation by lentil plants are inhibited by accelerated ethylene concentration in the root zone. Plant growth-promoting bacteria can help to overcome these deleterious effects. Seventy five strains of rhizobium and twenty strains of PGPR were isolated through enrichment using glucose peptone agar medium and DF salt minimal medium (ACC as a sole source of nitrogen), respectively. A series of jar, pouch, pot and field experiments were conducted for the screening of efficient isolates of rhizobia and rhizobacteria. Results of jar study showed that co-inoculation of pre-selected strains of rhizobium with PGPR containing ACC-deaminase increased root length, shoot length, total biomass and nodulation in lentils up to 70, 87, 98 and 26%, respectively, over uninoculated control while up to 86, 88, 98 and 24%, respectively, increase over uninoculated control was observed in pouch experiment. On the basis of laboratory study, three promising strains each of rhizobium and PGPR were selected for pot and field trials. Co-inoculation increased the total biomass, nodulation and grain yield up to 105, 72, and 75% in pot, and up to 75, 69 and 48%, over control in field trials, respectively. The study enabled us to select efficient PGPR and rhizobium isolates for co-inoculation to promote growth as well as nodulation in lentil grown in different regions of the country.

ICPS-122 - INTEGRATED USE OF PLANT GROWTH PROMOTING RHIZOBACTERIA CONTAINING ACC-DEAMINASE AND ENRICHED COMPOST FOR IMPROVING GROWTH, YIELD AND NODULATION IN CHICKPEA

S. M. SHAHZAD, A. KHALID, Z. A. ZAHIR, M. S. ARIF, M. ARSHAD, M. A. ANJUM AND I. MEHBOOB

[Institute of Soil & Environmental Sciences, University of Agriculture, Faisalabad-38040, Pakistan]

Abstract: The use of rhizobacteria containing ACC-deaminase may have beneficial effect on the growth and nodulation in chickpea by generating additional infection sites as well as by lowering endogenously synthesized ethylene. The current study assessed the integrated effect of PGPR containing ACC-deaminase and enriched compost as well as sole inoculation with PGPR on growth and nodulation of

chickpea seedlings under pot and field conditions. The pot and field studies showed that integrated use of PGPR containing ACC-deaminase and enriched compost gave better results compared with their separate application as well as untreated control. The integrated use of PGPR and enriched compost showed increase in fresh biomass, grain yield, number of nodules plant^{-1} and number of pods plant^{-1} up to 84, 79, 83 and 97%, respectively in pot and 73, 78, 87 and 95%, respectively, in field trial compared with untreated control. The findings imply that combined use of PGPR containing ACC-deaminase and enriched compost would be more effective than their sole application.

ICPS-123 - FERTILIZER DEPENDENT EFFICIENCY OF PSEUDOMONADS CONTAINING ACC-DEAMINASE FOR IMPROVING GROWTH, YIELD AND NUTRIENT USE EFFICIENCY OF WHEAT (*TRITICUM AESTIVUM* L.)

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Abstract: Acquisition of nutrients by plants is primarily dependent on root growth and bioavailability of nutrients in the rooting medium. Most of the beneficial bacteria enhance root growth but their effectiveness could be influenced by the nutrient status around the roots. In this study, two 1-aminocyclopropane-1-carboxylate (ACC)-deaminase containing plant growth promoting rhizobacteria (PGPR), *Pseudomonas fluorescens* and *P. fluorescens* biotype F were tested for their effect on growth, yield and nutrient use efficiency of wheat under simultaneously varying levels of all the three major nutrients N, P and K (at 0, 25, 50, 75 and 100% of recommended doses). Results of pot and field trials revealed that the efficacy of these strains for improving growth and yield of wheat reduced with the increasing rates of NPK added to the soil. In most of the cases, significant negative linear correlations were recorded between % increases in growth and yield parameters of wheat caused by inoculation and increasing levels of applied NPK fertilizers. It is highly likely that under low fertilizer application, the ACC-deaminase activity of PGPR might have caused reduction in the synthesis of stress (nutrient) induced inhibitory levels of ethylene in the roots through ACC hydrolysis into NH_3 and α-ketobutyrate. The results of this study imply that these ACC-deaminase containing Pseudomonad could be employed in combination with appropriate doses of fertilizers for better plant growth and savings of fertilizers.

ICPS-124 - INTEGRATED USE OF PLANT GROWTH PROMOTING RHIZOBACTERIA CONTAINING ACC-DEAMINASE AND ENRICHED COMPOST FOR IMPROVING GROWTH, YIELD AND NODULATION IN CHICKPEA

S. M. SHAHZAD, A. KHALID, Z. A. ZAHIR, M. S. ARIF, M. ARSHAD, M. A. ANJUM AND I. MEHBOOB

[Institute of Soil & Environmental Sciences, University of Agriculture, Faisalabad-38040, Pakistan]

Abstract: The use of rhizobacteria containing ACC-deaminase may have beneficial effect on the growth and nodulation in chickpea by generating additional infection sites as well as by lowering endogenously synthesized ethylene. The current study assessed the integrated effect of PGPR containing ACC-deaminase and enriched compost as well as sole inoculation with PGPR on growth and nodulation of chickpea seedlings under pot and field conditions. The pot and field studies showed that integrated use of PGPR containing ACC-deaminase and enriched compost gave better results compared with their separate application as well as untreated control. The integrated use of PGPR and enriched compost showed increase in fresh biomass, grain yield, number of nodules plant^{-1} and number of pods plant^{-1} up to 84, 79, 83 and 97%, respectively in pot and 73, 78, 87 and 95%, respectively, in field trial compared with untreated control. The findings imply that combined use of PGPR containing ACC-deaminase and enriched compost would be more effective than their sole application.

ICPS-125 - THE EFFECT OF THIDIAZURON (TDZ) ON *IN VITRO* MICROPROPAGATION OF *SOLANUM TUBEROSUM* L. CVS. DESIREE AND CARDINAL

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Abstract: Thidiazuron (1-phenyl-3- (1,2,3- Thiadiazol-5-yl) urea; TDZ) is one of the several substituted ureas that have been investigated recently for their cytokinin-like activity. TDZ is known to be more active than zeatin for stimulating the growth when added to a tissue culture medium at a low concentration. In this study, effect of TDZ on several *in vitro* growth parameters in *Solanum tuberosum* cvs. Desiree and Cardinal were observed. Shoot apices (1.0cm each) from both the cultivars were separately inoculated on full strength MS basal media as well as on MS full strength supplemented with different concentrations of TDZ (10^{-10}, 10^{-9} or 10^{-8} M) thus forming four combinations. Results were recorded for shoot length, shoot number, root length, root number, number of nodes, fresh and dry weight of plants after 30 days of explant inoculation. It was observed that MS full strength medium was found to be the best for *in vitro* micropropagation. However, TDZ did have an influence on the studied growth parameters, which have been discussed and interpreted herein.

ICPS-126 - ESTIMATION OF FIXED OILS FROM VARIOUS EXPLANTS AND *IN VITRO* CALLUS CULTURES OF JOJOBA (*SIMMONDSIA CHINENSIS*)

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Abstract: The present investigation was conducted for the estimation of fixed oils from various explants and respective callus cultures in jojoba (*Simmondsia chinensis*). Leaves, nodes, internodes, shoot apices and cotyledons were used as explants. MS media containing different concentrations of growth regulators were used for callus induction. Quantitative estimation of oils of different explants revealed that cotyledonary explant contained highest amount of oil, i. e., 15.026 %. Leaves contained second highest amount (8.3941 %) followed by shoot apices (5.361 %), nodes (2.868 %) and internodes (1.638 %). Comparison of oil yield from explants with six or nine weeks-old callus cultures indicated that explants had highest amount of oil content followed by nine and six weeks-old callus cultures. The results of this investigation provide evidence that in vitro jojoba plant material contains a reasonable quantity of fixed oils. Further refinement of protocols both at the level of in vitro culture manipulation as well as estimating fixed oils quantitatively/ qualitatively may have a potential to further broaden the possibility of obtaining commercial–level production of fixed oils from in vitro-established plant material of jojoba.

ICPS-127 - OVIPOSITION RESPONSES OF *HELICOVERPA ARMIGRA* TOWARDS THE MORPHOLOGICAL PLANT CHARACTERS OF SOME GENOTYPES OF COTTON

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[Department of Agri. Entomology, University of Agriculture, Faisalabad]

Abstract: Oviposition responses of *Helicoverpa armigera* were studied in different genotypes of cotton in relation to plant characters viz., trichome density, trichome length and gossypol glands from midrib, veins and leaf lamina, moisture contents and thickness of leaf lamina during 2003 and 2004. Significant variations were observed in Oviposition. Maximum number of eggs from upper portion of ten plants

was observed from FS-628 which was 23.10, while minimum number was 8.46 which was recorded from S-12. All the characters were negatively correlated with the oviposition, except trichome length on leaf lamina having the correlation coefficient of 0.575. Trichome density on leaf lamina, thickness of leaf lamina and gossypol glands on leaf lamina had significant but negative correlation having the correlation coefficient of -0.783, -0.688 and -0.858 respectively.

ICPS-128 - SURVEY OF ALTERNATE HOST PLANTS OF COTTON MEALY BUG *PHENACOCCUS SOLANI* FERRIS FROM SELECTED COTTON GROWING

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Abstract: Cotton mealy bug, *Phenacoccus solani* is the most devastating pest of cotton in Pakistan. A survey for alternate host plants of cotton mealy bug from cotton growing areas of Punjab (Pakistan) was conducted during 2005-2006 from Multan and Bahawalpur areas. These areas were intensively surveyed throughout the year. Twenty seven plant species of crops, ornamentals, trees, herbs, shrubs and weeds were recorded as host plants. Only those species of plants have been declared as hosts where the pest was found breeding. We also observed plant species where it was only present. Such plants were not counted as hosts. As this pest is difficult to control with insecticides due to presence of wax on its body, options for the management of this pest through alternate hosts are also discussed. (?) Accepted scientific name.

ICPS-129 - SEASONAL ACTIVITY OF APHIDS ON CANOLA *BRASSICA NAPUS* L. IN SOUTHERN PUNJAB (PAKISTAN)

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[University College of Agriculture, Bahauddin Zakariya University, Multan-60800, Pakistan, [1]Deapartment of Agri Entomology, University of Agriculture, Faisalabad]

Abstract: Experiments at Multan, Punjab (Pakistan) were sown with canola, *Brassica napus* L. from 2002 to 2006. Two species of aphids, *Brevicoryne brassicae* L. and *Lipaphis erysimi* (Kalt) were observed as devastating pests. These species appeared in the end of January and population was always sufficient to be recorded during mid February. Population of both the species reached the peak during 2nd or 3rd week of March. We observed that population of aphids was sufficient to initiate insecticide application during last week of February. Mean population (per 10 cm of top inflorescence per plant) of the both the species recorded was 14.42, 28.05, 64.00 and 17.74 during last week of February in four years of study.

ICPS-130 - HERBICIDAL ACTIVITY OF AQUEOUS EXTRACTS OF TWO SOLANACEOUS MEDICINAL HERBS AGAINST PARTHENIUM WEED

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[Department of Mycology & Plant Pathology, University of the Punjab, Quaid-e-Azam Campus, Lahore, Pakistan]

Abstract: Herbicidal activity of aqueous root and shoot extracts of two medicinal herbs of the family solanaceae viz. *Datura alba* and *Withania somnifera* was evaluated against germination and early seedling growth of an alien aggressive weed parthenium (*Parthenium hysterophorus* L.). Aqueous

extracts of 0, 5, …20% w/v were employed in the bioassays. Aqueous extracts of both the test plant species exhibited herbicidal activity against the target weed. However, variability in phytotoxicity was recorded in the different types of extracts. Generally shoot extracts of both the test species were more toxic than their corresponding root extracts. All the concentrations of shoot extract of *D. alba* significantly reduced germination by 31–63%. Similarly, shoot extract of all concentrations of *W. somnifera* except 5% significantly suppressed the parthenium germination. There was 13–82% reduction in germination due to shoot extracts of different concentrations. Root extracts of *D. alba* exhibited insignificant effect on germination while that *of W. somnifera* root extracts of various concentrations reduced germination by 31–41%. Root extracts of both the test species showed insignificant effect on seedling's shoot length. In contrast to that all other test aqueous extracts significantly declined shoot lenth, root and shoot length as well as seedling biomass of the target alien weed species. The present study concludes that aqueous extracts of both the test medicinal solanaceous plant species contain herbicidal constituents against one of the world's worst weed.

ICPS-131 - PARTHENIUM MANAGEMENT THROUGH AQUEOUS EXTRACTS OF *ALSTONIA SCHOLARIS*

A. JAVAID, S. SHAFIQUE, R. BAJWA AND S. SHAFIQUE

[Department of Mycology and Plant Pathology, University of the Punjab, Quaid-e-Azam Campus Lahore, Pakistan]

Abstract: Natural produces have been the source of many pesticides. In the present study herbicidal potential of aqueous leaf and bark extracts of *Alstonia scholaris* (L.) R. Br. was investigated against a noxious alien weed *Parthenium hysterophorus* L. In germination and early seedling growth bioassays, carried out in 9-cm diameter Petri plates, aqueous extracts of 2, 4, 6, 8 and 10% w/v of fresh *Alstonis* leaves significantly reduced seed germination by 30-80%. Seedling growth was also significantly reduced by all except 2% extract concentration. Bark extracts of same concentrations were proved less toxic resulted in an insignificant reduction in germination. Generally effect of bark extract on seedling growth was also insignificant. In foliar spray bioassays, three sprays of 50 and 100% w/v (on fresh weight basis) leaf extract were carried out on 15 days old *Parthenium* plants with 5 days interval each. A significant reduction in root and shoot biomass was recorded due to 100% foliar spray, after 2 week growth of the first spray. A variety of indole alkaloids present in leaves of *A. scholaris* may be responsible for herbicidal effects against the test weed species.

ICPS-132 - RESPONSE OF WHEAT TO EM (EFFECTIVE MICROORGANISMS) AND PARTHENIUM GREEN MANURE

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[Department of Mycology and Plant Pathology, University of the Punjab, Quaid-e-Azam Campus Lahore, Pakistan]

Abstract: A pot experiment was conducted in loamy textured soil amended with recommended dose of NPK fertilizers, and 1, 2, 3 and 4% Parthenium (*Parthenium hysterophorus* L.) green manure. A similar set of pots was also prepared for EM application. Wheat (*Triticum aestivum* L.) was grown as test crop 30 days after the mixing of green manure. EM application was carried out by applying 1 L of 0.2% dilution of the commercial stock EM solution per pot at fortnight intervals throughout the experimental period. Plants were harvested at flowering and maturity stages. Shoot length and dry biomass were gradually increased by increasing the quantity of green manure. There was 272% increase in shoot dry biomass over control at maturity due to 4% green manure addition as compared to 137% increase in recommended dose of NPK fertilizer. Highest root biomass was recorded in 3% green manure amended

treatment. Spike length, number of grains per spike and grains yield were also gradually increased by increasing the quantity of green manure. There was 43 to 253% increase in grain yield over control due to various green manure treatments as compared to 96% increase due to NPK fertilizers over control. EM application in uninoculated control, NPK fertilizers as well as in various green manure treatments exhibited either insignificant effect or significantly reduced the various studied parameters. The present study concludes that parthenium has the potential to be used as green manure. A 4% soil amendment with parthenium top obtained prior to flowering is best for wheat growth and yield. EM application is not suitable along with parthenium green manure for wheat.

ICPS-133 - ANTIFUNGAL POTENTIAL OF AQUEOUS EXTRACTS OF *CHENOPODIUM* SPP. AGAINST *MACROPHOMINA PHASEOLINA*

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[Department of Mycology and Plant Pathology, University of the Punjab, Quaid-e-Azam Campus Lahore, Pakistan]

Abstract: *In vitro* antifungal activity of aqueous leaf, stem, root and inflorescence extracts of three *Chenopodium* spp. viz. *C. album* L.*, C. murale* L. and *C. ambrosioides* L. was evaluated against *Macrophomina phaseolina* (Tassi) G. Goid.*,* the cause of charcoal rot of sunflower (*Helianthus annuus* L.). Aqueous extracts of all the parts of the three test *Chenopodium* species invariably and significantly reduced the biomass of target fungal species. There was 34-90%, 40-94% and 52-85% reduction in fungal biomass due to different aqueous extracts of *C. album, C. murale* and *C. ambrosioides*, respectively. Highest antifungal activity was exhibited by 4% root extract of *C. murale* followed by 4% root extract of *C. album* resulting in 94 and 90% suppression in test fungal species biomass, respectively.

ICPS-134 - ANTIFUNGAL ACTIVITY OF SYZYGIUM CUMINI AGAINST ASCOCHYTA RABIEI

K. JABEEN AND A. JAVAID

[Department of Mycology and Plant Pathology, University of the Punjab, Quaid-e-Azam Campus Lahore, Pakistan]

Abstract: Aqueous, ethanol and n-hexane extracts from leaves, fruit, root-bark and stem-bark of *Syzygium cumini* (L.) Skeels were tested for their antifungal activity against *Ascochyta rabiei* (Pass.) Lab. Different concentrations viz. 1, 2, …5% of both aqueous and organic solvent extracts were used in the study. Aqueous extracts of all the four test plant parts viz. leaves, fruit, stem-bark and root-bark showed significant antifungal activity resulting in 7–30%, 22–59%, 23–39% and 21–64% reduction in fungal growth. Similarly, n-hexane stem-bark extract, and ethanol root- and stem-bark extracts also significantly suppressed the growth of target fungal species resulting in 17–39%, 24–30% and 12–32% suppression in fungal growth.

ICPS-135 - EVALUATION OF ANTIFUNGAL ACTIVITY OF *EUCALYPTUS CITRIODORA* AND *ALSTONIA SCHOLARIS* AGAINST *ASCOCHYTA RABIEI*

K. JABEEN AND A. JAVAID

[Department of Mycology and Plant Pathology, University of the Punjab, Quaid-e-Azam Campus Lahore, Pakistan]

Abstract: Antifungal properties of aqueous, n-hexane and ethanol extracts of leaf, fruit, and root and stem barks of *Eucalyptus citriodora* Hook were investigated against *Ascochyta rabiei* (Pass.) Lab., the cause of blight disease in chickpea (*Cicer arietinum* L.). Effect of 1, 2, …5% extracts of different parts of the two test tree species were studied against radial growth of the test fungal species on 2% malt

extract agar medium amended with chickpea power @ 1 g 100 ml^{-1} of the medium. Aqueous leaf and root bark extracts of fruit of *E. citriodora* exhibited highly antifungal activity where different employed extract concentrations (1–5%) significantly reduced the colony diameter of *A. rabiei* by 25–38% and 22–41%, respectively. Similarly, fruit and root bark ethanolic extracts of *E. citriodora* were also very effective resulting in 13–25% and 16–42% suppression in colony diameter of the test fungal species, respectively. None of the aqueous or organic solvent extracts of *A. scholaris* exhibited antifungal activity against *A. rabiei.*

ICPS-136 - SEAWEED AS A MARINE BIOLOGICAL WARFARE AGENT AGAINST *LEISHMANIA MAJOR*

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Abstract: The *in vitro* bioassays can be viewed as a detection method of the fundamental and unique phenomena of living organisms. The ethanolic extract of some seaweed showed promising antileishmanial activity *in vitro* by using promastigote (extracellular, cell free bioassay) of parasite *Leishmania major.* The extract which showed potent antileishmanial activity is subjected to bioactivity-directed fraction and isolation.

ICPS-137 - SCREENING OF DIFFERENT SUGARCANE CLONES (SACCHRUM OFFICINARUM) FOR CALLUSING, EMBRYOGENESIS AND REGENERATION FOR GENETIC TRANSFORMATION

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Abstract: Sugarcane genetic engineering has become major tool for sugarcane improvement through tissue culture and genetic transformation. The present study was aimed to screen local elite clones of sugarcane for callusing, embryogenesis and regeneration. The screened embryogenic and regenerative callus will be used for genetic transformation. Seven elite clones such as S-98-CSSG-676, S-98-CSSG-668, NSG-311, NSG-555, SPF-242, CPF-245 and CPF-237 were screened on four different media having different concentrations and combinations of Auxin and Cytokinin. Out of these clones, CSSG-668 CSSG-676 and CPF-237 were found best to induce callus within 5 weeks on medium containing 2, 4-D (4 mg/L) along with caisene hydrolysate (0.5g/l). While S-98-CSSG-668 and CPF-237 produced embryogenic and regenerative callus on media containing NAA (1 mg/L), IAA (1 mg/L) and 2,4-D (2 mg/L) after 6 weeks. It was also observed that the best regeneration was obtained in clones S-98-CSSG-668, CPF-245 and CPF-237 on media containing BAP (1 mg/L), Kinetin (0.5 mg/L) and 2,4-D (1 mg/L). It was concluded that S98-CSSG-668 and CPF-237 might be ideal from the screened clones for the genetic transformation. Evaluated clones and protocol will be useful for regeneration of transgenic sugarcane plants as well as micro propagation.

ICPS-138 - SURVEY OF INCIDENCE OF KARNAL BUNT DISEASE *TILLETIA INDICA* [(MITRA) (MUNDHAR)] OF WHEAT IN VARIOUS DISTRICTS OF THE PUNJAB

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Abstract: A comprehensive survey of incidence of karnal bunt disease of wheat was conducted in 17 districts of the Punjab during the crop year 2005-06. Out of 624 samples collected from grain markets of various cities and towns, 208 samples were found infected by karnal bunt disease, revealing 33.33

per cent of the samples infected. The range of infection in the samples varied from 6.97 per cent to 60.97 per cent. Among 17 districts, Muzaffargarh, D.G. Khan and Lodhran district had 6.9, 8.00 and 17.85 per cent infection respectively (i.e. below 20%). The district Sheikhupura, Bahawalpur, Chakwal, Jhang, Sargodha, Nankana Sahib and Multan had 22.55, 23.00, 23.07, 23.68, 24.32, 31.57 and 32.00 per cent infection respectively (i.e. below 40%), while the district Gujranwala, Sialkot, Faisalabad, Sahiwal, Khanewal, Vehari and Toba Tek Singh had 40.54, 40.54, 40.57, 42.85, 45.0, 40.95 and 60.97 percent infection respectively (i.e. above 40%). The high incidence of karnal hunt disease in the wheat samples of the Punjab is of great quarantine concern.

ICPS-139 – ANTIFUNGAL EFFECT OF TWO *ALLIUM* SPECIES AGAINST *ASPERGILLUS NIGER* VAN TIEGHEM ISOLATED FROM GROUNDNUT (*ARACHIS HYPOGEA* L.)

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[[1]The Islamia University of Bahawalpur, [2]Community IPM Project Khanewal, [3]CABI]

Abstract: The present research work was designed to find in vitro antifungal activity of leaf extracts of two Allium spp, i.e. onion (*Allium cepa* L.) and garlic (*Allium sativum* L.) against *Aspergillus niger* van Tieghem isolated from groundnut (*Arachis hypogea* L.) to screen as an alternative effective natural substances to chemical preservatives. Aqueous extracts of the both plant species significantly inhibited the growth of test fungi. Fungal growth was recorded after 6 days of incubation. 300gm/ml of garlic exhibited marked antifungal activity reducing 86% radial colony growth of *A. niger*. Antifungal potential of onion extract was also pronounced against *A. niger* resulting in suppression of the fungi.

ICPS-140 - ASSESSMENT OF GENETIC PARAMETERS AND DISEASE INTENSITY IN BLACK SEEDED SESAME

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[Nuclear Institute for Agriculture and Biology Faisalabad Pakistan]

Abstract: Evaluation of thirty-three genotypes of black seeded sesame (*Sesamum indicum* L.) collected from different sources was performed during 2004 and eight high yielding genotypes were selected and advanced for further study in summer 2005. Data pertaining to different morphological characters like days to flower and mature, plant height, branches/plant, capsule/plant, capsule length and breadth, seed per capsule, 100 seed weight, seed yield per plant and disease (phyllody and leaf curl virus) intensity were recorded. Correlation coefficient, direct and indirect effects and genetic parameters were computed for all the morphological traits. Moreover, seed yield of high yielding genotypes along with losses due to disease attack were worked out. Seed yield, capsule number, and branches per plant showed high genetic advance coupled with heritability which indicated that these characters were controlled by additive type of genes. Branches per plant and capsule/plant also showed highly significant and positive phenotypic correlation with seed yield. Plant height, capsule length and seed/ capsule showed positive but non significant correlation with seed yield. Plant height, capsule/plant and capsule length showed positive direct effects along with positive genotypic correlation coefficients. It means that for improvement in seed yield, selection may be based directly on these traits. Capsule/ plant showed maximum indirect effect via capsule length. The second highest indirect effect of capsule/ plant was observed via days to mature. Plant height also showed positive indirect effect via capsule/ plant. The intensity of virus was higher as compared to phyllody and losses in seed yield were also higher due to virus attack. However, the losses were almost parallel to disease intensity in both the cases. Considering all these parameters under study, it may be concluded that maximum emphasis should be given to capsule number followed by plant height, branches per plant, and capsule length along with disease resistance for the improvement of seed yield in black seeded sesame germplasm.

ICPS-141 - IMMATURE BARK EXPLANTS: AN EXCELLENT SOURCE FOR CALLUS INDUCTION IN PECAN (*CARYA ILLINOENSIS* (WANGENH.) C. KOCH)

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Abstract: The objective of the present research work was to establish a method for callus induction, subsequent maintenance and plant regeneration in Pecan. Immature (greenish) and mature (brown) bark explants (0.5-1.0 cm) of pecan (*Carya illinoensis* (Wangenh.) C. Koch) were compared for callus induction on different media (DKW, WPM or MS) containing different concentrations and combinations of 2, 4-dichlorophenoxyacetic acid (2, 4-D), Naphthaleneacetic acid (NAA) or Thidiazuron (TDZ). Callus induction was not possible on MS medium. Moreover, mature bark explants did not show any response in terms of callus induction. Callus was initiated from the immature bark explants after 27-days on all tested DKW media containing TDZ (1.0, 10.0 µM or 1.0 nM) and 2, 4-D (4.52, 13.57 or 22.61 µM) with a maximum (100 %) callus induction and proliferation rate on TDZ+NAA (1.0+1.0 µM). Callus induction was also observed after 41-days on WPM medium supplemented with TDZ+NAA (1.0+1.0 µM) but further proliferation was limited. Calluses obtained from all DKW media were maintained up to 4th subculture. Such callus cultures were hard to maintain further due to sudden browning and necrosis. Callus cultures during different subcultures were also transferred for plant regeneration on MS medium supplemented with BAP (2.22 µM) or BAP+ TDZ (2.22+1.0 µM). The results from the present investigation have indicated that immature bark explants have an excellent ability for callus induction in Pecan. Further work on callus maintenance and differentiation using bark explants thus seems to be a strong possibility.

ICPS-142 - RESISTANCE AGAINST MEALY BUG IN DIFFERENT ORNAMENTAL PLANTS

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Abstract: Mealy bug (*Maconellicoccus hirsutus*) is a serious pest around the world and has been causing enormous economic damage to many crops. The pink hibiscus mealybug is expected to attack many crops including citrus, avocado, fig, guava, mango, and sugarcane; vegetable crops including beets, cabbage, peanuts, cucumber, lettuce, pepper, pumpkin, and tomato; forest trees, and many species of ornamental plants including *Anthurium, Bougainvillea*, *Croton*, *Ixora,* hibiscus, mulberry, *Zizyphus mauritiana* and palm. The study was conducted in the University College of Agriculture & Environmental Sciences, the Islamia University of Bahawalpur, Pakistan on some ornamental plants for resistance against mealy bug. Six ornamental plants, Dianthus Caryophyllus, Catharanthus roseus, *Amaryllus belledonna*, Chrysanthemum, *Beta vulgaris* subsp. cicla and *Gerbera jamesonii*) were selected for the study. Ten insects and approximately of the same age were introduced to the plants. Population growth on the plants was noted. However it was observed that insect preferred some of the plants like *Gerbera jamesonii*, *Beta vulgaris* subsp. Cicla and Chrysanthemum. Population of insect was restricted on Dianthus Caryophyllus, *Amaryllus belladonna* and Catharanthus roseus.

ICPS-143 - DNA MARKER FOR FREGO BRACT TRAIT IN UPLAND COTTON

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Abstract: Frego bract is narrow, elongated and flare away from the square, flower and boll instead of wide leaf like normal bracts. Frego bracts leave the square, flower and boll exposed so the eggs of

insect pests are vulnerable to environmental vagaries and predators. Frego bract trait confers resistance against bollworms in cotton. DNA marker for frego bract trait was identified using Random Amplified Polymorphic DNA (RAPD) technique through bulked segregant analysis (BSA). Out of the 320 RAPD primers used, 36 showed polymorphism among the parents. An F_2 population involving frego and normal bract parent was used to construct bulks for BSA. The 36 polymorphic primers when tested on bulks, only 6 revealed polymorphism among the bulks. The primer GLH-15_{930} showed very close linkage with the trait.

ICPS-144 - INHERITANCE OF FREGO BRACT AND ITS LINKAGE WITH FIBRE AND SEED TRAITS IN UPLAND COTTON

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Abstract: Frego bract in cotton has been reported to show resistance to insect pests like bollworms and boll weevil. Some cultivars with frego bract trait have also been developed. The inheritance of this trait was studied using a cross between frego and normal bract parent. Normal bract and frego bract plants were in the ratio of 3:1 in F_2 population showing monogenic inheritance of the trait, frego bract being recessive. The test cross ratio of 1:1 confirmed the monogenic inheritance. The correlation of frego bract with fibre and seed traits (staple length, fibre fineness, fibre strength, ginning out-turn, seed index and seed volume) using F_2 population showed that the trait had linkage only with fibre strength. Normal bract plants produced stronger fibre compared to frego bract plants. The absence of correlation of frego bract with the other traits, shows that gene for the trait would segregate independently. Hence frego bract type plant may be tailored with good combination of agronomic traits.

ICPS-145 - DNA MARKER FOR NECTARILESS TRAIT IN UPLAND COTTON

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Abstract: Nectaries are nectar producing glands. In addition to floral part, these nectaries are also present on lower side of cotton leaves. Nectar is sugar rich food source for insect pests. The leaf nectaries provide nectar source long before cotton plants begin to flower and attract insects. Nectariless cotton plant confer resistance to pink bollworm. Inheritance studies of this trait shows that it is double recessive trait. Introduction of double recessive trait into a plant would be easier if DNA marker for the trait is identified and used in marker assisted selection. Random Amplified polymorphic DNA technique was used to identify DNA markers linked to the trait. In total, 320 RAPD primers were used to find linkage with the trait. The primer GLE-11 amplified a polymorphic DNA fragment of 1145bp which was found linked to the trait at 10cM distance from the nectariless loci. This DNA marker was named as GLE-11_{1145}.

ICPS-146 - PLANTS OF JAHAN NAMA PROTECTED AREA, GOLESTAN PROVINCE, NE IRAN

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Abstract: Jahan Nama Protected Area is located in the highlands of eastern parts of Alborz Mountains, between 36°35′ and 36°42′ northern latitudes and 54°08′ and 54°36′ eastern longitudes with a

minimum altitudes of 800.m in Kordkuy forests and a maximum altitude of 3100 m in Talanbar mountain. The complicated topography and habitat heterogeneity, in addition to influencing the area by humid Caspian climate at the north and Mediterranean-like climate at the south and overwhelming cold high mountain climate in large part of area caused formation of diverse vegetation types including deciduous montane forest, cold-resistant Juniper woodland, montane steppes, grasslands and meadows, rocky and riverine vegetation. A total number of 588 vascular plant species were indentified from this area belonging to 330 genera and 85 families. The Dicots with 445 species comprises 75.6% of the flora of the area followed by Monocots with 131 species and 22.2% and Pteridophytes with only 12 species and 2%. The largest families in the area are Poaceae (51 species), Labiatae (50 species), Cruciferae (48 species), Compositae (38 species), Fabaceae (35 species) and the most diverse genera include *Astragalus* (17 species), *Carex* (12 species), *Veronica* (11 species), *Silene* (9 species) and *Gagea* (7 species). The floristic composition of the area is strongly influenced by large number of Euro-Siberian elements in the mesic parts and the Irano-Turanian elements in the Juniper woodland and montane steppes of the area. The area inhabited by several endemic plants of Hyrcanian and Kopetdgah-Khorassan floristic Provinces in addition to local endemics of the Eastern and Central Alborz and trees like *Taxus baccata* which is considered as protected and threatened tree in Iran.

ICPS-147 - EFFECT OF DIFFERENT ABIOTIC STRESSES ON SEED GERMINATION OF *SUAEDA HETEROPHYLLA*, FROM A MOUNTAINOUS SALT PLAYA OF PAKISTAN

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Abstract: Present study reports the influence of salinity, temperature and light on seed germination of *Suaeda heterophylla* (Kar. & Kir.) Bunge, a rare annual halophyte. Germination experiments were carried out using various iso-osmotic (0, -0.46, -0.92, -1.38, -1.84 and -2.30 MPa) NaCl and PEG-6000 solutions at different temperature (10/20, 15/25, 20/30 and 25/35 ^{o}C) and light (12 h photoperiod and dark) regimes. Germination decreased linearly with a decrease in osmotic potential both in NaCl and PEG-6000 solutions. Solute type had a significant effect on seed germination. NaCl treatment reduced salt tolerance of the species as compared to PEG-6000 and this effect was prominent at low and high temperature and complete darkness. Among all temperature regimes, 20/30 ^{o}C was found to be optimal for germination. Complete darkness showed an inhibitory effect on germination in all iso-osmotic concentrations of NaCl and PEG-6000 at all temperature regimes, suggesting role of light in seed germination. Ungerminated seeds from various iso-osmotic NaCl and PEG-6000 concentrations showed recovery of their germination, when transferred to distilled water after 20 days of solute treatments. This recovery of germination was higher in PEG-6000 than NaCl treatment at all temperature regimes, however highest recovery was observed in light treated seeds at 20/30 ^{o}C. Ungerminated seeds from NaCl treatment recovered well at moderate temperatures and in presence of light. Dark-treated ungerminated seeds also germinated when transferred to a 12 h photoperiod after 20 days of dark treatment, but low osmotic potential and other than optimal temperature reduced recovery of germination from dark, especially in NaCl. Mortality was also higher in NaCl than iso-osmotic PEG-6000 in both light and dark treated seeds. These results clearly indicate that NaCl has an ionic effect on seed germination and viability of the test species and these parameters are also influenced by light and temperature. Furthermore, high mortality of seeds under non-optimal conditions might be a reason for rare occurrence of the test species in the habitat.

ICPS-148 - *CUCUMIS SATIVUS*: IN VITRO MULTIPLICATION, CALLOGENESIS AND ORGANOGENESIS

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[Department of Botany, University of the Punjab, Lahore, [1]Department of Microbiology and Molecular Genetics, University of the Punjab, Lahore]

Abstract: The present work is concerned with the standardization of media and conditions for *in vitro* multiplication and callogenesis of *Cucumis sativus* (Hybrid). MS medium was used for *in vitro* multiplication with seeds taken as explant. For callogenesis, MS medium was supplemented with variable concentrations of Kinetin, coconut milk and 2,4-D. Callus obtained was used as explant for establishment of cell suspension cultures. To investigate shoot induction, MS medium supplemented with BAP ranging from 2 mg/L – 10 mg/L was used. Similarly other plant growth regulators were also checked in different concentrations to standardize media for organogenesis. To compare *in vitro* grown plantlets with the calli, biochemical analysis was carried out for which protein content, peroxidase activity and auxin content of the plants and calli was investigated.

ICPS-149 - USE OF DIFFERENT PLANT GROWTH REGULATORS FOR CALLUS INDUCTION, SHOOT FORMATION AND ROOT INITIATION OF *CELOSIA ARGENTEA*

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[Department of Botany, University of the Punjab, Lahore, [1]Department of Microbiology and Molecular Genetics, University of the Punjab, Lahore]

Abstract: The present study aims at the micropropagation of *Celosia argentea*. Murashige and Skoog medium was used for *in vitro* multiplication of *Celosia. In vitro* multiplied seedlings were used as source of explant for callogenesis. Callogenic response was investigated by supplementing MS medium with different plant growth regulators in variable concentrations and it was observed that 2,4 D with 10% coconut milk showed best callogenic response. To investigate organogenesis, *in vitro* grown calli were used as explant and MS medium was supplemented with different plant growth regulators i.e., 2,4-D, Kinetin, NAA and BAP in ranges from 0.1-0.3 mg/L, 0.5-2.0 mg/L, 0.1-0.3 mg/L and 0.5-2 mg/L respectively. Caulogenesis as well as rhizogenesis was observed on medium supplemented with 2, 4-D and Kinetin. Natural Plant, *in vitro* grown plant as well as calli were also compared through biochemical analysis. Cell suspension cultures were also established using callus as explant.

ICPS-150 - DETERMINATION OF VARIATION IN AMINO ACID CONTENTS OF THE HEALTHY AND *ASCOCHYTA RABIEI* INOCULATED PLANTS OF RESISTANT AND SUSCEPTIBLE CULTIVARS OF CHICKPEA

M. A. RANDHAWA, M. B. ILYAS AND M. U. GHAZANFAR

[Department of Plant Pathology, University of Agriculture, Faisalabad]

Abstract: The quantities of lysine, arginnine, aspartic acid, threonine, glutamine, isoleucine and tyrosine were higher in resistant cultivars and comparatively lower in susceptible cultivars. Proline, alanine and valine were higher in susceptible cultivars as compared to the resistant cultivars. Serine, glycine, methionine and phenylalanine were almost at the same level in both the resistant and susceptible cultivars. The total amino acids were higher in the resistant cultivars as compared to susceptible ones. Upon inoculation with *Ascochyta rabiei,* the cause of chickpea blight disease, there were general reduction in the amino acids contents. This reduction was marked in resistant cultivars (23.98%) higher (46.36%) in the susceptible cultivars

ICPS-151 - EFFECT OF INOCULATION OF RESISTANT AND SUSCEPTIBLE CULTIVARS OF CHICKPEA WITH *ASCOCHYTA RABIEI* ON THEIR PHENOLIC CONTENTS

M. A. RANDHAWA, M. B. ILYAS, M. U. GHAZANFAR AND M. A. KHAN

[Department of Plant Pathology, University of Agriculture, Faisalabad]

Abstract: The determination of phenolic contents of resistant, moderately resistant, moderately susceptible and susceptible cultivars of chickpea, before and after inoculating them with *Ascochyat rabiei*, the cause of chickpea blight disease revealed that, the amount of phenolic contents produced by resistant, moderately resistant, moderately susceptible, and susceptible cultivars of chickpea was almost the same in healthy plants before inoculation. Upon inoculation with *Ascochyta rabiei*, the phenolic contents increased. The resistant cultivars produce comparatively more phenolic contents when inoculated with the pathogen. This increase was 75.27 in resistant, 64.96 in moderately resistant, 46.79 in moderately susceptible, and 32.29 per cent in the susceptible cultivars. Thus the quantity of phenolic contents produced by chickpea cultivars was proportional to their level of resistance and susceptibility.

ICPS-152 - EFFECT OF WATER EXTRACTS OF RESISTANT AND SUSCEPTIBLE CHICKPEA CULTIVARS ON GERMINATION OF PYCNIOSPORES AND COLONY GROWTH OF *ASCOCHYTA RABIEI* AND BLIGHT SYMPTOMS APPEARANCE ON RESISTANT AND SUSCEPTIBLE CULTIVARS INOCULATED WITH *ASCOCHYTA RABIEI*

M. A. RANDHAWA, M. B. ILYAS AND M. U. GHAZANFAR

[Department of Plant Pathology, University of Agriculture, Faisalabad]

Abstract: The germination of pycniospores of *Ascochyta rabiei,* the cause of chickpea blight disease, in water extracts of resistant, moderately resistant, moderately susceptible and susceptible cultivars revealed that the germination of the spore was the highest in the water extracts of susceptible cultivars followed by that in the water extracts of moderately susceptible, moderately resistant and resistant cultivars but there were no statistical difference among them. The radial colony growth of *Ascochyta rabiei* was the least on the medium amended with extracts of susceptible cultivars. However, no correlation existed between colony growth of the fungus and level of resistant and/or susceptibility of the cultivars. Inoculation of resistant and susceptible cultivars with *Ascochyta rabiei* pyniospore inoculum revealed that the susceptible cultivars developed disease symptoms, like withering, yellowing, necrosis, pycnidal formation and defoliation about 3-4 days prior to the resistant cultivars.

ICPS-153 - SCREENING WHEAT GERMPLASM FOR HEAT TOLERANCE

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Abstract: High temperature (>32^{0}C) during grain filling is a major yield limiting factor. In the subcontinent (India and Pakistan) where wheat planting is delayed by late maturing Kharif crops the problem becomes more immense and causes 40- 50 % yield losses. To find out sources of heat tolerance Bread Wheat Germplasm was screened in a plastic sheet tunnel during 2003-04 and 2004-05 at Wheat Research Institute Faisalabad. 442 wheat varieties/lines were sown in one meter long row in a plastic sheet tunnel. A set of the material was sown in the open adjacent to the tunnel. The material was exposed to heat shock (>32^{0}C) by covering the tunnel with plastic sheet during grain formation for two weeks in 2003-04 and for four weeks in 2004-05. Data was recorded from 25 randomly selected

heads from each row for 1000 kernel weight, grains per spike and yield per spike was recorded. Data regarding survival (ability to stay green under heat stress) was also recorded during the year 2004-2005. Heat effect was expressed as ratio of stressed / non stressed plants Four entries CB-281 (*MAYA/PVN*), CB-367 (*BB#2/ PT// CC/ INIA /3/ ALD'S'*) CB-333 (*WL 711/3/KAL/BB//ALD 'S'*) and CB-335 (*WL711/CROW 'S'//ALD#1/CMH 77A. 917/3/HI 666/PVN 'S'*) showed maximum grain development and survival. During 2005-06, 196 bread wheat advance lines were screened by exposing to heat shock for two weeks in the plastic sheet tunnel. A line V-00183 (Shafaq-06) was found better tolerant. This was approved for general cultivation in 2006.

ICPS-154 - BREEDING FOR SALT TOLERANCE IN SPRING WHEAT *TRITICUM AESTIVUM* (L)

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[Wheat Research Institute, AARI, Faisalabad]

Abstract: Fast and effective hydroponics screening technique that could identify physiological variation in salinity tolerance of wheat was applied. A set of 442, previously unexplored wheat varieties/lines representing a wide range in genetic diversity was planted as control in ½ Strength Hoagland nutrient media, whereas two sets of the same material were exposed to salt (NaCl) application under two treatments i.e., 10 dS/m and 20 dS/m for the first two years (2003-04 and 2004-05). For the third year (2005-06) more intensive stress was given with salinity levels of 12.5 dS/m and 25 dS/m. Salinity tolerance was defined as differences in biomass (root-shoot ratio) production in saline versus non-saline conditions over prolonged periods, of 3–4 weeks (seedling to pre booting stage). For this purpose parameters like shoot length, root length, shoot weight and root weight along their relative ratios were studied. As a result of three year's study eleven common salt tolerant varieties/lines were identified including pasban-90, LU26, V-01078 and V01180. These selected salt tolerant lines would be included in our hybridization program/released for cultivation in salt affected areas of Pakistan. Some of these wheat lines like Gamdow-6, BAV 92//SAP/MON and Lakata-1 produced higher grain yield under saline field conditions. Whereas, Uqab-2000 was the best yielding in saline field conditions.

ICPS-155 - EVALUATION OF MULTIPLE REGRESSION MODELS BASED ON EPIDEMIOLOGICAL FACTORS TO PREDICT *MYZUS PERSICAE* POPULATION AND PLRV DISEASE INCIDENCE

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Abstract: Potato leaf roll virus transmitted by an aphid (*Myzus persicae*) is one of the most destructive virus diseases of potato inducing 40-70% yield losses. Environmental conditions play very crucial role in the transmission of aphid population and PLRV disease. Characterization of environmental conditions conducive for the development of vector population and PLRV would help to take disease management decisions. Twenty nine potato varieties/advance lines were sown in the research area of Department of Plant Pathology during 2005-06 and 2006-07 potato growing seasons. Natural inoculum of insect and virus was relied upon for infection; however, PLRV was confirmed through ELISA and biological assays. Potato leaf roll virus incidence and aphid population and environmental data recorded on weekly basis were subjected to correlation and stepwise regression analysis. There was significant correlation of air temperature (max and min) and relative humidity with PLRV disease incidence and aphid population. However, the degree of correlation varied greatly by years and varieties. The correlation of aphid population with PLRV disease incidence was highly significant. Based on two seasons data, stepwise regression determined significant influence of weekly maximum air temperature, relative humidity and wind speed on aphid population and PLRV disease incidence. This three environmental variable model explained 37-56% of the variability in aphid population and 59-60% of the variability in disease development.

ICPS-156 - EVALUATION OF ANTAGONISTIC FUNGI AGAINST *MACROPHOMINA PHASEOLINA* CAUSING CHARCOAL ROT OF SUNFLOWER

M. H. ULLAH, M. A. KHAN AND S. T. SAHI

[Authors did not provided their affiliation]

Abstract: Invitro, sensitivity of *Macrophomina phaseolina* (Tassi) Goid was tested by inhibition zone technique to antagonistic fungi viz., *Aspergillus niger*, *A. flavus*, *Trichoderma viride*, *T. harzianum* and *Penicillium capsulatum* amended into PDA medium. All the antagonists reduced the colony growth of *M. Phaseolina* significantly compared to control. *A. flavus* proved to be the most effective in reducing the colony growth of *M. phaseolina* (66.00%) followed by *A. niger* (55.55%), *T. viride* (51.11%), *T. harzianum* (26.67%) and *P. capsulatum* (11.11%), respectively. Seeds of four varieties treated with the culture of *A. flavus*, *A. niger*, *T. viride* and *P. capsulatum* and their combinations were sown in pots having infested soil (*M. phaseolina*). Results showed reduction in disease incidence of charcoal rot on sunflower cultivar G-66 with *A. flavus* (100%) followed by *A. niger* (64.86%) *P. capsulatum* (63.79%), and *T. viride* (31.89%) over control. Decrease in disease incidence over control was 100% where seed was treated with combination of *A. niger* and *A. flavus* while *A. niger* and *T. viride* combination was least effective on G-66 (30.80%). Soil drenching with *A. flavus*, *A. niger*, *T. virdie*, *P. capsulatum* and their combinations in field infested with *M. phaseolina* significantly reduced the disease incidence as compared to control. Reduction in disease incidence on G-66 was observed with *A. niger* (89.99%) followed by *T. viride* (80.14%) and the combination of *A. flavus* and *A. niger* (81.41%) and *A. flavus* + *P. capsulatum* (27.33%) respectively.

ICPS-157 - IDENTIFICATION OF RESISTANT SOURCES AGAINST CHARCOAL ROT OF SUNFLOWER CAUSED BY *MACROPHOMINA PHASEOLINA*

M. H. ULLAH, M. A. KHAN AND S.T. SAHI

[Department of Plant Pathology, University of Agriculture, Faisalabad]

Abstract: Thirty sunflower lines were sown in sick field infested with *M. phaseolina* Tassi Goid. Disease incidence was recorded at flowering stage. Lines viz. G-32 and G-66 were found highly resistant to charcoal rot. Eight sunflower lines viz. A-43, G-100, A-133, G-17, G-33, G-28, G-10, and G-78 were resistant against charcoal rot. Three sunflower lines namely G-40, A-185 and G-72 were moderately susceptible. Six lines i.e. G-15, G-11, G-37, G-51, G-46 and A-88 were found susceptible during 2006 & 2007. The screening results showed that lines A-75 and HRBS-1 were resistant in 2006 become moderately resistant in 2007; G-8, G-134, G-27 and G-68 were moderately resistant in 2006 become moderately susceptible in 2007 and G-8 shifted from moderately resistant to susceptible response, cultivars G-16, G-28 and G-32 were susceptible during 2006 but became highly susceptible in 2007 because of conducive environmental conditions. Environmental conditions were more conducive for charcoal rot disease development in 2007 compared to 2006.

ICPS-158 - CHARACTERIZATION OF ENVIRONMENTAL CONDITIONS CONDUCIVE FOR CHARCOAL ROT OF SUNFLOWER EPIDEMICS

M. A. KHAN, M. H. ULLAH AND S.T. SAHI

[Department of Plant Pathology, University of Agriculture, Faisalabad]

Abstract: Charcoal rot epidemics were generated on G-32, A-133, G-66, G-37 and G-51 by artificial inoculation with *Macrophomina phaseolina* infested tooth picks during 2006 and 2007 sunflower

growing seasons. Environmental data consisting of maximum and minimum air temperature, soil temperature, soil moisture, relative humidity and wind speed recorded by a weather station and disease severity based on a scale were subjected to regression analysis. Charcoal rot disease severity was higher in 2007 compared to 2006 in all the varieties. Relationship of weekly air and soil temperature, relative humidity and wind speed with charcoal rot disease development was best explained by linear regression models indicated by high r values (above 0.72) in all the varieties. There was a positive linear relationship between wind speed, soil temperature, soil moisture and negative linear relationship between increasing air temperature and relative humidity with charcoal rot epidemics during 2006 and 2007. Based on two seasons data the environmental conditions characterized for maximum disease development were, 39-40^{o}C, 26-27^{o}C and 31-33^{o}C maximum, minimum air temperature and soil temperature, 21 to 27% relative humidity, wind speed 3-5 km/h. and 21 to 22% soil moisture respectively.

ICPS-159 - EVALUATION OF PLANT EXTRACTS AGAINST CITRUS CANKER DISEASE

M. ATIQ, M. A. KHAN AND S. T. SAHI

[Department of plant pathology, University of Agriculture Faisalabad]

Abstract: Effect of different plant extracts viz., *Azadirachta indica (*Neem), *Allium cepa* (Onion) *Catharanthus rosius* (Sada Bahar), *Allium sativum* (Garlic), *Zingiber officinale*, (Ginger) and streptomycin against the growth of *Xanthomonas axonopodis* pv. *citri* were investigated through inhibition zone technique. All the bio-control agents at standard dose (75gm fresh leaves + 25ml of sterilized water) and streptomycin @1, 0.1, 0.2 % concentration reduced the growth of *Xanthomonas axonopodis* pv. *citri* significantly compared to control. *Azadirachta indica* and streptomycin sulphate alone and their different combination gave significant inhibition of the bacterium *in vitro*. But in greenhouse, *Azadirachta indica* extract @ standard dose did not exhibit effectiveness to control *X. axonopodis* pv*. citri.* However, Streptomycin sulphate @ 1 percent concentration reduced disease significantly than control and combination of Streptomycin sulphate @ 0.1 % and *Azadirachta indica* @ S/10 expressed significant effect to control disease.

ICPS-160 - SCREENING OF CITRUS GERMPLASM FOR THE SOURCES OF RESISTANCE AGAINST CITRUS CANKER

M. ATIQ, M. A. KHAN AND S.T. SAHI

[Department of plant pathology, University of Agriculture Faisalabad]

Abstract: Fifteen citrus cultivars were screened for the sources of resistance against citrus canker disease incited by *Xanthomonas axonopodis* pv. citri in a field trial conducted at research area of plant pathology department for two years i.e. 2005-07.Out of fifteen citrus cultivars *Citrus sinensis* cv. jaffa exhibited resistant response and five cultivars expressed moderately resistant response while *Citrus paradise, Citrus sinensis* cv. blood red*, Citrus limonia* cv. mayer lemon showed highly susceptible expression towards citrus canker disease. *Citrus sinensis* cv. valentia late*, Citrus reticulate* cv. feutral's early showed moderately resistant while *Citrus reticulate* cv. malta*, Citrus limettioides, Citrus limonia* cv. china lemon*, Citrus sinensis cv.* musambi were found moderately susceptible. No citrus cultivar was found immune against canker disease.

ICPS-161 - EVALUATION OF DIFFERENT SOURCES OF PHOSPHORUS AND GROWTH PERFORMANCE OF TWO LEGUMES AND THREE *BRASSICA* CROP SPECIES

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[Institute of Soil & Environmental Sciences, University of Agriculture, Faisalabad Pakistan]

Abstract: To assess the extent of variation in phosphorus (P) efficiency of two legumes and three brassica crop species for utilization of inorganic P from different sources like single super phosphate (SSP), dicalcium phosphate (DCP), *Tricalcium phospjate* (TCP) and rock phosphate (RP), a pot experiment was conducted by using quartz sand as growth medium to reduce the chances of P fixation. Nutrient supply, rhizosphere pH and water contents were kept equal for all crop species. Results showed that maximum total plant dry matter (TDM) was observed in SSP treated pots compared to all other P sources. SSP was found as efficient P sources and it was followed by RP > TCP > DCP. Crop species also showed variation in biomass production. Increase in TDM of gram was observed by application of TCP and SSP. However, raya gave good response to RP probably due to its root exudates which solubilize the insoluble P in the rhizosphere. Increase in TDM of lentil and taramira by the application of SSP might be due to inter and intra-specific diversity for uptake, translocation, distribution and use of nutrient by crop species. Maximum P uptake was observed in gram followed by lentil, taramira, raya and toria.

ICPS-162 - EFFECT OF RATE AND TYPE OF COATING OF CALCIUM CARBIDE ON GROWTH AND YIELD OF WHEAT CROP

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[Institute of Soil & Environmental Sciences, University of Agriculture, Faisalabad Pakistan]

Abstract: Calcium carbide when applied to soil, releases acetylene gas upon reacting with water. Acetylene is well known nitrification inhibitor and is reduced to potent plant growth regulator 'ethylene' in the soil environment. Ethylene can effect plant growth and development by entering into the plant through leaves and roots. Two field experiments were conducted on wheat (cv. Inqlab-91) at the experimental area of Institute of Soil and Environmental Sciences, University of Agriculture Faisalabad to determine the best rate and to select better coating material for calcium carbide. In the 1st experiment wax coated calcium carbide was applied to NPK fertilized plots @ 0, 15, 30, 45 and 60 kg ha^{-1} at 6 cm soil depth two weeks after germination. Treatment where coated calcium carbide (CCC) was applied @ 30 kg ha^{-1} produced maximum fertile tillers, total biomass, grain and straw yields, thousand grain weight and reduction in plant height compared with alone fertilizer treatment. Growth and yield parameters were suppressed where CCC was applied more than 30 kg ha^{-1}. In the 2nd experiment calcium carbide was encapsulated in medical capsules, coated with enamel paint, paraffin wax and lac and applied to wheat crop @ 30 kg ha^{-1}. Growth and yield parameters were positively effected by calcium carbide treatments in the order of paint coated > wax coated > lac coated > encapsulated > NPK alone.

ICPS-163 - EFFECT OF RATE AND APPLICATION DEPTH OF ENCAPSULATED CALCIUM CARBIDE (ECC) ON GROWTH, YIELD AND N-STATUS OF WHEAT CROP

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[Institute of Soil & Environmental Sciences, University of Agriculture, Faisalabad Pakistan]

Abstract: Calcium carbide is well known as a nitrification inhibitor and its role as a source of ethylene (C_2H_4), a potent plant growth regulator, is not thoroughly investigated. Two pot experiments were conducted in the wire-house to determine appropriate rate and application depth of encapsulated calcium carbide (ECC), with and without fertilizer N, on growth, yield and N-status of wheat (*Triticum aestivum* L., var. Inqlab 91). In the 1st trial no, half and full recommended rate of N fertilizer was used with ECC @ 0, 15, 30 and 45 mg kg^{-1} soil applied at 4 cm soil depth in the center of pot. Treatments in the 2nd trial were control, recommended NPK fertilizer, NPK plus ECC @ 0, 15, 30 or 45 mg kg^{-1} soil applied at 0, 4, 8 or 12 cm soil depth. It was noted that ECC applied @ 30 mg kg^{-1} soil with

recommended dose of NPK fertilizer performed better and enhanced almost all growth and yield parameters except plant height that was significantly reduced with ECC application. ECC applied at 8 or 12 cm soil depth gave better results than those where it was applied at surface (0 cm) or at 4 cm soil depth. Nitrogen uptake by grain and straw was increased with fertilizer and increasing rate and application depth of ECC plus fertilizer.

ICPS-164 - RESPONSE OF CORN (*ZEA MAYS* L.*)* TO HONEY BEE WAX COATED CALCIUM CARBIDE FOR GROWTH, YIELD AND NITROGEN USE EFFICIENCY

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Abstract: A pot experiment was conducted in the wire house to study the effect of honey bee wax coated calcium carbide (CaC_2) on growth and yield of corn (*Zea mays* L.*).* The CaC_2 was ground and coated with honey bee wax and applied two weeks after germination @ 7.5, 15, 30 and 60 mg plant^{-1} along with recommended doses of nitrogen, phosphorus and potassium (150-125-100 kg ha^{-1}, respectively). Half of the N and the entire P and K were applied at the time of sowing and remaining half of the N was applied two weeks after germination. A treatments pertaining to recommended doses of NPK and a control without NPK and CaC_2 were also included for comparison. Each treatment was replicated four times following a completely randomized design. Plant height, stalk and stover yield, cob weight, number of grains per cob, 1000 grain weight, grain yield, root weight, leaf area and nitrogen concentration in stalk and grain increased significantly with the application of wax coated calcium carbide along with recommended doses of NPK as compared to control and alone NPK. Maximum increased in grain yield was observed where wax coated CaC_2 was applied @ 30mg plant^{-1} with NPK fertilizer. Results suggest that maize grain yield could be increased by the application of slow releasing source of CaC_2 like honey bee wax coated CaC_2.

ICPS-165 - EFFECT OF CALCIUM CARBIDE DEPENDENT RELEASED ACETYLENE AND ETHYLENE GASES ON SEED GERMINATION, GREEN POD YIELD, NITROGEN USE EFFICIENCY, MOLECULAR PROTEIN AND DNA CONTENTS OF OKRA (*HIBISCUS ESCULENTUS* L.)

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[Institute of Soil & Environmental Sciences, University of Agriculture, Faisalabad Pakistan]

Abstract: Calcium carbide (CaC_2) is a rich source of acetylene (potent nitrification inhibitor) when applied to soil that is reduced to ethylene (plant hormone) by soil microbes. Different researchers in the world have conducted experiments on different crops to evaluate the response of applied calcium carbide as a source of acetylene and ethylene. However, very little work has been reported so far on okra. Laboratory studies were conducted at University of Agriculture, Faisalabad, as well as Sustainable Agricultural System Laboratory-USDA, Maryland, USA, to investigate the release of acetylene and ethylene gases from encapsulated calcium carbide and their effect on seed germination as well as on protein & DNA changes in plant parts. It was further studied how calcium carbide inhibits nitrification by studying NH_4^+ and NO_3^- contents of soil after CaC_2 application. A pot study was also conducted where recommended dose of P and K fertilizer was used with three levels of N fertilizer i.e. 0, 15 and 30 mg kg^{-1} soil. CaC_2 @ 0, 30 and 60 mg kg^{-1} soil was applied at sowing time 10 cm deep in center of pots. Results indicated different morphological changes in okra plant in response to CaC_2 application. There was significant reduced in internodal distance that coincide with increased thickness of stem. There was a 27 % increase in green pod yield recorded with the application of CaC_2–N, 30-30 mg kg^{-1} soil. Nitrification was also delayed up to 6 weeks that caused increase in nitrogen fertilizer use efficiency

(NUE) and thus decreasing the NO_3^- hazards to environment especially to groundwater. Protein and DNA contents were also studied. Variation in kind of proteins was observed separately in root, stem leaves and pods of okra in response to calcium carbide application. However, results on quantification of protein and DNA contents in stem indicate increase in protein and decrease in DNA contents after the application of calcium carbide.

ICPS-166 - VARIATION IN ACQUISITION OF PHOSPHORUS FROM DIFFERENT SOURCES OF PHOSPHORUS AND ITS INFLUENCE ON GROWTH PERFORMANCE OF FIVE CROP SPECIES

S. SIDDIQ, M. YASEEN, N. MANZOOR AND M. IBRAHIM

[Institute of Soil & Environmental Sciences, University of Agriculture, Faisalabad Pakistan]

Abstract: Variation in phosphorus (P) acquisition efficiency of five crop species (wheat, barley, oat, berseem and canola) from different sources like single super phosphate (SSP), dicalcium phosphate (DCP), tricalcium phospjate (TCP) and rock phosphate (RP) was assessed in a greenhouse experiment. Quartz sand was used as a growth medium to minimize the chances of P fixation. Results revealed differential behaviour of crop species for the production of total plant dry matter (TDM). Maximum TDM was observed in wheat followed by barley, oat, berseem and canola. These differences in TDM production indicated differences in acquisition, uptake and use efficient of P among the crop species. All crop species differed significantly ($p<0.05$) in their efficiency to acquire and uptake of P from different sources. Crop species can be ranked as wheat > barley > oat > berseem = canola on the basis of P uptake efficiency. These differences pointed towards the presence of genetic variation among crop species. Comparison of P sources showed maximum P uptake by the application of SSP followed by DCP, TCP and PR.

ICPS-167 - EFFECT OF ENCAPSULATED CALCIUM CARBIDE ON GROWTH, YIELD AND N USE EFFICIENCY OF RICE

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[Institute of Soil and Environmental Sciences, University of Agriculture Faisalabad]

Abstract: A field experiment was conducted to evaluate the potential of encapsulated CaC_2 on plant growth and yield of rice. Results indicated that application of N fertilizer increased the yield and yield contributing parameters compared to control. However, application of encapsulated CaC_2 in combination with recommended dose of N fertilizer significantly increased number of tillers, straw and paddy yield compared to N fertilizer application alone. Maximum number of tillers m^{-2} and paddy yield was observed where encapsulated CaC_2 @ 60 kg ha^{-1} was applied with N fertilizer @ 60 kg ha^{-1} applied two weeks after transplanting. Results revealed that half of the recommended dose of N produced maximum paddy yield just with addition of CaC_2 @ 60 kg ha^{-1} than that of full dose of N fertilizer. Moreover, application of encapsulated CaC_2 resulted in higher N-use efficiency by rice crops than that observed with N fertilizer alone. Maximum agronomic, apparent and physiological efficiencies were observed where CaC_2 plus N fertilizer (each applied @ 60 kg ha^{-1}) was applied. These findings imply that CaC_2 affects plant growth by improving N-use efficiency in addition to hormonal action.

ICPS-168 - GROWTH AND YIELD RESPONSE OF TOMATO (*LYCOPERSICON ESCULENTUM* MILL.) TO SOIL APPLIED CALCIUM CARBIDE AND L-METHIONINE

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Abstract: A pot experiment was conducted in the wire house to compare the effects of two precursors (calcium carbide and L-methionine) of ethylene on growth and yield of tomato. L-methonine (1 mg kg $^-$

^{1}soil) in the form of solution while calcium carbide (15 mg kg^{-1}soil) in medical capsule were applied. Encapsulated calcium carbide was applied 6 cm deep into soil. Recommended doses of N, P and K fertilizers @ 100-90-60 kg ha^{-1}, respectively were applied alone and in combination with precursors. Half dose of N and full dose of P and K was applied after one week of nursery transplantation and the remaining dose after three weeks of nursery transplantation. Encapsulated calcium carbide was applied after ten days of transplantation while L-methonine was dissolved in water and then applied after ten days of transplanting. A completely randomized design was fallowed with six treatments and three replications. Results regarding number of flowers, number of fruits, shoot dry mass weight, fruit weight, root weight, Nitrogen concentration in shoot / fruit and nitrogen uptake were significantly affected by both precursors in combination with fertilizers compared to control and alone fertilizer. However, maximum number of flower, fruit and weight and uptake was observed with the application of calcium carbide plus NPK fertilizers.

ICPS-169 - EFFECT OF DIFFERENT LEVELS OF IRRIGATION AND NITROGEN ON YIELD AND WATER USE EFFICIENCY IN FORAGE SORGHUM

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Abstract: In order to examine effect of different levels of irrigation and nitrogen on yield and water use efficiency in forage sorghum an experiment was conducted in Birjand (Iran) in 2005. The experimental design was split plot in form of RCBD with three replication and with 3 levels of irrigation (33, 66 and 100 percentage of water requirement) as main plots and 3 levels of nitrogen fertilizer (45, 90 and 135 Kg N/ha) as sub plot. Result of the experiment indicated that different levels water stress significantly effect on fresh and dray matter yield and water use efficiency of forage sorghum. High stress water decreased fresh and dry matter yield of forage up to 144 and 135 percent, respectively. At the treatment of 135 Kg/ha applied N and without water stress greatest dry matter yield (10.28 ton/ha) was obtained and at the treatment of 90 Kg/ha applied N and medium water stress had the greatest water use efficiency (0.332 Kg DM/$m^{3)}$. Also the greatest yield of dry matter and water use efficiency was obtained as a result of 135kg/ha nitrogen applied. The results of this research showed that water stress had negative effect on forage production, but the increase in nitrogen consumption even in water stress conditions caused an increase in the yield and yield components.

ICPS-170 - THE EFFECT OF IRRIGATION AND NITROGEN LEVELS ON YIELD AND COMPONENTS YIELD OF FORAGE MILLET

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[Department of Agriculture, Islamic Azad University, Birjand Branch, Iran]

Abstract: In order to examine effect of different levels of irrigation and nitrogen on yield and components yield in forage millet an experiment was conducted in Birjand (Iran) in 2005. The experimental design was split plot in form of RCBD with three replication and with 2 levels of irrigation (50 and 100 percentage of water requirement) as main plots and 4 levels of nitrogen fertilizer (0, 75, 150 and 225 Kg N/ha) as sub plot. Results of the experiment indicated that levels of irrigation had a significant effect on fresh and dry yield of forage millet. The reduction of irrigation from 100% to 50% of water requirement decreased the fresh yield of forage millet from 40.7 to 24.9 ton/ha and also dry yield of forage millet decreased to 40.1%. Also levels of nitrogen fertilizer had a significant effect on fresh and dry yield of forage millet. The increase in nitrogen applied from 0 to 225 kg/ha, increased dry yield of forage millet to 81.2%. The interaction between irrigation and nitrogen levels was not significant on yield and yield components of forage millet. The results of this research showed that water stress had negative effect on forage production, but the increase in nitrogen consumption even in water stress conditions caused an increase in the yield and yield components.

ICPS-171 - SILICON CARBIDE WHISKER-MEDIATED EMBRYOGENIC CALLUS TRANSFORMATION OF COTTON (*GOSSYPIUM HIRSUTUM* L.) AND REGENERATION OF SALT TOLERANT PLANTS

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Abstract: A silicon carbide whisker-mediated gene transfer system with recovery of putative and stable transformants was developed for cotton (*Gossypium hirsutum* L.) cv.Cocker-312. Two month old hypocotyl derived embryogenic / nonembryogenic at different days after subculture calli were treated with silicon carbide whisker for 5min in suspension of silicon carbide whisker carrying pRG 229 T-DNA with the AVP1 gene, encoding arabidopsis vacuolar pyrophosphatase, pGreen0029 with Gus gene and the neomycin phosphotransferase II (nptII) genes as a plant-selectable marker. Transformed calli was selected at different kanamycin regimes. Six weeks after, emergence of kanamycin resistant callus clusters development was noted. The transformed embryogenic calli were cultured on selection medium (50 mg/L and 25 mg/L kanamycin for initial 2wk and 10wk, respectively) for 3 mo. The putative transgenic plants were developed via somatic embryogenesis (25 mg/L kanamycin) within three months. The efficacy of the method was first measured by doing the GUS expresion of transformed callus. PCR amplification and Southern blot analysis of the proliferated calli transformants were used to confirm the stable integration of the transgenes. In 6 independent experiments upto 94% stable transformation efficiency was achieved by silicon whiskers. Salt treatment was given to T1 regenerated plant for six weeks on alternate days and significant enhancement in salt tolerance was observed in AVP1 transgenic plants as compared to control plants. Thus far, this is the only viable physical procedure after particle bombardment available for cotton that successfully can be used to generate fertile cotton transformants.

ICPS-172 - A CONTRIBUTION TO SOME ETHNOBOTANICAL ASPECTS OF BIRJAND AREA (IRAN)

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Abstract: Birjand is located near the Afghanistan border in E Iran at the 57° 45′ to 50° 60′ eastern latitude and 10° 31′ to 33° 15′ northern longitude with an altitude of 1419 m, and a surface area of 31704 Km. In this contribution some floristic and ethnobotanical aspects of the area are given according to the conventional methods used in taxonomical and ethnobotanical studies. All collected plants were identified using available flora. A total of 37 families, 128 genera and 160 species were identified from the area. The largest family is Asteraceae with 16 genera and 21 species and the largest genera are Salsola and Acanthophyllum with 4 species. About 40% of plants are used as medicinal plants, 47/8% pastural, 8/3% poisonous and 4% with industrial uses. The life form of plant species was determined using the Raunkier's method. Phanerophytes comprised 11/45%, chamaephytes 20%, hemicryptophytes 27%, geophytes 5/7% and therophytes 33% of the flora of the area.
The most important medicinal plants of the area are: *Achillea tenuifolia* (Asteraceae), *Berberis vulgaris* (Berberidaceae), *Ephedra procera* (Ephedraceae), *Crocus sativus* (Iridaceae), *Hymenocrater calycinus, Teucrium polium, Ziziphora clinipodiodes* (Lamiaceae), *Ziziphus jojoba* (Rhamnaceae) and *Pistacia atlantica*(Anacardiaceae). The most important industrial species are: *Ferula assa-foetida* and *Dorema ammoniacum* (Apiaceae).

ICPS-173 - AN ANNOTATED CHECKLIST, IDENTIFICATION KEY AND ILLUSTRATION OF THE PTERIDOPHYTE FLORA OF IRAN

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Abstract: The Pteridophytes of Iran are still not treated in Flora Iranica (ed. K. H. Rechinger). The Caspian forests provide suitable habitats for growing of many ferns and fern allies in Iran. In semi-arid and mountaneous areas of Iran, the Pteridophytes are restricted to rock crevices, near waterfalls and around fresh water lakes and streams. Based on field collections and study of herbarium specimens in Iranian herbaria an updated and annotated checklist of Iranian ferns and fern allies is provided with an identification key and illustration of almost all species. Altogether 50 species were determined in 26 genera and 15 families including Equisetaceae (4), Psilotaceae (1), Ophioglossaceae (3), Azollaceae (1), Marsileaceae (2), Salviniaceae (1), Aspleniaceae (9), Blechnaceae (1), Woodsiaceae (5), Dryopteridaceae (10), Dennstaedtiaceae (1), Osmundaceae (1), Polypodiaceae (2), Adiantaceae (8) and Pteridaceae (2). The intriguing discovery of *Psilotum nudum* is discussed with regards to habitat including a detailed anatomical study. *Azolla filiculoides* is an invasive recently introduced plant widely occupied surface of Anzali wetland and many other aquatic bodies in N. Iran. Notes are given on the destructive consequences of *Azolla* in N. Iran. *Equisetum fluviatile* and *Athyrium destinifolium* were excluded from Iranian pterydophyte flora and some other dubious reports in Parsa (1978) and Ghahramaninezhad (1999).

ICPS-174 - ROOT-TO-SHOOT SIGNAL TRANSDUCTION IN RICE UNDER SALT STRESS

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Abstract: This paper describes the impact of salt stress on changes in the level of Abscisic acid (ABA) and cytokinins as signal molecules transduced through root-to-shoot in rice. The study focuses to investigate the time related changes in the salt induced ABA and cytokinins concomitant with the changes in water potential and stomatal conductance. Seeds of 3 rice varieties were grown in plastic pots in phytotron. The changes in the level of abscisic acid (ABA), transzeatin riboside (t-zr) and 2-isopentyl adenine (2-ipa) were monitored in xylem sap and leaves of three rice varieties viz. BAS-385 (salt-sensitive), BG-402 (moderately tolerant) and NIAB-6 (tolerant) The salt solution (120 m*M* NaCl) were added to the rooting medium after transplanting when plants were 50d old. There was delay in response of stomata to salt treatment in BAS-385 as opposed to earlier increase in leaf resistance in BG-402 and NIAB-6. The stem water potential increased sharply in all the varieties following salt treatment but the decrease in stomatal conductance of leaves preceded the decrease in stem water potential. The concentration of xylem ABA increased significantly greatly reaching a peak in BAS-385 much earlier (24h of salt treatment) than that of other varieties. The ABA accumulation was delayed and the magnitude of ABA accumulation was greater in BG-402 and NIAB-6.The xylem flux of ABA followed a similar pattern. The concentration of xylem t-zr showed a short- term increase in all the varieties but the magnitude of increase was greater in BAS-385 at all the measurements till 96h of salt treatment. The concentration of xylem 2-ipa was higher in BAS-385 till 48 h of salt treatment. The flux of both the t-zr and 2ipa was greater in the tolerant variety 96h of treatment. The basal level of ABA and cytokinins appears to play important role in determining the response of a variety to salt stress. The xylem flux of ABA and cytokinins (2-ipa and t-zr) in response to salt stress determines the sensitivity of the tissue to stomatal resistance. The critical period when salt induces modulation in the ABA and CK has been discussed

ICPS-175 - *PYRACANTHA COCCINEA* ROEM. (*ROSACEAE*) AS A BIOMONITOR FOR CD, PB AND ZN IN MUGLA PROVINCE (TURKEY)

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Abstract: *Pyracantha coccinea* Roem. (Firehorn) is widely distributed in Mugla Province. It was used as a biomonitor to measure the levels of Cd, Pb and Zn pollution in the province and investigate the possibilities for its use in the phytoremediation of heavy metals. *Pyrecantha coccinea* samples were collected from 34 localities in four different areas of Mugla Province, in 2006. Cd, Pb, and Zn concentrations in washed and unwashed leaf samples and unwashed branch samples were measured by ICP-OES. Average highest value of Cd accumulation was found in the unwashed leaf samples collected near highway. It was 0.359±0.598 μgg^{-1} dw. The lowest value was detected (0.163±0.0418 μgg^{-1} dw) in the washed leaf samples from the industrial area. Average highest value of Pb (14.929 ± 1.227 μgg^{-1} dw) was determined in the branch samples collected from the industrial area whereas the lowest (5.602 ± 1.471 μgg^{-1} dw) value was found in the washed leaf samples collected from the same area. The highest Zn value (15.568 ± 1.660 μgg^{-1} dw) was measured in the branch samples collected from the city centre, whilst the lowest was measured in the branch samples (8.9954 ± 1.318 μgg^{-1} dw) from the same locality. The results showed that *Pyrecantha coccinea* can be used as a plant biomonitor for these heavy metals. It can also be used for phytoremediation purposes.

ICPS-176 - SCREENING OF ANTILEISHMANIA, ANTIOXIDANT, ANTIFUNGAL ACTIVITIES OF SOME SELECTED SPECIES OF CHLOROPHYTA AND PHAEOPHYTA

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Abstract: Seaweed represents a varied source of phytochemicals and bioactive compounds. During the present study, out of 13 species of Chlorophyta and Phaeophyta were collected from coast of Karachi. Prepared extracts of seaweed were examined for antileishmanial antioxidant and antifungal activities with the help of different bioassay techniques. Ethanoilc extracts of seaweed showed positive results. Various green seaweed showed a significant result against leishmmania disease some species showed good result while species of Fucales did not show antileishmanial activity. These extracts were also analyzed for their antioxidant and antifungal activities and they showed potent antioxidant and antifungal activities at high concentration. For an extensive investigation of seaweed research will be conducted to evaluate the pure compounds which will be isolated from the seaweed showing antioxidant, antifungal and antileishmanial activities.

ICPS-177 - HYPER PRODUCTION OF PEROXIDASE FROM HORSE RADISH GROWN UNDER DIFFERENT STRESS CONDITIONS

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Abstract: Plants contribute to our lives more than animals mainly due to their ordinary array of diverse classes of biochemicals with a variety of biological activities. Plant diversity in reality is an out ward manifestation of chemical diversity. Even plants contain thousands of chemicals and enzymes each one of them is capable to treat particular diseases. Horseradish is very important in biochemical research

fields as it contains enzyme peroxidase, vitamin C, potassium, calcium, magnesium and phosphorous, as well as volatile oils, such as mustard oil, which is an antibiotic. The function of (POD) is known to be involved in the lignification of cell walls. In many instances, peroxidases (POD) have been shown to be useful as markers of the reaction of plants to external environmental stresses. Salts deficiency and excessive salts are also stress factors for the plants. Therefore the relationship among (POD), salts and environmental stresses were investigated in this study. Full Hoagland solution and regular water were used for control group. Peroxidase was extracted from horseradish treated by different stress conditions. Different stress conditions were water, NaCl and boric acid. Boric acid with 4 ppm concentration showed highest activity of peroxidase among stress groups. The enzyme extract was subjected to 50-85% ammonium sulfate precipitation. The desalted enzyme exhibited increase in activity by 4.51%.

ICPS-178 - GROWTH AND IONIC RELATIONS IN MAIZE UNDER AMMONIUM SULPHATE APPLICATION

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Abstract: Application of Sulphur in the form of ammonium sulphate is an effective way to improve the growth of maize plants. A pot trial (CRD in triplicate) under glass house was conducted to evaluate the effect of S on maize (*Zea mays* cv. Gohar) plants in University of Arid Agriculture during 2004. Sulphur in the form of graded ammonium sulphute @ 0, 5, 10, 20, 40, 80, and 120 mg Kg^{-1} was applied.(*Zea mays* cv. Gohar). An additional dose of NPK was applied. The pots were irrigated when required. On 28^{th} day of sowing the plants were harvested. There was a significant ($p \leq 0.05$) effect of the treatment applied on the growth parameters as well as on nutrient concentration of maize. With the increasing concentration of the applied ammonium sulphate in the root medium, fresh mass and dry mass of shoot were increased. It was observed that use of S with could further enhance shoot length, relative water content by improving the nutrient status (K, P, Mg) of plants.

ICPS-179 - IDENTIFYING RISK SOURCE AND RISK MANAGEMENT STRATEGIES AMONG WHEAT FARMERS, ACCORDING DEGREE RISK AVERSE: A CASE STUDY OF KHORASAN RAZAVI PROVINCE OF IRAN

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Abstract: In this paper, the results of a survey conducted in the Khorasan Razavi province, Iran, are presented. The aim of this research is to identify groups of wheat farmers who differ in their risk source and risk management strategies. Respondents to the survey were divided into three groups according degree risk averse: risk averse, risk seeking and risk neutral. Statistical society of around 19536 individual wheat farmers of Khorasan Razavi Province which have been involved in cultivation of water wheat in the agricultural year of 2005 –2006. And have done the farming operation under the supervision of experts. From among this society categorical sampling method with considering 400 individual has been used and studied. The results of the research showed that the most threatening risks of wheat production according to their priority include the environmental, economic, political and technological and the most important used strategies used against them according to their priority include technological, financial strategies, social security and governmental information network.

ICPS-180 - TO INVESTIGATE EXTENSION MECHANISMS WHICH IS EFFECTIVE ON THE RISK MANAGEMENT OF WHEAT PRODUCTION

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Abstract: Today the food production for the growing population is the biggest challenge against the countries of the world and ensuring the food supply and nutrition is the most important purpose of the agricultural section, therefore the efforts for increasing production and realizing the potential capacities of the agricultural sector is the most essential objectives of the agricultural development. Reaching this purpose needs investments and appropriate technology. It should be mentioned that the agricultural sector has always been threatened with different threats. So if these threats are along with the poor knowledge and abilities of the farmers in controlling and managing the risks, then it will prevent the proper environment for investment and entrance of new technology. In order to overcome the above challenge, the empowerment of farmers to change the risks into opportunities will have a key role in this regard and the Ag. Ext. system is recognized as the best selection for this case. The past researches and experiences have shown that the success of the educational and extensional programs depends on the scientific researches and in accordance to the farmers and regions needs. The present research in this regard is an effort for identify and examining the extension mechanisms which is effective on the risk management of wheat Production in Khorasan Razavi Province. This study is of the survey kind with a statistical society of around 19536 farmers who produce wheat of Khorasan Razavi Province. They have been involved in cultivation of water wheat in the agricultural year of 2005 –2006. And have done the farming operation under the supervision of experts. From among this society categorical sampling method with considering 400 individual has been used and studied. In order to obtain information interview and questionnaire were used and its sustainability was approved by Cronbach's Alpha coefficient data by the Microsoft office Excel and SPSS were analyzed. The results of the research showed that the most threatening risks of wheat production according to their priority include the natural and economic and the most important used strategies used against them according to their priority include technological and financial strategies. The results of correlation analysis showed that there is a meaningful relation between capability of risk management of the farmers and level of education, attitude towards risk, the level of yield production and the level of participation in work groups. The findings obtained from the average comparisons examination showed that there is no meaningful difference between the capabilities of farmers risk management in six towns. In some cases the production resources of farm risk and the strategies used by farmers in various towns is different. The results factor analysis showed that the Extension mechanisms which is effective on the risk management of the five stages according to their priority are the followings: in knowing the risks of wheat production, abundant and group mechanisms, in the evaluation of the effects of the risks of wheat production, the individual and group mechanisms and using indigenous organizations, in identifying strategies and tools, group mechanisms**,** designing radio and TV program**,** in proper methods of selecting mechanisms, individual mechanisms and utilizing indigenous knowledge, and in analyzing decision making process, the individual and group mechanisms with emphasis on indigenous knowledge.

ICPS-181 - EFFECT OF IRRIGATION INTERVALS AND PLANTING PATTERN ON YIELD AND QUALITATIVE TRAITS OF FORAGE SORGHUM

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Abstract: In order to study the effect of irrigation intervals and planting pattern on the yield, component yield and qualitative traits of forage sorghum (speedfeed variety) was conducted an experiment in Research Field of Birjand Azad University (Iran) in 2004. The experimental design was split plot in form RCBD with three replication and with 4 levels of irrigation intervals (5,10,15 and 20 day)as main plots and 2 levels of planting pattern(one row on furrow and two rows into furrow) as sub plot. The irrigation intervals had a significant effect on the yield and yield components of forage sorghum but the planting pattern and the interaction of the irrigation intervals and planting pattern had no significant effect on the yield and yield components of this plant. The increase in irrigation intervals from 5 to 20 days decreased the weight of the dry leaf and stem of two cuttings to 57.2% and 72.1%, respectively. The total fresh and dry weight of two cuttings showed a significant difference in all of the irrigation intervals. The total dry forage in 5 days irrigation interval was 16.9 ton/ha which in comparison to 10, 15 and 20 days irrigation intervals advanced to 19.4%, 44.3% and 66%, respectively. The irrigation intervals had a significant effect on the percentage of crude protein, crude fiber, ash and protein yield of the first and second cuttings. The comparison of mentioned traits average in this experiment showed that with the increase of irrigation intervals, the percentage of crude protein, crude fiber and ash in each of the cuttings decreased significantly. For example in the first cutting of the 5 days irrigation interval with the production of 0.448 ton/ha had the highest yield of protein and the 20 days irrigation interval with 0.236 ton/ha had the lowest. In the second cutting also the increase of the irrigation intervals from 5 to 20 days caused crude protein yield decrease from 0.666 to 0.137 ton/ha and in the total of both the cuttings the yield of crude protein with the increase of irrigation intervals from 5 to 20 days decreased to %66.5. The result of this research showed that water stress had negative effect on forage production and qualitative traits but planting pattern had not significant effect on these traits.

ICPS-182 - Morphological and physiological response of forage sorghum to irrigation intervals and planting pattern

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Abstract: In order to study morphological and physiological response of forage sorghum to irrigation intervals and planting pattern was conducted an experiment in Research Field of Birjand Azad University (Iran) in 2004. The experimental design was split plot in from RCBD with three replication and with 4 levels of irrigation intervals (5,10,15 and 20 day) as main plots and 2 levels of planting pattern(one row on furrow and two rows into furrow) as sub plot. The results of this research showed that drought stress decreased height, diameter, number leaf of main stem and number of tiller in plant, significantly. Also low irrigation decreased LAI, CGR and total dry matter of forage sorghum. The 5 days irrigation interval with medium of 9.06 tillers in each plant, allocated to itself the largest tillering in the second cutting. In the first cutting the dry weight of plant in the 5, 10, 15 and 20 days irrigation intervals was 25.1, 21.8, 16.5 and 16.5 grams, respectively and LAI was 4.95, 4.5, 3.5 and 3.1, respectively. The maximum of LAI in this experiment was 13.3 which in the 5 days irrigation interval in the time of collection of the second cutting were observed. The obtained results of this research showed that the 5 days irrigation interval allocated to itself the highest yield of fresh and dry forage but with respect to water limitation and intense need to forage in the region, in order to scrounge in the amount of consumption water in the level unit and increase of under cultivation lands, we can use 10 days irrigation interval for the planting of forage sorghum in Birdjand region.

ICPS-183 - EFFECT OF DENSITY PLANT AND PLANTING PATTERN ON YIELD, COMPONENT YIELD AND MORPHOLOGICAL TRAITS OF FORAGE SORGHUM IN THE SECOND CULTIVATION

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Abstract: In order to determine effect of density and planting pattern on yield, component yield and morphological traits of forage sorghum an experiment was studied at Research Field of Azad University of Birjand (Iran) in year 2003. Design of the experimental was as factorial in form RCBD with three replication and 8 treatments. Factors were density with 4 levels (20, 30, 40 and 50 plant/m^2) and planting pattern with 2 levels (one row on furrow and two rows into furrow). The results obtained from the statistical analysis showed that density plant, planting pattern and interaction between density and planting pattern was not significant on yield and component yield of forage sorghum but the effect of density was significant on number of tiller in plant and stem diameter. The total produced fresh forage in the densities of 20, 30, 40 and 50 plant/m^2 was 25.8, 25.7, 25.6 and 28.6 ton/ha respectively and the total produced dry forage in this densities was 5.28, 5.35, 5.26 and 5.83 ton/ha, respectively. Increase of density decreased number of tiller in plant and stem diameter. In the density of 20 plants per square meter with the medium of 2.3 tillers per plant the maximum and in the density of 50 plants per square meter with the medium of 0.27 tillers per plant the minimum of tillering were observed. The results of this research indicated that for optimum use of the short length period of growth, using of forage sorghum dense cultivation in the second cultivation in Birdjand region is recommended.

ICPS-184 - VELVETLEAF (ABUTILON THEOPHRASTI) CONTROL WITH BENTAZON

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Abstract: Velvetleaf is one of the most troublesome weeds in soybean and cotton in Mazandaran. In 2001, a field study was conducted in Sari, Mazandaran (Iran) to evaluate the effect of reduced rates of bentazon at various growth stages of velvetleaf. The experiment was initiated as a factorial design in a randomized complete block with four replications. Bentazon at 0.84 (recommended rate), 0.67, 0.59, 0.50, 0.42 and 0.25 kg ai/ha were applied on a 6, 18, 33, and 54 cm velvetleaf. There was a possibility of 70% reduction in bentazon rate when applied on 6-cm velvetleaf. This rate (0.252 kg ai/ha) provided 94% control of velvetleaf. Bentazon application at 0.42 kg ai/ha gave 96% control of 18-cm velvetleaf. As velvetleaf height reached to 33 cm, the only reduce rate which provided 86% control, was bentazon application at 0.672 kg ai/ha. When bentazon applied at 54 cm velvetleaf, none of theses rates gave acceptable control. The recommended rate provided only 64% control. These results indicated that there is a possibility of reduction in bentazon rates (even 70%) if herbicide is applied at the right growth stages of weed.

ICPS-185 - ASSESSING FARMERS' SUSTAINABLE AGRICULTURAL PRACTICE NEEDS: THE CASE OF CORN GROWERS IN FARS, IRAN

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Abstract: The primary purpose of this study was to assess farmers' sustainable agricultural practice needs (SAPN) as determined conversely by their level of technical knowledge and understanding of sustainable corn farming practices. The population of this study consisted of all corn growers in Fars, a

southern province of Iran. A questionnaire was developed to gather the information required from 159 randomly selected farmers. Farmer's demographic and professional characteristics, including their level of technical knowledge, access to information sources, and level of mechanization were considered to be independent variables of the study. The Sustainable Agricultural Practice Needs was the dependent variable of the study. The result showed that a considerable numbers of farmers (46%) have a "high" level of needs concerning sustainable agricultural practice. the farmers level of technical knowledge showed to have a substantial(r=-0.64)and negative association with their SAPNs. Multivariate linear regression analysis indicated that 49.3% (R2=0.493) of the variance in SAPNs could be explained by the farmers' age, their access to information sources, and their level of technical knowledge. This implied that a substantial amount of variability (about 51%) in SAPNs are explained by other variables that were not studied in this research. further study is needed to determine factors affecting SAPNs and extend of the impact.

ICPS-186 - TAXONOMIC STUDY OF PARONYCHIOIDEAE SUBFAMILY OF CARYOPHYLLACEAE IN IRAN

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Abstract: The Paronychioideae is a subfamily of Caryophyllaceae. In order of execution national project "The flora of Iran" with aims of provide a reliable reference in Persian and suitable classification for all species this study had done. Based on references, field observation and studied all sheets of original herbarium in Researches Institute of Rangelands and Forests (National Herbarium of Iran) the Paronychioideae contained 13 genus and 30 species in Iran. In this study meanwhile the morphological species, subspecies and variety will describe, the new species, keys, dispersion and flowering season will introduction.

ICPS-187 - EFFECT OF DIFFERENT SOLVENTS ON YIELD AND QUALITY OF ESSENTIAL OIL FROM *TAGETES ERECTA* L. (CV. MINT MARIGOLD)

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Abstract: *Tagetes erecta* is not only grown for ornamental purposes but also used for essential oil extraction. Essential oils are natural plant products which accumulate in specialized structures such as oil cells, glandular trichomes and oil or resin ducts. In present study, extraction of essential oil from marigold (cv. Mint marigold) was carried out through solvent extraction method by using two solvents, petroleum ether and n-hexane. Both solvents yielded oil with differences in the percentage composition of each component, but hexane proved better (i.e. higher yield and more components) than petroleum ether for extraction of essential oil from marigold. Gas-chromatography of the rose oil was carried out for the qualitative and quantitative analysis of the oil constituents. Major compounds identified were citronellol, methyl eugenol, geraniol, geranyl acetate, phenyl ethyl alcohol, linalool, benzaldehyde, benzyl alcohol, rhodinyl acetate, citronellyl acetate, benzyl acetate and phenyl ethyl formate.

ICPS-188 - COMPARATIVE EFFICIENCY OF AUXIN AND ITS PRECURSOR APPLIED THROUGH COMPOST FOR IMPROVING GROWTH AND YIELD OF MAIZE

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Abstract: Significant improvement in growth and yield of plants has been reported by applying L-tryptophan (L-TRP) directly to soil, but its effectiveness through compost has yet not been reported. In the present study compost was prepared from waste fruit and vegetables and enriched with 25% (44 kg ha^{-1}) of full dose (175 kg ha^{-1}) of N fertilizer for maize. Pure auxin, indole 3-acetic acid (IAA) and L-TRP (precursor), were blended with respective batches @ 10 mg kg^{-1} compost for the value addition of N-enriched compost. Comparative effectiveness of IAA or L-TRP-blended N-enriched compost was studied, in the presence or absence of 50% (88 kg N ha^{-1}) of full dose of N fertilizer, through pot and field trials. Compost treatments were applied @ 300 kg ha^{-1}, and compared with full dose of N fertilizer. Results indicated that N-enriched compost with or without IAA supplemented with half dose of N fertilizer was as effective as full dose of N fertilizer in improving growth and yield of maize, saving 25% N fertilizer. However, precursor (L-TRP)-blended compost was found better than pure auxin (IAA)-blended, when both were compared with full dose of N fertilizer. It significantly improved growth, yield and nutrient uptakes (up to 8.5, 10.2 and 21% respectively) of maize over full dose of N fertilizer. The technology bears its promise not only to improve crop yield on sustainable basis but also reduce huge piles of organic wastes causing environmental pollution.

ICPS-189 - INFLUENCE OF ABSCISIC ACID AND SILICON ON SODIUM TRANSPORT AND BYPASS FLOW OF WHEAT (*TRITICUM AESTIVUM* L.) SEEDLINGS UNDER SALT STRESS

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Abstract: Experiments were conducted on two wheat varieties (Kharchia-65 and Punjab-85) at greenhouse conditions at University of Sussex, UK, to study the response of Abscisic acid (ABA) and Absicic acid with Silicate on growth and ion uptake. Ten days old plants of both the varieties were exposed to 100 m*M* NaCl and 100 mg/L trisodium-8-hydroxy-1, 3,6-pyrenetrisulphonic acid (PTS). Plants were harvested 6 and 10 days after salinisation (DAS). Results revealed that sodium chloride reduced the growth of wheat seedlings, while accumulation of excessive concentrations of sodium in shoot was observed. Salt stress reduced the growth of shoot but seed pretreatment of ABA (10^{-5}M) alone or with 3 m*M* silicate in the culture solution improved the growth of shoot. The sodium concentrations in shoot was reduced with ABA seed treatment while ABA with silicate did not reduced Na^+ concentrations at 6DAS while at 16 DAS Na^+ concentration was significantly decreased by ABA alone as well as with silicate in both the varieties at 0 and 100 m*M* NaCl stress. The use of PTS, an apoplastic tracer showed that ABA alone as well as with silicate decreased transpirational bypass flow in wheat at 16 DAS. This implies that the mode of action of ABA in presence of silicate may be partial blockage of transpiration bypass flow, the pathway by which decrease in sodium translocation is occurs. The mechanism by which ABA & silicates reduces the transpiration bypass flow will be discussed.

ICPS-190 -FUNCTION OF THE A-RICH REGION OF THE DNA 1 ASSOCIATED WITH COTTON LEAF CURL DISEASE IN PAKISTAN

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Abstract: novel type of circular singe-stranded satellite-like DNA, known as DNA 1, was recently characterized and demonstrated to be associated with monopartite begomoviruses. DNA 1 components are satellite-like, single-stranded DNA molecules associated with begomoviruses (family *Geminiviridae*)

that require the satellite molecule DNA β to induce authentic disease symptoms in some hosts. DNA β is essential for induction of characteristic symptoms in plants. The function of DNA 1 in begomovirus-DNA β infections remains unclear. They are not required for infection and it has been suggested that they may act to down-regulate the virus infection by competing for cellular resources. Interestingly, the DNA 1 components are closely related to the helper-dependent, Rep-encoding components of nanoviruses (a second family of single-stranded, plant-infecting DNA viruses), from which they are presumed to have evolved. DNA 1 molecules have two major sequence features. Firstly the component encodes a replication-associated protein (Rep) which is required to initiate rolling-circle replication. Consequently DNA 1 components are capable of self-replication in host cells but require the helper begomovirus to spread both within and between host plants. The second feature is a region of sequence rich in adenine (A-rich). To investigate the function of the a-rich sequence, this was deleted from the CLCuD DNA 1 by PCR mediated amplification. The A-rich deleted mutant of DNA 1 remained capable of replication and systemic infection in plants, in the presence of a helper begomovirus. This indicates that A-rich region is not required for replication or maintenance in plants. The possibility of utilizing DNA 1 as an expression/silencing vector in plants is discussed.

ICPS-191 - SELECTION CRITERIA FOR DROUGHT RESISTANCE IN CHICKPEA

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Abstract: Eight varieties of chickpea were field-grown under rainfed conditions of Gurgaon, Haryana, India, for two consecutive crop seasons (2002/03 and 2003/04) to explore the selection criteria for drought resistance in chickpea. Crop season 2002/03 was comparatively wetter (total rainfall 94 mm) than 2003/04 (total rainfall 33 mm). The performance of the crop was assessed in terms of seed yield and yield attributes, K uptake by crop and some of the plant water relation and other physiological attributes. Genotypic variability (GV) regarding seed yield, stover yield, crop biomass, osmotic potential at full turgor (OP100), chlorophyll content and leaf-NR activity was better in dry season compared to wetter season, indicating the better discrimination of the varieties in dry season in respect with these traits. In dry season, GV ranged from 50 to 87%, the highest value being obtained for crop biomass. Crop biomass, relative water content (RWC) and OP100 were highly correlated ($P<0.001$) with seed yield in dry season, indicating the contribution of these parameters to seed yield under severe drought stress. Besides, number of seeds m^{-2} was positively correlated ($P<0.01$), while one thousand seed weight was negatively correlated ($P<0.05$) with seed yield in dry season. In the wetter season, crop biomass, harvest index and K uptake in grain were highly correlated ($P<0.01$ and $P<0.001$) with seed yield. As per genetic variability and/or correlation of the attributes studied with the seed yield, crop biomass, followed by number of seeds m^{-2}, could be regarded as the best selection criterion among the yield attributes. Among the physiological attributes, both RWC and OP100 could prove good selection tools under severe drought stress. Whereas, crop biomass as well as harvest index and K uptake in seed could be used for selecting better chickpea varieties under mild stress conditions.

ICPS-192 - INVIGORATION OF NORMAL AND LOW VIGOR SUNFLOWER HYBRIDS BY SEED PRIMING

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Abstract: Sunflower seeds lose their vigor during storage at high temperature and high relative humidity. Present study was conducted to invigorate the performance of low-vigor seeds by using osmopriming technique. Low-vigor seeds of four sunflower hybrids (Hysun-33, 38, 44 and F-330) were

subjected to high temperature (40 ±1 ^{o}C) and approximately 100% RH for short duration (168 h), which followed already standardized vigor and viability tests. Aerated solution of PEG_{8000} (Ψ=-1.25 MPa) was used for o osmopriming the seeds. Priming was effective in reducing the time for 50 % emergence and MGT, and increase in germination percentage in low-vigor seeds of almost all hybrids except F-330 while FGP both in normal and low-vigor seeds showed minor increase. Osmopriming of normal and low-vigor seeds improved the vigor of seedling in term of redicle length, plumule length and their root /shoot fresh weight. After cold stress aged-primed and normal-primed exhibited significant change in all emergence parameters but Low-vigor seed of Hysun-44 had no significant effect in all parameters. Mean germination time in all hybrids had strong positive correlation coefficients with 50 % germination time of treated seeds and strong negative correlation in germination Index (GI). Some proteins were completely lost as a result of AA, which showed reappearance after osmopriming. The SDS PAGE studies provide clear understanding about the mechanism of accelerated aging and osmopriming. The results showed that the proteins with approximately 26, 48, 49, 69, 90, 118, 121,150 and 199 kDa effected by the AA. Osmopriming showed little improvement in the banding pattern and intensity of protein in normal seeds while low-vigor seeds had significant improvement in the banding pattern and intensity of protein.

ICPS-193 - THIDIAZURON INDUCES EMBRYOGENESIS FROM MATURE BARK EXPLANTS IN NORFOLK ISLAND PINE (*ARAUCARIA HETEROPHYLLA* (SALISB.) FRANCO)

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Abstract: Thidiazuron (N-Phenyl-N´-1, 2, 3-thiadiazol-5-ylurea (TDZ) exhibits the unique property of mimicking both auxin and cytokinin effects on growth and differentiation of cultured explants. The objective of the present study was to develop a protocol for *in vitro* callus induction, maintenance and plant regeneration by using TDZ and different explants of *Araucaria heterophylla* (Salisb.) Franco. Leaf needles, stem segments or mature bark were cultured on MS, WPM or LP basal media supplemented with 12 concentrations of TDZ (1pM, 10pM, 100pM**,** 1nM, 10nM, 100nM, 0.5µM, 1µM, 10µM, 20µM, 50µM or 100µM) for each medium. MS and LP medium did not support callus induction. WPM supported callus induction on all the tested TDZ concentrations with a maximum (100%) on10µM TDZ from mature bark explants. The induced calluses so obtained were maintained on three different concentration levels of TDZ (100nM, 1µM or 20µM) supplemented to WPM for 4 months. Effect of bark explants obtained during different times of year on callus induction percentage, morphology (color, texture and morphogenesis) and maintenance on WPM medium supplemented with above-mentioned concentrations of TDZ was also investigated. A gradual increase in callus induction percentage was observed from autumn to spring season at all the tested TDZ levels. Embryoids were produced (though sporadically) at 1nM TDZ level supplemented to WPM medium after 2 weeks of inoculation. Further differentiation of such embryoids was not possible. The present study thus reports the possibility of producing potentially regenerating callus cultures of Araucaria using TDZ and bark explants.

ICPS-194 - BIOSORPTION OF INDUSTRIAL HEAVY METALS BY *PLEUROTUS OSTREATUS*

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Abstract: In the present study the biosorption potential of *Pleurotus ostreatus* (Jacq.) Quélet, a Basidiomycetous fungus was evaluated for removing heavy metal ions Cu (II), Ni (II), Zn (II) and Cr (VI) from aqueous solution. To predict the biosorption performance of the test fungus with actual waste-water of Electroplating industrial unit, laboratory assays were conducted with synthetic pure

metal-bearing solutions. Experiments were performed as a function of pH, biomass dose, equilibrium time, stirring intensity, temperature and initial metal ion concentrations. pH evaluation showed biosorption of Ni (II), Cu (II) and Zn (II) ions reached plateau at around pH 4.5-5.0, whereas, for Cr (VI) ion it was between pH 2.0-2.5. Varying biosorbent dose demonstrated minimal and maximal limits of 0.1g and 0.4 g respectively, for optimum capacity and efficiency of heavy metal ions. Kinetics of metal ions adsorption was relatively fast and equilibrium was obtained in contact time of 2.5 h with more suitability of pseudo-second-order. The test fungus exhibited marked increase in metal ions uptake on increasing stirring intensity with maximum being at 150 rpm. Temperature variation exhibited insignificant effect in the range of 20-45^{o}C on the sorption activity of the test fungus. The regenerated biomass, reemployed in at least four cycles of biosorption with > 89% desorption capability. The assessments involving effect of various metal ion concentrations in the range of 20-100 mg L^{-1} presented significant uptake between 20-80 mg L^{-1}. The distribution of metallic ions between liQuaid and solid phase was analyzed by mono-component i.e., Langmuir and Freundlich, and multi-component i.e., modified Langmuir isotherm models. Both models adequately described all experimental data on sorption capacity of the test fungus. The biosorption efficiency of the *P. ostreatus* recorded on exposure of biomass in electroplating effluents for Cu (II), Ni (II), Zn (II) and Cr (VI) ions was 49.02, 61.69, 8.24 and 19.07%, respectively under pre-optimized conditions (established in pure metal-bearing synthetic solution bioassays).

ICPS-195 - PROBLEMS ASSOCIATED WITH SOME ETHNO-BOTANICALLY IMPORTANT PLANTS OF KOHAT REGION AND THEIR CULTIVATION IN A FARM

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Abstract: Plants, animals and the mankind evolved parallel to one another. Plants are used as a source of food, shelter, protection, amusement, cure, aromas, perfumes and many other purposes. Even pre-historic civilizations learnt to utilize herbals in their surroundings for cure of the diseases. This knowledge was passed on through generations to the present day mankind. This way it has helped in the establishment of a rich repository of medicinal plants and the ethno-botanic science. Literature reveals that useful medicinal plants grew in the wild on marginal lands. However, due to population explosion herbal habitats were converted into more pressing demands like shelter (accommodation), cultivation of crops, fruit orchards etc. to meet the necessities of day to day life. This biointerference coupled with overexploitation of the natural resources led to the deterioration of the habitat and some valuable species as well. This process continues even today. The marginal lands where herbals used to grow have resultantly shrunk threatening the very survival of highly priced medicinals. The alternative is to initiate medicinal plant farming to perpetuate and conserve the endangered medicinal germplasm. Kohat and the adjoining tribal belt is ideal for natural growth of many herbals and at the moment affords a rich biodiversity of some valuable medicinal and other plants. Some important commercial plants of the region e.g. Artemisia, Nannorhops, juniper etc. were destroyed due to influx of Afghan refugees during the years 1980-1995. Realizing this grave situation surveys were conducted to gather information regarding the overexploited plants, condition of the soil of the degraded habitat and climatic changes if any during this interference. Based on this information some important medicinal plants were cultivated in the Medicinal Plants Farm established at the University to make a comparison among the habitats and the possible cultivation of important herbals under controlled conditions in the green house. Prior to all this locals were interviewed regarding use of medicinal plants, their regeneration status and trade at present and in the past. AU theses aspects will be discussed in the conference deliberations and full length paper.

ICPS-196 - RESPONSE OF WHEAT TO ZINC OXIDE COATED MONO AMMONIUM PHOSPHATE

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Abstract: Zinc deficiency is widespread in Pakistan and consistent soil depletion will make things worse in future. Non availability of quality zinc fertilizers is a major issue faced by farmers and is one of the major variables discouraging zinc use. A practical solution of the problem could be use of zinc oxide coated phosphorus for improving crop yield. A field experiment was conducted to evaluate the interactive effect of zinc oxide coated source of phosphorous on growth and yield of wheat (*Triticum aestivum* L.) at the research area, Institute of Soil and Environmental Sciences, University of Agriculture, Faisalabad. Treatments were control (T1), mono ammonium phosphate (MAP) alone (T2), Zn-P_2O_5, 2-13 (T3), 1-81(T4), 1-77 kg/ha (T5) of zinc oxide coated MAP and MAP + Zn SO_4 @ 2 kg/ha (T6). All treatments were applied at sowing time. Results indicate that sources of zinc as $ZnSO_4$ or ZnO along with phosphorus had no significant effect on growth and yield of wheat. However the growth parameters were significantly affected compare to control. Zn and P concentrations in flag leaves did not differ, though these differed compared to control. Over all results encourage the use of fortified fertilizer products to eliminating micro nutrient deficiencies.

ICPS-197 - EFFECT OF NITROGEN AND POTASSIUM FERTILIZATION ON GROWTH YIELD AND NUTRIENT UPTAKE BY SUGARCANE GROWN UNDER SALINE CONDITIONS

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Abstract: The results of our pervious studies indicated that supra optimal level of potassium (150 kg K_2O ha^{-1}) is effective in achieving economical sugarcane yield and optimum nutrient uptake. Keeping in view these findings, experiments were conducted on salt-affected soils at four sites to select a suitable source and rate of N for obtaining optimum sugarcane yield and nutrient uptake. The experiments were conducted with two sugarcane varieties (salt tolerant and sensitive) using supra optimal level of K (150 kg K_2O ha^{-1}) as sulphate of potash SOP, 100 kg P_2O_5 ha^{-1} as DAP, 100 and 200 kg N ha^{-1} as urea or calcium ammonium nitrate (CAN). The results indicated that cane length and diameter, number of tillers per plant, cane yield and sugar recovery increased with the application of NPK in both the sugarcane varieties under normal and under saline conditions. Sugarcane growth and yield increased with increasing N rate from 100 to 200 kg N ha^{-1} in case of both urea and CAN. However, CAN as N source was more effective in enhancing sugarcane growth and yield than urea. The concentration of Na^+ and Cl^- increased in both the sugarcane varieties due to salinity, however, application of K and N decreased their concentration. The combined application of NPK also significantly reduced Na^+ and Cl^- uptake in leaves, however, the best combination observed was SOP+CAN. It was also observed that salt tolerant variety (SPSG-26) had lesser accumulation of Na^+ and Cl^- than that of sensitive one (CP-77400). Application of the N fertilizers significantly enhanced the nutrient (K, Ca, P, and N) uptake in both the varieties at both N rates, i.e. 100 and 200 kg N ha^{-1} under normal as well as saline conditions. However, maximum uptake of nutrients was recorded at the highest dose (200 kg N ha^{-1}) but CAN treated plants performed better than that of urea. On the basis of above results, the application of K as SOP and N as CAN was recommended for salt-affected soils to enhance the sugarcane yield. The salt tolerant variety for higher yield in salt-affected soil is also necessary which may improve the cost benefit ratio. The results indicated that if salinity level of soil would exceed 10 dS m^{-1}, considerable reduction in sugarcane yield could occur.

ICPS-198 - WEED FLORA OF *GLADIOLUS* FIELDS IN DISTRICT KASUR, PAKISTAN

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Abstract: District Kasur is the hub of *Gladiolus* cultivation in Punjab, Pakistan. Surveys of fields from 12 localities of the district were undertaken during 2005-06 and again in 2006-07 to study the distribution of various weed species in *Gladiolus* fields. A total of 60 weed species belonging to24 angiospecrmic families, were found growing in the fields of *Gladiolus. Ageratum conyzoides* L., *Amaranthus viridis* L., *Coronopus didymus* (L.) Sm., *Chenopodium album* L., *Chenopodium murale* L., *Convolvulus arvensis* L., *Cypreus rotundus* L., *Cynodon dactylon* Pers., *Poa annua* L., *Oxalis corniculata* L., *Rumex dentatus* L., *Melilotus parviflora,* L. *Cenchrus pennisetiformis* Hochest and *Eragrostis poaeoides* Beauv. were found to be the most prevalent weed species occurring in 90% or more studied areas during one or the other growing season. The frequently occurring weeds with absolute frequency above 40% were *C. didymus*, *C. arvensis, R. dentatus, C. pennisetiformis* and *C. dactylon. R. dentatus* was found to be the most frequently and densely populated weed species with absolute frequency of 57% and absolute density of 1.2 during 2006-07 growing season. Other densely populated weed species with absolute density above 0.50 were *A. conyzoides, C. didymus*, *C. arvensis, C. rotundus, Euphorbia prostrate, C. pennisetiformis* and *C. dactylon.*

ICPS-199 - TRANSFORMATION OF RICE CULTIVAR BAS-385 FOR INDUCTION OF BACTERIAL AND FUNGAL DISEASE RESISTANCE

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Abstract: Two disease resistant genes Xa21 and RCC2 has been introduced into Basmati 385 by *Agrobacterium* mediated transformation. Callus induction was achieved at its Maximum of 85% on MS medium with 2.0 mg/L 2,4-D. Different combinations and concentration of growth regulators (NAA and BAP) were used to develop an efficient culture environment for higher regeneration frequencies. Maximum plant regeneration (80%) from calli was achieved on RM5 (NAA 1.0 mg/L + BAP 5.0 mg/L). Hygromycin was used as selectable agent and at concentration of 50 mg/L proved to be lethal for scutellum derived calli. Calli of more than 5 mm in size were infected with *Agrobacterium* strain EHA101 containing the vector pTCL5 having bacterial blight resistance gene Xa21 and also with a Vector pB1333-EN4 having Chitinase gene RCC3 for fungal resistance. Age of the calli was found to be a limiting factor in transformation efficiency. Older calli of over four weeks were less efficient in transformation whereas 22-25 days old calli were found to be highly efficient in transformation. Selection of the calli was carried out with Hygromycin (50 mg/L) in addition to Cefatoxime (500 mg/L) in combination with Carbenicillin (500 mg/L). Transgenic plants regeneration frequency was observed as 7-8% with Xa21 and 10-11% with RCC2. Results for Xa21 were confirmed both with GUS assay and PCR while that of RCC2 were only with PCR analysis.

ICPS-200 - DIRECT ORGANOGENESIS AND EFFICIENT ROOTING FROM COTYLEDONARY NODES OF COTTON (*GOSSYPIUM HIRSUTUM* L.)

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Abstract: The purpose of this study was to develop an efficient micropropagation system for cotton (*Gossypium hirsutum* L.), a worldwide commercially important fiber crop. A successful shoot and root induction was achieved from cotyledonary nodes of two different cotton genotypes, Nazilli 84S and Çukurova 1518, which are widely planted in Turkey. Plant tissue culture systems were established on Murashige and Skoog (MS) media supplemented with various plant growth regulators using cotyledonary nodes with hypocotyl pieces as explant. Explants were placed on different MS media supplemented with different combinations of kinetin (KIN) and α-Naphteleneacetic acid (NAA). Seven-day-old explants were used and germination, regeneration and rooting processes followed for five weeks. Successful direct regeneration and efficient rooting were obtained. No significant differences were observed among two genotypes. In addition, regenerated young plants were phenotypically normal and they produced seeds. This meristematic shoot tip based rapid regeneration method is also available for use as particle gun and *Agrobacterium*-mediated transformation.

ICPS-201 - THE WALL FLORA OF THE ANATOLIAN SIDE OF ISTANBUL (TURKEY)

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Abstract: The wall flora from the urban areas of Anatolian side of Istanbul City was investigated in this study. The plant taxa were collected during 2005-2007. A total number of 89 taxa (70 species, 12 subspecies and 7 varieties) belonging to 67 genera and 32 families were recorded. Out of these 69 species belonged to *Dicotyledons* and only one to *Monocotyledons*. The families with largest number of taxa were *Asteraceae* (15 species, 21.4 %); *Poaceae* (6 species, 8.6 %) and *Lamiaceae* (5 species, 7.1 %). The most common plant species which covered the walls were *Parietaria judaica* L. (*Urticaceae*), *Stellaria media* (L.) Vill. subsp. *media* (*Caryophyllaceae*) and *Mercurialis annua* L. (*Euphorbiaceae*). The percentage of phytogeographical elements among the recorded taxa varied as follows; Euro-Siberian (5 taxa, 7.1 %), Mediterranean (7 taxa, 10 %), East Mediterranean (2 taxa, 2.8 %) and unknown (56 taxa, 80 %). The results revealed that 6 of total taxa (8.6 %) were cosmopolitan, 12 were (17.1 %) widespread whilst 1 was endemic (1.4 %). The results were compared with other wall floras from Europe.

ICPS-202 - IN VITRO DIRECT REGENERATION CAPACITIES OF THREE DIFFERENT COTTON (*GOSSYPIUM HIRSUTUM* L.) NODES

I. I. OZYIGIT

[Marmara University, Science and Arts Faculty, Department of Biology, Istanbul, Turkey]

Abstract: A comparative study was undertaken on the direct plant regeneration responses of three different nodes of cotton (*Gossypium hirsutum* L. *Var*. Nazilli 84S). Cotton seeds were germinated Murashige and Skoog (MS) media without hormones for 35 days. Cotyledonary nodes and first and second leaf nodes were cultured on MS media supplemented with 0.1 mg/L KIN (kinetin). Cultured seeds and explants were left in the growth chamber at 25 ^{o}C, 70 % humidity and 16 h light (7500 lx) and 8 h dark photoperiod. All three types of explants regenerated successfully without intervening callus formation, and no significant differences were observed among young plants. The best regeneration response (74.2 %) was obtained from cotyledonary nodes followed by first and second leaf nodes (60.7 % and 41.6 %). Regenerated shoots were rooted on WPM (Woody Plant Medium) supplemented with 1 mg/L IBA (indole-3-butyric acid) and after 15 days, they were ready for transfer to the soil.

ICPS-203 - EFFECTS OF BA-GA_3 AND NAA ON STOMATAL CONDUCTANCE OF CUCUMBER (*CUCUMIS SATIVUS* L.)

I. I. OZYIGIT AND I. E.YALCIN

[Marmara University, Science and Arts Faculty, Department of Biology, Istanbul, Turkey]

Abstract: The seedlings of 2 elite and widely planted cucumber (*Cucumis sativus* L.) varieties in Turkey; Beith alpha and Çengelköy; were used in this study. These were grown singly in the standard pots and were sprayed with two different concentrations (10^{-4} and 10^{-6}) of BA (6-benzyladenine), NAA (α-naphthaleneacetic acid) and GA_3 (Gibberellic acid). The regulators were sprayed on the lower surfaces of leaves at the rate of 2 ml/ day, for seven days. Stomatal diameters were measured with the help of micrometric ocular. For this purpose epidermal sections from the lower surfaces of leaves were used and examined by image processing and analysis software program. The data proved that, stomatal diameters were affected significantly with BA, GA_3 and NAA treatments, but responded variously in all treated plants as compared to the control groups.

ICPS-204 - ANTIPYRETIC EFFECTS OF THE HOMEOPATHIC MOTHER TINCTURE OF *MORINGA OLEIFERA* STEM BARK IN ANIMAL MODEL

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Abstract: Traditional medicines have been used to treat a number of infectious and non-infectious ailments. We analyzed the antipyretic effect of the homeopathic mother tincture of *Moringa oleifera* stem bark in rabbits. The animals were housed in animal facility of the Islamia University of Bahawalpur and subjected to treatment with *Moringa* mother tincture upon *E. coli's* endotoxins induced pyrexia. After receiving endotoxin injection in the marginal ear vein the animals developed pyrexia between 1-2 hrs, confirmed through taking rectal temperature after every 30 minutes post-injection. Among the five groups of five each, the first three were administered 15, 30 and 60 drops of undiluted *Moringa* mother tincture whereas the fourth negative control group received just vehicle prepared exactly like the mother tincture without adding any plant material. The animals in the positive control group received various concentrations of Paracetamol dissolved in solvent used for the preparation mother tincture. The body temperature of all groups was recorded hourly. We observed significant dose-dependent antipyretic effect of *Moringa* mother tincture. The animals groups administered with different doses of mother tincture showed fever reduction 1.9 -2.6 ^{o}F, 1.9 -3.0 ^{o}F, 2.3 - 3.1 ^{o}F for 15, 30 and 60 drops/kg body weight respectively. These data suggest that mother tincture of the stem bark of *Moringa oleifera* have significant antipyretic effect, particularly higher dose of mother tincture (60 drops kg-1 body weight). This further affirms the claim by local herbal practitioners of the area which use this plant to cure fever in humans. Further studies are needed to fully elucidate the molecular mechanisms involved in the antipyretic effects of this important plant.

ICPS-205 - INVASION OF NOXIOUS ALIEN WEED *PARTHENIUM HYSTEROPHORUS* L. IN GRAZING LANDS OF LAHORE, PAKISTAN

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Abstract: The present study reports the invasion of noxious, aggressive alien weed Parthenium (*Parthenium hysterophorous* L.) in grazing lands of Lahore, Pakistan. Parthenium was found in all the five studied areas of Lahore exhibiting 100% prevalence. Out of total 53 weed species found in the surveyed areas, only 5 weed species other than Parthenium showed 100% prevalence. Parthenium was found to be the second most densely populated weed species with absolute density (AD) of 16.8 and relative density (RD) of 15.59%, the first being the *Cynodon dactylon* Pers. with AD of 36 and RD of 33.4%. The other densely populated species with AD ranging from 1.5 – 5.78 were *Cypreus rotundus* L., *Croton sparsiflorus* Morong, *Euphorbia pilulifera* L., *E. prostrata* L., *Malvestrum tricuspidatum* A. Gray, *Brachiaria ramose* (L.) Stapf, *Dactyloctenium aegyptium* Beauv., *Digitaria timorensis* (Kunth) Balansa, *Echinochloa colonum* (L.) Link and *Eleusine indica* Gaertn. All other weed species showed AD below 1.0. The highest coverage was exhibited by *C. dactylon* (50%) followed by parthenium (30%).

ICPS-206 - STUDY OF DIRECTIONAL GROWTH PATTERN OF LOCAL BER (*ZIZIPHUS MAURITIANA* LAMK.) VARIETIES

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[Institute of Horticultural Sciences, University of Agriculture Faisalabad, Pakistan]

Abstract: *Ber* or jujube (*Ziziphus mauritiana* Lamk) tree grows in tropical and subtropical climate. It belongs to the family Rhamnaceae. In 1994-95, India produced 0.9 million tons of ber fruits from an area of 88 thousand hectares. India, Thailand and Pakistan export ber to the Middle East, Malaysia and Far East, but only Thailand exports on a year-round-basis. Most of the producing countries do not grow ber trees on a commercial scale and fruits are collected from trees that grow in home gardens and in the wild. It is a fast growing tree; the fruits are variable in shape, color and size. Leaves are alternate, simple, and 3- to 5-veined from the base. Branches are slender in down ward direction. Its cyme inflorescence has a wide spreading crown with a short bole. Small and bisexual flowers are born in axilliary heads in which 2 to 4 chambered ovary is enveloped by the disc. Fruit is fleshy, indehiscent, and drupe. In order to evaluate directional growth pattern, twelve ber varieties (Desi, Selection–13, Anonymous–I, Gola, Selection–11, Karnal Local, Gourh, Karela, Umran-9**,** Mirpuri, Khati Mithi, Anonymous-2 and Badam) were studied. Ten, current year branches were tagged randomly on each side of the trees including the topside. The final length of the tagged branches was measured. Numbers of secondary and tertiary shoots were recorded. Reproductive growth pattern was observed by determining number of inflorescence per primary shoot; number of floral buds, opened flowers and maximum/minimum flowers per inflorescence; flowering duration; fruit setting and fruit retention percentage. Vegetative and reproductive growth pattern and flowering potential was found to be significantly different (α=0.05) among different direction of under study ber verities. The northern side of the trees was found to be least productive. Total flowering period and fruit setting potential was also found to be cultivar specific while all the cultivars were found self-incompatible.

ICPS-207 - A QUALITATIVE AND QUANTITATIVE STUDY OF LEAVES AND FRUIT OF COMMERCIAL BER (*ZIZIPHUS MAURITIANA* LAMK.) VARIETIES

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[Institute of Horticultural Sciences, University of Agriculture Faisalabad, Pakistan]

Abstract: The genus *Ziziphus* (Jujube) belongs to buckthorn family (*Rhamnaceae*). It is a genus of about 100 species of deciduous or evergreen trees and shrubs distributed in the tropical and subtropical regions of the world between 34°S & 51°N latitude and up to 2800 meters above sea level. Some species, like *Z. mauritiana* occur in nearly every continent. In both China and India, *Ziziphus* varieties have a long tradition of selection and cultivation which result in better known and more widely

researched varieties than those in other regions. *Z. mauritiana* is an example of an extremely drought-hardy species and is a dominant component of the natural vegetation of the Indo-Pak deserts. Both leaves and fruits of ber are very important from nutritional point of view. Several local and exotic ber varieties are being cultivated in Pakistan for fruit production, but these have not been well researched and documented earlier from botanical point of view. So, during this study, existing gene pool was characterized for physical and morphological diversity to develop a reliable key of identification for these verities which would further lead us towards local patent varieties of Pakistan. Thirteen commercial varieties (Desi, Selection–13, Anonymous–1, Gola, Selection 11, Karnal Local, Gourh, Karela, Umran–9**,** Mirpuri, Khati Mithi, Anonymous–2 and Badam) of ber planted in University of Agriculture Faisalabad were studied for qualitative and quantitative characters. The quantitative studies included leaf area, petiole length and fruit diameter, weight and volume while, qualitative studies comprised of leaf shape, apex, base, margins and characteristics of leaf dorsal and ventral surface. Fruits were also studied for shape, type of stem-end and cavity, form of styler-end and skin roughness. Significant results revealed noticeable diversity among verities which provided basis to develop an identification key for the *Ziziphus* gene pool in Pakistan.

ICPS-208 - IN- VITRO EVALUATION OF NEW CHEMICALS FUNGI-TOXICANTS AND PLANT EXTRACTS AGAINST *COLLETOTRICHUM GLOEOSPORIOIDES* PENZ. CASUAL ORGANISM OF ANTHRACNOSE OF MANGO

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Abstract: Several pre and post harvest diseases are responsible for continuously lowering down production in mango. Among the fungal diseases anthracnose caused by *Colletotrichum gloeosporioides* Penz. is the most serious and important. As no detail work appears to have been done on biological control of disease. It is planned to evaluate the effectiveness of new chemistry fungi toxicants and plant extracts to control this important disease because fungicides are still most effective material to control the pathogen.

ICPS-209 - INFLUENCE OF VARIOUS FUNGI-TOXICANTS AND PLANT EXTRACTS ON MYCELIAL GROWTH AND SCLEROTIAL PRODUCTION OF *MACROPHOMINA PHASEOLINA*, CAUSE OF ROOT AND STEM ROT OF SUNFLOWER

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[Department of Plant Pathology, University of Agriculture, Faisalabad]

Abstract: *Macrophomina phaseolina* (Tassi) Goid is an imperfect fungus and causes various kinds of plant diseases such as stalk rot in corn and sorghum, seedling rot in flex, root and stem rot in sun flower. *Macrophomina phaseolina* is an important pathogen of sunflower in warmer countries. The effective control of crop is resistant cultivars but resistance against the disease in commercial cultivars is scarse. Application of fungicides is still the effective method of controlling the *Macrophomina phaseolina* diseases. The widespread use of chemical fungicides has become a subject of the research concern due to their harmful effect on non target organisms as well as their possible carcinogenicity. The use of bio-control agents is becoming an increasingly important alternative to chemicals in crop protection against many diseases. In view of the ecological hazards of chemicals but still effective control experiments will be conducted to determine the influence of different fungi-toxicants and plant extracts on *M. phaseolina*.

ICPS-210 - EXPRESSION OF AN *ARABIDOPSIS* VACUOLAR H^+-PYROPHOSPHATASE GENE (AVP1) IN TOBACCO (*NICOTIANA TABACCUM*) TO INCREASE TOLERANCE TO DROUGHT AND SALT STRESSES

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Abstract: Among various abiotic stresses salinity and drought are the two major factors limiting the crops productivity. Genetic engineered salt and drought tolerant plants could provide an avenue to the reclamation of farmlands lost to agriculture because of salinity and a lack of rainfall. The *Arabidopsis* gene AVP1 encodes a vacuolar pyrophosphatase that functions as proton electrochemical gradient in vacuole, thereby activating vacuolar membrane-antiporters including Na+/H+ antiporter, which helps in sequestration of Na+ into vacuole. In addition, overexpression of AVP1 gene increases auxin transport and enhances auxin mediated root development, consequently achieving higher water absorption and retention capacities. The goal of present work is identification and cloning of useful salt tolerance full length AVP1 (3.2kb) genes, from *Arabidopsis thaliana* which is proton pump and its transformation in tobacco through *Agrobacterium* mediated transformation method for its characterization. PCR salt and drought analysis showed the successful transformation of this construct in *Nicotiana tabaccum*. The putative transgenic plants were subjected to 250 m*M* NaCl. AVP1 expressing tobacco plants performed better than wild type plants and the increased salt tolerance is positively correlated with the AVP1 transcript.Under periodic drought stress treatment AVP1 expression plants are significantly more tolerant than wild type plants. These resistant phenotypes are associated with increased internal stores of solutes.

ICPS-211 - DNA BASED GENETIC VARIATION FOR RED ROT RESISTANCE IN SUGARCANE

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Abstract: Genetic difference between twelve red rot resistant and five susceptible genotypes of sugarcane cultivated in Pakistan were studied using the Random Amplified Polymorphic DNA (RAPD) markers. Initial screening was done using 300 markers and four genotypes (two resistant and two susceptible for red-rot). From these 300 markers, 24 were selected and further applied to all 17 genotypes. A total number of 181 loci were generated by these 24 primers. Off these 155 loci were polymorphic and 26 were monomorphic, whereas 10 loci were genotype specific. Moreover, the number of monomorphic loci for the resistant and susceptible genotypes were 29 and 52 respectively. However, none of the loci could be solely linked to either resistance or susceptibility of red-rot. The mean genetic similarity among the genotypes recorded was 74.37% which shows that a large part of the genome is similar and it may be due to the lack of parental diversity. This study reveals that there is possibly more than one genetic reason for resistance or susceptibility against red rot in sugarcane genotypes of Pakistan.

ICPS-212 - MORPHOLOGICAL CHARACTERS OF DIFFERENT COTTON CULTIVARS IN RELATION TO RESISTANCE AGAINST MITES.

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Abstract: Five cotton cultivars viz., CIM-506, VH-145, NAIB-999, NIAB-111 and FH-900, were evaluated against mite infestation in the farmer field trial at Multan. Different leaf morphological characters of the varieties gave different response to mite infestation. Variety NIAB-999 was found to be the most resistance whereas, FH-900 was least resistant to mite pests having over all mean of mites 0.22 and 1.54 nos./leaf throughout the season respectively. Other cultivars like CIM-506, VH-145 and NIAB-111 evaluated as intermediate resistant varieties against mite pests with an over all mean population 0.93, 0.67 and 1.17 nos./leaf respectively. Maximum number of mites were observed from the upper followed by middle and the lower leaves. Variety NIAB-999 showed the maximum hair density (504 cm^2) on leaf lamina, FH-900 having lowest number of gossypol glands (28 cm^2) on leaf lamina, VH-145 had the maximum hair length (310 cm^2), whereas FH-900 has minimum thickness of leaf lamina (23 cm^2) on top portion. It was concluded from the present findings that cotton genotype NIAB-999 among the other tested genotypes showed maximum resistant against the mite population due to some leaf morphological characters.

ICPS-213 - CELLULASE BIOSYNTHESIS BY SELECTED *TRICHODERMA* SPECIES

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[Department of Mycology and Plant Pathology, University of the Punjab, Quaid-e-Azam Campus Lahore, Pakistan]

Abstract: The enzyme cellulase, a multi enzyme complex made up of several proteins, catalyses the conversion of cellulose to glucose in an enzymatic hydrolysis. The indigenous fungi of Pakistan viz., *Trichoderma viride* Pers. ex Gray*, T. reesei* Rifai and *T. harzianum* Rifai were selected and analyzed on the basis of extent of hydrolyzing zones for the evaluation of their enzymatic activity in solid state fermentation on PDA and plate screening medium (PSM) at pH 4, 5 and 6. PSM at pH 4 depicted best results for all the strains tested. Strains FCBP-142 and FCBP-232 of *T. viride,* strains FCBP-271 and FCBP-364 of *T. reesei* and strains FCBP-210 and FCBP-325 of *T. harzianum* were considered best in their extent of hydrolyzing ability and were selected for evaluation of their cellulolytic activity through submerged fermentation using 3, 5-dinitrosalicylic acid (DNS) method. The maximum enzymatic activity was achieved after 72 h of incubation at 30 $\pm$ 2 ^oC at initial pH 4.

ICPS-214 - SCREENING OF *ASPERGILLUS NIGER* AND *A. FLAVUS* STRAINS FOR EXTRA CELLULAR ALPHA-AMYLASE ACTIVITY

S. SHAFIQUE, R. BAJWA AND S. SHAFIQUE

[Department of Mycology and Plant Pathology, University of the Punjab, Quaid-e-Azam Campus Lahore, Pakistan]

Abstract: Five fungal strains of each of the two filamentous fungi viz., *Aspergillus niger* Van Tieghem and *A. flavus* Link ex Gray, indigenous to Pakistan, were screened for their alpha-amylase activity. Different selected strains were grown on two growth media namely Potato Dextrose Agar (PDA) and Enzyme Production Medium (EPM), at three pH levels viz. 4.5, 5.5 and 6.5, in all the possible combinations. Performance of various strains was recorded in terms of hydrolyzing zone formation. Generally test strains exhibited their best performance on EPM at pH 4.5. On the basis of their best performance on solid media, strain 74 and strain 198 of *A. niger* and strain 209 and strain 231 of *A. flavus* were selected for periodic evaluation of their alpha-amylase activity in liQuaid medium, using shake flask technique. All the test strains exhibited their maximum alpha-amylase activity after 48 h incubation.

ICPS-215 - ALPHA-AMYLASE PRODUCTION BY TOXIGENIC FUNGI

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Abstract: This study is concerned with the screening of *Alternaria alternata* (Fr.) Keissler and *Alternaria tenuissima* (Kunze ex Pers.) Wilts strains for the biosynthesis of α-amylases. Nine strains of *A. alternata* and three strains of *A. tenuissima* were grown on enzyme production medium (EPM) and potato dextrose agar (PDA) using three pH levels (4.5 to 6.5); then selected strains which were able to produce bigger zones of starch hydrolysis on solid media were subjected to test their amylolytic efficacy in liQuaid medium. In primary screening, the amylolytic activity of all the strains was tolerant to wide range of initial culture pH values (from 4.5 to 6.5). Of all the cultures tested, *A. alternata* strains FCBP-100 and FCBP-385, and *A. tenuissima* strains FCBP-183 and FCBP-252 exhibited maximum potential in terms of starch hydrolysis at pH 4.5 on EPM, hence were selected for further studies. In secondary screening, the optimum pH of fermentation medium was adjusted to 4.5 by using 0.05M citrate buffer for production of amylolytic enzymes. At 48 hrs incubation, maximum α-amylase activity (31.8 Units mL^{-1}) was discerned by *A. tenuissima* strain FCBP-252.

ICPS-216 - MOLECULAR BASIS OF DISEARE RESISTANCEIN CEREAL CROPS: A REVIEW

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Abstract: Plant disease resistance is prerequisite for the successful utilization of crop species in modern agriculture. Resistant crops have been produced successfully by conventional breeding techniques. The modern tools of molecular biology has enabled the genes that confer disease resistance to be analysed at a molecular level, an analysis that is generating novel insights into the complexity of plant defence and host–pathogen co-evolution. This knowledge has also enabled more sophisticated breeding strategies to be employed by using marker-assisted selection and potentially offers biotechnological solutions for the problem of crop protection. All the cereal crops have always been under the threat of diverse diseases in different times. Different approaches are being applied to save them from these damaging dangers. Modern tools of Molecular Biology have revealed the information about the genes, their structure, proteins encoded by them and the mechanism by which these proteins produce defense response in the crops. The disease resistance in the cereals is conferred by "R" genes; members of super family encode proteins located on cytoplasmic surface or in the cytoplasm. These proteins interact with the pathogenesis related proteins in manner like "receptor-ligand" or indirectly with a complex of host proteins to generate defense response. Some of the "R" genes require additional genes for the expression of resistance. Investigations into the structure of "R" genes, proteins products, their location and mechanism of interaction with pathogen elicitor molecules and future perspective are discussed in this review.

ICPS-217 - EFFECT OF DROUGHT STRESS ON SEED YIELD, SEED QUALITY AND GROWTH OF TOMATO (*LYCOPERSICON ESCULENTUM*)

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Abstract: Plant growth is seriously affected by abiotic stresses such as drought, salinity or temperature. Drought is one of the most important limiting factors for agricultural crops all around the world. Acute shortage of irrigation water and drought are adversely affecting the crop production in general and vegetable production in particular. Drought stress during vegetative or early reproductive growth usually reduces yield by reducing the number of seeds, seed size and seed quality. To assess the effect of drought stress on seed yield, seed quality and growth of tomato, the experiment was conducted in green house in plastic pots at Pen-y-Fridd field station, University of Wales, Bangor, U.K. during 2003-2004. Tomato cv. 'Moneymaker' was used as a test crop. There were four treatments i.e. early stress (when first truss has set the fruits), middle stress (when fruits in first truss were fully matured and started changing their color), late stress (when fruits on first truss were ripened fully), whereas in control no stress was imposed. Analysis of data regarding various attributes (fruit weight and shoot dry weight per plant, number of seeds per fruit, total number of seeds and seed weight per plant, and vigour of seed) showed that drought stress had non-significant effect on vigor, quality and yield of tomato seed. Whereas, plant height, number of leaves and number of fruit per plant showed significant results toward drought stress signifying drought effects on growth of tomato.

ICPS-218 - POSSIBILITY OF THE INVOLVEMENT OF COMPULSORY SINISTRORSE OR DEXTROSE WINDING IN THE INDUCTION OF SALT TOLERANCE IN PEA (*PISUM SATIVUM* L.) PLANTS

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Abstract: In order to assess the possible involvement of compulsory sinistrorse or dextrose winding in inducing salt tolerance in pea, three week old pea plants were imposed to sinistrorse or dextrose winding and subjected to varying levels of salt stress. Although salt stress reduced the growth and yield of pea, imposed winding in either direction did not alleviate adverse effects of salt stress on growth and yield of pea. Although salt stress induced reduction in the net CO_2 assimilation rate and transpiration rate was not alleviated by imposed winding as sinistrorse or dextrose, compulsory binding in straight and dextrorse winding improved water use efficiency (*A*/*E*). In addition, sinistrorse or dextrose winding did not change leaf photosynthetic pigments under saline conditions. Salt stress reduced K^+ and Ca^{2+} accumulation with increase in Na^+ accumulation in the leaves and roots of pea. However, in the roots of sinistrorse winded plants such decrease in K^+ and Ca^{2+} was lower compared with salt stressed plants. In seed, salinity increased the Na^+ K^+ and Ca^{2+} concentration. Anatomical characteristics generally showed decreasing trend with increase in salt concentration in growth medium and enforce winding treatment. However, natural winding showed better adaptation against unfavorable environmental condition of salt stress. Epidermis thickness, cortical cell area and vascular bundle area increased with increase in salt level in leaf. Similarly stomatal density at both abaxial and adaxial leaf surfaces and stomatal area increased under natural winding. In stipule, vascular bundle area and cortical cell area increased in natural winding, while in petiole epidermis remain constant but phloem, metaxylem and vascular bundle area reduced.

ICPS-219 - INFLUENCE OF SALICYLIC ACID ON THE GROWTH AND PHYSIOLOGICAL ATTRIBUTES OF WHEAT (*TRITICUM AESTIVUM* L.) UNDER WATER DEFICIT CONDITIONS

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Abstract: In order to induce water stress tolerance in wheat using antioxidant compounds, two wheat cultivars i.e. S-24 and MH-97 were grown under normal or water stress conditions. Varying doses of salicylic acid (0, 25 and 50 mg L^{-1}) applied as a foliar spray. Growth of cv-S24 higher than that of MH-97 under normal conditions, whereas under water stress conditions both cultivars did not differ. Water stress reduced the growth of both wheat cultivars and exogenous application of SA did not improve the growth of both wheat cultivars. Although exogenously applied SA enhanced the stomatal conductance and transpiration rate, it did not change the net CO_2 assimilation rate. In contrast, leaf chlorophyll *'a'*, and *'b'*, and total chlorophyll contents due to foliarly applied SA particularly in cv. MH-97. In addition, varying doses of SA did not change the accumulation of N, P, and K. In conclusion, application of salicylic acid was beneficial upto some extent for wheat plant under control or drought stressed conditions when SA was applied @ 25 mg L^{-1}. Overall performance of cultivar S-24 was better than MH-97.

ICPS-220 - ENVIRONMENTAL INFLUENCE ON THE CHEMICAL COMPOSITION AND ANTIOXIDANT PROPERTY OF FENNEL (*FOENICULUM VULGARE* MILL) SEEDS

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Abstract: To assess environmental influence on chemical composition and antioxidant property of fennel (*Foeniculum vulgare* Mill.) seeds collected from different ecological zones, essential oil and fixed oil of seeds were extracted and different physical and chemical characteristics were determined. Seed oil of fennel from all ecological zones was highly mono-saturated oils. Petroselinic acid found to be the predominant fatty acid followed by oleic acid and lauric acid and ranges from 57-66 % in seeds of all ecological zones. Out of different volatile oil components anethole, fenchone, and estragole were of stable components from the seeds of different areas. Where as alpha-phallandrene was detected only in the seeds of Faisalabad region and limonene was found to be absent in the seeds of Faisalabad and Sukhar region. However, there were no significant differences in mineral nutrient composition among land races of fennel. Moreover, amount of toxic elements were comparatively low than that of essential elements in fennel seeds of all ecological regions which might be attributed to there good nutritive value. However, fennel seeds of all ecological regions significantly differed in antioxidant efficiency especially in different tocopherol contents. In conclusion, fennel seeds indigenous to Pakistan are potential source of nutrients and antioxidants so it might be exploited for commercial and nutraceutical purposes.

ICPS-221 - UCTION OF SALT TOLERANCE IN BARLEY (*HORDEUM VULGARE*) BY PRESOWING SEED TREATMENT WITH SALICYLIC ACID

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Abstract: Plants salt tolerance is a complex phenomenon which includes the accumulation of ions in different plant parts. It is, therefore, important that strategies must be adapted so that some economic returns may be obtained by growing crop plants in low to moderately salt stressed areas. In this respect the use of salicylic acid may be of greater importance to enable the plants to tolerate salinity. The data reported here suggested that SA applied in micro-quantities as presowing seed treatment was beneficial in improving salinity tolerance in barley. The enhancement in salt tolerance was noted in

terms of greater growth and photosynthetic capacity of leaves followed by increased K^+ content and reduced Na^+ of both shoot and root. Another important facet was the alleviation of oxidative damage as noted in terms of reduced production of H_2O_2 (a ROS) and MDA content and RMP. These findings suggested that application of SA was feasible for improving salinity tolerance in barley. However, field studies on naturally salt-affected fields are imperative to substantiate these findings

ICPS-222 - ASSESSMENT OF SALINITY TOLERANCE OF BARLEY GENOTYPES DIFFERING IN YIELD POTENTIAL AT SEEDLING STAGE

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Abstract: An experiment was carried out to assess the salt tolerance of some elite barley genotypes. Two barley genotypes i.e. B-00023 and Haider-93 differing in yield potential were subjected to varying levels of salt stress (0, 150 and 300 m*M* NaCl). Salt stress reduced the seed germination, speed of germination and early growth stage of both barley cultivars. However, this adverse effect of salt stress was more pronounced on Haider-93. Although salt stress reduced the accumulation of K^+ with concomitant increase in accumulation of Na^+ in plumule and radicle of both cultivars, genotype B-00023 accumulated more K^+ and low Na^+ in plumule and radicle. In contrast, the total soluble carbohydrate increased with increasing salinity levels in plumule, while decreased in radicle of both cultivars. However, Haider-93 accumulated higher total soluble carbohydrates in plumule and lower total soluble carbohydrates in radicle than those of B-00023 under saline conditions. Thus, higher salt tolerance at seed ling stage was due to its higher accumulation of K^+ and lower accumulation of Na^+. Furthermore, differential accumulation of total soluble carbohydrates could not induced salt tolerance in these barley genotypes.

ICPS-223 - GROWTH ENHANCEMENT OF CHICK PEA: USE OF N-FERTILIZERS AND MIXED-GROWTH REGULATORS

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Abstract: In order to improve the growth and yield of chick pea by N-fertilizer or commercial growth regulator, a pot experiment was carried out to explore beneficial effect of N-fertilizer or commercial growth regulator on various biochemical attributes and mineral nutrient status of two chickpea cultivars. Both N-fertilizer and/or pro-start application enhanced the growth and relative growth rate of both chickpea cultivars. This growth enhancement in both chickpea cultivars was further increased with increase in level of N-fertilizer and/or pro-start. However, at the highest level of N, this enhancement in growth was lower as compared with other levels of N-fertilizer or pro-start. In contrast, maximum yield produced in both cultivars when both N-fertilizer and pro-start was applied. In addition, growth and yield of Pubjab-2000 was higher under normal growth conditions or at varying levels of N-fertilizer and/or pro-start. This growth and yield enhancement due to N-fertilizer and/or pro-start was positively associated with increase in leaf chlorophyll '*a*', and '*b*' and nutrient accumulation such as N, P, K^+, and Ca^{2+}. So it was concluded that Prostart alone or with Nitrogen gave better results. However, Nitrogen at high level suppressed the growth of plants.

ICPS-224 - MAXIMIZING GROWTH OF MUNGBEAN (*VIGNA RADIATE* L. WILCZEK) USING PLANT GROWTH REGULATORS: USE OF GA_3 AND NITRO-PLUS

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Abstract: In order to enhancing growth of mungbean (*Vigna radiate* L.), an experiment was conducted to assess up to what extent commercial growth regulator pro-start enhance growth and yield of mung bean. Two varieties namely M-6 and Bhakar G/94-4-42 were subjected to varying doses of GA3, pro-start and nitro-plus. Application of all growth regulators enhanced growth and yield of both mungbean cultivars. Furthermore, all growth regulators enhanced the relative growth rate of both mungbean cultivars. However, application of GA3 was more beneficial in enhancing yield of both cultivars. Furthermore, improvement in growth and yield due to application of growth regulators was higher in cv. M-6. This growth enhancement was positively associated with growth regulator-induced enhancement in photosynthetic pigments such as chlorophyll '*a*', chlorophyll '*b*', and leaf protein. Application of growth regulators also improved the quality of yield by enhancing seed protein and sugar content. Overall, application of growth regulators improved the growth and yield of both cultivars, but this phenomenon is cultivar specific.

ICPS-225 - PRELIMINARY PALYNOLOGICAL ANALYSIS OF EARLY TRIASSIC SANDSTONES (MIANWALI FORMATION) WESTERN SALT RANGE, PAKISTAN

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Abstract: Mianwali Formation represents the Early Triassic strata of the Salt Range, Pakistan that is underlained by Chhidru Formation (Late Permian) and overlained by Tredian Formation (Middle Triassic). The Mianwali Formation has three members viz., Katwai, Mittiwali and Narmia member. It is predominantly composed of black shales along with the dolomite, limestone, sandstone and sandy shales. As far as the palynology is concerned it represents one of the most diverse and rich assemblage of palynomorphs like triletes, monoletes, aletes, monosaccates, pseudosaccates, bisaccates, monocolpates, monosulcates, polyplicates, cuticles, dinoflagellates and acritarchs. The detailed palynoflora recovered from Mianwali Formation cannot be covered in a single paper, therefore present paper reports the preliminary palynological analysis of three sandstone beds (katwai member) from the Nammal Gorge Section, Western Salt Range, Pakistan. The palynomorphs like *Leiotriletes bankolaensis, L. directus, Retusotriletes* sp, *Cyclogranisporites aeureus, C. minutus, Punctatisporites gratensis, P. aerius, P. pseudolevatus, Convolutispora fromensis, Dictyotriletes reticulocingulum, Lundbladispora variabilis, L. obselata, Guthoerlisporites cancellosus, Laevigatosporites callosus, and L. minor* were recovered.

ICPS-226 - IMPROVEMENT IN YIELD AND QUALITY OF KINNOW BY POTASSIUM FERTILIZATION

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Abstract: Citrus, especially Kinnow fruit yield and quality in Pakistan is not competitive with other countries which could be mainly attributed to lack of good nutrient management for citrus orchards.

Many of the soils under these orchards have been reported deficient in K. Therefore, work was initiated for improving citrus fruit yield, size and quality through K nutrition management. Experiments were conducted in four districts of Punjab including Faisalabad, Toba Tek Singh, Jhang and Sargodha and four rates of potash, i.e., 0, 50, 75 and 100 kg K_2O ha^{-1} were applied using sulphate of potash (SOP) along with recommended rates of P and N. Soils of all the selected sites were clay loam or sandy clay loam and deficient in K. The leaf analysis also showed that all the selected orchards were deficient in K. Application of K increased the fruit yield and quality but K @100 kg K_2O ha^{-1} was more effective in increasing the fruit weight and size, and peel thickness than other K rates in all the selected orchards. Juice volume and percentage significantly increased when K was applied @ 75 kg K_2O ha^{-1} at all sites. Nutrient uptake like K, P, and N enhanced with the increase in K application rate, however, the highest Ca+Mg was recorded at 50 kg K_2O ha^{-1}. The results indicated that all rates of K application improved the fruit yield and quality and reduced fruit dropping, however, 75 kg K_2O ha^{-1} rate was more effective as juice volume and percentage, TSS/acid ratio and nutrient uptake showed significant improvement.

ICPS-227 - EXTRACELLULAR ENZYME PRODUCTION DIVERSITY BY AN INDIGENOUS THERMOTOLERANT *BACILLUS SP. W.P.R.* TO B-GALACTOSIDASE

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Abstract: Thermotolerant enzymes are favoured for industrial applications because they generally show better stability to temperature, pH etc., compared to enzymes from mesophiles. A strain of *Bacillus* MA-1 isolated from a hot-water spring of Karachi producing extracellular beta-galactosidase activity at 6 days of growth in a shake flask. Optimum enzyme production occurred at 40°C (pH 6). The enzyme was stable over a range of pH 5-9, with maximum activity at pH 6. Temperature stability profiles revealed that the enzyme is stable up to 70°C, having maximum activity at 45 °C. The enzyme activity was enhanced in the presence of Ni^{2+}, Co^{2+}, and Cu^{2+}. The thermostability and pH-stability profiles make this enzyme potentially useful in the dairy industry. The aforementioned strain is also capable of producing other industrially important enzymes including, amylase, lipase, protease and chitinase simultaneously under the same consortia of requirement, indicating the possibility of this strain to be used as co-producer of these enzyme. The enzyme was partially purified and characterized by SDS-PAGE.

ICPS-228 - WATER STRESS INDUCED VARIATION IN PROTEIN PROFILES OF GERMINATING COTYLEDONS OF CHICKPEA GENOTYPES

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Abstract: Drought is a major abiotic stress limiting the production in most of the agricultural crops. Preliminary work was started to check response of chickpea genotypes to water stress (10%PEG) at germination stage. Four genotypes (CM2000, CM94/99, CM98 and 6153) were used and data were collected on first, third, fifth and seventh day after germination. Root length was taken along with the protein mobilization from cotyledons to seedling. Analysis of variance revealed highly significant differences among varieties under both control and stressed conditions. CM 94/99 showed significant increase ($p<0.05$) in root length while CM2000 showed significant decrease in root length under applied stress. SDS-PAGE was run to detect variations in protein profile of these genotypes from 1st to 7th day. Quantitative decrease in some proteins of high mol. wt. was observed at 5th day. Similarly some new proteins appeared at 7th day in controlled samples of all genotypes. Genotype specific variations were observed under water stress. In CM-2000 water stress delayed the expression of some proteins (30-40

kDa and 100-110 kDa) while in CM-94/99 these proteins were expressed earlier. Moreover expression of some proteins (45-60kDa) was delayed in CM-2000 but no change in expression of these proteins was observed in other genotypes. The experiment provides information about the effect of water stress in protein mobilization in germinating chickpea seeds and its relationship with growth of the seedling. Further studies on functional proteins may provide markers for selection of tolerant genotypes at germination stage.

ICPS-229 - PALYNOLOGICAL STUDY OF SOME CULTIVATED SPECIES OF GENUS *HIBISCUS*

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Abstract: Pollen morphology of four species of *Hibiscus* (*H. mutabilis, H. rosasinensis, H. schizopetalous and H. syriacus*) and three cultivars belonging to *Hibiscus rosasinensis*, of family Malvaceae were examined by using both light as well as scanning electron microscope. Pollen grains were monomorphic to dimorphic, radially symmetrical, apolar, spherical to spheroidal in polar view and oval to ellipitic in equatorial view, colpate and pantoporate. Tectum uniformly echinate, striate-regulate, medium to finely perforated or punctuate with granules or scabrae in between spines. Cultivars of *H. rosasinensis* were identified by differences in their echini apices and presence or absence of specific central spines and basal cushions. On the basis of various parameters of pollen morphology such as pollen shape, size, polarity, symmetry, wall sculpture, echini height, echini base, distance between echini apices and bases, plants were identified beside differences in their plant morphology.

ICPS-230 - LEAD (PB) TOXICITY INDUCED CHANGES IN RELATIVE GROWTH RATE, NITRATE REDUCTASE ACTIVITY AND NUTRIENT UPTAKE IN CANOLA (*BRASSICA NAPUS* L.) CULTIVARS

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Abstract: Studies were conducted in the wire house in pots to examine the lead (Pb) toxicity induced changes in growth and physiochemical attributes in different cultivars of *Brassica napus* L. Experiment was comprised of four lead (Pb) levels i.e. 0, 30, 60 and 90 mg Pb kg^{-1} of soil with three replications. The treatments were imposed at 30 days old seedlings. For growth analysis, four harvests at an interval of fifteen days each were taken after the application of Pb treatments. Each time plant height, fresh weight and dry weight of plants were recorded. A gradual decrease was noted for relative increase in plant height, relative growth rate and relative increase in fresh weight with the increment of heavy metals.

Different physio-chemical parameters such as nitrate reductase activity and nutrient uptake were recorded at physiological maturity and a decreasing trend in NRA with Pb toxicity. Nutrients like potassium (K), sodium (Na), phosphorus (P), N and Ca uptake decreased with increasing Pb concentrations in the growing medium. Accumulation of Cl and Pb increased with increasing level of heavy metal (Pb). Overall Pb toxicity caused adverse effects on all the parameters.

ICPS-231 - EFFECT OF INOCULUM DENSITY ON FUSARIUM CORM ROT DISEASE OF GLADIOLUS

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Abstract: Corm rot is an important disease of gladiolus caused by a soil-borne fungal pathogen *Fusarium oxysporum* f.sp*. gladioli*(Massey) Snyd. & Hans*.* The present study was carried out to investigate the effect of inoculum density of *F. oxysporum* f.sp. *gladioli* on incidence and severity of disease, plant mortality and subsequent effect on plant growth of gladiolus (*Gladiolus grandiflorus* sect. Blandus) cv Aarti. Treatments included a control, and 2, 4 and 8 g chickpea carried fungal inoculum per 100 g of soil. Highest disease incidence of 100% was recorded in 4% treatment. However, highest wilt incidence (20%), mortality (20%), disease severity (rating scale 2-3) and number of infection lesions on corms were recorded in 8% treatment. Both root and shoot growth were significantly declined in all the inoculated treatments as compared to control.

ICPS-232 - AMELIORATIVE EFFECT OF EXOGENOUSLY APPLIED THIOUREA ON SUNFLOWER (*HELIANTHUS ANNUUS* L.) PLANTS EXPOSED TO SALT STRESS

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Abstract: A greenhouse experiment was conducted to assess the effectiveness of foliar application of thiourea in alleviating the adverse effects of salt stress on sunflower plants. Three levels of thiourea (0, 10 and 15 m*M)* were applied foliarly to salt stressed and non-stressed sunflower plants. Results showed that foliar application of 15 m*M* thiourea increase shoot and root fresh and dry weights under both control and salt stress, however shoot length was not influenced by salinity. Thiourea significantly improved stomatal conductance, photosynthetic rate and sub-stomatal CO_2 concentration, but Ci/Ca ratio was not influenced marked increase in shoot and root Na^+ as well as Cl^- contents was observed under saline conditions, but foliar application of thiourea significantly decreased Na^+ and Cl^- contents in shoot as well as roots. However a significant increase in K^+ content was noted due to foliar applied thiourea. In conclusion, foliar application of thiourea could significantly ameliorate the inhibitory effects of salt stress on the growth of sunflower.

ICPS-233 - PARATIVE EFFECTIVENESS OF EXOGENOUS APPLICATION OF SOME CHEMICAL AGENTS ON SOME GROWTH AND PHYSIOLOGICAL CHANGES IN EMBRYONIC TISSUE OF MAIZE UNDER HEAT STRESS

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Abstract: at stress is a stringent factor for crop production around the globe and warrants finding strategies to cope with this gradually increasing environmental adversary. In this study efficiency of exogenous application of various organic and inorganic sources including NaCl, $CaCl_2$, KCl, urea, H_2O_2 (inorganic sources), proline, glycinebetaine, ascorbate, and glucose(Organic sources) at 10 m*M* levels were used to induce heat stress tolerance in maize (*Zea mays* L. var. SWL-2002). The data were recorded for changes in length, fresh and dry weight of embryonic structures (plumule, radicle and mesocotyl), Na^+ and K^+ content and anatomical characteristics including epidermal cell area, cortical area and vascular bundle thickness. The length, fresh wt. and dry. wt was improved although

improvement was greater in plumule & radicle under heat stress. Improved fresh wt. indicated a specific influence of the applied treatments in increasing the water content under heat stress. Application of various treatments had a profound influence on the improved K^+ content under heat stress, which appeared to be specific effect of these treatments. K^+ act as osmolyte which improve cell water balance. Among the anatomical attributes, heat stress reduced the area of epidermal cells, cortical tissue and reducing the thickness of the stele tissue, while application of organic sources improved all these tissues greater than the inorganic sources under heat stress. In Short, seedling application of various organic and inorganic sources greatly improved growth and water content of all the embryonic structures under heat stress. These benefits were related to improved water status and K^+ nutrition of plumule, radicle and mesocotyl tissues, and production of minimal changes in tissue structure under heats stress. The application of all investigated organic and inorganic sources may support the plant growth in the field under relatively high ambient temperature.

ICPS-234 - PALYNOLOGY OF EARLY EOCENE GHAZIJ FORMATION, NORTH EAST, BALOCHISTAN, PAKISTAN

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Abstract: Early Eocene Ghazij Formation, North East Balochistan, Pakistan is one of the significant lithostratigraphic unit of Pakistan. The Formation is divisible into three parts viz., lower, middle and upper parts respectively. Lithologically it is composed of mostly dark grey calcareous mudrock, calcareous sandstone, carbonaceous shale, clayey shale, coal and conglomerate. It is overlained by Dungan Formation and overlained by Kirther Formation. In this paper trilete spores recovered from the Ghazij Formation are described, illustrated and interpreted. Out of total 67 genera and 75 species, 21 genera and 30 species belonged to Pteridophytic spores. Important trilete spores are *Leiotriletes sphaerotriangulus, Todisporites major, Dandotiaspora tenola, Dictyophyllidites harrisii, Triplanosporites sinonicus* and *Gleicheniidites sinonicus.*

ICPS-235 - PREDICTION OF YIELD LOSSES IN WHEAT (*TRITICUM AESTIVUM*) CAUSED BY YELLOW RUST IN RELATION TO EPIDEMIOLOGICAL FACTORS IN FAISALABAD

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Abstract: One hundred and seventy two varieties/lines were screened against yellow rust to check their level of susceptibility or resistance. Among 172 varieties/lines screened against yellow rust, 18 were susceptible, 6 were moderately susceptible to susceptible, 7 were moderately resistant to moderately susceptible and 5 varieties/lines remained resistant, while all other varieties/lines showed no reaction or remained fleck against yellow rust. Yield losses were predicted in wheat varieties/lines on the basis of yellow rust severities. Maximum severity of 80% of yellow rust resulted in 45% predicted losses while the calculated losses of yellow rust severity at maximum severity (80-100%) were 60 and 47 % respectively. However, non significant correlation was found between stripe rust and the environmental conditions.

ICPS-236 - EFFECT OF SOIL APPLIED CALCIUM CARBIDE ON PHYSIOLOGICAL AND AGRONOMIC PARAMETERS OF COTTON GROWN UNDER SALINITY STRESS

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Abstract: A field experiment was conducted on cotton (*Gossipium hirsutum*; NIAB-111-cv) under saline conditions. The objective was to explore the potential of encapsulated calcium carbide (CaC_2) in improving performance of cotton under salinity stress. The study was based upon net photosynthesis (Pn), transpiration rate (E), stomatal conductance (C), relative leaf water content (RWC), total water concentration in plant, yield of seed cotton and other agronomic parameters. Three salinity levels (0, 1250, 2000 mg kg^{-1} soil NaCl) were maintained and N, P and K were applied at the rate of 150-90-60 kg ha^{-1} in the form of urea, SSP and SOP respectively. Encapsulated CaC_2 was applied after two weeks of germination at the rate of 0, 3, and 6 g m^{-2}. The results indicated that salinity increased E, however, CaC_2 decreased E but C was increased and a strong negative correlation existed between the two. Calcium carbide improved relative leaf water content, total water concentration, greenness, yield and conductance up to 5%, 20%, 18%, 18.15% and 35% respectively. A significant positive correlation was observed between yield and relative leaf water content and total water concentration however, greenness showed a significantly negative correlation with yield. Number of sympodial branches was enhanced by calcium carbide up to 27%, however, increase in number of monopodial branches was not significant. Salinity and calcium carbide showed positive correlation in case of total water concentration, greenness, yield of seed cotton, shoot dry weight and conductance, while rest of the parameters showed a negative correlation between salinity and calcium carbide. These results indicate that encapsulated CaC_2 could help mitigate the drastic effects of salinity through hormonal action of ethylene.

ICPS-237 - PERSISTENCE AND SURVIVAL STRATEGIES OF SOME WEED SPECIES FROM CEREAL (TRITICUM AESTIVUM) MONOCULTURE

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Abstract: In the present study, a possible mechanism of persistence of some weed species in wheat fields was assesses. For this purpose, soil seed reserves of some weed species (*Avena fatua* L. (Wild oat), *Convolvulus arvensis* Retz. (Bindweed), and *Phalaris minor* L. (Canary grass)) were analyzed for their role in weed infestation. Two soil profiles were sampled and buried viable seeds were quantified via seedling emergence. The seed bank size of the above weed species was estimated as well. Also, the effect of wheat density on the density of the three weed species was evaluated. Moreover, keeping in view the greater densities of *A. fatua* (wild oat) in the fields under study, various foraging traits of the species were biometrically assessed in order to establish the competitive success of the species.

Buried viable weed seeds were found from both of the soil depths sampled. More seedlings emerged from the deeper soil profile that signified the possible role of tillage causing infestation. *C. arvensis* had the greatest seed bank size followed by *A. fatua* and *P. minor* respectively. Wild oat had the greatest overall density as compared with the other two weed species. Moreover, both wild oat and canary grass exhibited a density dependent response i.e. their density decreased with the increasing wheat densities. Bindweed (*C. arvensis*) didn't show any such response.

Modification of various morphological attributes was observed for wild oat growing in competition with wheat. The plasticity of leaf attributes accompanied by the better biomass allocation and reproductive characters might have enabled the weed to persist under severe competitive conditions. Moreover, all the five fields used for sampling were well differentiated for the morphological attributed studied. As morphology is the result of interaction of a particular genotype with environment, there seems to be the possibility of existence of various biotypes of the weed.

The study clearly revealed that the weedy plants maintained their populations within the wheat fields through the traits that supported *r- and k- selection*. Consequently, *C. arvensis* appeared to be *r*-strategists and produced greater number of progeny. While wild oat plants exhibited strong competitive traits and were therefore *k*- strategists.

ICPS-238- EVOLUTIONARY IMPLICATIONS OF PHENOTYPIC DIFFERENTIATION IN POPULATIONS OF *CHENOPODIUM ALBUM* ON A SMALL GEOGRAPHICAL SCALE

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Abstract: Microevolution among natural occurring populations of *Chenopodium album* was assessed using phenotypic differentiation. These populations were sampled from three habitats on a small geographical scale differing in their soil and moisture conditions. Twenty individual plants each regarded as genet was sampled and consistent measurements were taken for various phenotypic traits. Morphometric character analysis revealed a significant variability for various character expressions. Similarly, populations of *C.album*, exhibited a significant contrast that was pertinent to their habitat conditions. The populations appeared to be well adapted to their environments through the variability of morphologically expressions. Therefore, the species seems to possess a potential for quick modification of various modules. This study clearly suggested that phenotypic differentiation in populations has a considerable impact on the microevolution of the species on a local scale. The synthesis of phenotypic behavior and evolutionary processes that can shape and govern the ecological breadth of the species to colonize a diverse range of habitat is discussed. The study indicated that the species is not vulnerable to changing soil and moisture conditions. Furthermore, quick evolution in the populations renders no threats to the species particularly on this small geographical scale.

ICPS-239 - EFFECT OF NITROGEN MANAGEMENT AND METHOD OF SOWING ON CHLOROPHYLL CONTENT, GROWTH AND YIELD OF CORN

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Abstract: A field experiment was conducted to assess the effect of nitrogen management and planting method on the yield and yield contributing parameters of corn. Planting method involved the sowing of crop on level field and ridges in double row (20 cm apart) and single row (45 cm apart) layout. Nitrogen treatments involved: all at sowing time, half at sowing and half as topdressing in two splits, 1/3rd at sowing and 2/3rd as topdressing in two splits, and all as topdressing in two splits. Response of corn to nitrogen was highly significant in nitrogen treated plots compared to control. Results showed significant variation among treatments for time of appearance of tassels, silk and ultimately maturity. Crop was matured early in plots treated with nitrogen all at sowing. Similarly cob size and grain formation was better in this treatment. Maximum grain and biomass yield was observed in the treatment where nitrogen was applied at sowing time. Crop maturity, cob formation and grain yield was consistently decreased with increase in application rate of topdressing nitrogen.

ICPS-240 - GENETIC VARIABILITY IN DIFFERENT BIOCHEMICAL TRAITS AND RELATIONSHIP WITH YIELD AND YIELD PARAMETERS IN COTTON CULTIVARS GROWN UNDER WATER DEFICIT CONDITIONS

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Abstract: Water stress is a limiting factor to cotton production worldwide especially in Pakistan. It is vital to understand genetic variation for different biochemical traits under limited water condition. In the

present studies, 24 genotypes/cultivars of *G. hirsutum* were planted in a replicated trial. At physiological maturity, the leaves were collected and analyzed for nitrate reductase and nitrite reductase activities and total free amino acids. At maturity, yield and yield parameters were also recorded. After imposing water stress, significant reduction in nitrate reductase and nitrite reductase activities, and yield parameters were observed in all the genotypes, however, quantity of total free amino acids were increased. A positive correlation between nitrate reductase activity and yield parameters was observed. Varieties with high free amino acids under drought conditions showed higher yield estimates. It was concluded that these biochemical traits can be used for screening the germplasm for evolving high yielding drought tolerant cotton varieties. This project will be helpful in bridging plant biochemistry and molecular biology for identifying and selecting genes involve in conferring drought tolerance.

ICPS-241 - EXPRESSION OF SOME ANTISTRESS GENES IN TWO CULTIVARS OF CANOLA (*BRASSICA NAPUS* L.) UNDER SALT STRESS

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Abstract: Soil salinity limits the productive yield of potential oil-seed crops in salinized lands depleting the precious natural resources that sustain life. Increasing the yield of crops in salinized lands is essential for feeding the world. Molecular genetic research is evaluating the potential for enhancing salt-tolerance in oil-seed crops. The present project has examined the effects of NaCl on canola to compare differences in gene expression between salinity-stressed and unstressed (control) plants. Two accessions of canola a salt tolerant (Dunkled) and a salt sensitive (Cyclon) were used in the present study. The plants were subjected to 150 m*M* NaCl and the leaves were harvested for RNA isolation at different time intervals after imposition of salt stress. Expression of the salt tolerant genes was tested with the help of PCR using gene specific primers. Of the eleven genes tested for expression, four of these cDNAs were confirmed to be expressed differentially in response to salinity stress by reverse transcriptase polymerase chain reaction (RT-PCR). After 8 h of induction through salt stress, *SOS2* had better expression as compared to *P5CS2*, whereas no expression was found for *SOS3*, *P5CS1*, *OAT*, *UBQ10*, *AcPMP3-1* and *AcPMP3-2*. In a separate set of experiment, the plant leaves were harvested 2, 4 and 8 h after the salt treatment. *SOS1* did not show expression even after 8 h post treatment. *Glutamate dehydrogenase (GLD)* exhibited higher expression after 2 h of post-induction as compared to 4 and 8 h after the induction. *Proline dehydrogenase (PDH)* was expressed after all the time intervals tested during the study, although the expression was low.

ICPS-242 – EFFECT OF DIFFERENT CONCENTRATIONS OF SODIUM CHLORIDE (NA CL) ON GROWTH OF *SESBANIA SESBANE* L.

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Abstract: In this investigation, the effects of different concentrations of Sodium chloride (NaCl) upon different vegetative growth parameters at different harvest intervals of *Sesbania sesbane* L. were studied. It was found that with increasing the salinity level, growth was badly disrupted. However, the effects of salinity were different at different harvest intervals. At highest salinity level (1M NaCl), minimum growth was found at first harvest while maximum growth was found in control and lower salinity level (0.25 M NaCl) at fourth harvest. It was also investigated that lower salt concentration (0.25 M) showed positive effect on the stem and root dry weight, which were more significant at fourth

harvest. From the results it was concluded that *Sesbania sesbane* L. could be cultivated successfully in soils of low salinity level (0.25 M) and thus can help in fertility of low saline soils as it bears nodules that contain nitrogen-fixing organisms.

ICPS-243 - STAINING EFFECT OF THE DYES EXTRACTED FROM LEAVES OF HENNA (*LAWSONIA ALBA* LAM.) ON ANGIOSPERMIC STEM TISSUES

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Abstract: Section staining is the most fascinating part in preparation of specimens for microscopy. In general, most biological tissues have very little contrast and cellular details are hard to discern with ordinary light microscope, Stains can improve the visibility of the specimen. In this investigation, the two dyes (red and greenish red) were extracted from leaves of Henna (*Lawsonia alba* Lam.) in two solvents viz.water and ethanol respectively and their effectiveness as staining agents for plant tissues were studied. The dry leaves of Henna were powdered, decanted and than the drug powder was immersed in petroleum ether (6%v/v).After six days, petroleum ether was evaporated and remaining crystals were scratched. Than different solutions of drug powder (1 %, 5%, 10% w/v) were prepared in water and ethanol respectively. The solutions were filtered and than applied to angiospermic stem tissues as staining agents. Both the dyes stained the lignified tissues of both monocotyledon as well as dicotyledon stem cross sections. However, the dye extracted in ethanol (10 % w/v) was found more effective than that extracted in water. The dye extracted in ethanol was investigated to be good natural stain for staining lignified plant tissues.

ICPS-244 - CO_2 ENRICHMENT AND SALINITY EFFECT ON PHYSIOLOGICAL AND MORPHOLOGICAL TRAITS OF WHEAT

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Abstract: The effect of salinity and CO_2 on morphological and physiological traits of wheat (cv. Falat) was studied in a completely randomized block design with three replications in Agriculture faculty research greenhouse of Ferdowsi Mashhad University in 2002. Two levels of CO_2 (Ambient CO2 and CO_2 enrichment) and three levels of salinity (0, 150 and 300 mol m^{-3}) were used as treatment. Salinity conducted in sand culture by combining sodium and calcium chloride solution in 1:10 molar ratio and boxes were irrigated with modified Hogland solution in close system. Elevated CO_2 decreased chlorophyll content of flag leaf. Interaction of CO_2 and salinity were significant. Elevated CO_2 increased stomatal conductance and improved water status of leaf water under salt stress too. CO_2 enrichment increased specific leaf weight (SLW) and interaction of salinity and CO_2 on SLW were significant. CO_2 enrichment increased plant height (15%) and at 300 mol m^{-3} had significant effect (25% increase). Elevated CO_2 increased seed weight and number of seed per spike but interaction of salinity and CO_2 were not significant. CO_2 enrichment decreased nitrogen content of leaf (14.4%). In all elevated CO_2 improved plant tolerance to salinity.

ICPS-245 ALTITUDINAL VARIATION IN MINERAL COMPOSITION OF COMMON BUCKWHEAT PLANT AND IN SEED FRACTIONS

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Abstract: Common buckwheat has long been used as traditional food in mountain areas of baltistan. Two different accessions "kaldaq" and "sadpara" were collected from ghanche district and skardu district respectively. Both accessions were grown in field at two different altitudes at experimental station agriculture department skardu (2400 masl) and royal organic garden khaplu (2800 masl). Plant samples were harvested at maturity stage. The dried plant material and seeds (seed hull and dehulled seed) were analyzed by wet digestion method using atomic absorption spetcrophotometer for major and trace elements. Physico-chemical properties of corresponding soils were also investigated. Maximum concentration of mg and k was observed in fractions of dehulled seeds of khaplu at higher altitude (2800 m.a.s.l.) Than that of skardu (2400 m.a.s.l.). Significant differences were found in dehulled seed fractions at lower altitude, while concentration of mn and zn were significantly higher in hull fraction of sadpara accession. At both altitudes the concentrations of p, mg, k, fe and zn were also significantly higher.

ICPS-246 - ELEMENTAL INVESTIGATION OF SOME MEDICINAL PLANTS FROM BALTISTAN

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Abstract: Essential elements play vital role for various physiological functions in the human body. Their deficiency may cause serious problems and disorders. According to a WHO estimate around 80% of the worlds 6.0 billion population relies on herbal remedies for their basic health care needs. Generally in developing countries, people suffer from mineral deficiencies. Present study was carried out to investigate some major and trace elements like K, Mg, Ca, Fe, Zn, Mn, Cu and Co from medicinal plants of Baltistan region.Eight medicinal plants viz. *Thymus serpyllum* L., *Delphinium brononianum* Royle., *Carum carvi* L., *Trachyspermum ammi* L., *Fagopyrum esculentum* Moench., *Fagopyrum tataricum* Gaertn., *Sophora mollis* (Royle) Baker and *Tanacetum senecionis* (Jacq. ex Sesser) DC. traditionally used by local people were collected from different geographical areas of Baltistan at altitudes ranging from (2400 m.a.s.l. to 4150 m.a.s.l.) during summer 2007. Ethnobotanical information and their distribution were recorded during field visits by resource persons, local healers and through focus group discussions. All specimens were identified at QAU herbarium. The dried plant materials were analyzed using Atomic Absorption Spectrophotometer. Alpine medicinal herbs have significantly higher concentration of Mg, K as major elements and Fe, Zn, Mn and Cu as trace elements compared to that of plants from lower altitudes. However, the plants from lower altitude have significantly higher concentration of Ca in their seeds.

ICPS-247 - ASSOCIATION OF *LASIODIPLODIA THEOBROMAE* WITH DIFFERENT DECLINE DISORDERS IN MANGO (*MANGIFERA INDICA* L.)

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Abstract: Mango decline has assumed an alarming position due to increasing losses day by day in the orchards of Pakistan. The problem is intensified due to dearth of reliable information and suitable control strategies. The present studies were planned to characterize the isolates of fungus *Lasiodiplodia theobromae*, test their virulence and evaluate different fungicides to find out effective ones for field application. Ten isolates were identified from 10 mango growing districts of the Punjab province of Pakistan. The fast growing isolates viz. LT-3, LT-6 and LT-7 showed 66.66% mortality and 3.0, 4.9 and

4.5 cm^2 pathogenicity lesion, respectively. Five fungicides viz. Thiophanate methyl 70 WP, Carbendazim 50 WP, Precure combi (Thiophanate methyl + Diethofencarb) 65 WP, Copper oxychloride 50 WP and Captan 50 WP with two doses of concentration, 50 and 100 ppm, were applied *in vitro* by food poison technique. Colony diameter in amended Petri plates was recorded after 2, 4, 6 and 8 days of inoculation. Thiophanate methyl, Carbendazim and Precure combi showed 100% decrease over control at 50 and 100 ppm doses while Captan and Copper oxychloride exhibited only 26.84 and 7.8, and 35.26 and 20.2% decrease at both tested doses, respectively. The results of the present studies will be helpful to devise management strategies for the control of mango decline in the Punjab province of Pakistan.

ICPS-248 - RESPONSE OF DIFFERENT GENOTYPE FOR CALLUS INDUCTION AND PLANT REGENERATION IN CHILI (*CAPSICUM ANNUM* L.)

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Abstract: Five different chili genotypes were evaluated for their callusing response and regeneration potential. Chili hypocotyls explants obtained from 2 week old seedlings were cultured on solid Murashige and Skoog (MS) medium supplemented with 1% (w/v) sucrose, 0.1 mg/L NAA (Naphthalene acetic acid), or 0.5 mg/L IAA (Indole acetic acid) or in combination with 2 mg/L Zeatin or 2 mg/L BA (Benzyl adenine) to produce callus. After 2 weeks of culturing, callus was visible at the cut edges of hypocotyls explants. Callused explant were transferred to regeneration medium containing Murashige and Skoog (MS) medium supplemented with 1% (w/v) sucrose, 0.05 mg/L NAA (Naphthalene acetic acid), or 0.1 mg/L IAA (Indole acetic acid) in combination with 1mg/ml Zeatin or 1mg/ml BA (Benzyle Adenine) soon after induction. Of the evaluated genotypes, Lungi and silky red were superior in their response for callusing and regeneration potential. It was found that prolonged period for callusing leads to green hard/compacted callus losing embryogenic potential and proliferation capability. Of the tested growth regulators, Zeatin was optimal for the induction of embryogenic callus followed by BA. This protocol demonstrates the genotype dependent response for somatic embryogenesis and plant regeneration. This type of study will help to suggest particular chili genotype for transformation and regeneration of transgenic chili plants.

ICPS-249 - WHEAT (*TRITICUM AESTIVUM* L.) ROOT PROTEIN PROFILES

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Abstract: To investigate the effect of seed priming treatments on the protein profiles of the roots of wheat seedlings grown under salinity. The protein contents were determind by SDS-PAGE. Qualitative analysis of proteins uncover that proteins of molecular weights 25, 32 kDa were over expressed after $CaCl_2.2H_2O$ treatment. The proteins over expressed in chilling and kinetin treatments were 40 kDa and 21 kDa respectively. The present investigations suggest that some of the proteins are over expressed in roots when priming treatments are applied to wheat grown under salinity.

ICPS-250 - LATE PERMIAN POLLEN AND SPORE FROM CHHIDRU FORMATION, SALT RANGE, PAKISTAN

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Abstract: Chhidru Formation Salt Range, Pakistan belongs to the late Permian (Dzulfian) and marks the termination of Palaeozoic era. The Formation overlies Wargal Formation and is overlain by the Mianwali Formation conformably. It predominantly consists of sandstone, mudstone, limestone with shaly streaks. Chhidru Formation was studied at three localities in the Salt Range viz; Nammal, Zaluch and Chhidru Gorges respectively. Extensive palynological studies were undertaken and rich palynoflora was recovered. The scope of the present paper is to describe non vesiculate and vesiculate palynomorphs obtained from the Chhidru Formation viz; *Lavigatosporities flexus, L. callosus, Punctatosporities minutus, Plicatipollenites indicus, parasaccites bilateralis, P. gondwanensis, florinites eremus protohaploxyipinus gorainsis, P. varius, P. amplus, striatopodocarpites cancellatus, S. rarus, striatoabietes multistriatus, S. el*ongates. On the basis of palynoflora, late Permian vegetation in the Salt Range, Pakistan was evaluated and reconstructed. In addition to this palaeoclimate, organic thermal maturity, oil and gas bearing potential of the Chhidru Formation were also estimated.

ICPS-251 - PALYNOLOGICAL CHARACTERIZATION OF EARLY JURASSIC STRATA (DATTA FORMATION) WESTERN SALT RANGE, PAKISTAN

S. MAAROUF AND K. R. MASOOD

[Department of Botany, University of the Punjab, Lahore, Pakistan]

Abstract: Rock samples from an outcrop of Datta Formation (Early Jurassic) Nammal Gorge Western Salt Range, Pakistan were investigated palynologically. Palynoflora consisted of sixteen palynomorph genera. Studied section consisted dominantly of variegated beds of compact sandstone, fine grained siltstone and shale with carbonaceous streaks and loose clay. Palynoflora existed in good state of preservation. Trilete and monolete spores produced by Pteridophytes were most common where as monocolpate, monosulcate and circumpolar pollen produced by Gymnosperm and seed ferns were next important subordinates. Cysts, fungal spore and fruiting body including varia were also observed. Wood and cuticular fragments were encountered in almost all samples. Early Jurassic flora was mainly dominated by Pteridophytes and Gymnosperms. Palaeoclimatic evaluation of palynological data showed prevalence of cool temperate to sub-temperate climate with moderate to high humidity. Palynoflora exhibited close resemblance with Australian palynoflora as both assemblages exhibit domination of Fern and Gymnosperm spores and pollen.

ICPS-252 - EVALUATION OF INOCULUM POTENTIAL OF FIFTEEN DIFFERENT INOCULA FOR INDUCING ARBUSCULAR MYCORRHIZA IN WHEAT (*TRITICUM AESTIVUM* L. CV. PAK 81)

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Abstract: Fifteen different inocula i.e. outer dried scales of bulbs of Amaryllis vittata, Zephyrenthes citrina scale like leaves of Colocasia antiquorum, Curcuma longa, C. zoedoria, Zingiber officinalis, Cana indica, Chlrophytum commosum, earthworm casts, Cycas soil spores, Dalbergia sissoo leaves, wheat roots, wheat stumps, and roots and scales of Agave pyrii, were used for inducing AM colonization in experimental wheat (Tritium aestivum L.cv.pak 81) plants in aseptic condition. The preinoculation assessment of these inocula indicated the presence of variety of AM structures i.e. vesicle, hyphae and spores. For Scale leaves of Colocasia antiquorum, Amaryllis sp., Zephyrenthes citrina, Agave pyrii Cycas soil spores, Dalbergia sissoo and wheat root segments inoculum, the results were significant in a descending order. The development of mycorrhizal colonization was maximum in the case of C. antiquorum scale inoculum. About 95% of the wheat root system was colonized. For rest of the inocula the colonization of host root system varied from 65 to 80 %. It is proposed that for growth response studies and for initiation of AM culture collection bank the above mentioned inocula may be used.

ICPS-253 - GLOMALEAN SPORE FLORA OF PAKISTAN: ARBUSCULAR MYCORRHIZAL FUNGI FROM TISSUE CULTURE RAISED POTATO FIELDS IN SAHIWAL, PAKISTAN

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Abstract: During the last two decades arbuscular fungi (AM) are reported to be of much wider occurrence than were thought of earlier. The fungi enhance P nutrition rendering a variety of benefits to the phytobiont. The plants having mycorrhizae are resistant to the root born diseases, deficiency and toxicity of trace elements, drought and other environmental stresses like pollution. The significance of AM fungi for a tissue culture raised plantlets is of special concern. The plantlets mass multiplied through the aseptic technique have to face vicissitudes of the environment when are transplanted in the unsterilized field soil. Root born plant diseases are one of them. Over 50% plantlet mortality have been reported at this stage. This hampers the utility of this technology for human well being. AM fungal preinoculation have been indicated as a vital tool to reduce the mortality percentage. However to fulfill the objective, selection/s of the rightorganism/sneeds to be done carefully. In the present paper the types of arbuscular mycorrhizal propagules in the rhizosphere soil of the four different varieties of potato raised by meristem culturing method has been listed. A total of twenty-nine species of Glomalean spores were recorded in the soil. Nineteen of these spores associated with potato crop were reported in the genus *Glomus*. The spore number in the rhizosphere of these potato varieties have been recorded so that right choice of the fungi is made for field application.

ICPS-254 - WHY DO ARBUSCULAR MYCORRHIZAL FUNGI FORM HYPHAL PLATOONS?

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Abstract: Arbuscular Mycorrhizal (AM) fungi belong to the order Glomales (recently raised to the level of a division, Glomeromycota) is a small group of 6 genera ans 160 species. However, these fungi form mutualistic symbiotic relationship with over 95% of plant species. The literature is now ample for conforming the presence of AM structures in non-root portions also, like scale-like leaves, seed testa, organic matter, decaying leaves and peanut pegs etc. The hyphae are aseptate but occasionally form septa at maturity. These fungi may form platoons of mats of septate hyphae intra or extramatrically. When associated with non root portions like scale leaves, epidermis of rhizomes, corms or bulbs etc. or testa of seeds buried in soil, these hyphal mats are considered analogous to Arbuscules and act as the sites of bilateral exchange materials due largely to enormous surface area. Further more these are the sites from where the spores or the sporocarps develop as is being reported in the case of *Sclerocystis pakistanica* in the scale leaves of *Chlorophytum commosum* and *Zephyranthus citrina*, *Glomus mosseae*, *G. fasciculatum* and *G. monosporum* in the scales of and decaying sheathing leaves of wheat and *Glomus intraradices* and *G. diaphanum* in the mature roots of some of the Transgenic fluorescent tobacco lines. The present paper highlights the steps involved in the formation of hyphal congregations or platoons in association with these plant portions and their possible role in nutrient uptake and serving as propagules for vegetative reproduction of AM fungi.

ICPS-255 - CYTOKININ PRIMING AS A TOOL TO INDUCE *INVITRO* GROWTH AND BIOMASS PRODUCTION OF SOME SOIL FUNGI

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Abstract: Effect of different concentrations of Cytokinin was studied on growth of four species of soil fungi namely, *Aspergillus oryzae, A. terreus*, *A. niger* and *Alternaria alternata*. The hormone was applied singly in various concentrations. Increased growth rate and biomass production revealed significant values when treated with dilute solutions of Cytokinin at 15, 30 and 45 mgL^{-1}. For all test fungi fresh weights and dry weight values dropped significantly when treated with 60 mgL^{-1} concentration of the hormone solution. The data on fresh and dry biomass revealed that the highest biomass increase was obtained for *Alternaria alternata*. Fresh biomass of *Alternaria alternata* showed 39.9% increase when treated with 45 mgL^{-1} concentration of hormone solution in comparison to control, whereas an increase of 43.75% was obtained in the case of dry weight. At 60 mgL^{-1}, a significant fresh biomass suppression of 17.9% and 17.64% was observed for *Aspergillus niger* and *A. oryzae*, respectively. The highest loss for dry biomass was noticed in *Alternaria alternata* (18.75%).
Oral Presentation

ICPS-256 - IMPACT OF EFFLUENTS OF A CHEMICAL INDUSTRY ON THE GROWTH PERFORMANCE AND PRODUCTIVITY OF SOME CULTIVARS OF BARLEY

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Abstract: The wastewater of chemical industry was alkaline with high BOD and COD values along with much higher concentrations of total settleable and suspended solids, SAR and high sodium. Effluents were examined for its chemical nature, and effects of its various dilutions were extensively investigated using newly recommended two barley cultivars. The vegetative growth parameters viz., plant height, number of leaves and number of tillers per plant were extremely reduced with the increasing levels of effluents, while plants in lower treatments did not showed severe retardation of growth as compared to their counterparts from control. Senescent rate was higher in plants from higher treatment levels of both cultivars (Haider 93 and Jou-87) compared with plants of lower treatments, which were much healthier and better developed. Productivity of barley crop was highly reduced in the present investigation due to effluents concentrations in various parameters of reproductive growth i.e., ears per plant (49%), spikelets per ear (36-40%), seeds per ear (49%), seed weight per plant (61-66%), and 1000-seed weight (49-59%) at highest pollution concentrations for both the cultivars. Biomass production was also severely decreased in both the cultivars at higher doses. Overall the results are important for both academic viewpoint and agricultural research sector.

ICPS-257 - EFFECT OF PRECEDING CROPS ON GROWTH AND MYCORRHIZAL COLONIZATION OF GLADIOLUS UNDER BIOTIC STRESS OF *FUSARIUM OXYSPORUM*

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[Department of Mycology & Plant Pathology, University of the Punjab, Lahore, Pakistan]

Abstract: *Fusarium oxysporum* f.sp*. gladioli* is the cause of corm rot disease of gladiolus. Present study was carried out to investigate the effect of eight preceding crops viz. *Allium cepa, Brassica campestris, Capsicum annuum, Eruca sativa, Helianthus annuus, Tagetes erectus* and *Zea mays*, on growth and mycorrhizal colonization of *Gladiolus grandiflorus* cv. Aarti under biotic stress of *F. oxysporum* f.sp*. gladioli.* These crops were sown in pots. At maturity these crops were harvested and soil was inoculated with *F. oxysporum* inoculum @ 5 g 100^{-1} using chickpea seeds as inoculum carrying material. Gladioulus was cultivated in these pots. Data regarding the various plant growth and arbuscular mycorrhizal (AM) traits were recorded. Disease incidence was significantly suppressed in all the preceding crops treatments ranging from 29 – 53%. In general root biomass was enhanced while shoot biomass was suppressed due to various preceding crops under the *Fusarium* stress. Mycorrhizal colonization was significantly enhanced due to all the preceding crops.

ICPS-258 - EFFECT OF PLANT MORPHOLOGY ON ABUNDANCE OF PREDATORY MITES OF GENUS POLLUX (ERYTHRAEIDAE : ACARINA)

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Absract: Morphology of different plants effect the abundance of predatory mite population of genus *Pollux (*Erythraeidae). Mite population of this genus was recorded from four different narrow leaved weed plants viz., Baru grass (*Sorghum halepence)*, Foxtail grass (*Dichanthium annulatum*), Madhana grass (*Desmostachya bipinnata*) and Khabbal grass (*Cynodon dactylon*) from five different localities. According to the observation recorded, leaf hairiness, length of hairs on leaves, leaf area thickness of leaf lamina and width of leaves had positive correlation with abundance of mite population. Maximum population was recorded from Baru grass which was 1.8/ leaf followed by Foxtail grass, Madhana grass and Khabbal grass having 1.2, 0.8 and 0.2 respectively.

ICPS-259 - EFFECT OF SOME MORPHOLOGICAL PLANT CHARACTERS IN HOST SEEKING BEHAVIOUR OF PREDATORY MITE OF GENUS *AMBLYSEIUS* (PHYTOSEIIDAE: ACARINA)

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Abstract: Bio-control agents are increasingly used in controlling different insect and mite pests because of increasing pest resistance to chemicals and pesticide hazards to consumers especially in vegetables. Predatory mites of genus *Amblyseius* play pivotal role in controlling phytophagous mites and small soft bodied insects. Morphological plant characters influence the ability of predatory mites to suppress the population of different crop pests. Therefore, the present study was conducted to determine the role of morphological plant characters viz., leaf hairiness, length of hair, thickness/toughness of leaf lamina, leaf area and moisture contents in leaf of different vegetables such as pumpkin, brinjal, okra and tomato against the incidence of predatory mite *Amblyseius* in four different localities of Punjab. The maximum population of the mite was observed on brinjal (3.7 mites per leaf) which is followed by pumpkin (2.4 mites per leaf), tomato (1.2 mites per leaf) and okra (0.54 mites per leaf). Leaf hairiness, length of leaf, thickness of leaf lamina and leaf area had shown negative correlation with *Amblyseius* mite population. However, moisture contents in leaf had no significant effect on mite population. Tough and rough leaf surfaces are not preferred by the mite as compared to smooth and soft surfaces. It was finally concluded that no single factor is responsible in mite population fluctuation but all the factors work in compliment and hence their relative abundance.

ICPS-260 - GENETICS OF ADULT PLANT LEAF RUST RESISTANCE IN SPRING WHEAT

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Abstract: Adult plant leaf resistance in wheat (*Triticum aestivum L.*) was determined from three wheat crosses developed from three resistant and one susceptible parents. Six populations (P_1, P_2, F_1, F_2, BC_1 and BC_2) of each cross were grown under field conditions and were artificially inoculated with isolates of prevalent races of leaf rust. Leaf rust intensity and reaction type were recorded and the coefficient of infection was computed. Generation means and variance analyses were performed revealed that additive, dominant as well as epistatic genetic effects are involved in the inheritance of leaf rust resistance. Narrow sense heritability estimates have been found low which also depict the presence of epistatic genetic effects. The observations aid in selection of desirable adult plant in segregating generations and for the development of high yielding wheat varieties with resistance to leaf rust.

ICPS-261 - GENETIC STUDIES IN WHEAT UNDER LEAF RUST CONDITIONS (*PUCCINIA RECONDTIA*)

F. HUSSAIN AND M. ASHRAF, A. S. MUMTAZ AND T. MAHMOOD

[Department of Plant Sciences, Quaid-e-Azam University, Islamabad, Pakistan]

Abstract: F_0 diallel crosses in all possible combinations from eight genetically different wheat varieties viz. LU26, SA42, Chenab70, MH97, Nacozari, Crow, Parula and Inqilab91 were studied to ascertain gene action under artificial leaf rust conditions during the year 1999-2000 at the Wheat Research Institute Faisalabad. The experiment was planted using RCB Design in three replications and the data were recorded for the traits; grain yield/plant, tillers/plant, grains/spike, 100-grain weight, spikelets/ spike, spike length, peduncle length, and plant height. Highly significant additive and dominance affects with directional dominance effects, asymmetrical gene distribution and important role of specific genes were found for all the traits. Maternal and reciprocal effects were non-significant for all traits except for grains/spike. Analysis for genetic components has indicated that additive (D) and dominant (H) were significant for all the traits studied. However, unequal distribution of dominant alleles were present in the traits except spikelets per spike. These studies shed light on genetic behavior of the parents for development of high yielding and leaf rust resistant wheat varieties.

ICPS-262 - ESTIMATION OF NUMBERE OF GENES CONTROLLING FOR ADULT PLANT LEAF RUST RESISTANCE IN WHEAT (*TRITICUM AESTIVUM* L.)

F. HUSSAIN, M. ASHRAF, A. S. MUMTAZ AND T. MAHMOOD

[Department of Plant Sciences Quaid-e-Azam University, Islamabad]

Abstract: To estimate of number of genes for genetic control of slow rust resistance to leaf rust(*Puccinia recondita*), 200 F6 lines were developed through single seed descent method from each three crosses from one fast rusting as female parent and three resistant to slow rusting as male parents wheat varieties. Parents and F6 progenies were planted in two replications in the field and highly susceptible variety, Morocco was planted all around the experiment. An artificial epidemic condition was created for leaf rust. Three consecutive observations with 10 days interval were recorded for leaf rust reaction from all genotypes in the field. Area under disease progress curve (AUDPC) was manipulated

to measure rust severity over time. Statistically highly significant differences were found among families for all crosses. Area under disease progress curve was ranged from 7.5 to 1450. Highest heritability estimates (94-99%) were found. Two to three number of genes were determined to control slow rusting depending on the parents used in the crosses.

ICPS-263 - ASTRUCTURAL STUDY OF SYNAPTONEMAL COMPLEX IN MEIOCYTES OF *DATURA INNOXIA*

M. ASHRAF AND A. S. MUMTAZ

[Department of Plant Sciences, Quaid-e-Azam University, Islamabad, Pakistan]

Abstract: At the ultrastructural level Synaptonemal Complex were studied in *Datura innoxia*, a polyploid. The attachment of the chromosome ends with the nuclear membrane is documented. In additionb our study has revealed the general features of synaptonemal complexes associated with centromeres (CM) and recombination nodules (RNs). The present research also described for first time a close relationship between nucleolus and chromosomes. The present paper describes the chromosomal formulations of homologous chromosomes associated with nucleolus, synapsis, chiasmata formation and crossing over at meiotic prophase.

ICPS-264 - BIOCHEMICAL EVALUATION OF WHEAT GENOTYPES

M. ASHRAF, S. A. R. KAZMI AND F. HUSSAIN

[Department of Plant Sciences, Quaid-e-Azam University Islamabad]

Abstract: Wheat is a staple food for the inhabitants of Pakistan and contributes more than 60% of the total protein requirements in daily diet (Anonymous, 2004). In the present investigation 66 wheat genotypes of *Triticum aestivum* which were studied at Department of Plant Sciences, Faculty of Biological Sciences Quaid-e-Azam University Islamabad**.** These 66, wheat genotypes were biochemically evaluated by using Kjeldahl method of Approved Methods of the American Association of Cereal Chemists (AACC, 2000). A protein was fractionated using electrophoresis through polyacrylamide gels in the presence of the anionic detergent, Sodium dodecyle sulphate (SDS-PAGE) and polymorphic patterns of proteins were studied. SDS-PAGE is an integral component of the analytical techniques of immune precipitation and Western blotting.The wheat lines were further characterized for high molecular weight (HMW) Glutenin subunits encoded at three genes (*Glu-Al, Glu-BI, Glu-DI*) with the help of sodium Dodecyl sulphate-=Polyacrylamide Gel Electrophoresis (SDS-PAGE) using Chinese Spring Wheat as a standard, In these lines *Glu-AI* (2) and *Glu-BI* (8)were presents in 55 wheat genotypes with the same frequency of 83.3%. *Glu-A1* (7) was found in 62 genotypes with very high frequency of 93.9%while *Glu-B1* pair subunit (7+8) with 80.3% frequency present in 53 samples. *Glu-D1* (2+12) was present in 35 samples with frequency of 53.03% and in *Glu-D1* (12) 63.6% frequency found in 42 wheat genotypes. The significance of the protein content of all those wheat lines was discussed in relation to genetic polymorphism. Protein contents ranged from 7.78-13.64%.These results provide us bases for the selection of wheat lines with high quality protein. Wheat seed storage proteins would be determined quantitatively and qualitatively. This data can be used to evaluate flour quality. Further wheat lines with high seed protein content are very attractive source to wheat breeders all over the world.

ICPS-265 - SLOW RUSTING RESPONSE OF WHEAT VARIETIES TO LEAF RUST AND GENETIC GAIN INDICATED ENHANCED GRAIN YIELD

F. HUSSAIN, M. ASHRAF, A. S. MUMTAZ AND T. MAHMOOD.

[Department of Plant Sciences Biological Sciences Department, Quaid-e-Azam University, Islamabad, Pakistan]

Abstract: Fifteen wheat varieties were evaluated for slow rusting to disease under artificially created leaf rust epidemics with and without fungicide protection. The varieties, Inqilab-91, Iqbal-2000, Parula were found resistant group followed by Auqab-2000, Chenab-2000, Parwaz-94, Pavon-76, MH-97 and LU-26 caused by slow rusting while, Punjab76, SA-42, Chenab-70 and WL-711 were found to have fast rusting. Punjab-96 and Pak-81 were classified as intermediate slow rusting. Average loss in grain yields was between 0.31 to 46.31 % and the grain weight losses ranged 0.28 to 58.23 %. Average losses in grain number per spike were between 0.36 to 20.39 %. Slight reduction was observed in spikes/m^2 and plant height under rusted condition. The susceptible or fast rusted varieties, Punjab-76(46.31%), SA-42(43.23%), Chenab-70(37.48%) and WL-711(27.68 %) gave higher averaged losses of grain yield while, losses of grain weight were 58.23, 20.46, 22.27 and 27.14 % respectively from these varieties. However, higher relative area under disease progressive curve (RAUDPC) was measured 93.89, 90.95, 78.15 and 67.38 % respectively under rust epidemic. The average annual genetic progress in grain yield potential achieved through breeding averaged over four trials was computed to be 0.86 % (R^2= 0.682) for protected and 2.23 % ((R^2= 0.787) in rusted conditions. Hence, it is concluded that slow rusting in wheat varieties released during 1970 and 2000 in Pakistan gained rust resistance due to incorporation of slow rusting genes.

ICPS-266 - ASSOCIATION OF SLOW RUSTING WITH PLANT HEIGHT, DAYS TO HEADING AND GRAIN FILLING PERIOD

F. HUSSAIN, M. ASHRAF, A. S. MUMTAZ AND T. MAHMOOD

[Department of Plant Sciences, Quaid-e-Azam University, Islamabad, Pakistan]

Abstract: Association of leaf rust resistance has been studied in 200 lines developed from three resistant male and one fast rusting female parent. All offsprings to F6 stage and parents were planted in two replications along with highly susceptible variety "Morrocco" in the field. Leaf rust reaction from all genotypes was studied at 10 days interval for 30 days. Area under disease progress curve (AUDPC) was utilized to measure rust severity over time. Significant differences were observed among crosses and progenies for plant height, days to head and grain filling period. Analysis of pooled data further revealed significantly negative correlation of AUDPC with plant height (r = -0.554) and days to heading (r = 0.764) while a positive correlation with grain filling period (r = 0.341). These results have implications in addressing issues of wheat rust resistance in Pakistan.

ICPS-267 - PHYTOTOXICITY OF ALIEN WEED PARTHENIUM AS COMPARED TO TWO NATIVE ASTERACEOUS SPECIES AGAINST MUNGBEAN

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Abstract: Parthenium (*Parthenium hysterophorus* L.), an alien weed of family Asteraceae, native to the subtropics of North and South America, has achieved major weed status in Pakistan during the last 15-20 years. Although generally parthenium has been identified as a wasteland weed in Pakistan, however, it has also been reported in some field crops. The weed is notorious for its well-established allelopathic effects against associated plants. The present study was carried out to investigate the phytotoxic effects of this alien weed species in comparison with two native asteraceous weed species viz. *Ageratum conyzoides* and *Sonchus oleraceous* against mungbean [*Vigna radiate* (L.) Wiszek]. Highest conc. of 15% of parthenium extract reduced mungbean germination by 26% as compared to 11% reduction in germination due to same extract concentration of *Sonchus.* However, lowest concentration of 5% was found most toxic in case of *Ageratum* resulting in 30% reduction in mungbean germination. Shoot length was reduced from 17-52% and 23-52%, and shoot biomass from 26-36% and 2.4-58%

due to various extracts of parthenium and *Ageratum,* respectively. Shoot length was stimulated by *Sonchus extracts.* In generally extracts of all the three test weed species stimulated the root growth of mungbean. The present study concludes that aqueous extracts of alien weed parthenium exhibit similar phytotoxic effects on germination and seedling growth of mungbean as do the two test native weed species belonging to the same family.

ICPS-268 - SOME STUDIES ON VERTICLE PROFILE OF AIRBORNE MYCOFLORA OF LAHORE

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Abstract: Allergy is defined as sensitivity to normally harmless substances, one that does not bother most people. Allergic reactions are caused by allergens. Allergens contain protein, which are organic compounds. Molds and fungi are prolific producers of potentially allergenic proteins. A vertical profile of air of a district was studied by using Petri plates containing different media like MEA and PDA and then exposing them at different heights for two minutes. Microscopic observations were taken after 48 h incubating at 25 $\pm$ 2^{o}C. Fungal colonies counts were made and the Petri plates were saved for further studies. A year round data for fungal colony counts was obtained from October 2006 to September 2007. The results indicated the highest colony counts for allergic fungi in the month of May. The major pathogenic fungi found were *Penicillium* spp, *Alternaria alternata, Aspergillus niger* and *Cladosporium. Penicillium sp* is known to cause skin diseases and was found in abundance in air in the month of January and February. After extracting their spores protein estimation was done in order to check their allergic potential in human beings.

ICPS-269 - TRILETE MIOSPORES OF INFRATURMA *LAEVIGATI* FROM MIDDLE TRIASSIC, WESTERN SALT RANGE, PAKISTAN

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Abstract: Thirteen trilete miospore species belonging to two genera are described from the Tredian Formation (Middle Triassic), at Tredian Gorge, Nammal Gorge and Zaluch Gorge, Western Salt Range Pakistan. Tredian Formation comprises two members; the lower is Landa Member (Kummel, 1966) and the upper the Khatkiara Member (Danilchik and Shah, 1967). The Landa Member consists of sandstone and shale. The sandstone is micaceous and varies in colour from pinkish, reddish grey to greenish grey. It is thin to thick bedded, with ripple marks and slump structures. The thickness varies from 20m to 25m in Zaluch and Nammal Gorge sections respectively. The Khatkiara Member is a massive thick bedded white sandstone that grades into the overlying Kingriali Formation with the inclusion of some dolomitic beds in its upper part. The thickness varies from 55m to 30m in the Zaluch Nala and Nammal Gorge Sections, respectively. All miospores are azonate and belong to the Infraturma Laevigati (Bannie and Kidson) Potonie, 1956. They are characterized by psilate, infra punctate to granulate exine and poorly developed labra. Rock samples were collected at exactly half meter distance.

ICPS-270 - PALYNOLOGY OF MIDDLE TRIASSIC CARBONACEOUS SHALES (TREDIAN FORMATION) WESTERN SALT RANGE, PAKISTAN

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Abstract: Samples from coaly shales belonging to the Tredian Formation (Khatkiara Member), Western Salt Range, Pakistan were palynologically analyzed. Palynoflora included Trilete, Monolete, Monosaccate, Bisaccate, Trisaccate and Varia. Most spores and pollen were long ranging but few exhibited restricted occurrence. On the basis of affinities of these palynomorphs paleovegetation of the Mid Triassic period in the Salt Range was worked out. The vegetation mainly consisted of Gymnosperms (Conifers and Cycads). Resolution of palynological data in terms of environment of deposition of the presently investigated Mid Triassic Coaly strata suggested arid subtropical to tropical paleoclimate in the low land area whereas subtropical to sub temperate with mild humidity in the near by upland area. Some important genera were *Alisporites, Falcisporites, Vitrisporites, Aratrisporites, Klausipollenites and Cedripites.*

ICPS-271 - PHYSIOLOGICAL RESPONSE OF SALT SENSITIVE AND SALT TOLERANT WHEAT GENOTYPES TO SALT STRESS WITH AND WITHOUT SILICON APPLICATION

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Abstract: We investigated the effect of exogenous application of silicon on growth and physiological response of salt stressed wheat genotypes. Two contrasting wheat genotypes SARC-1 (salt tolerant) and Auqab-2000 (salt sensitive) were grown in nutrient solution containing 150 m*M* NaCl (control) with and without 2 m*M* Si (as sodium silicate). Sodium uptake by plant roots was estimated by nutrient depletion technique. Shoot and root growth of plants grown in Si amended treatment was significantly more than control. The plants receiving Si in root medium had slightly higher chlorophyll contents and water contents in their leaves. Membrane stability in leaves, assessed by measuring electrolyte leakage percentage was more in Si fed plants than Si deprived plants. Electrolyte leakage percentage was lower in SARC-1 than in Auqab-2000. Sodium uptake was significantly lower in Si fed plants. Sodium influx into plant roots was lower in Si fed plants. The exposure of plants to salinity stress in the presence of 2 m*M* Si reduced the Na influx in plant body by influencing the kinetics parameters viz K_m and V_{max} The K_m value for Na uptake was increased from 27 to 73 m*M* and 12 to 71 m*M* respectively in Auqab-2000 and SARC-1, but V_{max} vale was reduced to 40 %.

ICPS-272 - EARLY WINTER SPRAY OF LOW BIURET UREA IMPROVES MARKETABLE YIELD AND FRUIT QUALITY OF SWEET ORANGES

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Abstract: The current study was aimed at determining the optimum time of low biuret urea (LBU) foliar spray to improve marketable yield and fruit quality of Blood Red sweet orange (*Citrus sinensis* L. Osbeck.) through nitrogen enrichment of over wintering leaves. LBU solution (2 %) was sprayed on to 12-15 years old trees to the point of run off, during mid October, November and December along with control sprayed with simple water. The experimental trees grafted on rough lemon root stock were growing at University of Agriculture Faisalabad (Latitude 31° 25' North; Longitude: 73° 09'), Pakistan. Treatment unit consisted of single tree in three replicates. The two forms of nitrogen (NH_4 & NO_3) were monitored in tree leaves on day 0, 03, 06 after spray and then during February (flushing), March (flowering) and April (fruit set). The total nitrogen level was found highest in December treatment (3.3 %) followed by November (3.0 %) and October (2.8 %) respectively as compared to control (2.4 %). Similarly, maximum NH_4-N was also found in December and November sprayed trees (1.7 % each). The foliar LBU spray significantly increased total (102%) and of grade-1 fruit yield (75%), compared to

control. Fruit quality including pulp colour score (40%), TSS (33%), vitamin C (10%), TSS/TA (19%), sugars (44%) and taste score (37%) were also significantly improved as compared to control. All the treatments caused significant decrease in fruit weight, fruit diameter, number of aborted seeds/ fruit as compared to maximum values in control, followed by December, October and November sprays respectively. Minimum fruit weight (108.3 g) and diameter (5.69 cm) were found in November treated trees. The LBU treatments did not significantly influence fruit set, juice content, peel weight or acidity (%). Overall LBU spray during November gave the best results for improving marketable yield and fruit quality of sweet orange.

ICPS-273 - INDUCTION AND EVALUATION OF MUTANTS FOR CLCUV-B DISEASE RESISTANCE IN COTTON

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Abstract: CLCuD emerged as a key disease in Punjab during 2003 and even the parental material (LRA-5166, CP-15/2 and Cidex) which was resistant to CLCuV (Multan strain) also became susceptible. A research project was initiated at NIAB during 2003-04 to induce resistance against CLCuV-B (Burewala strain) through the use of induced mutations in high yielding varieties/ advance lines of cotton. As a result of these efforts a large number of desirable mutants have been developed. During 2006-07, 95 single plants exhibiting field resistance to CLCuV-B were selected from M_4 generation/progenies obtained from the gamma irradiation of mutant NIAB-98. These had yield up to 503 gm/plant, GOT 43.0%, fibre length 30 mm, fineness 3.8-4.6 µg/in and fibre maturity 89%. While 102 single plants having field resistance to CLCuV-B were selected from M_3 progenies. These had yield up to 447 gm/plant, GOT 44.3%, fibre length 30 mm, fineness 3.8 µg/in and fibre maturity 88.2 %. Furthermore, 114 mutants showing field resistance to CLCuV-B disease were also selected form M_2/F_2 generation raised at hot spot areas i.e. CRS Vehari, CCRI, Multan and NIAB Faisalabad to CLCuV-B disease. These mutants had yield up to 279 gm/plant, GOT 44.9%, fibre length 30 mm, fineness 3.8 µg/in and fibre maturity 88.6 %. The results of the studies carried out on the above mentioned mutants/progenies regarding their breeding behaviour and field response to CLCuV-B disease during 2007-08 will be described and discussed.

ICPS-274 - INCIDENCE AND ENVIRONMENTAL INFLUENCE ON SYMPTOMS EXPRESSION OF YELLOW VEIN CLEARING VIRUS IN LEMON VARIETIES

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Abstract: Citrus orchards at two locations (NARC & ZTBL) and nurseries in Islamabad were surveyed in order to check the disease incidence and effect of environmental factors on the symptoms expression of yellow-vein clearing virus (YVCV)-a neglected and undescribed viral disease of lemon. The mean disease incidence at both locations was ranged from 69% to 98%. Two lemon cultivars Eureka and Lisbon showed 100% and 64% infection respectively while Mesero and Verna were free. Among environmental factors maximum, minimum temperature and wind speed exhibited the significant correlation with symptoms expression of YVCV in Eureka lemon but not in Lisbon. A comprehensive study on distribution of disease in major citrus growing areas of country and effect of environmental factors is required.

ICPS-275 - ISOLATION OF LOW PHYTATE BASMATI RICE THROUGH INDUCED MUTATION

A. A. CHEEMA, Z. QAMAR, M. RASHID, M. ASHRAF AND V. RABOY

[Authors did not provided their affiliation]

Abstract: Phytic acid (myo inositol 1,2,3,4,5,6 Hexakis phosphate), major storage form of the seed phosphorus is an anti nutritional factor in cereals and legumes. It is deposited in seeds as a mixed phytates or phytin salts of Potassium, Magnesium, Calcium, Iron and Zinc resulting in deficiencies of these mineral elements which lead to various physiological disorders such as anemia, abortion and osteoporosis in human. To tackle these problems various strategies have been devised such as the food fortification with minerals and phytates, food supplementation and food diversification. Of all these induced mutation offers a sustainable solution to this problem especially to third world countries like Pakistan where other strategies are not affordable by majority of the population. Induced mutation has been successfully employed for the production of low phytate mutants in legumes and cereals. Rice is the 2nd staple diet after wheat and important export commodity of Pakistan is also rich in phytic acid and the low phytate rice can help to combat these health problems associated with high phytate contents. Dry and dormant seeds of high yielding commercial variety Super Basmati were irradiated with different doses of gamma rays (^{60}Co) i.e 150 Gy, 200 Gy and 250Gy. Sufficient M_2 population of each dose was raised. Each plant per dose was harvested separately and analyzed for low phytic acid mutation using colorimetric assay technique. Variants were selected on the basis of high inorganic-P. One progeny in M_5 and two progenies in M_4 generation were found stable for *Lpa* mutations exhibiting 58.33% to 52.80% inorganic-P as compared to Super Basmati (parent) 9.86%. These selected mutants will be evaluated for yield and yield related characteristics. The results based on these studies were discussed.

ICPS-276 - PLANT ROOTS ASSOCIATED BENEFICIAL BACTERIA: AN ALTERNATIVE TO CHEMICAL PESTICIDES FOR THE MANAGEMENT OF ROOT ROTTING FUNGI AND ROOT KNOT NEMATODE

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Abstract: There is an increasing awareness that pesticides and fertilizers cause damage to the environment and effect human health. As a consequence, there is a trend toward finding ways to minimize the use of pesticides. The use of biocontrol agents and alternative treatments (e.g., cultural practices, cover crops, organic amendments) are perceived to be less harmful than conventional pesticides and may be an alternative in controlling plant diseases. In this study several strains of *Pseudomonas aeruginosa,* a plant growth promoting rhizobacterium isolated from rhizoplane of various crops and rhizobia isolated from root nodules had caused growth inhibition of root rotting fungi *Macrophomina phaseolina, Rhizoctonia solani, Fusarium* solani and *F.oxysporum* in dual culture plate assay. Cell free culture filtrates of PGPR and rhizobia also showed nematicidal activity by killing the 2nd stage juveniles of *Meloidogyne javanica* at varying degrees. Application of PGPR and rhizobial isolates significantly ($p<0.05$) suppressed root rotting fungi and root knot nematode both in screen house and in field plots on both leguminous and non-leguminous crops. Use of beneficial plant root bacteria offers a potential, non-chemical mean for the control of root rotting fungi and root knot nematode affecting economic crops.

ICPS-277 -EFFECT OF SALINE CULTURE ON THE CONCENTRATION OF Na^+, K^+ AND Cl^- IN *AGROSTIS STOLONIFERA*

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Abstract: A glass house pot experiment was conducted to assess ionic (Na^+, K^+ and Cl^-) relations and ionic contents (Na^+, K^+ and Cl^-) in different parts of salt marsh (SM) and inland clones (IL) of *A. stolonifera*. In non-saline medium the roots, stems and leaves of the SM and IL clones demonstrated relatively lower concentration of Na^+ and Cl^- as compared to concentration of K^+. But when *A. stolonifera* clones were cultured with NaCl, the concentration of Na^+ and Cl^- increased in all organs in both the clones. Increased NaCl concentration in culture medium caused a progressive decrease of K^+ uptake in the roots and stems of both the clones. It was also found that Na^+ and Cl^- concentrations were higher in stems than in roots and leaves in salt treated plants. In the leaves, however, Na^+ and Cl^- levels showed a stiochiometric relationship. In older leaves higher concentration of Na^+ and Cl^- was found as compared to younger leaves in SM and IL clones.

ICPS-278 - COMPARATIVE STUDY OF NACL STRESS ON SEED GERMINATION IN *CENCHRUS* SPECIES

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Abstract: Screening of plant species for salt tolerance has often been accomplished by recording germination percentage and rate of germination at various salt levels. Considering these indicators, the germination response in *Cenchrus ciliaris, Cenchrus setigerus* and *Cenchrus biflorus* has been studied at different NACL levels (Control, 50,100, 150 and 200 m*M*). It was found that *C. cilaris* at control have 84% germination and by increasing salt concentrations of 50 m*M* to 200 m*M* reciprocated the germination percentage and germination rate was also reduced from 60% in control to about 10% at 200 m*M* of NaCl. *C. setigerus* and *C. biflorus* gave only 20% seed germination and gradually increase by increasing salt concentration at 50 m*M* (24% each), 100 m*M* (20% and 32% respectively) and 150 m*M* (24% and 32% respectively) of NaCl which entails that salt has some stimulatory effect on seed germination in these species. As the NaCl stress increased the germination of seeds delayed and reduced. At 200 m*M* NaCl all the three grass species showed only 8% seed germination. The ratio of the total germinated seeds to un-germinated seeds was also calculated give exactly an opposite values highest at 200 m*M* and lowest at control which confirms the percentage of germinated seeds. The germination rate was almost linear in *C. setigerus* and *C. biflorus* at salinity levels of 100 m*M* and 150 m*M* of NaCl. It is concluded that C. biflorus appeared to be more salt tolerant as assessed by seed germination percentage and rate of germination.

ICPS-279 - MORPHOLOGICAL VARIATIONS IN SALT STRESSED ACCESSIONS OF *PANICUM ANTIDOTALE* RETZ.

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Abstract: A pot experiment with completely randomized design (CRD) was conducted to assess the morphological variations in six accessions of *Panicum antidotale* at different NaCl stresses (Control, 5, 15 and 20 dSm^{-1}). The data of quatitative traits viz. plant height, leaf number on main tiller, stem thickness of main tiller, internodes on main tiller, tillers per plant, fresh and dry weight of main tiller were recorded and subjected to analysis of variance (ANOVA) based on CRD factorial design. The data showed high variation among accessions. It was observed that at control the accession KH1 and LS1 gave better growth. But at the salinity levels of 5, 15 and 20 dSm^{-1} only one accession LS1 collected from "Lal Sohanra" gave higher growth and excel all other accessions in salinity tolerance.

ICPS-280 - SEED MORPHOLOGY OF NATIVE FLORA FROM THE CHOLISTAN DESERT

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Abstract: Seed samples of some native trees, shrubs and undershrubs were collected from the Cholistan desert to explore morphological variation and adaptive patterns in seed coat. Quantitative morphological characteristics like seed size, seed diameter and 100-seed weight were noted. Qualitative seed morphological characteristics like seed colour, seed shape and seed texture and polymorphpism in the seed were also recorded. Seed of *Acacia jacquimontii*, *A. nilotica*, *Calligonum polygonoides*, *Tribulus terrestris*, *T. longipetalus*, *Capparis decidua*, *Anticharis linearis*, and *Prosopis cineraria*, were large in size but showed no polymorphism. Small-sized seed of *Chorchorus trilocularis*, *C. depressus*, *Molluga cerviana*, *Suaeda fruticosa*, *Withania somnifera*, *Pennisetum divisum*, and *Sesuvium sesuvioides* but showed polymorphism. Owing to these variabilities in the seeds of Cholistan desert plants and the occurrence of polymorphism in various species can lead to better establishment of the plant species in various ecological conditions of the Cholistan desert. These studies are preliminary step towards evaluation and for the exploration of soil seed bank of the Cholistan desert.

ICPS281 - ANATOMICAL ADAPTATIONS IN SOME CULTIVATED, WEEDY AND NATIVE GRASS SPECIES IN THE FAISALABAD REGION

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Abstract: Comparative anatomical studies were conducted to evaluate anatomical adaptations in some cultivated (*Triticum aestivum, Hordeum vulgare,* and *Avena fatua*), weedy (*Phalaris minor* and *Polypogon monspeliensis*), and native (*Aristida adscensionis* and *Stipagrostis plumosus*) grass species in relation to their ecological success in a variety of ecological conditions. Cultivated species, *T. aestivum* and *H. vulgare,* and widespread weedy species *P. minor* showed thick epidermal layers in root. In stems, relatively more drought tolerant cultivated species (*H. vulgare*, and *Avena fatua*) and *A. adscensionis* from desert climates had the thickest epidermis. Thicker epidermis in the stem of *Hordeum vulgare* might be the reason for its successful cultivation in semi-arid areas throughout Pakistan. Highly drought tolerant grass from the Thal desert (*S. plumosus*) *had the thickest* endodermis and this may prevent radial water flow in and outside the vascular tissue, therefore, very crucial in desert climates. Enlarged pith parenchyma of this species enables this species better moisture storage and may aid in the successful survival under harsh climates. *Triticum aestivum* with relatively larger vascular tissue in root and stem perhaps the better adaptation to a variety of environment types along with high yield potential, and hence, the wider distributional range as compared to other species. Among species, sclerenchyma thickness was found maximum in stem of *S. plumosus* and *A.*

adscensionis, both are the species of arid and semi-arid regions, and this characteristics seems to be directly related to high drought stress tolerance.

ICPS-282 - DIURNAL AND SEASONAL TRENDS OF WATER RELATIONS AND PHOTOSYNTHESIS IN FOUR CO-OCCURRING DESERT SPECIES

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Abstract: Diurnal water relations and photosynthesis were studied before and after rain in four desert plants: *Abutilon indicum* (Linn.) Sweet, *Calotropis procera* (Ait.) Ait. f., *Desmostachya bipinnata* (Linn.) Stapf and *Phragmites karka* (Retz.) Trin. ex Steud. from Karachi University Campus. Temperature, relative humidity (RH) and photosynthetically active radiation (PAR) were all highest at noon. Temperature and PAR were higher before monsoon rains while RH was lower in comparison to values recorded after rains. Water potential (Ψ_w) and osmotic potential (Ψ_o) were more negative before rain in all test species with relatively greater diurnal variations in *P. karka* and *A. indicum*. *Calotropis procera* showed more negative Ψ_w and Ψ_o than the other three species both seasonally and diurnally. In general, turgor potential was lower in *A. indicum* and higher in *C. procerea* while all species appeared to maintain turgor by varying their Ψ_w and Ψ_o. The photosynthetic rate of *C. procera* and *A. indicum* increased by about 2 to 2½ folds after monsoon rains, respectively while the grasses *P. karka* and *D. bipinnata* showed little variation between the two seasons at noon. Greater diurnal variations in photosynthesis, stomatal conductance (g_S) and transpiration (E) were recorded after monsoon rains in all test species.

ICPS-283 - SALT TOLERANCE STUDIES IN WHEAT (*TRITICUM AESTIVUM* L.) GENOTYPES

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[Nuclear Institute Of Agriculture, Tandojam, Sindh, Pakistan]

Abstract: Salt tolerance studies were conducted in some wheat genotypes under control conditions (cemented tanks filled with gravels). Four salinity levels, i.e. control (1.5 dS/m), low saline (6.0 dS/m), medium saline (9.0 dS/m) and highly saline (12.0 dS/m) were imposed after one week of germination by $1/4^{th}$ Hoagland nutrient solution, salinized by common salt (NaCl). Crop was irrigated at the interval of two weeks or whenever required with $1/4^{th}$ Hoagland nutrient solution of respective concentrations. The excess water was drained out to maintain required salinity levels. Salinity level of each treatment was regularly monitored by installing microtensionic to avoid salt deposition through out the growing period. Yield and yield components were recorded at the time of crop maturity. On the basis of less than 50% reduction in different growth variables, five genotypes viz. LU26s, HT-45, ESW-9525, Sarsabz and S-24 were found tolerant. Physiological parameters (chlorophyll, proline and K/Na ratio) recorded at the time of flowering also supports the findings.

ICPS-284 - GAMMA IRRADIATION INDUCED CHANGES ON GROWTH AND PHYSIOLOGICAL RESPONSES OF RICE UNDER SALINE CONDITIONS

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[Nuclear Institute of Agriculture, Tandojam, Sindh, Pakistan]

Abstract: Seeds of three rice varieties (Shua-92, Sarshar and IR-8) were irradiated with gamma rays (150, 200 and 250 Gy of Cobalt-60) for determining the effectiveness of different doses of irradiation on growth behaviour and physiological responses (chlorophyll contents and ionic concentrations) of rice pants. Seeds of all these varieties at M_2 generation along with their parents were grown at different levels of salinity (0, 50 and 75 m*M* NaCl) under water culture conditions for the period of two weeks. Significant reduction was observed in plant height, leaf area and fresh weight in all parent varieties. None of the parents was able to survive at 75 m*M* NaCl salinity. Comparison among different doses of radiation have shown that 150 Gy was found comparatively more effective not only for survival under higher salinity level (75 m*M* NaCl) but also exhibited an enhancement in biomass production and have pronounce effects on ionic responses of these plants. These studies have revealed that enhanced chlorophyll, potassium and less Na uptake may be responsible for better growth under saline condition.

ICPS-285 - PHYSIOLOGICAL RESPONSE OF WHEAT (*TRITICUM AESTIVUM* L.) GENOTYPES UNDER WATER STRESS AT SEEDLING STAGE

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[Nuclear Institute of Agriculture, Tandojam, Sindh, Pakistan]

Abstract: A number of experiments were conducted in laboratory to study the physiological response of wheat genotypes under water stress. Thirty seeds of 12 wheat genotypes namely C-591, Chakwal-86, C-228, AGA, Bucs, RG-24, M-172, HT-37, DS-11, ESW-9525, QM-4531 and QM-4934 were planted in glass bowls (15cm diameter and 10cm in depth). Water stress was induced by (PEG-6000) solution to give 0.00 (control), -0.5 and -0.75 MPa osmotic stress. Seedlings were grown in programmed growth cabinets under 12hrs photoperiod (41.69 μmol m^2 s^{-1}). The experiment was terminated after twenty days for various growth (shoot and root length) and physiological (K contents, proline and nitrate reductase activity NRA), observations. The results showed that the genotypes C-591, Chakwal-86, C-228 and AGA were tolerant at -0.75 MPa, whereas Bucs, RG-24, M-172 and HT-37 were medium tolerant and DS-11, ESW-9525, QM-4531 and QM-4934 were sensitive to water stress. Proline contents in tolerant genotypes were high at -0.75 MPa osmotic stress. Similarly, nitrate reductase activity and potassium accumulation were recorded higher in tolerant genotypes.

ICPS-286 - PERFORMANCE OF SOME BRASSICA VARIETIES (*BRASSICA NAPUS*) UNDER SALINE FIELD CONDITION

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Abstract: Field studies were conducted to test the growth and yield performance of some brassica varieties under normal (1.2 – 3.6 dS/m) and saline (11.1 – 22.9 dS/m) field conditions. The Sodium Adsorption Ratio (SAR) of normal and saline field ranged as 4.85 – 15.45 and 47.93 – 147.96 respectively. The saline field is categorized as saline-sodic. The genotypes tested were Con-II, Con-III, Rainbow, Wester and Abaseen-95. The growth performance was recorded at the time of maturity, in terms of plant height, grain yield/plot and 100-grain weight. The results showed that there was an overall 5 – 25% decrease in plant height due to salinity of the soil, with Rainbow and Wester showing the least decrease in plant height i.e. 4.93 and 5.59% respectively. The decrease in case of grain yield/plot was significant. The genotypes showing less than 50% reduction were Wester and Abaseen-95 i.e. 9.44 and 35.34%, respectively. Similarly, both the genotypes were also showing least reduction in 100-grain weight. Plant sample (leaves, stem and roots) were analyzed to study the ionic behaviour of brassica genotypes under saline environment. It was observed that there was less deposition of Na ions in leaves as compared to stem and roots. Whereas, the trend in case of K ion was reverse showing

higher values in leaves as compared to stem and roots. The higher values of K/Na ratio in Wester and Abaseem-95 indicate their better adaptation under saline condition through osmotic adjustment.

ICPS-287 - PHYSIOLOGICAL RESPONSES OF SOME BRASSICA SPECIES (*BRASSICA NAPUS* L.) UNDER WATER STRESS CONDITIONS

M. A. KHAN, S. M. MUJTABA, B. KHANZADA, M. U. SHIRAZI, M. A. KHAN AND S. MUMTAZ

[Nuclear Institute of Agriculture, Tandojam, Sindh, Pakistan]

Abstract: An experiment was conducted in the wire-netted pot house in the cemented tanks (9m x 1m) with the objective to explore some suitable physiological markers in *Brassica napus* species under water stress conditions. Three canola type varieties (Con-III, Hyola-42 and Shiralee), two mutants of Rainbow along with parents (Rainbow-1, Rainbow-2, Rainbow-6,P) and one *Brassica juncea* variety (NIFA Raza) was sown as per RCBD in triplicate. There were four treatments, control, pre-anthesis, post-anthesis and terminal drought. The plant to plant distance was maintained as 20 cm and row to row 30 cm. The texture of the experimental soil was sandy clay loam, having field capacity 18%. The biochemical (proline, nitrate reductase activity, potassium in leaves, chlorophyll and oil contents), physiological (relative water contents and osmotic potential) and agronomical parameters (plant height, number of branches, number of pods, pod length, grain weight and 1000-grain weight) were studied at different growth stages. Results showed that two mutants of Rainbow, Rainbow-1 (R-75/1) and Rainbow-2 (R-100/6) were low water requiring. Proline contents in these two mutants were increased by > 300 folds in water stress condition. However, no significant increase/ decrease were observed in K contents. Two above mentioned mutants of Rainbow and genotype Shiralee showed non-significant ($p \leq 0.05$) reduction in the oil contents (41-37 %) as compared to control under water stress condition. Similar pattern of reduction was observed regarding 1000-grain weight in the above mutants and genotypes.

ICPS-288 - ENHANCEMENT OF AGRICULTURAL PRODUCTIVITY THROUGH INDUCED MUTATIONS AND CONVENTIONAL BREEDING

M. A. ARAIN, M. A. SIAL AND S. K. SHAH

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Abstract: Induced mutations as well as conventional breeding methods have been used in many countries for the genetic improvement of agricultural crops. At Nuclear Institute of Agriculture, Tando Jam, besides conventional breeding, mutation breeding through physical and chemical mutagens has proved worth in developing mutants with distinct characters and new crop varieties in wheat, rice, cotton, mungbean and lentil. The cultivation of these varieties in Sindh province has made significant impact on agricultural productivity. The realities and possibilities of genetic improvement in quantitative and qualitative traits via induced mutations and conventional breeding methods will be discussed.

ICPS-289 - PERFORMANCE OF WHEAT MUTANTS DERIVED FROM DIFFERENT CULTIVARS FOR YIELD AND YIELD COMPONENTS

M. A. AHMEDANI, M. A. ARAIN, M. A. SIAL AND M. A. NAHYOON

[Nuclear Institute of Agriculture, Tando Jam, Sindh, Pakistan]

Abstract: Four locally bred wheat cultivars i.e. Kiran-95, T.J.-83, Anmol-91 and Abadgar-93 were subjected to gamma irradiation 2000-01. Treatments applied were 0, 50, 100, 150 and 200 Gy.

Reasonable genetic variability was obtained in early generations that helped for selection of viable mutants with desired traits. Selection was made on the basis of yield and yield contributing agronomic traits like days to heading, days to maturity, 1000 grain weight spike length, spikelets per spike, grains per spike, grain yield and plant height. It was noted that higher treatment doses produced lethal effects on the growth and development of the plants, resulting in the stunted growth and more reduction in the yield parameters during early generations. Twelve phenotypically stable mutant lines were selected to raise M_5 generation during rabi-2005-06 at NIA, Tando Jam. None of the mutants produced significantly higher yield than respective parent, hence the present mutation treatments were not found effective in enhancing the yield. Six mutants, i.e. MK06, MTJ061, MTJ062, MAN061, MAN062 and MAB06, had significantly higher 1000-grain weight (39.63, 29.5, 28.38, 36.0, 37.25 and 36.25 respectively) as compared to the other mutants and their respective parents.

ICPS-290 - EVOLUTION OF HIGH YIELDING AND WATER STRESS TOLERANT WHEAT VARIETY "KHIRMAN" FOR SINDH

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Abstract: Plant breeding is a continuous process and new varieties are regularly needed either to replace the old ones or to supplement the existing stock of varietal complex. At present, Sindh province has a diversified varietal complex and the average yield is higher than other provinces in the country. The climate of Sindh in the last five years has significantly changed and wheat crop has started suffering from high temperature stress at both ends. This has been supplemented by severe drought and water shortage. Besides environmental factors, consistently higher yields are only manageable when varieties cultivated are genetically stable and widely adapted to a range of environments. The efforts were therefore concentrated on screening the exotic elite material for yield and yield components in a diversified environmental conditions prevailing in the province of Sindh. A new high yielding line with different genetic make-up was identified and its performance has been confirmed over years. The variety Khirman (SI-91195) is high yielding, widely adapted to different environments particularly abiotic stresses. The variety Khirman is suitable both for normal and late planting and has the potential of producing higher yield under water stress conditions in comparison with other commercial varieties. The variety has produced significantly higher yield than contesting entries including checks in zonal, national and other water stress trials over the years. The addition of Khirman as a new variety in the varietal complex of Sindh province has increased the genetic diversity at one end and will enhance the overall productivity at the other.

ICPS-291 - EFFECT OF WATER STRESS ON YIELD AND YIELD COMPONENTS OF SEMI-DWARF BREAD WHEAT (*TRITICUM AESTIVUM* L.)

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Abstract: Water stress is one of the main yield limiting factors for different crops including wheat in Pakistan. One of the greatest challenges facing breeders is how to use scarce resources in an equitable and sustainable way. This stresses the need to increase the productivity of wheat crop under available limited water resources. The breeding efforts were therefore, undertaken to evolve wheat genotypes, which possess tolerance to water stress and produce higher yields with one or two irrigations. Twenty-one drought-tolerant genotypes developed through hybridization and mutation breeding were evaluated

along with four drought-tolerant check varieties viz., Chakwal-86, Margalla-99, Thori (awnless) and Sarsabz under water stress conditions. Four experiments having 4 different irrigation treatments viz., single, two, three and four were conducted at NIA, Tando Jam. Observations on morphological (plant height, 1000-grain weight, grain yield), phenological (days to heading, days to maturity, grain filling period) and meteorological parameters were recorded. Genotype NIA-8/7 produced significantly the highest 1000-grain weight (37.9, 41.7, 42.0, 45.5g) at single, two, three and four irrigations respectively than other genotypes including check varieties; hence more tolerant to water stress conditions. Ten genotypes viz., BWM-3, NIA-8/7, 25/1, MSH-14, MSH-17, MSH-36, BWS-77, BWS-78, BWM-47 and Khirman produced higher grain yield (>3500 kg/ha) with two irrigations; indicated tolerance to water stress environments.

ICPS-292 - EFFECTS OF SOWING DATES ON YIELD AND YIELD COMPONENTS ON MUTANT CUM HYBRID LINES OF BREAD WHEAT

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[Nuclear Institute of Agriculture (NIA), Tando Jam, Sindh, Pakistan]

Abstract: Twenty-one stable mutants lines developed through indirect use of mutagenesis (intraspecific hybridization cum radiation-induced mutations) were evaluated along with four check varieties viz., Sarsabz, Kiran-95, T.J.83 and Khirman. Experiments were conducted for two years with four replications under normal and late planting at Nuclear Institute of Agriculture, Tando Jam. The observations were recorded on yield and its associated traits i.e., plant height, 1000-grain weight, grain yield/plot, spike length, spikelets/spike, grains/spike, grains/spikelet, single grain weight and main spike yield. Phenological data on days to heading, grain filling period and days to maturity were also recorded. To see the effects of heat stress on yield components of newly developed mutant lines, the meteorological data on daily minimum and maximum temperature and humidity were observed during entire cropping season. Terminal heat stresses (>30^{o}C) were observed during grain filling period of the crop. Eleven mutant lines possessed improved yield components and produced higher grain than Sarsabz, T.J.83 and Khirman while four produced more grain yield than Kiran-95 at late planting time. At normal sowing time twelve mutant lines matured earlier than T.J-83 and Khirman whereas two lines were earlier than Sarsabz and Kiran-95. At late sowings, eight mutant lines showed early maturity than T. J-83, Khirman and Kiran-95; however, two matured earlier than Sarsabz. One thousand grain weight and grain yield of wheat genotypes reduced at late sowings as compared to normal planting time. Eleven mutant lines produced significantly more 1000-grain weight than commercial wheat varieties Sarsabz and short duration variety T.J-83 while 5 mutant lines had more 1000-grain weight than Khirman and Kiran-95 under late planting time.

ICPS-293 - MACRO AND MICRO-MORPHOLOGICAL STUDIES IN BREAD WHEAT GENOTYPES UNDER RESIDUAL MOISTURE OF RICE CROP

M. N. YOUSUF ZAI

[Nuclear Institute of Agriculture (NIA), Tando Jam, Sindh, Pakistan]

Abstract: Six bread wheat genotypes (Pasban, Rohtas, Sind-81, Lu-26-S, Chakwal-86 and DS-17 were grown during rabi season 2005-2006 on the residual moisture of rice field, at the experimental field of NIA TandoJam. Significant differences were observed in macro and micro-morphological traits. The genotypes Pasban and Lu-26-s showed longer spike, higher grain /spike and higher grain yield under drought condition as compared to other. Pasban and Lu-26-s also showed more tolerance in micro-morphological traits such as stomatal frequency /mm^2, epidermal cell frequency/mm^2 and stomatal length in flag leaf as compared to others.

ICPS-294 - EFFECT OF DIFFERENT PICKING DATES ON SEED MATURITY ANDVIABILITY, LINT RATIO AND STAPLE LENGTH IN *GOSSYPIUM HIRSUTUM L*.

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[Nuclear Institute of Agriculture, Tando Jam, Sindh, Pakistan]

Abstract: The cotton seed maturity and viability are badly affected in the humid agro-ecological zone of southern Sindh prevailed with high wind velocity and high (> 65%) relative humidity. A study of six picking dates on weekly basis was designed in comparison to one sole picking treatment to determine the impact of different picking dates over seed maturity/viability and lint quality. The treatment 2nd, 3rd and 4th of almost all varieties contributed approximately 93, 84, and 78% germination separately as compared to approximately 37% germination of sole treatment. The frequent picking treatments envisage better lint ratio, staple length, higher seed index and seed maturity. The constraints responsible to deterioration of seed viability and lint quality will be discussed in detail.

ICPS-295 - COMBINING ABILITY AND HETEROSIS FOR YIELD CONTRIBUTING TRAITS IN UPLAND COTTON

S. ABRO, M. M. KANDHRO, S. LAGHARI, M. A. ARAIN AND Z. A. DEHO

[Nuclear Institute of Agriculture, Tando Jam, Sindh, Pakistan]

Abstract: A 4x4 complete diallel cross between Sadori, CRIS-134, Sohni and CIM-448 was designed to estimate the general and specific combining abilities of genotypes and to detect the degree and direction of heterosis and selection of promising recombinants for future breeding programme. The results of GCA showed that the variety Sadori exhibited higher array mean and proved best general combiner for plant height, sympodial branches/ plant and number of bolls/ plant. While the crosses Sadori x CIM-448 and Sadori x CRIS-134 exhibited high SCA effects for boll number/plant. All the crosses showed positive magnitude of heterosis over mid and better parental means for plant height. The crosses Sadori x CIM-448 followed by CIM-448 x Sohni and CIM-448 x Sadori exhibited positively higher heterosis and heterobeltiosis for seed cotton yield/plant due to higher heterotic effects for boll number/plant respectively.

ICPS-296 - COTTON LEAF REDDENING AND EFFECT ON COTTON YIELD

M. M. KANDHRO, S. LAGHARI, H.M. AHMED, S. ABRO, AND N. DEPAR

[Nuclear Institute of Agriculture, Tando Jam, Sindh, Pakistan]
Abstract: The leaf reddening of Gossypium spp was first reported in southern Pakistan (Sindh) in 2001. The symptoms appeared with yellowing of leaves and then turned to red at adult plant stage. The seedcotton and lint yield (kg/ha) were decreased upto 27% and 30% respectively in Distt: Sanghar and Mirpurkhas. The collection of germplasm/strains and, local/commercial varieties of cotton showed varying response for leaf reddening screening. It was not genetical but it was rather due to complex factors associated with drought conditions. The application of foliar spray of essential macro and micro nutrients K, Zn, Mg and B did not exhibit visible symptoms. However, leaf analysis showed the partly reddening of leaves in control treatments due to the deficiencies of K and Zn nutrients.

ICPS-297 - PYRAMIDING OF VERTICAL AND HORIZONTAL RESISTANCE GENE(S)/TREATS "A PATH WAY TO ENHANCE DURABLE RESISTANCE AND YIELD IN BREAD WHEAT"

S. KHANZADA

[Nuclear Institute of Agriculture, Tando Jam, Sindh, Pakistan**]**

Abstract: Emergency, occurrence and infestation of new races/virulence/pathotypes of yellow rust (Attilla virulences Yr 27), stem rust (Kiran-95 virulence), and leaf rust pathotypes "104-1, 2, 3, (6), (7), 11" on mega wheat varieties under cultivation on large scale all over the wheat growing areas of Africa, Asia and Australia, have caused tremendous losses in space and time. This is also a threat for future harvest of wheat crop on global basis. The situation therefore demands an urgent need of strategic planning for their management through breeding rust resistance varieties and their deployment, as that is only option for third world countries. At Nuclear Institute of Agriculture Tando Jam efforts have been made to overcome the problem through new genetic combinations. New idiotypes of bread wheat with enhanced durable resistance against prevailing virulence of rust diseases endowed with high yield and yield components (not reported earlier) have been developed. These genotypes possess vertical and horizontal resistance genes, coupled with agronomic and economic traits and are the valuable assets for utilization in wheat breeding programme for today and tomorrow. Future possibilities of improving genetic stock available at different research institutes willl be discussed in the light of present and future perspectives of disease spectrum at global and regional levels.

ICPS-298 - RE-OCCURRENCE OF NEW STEM RUST RACE (KIRAN VIRULENCE) IN SOUTHERN PAKISTAN AND ITS POTENTIAL DANGER FOR NATIONAL FOOD SECURITY

S. KHANZADA

[Nuclear Institute of Agriculture, Tando Jam, Sindh, Pakistan]

Abstract: A new stem rust race (Kiran virulence) detected and reported in South Pakistan Sindh during Rabi 2000-01 found virulent on mega wheat variety Kiran-95. Its reoccurrence /infestation at Jhudo site, district Mirpurkhas,Sindh, South Pakistan was re-observed with high intensity on mega wheat varieties Kiran-95,T.J-83, Sarsabz,T.D-1 and Inqilab-91 during Rabi 2005-06 and 2006-07. The susceptibility of commercial wheat varieties being planted on large scale in the country and candidate varieties will be discussed along with its potential threat for future sustainable wheat production and impact on national food security.

ICPS-299 - YIELD AND YIELD COMPONENTS WITH RELATION TO PLANT HEIGHT IN SEMI-DWARF WHEAT

K. D. JAMALI AND S. A. ALI

[Nuclear Institute of Agriculture, Tando Jam, Sindh, Pakistan]

Abstract: Eighteen genotypes including two check varieties were compared for yield and yield components. In this yield comparison lines 04 and 08 had the highest grain yield per plot. The subsequent lines which had higher grain yield was 06. The possible reason for the highest grain yield in line 04 could be due to the longest spike length, the higher number of spikelets per spike, higher number of grains per spike, higher grain yield of main spike and higher grain weight. Correlations were calculated for pooled yield and yield components for the data of various genotypes. Plant height showed positive and highly significant correlation with spike length, number of spikelets per spike, number of grains per spike and main spike grain yield but no correlation with number of grains per spikelet. Main spike grain yield exhibited positive and highly significant correlation with plant height, spike length, number of spikelets per spike, number of grains per main spike and number of grains per spikelet.

ICPS-300 - PERFORMANCE OF SOME ADVANCED LINES OF WHEAT AT DIFFERENT SOWING DATES

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[Nuclear Institute of Agriculture, Tando Jam, Sindh, Pakistan]

Abstract: Twenty wheat (*Triticum aestivum*,L) genotypes, including four local check varieties, were evaluated for yield and yield components at two sowing dates i.e normal (November) and late (December) sowing. Seeding was done at the rate of 125 and 150 kg/ha under normal and late sowing respectively. The parameters like days to heading, days to maturity, plant height, grain filling period, grain yield, thousand grain weight, spike length, spikelets per spike and number of grains per spike were studied. A distinct variation for different agronomic traits was found among the genotypes studied. Almost all the parameters showed drastic decline at late sowing as compared to normal planting. Grain yield, number of grains per spike and thousand grain weights of advanced genotypes tested were superior to check varieties at early sowing dates. However grain yield, number of grains per spike and thousand grain weight of Mani-4 and Mani-9 were inferior than local checks. Almost similar trend was observed under late plantation. However, over all 2-15% reduction in grain yield was recorded due to late planting. The performance of four entries i.e Mani-1, Mani-8, Mani-14 and Mani-16 were superior than check varieties at both sowing dates. Six strains, i.e Mani-2, Mani-3, Mani-6, Mani-7, Mani-10 and Mani-13, were at par to the checks, while the remaining strains were inferior in their performance at normal sowing. Three other entries i.e. Mani-6, Mani-7 and Mani-15 were also superior than check varieties at late sowing. Six genotypes viz: Mani-1, Mani-2, Mani-3, Mani-11, Mani-12 and Mani-13 were at par with check varieties and remaining three entries, i.e. Mani-4, Mani-5 and Mani-9,were inferior than check varieties at late sowing. Among the check varieties Sarsabz performed well under both the sowing dates.

ICPS-301 - EVOLUTION OF FIRST HIGH YIELDING LENTIL VARIETY THROUGH INDUCED MUTATIONS IN SINDH

J. A. F. ALI AND N. A SHAIKH

[Nuclear Institute of Agriculture, Tando Jam, Sindh, Pakistan]

Abstract: Genetic manipulation through induced mutations has been very instrumental in crops improvement. Genetic variability in lentil was created in a non exotic variety M- 85 and exotic variety ICARDA- 8 by treating with different doses of gamma rays ranging from 100 – 600 Gy. After creating induced diversity for elite plant traits, desirable mutants were selected in M_2 for high yield, earliness and 100 grain weight. These mutants were confirmed for their yield contributing characters and growth behavior in M_3 generation. True breeding mutant lines were evaluated further for their yield potential. The promising mutant strains having better yield potential were tested for yield and other important agronomic traits at different stations and advance yield trials. Mutant strain AEL 49/20 produced highest grain yield in zonal yield trials conducted under various agro climatic zones in Sindh province. Observing its better performance, AEL 49/20 was promoted in National uniform yield trials, where it ranked first in the province of Sindh. On the basis of outstanding performance it is approved and released as the first lentil variety "NIA- MASOOR-05" in the province of Sindh for general cultivation. In this paper enhancement of genetic potential for improvement of lentil is discussed.

ICPS-302 - GENETIC MANIPULATION OF LENTIL THROUGH INDUCED MUTATIONS

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Abstract: Induced mutation in crops improvement plays an important role in manipulating the genetic structure of plant. Drought is considered to be the major environmental stress that limits lentil yields. Genetic diversity in lentil (*Lens culinaris* Medik) was developed in a local variety Masoor- 85 and exotic cultivar ICARDA- 8 by treating with gamma rays ranging from 100 – 600 Gy. Desirable segregants were selected in M_2 for high yield, earliness and improved100 grain weight. These mutants were confirmed

for their yield contributing factors and growth behavior in M_3 generation. True breeding lines were evaluated for yield potential under residual moisture of rice crop in the field and to screen down suitable drought resistance genotypes which can cope with the prevailing water shortage in Sindh. The promising mutant strains giving better yield potential were tested for yield and other agronomic traits in different station yield trials. Mutant strain AEL23/40 produced highest grain yield in zonal trials conducted under different agro-ecological zones in Sindh province. Observing its better performance AEL 23/40 was promoted to National yield trials, where it ranked first in the province of Sindh. In this paper performance of lentil mutant lines evaluated under residual moisture of rice crop and enhancement of genetic potential for drought resistance is discussed.

ICPS-303 - HETEROSIS FOR ECONOMICALLY USEFUL CHARACTERS IN INTRA SPECIFIC HYBRIDS OF UPLAND COTTON

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Abstract: Six intra-hirsutum F_1 hybrids were evaluated for heterosis and heterobeltiosis in seven important characters of cotton. The experiment was carried out in Randomized Complete Block Design (RCBD) with four replications. Analysis of Variance revealed that parents and their F_1 hybrids differed significantly for all the traits except GOT%, indicating the existence of great genetic variability in number of sympodial branches per plant, number of bolls per plant, boll weight, staple length, seed index and seed cotton yield per plant. The hybrid Reshmi x Rahmani displayed outstanding performance in case of sympodial branches, boll weight, GOT%, staple length and seed index, whereas, the hybrid Qalandari x Rahmani manifested remarkable performance in case of number of bolls per plant and seed cotton yield per plant. Both the hybrids also displayed heterotic performance in sympodial branches and seed cotton yield per plant. Therefore, may be selected out as superior hybrids and on the criteria of genetic selection parameters, which can be exploited as a source of generating new high yielding genotype for commercial utilization.

ICPS-304 - GENETIC IMPROVEMENT OF AN INDIGENOUS AROMATIC VARIETY "JAJAI 77" THROUGH MUTAGENESIS

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[Nuclear Institute of Agriculture, Tando Jam, Sindh, Pakistan]

Abstract: The mutant Jajai-25/A has been developed from an indigenous aromatic rice variety Jajai 77 through the radiation of gamma rays (250 Gy). The mutant Jajai-25/A was initially selected on the basis of short plant stature, lodging resistance and improved yield components. After confirmation, the performance was evaluated in preliminary and advanced yield trials. The analysis of variance of different trials revealed significant differences among all the mutants, parents and check varieties. This mutant was significantly better than its mother variety Jajai 77 in respect of all the yield and yield contributing traits. It has shown consistency in better paddy yield than all the mutant lines including its parent and local check in various preliminary and advanced yield varietal trials at Nuclear Institute of Agriculture Tando Jam. Pooled performance of three years showed that Jajai-25/A produced 57% and 33% higher paddy yield than its parent and check variety Super Basmati. The mutant maintained its yield superiority in the zonal trials in Sindh province and produced 3911 kg/ha in comparison to Super Basmati (2941kg/ha). In the national trials, it confirmed yield superiority and ranked first (4372 kg/ha) on the national level (NURYT-2006). The mutant Jajai-25/A provides an example of peaceful use of atomic energy in agriculture.

ICPS-305 - GENETIC VARIABILITY AND CORRELATION STUDIES IN RICE (*ORYZA SATIVA* L.)

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Abstract: Eighteen M_5 mutants of paddy developed by radiating the three rice varieties IR8, Shua 92 and Sarshar with gamma rays at three different doses (150Gy, 200Gy, 250 Gy) were evaluated for seven quantitative characters at Nuclear Institute of Agriculture, Tando Jam during kharif 2006-07. All mutants showed significant differences for all characters studied. Genetic coefficient of variation was high for grain yield per plant whereas estimates were low to moderate for remaining traits. High heritability values were associated with high genetic advance with respect to days to 50% flowering, number of fertile grains per panicle and grain yield per plant indicating the presence of additive genes. Selection for these characters therefore has the most potential for further improvement. Correlation studies revealed that grain yield per plant showed positive nad significant genotypic correlations with days to 50% flowering, number of fertile grains per panicle and 1000 grain weight while it showed negative correlation with plant height indicating that these traits should be considered as priorities in a breeding programme to increase grain yield.

ICPS-306 - ESTIMATION OF GENTIC DIVERSITY IN YIELD COMPONENTS IN EXOTIC MATERIAL OF BREAD WHEAT

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Abstract: Bread wheat is the principle food source for the majority of population. With the introduction and domestication of CIMMYT semi-dwarf fertilizer responsive varieties, there has been dramatic increase in world wheat production. At CIMMYT, Mexico, breeding material is generated through hybridization and other breeding methods. This material is evaluated and made available to the member counties for their use. In the present studies 174 lines included in 39th International Bread Wheat Screening Nursery (39IBWSN) from CIMMYT was evaluated along with commercially grown varieties (Sarsabz, T.J-83 and Kiran-95) for comparison. The plant observations were recorded on morphological as well as on yield and yield components. Significant variation was observed for most of the studied traits, for instance, the flag leaf ranged between 15.5 to 28.94cm, plant height between 71.0 and 104.2 cm, number of grains per spike between 33 and 78, days to heading between 64 to 88 and maturity between 101 to 125 in Tando Jam condition. The experimental results are discussed with improvement over check varieties and correlations among different characters.

ICPS-307 - GENETIC VARIATION FOR PRODUCTIVE TRAITS IN NEW BREAD WHEAT STRAINS OF PAKISTAN

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Abstract: Successful strategies in wheat breeding to produce genotypes with higher yield, increased resistance to biotic and abiotic stresses, better quality and other beneficial properties are based on the available diversity of genetic resources. Development of high yielding varieties showing stability in

performance under different agro-ecological conditions is very important for achieving sustainability in production. Hence new lines are evaluated in national trails in the country. One such trail comprising 19 advanced genotypes was planted along with local check variety at NIA Tando Jam to assess the genotypes for the variation among characters of agronomic significance, including grain yield. Significant differences among genotypes were observed for flag leaf length and width, plant height and internode lengths, spike characters, seed index and number of days required for heading and maturity. Genotypes superior to national check Sehar-06 and local check Sarsabz were identified for yield and yield contributing characters. Flag leaf established positive correlations with first internode length (0.866), spike length (0.581), number of grains per spike ((0.429), days to heading (0.429) and maturity (0.441). Some negative correlation coefficients were also obtained but their values were not significant.

ICPS-308 - IDENTIFICATION OF RESISTANT SOURCE OF *ASCOCHYTA* BLIGHT FROM LOCAL LENTIL GERMPLASM

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Abstract: Ninety local lentil accessions were evaluated under greenhouse as well as in the field conditions against a virulent isolate of *Ascochyta lentis*. Significant differences for both disease stages and accessions were observed with major portion contributed by disease stages. On the basis of provincial distribution, none of the accessions from Baluchistan and Northern Areas was highly resistant at either stage. Two accessions (5473, 5490) from Punjab and one (5569) from Sindh were highly resistant. Among all the accessions, 5473, 5490, 5499, 5569, 5545, 5547, 5548, and 5570 were resistant against *Ascochyta* blight and these could be used in the lentil hybridization program for development of blight resistant varieties with high yield potential. Due to linear relationship between two screening methods it was suggested to screen huge lentil germplasm at seedling stages under greenhouse conditions and then only resistant and tolerant accessions could be screened at flowering or adult plant stage under field conditions to economize time and labour.

ICPS-310 - MAXIMIZING COTTON (*GOSSYPIUM HIRSUTUM* L.) PRODUCTION ON BORON AND ZINC DEFIENCT SOIL: GROWTH AND PHOTOSYNTHESIS

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Abstract: In order to enhance cotton production on boron and zinc deficient soil, in a field experiment, varying levels of boron and zinc (5, 7.5, 10 and 12.5 kg/ha) were supplied to cotton cv. CIM-498 grown in boron and zinc deficient soil. From the results, it was obvious that addition of boron and zinc enhanced the growth and yield of cotton. Although addition of both boron and zinc enhanced the net CO_2 assimilation rate, no positive relationship can be drawn between growth and photosynthesis. Similarly, parallels can not be easily drawn among various gas exchange attributes such as transpiration rate, stomatal conductance and water use efficiency. However, boron and zinc induced enhancement in photosynthetic pigments are positively correlated with growth. Furthermore, this relationship was stronger in boron compared with that of zinc. Thus, addition of boron and zinc might have promoted synthesis of photosynthetic pigments which in turn increased growth and yield. However, this effect was more pronounced with boron application.

ICPS-311 - EFFECT OF EUCALYPTUS LITTER ON GROWTH AND NODULATION OF *VIGNA RADIATA*

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Abstract The effect of Eucalyptus leaf litter on growth and root nodulation of mung bean (*Vigna radiata* {L.} R. Wilczek) was studied in pot experiment under natural conditions. There were five Eucalyptus litter treatments (0%, 8%, 16%, 24%, and 32% on v/v basis) applied in garden soil. The experiment was set up in completely randomized design with nine replicates for each treatment at each harvest. The four harvests were taken at the following developmental/physiological stages: start of flowering, start of pod formation, middle of pod formation, and seed maturity. A number of growth parameters were used to collect data at each harvest. The data was subjected to statistical analysis by applying Analysis of Variance (ANOVA) and the means were compared by Duncan's Multiple Range Test (DMRT). The Eucalyptus litter treatments generally showed adverse effect on various parameters of vegetative growth, reproductive growth and root nodulation of mung bean. The adverse effect increased with increasing Eucalyptus litter treatments. The results highlighted negative effect of Eucalyptus plantation on the growth and yield of mung bean.

ICPS-312 - USING RAPD ANALYSIS AS BIOINDICATOR OF GENOTOXIC EFFECTS OF BORON IN CROPS

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Abstract: Boron is an essential micronutrient for higher plants and plays an important role in some plant functions in metabolic pathways, membrane structure and many other functions in plants. Not only deficiency create problems, but also the excess concentration cause some toxic effect in plants. Boron toxicity is an important disorder that can limit plant growth on soils of arid and semi arid environments throughout the world. In recent years, several tests have been developed to evaluate the toxicity of environmental contaminants on plants. In this study, bean (*Phaseolus vulgaris* L.) and wheat (*Triticum aestivum* L.) seedlings were used as bioindicators to determine genotoxic effects of different concentrations of boron. Inhibition of root growth in the bean and wheat seedlings was observed with an increase in the boron concentration. The changes occurring in random amplified polymorphic DNA (RAPD) profiles of root tips following boron treatment included variation in band intensity, loss of normal bands and appearance of new bands compared with the normal seedlings. Additionally, we found that the effect of changes was dose-dependent. These results indicated that genomic template stability (a qualitative measure reflecting changes in RAPD profiles) was significantly affected at high boron concentration. Thus, DNA polymorphisms detected by RAPD analysis could be used as an investigation tool for environmental toxicology and as a useful biomarker assay for the detection of genotoxic effects of boron pollution on plants.

ICPS-313 - EFFECT OF HUMIC COMPOUNDS ON MITOSIS AND CELL GROWTH IN ROOTS OF ONION (*ALLIUM CEPA* L.*)*

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Abstract: An experiment was conducted to asses the effect of humic compounds on two varieties of onion (Allium cepa.L.) i.e. darkred and phulkara. Different levels of humates were applied to onion in different experiments. In first experiment shoot did not appear in first 6-7 days. Incidentally, the root

proliferation was not very active and the root appeared to be unhealthy and damaged significantly. The root length was decreased with increase in humates concentration. The root number was increased in both varieties. In second experiment root length was decreased due to addition of humates and ranged between 2 and 9.5 cm in different treatments. The number of root was increased and per bulb varied <40 and >70 in different treatments. In third experiment, results were same but this time dark red was more responsive than phulkara. Concentration of humates above 0.5 ml had negative effect in both varieties. In fourth sand culture experiment root number and root length were approximately similar in both humates and control. Cell size and mitotic index were also noted in this experiment. The mitotic index showed a variation between 51 and 62 and was not very different for the two varieties. Minimum values of cell length recorded were <1 and 1.5 µm, while cell width was <0.5 and 1.3 µm in the absence and presence of humates, respectively. In the last experiment two bulbs of approximately similar size was removed from the dish and placed on top of the vials containing 20 ml water or 20 ml water plus. 5 ml of a neutral (pH 7.0) solution of humates as used in other experiment. An important observation, however, was that healthy shoot started emerging under the influence of humates. No shoot emergence was apparent in the absence of humates. It is evident here that in contrast to root, humates stimulated the emergence shoot in onion.

ICPS-314 - INDUCTION OF STRESS PROTEINS UNDER WATER DEFICIT CONDITIONS IN UPLAND AND LOWLAND RICE VARIETIES

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[Nuclear Institute for Agriculture and Biology (NIAB), Jhang Road Faisalabad]

Abstract: Different rice varieties and their hybrid derivatives were grown under water stress levels (one, three weeks irrigation and control). The objective was to study the induction of low and/or high molecular weight proteins in parents and hybrids under water deficient conditions. Induction of stress proteins were analyzed on 10 % concentration of Polyacrylamide Gel Electrophoresis (PAGE). Hybrid derivative of first set of varieties (IR-56 and OS-6) showed that hybrids were well adapted under three weeks irrigation compared to one week and control (full irrigation). Results indicated that adaptation of to water stress is better than parents. Similarly hybrid derivatives of second set of varieties (IR-56 and CG-14) showed good adaptation in one and three week irrigation as compared to control. Induction of low molecular weight proteins was observed in these genotypes. It was evident from results that hybrid of these upland and lowland rice varieties performed better under water deficient conditions than under normal irrigation conditions which can be used to bring improvement in the flooded rice varieties against water stress.

ICPS-315 - EVALUATION OF SALT TOLERANCE BASED ON MORPHOLOGICAL AND YIELD PARAMETERS IN WHEAT (*TRITICUM AESTIVUM* L.)

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Abstract: A pot experiment was conducted to asses the salt tolerance of three wheat genotypes(Inqlab, N-1073 and N-9760) growing under different salinity levels i.e. 1.5 (control), 5, 10 and 15 dSm^{-1}.Fresh and dry weights of shoot and root of three wheat genotypes were significantly reduced by increasing levels of salinity. Minimum reduction in the above mentioned parameters was observed for N-9760 showing its tolerant behavior. Three wheat genotypes also differed significantly in shoot and root length under control and stress conditions. Maximum reduction in root and shoot length was observed in N-9760 and Inqlab respectively at EC 15 dSm^{-1}. However, minimum reduction in both the parameter was observed in N-1073 and Inqlab for shoot and root length, respectively. Reduction in plant height at all salinity levels and in all the genotypes is significant with maximum being observed in Inqlab at EC 15 dSm^{-1}. Reduction in spike length is only significant at EC 5 and 10 dSm^{-1} while these

differences are not significant at EC 15 dSm^{-1}. The number of tillers and leaves and leaf area reduced significantly in Inqlab indicating thereby that this genotype (commercial cultivar) is salt sensitive and is not fit for cultivation on saline lands. The highest grain yield was recorded for genotype N-1073 under salinity which could possibly be due to the presence of more number of productive tillers $plant^{-1}$and spikes. Although the three wheat genotypes differed significantly in most of the parameters but the overall behavior of N-1073 under saline conditions was the best, which is an indication of its salt tolerance.

ICPS-316 - DIFFERENCES IN AGRONOMIC AND PHYSIO-CHEMICAL PERFORMANCE OF VARIOUS RICE VARIETIES AND THEIR HYBRID DERIVATIVE GROWN UNDER WATER DEFICIT CONDITIONS

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Abstract: Different upland and lowland rice varieties (IR-56, WAB56-104) and their hybrid derivative were studied under control (non-stress) and water stress conditions. The objective was to detect variations in adaptation of exotic varieties and hybrids under water deficit conditions on the basis of physico-chemical parameters such as transpiration rate, stomatal conductance, net photosynthesis, grain yield $plant^{-1,}$ CO_2 assimilation, proline and abscisic acid (ABA). Hybrid of these varieties showed low stomatal conductance which in return reduced transpiration rate as compared to their parent varieties under control and stress levels (one/three weeks irrigation). Hybrid showed better adaptation to stress conditions as compared to control and maximum net photosynthesis, CO_2 assimilation and chlorophyll fluorescence were observed at one week irrigation. Hybrid derivative of these rice varieties accumulated more proline and ABA under stressed condition than control. On the basis of biochemical analysis it is evident that hybrid derivative of these rice varieties can grow better in water stress conditions as compared to control. The varieties and derivative tested in this study can be used to bring improvement in these parameters for flooded rice varieties under water stress conditions.

ICPS-317 - EFFECT OF SALICYLIC ACID ON SEEDLING GROWTH AND METABOLIC ACTIVITIES IN MUNG BEAN (*VIGNA RADIATA* L. WILCZEK) UNDER SALINE CONDITIONS

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Abstract: An experiment was conducted in the laboratory to study the effects of salicylic acid on seedling growth and biochemical parameters in mung bean under saline conditions. In the present studies, application of the test levels of NaCl to mung bean adversely influenced growth and biochemical parameters (seedling shoot and root lengths, and seedling fresh weights of shoots, seedling shoo/root ratio) as compared with control. α-amylase activity, increased with the application of salicylic acid as compared to control whereas it decreased under salt stress conditions. Sugars (reducing and non-educing), protease activity, amino acids decreased abruptly under salt stress conditions as compared to control but an increase over control was observed with the application of salicylic acid. Protein contents increased under saline conditions as compared to control but almost equal with salicylic acid application as compared to control and increased under combined treatment of salinity and salicylic acid. The correlations among different seedling growth and biochemical characteristics showed that some of the seedling growth parameters had significant positive as well as negative association with biochemical parameters.

ICPS-318 - SPATIO-TEMPORAL VARIATIONS IN PHYSIOCHEMICAL PARAMETERS OF *ADIANTUM CAPILLUS VENERIS* IN SOONE VALLEY OF SALT RANGE IN PAKISTAN

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Abstract: In this study, spatio-temporal variations in biochemical and physicochemical parameters of *Adiantum* shoots during different seasons and at different sites of Soone Valley in Salt Range were investigated. *Adiantum* was located only at two sites *i.e.* at Knotty garden during all the four seasons and at Dape sharif site only during spring. All the parameters studied varied significantly during different seasons and at both sites. It was observed that dry matter, fiber and total mineral contents were maximum during winter whereas, moisture, fat and protein contents were the highest during autumn at Knotti Garden site. In contrast, NFES and NFE were found higher during spring at Dape sharif. Among the ionic contents studied, Ca, P and Fe were higher during spring at Dape Sharif where as N and K were more during autumn at Knotti Garden. Mg and Zn were maximum during summer and spring at Knotti Garden respectively. Partial RDA of the data obtained reveled that Phenols and flavonoids were associated with spring at Knotti Garden whereas, alkaloids were associated with spring at Dape Sharif. It was concluded that association of phenolics and falvonoids with Knotti Garden was due to low temperature stress, where that of alkaloids with Dape Sharif with high pH and EC of the site.

ICPS-319 - TEMPORAL VARIATIONS IN ECOPHYSIOLOGICAL ATTRIBUTES OF *MENTHA LONGIFOLIA* AT KNOTTI GARDEN (SOONE VALLEY) IN SALT RANGE OF PAKISTAN

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Abstract: Temporal variations in biochemical and physiological parameters of *Mentha longifolia* shoots at Knotti Garden in Soone Valley of Salt Range were investigated. All the parameters studied, varied significantly during different seasons. Maximum fats, proteins, NFES, NFE, phenol, flavonoids and certain minerals were observed during winter where as dry matter, fiber and total mineral were higher during summer and moisture contents, K and alkaloids were associated with autumn. Association of most of the biochemical parameters with winter were correlated with maturity of the plants where as phenols and flavonoids were correlated with some kind of stress particularly low temperature stress. However, association of minerals with summer was correlated with more water available due to high rain fall and high transpiration rate due to high temperature.

ICPS-320 - ANTIFUNGAL ACTIVITY AND COAGULATION KINETICS OF SEED EXTRACTS OF *WHITANIA SOMNIFERA*

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Abstract: The current study was undertaken to investigate antifungal activity of *Whitania somnifera* against a panel of opportunistic fungi *Fusarium solani* and *Alternaria solani* by disc diffusion method. Appreciable inhibition zones were formed by crude, supernatant, residue and dialysed samples of *Whitania somnifera* against both the fungal strains. The crude extract exhibited pronounced activity against *Alternaria solani* with 21 mm zone. Ethanolic extract also showed significant inhibition with MIC

0.1µg/mL. The plant seed extracts prepared in distilled water, 5% NaCl and potassium phosphate buffer showed high coagulative effect in Koalin clay suspension (turbid water). The plant seed protein coagulated well the particles in the samples. It is worth noting that potassium phosphate buffer extract showed high activity among all the extracts at high turbidity and distilled water extract at low turbidity, that is comparable to previously used chemical sorbent (alum). Based on our findings, we suggest that *Whitania somnifera* hold promise as a candidate for broad spectrum disease protection, so a resource for new biofungicide and may also serve as good starting material for the synthesis of environment friendly natural coagulant and disinfectants.

ICPS-321 - EVALUATION OF TOTAL SEED STORAGE PROTEINS OF CHICKPEA USING SODIUM DODECYL SULPHATE POLYACRYLAMIDE GEL ELECTROPHORESES

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Abstract: Food legumes are an important source of proteins. In Pakistan mainly 4 kinds of pulses (food legumes) are grown viz; chickpea, lentil, mungbean and mash. Chickpea is grown as rabbi (cold season) crop. During 2004-2005, it was cultivated on an area of 982,300 ha with a total production of 611,100 metric tones giving an average yield of 1.61 tones/ha. Like any other crop, information regarding genetic diversity in the germplasm is important for chickpea breeding. Present study was conducted to analyze genetic diversity in Pakistani germplasm of chickpea using seed storage protein. Relatively lower level of genetic polymorphism(GD = 0-0.8) was observed in the material. Fifty seven chickpea genotypes were grouped in seven cluster using dendrogram analysis.

ICPS-322 - SEED STORAGE PROTEIN PROFILE OF RICE VARIETIES COMMONLY GROWN IN PAKISTAN

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Abstract: Rice (*Oryza sativa*) is second most important human food in Pakistan after wheat. Mainly two types of rice viz; basmati and IRRI rice are grown on an area of 2.5 million ha in Pakistan. For establishment of successful breeding program, information regarding genetic diversity in local varieties /germplasm is of prime importance. Biochemical analysis based on seed storage protein profiles are commonly used for estimation of genetic diversity in many important commercial crop plants. During present study, seed storage protein profile of eleven released varieties / genotypes of rice were studied using SDS-PAGE. Lower level of genetic polymorphism (GD = 0 - 0.8) was estimated in the material. Six comparisons showed complete homozygosity (GD = 0%) for seed storage protein while one comparison showed maximum genetic difference (GD = 80%). Remaining comparisons showed varying degree of genetic differences among the rice varieties ranging from 20 – 70%.

ICPS-323 - RAPD ANALYSIS OF SOME LOCAL BREAD WHEAT CULTIVARS

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Abstract: Common (hexaploid) wheat (*Triticum aestivum* L.) is the most common cereal crop of the world. National average yield of wheat in Pakistan (2.5 tonnes per ha) is approximately 3 times less than national average of wheat in developed countries (6 tonnes per ha). For the improvement in yield of local varieties, indigenous breeding program is of prime importance. A prerequisite for successful breeding program is the knowledge of existing genetic diversity in local germplasm. Present study was aimed at studying genetic diversity in 24 wheat genotypes collected from NWFP and FATA area. Randomly Amplified Polymorphic DNA (RAPD) primer OPB-12 showed high amount of genetic variability (GD ranging from 0 - 100%) was estimated among various comparisons. Genotypes collected from "Darra Swabi" and "Kohat 1 white" were found most distantly related to each other and it is recommended that these two genotypes should be used in future breeding program to create much needed genetic variability in Pakistani wheat germplasm.

ICPS-324 - STUDIES ON GENETIC VARIABILITY AT HMW-GS LOCI IN COMMON WHEAT CULTIVARS OF PAKISTAN

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Abstract: Bread/common wheat (*Triticum aestivum* L.) is cultivated worldwide and is the most important human food grain in Pakistan. It is an allohexaploid with 2n = 6x = 42 chromosomes. The unique properties of the bread wheat grain reside primarily in the gluten-forming storage proteins of its endosperm (generally called seed storage proteins). During present research High Molecular Weight Glutenin Subunit (HMW-GS) pattern of wheat cultivars commonly grown in Pakistan was studied using SDS-PAGE. The study was carried-out using sixty-two wheat genotypes / landraces collected from different locations of NWFP and FATA area and 46 released varieties. Among the 62 cultivars collected from NWFP and FATA area, at *Glu1A* locus, 56 cultivars showed null allele while 6 genotypes showed "1" allele. At *Glu1B* locus, 25, 21, 4,and 9 cultivars exhibited 17+18, 7+8, 13+16 and 7+9 allele, respectively. At *Glu1D* locus, 54 genotypes had 2+12 and 8 genotypes had 5+10 HMW-GS allele. Among the 46 released varieties, approximately 20 % varieties showed "1" allele at *Glu-1A* locus while 80 % genotypes showed null allele ("0") at this locus. At *Glu1D* locus only 28 % genotypes (13 out of 46) had good bread making allele (5+10) while most of the genotypes (71 %) had 2+12 allele, which is associated with poor bread making quality.

ICPS-325 - ESTIMATION OF GENETIC DIVERSITY IN TEA GENOTYPES USING DNA BASED MARKERS

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Abstract: Tea (*Camellia sinensis*) is an important cash crop. Recently tea cultivation has been initiated in Mansehra district on experimental basis. Information regarding genetic diversity in tea is an important pre requisite for improvement quality and quantity of the product. Present study was conducted to estimate genetic variability in promising tea genotypes using Randomly Amplified Polymorphic DNA primers. On an average, 9.9 alleles per genotype were amplified using RAPD primers. High level of Genetic Diversity (GD values ranging from 0 – 100%) was estimated among the genotypes used. The results of cluster analysis based on RAPD markers revealed four groups among the 24 tea genotypes grown in Mansehra district. More genetic analysis using various molecular and biochemical markers is under process.

ICPS-326 - STUDIES ON GENETIC DIVERSITY IN COMMON OAK SPECIES USING SDS-PAGE

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Abstract: Common Oak (genus *Quercus)* belongs to family Fagaceae and comprises mostly monocous evergreen or deciduous trees. *Quercus* species are commonly found in temperate region of the world. Five Oak species of genus *Quercus* found in Pakistan are *Quercus baloot, Quercus dilatata*, *Quercus incana, Quercus glauca* and *Quercus semicarpifolia*. *Quercus* species are generally used for making furniture, forming tools, used as fuel, fodder, and as medicinal plants. During present study seed storage proteins in five species of common Oak commonly found in northern areas of Pakistan were analyzed using Sodium Dodecyle Sulphate Polyacrylamide Gel Electrophoresis (SDS-PAGE). A modified protocol was developed to separate seed storage protein of Oak. One sample of *Quercus Incana* collected from Shawer, Swat was identified where a protein band was missing indicating possibilities of previously miss identification of the species. More research work is needed for better understanding of the genetic structure of the species.

ICPS-327 - A SIMPLIFIED PROTOCOL FOR CALLUS INDUCTION AND PLANT REGENERATION IN MAIZE

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Abstract: Six maize genotypes were evaluated for their callusing response at different 2,4-D concentrations. Except EV-7004, all the genotypes showed callusing in the presence of 2,4-D in the induction media. Variability was observed not only among the genotypes but also within all genotypes at different concentrations of 2,4-D in the culture medium. The induction frequency of primary callus ranged from 40.32 to 77.47 percent depending on the 2,4-D concentrations. Calli could not be induced in induction medium in the absence of 2,4-D and mature embryos readily germinated within 2–3 days of culturing. However the five maize genotypes showed the highest induction of primary calli in the presence of 4.0 mg L^{-1} 2,4-D in induction medium. Most of the explants exhibited direct callusing without germination. Higher concentration of 2,4-D (5.0 mgL^{-1}) did not significantly change the callus quantity or quality.

ICPS-328 - CLONING, SEQUENCING AND IN SILICO ANALYSIS OF GERMIN-LIKE PROTEIN GENE 1 PROMOTER FROM ORYZA SATIVA L. SSP. INDICA

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Abstract: Germin and germin-like proteins constitute a large family of plant proteins which are also considered as germination markers due to their high expression levels during germination/early growth. These proteins are known to be involved in many stress related processes as well, but their biochemical functions and physiological roles have not been fully described. In order to gain insight into the functions and regulation of a rice germin-like protein gene 1, about 1.2 kb of its upstream region was amplified, cloned, sequenced and analyzed. Analysis showed that this promoter has very little homology with the promoters of other GLP genes within rice genome, although some short sequences of this promoter were found conserved within the promoters of two GLPs on rice chromosome 8. These conserved sequences contain some putative regulatory elements. This promoter being unique requires further characterization to explore its regulatory role.

ICPS-329 - RESPONSE OF RICE TO DIAZOTROPHIC (*AZOTOBACTER + AZOSPIRILLUM*) INOCULATION

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Abstract: Microbial inoculants contribute towards plant growth promotion through sustainable management of plant nutrients by biological nitrogen fixation, bio-control of soil pathogens, stress relief and production of growth hormones. N-fixation by free living microorganisms have got much attention in the recent past as the area under cereals, forages and fiber crops of the world are much higher than the legumes. Species of the diazotrophic genera like *Azotobacter*, *Azospirillum* and *Acetobacter etc.* have proved their worth as commercial inoculants in numerous studies around the world by synthesizing plant hormones, antibiotics and vitamins. Field studies were conducted at the Soil Salinity Research Institute (SSRI), Pindi Bhattian and Agronomic Research Station (ARS), Farooqabad to see the rice crop (Shaheen Basmati) benefits due to diazotrophic (a consortium of *Azotobacter chroococcum* and *Azospirillum lipoferum*) inoculation with three fertilizer levels 28-66-62, 55-66-62 and 110-66-62 kg NPK ha^{-1}. Bacterial isolates were screened at the Soil Bacteriology Section and inoculum was prepared by mixing both microbes in 1:1 ratio and applied as nursery dipping. The bacterial inoculum significantly increased paddy yield 3847, 3334 kg ha^{-1} compared to 3700 and 3083 kg ha^{-1} without inoculum at SSRI and ARS, respectively. The highest paddy yield 4100, 3540 kg ha^{-1} was obtained at 110-66-62 kg NPK ha^{-1} along with inoculum showing 4.0 and 8.14% improvement in yield at SSRI and ARS, respectively. Percent N and P in grains and straw were also higher with inoculum. Site specific studies are needed to assess the non-symbiotic nitrogen fixation by various microbes in improving cereal yields.

ICPS-330 - PHOTOSYNTHATE PARTITIONING IN WHEAT (*TRITICUM AESTIVUM* L.) AS AFFECTED BY ROOT-ZONESALINITY AND FORM OF N

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Abstract: Studies were conducted at NIAB, Faisalabad, Pakistan to examine the root zone salinity and N induced changes in photosynthate partitioning of wheat. Thirty days old plants grown in continuously aerated Arnon and Hoagland nutrient solution were subjected to ^{14}C pulse labeling for 24 h and transferred to aqueous rooting medium containing 0, 150, and 300 m*M* NaCl in all combinations with different forms (calcium nitrate, ammonium sulphate, and ammonium nitrate) and amounts (0.5, 1.0, 1.5, and 2.0 times the standard N concentration of Arnon and Hoagland plant growth medium). Plant samples immediately after pulse labeling, following 7 days of growth under different rooting medium conditions, and the freeze-dried rooting medium were analyzed for total C and ^{14}C. Length and fresh/dry weight of root and shoot portions and calculated values of unaccounted ^{14}C were determined. Of the applied ^{14}C pulse, 83% was determined in plants, while of the total plant ^{14}C, 89% and 11% was determined in the shoot and root portions, respectively. Salinity had a depressing effect on different agronomic parameters particularly root. However, NO_3^--fed plants showed better growth than NH_4^+- fed at all the salinity levels. Presence of NaCl in the rooting medium led to a decrease in the water content of both root and shoot. During 7 days of growth under different conditions in the rooting medium following pulse labeling, root portion contained 30-38% of the assimilated ^{14}C, while shoot portion retained 40-48%. The proportion of assimilated ^{14}C released into the rooting medium as rhizodeposits varied between 1.5 and 3.2%, while 8-13% was unaccounted for and assumed to be respired. Rooting medium salinity led to higher rhizodeposition and lower loss of ^{14}C. Relatively higher proportion of ^{14}C was released as rhizodeposits and retained in root/shoot portions of plants fed with NH_4^+ or NH_4^++NO_3^- , than those with NO_3^-, while less was respired. Rhizodeposits accounted for 2.33, 2.80 and 2.77% of

the assimilated ^{14}C, while 12.2, 9.4, and 10.3% was respired in plants fed with NO_3^-, NH_4^+ and NH_4^++ NO_3^-, respectively. From 3 to 5% of the total plant C was found in the rooting medium after 7 days of growth under different conditions of salinity and form and availability of N. The specific activity of the rhizodeposits (kBq ^{14}C g^{-1} C) was also higher under saline conditions. The rhizodeposits in NH_4^+-fed plants were more highly labeled as compared to NO_3^--plants.

ICPS-331 - RESPONSE OF COTTON CULTIVARS FH-901 AND CIM-473 TO *AZOSPIRILLUM LIPOFERUM* INOCULATION

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Abstract: Plant growth promoting rhizobacteria (PGPR) exert beneficial effect on plant growth by fixing atmospheric N, regulating phytohormones and vitamins, improving the nutrient uptake and enzymatic reactions in plants, solubilizing inorganic phosphates and enhancing stress resistance. Inoculation with these rhizobacteria resulted in increased germination rate, shoot and root growth, chlorophyll content, higher NP content and ultimately yields of the crops. Species of the genera *Azospirillum* are the most often reported PGPR with marvelous potential to increase crop yields. Field studies were conducted at the Fiber Crop Section AARI Faisalabad to assess the influence of *Azospirillum lipoferum* on cotton cultivars i.e. FH-901 and CIM-473 in split plot design during 2004 and 2005. Experiments were conducted on a clay loam soil having pH 8.1, EC 2.1 dSm^{-1}; organic matter 0.85% Available P and K was 10.0 and 195 ppm respectively. Peat based inoculum was applied as seed coating with three fertilizer levels viz. 0-0-0, 56-27-0, 112-54-0 kg NPK ha^{-1}. The data regarding yield parameters viz. seed cotton yield, plant height, number of bolls per plant and boll weight were recorded. Results revealed that inoculation increased seed cotton yield significantly in both the cultivars i.e. FH-901 (12.02) and CIM-473 (15.90%). *Azospirillum* inoculum produced 1187.83 and 1257.50 kg ha^{-1} seed cotton yield compared to 1047.83 and 1120.17 of un-inoculated ones at highest fertilizer level and also increase in number of bolls per plant was 15.37 to 5.99% in case of FH-901 and CIM-473, respectively. Both the cultivars respond to inoculation but the results were more pronounced in case of FH-901 as compared to CIM-473.

ICPS-332 - EFFECT OF INSECTICIDE AND DIAZOTROPH ON MICROBIAL POPULATION AND FODDER YIELD OF MAIZE

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Abstract: Rhizobacteria play an important role for the growth of plant and soil health. Insects, pests and diseases the prime factors causing low agricultural productivity, are mostly controlled by chemical means. A large amount of foreign exchange is being consumed for the import of pesticides. These are not only high priced inputs but are also hazardous to the useful microbes. This all necessitate cutting down the pesticide use to an acceptable level. To investigate the effect of insecticide on soil microbial population and fodder yield of maize, field studies were carried out at the Soil Bacteriology section AARI Faisalabad. Confidor @ 10 g kg^{-1} seed and diazotrophic inoculum were applied as seed dressing with three nitrogen levels, i.e. 50, 100 and 150 kg ha^{-1} where as P & K @ 120 and 60 kg ha^{-1} was applied as basal dose, respectively. Total viable count (TVC) was determined at 10, 20 and 30 days interval after the application of insecticide on nutrient agar media by Dilution Plate Technique. Results revealed that maximum population i.e. 6 x 10^7 was noted with diazotrophic inoculation in comparison with 3 x 10^7 with confidor after 30 days of application. Highest maize fodder i.e. 84 was observed with diazotroph at 150-120-60 kg NPK ha^{-1} followed by 80 with control and 78 tonnes ha^{-1} with confidor at the same

fertilizer level. Study concluded that diazotrophic inoculum significantly increased the microbial population resulting in better fodder yield. Study discouraged the indiscriminate use of insecticide as they affect the non-target organisms.

ICPS-333 - PLANT GROWTH BENEFITS DUE TO PGPR INOCULATION ON WHEAT CULTIVARS

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Abstract: Plant Growth Promoting Rhizobacteria (PGPR) are specific to exert various beneficial effects on crop cultivars. Mechanisms such as BNF, phytohormone synthesis, biocontrol, siderophore production, improved nutrient uptake, solubilizing inorganic and mineralizing organic phosphates have been reported by various researchers. The paper summarizes some lab, glass house and field studies where PGPR isolated from wheat rhizosphere and identified as *Azotobacter* and *Azospirillum* were tested upon various wheat cultivars. Gnotobiotic studies inferred that species of *Azotobacter* and *Azospirillum* reduced germination time, increased germination percentage, seedling growth, number and surface area of roots and nutrient uptake in most of the wheat cultivars. The pace of increase was not consistent in all the five cultivars studied. Multi-location field trials conducted by Soil Bacteriology AARI Faisalabad staff in various districts of the Punjab with a consortium of *Azotobacter* and *Azospirillum* in 1:1 ratio indicated significant yield increases in AS-2002 and Inqlab-91, the two most promising wheat varieties. P-solubilizing capacity of PGPR was observed with enhanced values of soluble P in soil and P-uptake in inoculated treatments. Plant growth responses were variable and dependent upon the inoculated strains of bacteria as well as crop plants. As different isolates and crop cultivars behave differently in their positive effects.

ICPS-334 - EFFECT OF PHOSPHATE SOLUBILIZING MICROORGANISMS AND RHIZOBIA-CHICKPEA SYMBIOSIS.

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[Soil Bacteriology Section AARI Faisalabad]

Abstract: More than 88% plant species of the family leguminosea till now studied have a well established legume-rhizobia symbiosis, which meet their N-requirements. Species of the bacteria *Rhizobium* nodulate roots of legumes through root hair infection and fixes N depending upon the soil conditions and bacterial specificity. This symbiosis has yielded a major portion of the world supply of organic nitrogen. Phosphorus is sparingly soluble in arid and semi arid regions like Pakistan because of high pH soils. Phosphate anions are extremely reactive and may be immobilized through precipitation with cations of calcareous nature of soil. Soil micro flora plays a vital role in mineralization, mobilization and solubilization of native / added phosphatic fertilizers. A pot study was conducted with fertilizer levels i.e. 0-15-0, 15-30-0, 30-60-0 kg NPK ha^{-1} at the Soil Bacteriology Section AARI Faisalabad to evaluate the effect of co-inoculation (*Rhizobium sp.* and *Bacillus sp.*) on the yield parameters of chickpea (Bittle-98) on a medium textured soil having pH 7.5, EC 1.6 dSm^{-1}, N 0.029% and available P 9.6 mg kg^{-1}. Results revealed that the co-inoculation of *Rhizobium* and phosphate solubilizing microorganisms (PSM) produced the significant higher plant dry matter and pod yield i.e. 27.4 and 22.4 g pot^{-1}in comparison with their respective controls. *Rhizobium* and PSM inocula produced 26.5, 25.0 g pot^{-1} plant dry matter and 22.0, 19.6 g pot^{-1} pod yield, respectively as compared to un-inoculated one i.e. 24.6 plant dry matter and 19.7 g pot^{-1} pod yield. The maximum plant dry matter 29.1 g pot^{-1} and pod yield 24.8 g pot^{-1} was observed at highest fertilizer level mixture of *Rhizobium* and phosphobacterium. Co-inoculation produced higher root fresh weight i.e. 181.4 grams, root length i.e.

58.4 cm and 61 nodules as compared to 94.7 grams, 52.1 cm and 14 nodules of un-inoculated control. Rhizobial and phosphobacterium inoculum alone also produced 188.4, 161.4 grams root mass; 66.0, 53.3 cm root length and 48, 28 nodules, respectively. Rhizobial and phosphobacterium inocula both increased the root masses separately but their combined application has a more pronounced effect on the root parameters. *Rhizobium and phosphobacterium* inoculation increased the percent P-content in chickpea plant and grains but this effect was more pronounced with the co-inoculation. Rhizobial inoculation increased the percent N-content in chickpea plant i.e. 1.91% as compared to co-inoculation while N-content i.e. 4.36% was observed in case of co-inoculation as compared to 4.17% of the control.

ICPS-335 - INHERITANCE OF MORPHOLOGICAL CHARACTERS ASSOCIATED WITH PLANT AND DRIED SEED IN LENTIL (*LENS CULINARIS* MEDIK)

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Abstract: Seed morphological characters such as seed coat color and cotyledon color are important commercial attributes of lentil. These traits influence the acceptability and market value of new cultivar due to ethnic preferences. In order to breed new cultivars with desired combination of seed morphological traits, an understanding of genetic mechanism controlling these characters is required. In the present investigation inheritance of testa color (Seed coat color), testa pattern, cotyledon color and stem color was studied in crosses of lentil involving parents with brown, grey and green testa color, red and yellow cotyledon color and with green and colored seedling stem. Analysis of F1 and F2 plant populations of crosses between green and colored (pink) stem revealed that colored stem was dominant over green stem. The F2 population segregated between colored and green stem in a 3:1 ratio. Similarly, red cotyledon was dominant over yellow cotyledon and F2 seeds segregated to fit a ratio of 3 red : 1 yellow. These results indicated red cotyledon and colored stem to be monogenic dominant. The analysis of F2 and F3 seeds (having F1 and F2 testa respectively) harvested from F1 and F2 plant population revealed that spackled testa was dominant to even (without speckles) testa, grey testa color was dominant to green testa color and brown testa color was dominant to both grey and green testa color. The F2 segregation ratio from cross involving parents with brown and grey testa was 9 brown : 3 grey : 4 green. On the contrary, the crosses between parents with grey and green testa color segregated to fit a ratio of 3:1between dominant and recessive color. The back cross between green and (grey x green) segregated to 1 grey and 1 green. These segregating patterns revealed involvement of two genes and a recessive inhibitor in the regulation of testa color. These results will be discussed in detail with reference to those obtained from other studies.

ICPS-336 - IMPACT OF PRUNING ON FLUSHING AND MALFORMATION IN VARIOUS CULTIVARS OF MANGO (*MANGIFERA INDICA* L.)

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Abstract: Experimental fruit trees of mango cultivars, Anwar Ratul, Chaunsa and Alphanso were growing in uniform agro-climatic conditions of Experimental Fruit Garden (Square No.9), Institute of Horticultural Sciences, University of Agriculture Faisalabad, Pakistan and receiving similar cultural practices for fertilizers, irrigation and plant protection during investigation period of 2002-04. Malformed and fruit carrying panicles were pruned during April-May with 15 days interval while other panicles barren in these dates were allowed to stay intact to study their flushing pattern and carryover effect of malformation of inflorescence. Early emergence of flushes was significantly high in early pruning of panicles in all cultivars. Flush vigor (shoot length) and number of leaves per flush was significantly

affected by time of pruning of different type of panicles.Significiently high reduction of carryover effect of malformation was recorded on early emerged shoots in all cultivars. Intensity of malformation of inflorescence was significantly high on Chaunsa followed by Alphanso and Anwar Ratul (respectively) and reduction in carryover effect of malformation was significantly high in Anwar Ratul followed by Chaunsa and Alphanso respectively.

ICPS-337 - PALYNOLOGICAL ANALYSIS OF LATE PALAEOCENE SEDIMENTS (PATALA FORMATION), NAMMAL GORGE SECTION, WESTERN SALT RANGE, PAKISTAN

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Abstract: Data presented here is based on the palynological examination of the rock samples belonging to the Patala Formation, Nammal Gorge Section, Salt Range, Pakistan. Patala Formation consists dominantly of shale with subordinate marl, sandstone and limestone. The palynological data recovered is interpreted in terms of depositional environment and palaeoclimatology. The diversification of pteridophytic taxa is noted. Amongst 37 pteridophytic taxa recovered from the sediments, mostly belonging to the trilete spores. The pteridophytic spores viz., *Cicatricosisporites grandiosis, Gleicheiinidites taiwanensis, Leiotriletes triangulatus, Polycingulatisporites reduncus* and *Cyathidites formosensis* which are comparable to living genera *Anemia, Glechenia, Schizaea, Pteris* and *Cyathea* respectively. Other taxa are represented by *Lycopodiumsporites austroclavatidites, Lygodiumsporites lakiensis, Dandotiaspora reticulatus, Dandotiaspora sorangi, Dandotiaspora tenolata, Calamospora nathorstii* and *Leiotriletes maxoides.* On the basis of palynological investigations, the palaeoclimate indicate the prevalence of perennial water bodies in the close vicinity and warm humid tropical climate during the deposition of Patala Formation.

ICPS-338 - PALYNOLOGY OF THAR COAL FIELD (BARA FORMATION), SINDH, PAKISTAN

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Abstract: The present paper describes Eocene palynomorph assemblages from Thar coalfield, Sindh, Pakistan. Palynological work has been carried out for the first time from five drill holes viz., STP- II, STP-III, STP-IV, STP-XI and STP- XII. Thar Coal field is of an utmost economic importance as it contains a huge amount of coal that has to be dated palynologically. It is located in Thar Desert in the eastrern part of Pakistan extending eastwardly across the international borders into India. Main flora recovered constitutes pteridophytic spores, angiosperm and gymnosperm pollen and a rich assemblage of fungal spores and cuticular fragments. Although no important age diagnostic palynofossils were recovered but combined occurrence of *Arengapollenites*, *Retitricolpites* and *Todisporites* suggested Early Eocene (Ypresian) age of the presently studied subsurface sediments.

ICPS-339 - COMBINING ABILITY ANALYSIS IN TOMATO (*LYCOPERSICON ESCULENTUM* MILL.)

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Abstract: Line x tester experiment was conducted to evaluate the performance of 30 F_1 tomato hybrids along with 13 parents during 2005 and 2006. Data was recorded on fruit weight, number of fruit per plant and yield per plant. The analysis of variance revealed highly significant differences

among treatments, parents, parents vs. crosses and crosses. Lines exhibited non-significant genetic variability for yield per plant whereas testers for fruit weight and yield per plant for first year and number of fruit per plant for second year. However line x tester interactions were non-significant for fruit weight during second year. Line 88572 was found to be good general combiner for yield and its related traits. Variance ratio of general to specific combining ability was less than unity showing preponderance of non-additive gene effects in the inheritance of all traits studied. Three hybrids viz. 88572 x Riogrande, Picdenato x Riogrande and T2 x Nagina excelled other hybrids in acquiring significantly positive specific combining ability effects and might be used for exploitation of heterosis

ICPS-340 - SUSCEPTIBILITY AND INFLUENCE OF INOCULUM LEVELS OF *RHIZOCTONIA SOLANI* ON POTATO GERMPLASM

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Abstract: Susceptibility in 14 potato (*Solanum tuberosum* L.) cultivars and advanced breeding lines was investigated by using isolate CL-58 of *Rhizoctonia solani* AG-3 under greenhouse conditions. Parameters viz., eyes germination, sprouts killing, incidence and severity of stem and stolon canker, black scurf and yield of potato germplasm was evaluated. Results revealed Cv. Desiree and line SH-216-A as susceptible and Cv. Cardinal and line CIP-393574-61 as resistant to disease. Subsequent experiments were conducted with two potato Cvs. Cardinal and Desiree and three lines SH-216-A, TPS-9813 and CIP-393594-61 using three inoculum levels of the fungus, 10, 15 and 20g/pot (8 x 11 inch) in sterilized potting mixture to determine their relative susceptibility to Rhizoctonia disease. It was found that as the inoculum level of the fungus increased in the soil, there was a significant (P=0.05) increase in all the disease parameters studied.

ICPS-341 - INFLUENCE OF TEMPERATURE ON RADIAL MYCELIAL GROWTH OF POTATO ISOLATES OF *RHIZOCTONIA SOLANI* KÜHN

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Abstract: Eighteen *Rhizoctonia solani* anastomosis group 3, 4 and 5 isolates viz. KR-2, TH-1, SL-5, PK-1, TAX-1, OK-1, CL-58, BLN-1 (AG-3), JG-4, JG-7, TH-2, SL-8, ST-9 (AG-4), ST1, QA-9, CL-56, SJ-5 and KM-2 (AG-5) recovered from potato tubers were evaluated for their radial mycelial growth rates at 15, 20, 25, 30 and 35˚C temperatures. All the eight *R. solani* AG-3 isolates evaluated showed the maximum radial mycelial growth rate at 25°C, although, there were differences in growth rate among various *R. solani* AG-3 isolates. Among the AG 3 isolates, isolate CL-58 showed the highest growth rate of 1.5 cm per day pursued by isolate KR-2, 1.42 cm/day and TH-1, 1.40 cm /day but were at par with each other. As an AG, *R. solani* AG-3 isolates showed the maximum mean radial mycelial growth of 1.33 cm/day at 25°C. Temperature of 25°C was also found the best for radial mycelial growth of *R. solani* AG-4 isolates tested except isolate SL-8, which exhibited the maximum growth at 20°C but was statistically at par with AG-4 isolates, TH-2 and ST-9. *R. solani* AG-5 isolates also showed the best growth at 25°C followed by 20°C. Statistically non-significant differences were found among all the isolates of AG-5. In general, growth rate increased with increase in temperature up to 25°C for most of the isolates from the various AGs studied.

ICPS-342 - PREDICTION MODELS FOR ESTABLISHMENT OF YELLOW RUST OF WHEAT (*TRITICUM AESTIVUM* L. EM. THELL)

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Abstract: On the basis of five years (2001-02, 2002-03, 2003-04, 2004-05 and 2005-06) data of yellow rust disease severity and environmental factors, disease prediction models were developed for the wheat Cvs. Pirsabak-85, Inqalab-91, Sarsabz and Zarghoon. The most highly correlated meteorological parameters i.e., minimum temperature, relative humidity and wind velocity were used as independent variables with disease severity as dependent variable. The R^2 value ranging from 81-96% revealed strong positive correlation between disease severity and the environmental factors. When applied on the field trial data of year 2006-7 for validation of the models, the prediction accuracy was in the range of 69-93 %. The statistical software Minitab 13.1 was effectively used for the purpose. Models derived can be used for prediction of the disease and devising appropriate yellow rust management strategies in the barani area.

ICPS-343 - EFFECT OF DIFFERENT PRUNING INTENSITIES ON THE GROWTH OF KIKAR (*ACACIA NILOTICA)*

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Absract: Reduced plantation densities have the effect that obtaining natural pruning and stem straightness are less assured. The physiological process of self-pruning is replaced by manual pruning. Generally, plantations are denser and have more uniform spacing than natural forests. In many, if not most species, natural pruning is never a satisfactory option, even after branch senescence, if production of clear wood is a management objective. Natural pruning can only be considered on a species by species basis. A preliminary pruning trial was conducted at two different sites, UAF and PARS, in Faisalabad, Pakistan. Different pruning treatments ranging from tree height up to 2.5 to 6 m were assigned to same aged stands in the above said sites. All pruning treatments resulted in reduction in diameter growth. However, significant reduction in diameter growth was observed when crown removal was more than 40%. Taper study was done by taking diameter measurements at 0.15 m, at diameter breast height (1.37 m), at 2 and 4 m, respectively. The results revealed that pruning treatments have a significant effect on tapering of the stem. In general, there was a diameter decrease of 1 cm on every 1 m in height.

ICPS-344 - DISTRIBUTION, ECOLOGY AND MANAGEMENT OF CITRUS NEMATODE, *TYLENCHULUS SEMIPENETRANS*

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Abstract: Among pests and diseases, the citrus nematode, *Tylenchulus semipenetrans*, associated with slow decline is a universal problem including Pakistan. It limits production of citrus fruit under a wide range of environmental and edaphic conditions. In Pakistan very little attention has been paid to this nematode, so the present investigations were conducted on the distribution, ecology and management of the nematode. Survey of different localities of Faisalabad, Sargodha, Toba Tek Singh and Sahiwal districts revealed that citrus nematode, *T. semipenetrans,* is widely distributed in all the citrus orchards. The infestations of citrus nematode in these districts were 84 %, 96 %, 92 % and 92 % respectively. In Faisalabad and Sargodha districts 66.66 % of the infested orchards showed infection above economic threshold level while in Toba Tek Singh and Sahiwal districts infection above economic threshold level was recorded in 60.87% orchards. In population dynamics studies, the maximum numbers of *T.*

semipenetrans per 500 g of soil were observed at the depth of 20 cm. Above and below this depth, the nematode population was less except in the month of July, August and January when the temperature was 38°C, 39°C and 15-17°C respectively. The female nematode population remained high in the month of May and November when temperature was 27°C. The lowest number of nematodes was found at depth of 10 cm. Effect of different soil types was also studied on the movement and infection rate of *T. semipenetrans*. The maximum movement and infection rate was observed in loamy sand in both top and lower half of the pots, followed by sandy loam and coarse sand respectively. Sand-peat (2:1) allowed the minimum number of females to move and penetrate in roots. In another experiment 13 citrus rootstocks were screened for their susceptibility/resistance in the greenhouse. Data indicated that three rootstocks (Carrizo citrange, Savage citrange and Yuma citrange) allowed the minimum number of females of *T. semipenetrans* in the roots (< 1 / cm of root), hence categorized as resistant. Three rootstocks (Bitter sweet orange, Sachton citrumelo and citrumelo 1452) were rated as moderately resistant (< 2/cm of root). The remaining seven rootstocks (Gada Dahi, Brazilian sour orange, sour orange, grapefruit, rough lemon, chakotra and kharna khatta) proved to be susceptible to *T. semipenetrans*. The effect of five nematicides viz. Furadon, advantage, Rugby, Basudine and Unihypo was studied against *T. semipenetrans.* The maximum reduction in nematode populations and increase in yield were obtained with Rugby followed by Advantage, Furadon and Basudine respectively. Unihypo was the least effective.

ICPS-345 - MANAGEMENT OF *MELOIDOGYNE JAVANICA* BY *PASTEURIA PENETRANS* OVER THREE CROP CYCLES OF EGG PLANT

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Abstract: The effects of three *Pasteuria penetrans* isolates and their blend (PP1, PP2, PP3 and PP blend) were studied on the number of galls and egg masses caused by *Meloidogyne javanica* and number of juveniles per 500 g of soil over three crop cycles of egg plant. The data were analyzed as "treated / control" and shown as D-gall, D-egg mass and D-juvenile. The three subsequent crops have affected the numbers of galls and egg masses. After each crop the numbers of galls and egg masses were significantly reduced, but a marked reduction was found after third crop. A similar trend was also observed in number of juveniles. D-galls were 0.927, 0.581 and 0.109; D-egg masses were 0.470, 0.279 and 0.055 while D-juveniles were 0.755, 0.759 and 0.421 after first, second and third crop cycles respectively. The three isolates of *P. penetrans* and their blend also affected the D-galls and D-egg masses. PP1, PP2 and PP blend behaved almost similarly for gall production. Comparatively less egg masses were produced in PP1, PP2 and PP3 as compared to PP blend. No significant differences were recorded in number of juveniles after each crop for all the

P. penetrans isolates. After first crop the numbers of spores attached were 6.00 / J2 which rose to 13.15spores / J2 after second crop and finally reached to 26.89 spores / J2 after third crop. The three isolates of *P. penetrans* and their blend also behaved significantly differently. The maximum numbers of spores attached were with PP3 (23.15 spores / J2) followed by PP blend (16.24 spores / J2), PP1 (12.74 spores / J2) and PP2 (9.25 spores / J2).

ICPS-346 - INDUCED GENETIC VARIABILITY AND YIELD PERFORMANCE STUDY IN CASTORBEAN (R*ICINUS COMMUNIS* L.) MUTANTS

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Abstract: Three varieties of castorbean viz. DS-30, DC-15 and L 57 were treated with gamma rays ranging from 100-1000 grey to create genetic variability. The induced material is under study since 2003. M_2 generation was raised during 2004-05 and putative segregants were selected and confirmed during 2005-06 in M_3 generation. M_4 generation was studied during 2006-07 and best performing mutants were further advanced for evaluation of seed yield and other attributes during 2007-08 in M_5 generation. Data pertaining to different morphological attributes like days to mature, plant height, number of spikes/plant, length of main spike, number of capsule of main spike, capsule weight, 100 seed weight and seed yield per plant were recorded in M_4 and M_5 generations. Correlation coefficient, path analysis and genetic parameter of these attributes were computed. Significant and positive correlation of capsule weight with seed yield was observed. Hundred seed weight showed positive but non significant phenotypic and significant genotypic correlation with seed yield. Capsule weight also showed high direct effect combined with high positive and significant genotypic correlation. More than 50 percent heritability was observed in all the traits except 100 seed weight and capsule weight. Number of capsule of main spike showed the maximum genetic advance followed by spike length and number of spikes. Characters like number of capsules, spike length and number of spikes showed high heritability combined with high genetic advance. It means that these characters were governed by additive type of genes and for the improvement of seed yield; selection may be based directly on these attributes. A mutant namely M-7-35 in M_4 has been evolved which matures in 120-130 days whereas parent variety DS-30 matures in 180-200 days. The early mutant can successfully fit in cropping system and has the potential of castor cultivation on commercial scale. The average seed yield of M-7-35 mutant is 3844 kg ha^{-1} whereas parent variety DS-30 produced 2710 $kgha^{-1}$ seed yield. After the harvest of this mutant, farmer can easily sow wheat crop. Another mutant line DC-15-1 also showed earliness and produced higher seed yield than DS-30.The mutant M 57-1 had long main spike (67 cm) as compared to 34 cm of DS-30 alongwith higher seed yield. Considering these results, it may be concluded that for direct improvement in seed yield, primarily, main emphasis should be given to number of spikes and capsule weight for selection of high yielding variants /mutants. However to some extent, length of spike and 100 seed weight may also be considered for improvement in seed yield. In this paper the genetic parameters and yield performance of induced mutants in M_4 and M_5 is discussed.

ICPS-347 - CHARACTERIZATION OF ENVIRONMENTAL FACTORS CONDUCIVE FOR ULCV DISEASE DEVELOPMENT

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Abstract: In order to see the impact of environmental conditions on urdbean leaf crinkle disease development, twenty genotypes viz., 6022-22, 95009, 6036-12, 96cm-016, AARIM-32, AARIM-164, M-17, M-3, 95024, Mash-88, 6036-7, ES-1, NCH-3-3, 6036-7, Mash-1, 4cm-717, IAM 33-40, 3cm-706, 6036-14 and Mash-97 from the reaction groups viz. MR, MS, S and HS were sown for four seasons (spring and summer) during 2005-2006. Disease incidence differed in each growing season whereas it showed overall significant correlation with maximum and minimum temperature and no correlation with relative humidity, rainfall and wind speed in each growing season, respectively. When data were split by genotypes the level of correlation decreased. To characterize the environmental conditions conducive for the disease epidemics, it was found that maximum ULCV disease severity/incidence was recorded at 35-42 ^{o}C (maximum temperature) and 21-29 ^{o}C (minimum temperature). There was absolutely no correlation with weekly relative humidity, rainfall and wind movement.

ICPS-348 - COMBIBNING ABILITY ANALYSIS OF SOME MORPHO-PHYSIOLOGICAL TRAITS IN BASMATI RICE

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Abstract: Combing ability analysis on 27 F_1 hybrids along with 12 Basmati rice parental genotypes was conducted to identify superior genotypes based on morpho-physiological traits. The experiment was done following line × tester mating design. Highly significant genetic variability was present among treatments, parents, parents vs. crosses, crosses, testers and line × tester interaction for flag leaf area, panicle density, harvest index, biological yield per plant and yield per plant. However, lines were significant for all the traits except for flag leaf area and yield per plant. Pivotal role of non-additive gene effects was seen by higher value of variance of specific combining ability than that of general combing ability, ratio of variance of general to specific combining ability and degree of dominance. Four lines viz. Basmati 2000, Kashmir Basmati, DM-107-4 and Super Basmati and tester Basmati-385 recorded desirable significant positive general combining ability effects for yield per plant. All these parents except Kashmir Basmati showed desirable general combining ability effects for other parameters. Seven different hybrids for yield per plant, plant height and panicle density, 4 for flag leaf area, 3 for harvest index and 8 for biological yield per plant excelled other hybrids in desirable specific combining ability effects and mean performance. These hybrids are recommended for heterosis breeding depending upon the objective (s). Hybrid Kashmir Basmati x Basmati-385 is recommended for recombination breeding following pedigree method of selection in early generation while DM-107-4 x Basmati-385 and super Basmati x Basmati -385 are also favorable for recombination breeding with the condition that selection of superior genotypes may be delayed to later generations to develop potential varieties.

ICPS-349 - SAMPLING SIZE FOR TREE SPECIES DIVERSITY IN TROPICAL RAIN FOREST: THE CASE OF TWO FOREST TYPES IN MALAYSIA

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Abstract: Sample plots have often been used in to comprehend the richness of forest biodiversity. An ample sample plot size must be able to capture the diversity of a particular forest type. To date however, the sample plot size has been various and this makes sampling inconsistent. Studies are being carried out to find the minimum sample plot size that will be sufficient to capture tree species diversity of different forest types in Malaysia. The results reported here are from ongoing studies on two of the sixteen forest types in Malaysia which are the lowland (logged-over) and hill forests (virgin). In both forest types, the number of species increment decreased with increasing sample size. *A minimum* area of 5-ha plot is recommended to capture species diversity in a lowland tropical logged-over forest. In the hill forest, the cumulative species-area curve reached its asymptote at 391 to 426 species in the 2-ha plot using Chao 1 species richness estimator and the points of inflection were between 0.8 and 1 ha, corresponding to 80 and 100 quadrats. An area of 2-ha is recommended for sampling a virgin hill forest.

ICPS-350 - EFFECT OF NICKEL STRESS ON WATER RELATIONS OF SUNFLOWER

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Abstract: In a sand culture experiment, the seed of the two cultivars (Hysun-33 and SF-187) were exposed to varying levels of nickel (0, 10, 20, 30 and 40 mg Ni L^{-1}). Nickel was applied using $NiSO_4$ and mixed in Hoagland's nutrient solution prior to sowing. Data for various water relation parameters were recorded for five 7-day intervals. Results revealed that changed in water, osmotic and turgor potential more apparent at early growth stages as compared to adult stage. Moreover, osmotic potential was more drastically reduced under nickel stress as compared to water potential. Both sunflower hybrids showed turgor maintenance that indicated nickel tolerance potential of these hybrids. Overall, SF-187 showed less reduction in water potential and greater maintenance of turgor which was attributed to grater ability of this hybrid to accumulate compatible solutes like soluble sugars and proline.

ICPS-351 - SELECTION INDICES FOR YIELD AND QUALITY TRAITS IN SWEET CORN

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Abstract: The efficiency of three selection indices 1) Smith-Hazel index (SHI), 2) Desired gain index (DGI), and 3) Base Index (BI) was compared for the improvement of an open- pollinated sweet corn (*Zea mays* L. *Saccharata*) population. The data of various plant traits (comprising grain yield, its components and quality traits) among S_1 families of sweet corn population were used to construct different selection indices. Smith-Hazel index was the most efficient in improving the aggregate genotype of agronomic traits for most of the selection strategies. Base index proved to be more efficient as compared to Smith-Hazel index in the improvement of aggregate genotype for five out of six selection strategies of quality traits. Both smith-hazel and Base indices were found useful for the improvement of sweetness and sweet flavor for all the selection strategies. When selection was confined to eight agronomic and four quality traits simultaneously, Base index proved to be more efficient as compared to Smith-Hazel index and desired gain index in improving the aggregate genotype for almost all the selection strategies.

ICSP-352 - CHANGES IN THE ACTIVITIES OF ANTIOXIDANTS ENZYMES IN SUSCEPTIBLE AND RESISTANT CULTIVARS OF BLACKGRAM DUE TO URDBEAN LEAF CRINKLE VIRUS INFECTION

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Abstract: Changes in total soluble proteins and in activities of antioxidant enzymes were compared in ULCV susceptible (mash-88) and resistant (Chakwal Mash-2002) urdbean cultivars at different growth stages under both inoculated and un-inoculated conditions. ULCV infection resulted in significant reduction in total soluble protein content of the leaves in both the reaction groups when compared with the un-inoculated control plants. The superoxide dismutase (SOD) activity significantly decreased in the virus-infected leaves of the resistant cultivars whereas, the decrease remained non-significant in the diseased leaves of the susceptible cultivars. No significant changes in catalase (CAT) activity were detected in the leaves of ULCV infected plants over the control. The activity of peroxidase (PO) increased significantly and non-significantly between 15 and 30 days after virus-inoculation in resistant and susceptible cultivars, respectively. Thus it can be presumed that the enhancement of peroxidases contributes to the oxidative stress in systemic plant-virus interactions. By way of oxidation of indole-3-acetic acid up-regulated peroxidases might also be responsible for growth reductions and malformations in virus-infected plants.

ICPS-353 - CHARACTERIZATION OF WHEAT GENOTYPES AND LAND RACES FOR HIGH MOLECULAR WEIGHT (HMW) GLUTENIN SUBUNITS INVOLVED IN BREAD MAKING QUALITY

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Abstract: Sixty four Pakistani wheat varieties were investigated for the composition of High Molecular Weight Glutenin Subunits (HMW-GS) and their contribution for bread making quality. HMV–GS were fractionated through SDS-polyacrylamide gel electropheroisis and quality scores were assigned according to the previously described system. All the genotypes fell into 20 different groups on the basis of their glutenin subunits composition. Both alleles encoded by A genome were identified but subunit 1 showed lowest frequency (20%). Twelve different combinations of Glu-B subunits were detected with highest frequency of 17+18 subunits (28.13%). For Glu-1D subunit combinations 2+12 and 5+10 were dominant with a frequency of 37.5% and 28.13% respectively. Analysis of quality score reveled that 28.13% of the verities achieved a score of 6 whereas only 4 varieties in total had scores of 9 or 10. From the results of this investigation it can be perceived that a large variation in term of HMV-GS exists in Pakistani wheat varieties. The good quality score are in lower proportion indicating that varieties haven been developed without considering the quality aspects, knowledge of glutenin subunit composition and their contribution toward bread making quality. The information generated through this investigation provides important information helpful for breeding programs aimed at characterization and selection of genotypes with good bred making quality.

ICPS-354 - QUANTITATIVE ASSESSMENT OF GENETIC DIVERSITY IN WHEAT GERMPLASM USING MICROSATELLITE MARKERS

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Abstract: It has been claimed that plant breeding reduces genetic diversity in elite germplasm which could seriously jeopardize the continued ability to improve crops. The main objective of this study was to examine the loss of genetic diversity in bread wheat during the change from traditional landrace cultivars (LCs) to modern breeding varieties, and recent trends of national wheat breeding programs. A total of 25 SSR markers, representing at least one marker from each chromosome of wheat, were used to analyze the genetic diversity of 60 wheat varieties and land races. All primer sets produced clear and strong expected amplifications. A total of 69 alleles were generated by the 25 loci with an average of 2.76 alleles per marker. A loss of genetic diversity, although not quite significant, was observed from the LCs to the elite cultivated varieties. Average genetic similarity between landraces was 95.1% while varieties released after 1995 showed 96.5% similarity. Range of genetic distance observed between all possible pairs was from 2.45 to 4.90. It was also observed that most of the varieties released from one source showed much lower diversity indicating the utilization of common elite breeding material or interbreeding of released varieties. A total of 35 EST-SSR markers were used to analyze the genetic diversity and phylogeny of 96 wheat germplasm accessions. All primer sets produced a clear and strong expected amplifications. A total of 129 alleles were generated by the 35 loci, but most of the primer pairs produced 2-4 alleles. Approximately 87.6% of the 129 alleles showed polymorphism among the cultivars. Primer pairs can be used to identify some cultivars, according to specific PCR amplifications; and to reveal the phylogeny between hexaploid wheat collection and their ancestral chromosome donors. Based on a 0.745 similarity coefficient, synthesized double diploid cultivars and hexaploid wheat were classified into different subgroups. Compared to SSR markers from genomic DNA, EST-SSRs were parts of expressed genes. Therefore, when used in wheat genetic analysis, EST-SSR markers not only

act as genetic markers but also reveal differences in related gene expression. It has been claimed that plant breeding reduces genetic diversity in elite germplasm which could seriously jeopardize the continued ability to improve crops. The main objective of this study was to examine the loss of genetic diversity in spring bread wheat during (1) its domestication, (2) the change from traditional landrace cultivars (LCs) to modern breeding varieties, and (3) 50 years of international breeding. We studied 253 CIMMYT or CIMMYT-related modern wheat cultivars, LCs, and *Triticum tauschii* accessions, the D-genome donor of wheat, with 90 simple sequence repeat (SSR) markers dispersed across the wheat genome. A loss of genetic diversity was observed from *T. tauschii* to the LCs, and from the LCs to the elite breeding germplasm. Wheat's genetic diversity was narrowed from 1950 to 1989, but was enhanced from 1990 to 1997. Our results indicate that breeders averted the narrowing of the wheat germplasm base and subsequently increased the genetic diversity through the introgression of novel materials. The LCs and *T. tauschii* contain numerous unique alleles that were absent in modern spring bread wheat cultivars. Consequently, both the LCs and *T. tauschii* represent useful sources for broadening the genetic base of elite wheat breeding germplasm.

ICPS-355 - CHANGES IN MINERAL AND MINERALIZABLE N OF SOIL INCUBATED AT VARYING SALINITY, MOISTURE AND TEMPERATURE REGIMES

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Abstract: In Pakistan, rapid salinization of originally productive soils is mainly because of the agroclimatic conditions including high temperatures and surface irrigation. These soils are being reclaimed for enhancing agricultural productivity by using many divergent approaches but very little attention had been paid on nutrient availability particularly on i) forms and availability to plants of N and ii) the effect of N supply on photosynthate partitioning. Keeping in view to select appropriate form of N for application under saline conditions, an incubation experiment was conducted for i) quantification and chemical characterization of N available for plant uptake in saline soils, ii) plant uptake, assimilation of NH_4^+, NO_3^-, and NH_4^++NO_3^-—N. Soil samples amended with 0.5% plant material (*Sesbania aculeata*) and salinized to EC_e 7, 9, and 18 dSm^{-1} were incubated at 3 moisture levels (15, 30 and 45%, w/w) and three temperature regimes i.e., 20, 30 and 40 ^oC for 8 weeks. NH_4-N, NO_3-N and mineralizable N at 2, 4, and 8 weeks was determined. Ammonification of organic N (as determined by the accumulation of NH_4-N in soil) increased with increased moisture and temperature while decreased with enhanced salinity. The content of mineralizable N content remained higher under high moisture conditions, while high salinity and temperature had a variable and negative effect. Complete loss of NO_3-N was observed during incubation of soil samples that was attributable to denitrification.

ICPS-356 - INVASION OF HOSTILE ALIEN WEED *PARTHENIUM HYSTEROPHORUS* L. IN WAH CANTT, PAKISTAN

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Abstract: A survey of Wah Cantt district Rawalpindi was carried out in April 2007 to study the invasion and distribution of an alien invasive weed parthenium (*Parthenium hysterophorus* L.). Eight wastelands, each of about 1 ha area were selected in different areas of Wah Cantt. Sampling was done with 1 m^2 quadrate. Data regarding prevalence, absolute and relative frequency, and absolute and relative density of parthenium and other weeds of the area were recorded. A total of 44 weed species belonging to 24 families of angiosperms were recorded in the studied area. Parthenium was found in all the eight studied sites showing 100% prevalence. Parthenium was the second most frequently occurring weed in

the study area with absolute frequency (AF) of 76% and relative frequency of 3.92%, after *Cannabis sativa* with 86 and 4.28% of AF and RF, respectively. Similarly *C. sativa* and parthenium were found the two most densely populated weeds with 1.82 and 1.63 absolute density (number of plants m^{-2}) and 6.68 and 5.99% relative density, respectively. The present study reveals that the parthenium has attained the second most frequently and densely occurring weed in the area. There is fear that because of its high reproductive potential, fast growth rate, allelopathic nature and high adaptability to the prevailing environmental conditions, parthenium may attain the status of dominating weed in the studied and surrounding areas. Therefore, there is need for an urgent parthenium management strategy to stop further spread of this noxious alien weed in the area.

ICPS-357- THE PHYSIOLOGICAL RESPONSES AND ION ACCUMULATION UNDER SODIUM CHLORIDE STRESS IN PEARL MILLET (*PENNISETUM AMERICANUM* L.)

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Abstract: The general differences among accessions for ions accumulation were studied in this experiment. Tolerant accessions accumulated higher concentrations of ions, which could be regarded as physiological mechanism for tolerance to salt stress. Na^+, Mg^{2+} and Cl^- showed negative correlation with Ca^{2+}, K^+, and plant growth, plant growth is directly correlated with Ca^{2+} and K^+ contents. Which suggests that additional supply of Ca^{2+} and K^+ in rooting media would be helpful for plant growth under NaCl stressed soils. In tolerant and sensitive accessions patterns of accumulation in leaf, sheath, and root of Na^+, K^+, Ca^{2+} Mg^{2+}, and Cl^- from NaCl were analyzed. The distribution patterns of these ions in the three plant parts differ significantly between tolerant and sensitive accession. With increased salt concentrations, the K^+/Na^+ ratio was decreased drastically, and plant growth decreased with decreased K^+/Na^+ ratio. In the present study, tolerant accessions 10528, 10876, 10878, and ICMV- 93753 accumulated more Ca^{2+} in leaves when grown in salt, whereas 10876 and 10878 (tolerant accessions) also maintained the comparatively highest K^+/Na^+ ratio in leaves, sheath, and root in higher salt concentrations. Thus it is concluded that K^+/Na^+ ratio can help in pearl millet for selecting salt tolerant accessions, although root and shoot growth in saline solution would be a more simple means of primary selections.

ICPS-358- SALINITY EFFECTS ON THE YIELD AND PHYSIOLOGICAL CHARACTERS OF NAKED BARLEY

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Abstract: Planting of naked barley and its application has been increased recently for edible of birds and additionally for using of salinity fields the best method is application of tolerant varieties. In order to evaluate of salinity stress effect on growth, yield and physiological characters of naked barley, this experiment was conducted using a factorial arrangement in a completely randomized block design with four replications in greenhouse of College of Agriculture University of Gorgan during 2004 – 2005 crop year. The factors consisted of four salinity treatments containing 0.84, 5.48, 9.27 and 14.25 dS/m by using NaCl-CaCl2 salts (1:1 weight ratio) and four genotype of naked barley containing ICB-118305(G1), 4679 / 105 / VEA / 32TH / ALGER(G2), ELDO / BERMEJO / 5 / CM67 - / CENTENO(G3), CERAJA 3 / ATACO / ACHIRA / / HIGO (G4). Vary characters measured in four stages consist of stem extension, flowering, seeding and harvest stage. Results showed that the salinity stress imposed significant effects on growth, fluorescence, elemental concentration, yield and yield components.

Salinity stress imposed significant positive effects on elemental concentration and fluorescence, therefore yield and yield components reduced. In stem extension phase some of characters, same to leaf area and leaf dry matter, did not show any negative effect under 5.48 dS/m salinity. Main spike yield had more correlation with seed number while yield of tillers and whole plant had most correlation with spike number. In all sampling stages, G4 and G1 genotypes had most rate of K/Na, photochemical efficiency and growth. Also the yield threshold of these genotypes was more than other. In between genotypes although yield sensitive index was not significant, but G4 was identified as the best genotype because of having the majority of yield and percentage of grain protein.

ICPS-359 - SELECTION OF COMMON BARLEY (*HORDEUM VULGARE* L.) GENOTYPES FROM MULTI-LOCATION TRIALS UNDER SALINE SOIL CONDITIONS

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Abstract: Barley (*Hordeum vulgare L.*) is a salt-tolerant crop species with considerable economic importance in salinity-affected arid and semiarid regions of the world evaluation of the salt tolerance of crop cultivars under field conditions is greatly complicated by the typical temporal and spatial variability of soil salinity. This research was conducted to select of salt-tolerant barley genotypes under saline soil (EC_e =12-15dS/m) during three cropping year (2004 – 2007) in Aghala salinity researches station. 1188 barley genotypes were compared for response to salinity from MLT(Multi Location Trials) experiments during(2004-2005) observantly. Finally 400 genotypes were selected as a tolerant genotypes. The results of this statistical analysis of multi-location yield-data were compared with a morpho-physiological characterization of the lines. Selective of genotypes from initiation stage were evaluated in three experiments A_1, A_2 (22 genotypes) and A_3 (23 genotypes). This experimental design was a randomized complete block (RCBD) with three replications. Elevated of salinity in either genotype caused a reduction in spike length, number of spiklets per spike, total grain yield and fertile tillers of all the genotypes but with quite differential behavior of the genotypes. Tolerant genotype displayed greater economic yield than the sensitive one. Analysis of variance showed significant difference among genotypes in grain yield. According to average comparisons, in A_1, A_2 and A_3 experiments number of 17 genotypes produced the highest grain yield respectively. Plant height showed negative and highly significant correlation with grain yield, in A_1, A_2 experiments. Also in A_3 between heading and ripping stage with 1000 grains weight was negative and significant difference correlation. Based on these results 17 barley genotypes were selected for advance experiment. On the basis of the evidence from the present study, Y (grain yield) is the best statistic for predicting the most productive barley genotypes in salt-affected soils.Key Words: Barley, Genotype & Salinity stress

ICPS-360 - STUDIES ON BIOLOGICAL DIVERSITY OF *RALSTONIA SOLANACEARUM* STRAINS CAUSING BACTERIAL WILT OF TOMATOES IN PUNJAB

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Abstract: Bacterial wilt of tomatoes caused by *Ralstonia solanacearum* poses a major threat to tomato production in Pakistan. The conditions of high humidity and high light intensity during moon soon season succumb tomatoes to bacterial wilt but unfortunately this problem is often mystified and concealed with other disease problems. There is high probability of increase in disease incidence through seed transmission, as most of the farmers in Pakistan use their own seed which is un certified and un healthy. Diseased samples from various tomato growing areas of Punjab province and seed samples of various tomato varieties were collected. The pathogen was isolated and identified using

different biochemical tests. Out of total isolates obtained 32.2% were confirmed to be RS. Further characterization revealed that 50 % of these were Biovar 2 and 50% were Biovar 3. Both Biovars were found to be associated with plant as well as seed samples of tomato varieties Roma, Reogrande and Money Maker. Pathogenic variability of the isolates was checked by three different methods i. e. soil drenching, leaf clipping and detached leaf method. Among all these methods detached leaf method was found most efficient for development of wilt symptoms on tomato. Significant variability was noticed among isolates and it was concluded that RS strains belonging to Biovar 3 were more aggressive on tomato.

ICPS-361 - ESTIMATION OF CORRELATION COEFFICIENT AMONG SOME YIELD PARAMETERS OF WHEAT UNDER RAINFED CONDITIONS

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Abstract: Correlation studies were conducted in F_2 progenies of an 8x8 complete diallel cross of wheat genotypes, sown at the Department of Plant Breeding and Genetics, University of Arid Agriculture, Rawalpindi during 2002. The association among different yield contributing traits was studied at genotypic and phenotypic levels. The results revealed positive correlation of number of spikelets per spike, number of grains per spike and 1000 grain weight with grain yield at both genotypic and phenotypic levels. However, number of tillers per m^2 and spike length contributed negatively towards grain yield at both levels. Plant height was positively correlated with grain yield at genotypic level, whereas negatively correlated at phenotypic levels. It was, therefore, suggested that number of spikelets per spike, number of grains per spike and 1000 grain weight should be given emphasis for future wheat yield improvement programs.

ICPS-362 - FREUNDLICH MODEL BASED PHOSPHORUS REQUIREMENT OF WHEAT IN RASULPUR SOIL SERIES OF PAKISTAN

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Abstract: A field experiment was conducted in Rabi 2004-2005 on Rasulpur soil series (Typic Camborthid) to determine the P requirement of wheat for obtaining 95 % relative yield. Site selection was based on calcareousness and P deficiency. Phosphorus sorption isotherms were constructed to study the behavior of soil to phosphate application by adding 0, 5, 10, 15, 20, 40, 60 and 80 µg P mL^{-1} and were examined by the Freundlich equation. The parameters a (amount adsorbed in µg g^{-1}) and b (buffer capacity in mL g^{-1}) were estimated by regression of the logarithmic form of the data obtained from the adsorption isotherms. Theoretical doses of P (mg kg^{-1} soil) were calculated from this equation to develop P levels in the soil solution under field conditions which were 0.05,0.10, 0.15, 0.20, 0.25, 0.30, 0.40, 0.50 and 1.00 (mg P L^{-1}) with native solution P level as control with and without N and K fertilizer application. Wheat crop was grown in the randomized complete block design with three replications. Maximum wheat grain and straw yield of 3.51 and 3.67 Mg ha^{-1} was recorded at solution P level of 0.20 mg P L^{-1}, respectively. Maximum phosphorus concentration in wheat grain and straw was 0.410 and 0.145 % which was found at solution P level of 0.50 mg P L^{-1}, respectively. External solution P requirement was 0.172 mg P L^{-1} and internal P requirement was found 0.302 % for obtaining 95 % relative yield of wheat.

ICPS-363 - RHIZOFILTRATION OF HEAVY METALS FROM THE TANNERY SLUDGE BY THE ANCHORED HYDROPHYTE*, HYDROCOTYLE UMBELLATA* L.

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Abstract: The anchored hydrophyte, *Hydrocotyle umbellata* L. was employed for the removal of metals from tannery sludge concentrations (w/v) from a tanneries waste water plant. Different concentrations of wet tannery sludge were prepared and plants of *H. umbellata* showed a good tolerance for all the prepared concentrations. Plants retrieved after 30, 60 and 90 days and the sludge concentrations showed reduction in sodium chloride percentage, chlorides, bicarbonates and COD. Among the essential elements, the maximum metal uptake was observed after 90 days exposure of *H. umbellata* The order of uptake efficiency was Na> Ca> K, being 7,692 mg kg $^{-1}$ for Sodium, 5,200 mg kg $^{-1}$ for Calcium and 6,488 mg kg $^{-1}$ for Potassium in the roots. The accumulation of heavy metals in the plants was significantly increased, with increasing exposure time of plants. A higher amount was accumulated in the roots than in the shoots. The bioconcentration factor of Cr was higher than that of Zn and Cu at the same exposure time, indicating a higher accumulation potential of Cr than Zn and Cu by *H. umbellata.* The order of uptake efficiency was Cr> Zn> Cu and the maximum metal uptake was observed after 90 days exposure of *H. umbellata*, 18,200 mg kg $^{-1}$ for Chromium, 15,560 mg kg $^{-1}$ for Zinc and 6,660 mg kg $^{-1}$ for Copper in the roots. These plants not only tolerated the maximum concentration of tannery sludge but also reduced chromium content of sludge up to a considerable extent.

ICPS-364 - ROLE OF RHIZOSPHERE FUNGI IN ENHANCEMENT OF METAL UPTAKE FROM TANNERY SLUDGE AMENDED SOIL BY *BRASSICA JUNCEA*

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Abstract: The metal accumulation potential and its tolerance in the plants of *Brassica juncea* L. grown on various amendments of tannery sludge (10%, 22%, 50%) were studied. Different treatments of rhizosphere fungi were given to the plants. *Trichoderma pseudokoningii* was used as fungus inoculum (F) and colonized roots of Maize as the mycorrhizal inoculum (M). These plants were found to be effective accumulators of metals (Cr, Cu, Zn, and Cd); the plants given both the fungus and mycorrhizal (F+M) treatment showed significantly high growth in all types of soil. Plants given only fungus (F) and only mycorrhizal (M) treatment also showed significant growth rate as compared with control treatment. From the results of elemental assay in the harvestable parts, it was observed that roots accumulate more metals as compared with aerial parts of plants. The accumulation of metals (Cr, Zn, and Na) in different parts of *B. juncea* plants grown on tannery sludge amended soil increased with the concentration of the sludge in the soil. Among the heavy metals, lead was absent in all types of soil. Cr, Na, Zn, Cd and Cu were present and their uptake by plants was also detected but results of plants treated with both fungus and mycorrhizal treatment were more significant. The statistical analyses of the results showed increase in all physiological parameters in lower sludge amendment ratio at all exposures followed by a decrease at highest (20%) sludge amendment ratio.
In view of growth parameters and metal accumulation in the plant, it was observed that lower amendments (10% and 20%) of tannery sludge were found suitable for the phytoremediation of most of the studied metals.

ICPS-365 - ECOLOGICAL STUDY OF AQUATIC HYPHOMYCETES IN A CANAL AND ITS CONNECTING IRRIGATION CHANNELS

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Abstract: The ecological studies of the Aquatic Hyphomycetes were carried out at the Lahore Branch of the BRB Canal and the irrigation water channels originating from it at Quaid-e-Azam Campus, University of the Punjab, Lahore. The present study was a comparison between the canal and its connecting irrigation channels for their physcio-chemical properties and the spora of the Aquatic Hyphomycetes. Two water channels named as WC-1 and WC-2 were selected for this purpose. The most important characteristic feature of these irrigation water channels is the intermittent desiccation due to water closure. The canal and the irrigation water channels differ from each other in their riparian vegetation and water chemistry. The importance of study of Aquatic Hyphomycetes in these irrigation water channels is to determine the fate of fungal spora after it enters into these water channels from canal. The comparison reveals that there is greater similarity in Hyphomycetes community of these irrigation water channels as compared to that of canal. A total of eighteen Aquatic Hyphomycetes species were detected from the canal, ten from WC-1 and eleven from WC-2 by using leaf pack baiting technique. The absence of some canal species from irrigation water channels shows the absence of favorable stimulus for survival or presence of some inhibiting factor. The species found in these irrigation water channels were similar to these of canal except for two new species named as Species A and Species B. this is due to the new environmental conditions present in these water channels and the riparian vegetation along the channels.

ICPS-366 - RICE ALLELOPATHY: GROWTH RESPONSE OF *RUMEX DENTATUS* TO RICE MULCHING

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Abstract: Plants which are, unwanted, destructive, persistent, prolific, competitive and generally grow out of their place, known as weed. These plants compete with the economic crops for growth factors like nutrients, moisture, light and space, resulting in huge damage to the yield of these crops. So proper weed control become essential for successful crop production and farmers use mechanical, chemical and biological methods for this purpose. These methods being costly, harmful and specific in nature are not economical. Allelopathic being economic and environment friendly provides an alternative to this situation. Therefore, keeping in view the role of rice mulching in weed management, the present study was designed to manipulate the allelopathic traits of rice for control of *Rumex dentatus*. Results revealed that shoot length of *R. dentatus* was shortened by 33.79% and reduction in shoot fresh and dry weight remained 39.98% and 35.94% in 25% rice mulching in comparison to control. Data recorded on root growth parameters was also on the same pattern. Overall 25% rice mulch regime proved effective against *R. dentatus* than higher concentrations of 50% and 75%.

ICPS-367 - RICE ALLELOPATHY: GROWTH RESPONSE OF *CONVOLLULUS ARVENSIS* TO RICE MULCHING

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Abstract: Weeds plants are noxious, troublesome, aggressive, resistant competitive and of little economic importance. These interfere with the utilization of natural resources as their requirements for the key growth factors are same as does the crops. It results huge reduction in the yield of economic crops, thus must be controlled. Farmers used mechanical, chemical and biological methods for weed management with mixed results. These practices are costly, harmful, specific and hazardous in nature. Allelopathy, being safer and environment friendly provides alternative to this situation and is used for biological weed control. In present study rice allelopathy was exploited for the control of *convolvulus arvensis* during a field trials, during which it was grown in non-mulch and rice mulch regimes of different concentrations. Recorded data exhibited a decrease of 54.02% 70.88% and 60.43% in shoot

length, fresh and dry weight respectively in 50% rice mulch concentration at 90 days growth stage. Results at later growth stages and on growth parameters of root were also found on the same pattern. It is important to mention that *C. arvensis* completely failed to grow germinate under 25% rice mulch regime.

ICPS-368 - SUNFLOWER ALLELOPATHY: GROWTH RESPONSE OF RICE TO SUNFLOWER INCORPORATION

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Abstract: The chemical mechanism of plant interference, characterized by a reduction in plant emergence or growth, reduces their performance in association and causes detrimental effects, is allelopathy. Chemicals with allelopathic potential are present in almost all plants and in many tissues which are released into the environment by means of volatilization, leaching, decomposition of residue and root exudation in ample quantities to affect a neighboring or successional plants. This aspect of allelopathy was exploited during present study when rice variety B. kernel was grown under the stress of sunflower allelopathy. Results exhibited a significant decrease of 30% in till… capacity of rice under sunflower incorporation as compared to control. It was followed by 21.43% and 33.33% reduction in shoot fresh and dry weight respectively. Measurements on root growth parameters revealed the similar pattern over the entire period of growth.

ICPS-369 - SUNFLOWER ALLELOPATHY: GROWTH RESPONSE OF WHEAT TO SUNFLOWER INCORPORATION

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Abstract: Plant – Plant biochemical interactions that cause inhibitory effects are referred as allelopathy. It has now been recognized as an important ecological factor in plant interactions. Allelopathic inhibition is due to the combined action of a variety of allelochemical which are present in almost all the plants and plant parts. This chemical interference with several physiological processes resulting in morphological effects. Sunflower allelopathic potential was exploited during present study when wheat variety Inqlab91 was grown after harvesting and mixing this plant into the field plots. Data recorded revealed 37.50% decrease in tillering capacity followed by 23.86% and 58.66% depression in shoot fresh and dry weight respectively at 90 days growth stage. Results at later growth stages of 120 and 150 days and also on root growth parameters were on the same lines.

ICPS-370 - EFFECTS OF SOME ENVIRONMENTAL FACTORS ON THE PRODUCTIVITY OF CRIMEAN PINE (*PINUS NIGRA* ARN. SSP. *PALLASIANA* (LAMB.) HOLMBOE) IN SUTCULER REGION, TURKEY

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Abstract: This study was undertaken on *Pinus nigra* ssp. *pallasiana* commonly known as Crimean pine. The forests of the Crimean pine have a great ecological and economic importance. The aim of present investigation was to determine the important site factors affecting the development of these forests.

The studies were undertaken in the Sütçüler region which experiences a transitional climate between Mediterranean and Continental. There is a strong water deficit in summer. The data was collected from 37 sample plots. It was analyzed statistically by using upper stand height (BE) as a dependent variable and some site characteristics as independent variables. The results revealed that an important negative linear relationship occurs between upper stand height (BE) and Ah organic matter in the simple regression analysis. The reasons for this indirectly depend on other site factors (aspect, slope position, altitude, slope degree and humus forms) determined by means of factor analysis. As a result, an equation explaining these impacts was achieved by means of Discriminant analysis using the site factors mentioned here.

ICPS-371 - CHEMICAL COMPOSITION AND ANTISTAPHYLOCOCCAL ACTIVITY OF AN ENDEMIC *SALVIA CHRYSOPHYLLA* STAPF. NATURALLY DISRIBUTED DENIZLI PROVINCE (Turkey) AND ITS VICINITY

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Abstract: In this study, it was investigated that antistaphylococcal activity of endemic *Salvia chrysophylla* Stapf. naturally distributed in Denizli (Turkey) and its vicinity. The antistaphylococcal activity of the crude extracts was evaluated against strong 2 microorganisms which are *Staphylococcus aureus* and *Cowan liyofili.* In order to detect the antistaphylococcal activity was used broth microdilution methods. When compared with other studies, mic value of our study is further low. The essential oils of endemic *Salvia chrysophyla* in Denizli was analyzed by GC-MS. The major constituents of the oil of *S. chrysophyla* were 3-oktanol, α-phellandren-8-ol, camphor and limonene.

ICPS-372 - USING RAPD ANALYSES AS BIOINDICATOR OF GENOTOXIC EFFECTS OF BORON IN CROPS

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Abstract: Boron is an essential micronutrient for higher plants and plays an important role in some metabolic pathways, membrane structure and many other functions in plants. Not only deficiency create problems, but also the excess concentration cause some toxic effect in plants. Boron toxicity is an important disorder that can limit plant growth on soils of arid and semi arid environments throughout the world. In recent years, several tests have been developed to evaluate the toxicity of environmental contaminants on plants. In this study, bean (*Phaseolus vulgaris* L.) and wheat (*Triticum aestivum* L.) seedlings were used as bioindicators to determine genotoxic effects of different concentrations of boron. Inhibition of root growth in the bean and wheat seedlings was observed with an increase in the boron concentration. The changes occurring in random amplified polymorphic DNA (RAPD) profiles of root tips following boron treatment included variation in band intensity, loss of normal bands and appearance of new bands compared with the normal seedlings. Additionally, we found that the effect of changes was dose-dependent. These results indicated that genomic template stability (a qualitative measure reflecting changes in RAPD profiles) was significantly affected at high boron concentration. Thus, DNA polymorphisms detected by RAPD analysis could be used as an investigation tool for environmental toxicology and as a useful biomarker assay for the detection of genotoxic effects of boron pollution on plants.

ICPS-373 - SEED GERMINATION BEHAVIOUR OF *DIPLOTAXIS TENUIFOLIA* (L.) DC.

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Abstract: Genus *Diplotaxis* is represented by more than 20 species mainly distributed in the North Mediterranean.Out of these *Diplotaxis tenuifolia* (L) DC (wild rocket) is used widely in Italian and French cuisine. It has also been used for medicinal purpose for different illnesses throughout the history. In this study the germination behavior of the seeds of *D.tenuifolia* was investigated. The seeds were very sensitive to pH and salinity stress. The seed germination increased under daylight conditions reaching a level of 80 percent but decreased in dark and continuous light. A remarkable increase was recorded (90 %) in the germination of seeds subjected to $+4^0$C shock for a week or two before left for germination. Pre-hydration followed by re-drying increased the germination to some extent (28 %). These findings reveal that the storage conditions are important for establishing a seed bank of *D. tenuifolia,* in order to get highest germination.

ICPS-374 - ETHNOECOLOGY OF POISONOUS PLANTS OF TURKEY

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Abstract: Turkey shows a flourishing plant diversity. The country embodies more than 9000 taxa of higher plants and a large proportion of the population is using plants for different purposes. Interest in plants is increasing and much work is being carried out these days on the multipurpose uses of plants. A great impetus has been given to this during the last 3 decades. Several publications have been made by different investigators. Large number of naturally growing plants are collected and sold at the markets. Nearly 500 plants are used for primary health care, but not much is known about the poisonous plants. Plant poisoning in Turkey lies around 6 %, rurals suffer more from the consumption of naturally growing plants as compared to urban dwellers. Most important poisonous taxa are: *Equisetum arvense*, *Juniperus excelsa*, *Aconitum cochleare*, *Adonis aestivalis*, *Consolida orientalis*, *Ranunculus sceleratus*, *Agrostemma githago*, *Peganum harmala*, *Lathyrus Sativus*, *Vicia sativa*, *Sambucus nigra*, *Bellis perennis, Solenanthus stamineus*, *Nicotiana glauca*, *Digitalis ferruginea*, *Digitalis trojana*, *Euphorbia cyparissias*, *Ornithogalum narbonense*, *Lolium temulentum*, *Rumex acetosella*, *Conium maculeatum*, *Apocynum venatum*, *Nerium oleander*, *Arum detruncatum*, *Dracunculus vulgaris*, *Cionura eracta*, *Cynoglossum montanum*, *Cannabis sativa*, *Viburnum lantana*, *Cistus laurifolius*, *Artemisia absinthium*, *Cnicus benedictus*, *Scorzonera latifolia*, *Tanacetum vulgare*, *Cheiranthus cheiri*, *Ecballium elaterium*. Some of these are toxic and others cause reaction. One has to be very cautious before using these plants as the plants used for the purpose of treatment of diseases as a whole or parts thereof or consumed by the public directly could prove dangerous for their health. This paper describes ethnoecological aspects of the widely distributed major poisonous plants in Turkey which can prove fatal if used unknowingly. Major applications and active constituents of plant taxa are outlined.

ICPS-375 - EFFECT OF BAYTAN (FUNGICIDE) ON GERMINATION, SEEDLING GROWTH AND MOISTURE CONTENT ON DIFFERENT WHEAT VARIETIES OF BALOCHISTAN

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Abstract: Effect of fungicide (baytan) was estimated against six local wheat varieties (Local white, Pak-81, Sonalika, Zamindar, Zardana and Zarghoon) of Balochistan. The fungicides were used in four different concentration (25%, 50%, 75%, 100%) and the results were compared with control treatment. Plant morphology, seed size, germination rate, seedling growth, moisture content, epidermal architecture were also studied. Results showed that morphological variability occurred at 25%- 50% concentration of Baytan. Beside this maximum germination was also observed on the same concentration while the 75%, 100% of baytan delayed the germination and produced morphologically weak of seedlings in all wheat varieties. The high moisture content was also observed in the same seedlings produced with 25%- 50% of Baytan.

ICPS-376 - MICRO AND MACRO ELEMENTS OF TWO DOMINATED TREES OF QUETTA DISTRICT USED AS FODDER

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Abstract: Macro and micro elemental composition N, P, Ca, K, Na, Fe, Al and Mn of foliage of two dominated tree *Fraxinus xanthoxyloides* and *Pistacia khinjuk* of Quetta district were analyzed seasonally to determine their nutritional value as fodder. Elemental concentration was determined by using atomic absorption, flame photometer and X-ray florescence spectrophotometer. *F. xanthoxyloides* was found to be better than *P. khinjak* as it had significantly high mineral content. High concentrations of Phosphorus and calcium were found in F.xathoxyloides while low amounts Iron and Potassium were recorded. These concentrations were almost similar to those required for good animal nutrition. These concentrations of minerals were high during summer season. Mineral concentration gradually increased from spring to autumn season and decreased in winters.

ICPS-377 - HEAVY METALS CONTAMINATION IN SOME PLANTS GROWING ALONG THE ROADS OF QUETTA CITY

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[Department of Botany University of Balochistan, Quetta]

Abstract: The level of heavy metals from the leaves of *Fraxinus Sp, Morus alba* and *Pinus halepensis* trees growing along the roads of Quetta city were determined by Atomic Absorption Spectrophotometer. Samples of leaves were collected seasonally. The concentration of heavy metals was found during all the season and in all the leaves samples, but with variation. Seasonally, the concentration of all the metals was found maximum and significantly high during autumn and minimum during spring season. Among the metals Mg, Zn and Pb was found most abundant and significantly high in all the leaves samples collected from the city areas as compared to the control Area University campus and Botanical garden, while copper and zinc were found in low amounts but their concentration was high in the city area as compared to the control area. Jinnah road trees were found most polluted by lead contents.

ICPS-378 - PHYSIO-CHEMICAL COMPOSITION OF DRINKING WATER IN AND AROUND THE QUETTA CITY

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[Department of Botany University of Balochistan, Quetta]

Abstract: Drinking water samples collected from in and around the Quetta city were analyzed for Bacterial, Chemical and Metallic composition by Atomic Absorption Spectrophotometer and other techniques. Temperature, conductivity and pH of water varied from location to location and season to season. Low water temperature was found during winter and high during summer season. High conductivity was found in the water of Kach dam, Brewery watercourse and Jalugir pond, while lower in Spin karaze, Hanna Lake and Kasiaabad pond. The pH value was more than 7 in all the water samples and seasonally it slightly increased in spring and reached to its maximum in summer, thereafter, it started decreasing smoothly in autumn to winter season. Calcium, Magnesium and total catIon showed variation from location to location. The two ions (Ca & Mg) showed inverse relationship between them, in which the Mg showed its increase, while Ca showed its decrease pattern except at two localities i.e. Hanna Lake where both ions remain low and Berma hotel where both ions remain high. The nutrients and salt (Chlorides, Sodium and Sulphates) were found to be fluctuating very irregularly. Total ions and bicarbonates were always found in all the water samples but the Carbonates were mostly nil except four locations i.e. Sariab tube well, Spin karaze, Jalugir pond and Brewery watercourse. The number of Bacteria varied from location to location and season to season. Very high number of bacteria was found in the water of Karazes, Lakes, Ponds, Water courses and Dam during summer and winter season, while very low number was present in tube wells water during spring season. An interesting fact, appeared at the Sariab tube well, where sudden increase in number of bacteria occur, which indicate that the natural condition of the area is now undergoing the process of alteration due to increased human interference. The level of all the metals (Pb, Cu and Mn) except Zn and Ni remained higher at surface water samples (ponds, lakes, dam, karazes and water courses) but lower in ground water (tube wells).

ICPS-379 - IN VITRO CALLUS INDUCTION, SOMATIC EMBRYOGENESIS AND REGENERATION IN LOCAL WHEAT (TRITICUM AESTIVUM L.)

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Abstract: Wheat is important cereal crop for human consumption in Pakistan and worldwide. Development of a reliable *in vitro* plant regeneration procedure through somatic embryogenesis is prerequisite for its improvement through somaclonal variation and gene manipulation. Present experiments were conducted to study the callus induction, somatic embryogenesis and regeneration of three local wheat varieties i.e. Marvi 2000, Sindh 81 and TJ 83 on MS medium supplemented with different concentration of growth regulators BAP, 2,4-D and Kn. MS medium supplemented with 4.0 mg/L 2, 4-D showed the maximum callusing response in all varieties while somatic embryogenesis was found higher in Marvi 2000 when the proliferating calli were shifted on MS medium supplemented with 3.0 mg/L Kn. Similarly TJ 83 showed higher regeneration response on 4.0 mg/L BAP while Marvi 2000 on 3.0 mg/L Kn containing MS medium.

ICPS-380 - SOMATIC EMBRYOGENESIS AND REGENERATION IN LOCAL MUNGBEAN (*VIGNA RADIATE* L.)

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Abstract: In present study the callusing and regeneration response of four EMS and NaCl treated lines of two local mungbean cultivars Jhapil and Siterdia were evaluated using shoot apical meristem, cotyledon, and leaf explants on MS medium supplemented with various concentrations of 2, 4-D and BAP and IBA. The highest callusing response was obtained in L_2 when leaf and shoot epical meristem explant were used on MS medium supplemented with 1.809µM 2, 4-D and 3.555µM BAP while leaf explants of L_1 and L_2 lines produced maximum callus by fresh weight. The shoot apical meristem,

cotyledon and leaf explants showed callusing response after seven days, ten days and one month respectively. The MS medium supplemented with 3.4 µM IBA showed maximum regeneration in calli obtained from different lines.

ICPS-381 - SEED GERMINATION BEHAVIOUR OF *DIPLOTAXIS TENUIFOLIA* (L.) DC

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Abstract: Genus *Diplotaxis* is represented by more than 20 species mainly distributed in the North Mediterranean.Out of these *Diplotaxis tenuifolia* (L) DC (wild rocket) is used widely in Italian and French cuisine. It has also been used for medicinal purpose for different illnesses throughout the history. In this study the germination behaviour of the seeds of *D. tenuifolia* was investigated. The seeds were very sensitive to pH and salinity stress. The seed germination increased under daylight conditions reaching a level of 80 percent but decreased in dark and continuous light. A remarkable increase was recorded (90 %) in the germination of seeds subjected to $+4^0$C shock for a week or two before left for germination. Pre-hydration followed by re-drying increased the germination to some extent (28 %). These findings reveal that the storage conditions are important for establishing a seed bank of *D. tenuifolia,* in order to get highest germination.

ICPS-382 - ANTIMICROBIAL POTENTIAL OF SEED EXTRACT OF *RAPHANUS SATIVUS SATIVA*

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Abstract: The antimicrobial activity of crude water extract, Supernatant as well as Methanolic extract of *Raphanus sativus* were investigated in vitro using Agar well diffusion method. All Extracts were tested against two gram negative bacteria and four fungal cultures. Plant extracts exhibited concentration dependent antimicrobial properties. The extracts displayed highest antibacterial activity while fungal species viz. *Penicillium lilacinum, Paecilomyces variotti, Spadicoides stoveri, Penicillium funiculosum* showed variable degrees of inhibition even at lower concentration.

ICPS-383 - EFFECT OF FOLIAR APPLICATION OF UREA ON SUNFLOWER UNDER SALINE

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Abstract: A greenhouse experiment was conducted to assess the effectiveness of foliar application of urea in alleviating the adverse effects of salt stress on sunflower plants. Three levels of urea (0, 10 and 20 m*M)* were applied foliarly to salt stressed and non-stressed sunflower plants. Results showed that foliar application of 20 m*M* urea increase shoot and root fresh and dry weights under both control and salt stress, however shoot length was declined by salinity. urea significantly improved stomatal conductance, photosynthetic rate and sub-stomatal CO_2 concentration, but Ci/Ca ratio was not influenced marked increase in shoot and root Na^+ as well as Cl^- contents was observed under saline conditions, but foliar application of urea significantly decreased Na^+ and Cl^- contents in shoot as well as roots. However a significant increase in K^+ content was noted due to foliar applied urea. In conclusion, foliar application of urea could significantly ameliorate the inhibitory effects of salt stress on the growth of sunflower.

ICPS-384 - EFFECTS OF VARYING NaCl, K^+/Na^+ AND $NaHCO_3$ LEVELS ON BARLEY (*HORDEUM VULGARE* L.) CULTIVARS DIFFERING IN SALT TOLERANCE

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Abstract: Barley (*Hordeum vulgare* L.) is rated as salt tolerant among the crop plants, however a great genetic variation exists for salt tolerance in its cultivars. Growth and ion uptake of three barley cultivars, differing in salt tolerance, were examined under different levels of NaCl, K^+/Na^+ and $NaHCO_3$ in the root medium. The cultivars varied greatly in their responses to varying root medium conditions. Plant growth was more adversely affected by $NaHCO_3$ than NaCl. In general, biomass yields were comparable under control and 100 m*M* NaCl. However, growth of all barley cultivars was significantly inhibited by $NaHCO_3$ even at low concentration (10 m*M*). Improved K^+ supply in saline medium increased K^+ uptake and growth of less tolerant cultivars. K^+ uptake was more adversely affected by $NaHCO_3$ than NaCl salinity. Selective K^+ uptake and lower Cl^- in shoots seemed to be associated with the growth responses. When grown in normal soil, all the three cultivars had comparable growth under irrigation with fresh canal or saline underground water. K application would help better growth of these cultivars on K-deficient saline-sodic soils and under irrigation with poor quality (high bicarbonate) water. However, accumulation of salts in root-zone under irrigation with saline water warrants periodical leaching of soil to sustain plant productivity.

ICPS-385 - INTERACTIVE EFFECT OF ROOTING MEDIUM APPLICATION OF PHOSPHORUS AND NaCL ON PLANT BIOMASS AND MINERAL NUTRIENTS OF RICE (*ORYZA SATIVA* L.)

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Abstract: A greenhouse experiment was conducted to assess the influence of rooting medium application of phosphorus on mineral nutrient accumulation of rice (*Oryza sativa* L.) plants under normal and saline conditions. There were four levels (0, 20, 40 and 60 mmol kg^{-1}) of NaCl and three levels of phosphorus (control, 30 and 60 mg kg^{-1}) applied through rooting medium. Rooting medium salinity reduced the plants fresh and dry biomasses. Application of P also adversely affected the plant fresh and dry biomasses. Salt stress significantly increased the leaf, root and grain Na^+, Cl^- and Ca^{2+} concentrations while markedly decreased the leaf, root and grain K^+ of rice plants. Maximum increase or decrease in these nutrients was observed at 60 mmol NaCl/kg. However, a non-significant effect of salt stress was observed on leaf, root and grain P concentration. Effect of different levels of phosphorus was considerably increasing on leaf Na^+, Cl^-, Ca^{2+}, root Ca^{2+}, grain Na^+, and reducing on leaf, root P and K^+. However, consistent results were observed for others. Among all levels, 60 mg kg^{-1} of phosphorous was observed most effective in relation to the accumulation of these nutrients in rice plants.

ICPS-386 - CHARACTERIZATION OF *PHYTOPHTHORA INFESTANS*, THE CAUSE OF LATE BLIGHT OF POTATO

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Abstract: One hundred and twenty isolates of *Phytophthora infestans* collected from Chiniot and Miandam, Pakistan, were characterized for their metalaxyl sensitivity, mating type, isozyme and mitocondrial haplotypes to establish a phenotypic/genetic relationship between them. Frequency of A2 mating types was dominant at both the locations whereas all the isolates showed resistance against

metalaxyl. Sixty five isolates were analyzed for *Gpi* isozyme and five genotypes were identified in the whole collection. *Gpi* 122/86 and 122/90 were rare while 122/100, 122/122, and 122/111 were frequent among isolates. *Gpi* 122/100 was present in collections from both the locations. *Gpi* 122/86 was found only in Miandam but absent in Chiniot whereas genotypes 122/122, 122/90 and 122/111 were present in Chiniot collection while absent in Miandam. Mitochondrial haplotype analysis of 64 Chiniot isolates revealed haplotype Ia, IIa and IIb. Moreover, haplotype Ia was more frequent as compared to IIa and IIb. This study helped in finding diversity among isolates of *P.infestans* in Pakistan.

ICPS-387 - RELATIONSHIPS BETWEEN CARBON ISOTOPE DISCRIMINATION AND GRAIN YIELD, WATER-USE EFFICIENCY, AND GROWTH PARAMETERS IN WHEAT (*TRITICUM AESTIVUM* L.) UNDER DIFFERENT WATER REGIMES

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Abstract: Carbon isotope discrimination (Δ) has been proposed as indirect selection criteria for grain yield and water-use efficiency in wheat. Present studies were conducted to identify high yielding wheat genotypes for target environments and establish relationship between Δ and grain yield (GY), Water-use efficiency (WUE) and other parameters. A set of eight wheat genotypes screened previously for variation in Δ and higher grain yield were grown under four water regimes; well-watered (WW), medium-watered (MW), low-watered (LW) and stored soil moisture (SSM) conditions. Early leaf and grain samples collected at maturity were analysed for Δ. Plants parameters, days to 50% flowering, plant height and maturity days were recorded. At harvesting spike length, number of grains per spike, grain weight per spike, biomass yield, grain yield harvest index and WUE were determined.

Significant effects of genotype and treatments on leaf Δ, BY, GY, HI, WUE_B, WUE_G, HD, NTPP, plant height (PH), NGPS, GWPS and spike length (SL) were observed. Genotype x treatment interaction had a significant effect on HI, PH, SL, GWPS, HD and MD but effect was non-significant on other traits. Leaf Δ varied from 18.63 to 20.93 ‰ (12%) in these genotypes Water stress resulted significant decrease in mean ΔL. Under SSM and LW treatment ΔL were 01.05‰ and 1.02‰ lower respectively, than WW treatment. Grain yield showed wide variation among these genotypes and water stress resulted marked decrease in GY. Genotype, Sitta produced highest mean GY (4404 $kgha^{-1}$) with highest WUE_G (23.3 $kgha^{-1}mm^{-1}$) averaged across the treatment.

Grain yield showed a significant positive correlation (r = 0.761*) with ΔL. GY was strongly and positively correlated with HI (r = 0.845**), SL (r = 0.779**), GWPS (r = 0.943**), TGW (r = 0.899**) and plant color (r = 0.719*). GY had a significant negative correlation with NTPP (r= -0.854*) and heading days (r= -0.708*). WUE_G was positively correlated (r = 0.758*) with ΔL, HI (r = 0.846**), SL (r = 0.783*), GWPS (r = 0.948**), TGW (r = 0.895**) and plant color (r = 0.709*). WUE_G was negatively correlated with NTPP (r= -0.813*) and heading days (r= -0.744*).Results highlight significant positive linear correlations between GY, WUE and Δ in wheat and potential of Δ as indirect selection criterion for wheat yield in Pakistan. Two genotypes Sitta and FD-83 having very high yield potential and water-use efficiency under water stress conditions are recommended as varieties for rain-fed and low water environments of the country.

ICPS-388 - MORPHOLOGICAL VARIABILITY AND MYCELIAL COMPATIBILITY AMONG THE ISOLATES OF *SCLEROTINIA SCLEROTIORUM* ASSOCIATED WITH STEM ROT OF CHICKPEA

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Abstract: Variability among 16 isolates of *Sclerotinia sclerotiorum* associated with the stem rot of chickpea plant samples collected from various localities in Pakistan reported. The isolates varied in colony morphology, mycelial growth rate, sclerotium formation, and sclerotial size and color. Variability among the isolates on the basis of their mycelial compatibility was also observed, and out of 120 combinations, 70 showed compatible reactions. Based on mycelial compatibility, 58% vegetative compatibility groups (VCG) were identified among the isolates.

ICPS-389 - VARIABILITY AMONG ISOLATES OF SCLEROTIUM ROLFSII ASSOCIATED WITH COLLAR ROT DISEASE OF CHICKPEA IN PAKISTAN

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Abstract: The isolates of *Sclerotium rolfsii* were removed from collar rot diseased samples collected from chickpea producing areas of Pakistan. The isolates varied in colony morphology, mycelial growth rate, sclerotial formation, sclerotial size and color. Mycelial incompatibility among the isolates was also observed. Out of 66 combinations, only 26 combinations (39%) showed compatible reactions. Based on mycelial compatibility, 40 vegetative incompatibility groups (VCG) were identified among the isolates.

ICPS-390 - IMPROVEMENT IN SALINITY AND HEAT TOLERANCE IN WHEAT BY FOLIAR APPLICATION OF THIOUREA

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Abstract: Salinity and heat singly or in combination are stringent threat to plant productivity. Exogenous application of thiourea, by virtue of its biological properties, can improve stress tolerance in crops. Studies were conducted on five wheat varieties to determine the improvements in salinity and heat stress tolerance by foliar application of thiourea (10 m*M*) at seedling, tillering and pre-anthesis growth stages. Salinity tolerance was determined in terms of change in the salt tolerance threshold value, while heat tolerance was estimated as percent changes over controls. Foliar application of thiourea was effective in improving salinity and heat tolerance of wheat at all growth stages, being more pronounced at initial growth stages. Although improvement in growth and yield was evident in all the varieties, maximum salinity tolerance (9-11) was noted in MH-97 (sensitive to salinity) and maximum heat tolerance (7-9%) in S-24 (sensitive to high temperature). These data suggest that in view of its growth promoting properties, field use of foliar applied thiourea is feasible and cost effective.

ICPS-391 - TOLERANCE OF WHEAT SEEDLINGS TO NaCL STRESS PRETREATED WITH SALICYLIC ACID LEVELS

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Abstract: Soil salinity is the problem of global concern, which causes substantial yield loses to a number of crops including wheat. A pot experiment was conducted to asses the tolerance of wheat

seedlings to NaCl stress pretreated with salicylic acid in the alleviation of adverse effects of salt stress on wheat plants. Three salicylates including salicylic acid (SA), acetyl salicylic acid (ASA) and sulphosalicylic acid (SSA) each at 0, 25, 50, 75, 100 µM concentrations were used as seed pretreatment. Twenty five day old wheat plants were subjected to 150 m*M* NaCl stress. Application of these salicylates significantly improved overall growth, which was related to more improved net photosynthesis, stomatal conductance, transpiration rate and tissue K^+ concentrations while reduced Na^+ and Cl^- than those not pretreated with these salicylates. Pretreatment with of 50 µM level of SSA and 75 µM with K^+ were the most effective concentrations in improving wheat growth under saline conditions.

ICPS-392 - ORGANIC SOLUTE STATUS AND IONIC BALANCE OF SOME CONTRASTING MUNG BEAN (*VIGNA RADIATA* (L.) WILCZEK) ACCESSIONS GROWN UNDER SALT STRESS

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Abstract: It is now well established that assessment of salt tolerance of a crop at each growth stage is crucial to determine its ultimate salt tolerance. Therefore, salt tolerance of the two tolerant, Pak 45600 and Pak 45603, two moderate, Pak 45601 and NM 12 1-25 and two sensitive accessions, Pak 45594 and M-28, selected at germination and seedling stage was assessed at the adult stage. The two tolerant Pak 45600 and Pak 45603 and two sensitive Pak 45594 and M-28 accessions showed consistent correlation between the degrees of salt tolerance at the germination, seedling and adult stage. By contrast two moderate accessions, Pak 45601 and NM- 12 1-25 were almost similar in performance to those of the sensitive accessions at the adult stage thus showing a negative correlation between tolerances at different growth stages. Shoot and root fresh and dry biomass, shoot K/Na ratios, soluble proteins, water potential and osmotic potential decreased, whereas, shoot Na and shoot and root CF increased in all six accessions with the increase in NaCI concentrations. By contrast root Nat, shoot and root K and Ca free amino acids, soluble sugars, and root starch in all these accessions did not have any consistent pattern of increase or decrease in relation to salt stress. The tolerant accessions maintained relatively greater concentrations of Na and cr thus showing a typical halophytic mechanism. The tolerant accession Pak 45600 had greater amount of soluble proteins, root soluble sugars and starch and leaf osmotic potential, whereas the other tolerant accession, Pak 45603 had significantly greater amount of soluble proteins, root starch and root and shoot Na and CF than the other accessions. By contrast shoot and root K/Na ratios, free amino acids, shoot soluble sugars and leaf water potential were significantly greater in the salt sensitive accessions compared with the tolerant ones. It is amply clear from the present study that salt tolerance observed at the early growth stages is reflected at the adult stage in most of the accessions. But for others in which no positive correlation was observed a combination of certain morphological and physiological characters may be used for improving salinity tolerance in mung bean.

ICPS-393 - INVASIVE SPECIES OF FEDERAL CAPITAL AREA ISLAMABAD PAKISTAN

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Abstract: Islamabad, the federal capital of Pakistan, due to good climatic factor, has a well-developed flora rich in abundance and variety. Due to good city planning, the native flora is not yet affected by the population. But it has further been enriched by the introduction of a great number and variety of ornamentals, particularly trees. The tree plantation by CDA has reached the 11 million Mark, in 1982.

(Vide "Islamabad" CDA brochure1982) and much research work was carried during the period of 1980. Till now the dicotyledons in this area include 103 families. The number of genera described has reached the figure of 466. A total of 793 species has been reported of which 439 are wild and 354 are cultivated. Previously the invasion of new species in capital area was not noticed but when the harmful effects of some of these non native species occurred then the experts took it seriously and then much research work was carried out to find out the harmful effects of these species. This project deals with such exotic species of Islamabad capital area, which produced serious problems in various ways, while some plant species which are invaded through seed import or through seed disposal by air, water, animals from the nearby areas or other cities and countries. In the present work about 16 species are dealt with which are the most aggressive weeds of the Capital area and these are as: *Broussonetia papyrifera*, Parthenium *hysterophorus*, *Cannabis sativa*, *Lantana camara, Xanthium strumarium, Alternanthera pungens, Trianthema portulacastrum, Tagetes minuta, Amaranthus hybridus, Robinia pseudoacacia, Ailanthus altissima, Pistia stratiotes, Phragmites australis, Galium aparine and Emex australis.* These are an example of alien invasive plant species which not only reduce land value and cause great loss to agricultural communities but were detected as a source of allergy. Based on the indigenous botanical knowledge obtained from local communities a project is aimed to find out the list of invasive plant species, their impact on ecosystem and possible arrangement.

ICPS-394 - INDIGENOUS MEDICINAL PLANTS USED BY LOCAL WOMEN IN SOUTHERN HIMALAYAN REGIONS OF PAKISTAN

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Abstract: The present work is based on the results of research conducted on Traditional uses of some important plants by the local women in southern Himalayan Mountains, Pakistan. The locals especially women of the area have been using the medicinal plants for many day to day uses for various ailments and are dependent on the plants in their surroundings for food, health, medication, and various cultural purposes. A total of 28 important plant species belonging to 25 families were recorded which were used medicinally and various other purposes by the local women. About 130 informants were interviewed in this regard. Mostly plants like *Viburnum foetens* Dcne., *Bergenia ciliata* (Haw.) Sternb*, Berberis lycium* Royle, *Geranium wallichianum* D. Don ex Sweet and *Skimmia laureola* (DC.) Sieb. & Zucc. ex Walp. are used by the local women for medication, health care and other purposes. *Geranium wallichianum* D. Don ex Sweet is most commonly used as tonic by women especially for body strength and other internal body disorders. *Bergenia ciliata* (Haw.) Sternb. is used as anticancerous plant and for internal wounds. *Skimmia laureola* (DC.) Sieb. & Zucc. ex Walp. is another highly used plant for respiratory disorders in children by the local women. People have strong faith in herbal medication by ethnomedicinal plants and women are leading men in applying the recepies for medication by these plants.

ICPS-395 - INDIGENOUS KNOWLEDGE OF SELECTED ECONOMICALLY IMPORTANT PLANTS AS FOLK MEDICINES IN DISTRICT ATTOCK, PUNJAB, PAKISTAN

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Abstract: This present work is the study of indigenous knowledge of some economically important plants used for medicinal purposes in the area of District Attock. Plant researchers have rarely visited the area, so this study mainly focus on formations regarding traditional uses of plants over the area of

local people. For each species the information is provided regarding scientific names. English name, local name, and family name, part use medicinal importance uses. In total of 49 species belonging to 45 genera of 29 families are reported from area. During the course of study 12 Hakims (Specialists) and 100 local people were interviewed. The interviews were semistracted departing from a general interest in which type of plants was used for medicinal purposes. Further questions about preparation, seasonal collection times, location and part of the plants used were made.

ICPS-396 - ALPINE AND SUBALPINE FLORA OF NEELUM VALLEY, AZAD JAMMU AND THEIR FOLK USES

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Abstract: The present investigation is based on the floristic list and ethnobotanical studies of Angiosperms found in association with timberline vegetation in the Neelum Valley, Azad Jammu and Kashmir. The floristic list is represented by 207 species belonging to 138 genera of 42 Angiosperm families. It is found that the family *Asteraceae (Compositae)* is the largest family represented by 37 species. Th e second largest family is *Lamiaceae (Labiatae)* consisting about 17 species. The other families are represented by various number of species ranges from 1-16 species in Neelum Valley of Azad Jammu and Kashmir. Ethnobotanical studies include 146 species belonging to 102 genera and 35 families

ICPS-397 - ETHNOBOTANICAL STUDIES OF DHIBBIA KARSAL VILLAGE OF MIANWALI DISTRICT (PUNJAB)

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Abstract: Medicinally important plants are necessary for the production of the various drugs and curing diseases. The local people use twenty-three species of the vascular plants of the Mianwali district for medicine, Furniture and Agricultural implements and as the food The local community are extremely knowledgeable about the local plants but unfortunately this knowledge is going to be lost as traditional cultures is disappearing. The information obtained while studying the flora of the here is presented here. For each plants its botanical name, family name, vernacular names and method of using this plant is given. Total of 23 species belong to 18 families were recorded for the medicinal use and five species are utilized for agricultural implements and for other purposes.

ICPS-398 - MEDICINAL VALUE OF SOME IMPORTANT ROSES AND ALLIED SPECIES OF NORTHERN AREAS OF PAKISTAN

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[Department of Plant Sciences, Quaid-e-Azam University, Islamabad]

Abstract: The Northern Areas of Pakistan is well known for its biodiversity. About 3000 species of plants have been reported to exist in the area, out of which many species have medicinal properties. Some of these medicinal plants are aromatic, including 15 rose species. A total of 13 localities were visited during the Field Collection Trip and plant specimens Accession No. 123483 to 123673 i.e., 170 specimens have been collected along with ethnobotanical information obtained from local inhabitants

during Field Trip. All the collected plant material including many rose species was dried, pressed, preserved, accessioned, identified and deposited in the Herbarium, Department of Biological Sciences, Quaid-e-Azam University, Islamabad (ISL).

ICPS-399 - SINGLE NUCLEOTIDE POLYMORPHISM ANALYSIS OF MITOCHONDRIAL HEAT SHOCK PROTEIN GENE OF *G. ARBOREUM* AND ITS RELATIONSHIP WITH OTHER DIPLOID GENOMES, *G. HIRSUTUM* AND *ARABIDOPSIS THALIANA*

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Abstract: Single nucleotide polymorphisms (SNPs) are the most popular DNA markers because of their abundance and consistency in the genomes. House keeping genes are conserved in nature across the genomes of different organisms. Study of variations in these conserved genes can reveal the hidden facts of evolution which can not be excavated with conventional DNA marker systems. In the present study, mitochondrial heat shock protein gene has been explored to find nucleotide variations within *Gossypium arboreum*, with the other diploid *Gossypium* genomes, *G. hirsutum* and also with *Arabidopsis thaliana*. A conserved region spanning 300bp was amplified and sequenced from two *G. arboreum* (A_2) genotypes, species of other diploid genomes A1, C, E1, D4, D6, D9 and *G. hirsutum* (AD). Sequence of the gene of *A. thaliana was* retrieved from gene bank. These sequences were aligned. Within *G. arboreum* genome 7 SNPs were found including 3 substitutions and 4 indels. While, 'C' genome showed the least nucleotide variations with the 'A' genome species (*G. arboreum)* as compared to other genomes. D genome species were closely related with each other. *G. herbaceum* which is considered the ancestor of *G. arboreum* is more distant as compared to other genomes. *G. hirsutum* and *A. thaliana* were closely related with each other and most distantly related with other genomes. The present studies reveal that SNP markers could be identified in conserved regions where conventional markers are of little or no use. This study will lead to the better understanding of *G. arboreum* evolution and understanding how these variations can be utilized for the improvement of cotton genome.

ICPS-400 - FUNGUS INDUCED EXPRESSION AND PURIFICATION OF ANTIMICROBIAL PROTEINS/PEPTIDES FROM *PSORALEA CORYLIFOLIA*

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Abstract: Peptides and proteins from plants, recently reviewed have been considered as alternative to synthetic antibiotics. The present project was set out to check the ability of the *Psoralea corylifolia* to express antifungal protein/peptides under biotic stress of *Fusarium solani* and to exhibit antifungal activity against selected microbial strains at seedling stage. The plant material was harvested and extracted at different day post inoculation (dpi). At dpi3 the sample showed highest antibacterial activity against *Escherichi coli* as compared to *Staphylococcus aurreus* and *Bacillus subtilus.* Highest antifungal activity was found against *Fusarium solani* and *Aspergillus niger* as compared to *Trichoderma harzianum* and *Helmenthosporium myedis* after the same dpi. Dpi 3 extract was partially purified by ammonium sulphate at 80% saturation level and then further purified by using gel filtration chromatography using Sephadex G-75-120 and DEAE Sephadex anion exchange chromatography. Fractions that produced clear zones of fungal inhibition were subjected to SDS-PAGE. Expression of

medium molecular mass proteins/peptides was predominant. On the basis of these results, it is suggested that *Psoralea corylifolia* is a good source of antimicrobial peptides.

ICPS-401 - EFFECT OF COPPER, ASCORBATE AND GIBBERELLIN ON GERMINATION, ION CONTENT, PROLINE, SOLUBLE SUGAR AND STARCH CONTENT IN TWO CULTIVARS OF RAPE SEED (*BRASSICA NAPUS* L.)

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Abstract: Copper is a heavy toxic metals for plants. In this study the toxicity effects of copper on some of physiological activities of *"Brassica napus* L.*"* cultivars Hyola 401 and RGS have been studied. Seeds of *Brassica* were cultivated in hydroponic condition under different treatments: Cu (5, 15, 25 µmol/L), Cu & AsA (0.5 mmol/L), Cu & GA_3 (0.05 mmol/L) and Cu & AsA & GA_3 (0.05 mmol/L). Three replicates have been investigated for each treatment group. In both cultvars, Hyola401 and RGS germination percent, insoluble sugar, K^+ ions (in shoot and root) were decreased significantly ($P < 0.05$). But soluble sugar and proline were increased significantly ($P < 0.05$). The results of this study suggest that cult. var. Hyola401 was more resistantto copper than RGS. AsA treatment accompanying Cu, reduced the toxic effects of Cu *Brassica* seedling, however, GA_3 increased the Cu effects. Our statistical studies clearly show that Cu induces inhibitory effects on growth and some of physiologic activities in *Brassica*.

ICPS-402 - DIFFERENT PHYSIO-BIOCHEMICAL ASPECTS OF BANANA (*MUSA* SP.) MICROPRPAGATED UNDER NACL STRESS

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Abstract: Salinity is major abiotic growth limiting factor in banana. An experiment was designed in which effect of salinity on micro-propagation efficiency of banana (Basrai) was assessed under *in vitro* conditions. Micro-propagated plantlets were sub-cultured on shoot multiplication [Murashige and Skoog (MS) basal medium; benzyl amino-purine (15 µM) with 2 g l^{-1} phytagel)] medium under different sodium chloride (NaCl) stresses (0, 50, 100 and 150 m*M* NaCl) for 28-days. The *nitrate reductase* activity (NAR) and micro-propagation efficiency of cultured plantlets were reduced under increased salinity stress significantly. A significant effect of salinity treatment was also observed on growth and bio-chemical contents in the micro-propagated plantlets. When NaCl stress was supplemented to the normal micropropagation medium, Ca^{2+}, K^+, total protein, number of plantlets per explant, pseudostem diameter and dry weight were decreased while Na^+, Cl^-, proline, betaine and reducing sugar contents were increased significantly. A non-significant effect of treatment was observed on fresh weight of the plantlets. So salinity is a major a-biotic factor, under which variant characteristics were observed.

ICPS-403 - INVESTIGATIONS ON INCREASING PRODUCTIVITY OF GINGER (*ZINGIBER OFFICINALE*) BY AMENDMENT OF VERMICOMPOST AND BIOGAS SLURRY IN SALINE SOILS.

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Abstract: Ginger is a crop of economical importance. Though its productivity is generally reduced under saline conditions, it could be still improved by various physiological treatments, which offset

toxicity of excessive sodium of rooting medium. Amendments of Vermicompost and Biogas slurry have shown some reduction of sodium induced inhibitory effects, in present investigation. Chlorophyll analysis of leaves and production of carbohydrate protein etc with respect of various above-mentioned treatments have been undertaken. Vermicompost amendments improved net yield, fresh and dry weight of aerial and underground parts of plants, their chlorophyll, carbohydrate and protein contents both under the saline and non-saline conditions. Keeping in mind economical feasibility one can still obtain permissible economic returns from moderately saline soil, which was so far considered not suitable for ginger production.

ICPS-404 - SALINE AGRICULTURE AND ITS NECESSITY IN IRAN

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Abstract: The rapidly increasing human population in the arid and sub-arid regions of the world has tremendously increased the pressure on the availability of good quality water for human consumption and for agriculture. It is becoming increasingly difficult to grow conventional crops in some saline ecosystems and therefore it is imperative to look for other solutions. In more than 70% of the Iran plateau, people are facing shortage of rainfall, receding the groundwater level, salinisation of soil and water resources, growing demand of water from other sections such as industry, desertification of their lands (rangelands, and arable lands) and day to day pressure in the natural resources is also increasing. On the other side, population of the country is growing rapidly, living standards of society is improving, with advancement of better utilization of resources. In Iran thousand hectares of land are left unused because of accumulation of excess salt on them, or due to dryness of the water resource. The plant coverage of rangelands and forests of Iran particularly in desert areas is reducing regularly. Many villages left due to inefficient agricultural activities. Salinity of groundwater is more serious than that of surface waters. This has been increasing in recent years due to the overdraft and intrusion of the surrounding saline bodies of water. Considering the fact that nearly half of the water used in Iran's agriculture comes from the groundwater, the threat of the effects caused by salinity on the sustainability of crop production in the country becomes evident. This is not limited to Iran; the situation is the same on many other countries in the region. What we are able to do for our nations as agricultural specialists? I think we should looking for the key of this lock in nature of the region, how, the camel adapted to the desert conditions and how did human explore that camel could be used as a mode of transportation in the harsh desert conditions, how did human find date palm trees, in the hot and saline desert? There are thousand of plants and animals species that which have became acclimatized to such conditions and these can be more effectively utilized as crops, forages or domestic animals. The production of halophytes using saline waters and soils, and feeding livestock with them, is one of the most sustainable ways of conservation desert ecosystems and food production for people living in these areas. In this paper I will discuss in reference to Iran about the extent of degradation due to salinity, various approaches adopted to address salinity problems and efforts to introduce cash crop halophytes to sustained management of saline areas.

ICPS-405 - EFFECT OF DROUGHT STRESS AT DIFFERENT TIMES AFTER ANTHESIS ON PHYSIOLOGICAL CHARACTERISTICS IN DIFFERENT WHEAT (*TRITICUM AESTIVUM* L.) CULTIVARS

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Abstract: In order to study the effect of drought stress on yield and physiological characteristics of wheat (*Triticum aestivum* L.) a green house experiment was arranged in a completely randomized factorial with four replications. Three wheat cultivars, Chamran, Alvand (resistance), Navid (susceptible to water stress) and four levels of water stress (control, stress at %50 anthesis and 10, 20 days after anthesis) were used as treatments. Water stress imposed at different times after anthesis resulted in a decrease in relative water content (RWC), membrane stability index (MSI) and increased stomata resistance and SPAD reading in all cultivars. Genotypes Alvand and Chamran, which had higher membrane stability, had the lower relative water content and SPAD reading than genotype Navide under water stress. In this experiment, grain yield, number of kernel per spike and 1000 kernel weight of Navid was lowest and Alvand cultivar had highest of these traits. In this experiment Navid cultivar had the highest physiological characteristics such as RWC, stomata resistance and SPAD reading, but increase in theses parameters did not cause to heighten the grain yield of this cultivar. It seems that drought resistant genotypes have a tolerance mechanism to stand drought stress, because the physiological characteristics of them such as RWC, stomata resistance and SPAD reading were lower than susceptible genotype, while Navid cultivar uses the avoidance mechanism to stand drought stress.

ICPS-406 - NEW INSIGHTS INTO PHYLOGENY AND CLASSIFICATION OF CHENOPODIACEAE

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Abstract: Family Chenopodiaceae is the most important plant group diversified in arid, semi-arid, saline and hypersaline ecosystems. This family contains largest number of C_4 plants in Dicots including several types of Kranz anatomy and two unique type of C_4 photosynthesis without Kranz anatomy. The Chenopods have been traditionally classified into two subfamilies: Cyclolobeae with annular embryo, and Spirolobeae with spirally coiled embryos. The Cyclolobeae is equal to the subfamily Salsoloideae and Spirolobeae was equal to Chenopodioideae sensu Blackwell or the subfamilies Chenopodioideae, Salicornioideae and Polycnemoideae *sensu* Kühn et al. (1993). The recent molecular studies has drastically changed the circumscription of these subfamilies and showed that Suadoideae with spiral embryos forms a monophyletic clade with Salicornioideae with annular embryo and tribe Camphorosmeae with annular embryos forms a monophyletic clade with Salsoleae s.l. with spiral embryos. Molecular and morphological studies support following subfamilies Betoideae, Corispermoideae, Chenopodioideae, Salicornioideae, Suaedoideae and Salsoloideae. In Salicornioideae the traditional circumscription of most genera has been confirmed, however, the Australian endemic genera form a monophyletic large genus *Tecticornia*. In Suadoideae two genera *Bienertia* and *Suaeda* (including *Alexandra* and *Borszczowia*) are accepted. Salsoloideae has been the subject of major changes. It is divided into three tribes: Camphorosmeae, Salsoleae and Caroxyloneae. The two later tribes are well distinguished by a number of morphological and physiological characters including indumentum type and subtype of C_4 photosynthesis. The most basal species in tribe Salsoleae s.str. is the C_3 species *Sympegma regelii* from the Central Asia. The most basal species of the tribe Caroxyloneae are two closely related species *Caroxylon canescens* and *C. carpathum* known from East Mediterranean to Central Asia. The traditional *Salsola* known to be polyphyletic. This genus is divided into 10 genera/lineages including four previously described genera (*Caroxylon*, *Climacoptera*, *Kali*, *Xylosalsola*), three newly described genera (*Kaviria*, *Pyankovia* and *Turania*) and three informally named lineages ("Canarosalsola", "Collinosalsola" and "Oreosalsola"). The genus *Salsola* s. str. includes *Salsola* sect. *Salsola* s.s., *Salsola* sect. *Caroxylon* subsect. *Coccosalsola*, *Salsola* sect. *Obpyrifolia*, *Fadenia*, *Hypocylix*, *Seidlitzia* and *Darniella*. Our data clearly indicate that the origin and centre of diversification of both Salsoleae and Caroxyloneae is the deserts located in the Central Asia, Middle East

and North Africa. The diversification of *Caroxylon* (formerly *Salsola* sect. *Caroxylon*) in southern Africa is secondarily as proved by the close affinity of the Central Iranian relict species *Caroxylon abarghuense*.

ICPS-407 - IDENTIFICATION AND CHARACTERIZATION OF RESISTANCE GENE ANALOGUES (RGAS) IN *GOSSYPIUM ARBOREUM* L.

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Abstract: Resistance gene analogues (RGAs) from cotton are used as specific markers of natural resistant genes. The nucleotide-binding-site leucine- rich repeats (NBS-LRR) encoding gene family has attracted much research interest because approximately 75% of the plant disease genes that have been cloned to date are from this family. It is reported that more than 40 genes conferring resistance to various pathogens, including bacteria, fungi, nematodes, and viruses have been cloned from plants. In the present study we have analysed the diploid cotton species *Gossypium arboreum* L. For the presence of resistance gene analogues (RGAs) covering an area of approx.10% in Pakistan. This species is not preferred due to its shorter staple length and low yield of seed cotton yield. It is one of the progenitors of the major cultivated, tetraploid cotton (*Gossypium hirsutum* L.) and has immunity to cotton leaf curl disease (CLCuD); a major constraint to cotton production caused a number of distinct geminiviruses. This CLCuD resistance is the major reason for initiating this study. The specific primers for RGAs were designed based on sequences published for *G. hirsutum* L. and RGAs were amplified by polymerase chain reaction. This confirmed the presence of RGAs in the AA genome of *Gossypium* spp. The amplified products were cloned into the plasmid vector pTZ57R and sequenced in their entirety. Blast comparisons to the databases showed all 22 cloned DNA fragments to have approx. 90% nucleotide sequence identity with sequences of RGAs from *G. hirsutum* L. This shows that RGAs were maintained following the hybrisation leading to *G. hirsutum* L. Efforts are going on to isolate the complete genes represented by these RGAs from cDNA libraries of *Gossypium arboreum* L. that are available at NIBGE. The aim of present study is to understand plant-pathogen interactions and develop novel approaches to effectively control pathogens of cotton, especially viruses, which are a major constraint to production.

ICPS-408 - EVALUATION OF FREEZING TOLERANCE IN RAPESEED (*BRASSICA NAPUS* L.) CULTIVARS UNDER CONTROLLED CONDITIONS

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Abstract: In order to determine freezing tolerance of 10 rapeseed (*Brassica napus* L.) cultivars including Zarfam, Licord, Elit, SLMO46,Okapi, Symbol, Calvert, Opera, Ebonit and Alis, a trial carried out at the greenhouse of college of agriculture, Ferdowsi University of Mashhad. In these study 10 rapeseed genotypes, with 5 temperatures (0, -4, -8, -12 and -16 °C) on subplot and acclimation and non acclimation on main plot were evaluated on RCD factorial split plot with two replications. Plants were kept until 3-5 leaf stage in greenhouse condition with $23/16 \pm 2$°C (day/night) and natural photoperiod. After that, the plants of non-acclimation treatment were frozen immediately and for acclimation treatment after three weeks that put them under under acclimation freezing was done.Survival percentage, leaf area, SPAD reading, dry weight, (LT_{50}) and ($RDMT_{50}$) were determined after 3 weeks. Survival percentage after freezing was different in cultivars ($P<0.01$). Calvert, Symbol and Zarfam cultivars had the highest (77, 76 & 75) and Opera cultivar showed the lowest (63) survival percentage, respectively. Cultivars were different in leaf area, dry weight and $LT_{50.}$ The most freezing

damage on the plant was absorbed at the lower than -4°C temperatures. Although acclimation decreased the freezing effects on the most characteristics. In according to the good correlation between LT_{50} and SPAD reading and LT50 with survival percentage, it seems that for evaluation of freezing tolerance in rapeseed using, the LT_{50} and SPAD reading may be useful.

ICPS-409 - SPRING WHEAT GROWTH AND GRAIN YIELD: I. INFLUENCE OF PLANTING TIME

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Abstract: The present study was conducted at National Agricultural Research Centre (NARC), Islamabad. In this study a series of experiments were conducted over time (2001-2007) using six genotypes (Wafaq-2001, Chakwal-97, NR-55, NR-232, NR-234 and Margalla-99) planted at four planting times, started from mid of October and extended until the end of December to cover the whole range of planting time. These four planting times were symbolized as Planting Windows (PWs) denoted as PW1, PW2, PW3 and PW4. Considerable differences were observed in the pattern of biomass accumulation in four PWs across six genotypes. Changes in planting time have a negative impact on crop growth rate and a decreasing trend was observed in the biomass accumulation across six genotypes. Among genotypes, NR-234 showed maximum crop growth rate across four PWs. The reduction of 11 % and 39 % was observed for the crop growth rate across genotypes when planted in PW3 and PW4 respectively, from PW1 and PW2. This reduction in crop growth rate resulted in a decrease of about 6%, 22% and 51% in biomass from PW1 to PW2, PW3 and PW4 respectively. Grain yield also reduced considerably in all the genotypes with the change in planting time. Generally, a yield reduction of 30% and 50% was observed in PW3 and PW4, respectively, in comparison to PW1. Quantification of this yield reduction showed a reduction of about 60 kg/ha/day after PW1 across the genotypes under study for this area.

ICPS-410 - SPRING WHEAT GROWTH AND GRAIN YIELD: I. STATISTICAL CORRELATION

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Abstract: The present study was conducted at National Agricultural Research Centre (NARC), Islamabad. In this study a series of experiments were conducted using six Genotypes (G) (Wafaq-2001, Chakwal-97, NR-55, NR-232, NR-234 and Margalla-99) planted at four planting times, started from mid of October and extended until the end of December to cover the whole range of planting time. These four planting times were symbolized as Planting Windows (PWs) denoted as PW1, PW2, PW3 and PW4 and each PW was considered as a distinctive Management (M) option. The experiment was conducted overtime and each year from 2001 to 2007 was treated as a different Environment (E). The genotypic differences among these six genotypes regarding contribution of various parameters, relating to crop growth and development, to yield were not significant. Among the parameters analyzed, biomass, number of spikelets per spike, and 1000 grain weight were the most important predictors of yield. Anthesis and maturity (*Days after Sowing*) and number of tillers (*per m²*) also had positive relationship with yield but their contribution was not statistically significant. Other variables like plant height (*cm*) and spike length (*cm*) had negative values of regression coefficient. G x E x M interaction was then analyzed to find the significance of these factors. In the analysis of G x E x M interaction for grain yield,

M played a significant contribution towards the grain yield, with the contribution of 57% to the total sum of squares, reflecting the importance of the selection of optimum planting time in this rainfed area.

ICPS-411 - APSIM-WHEAT MODULE: PARAMETERIZATION, EVALUATION AND UTILIZATION UNDER LOCAL CONDITIONS

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Abstract: The present study was conducted at National Agricultural Research Centre (NARC), Islamabad using *A*gricultural *P*roduction *S*ystems S*im*ulator (APSIM), as a bioinformatics tool to better understand the wheat performance in relation to rainfed environment and to depict tactical management decisions based on such results. In this study a series of experiments were conducted overtime (2001-2007) using six genotypes (Wafaq-2001, Chakwal-97, NR-55, NR-232, NR-234 and Margalla-99) planted at four planting times, started from mid of October and extended until the end of December to cover the whole range of planting time. To use this bioinformatics tool as a decision support system APSIM was evaluated and parameterized using climatic data of Islamabad. The improved/modified cultivar coefficients in wheat module accurately regulated the phasic development of the genotypes used in this study which lead to goodness-of-fit between simulated and measured data regarding the occurrence of anthesis and maturity. This improvement in the model's ability also improved the simulation capabilities of the model regarding biomass accumulation across planting windows and yield. It was then used as a tool for selecting optimum planting time and cultivar in conjunction with the knowledge of seasonal climate forecasting, using El Niño Southern Oscillation (ENSO)/Southern Oscillation Index (SOI) phases. The simulation analysis regarding partitioning of wheat yield, averaged across PWs, using SOI phases showed that planting after mid November (PW3 and PW4) was vulnerable to climatic fluctuations governed by SOI phase in July. The investigation also revealed an increased yield of about 1 t/ha with the SOI phase 3 during July which might have a link with the rainfall variability during the wheat crop establishment. The study using probabilistic approach discovered that, based on long term rainfall data, the Islamabad zone hade 44% and 35% possibility of exceeding median rainfall with consistently near zero and consistently negative SOI phases, respectively during July. Since in this rainfed area almost 60% rain was received during summer (June-September), a scenario analysis using APSIM revealed that wheat crop is well favored in mungbean-wheat cropping system being agronomically suitable and economically viable than the traditional fallow-wheat system.

ICPS-412 - CONSEQUENCES OF BORON APPLICATION ON COTTON UNDER HIGH pH CALCAREOUS SOILS OF COARSE LOAMY *TYPIC USTOCHREPTS*

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Abstract: Cotton is major cash crop of Pakistan that is facing severe boron deficiency. The total cultivated area of Pakistan is 22 M ha which is mostly alluvial and loessial in nature, having alkaline pH and high levels of $CaCO_3$ contents with low organic matter. Boron deficit not only hindering cotton yield out put but also is aggravating produce value. A field study was conducted on coarse loamy, hyperthermic T*ypic Ustochrepts* rasulpur soil series during 2005-2008 at institute of soil and environmental Sciences, to assess the responses of cotton to B fertilization sown under high pH calcareous soils. Ten B treatments (0, 0.25, 0.50, 0.75, 1.00, 1.25, 1.50, 1.75, 2.00, 3.00 kg ha^{-1}) were applied in triplicate at three different sites with sandy clay loam, loamy sand and sandy loam textures

with recommended N, P and K cotton. Boron was applied at sowing as basal dose. The results revealed that B application significantly improved the yield parameters. In sandy clay loam, loamy sand and sandy loam textures highest number (34, 30 and 36 bolls plant^{-1}, respectively) and weight (3.59, 3.42 and 4.23 g boll^{-1}, respectively) of bolls were obtained from the treatments of 0.75, 1.75 and 1.25 kg ha^{-1}. Physical observations exhibited that the shape and size of bolls of B treated plots were comparatively better than control treatment. Dry matter yield (DMY), seed cotton yield (SCY) and lint yields were also significantly affected by B and maximum DMY (5.96, 5.00, 6.26 t ha^{-1}), SCY (2320, 2639 and 3051 kg ha^{-1}) and lint yield (1056, 1123 and 1180 kg ha^{-1}) were obtained from the treatments of 0.75, 1.75 and 1.25 kg ha^{-1}, respectively. The yield increased over control ranged from 12.4 % to 19.5 % at three different sites in both the years. Data also pointed out that increasing B application resulted into highest B concentration (63.5 mg kg^{-1}) in cotton plants.

ICPS-413 - MODELING FOR WHEAT YIELD PREDICTION IN SALINE ZONE OF CHAJ DOAB

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Abstract: Water samples collected from farmer's tube wells installed in Lalian unit (District Sargodha) were evaluated for their quality characteristics. The data depicted the average values of EC_{iw}, SAR_{iw} and RSC_{iw} corresponding to 1.93 ± 0.67 dS m^{-1}, 12.2 ± 65.00 mmol L^{-1})$^{0.5}$ and 3.6 ± 1.96 mmol L^{-1}. The range values noted for different water quality indications were 0.78 ≥ EC_{iw} < 3.12 dS m^{-1}, 2.57 ≥ SAR_{iw} ≥ 23.98 (mmole L^{-1})$^{0.5}$ and 0.10 ≥ RSC_{iw} < 7.10 mmole L^{-1}. Within the conventional water quality indicators a significant correlation was found between SAR_{iw} and EC_{iw} (r=0.84**) showing that SAR_{iw} is a function of total salinity in irrigation water. However, RSC_{iw} and EC_{iw} were not significantly correlated (r=0.32). The significant correction coefficients showed an increase in SAR and EC of soil with the use of irrigation water of high EC_{iw} and SAR. The wheat yield collected from the fields irrigated from tube well waters was found affected more by the sodicity of the water than the salinity. A statistically justified model (R^2=0.934) $Y=8317[EC_e]^{0.177}\ [EC_{iw}]^{0.883}\ /\ [SAR_{iw}]^{0.396}\ [SAR_s]^{0.416}\ [RSC_{iw}]^{0.382}$ was developed to predict wheat yield trend under a given set of soil and water characteristics. It was concluded that subsoil water of the region is poor in quality and should not be exploited by the farmers at their own will. Its injudicious use would salinize or sodicate the soils. It should be scientifically exploited for crop production.

ICPS-414 - ASSESSMENT OF SOILS AND PLANTS FOR BORON CONTENTS IN WHEAT-COTTON GROWING AREAS OF PUNJAB

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Abstract: Boron is an essential micronutrient which is necessary for reproductive organs including pollen tube formation in wheat (*Triticum aestivum* L.) and flowering and boll formation in cotton (*Gossypium hirsuttum L.*). The global study about Pakistan reported that about 50 % wheat-cotton rotation area is B deficient and its deficiency seriously affects the growth and yield. This study was conducted to know the boron status of soils and plants planted to wheat and cotton growing areas in central and southern Punjab. Twenty soil samples were taken from the different locations of farmer's fields at depths of 0-6 cm and 6-12 cm depths, while plant samples were taken at booting and

flowering stages of wheat and cotton, respectively. The soil samples were analyzed for soil texture, EC_e, pH_s, organic matter, Olsen P, extractable K and hot water extractable B. The results showed that all the soils were normal regarding salinity or sodicity and sixteen soil samples were low in boron (ranged from 0.19 to 0.46 mg kg^{-1}) and this low B was due to coarse texture because these soils had sandy clay loam, sandy loam and loamy sand texture. Four samples had B contents more than the critical level (0.50 mg kg^{-1}) of B in soil. The data also indicated that pH_s of all the soil samples were more than 8.00 but all of these contained less than 0.50 % organic matter, low in available P and extractable-K. The data regarding plant analysis showed that B concentration in wheat and cotton plants ranged from 2.39 to 5.13 mg kg^{-1} and 16.86 to 23.71 mg kg^{-1}, respectively. This information clearly indicated B deficiency in wheat-cotton belt of Punjab and necessitates the application of B on these crops in coarse textured soils of Punjab, Pakistan.

ICPS-415 - INDUCTION OF LONG GRAIN BASMATI RICE

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Abstract: The major advantage of parboiled rice is accounted for reduced grain breakage during milling and does not mash after cooking resulting less loss of solids in cooking water.

To induce long grain Basmati rice for parboiling purpose, dry dormant paddy seeds of Basmati 370, Basmati Pak and Super Basmati were exposed to 150, 200, 250, 300, 350 and 400 Gy doses of gamma rays at 13% moisture. In M_1 generation, the radiation effects were studied on germination, seedling shoot and root lengths in the laboratory, and in the field on seedling emergence, plant height, spikelets per panicle and panicle fertility. No pronounced radiation effects were observed on germination. The seedling shoot and root lengths, and emergence showed detrimental effects particularly at higher doses. All the varieties showed dose dependent response to plant height, spikelets per panicle and panicle fertility. M_2 populations of three Basmati varieties were raised. From the segregating populations, eight long grain mutants were isolated in Basmati Pak at 200 and 250 Gy doses. The results based on these studies are discussed.

ICPS-416 - ASSESSMENT OF PHYSIOLOGICAL ATTRIBUTES FOR THE SCREENING OF DROUGHT TOLERANT WHEAT GENOTYPES

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Abstract: Forty advanced lines and cultivars of wheat were tested at University of Arid Agriculture Rawalpindi and BARI Chakwal to assess the suitability of various physiological and morphogenetic traits to screen wheat genotypes for drought tolerance. Data were recorded for osmotic potential, leaf diffusive resistance, leaf succulence, relative water contents, biomass at 50% flowering, days to heading, grain filling period, grain yield, flag leaf area, spikes/m^2 and number of kernels per spike in open field conditions and inside tunnel for two years and subjected to analysis of variance. It revealed significant differences among genotypes. The leaf osmotic potential of the treated pots did not differ much from the leaf water potential of the treated pots during the first two drying spells, but during the third drying spell the former declined significantly with the leaf relative water content of the treated pots keeping at a rather high level of 78%, indicating that the leaves of the treated pots experienced an osmotic regulation through the treatment.Under drought condition Uqab2000 possessed maximum osmotic potential while under irrigated condition 00BT004 showed maximum osmotic potential. Leaf diffusive resistance was almost double under irrigated field conditions as compared to drought

conditions. Genotype 3C069 exhibited maximum stomatal conductance under drought and 00FJ03 under irrigated conditions. Relative water contents were relatively low under drought conditions than irrigated field conditions. Maximum relative leaf water contents were exhibited by Khyber-87 under drought conditions whereas Iqbal-2000 and V02172 exhibited maximum relative leaf water contents under irrigated field conditions. Little differences were observed for leaf succulence between both treatments. However it was slightly higher under irrigated field conditions. Rawal-87 exhibited maximum flag leaf area (23.5) under drought conditions whereas Chakwal-86 depicted maximum flag leaf area (35.9) under irrigated conditions. Maximum dry weight at heading was produced by 98C010 (684.5) followed by 00-FJ03 (644.5), 00BT004 (642.8) and V-02169 (630.1). Thousand grain weight appeared to be independent of grain filling period as 3C069 despite availing 45 days as grain filling period produced highest 1000 grain weight (47.4) as compared with 00C010 that utilized 43 days for grain filling and succeeded to accumulate only 28.4g as 1000 grain weight. Highest yield of 6313 kg/ha was produced by NR-234 followed by 3C062 (6173 kg/ha) and 1C020 (6063). Lowest yield kg per hectare was produced by 3C066 (2810). Genotypes like 00FJ03, Margalla 99, Iqbal 2000 and 3C061 performed better on the basis of osmotic potential spikelets per spike and total grain weight when sown inside the tunnel and showed more dominant traits.

ICPS-417 - GENETIC MECHANISM OF DROUGHT TOLERANCE IN BREAD WHEAT

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Abstract: For the study of genetic mechanism of drought tolerance, the genotypes were selected on the basis of germination tested in paper towel under moisture stress conditions created by using polyethylene glycol (PEG) in four concentrations (control, 15% PEG, 20% PEG, 25% PEG) and two years field evaluation for morphophysiological traits. Data were recorded for osmotic potential, relative water contents, leaf diffusive resistance, succulence, flag leaf area (cm^2), plant height (cm), No. of spikes/m^2, No. of spikelets/spike, No. of kernels/spike, one thousand kernel weight, grain yield /m^2. Two sets of crosses were made. In first set three drought tolerant and three drought susceptible genotypes were crossed in diallel format in 2^{nd} set four drought tolerant and four high yielding genotypes were crossed. F_1 of Bhakkar x Margalla-99 cross possessed maximum osmotic potential inside and out side the tunnel. Inside the tunnel 99FJ03 possessed maximum relative water contents while out side the tunnel 00FJ03 showed maximum relative contents. In case of biomass inside the tunnel the maximum biomass was produced by Bhakkar x 00FJ03 cross while 00FJ03 produced maximum biomass out side the tunnel. Biomass at maturity was almost half under drought conditions as compared to biomass per plant under field conditions. Inside the tunnel F_1 genotypes of 00FJ03 x Iqbal 2000 cross showed the maximum flag leaf area while out side the tunnel F_1 of 99FJ03 x Rawal 87 cross also possessed maximum flag leaf area. Tallest plants under drought conditions were produced by Uqab-2000 x 00FJ03 whereas genotype of Inqlab-91 x Margalla-99 cross produced tallest plants normal field conditions. The maximum Spikes per m^2 inside the tunnel were observed by F_1 genotypes of 00FJ03 x 99FJ03 cross while out side the tunnel genotypes of Margalla 99 x Rawal 87 cross possessed maximum spikes per m^2. Under the tunnel conditions the F_1 genotypes of 00FJ03 x Margalla-99 cross possessed maximum spikelets per spike while F_1 of Margalla-99 x 99FJ03 cross showed maximum spikelets per spike out side the tunnel. F_1 genotypes of Rawal 87 x 3C061 cross possessed maximum succulence inside and out side the tunnel. The differences were significant among genotypes for 1000 grain weight. Inside the tunnel F_1 genotypes of Rawal 87 x 3C061 cross possessed maximum 1000 grain weight while F_1 of 00FJ03 x Margalla-99 showed maximum 1000 grain weight out side the tunnel. The maximum relative water contents was shown by 99FJ03 inside the tunnel while out side the tunnel, 2KC050 X 00FJ03 showed maximum value for relative water contents. Over dominance was observed in all the traits studied and regression line cut the Wr axis below the origin. Genotypes viz 00FJ03, Iqbal-2000 and 99FJ03 performed better out side the tunnel on the basis of osmotic potential, relative water

contents and total grain weight and possessed dominant genes for these traits. Genotypes 00FJ03, Margalla 99, Iqbal 2000 and 3C061 performed better on the basis of osmotic potential, spikelets per spike and total grain weight when sown inside the tunnel and showed more dominant traits. Crosses of 00FJ03 x Iqbal 2000, 00FJ03 x 3C061, Margalla 99 x Rawal 87, Iqbal 2000 x 3C061 and Rawal 87 x 3C061 performed better on the basis of osmotic potential, relative water contents and total grain weight when sown inside the tunnel and possessed dominant genes for these traits.

ICPS-418 - IDENTIFICATION OF BACTERIAL BLIGHT RESISTANCE GENES *XA4* IN PAKISTANI RICE GERMPLASM USING PCR

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Abstract: Bacterial blight (BB) caused by *Xanthomonas oryzae* pv *oryzae (Xoo)* is a major biotic constraint in the irrigated rice belts. Genetic resistance is the most effective and economical control for bacterial blight. Molecular survey was conducted to identify the rice germplasm/lines for the presence of *Xa4*, a bacterial blight resistance gene. PCR with primers specific for *Xa4* resistances gene was used in the study. During this polymorphic survey, out of 100 rice germplasm lines obtained from NARC (IABGR), 49 lines were observed with *Xa4* gene. While 51 germplasm showed the absence of *Xa4* gene. Of the nineteen basmati breeding lines, obtained from Rice Research Station Kala Shah Kaku (KSK RRI), 7 lines (KSK1, KSK4, KSK6, KSK7, KSK8, KSK12 and KSK16) showed the presence of *Xa4* gene. The Pakistani released Basmati varieties were also surveyed. Of the eight Pakistani basmati varieties used, Basmati 198, Basmati 385, Basmati 2000 and Shaheen Basmati have the *Xa4* gene. The identification of *Xa4* gene in Pakistani rice germplasm will help in accelerating the elite breeding program in future, including pyramiding of different disease resistant genes in basmati varieties.

ICPS-419 - IMPACT OF NITROGENOUS REGIMES ON GROWTH, YIELD, RADIATION USE EFFICIENCY AND CHLOROPHYLL CONTENTS OF HYBRID MAIZE VARIETIES UNDER AGRO-CLIMATIC CONDITIONS OF MULTAN

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Abstract: Adoption of new approved cultivars is as important as the evolution of new varieties. Nitrogen being the most deficient and crucial element affects crop growth and productivity. Maize being a nitro positive cereal crop needs high amounts of nitrogenous fertilizer for optimum growth and final productivity. It is therefore imperative to study the impact of nitrogenous regimes on growth, yield, chlorophyll contents and radiation use efficiency of new approved maize cultivars under the agro-climatic conditions of Southern Punjab (Multan). Keeping in view the importance of new varieties and nitrogen, the present field study was carried out at University Farm, Bahauddin Zakariya University, Multan during autumn season 2006. Five hybrid maize cultivars, viz., V_1 = 3062, V_2 = 6621, V_3 = 919, V_4 = 31R88 and V_5 = 4444 and five nitrogenous regimes, viz., N_1 = 125 kg ha^{-1}, N_2 = 175 kg ha^{-1}, N_3 = 225 kg ha^{-1}, N_4 = 275 kg ha^{-1} and N_5 = 325 kg ha^{-1} were selected for this field study. The variables were allocated in a randomized complete block design with split plot arrangement. Data collected on various growth and yield parameters were collected and analyzed statistically and the treatment means were compared using least significant difference (LSD) test at 5% probability level. Leaf area index, photosynthetically active radiation (PAR) and biomass accumulation were measured. The amount of

cumulative intercepted PAR differed significantly among cultivars and increasing rates of N application from lower to higher rates increased cumulative intercepted PAR. The relationship between total dry matter accumulation and cumulative intercepted PAR was highly significant and the common regression line gave radiation use efficiency of 3.75 g of dry matter produced for each MJ of intercepted PAR. The results revealed that yield variations among cultivars were primarily caused by amount of intercepted PAR and to a lesser extent of radiation use efficiency (RUE). Higher nitrogen rates, viz., 275 kg ha^{-1} and 325 kg ha^{-1} gave good results as compared to the lower rates. From the results it can safely be recommended that hybrid maize cultivars 3062 and 31R88 and nitrogen @ 325 kg ha^{-1} are recommended for higher production and higher economic returns under agro-climatic conditions of Multan.

ICPS-420 - MORPHOLOGICAL STUDY OF TENDRILS IN FAMILY CUCURBITACEAE

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Abstract: Members of family Cucurbitaceae possess either simple or branched tendrils that occupy lateral position with respect to other organs in the axil of the leaf. The transverse section of tendril shows five ridges alternating with five furrows. The distribution of tissues is same in all species. The vascular bundles are bicollateral. The vascular supply to the tendril suggested some relationship between the axillary flower and tendril and can be regarded as a modified first lateral branch of the floral axis. The similarity in the anatomy of the basal part of the flower and that of the tendril imply support this conclusion.

ICPS-421 - EFFECT OF VARYING LEVELS OF NITROGEN ON BIOCHEMICAL, WATER RELATION AND GAS EXCHANGE PROPERTIES OF TWO COTTON (*GOSSYPIUM HIRSUTUM* L.) CULTIVARS DIFFERING IN RESISTANCE TO COTTON LEAF CURL VIRUS (CLCUV)

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Abstract: The responses of two cultivars of cotton (*Gossypium hirsutum* L.), S-12 (CLCuV-susceptible) and CIM-448 (CLCuV-resistant), to varying concentrations of nitrogen were examined under glasshouse conditions. Plants of two cultivars were subjected to 224, 114 (control) and 56 mg N L^{-1} in Hoagland's nutrient solution. Virus resistant cultivar, CIM-448 remained free of all disease symptoms, whereas in virus susceptible cultivar, S-12 leaf curling and vein thickening occurred at all external nitrogen regimes but viral symptoms were more severe at higher nitrogen regimes. Soluble proteins were higher in virus resistant CIM-448 as compared to healthy or diseased leaves of virus susceptible S-12. Different nitrogen regimes showed no significant effect on the accumulation of free amino acids. Total soluble sugars decreased with decreased in nitrogen regimes in all cultivars. However CIM-448 was higher in accumulation of total soluble sugars as compared to healthy or diseased leaves of S-12. Starch was inconsistent in all cultivars at varying N regimes. Net CO_2 assimilation rate and water use efficiency decreased significantly with the decrease in nitrogen regimes in all the cultivars. However CIM-448 had higher net CO_2 assimilation rate as compared to healthy or diseased leaves of S-12. Transpiration rate in the healthy leaves of S-12 and CIM-448 increased consistently with decrease in external N regimes, whereas in the diseased leaves of S-12 it was high at the lowest N regime. Substomatal CO_2 concentration in the healthy leaves of S-12 and CIM-448 decreased significantly with decrease in external N level. The ratios of substomatal CO_2 to ambient CO_2 in both cultivars remained unaffected in all the external N regimes.

ICPS-422 - SOME PROSPECTS ON BIOTECHNOLOGICAL STRATEGIES FOR CROP IMPROVEMENT AGAINST VIRAL DISEASES

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Abstract: Various abiotic and biotic stresses limit crop productivity and quality. Among them, viral diseases in plants are a serious threat to plant productivity, particularly in cash crops. Despite various strategies have been proposed to induce virus resistance in plants, advanced molecular biological techniques are offering deeper insights into detection and identification of plant viruses, plant-virus interactions, plant defense mechanism against viruses, and identification of virus resistance traits, which will ultimately results into development of virus resistant plants. These advancements in biotechnology are now opening new avenues for the genetic engineering of crop plants with enhanced resistance to diseases. As major crop plants such as rice, maize, soybean, sugar beet, cotton and potato are genetically engineered against viruses, these crops with engineered genetic resistance to virus diseases should be available to the farmer. This review highlights some of the recent developments in identifying plant viruses in plants and virus propagating materials using enzyme-linked immunosorbent assay (ELISA), polymerase chain reaction (PCR), and microarray detection. In separate section, efforts to combat plant viruses in transgenic plants, such as coat protein mediated resistance, RNA interference technology, are highlighted. Finally, potential risks and benefits of resistant plant varieties on future crop protection practices are also discussed.

ICPS-423 - ALLEVIATING ADVERSE EFFECTS OF SALT STRESS ON CANOLA (*BRASSICA NAPUS* L.) AT SEEDLING STAGE BY EXOGENOUS APPLICATION OF GLYCINEBETAINE AND PROLINE

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Abstract: In order to assess whether exogenous application of glycinebetaine and proline could induce salt tolerance in canola at germination and seedling stage, two canola cultivars Dunkeld (salt tolerant) and Cyclone (salt sensitive) were allowed to germinate and grow at 0, and 120 m*M* NaCl for two weeks. Varying concentrations (0, 0.01, 0.05, 0.1, 1.0, and 2.0 mg L^{-1}) of glycinebetaine (GB) and proline were applied to non-stressed and salt stressed plants through the rooting medium. Salt stress reduced the seed germination rate and total seed germination percentage of both canola cultivars. However, adverse effect of salt stress was more in salt sensitive cultivar *i.e.*, Cyclone. Root applied GB and proline alleviated adverse effects of salt stress on seed germination. However, 0.1 mg L^{-1} GB was more effective in alleviating adverse effects of salt stress. Furthermore, higher concentration of GB did not improve the seedling growth of both canola cultivars.

ICPS-424 - BIOMONITORING OF HEAVY METAL POLLUTION USING LICHEN (*PSEUDEVERNIA FURFURACEA* (L.) ZOPF.) EXPOSED IN BAGS IN A SEMI-ARID REGION, TURKEY

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Abstract: In this study, the lichen *Pseudevernia furfuracea* (L.) Zopf. samples were collected from Çat Forests near the village of Sızır in Sivas province and exposed in bags in 29 different sites of Kayseri city, Turkey. The elements Pb, Cd, Cu, Zn, Cr, and Co were analysed by ICP-OES in the lichen samples. Lichen bags were exposed for two periods starting from the beginning of July 2005. In the wet period, ıt is observed that the lichen accumulates a larger quantity of metals. The contents of heavy metals in lichen samples were found to be in range of 0.16-0.31µgg^{-1}, 9.50-18.89 µgg^{-1}, 23.50-68.24 µgg^{-1}, 3.10-30.81 µgg^{-1}, 0.07-2.54 µgg^{-1}, and 3.33-5,63 µgg^{-1} for Cd, Cu, Zn, Pb, Cr, and Co respectively. *Pseudevernia furfuracea* has been found to be a useful biomonitor of the six heavy metals studied because of greater lichen resistance to the dry and stressing conditions of urban environments.

ICPS-425 - ESTIMATION OF GENE ACTION FOR QUALITATIVE TRAITS IN UPLAND COTTON

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Abstract: The experiment was laidout in randomized complete block design with four replications in the experimental field of Botanical Garden, Department of Plant Breeding and Genetics, Sindh Agriculture University, Tandojam for assessing the gene action for quality traits in a 5x5 complete diallel cross having five varieties of *Gossypium hirsutum* L.
The genetic components of variance revealed that dominance components (H_1 and H_2) and additive component (D) were highly significant for all the traits except staple length in dominance components. It was further observed that dominance components were greater in magnitude than additive components. The average degree of dominance for lint index, GOT%, staple length and fibre strength were more than a unity, displaying over dominance type of gene action, the positive non-significant F-value revealed that the dominant genes were less frequent than recessive genes in the parents and that they were in decreasing position as exhibited by h^2 value. Estimated ratio of h^2/H_2 indicated that there were atleast one group of genes controlling GOT%, two group of genes controlling lint index and fibre strength and three group of genes controlling staple length.

ICPS-426 - ECOLOGICAL STUDY OF ALGAL FLORA OF KINJHAR LAKE, THATTA

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Abstract: An ecological survey of algal species from freshwater Lake Kinjhar was carried out w.e.f. August 2005 to July 2006. A total of 135 algal species belonging to 56 genera of 9 phyla (Cyanophyta, Volvocophyta, Bacillariophyta, Chrysophyta, Dinophyta, Xanthophyta, Euglenophyta, Chlorophyta, Charophyta and along with some physico-chemical parameters were recorded. Water is rich in primary productivity and fish production so the several fish species were commonly found due to rich in algal species. The abundance of Algal species as a result the ratio of D.O. was high through out the year which is beneficial for aquatic organisms, fish, fauna etc. water was alkaline recorded. While difference species have various value from point of importance like some species are useful for medicine, nitrogen fixing, vitamins, toxic, for oil, pollution, water quality, hard, soft, alkaline as well as excellent food produced species were recorded.

ICPS-427 - PHYTOREMEDIATION POTENTIAL OF SOME WILD PLANTS GROWING IN THE CONTAMINATED SOIL (TANNERY EFFLUENTS) OF KASUR

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Abstract: In a survey of the contaminated fields of Kasur, the soil and available wild plants were analyzed for the carcinogenic heavy metal chromium and toxic metal Sodium.
Soil samples collected from the selected contaminated site at Kasur were found to be very high in values of pH (8.2) and Conductivity (16.4dSm^{-1}). The metal content was very high, being the highest for sodium (55,250mg kg^{-1}) and the heavy metal Chromium (2,500mg kg^{-1}). The amount of Cr in the polluted soil was very high as compared to normal soil where it was almost negligible. Twelve naturally growing wild plant species namely *Panicum antidotale, Cynodon dactylon, Heliotropium echwaldii, Alternanthera sessilis, Trianthema portulacastrum Chenopodium murale, Rumex dentata, Echinochloa colonum, Suaeda fruticosa, Kochia indica, Calatropis procera,* and *Dichanthium annulatum* were collected from the contaminated sites and were analyzed to estimate their metal uptake ability and biomass production. *Suaeda fruticosa* was found to be the best among the tested wild plants for greater biomass production and metal uptake as well. The highest co-efficient of extraction for Na extraction was observed in shoots of *Suaeda fruticosa* (2.17) followed by *Trianthema monogyna* (1.01), and *Chenopodium murale* (1.03). Roots exhibited relatively lower co-efficients of extraction. High shoot to root co-efficient of extraction revealed that plants accumulated the element actively against the gradient.

ICPS-428 - PALYNOLOGICAL CHARACTERIZATION OF CHHIDRU FORMATION (60M TO 64.5M), WESTERN SALT RANGE, PAKISTAN

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Abstract: Samples from the Chhidru Formation (late Permian- Dzulfian) Western Salt Range have been investigated palynologically. Twenty seven (27) species belonging to twenty one (21) palynomorphs genera were recorded and systematically described. Of these genera ten (10) were of bisaccates, seven (7) belonged to triletes, and one (1) belonged to monosaccate, pseudosaccate, monolete and moncolpate. Preservational status of palynomorph highly varied from sample to sample. There was an overall dominance of bisaccate pollen. Among the bisaccates, alete as well as striated and taeniate forms were reported. Next important forms were trilete, while monosaccates, monocolpates and polyplicates were rare to very rare. Comparison of affinities of palynoflora with megaflora indicated four (4) major plant groups. These plant groups are Ferns, Gymnosperms (conifers), Cycads and Seed ferns. Palaeoclimatic interpretations revealed that the Chhidru Formation deposition is indicative of subtropical to sub temperate climate with high humidity.

ICPS-429 - PALYNOLOGICAL CHARACTERIZATION OF CHHIDRU FORMATION (35M TO 40M), WESTERN SALT RANGE, PAKISTAN

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Abstract: The samples from Chhidru Formation (Late Permian-Dzulfian), Western Salt Range, Pakistan have been investigated palynologically. The presently studied section of Chhidru Formation contained moderately to poorly preserved palynoflora. Forty one (41) species belonging to twenty five (25) palynomorphs genera were recorded and systematically described. Thirteen genera (13) belong to bisaccates, five (5) to monosaccates, three (3) to monocolpates, two (2) to polyplicates, two (2) to triletes and three (3) to monoletes. Cuticular and wood fragments were also recorded but not technically discussed. There was an overall dominance of bisaccate pollen. Monosaccates were next important subordinate. Triletes and monoletes were also reported in fairly good number, however monocolpates and monosulcates were rare. Comparison of affinities of palynoflora with megaflora

indicated four major plant groups i)Ferns, (ii)Conifers, (iii)Seed ferns/Glossopterids, (iv)Cycads] Palaeoclimatic evaluation of palynological data indicated a typical subtropical to subtemperate environment with fluctuating level of humidity.

ICPS-430 - SOME NEW FUNGAL RECORDS ON *MORUS ALBA* FROM FAISALABAD PAKISTAN-2007

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Abstract: *Morus alba* is common in Pakistan as plantation of social forestry and naturally propagated tree. This plant is very important due to its economic and medicinal value. Sixty fungi have been recorded on *Morus* spp. from Pakistan, (Ahmad 1956, 1969, Khan 1955, 1956, 1960, Khan and Bukhari 1970, Qurashi and Ahmad 1971, Mirza and Quraishi 1978, Ahmad *et al* 1997). In the present studies ten fungi are reported first time on *Morus alba* from Pakistan viz. *Gliomastix Novae-zelandia* Hughes & Dikinson, *Curvularia lunata* (Wakker) Boedijin, *Pseudocercospora terminaliae* (Lev.) Speg, *Drechslera* state of *cochliobolus spicifer* (Bainier) Arx, *Eurotium repens* de Barry, *Graphium penicilloides* Corda, *Cunninghamella echinulata* (Thaxter) Thaxter, *Memnoniella echinata* (Riv.) Galloway), *Tetracoccosporium paxianum* Szabo, two *Triadelphia* spp. Five fungi *Gliomastix Novae-zelandia* Hughes & Dikinson, *Curvularia lunata* (Wakker) Boedijin, *Pseudocercospora terminaliae* (Lev.) Speg, *Drechslera* state of *cochliobolus spicifer* (Bainier) Arx, *Eurotium repens* de Bary, and two genera *Tetracoccosporium and Triadelphia* are new record from Pakistan.

ICPS-431 - OPTIMIZATION OF CULTURAL CONDITIONS FOR ENHANCED GLUCOAMYLASE PRODUCTION IN SUBMERGED FERMENTATION BY *GYMNOASCELLA CITRINA*

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Abstract: Experiments were conducted at Biotechnology Research Lab., Department of Botany, GC, University, Faisalabad. Submerged state cultivation of *Gymnoascella citrina* was carried out for enhanced production of glucoamylase (GA) using crude mixture of vegetable/fruit peel. The SmF medium containing vegetable/fruit peel as a substrate yielded the highest enzyme activity. The physical parameters like substrate concentration, pH and temperature were optimized. Maximum enzyme activity (1.15) U/Ml of vegetable/fruit peel was achieved under optimum growth conditions. The optimum conditions were starch as carbon and energy additive 2.5 % (by mass) at 45°C, SmF conditions were applied as optimum incubation period 24 hrs, optimum incubation temperature 45°C and optimum pH=4. This was the first ever report about optimum conditions for *Gymnoascella citrina*.

ICPS-432 - INTEGRATED EFFECT OF PLANT GROWTH PROMOTING RHIZOBACTERIA AND PHOSPHATE SOLUBILIZING MICROORGANISMS ON WHEAT (*TRITICUM AESTIVUM*)

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Abstract: Biofertilizers are now considered to be the only alternative of chemical fertilizers which apart from their soaring cost, are enhancing in pollution hazards of our environment. Nitrogen and phosphorus are the major limiting factor in agricultural soils of Pakistan.This study can be categorized

into three steps. Firstly, Collection of samples/ isolation of bacterial strains from wheat root rhizosphere from multiple locations i.e., NARC, Potowar, Kala Shah Kaku and Faisalabad. Dilution plate method was used for isolation. Respective media was used for PGPR and PSM bacterial isolates. Secondly, Characterization of isolates was done by Gram Staining, IAA spot test, and through microscopy. The qualitative evaluation for PSMs was done by measurement of clearing zone around the colonies on Pikovskaia medium. PSM culture were incubated for seven days on Pikovskaia broth medium and following analysis were carried out i.e solubili-zation index (SI), pH change, quantification of P solubilized by isolated strains, organic acid production through HPLC. Identification and quantification of IAA produced by PGPRs was done by calorimetric and HPLC technique. Thirdly, evaluation of selected wheat PGPR isolates were tested on germination, seedling vigor and growth of wheat plants in growth chamber (under controlled conditions). There were eight treatments including control with three replicates. Seeds of wheat variety GA-2002 were sterilized and put in fresh inoculum of strains (WPR-32, WPR-42, WPR-51).These were sown in Petri plates and placed in incubator at 26 ^{o}C. After six days these seedlings were transfer into sterilized sand pots. Data was collected after 8 weeks. Total 63 PGPR and 18 PSM isolates acquired from wheat rhizosphere. After study in lab 8 PGPR and three PSM isolates selected for various aspects. P solubili-zation index of these strains ranged from 1.63-3.29. Drop in pH of the medium ranged from 7 to 3.2 during seven days. The HPLC results showed that PSM isolates produced gluconic, fumaric, succinic, acetic acids in smaller concentrations while oxalic and citric acids in larger concentrations. The P solubilization by PSM isolates was quantified by spectrophotometry and was found to ranged from 65-130 µg/mL. All PGPR isolates produced reasonable amount of IAA ranged from 19.5- 31 mg/L PGPR strains promoted early germination and improved vigor of seedlings and they have positive effect on wheat growth. Strain WPR-32 performed best than WPR-42, WPR-51 while mixture of PGPR strains had highest value of root and shoot parameters.

ICPS-433 - RESPONSE OF DIFFERENT WHEAT GENOTYPES TO SOMATIC EMBRYOGENESIS AT DIFFERENT CONCENTRATIONS OF 2,4-D

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Abstract: A research was conducted to evaluate the response of different wheat genotypes to tissue culture and somatic embryogenesis. The genotypes used were Auqab-2002, Inqalab-91, Saleem-2000, Sulman-96, Wafaq-2001 and Zarlashta-99. Their seeds were collected from the wheat programe, National Agriculture Research Centre (NARC), Islamabad. All the six genotypes responded for callus induction from mature wheat caryopsis. However, variability was observed not only among the genotypes but also within all genotypes at different concentrations of 2, 4-D in the culture medium. The effect of 3 mgL^{-1} of 2,4-D was found to be significant for callus induction for most of the genotypes evaluated. During the study it was also found that fresh weights of calli were significantly and highly correlated with dry weights in all genotypes. Subculturing of callus was done on media with 2 mgL^{-1} of 2,4-D. During the subculture period of four weeks, the changes like greenish white colour, visible globular nodules and improved callus texture were observed. After four weeks, subcultured embryogenic calli were transferred to regeneration media. The regeneration media was supplemented with various concentrations of growth regulator, IAA and BAP and one control. All the genotypes responded for plant regeneration, but best response was shown by Inqalab-91 and Wafaq-01. In these two genotypes whole plant regeneration was observed in the form of clusters. In other genotypes, green spot formation was observed much frequently but whole plant regeneration was not observed. It was also observed that all the genotypes responded for callus induction while plant regeneration occurred only in Wafaq-01 and Inqalab-91.

ICPS-434 - GENOTYPE INTO ENVIRONMENT INTERACTION ON THE QUALITY OF EMBRYOGENESIS IN WHEAT

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Abstract: A research work was conducted in the Department of plant breeding and Genetics Pir Mehr Ali Shah Arid Agriculture University of Rawalpindi, to evaluate the interaction of genotype and environment on the quality of embryogenesis in wheat. The genotypes used were, Auqab-2002, Inqalab-91, Saleem-2000, Sulman-96, Wafaq-2001, Zarlashta-99. The media used for callus induction was supplemented with various concentrations (1, 2, 3, 4, 5 and 6 mgL^{-1}) of 2,4-D. MS salts and vitamins were used for regeneration with different concentration of IAA and BAP. It was found that genotype Wafaq-2001 showed best quality of callus at 3 $mgL^{-1}$of 2, 4-D followed by Inqalab-91. While Saleem-2000, showed poor quality of callus at different concentrations of 2,4-D. Similarly different genotypes showed variable results on different media concentrations. At the same time genotype Wafaq-2001 showed best quality regeneration followed by Inqalab-91. And all other genotypes did show plant regeneration on different media combination. It is concluded that quality depends upon the interaction of genotypes with environment.

ICPS-435 - INHERITANCE PATTERN OF AGRONOMIC TRAITS OF SOYBEAN UNDER SHADING STRESS

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[Bogor Agricultural University, Indonesia]

Abstract: The objective of this study was to estimate the inheritance of agronomic traits, which was conducted in a diallel matting design. Four parental lines were used in a diallel crossing, namely, Ceneng, Godek (tolerant parents), Slamet and Pangrango (sensitive parents). The diallel analysis revealed that the additive-dominant gene action was sufficient to explain the variability of agronomic traits of soybean under low light intensity condition except for the number of total pod per plant. The allelic interaction for plant height, number of productive branch, number of total node and number of filled pod was over dominance; whereas, number of unfilled pod, number of total pod, percentage of filled pod and seed weight were controlled by partial-dominant gene action. The broad-sense heritability were high for all of the traits (0.75-0.96); whereas, narrow sense heritability were high for the number of unfilled pod, percentage of filled pod and seed weight. The results suggested that seed weight is the best selection criteria for yield improvement of soybean under low light intensity condition.

ICPS-436 - ADAPTABILITY/PERFORMANCE OF SOME OIL BEARING EUCALYPTUS SPECIES IN FAISALABAD ENVIRONMENT

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Abstract: Efforts were made to study the adaptability/performance of some oil bearing *Eucalyptus* species in Faisalabad, Pakistan. Seeds of eight different oil bearing *Eucalyptus* species were germinated during October, 2003 in sand culture. Rate of germination was maximum in *E. camaldulensis, E. citriodora* and *E. smithii*, intermediate in *E. polybractea* and *E. viridis,* poor in *E. dives* and *E. radiata*

and zero in *E. behriana.* Rate of survival at seedling stage was best in *E. camaldulensis, E. citriodora*, intermediate in *E. polybractea* and *E. viridis,* poor in *E. dives* and *E. radiata* and all the seedlings of *E. smithii* became dead in April, 2004. During August 2004 some plants from all the survived species were transferred into the NIAB field area to monitor their performance in normal soil. The data of plant height and stem diameter, at different intervals revealed that maximum and minimum growth rate was of *E. radiata* and *E. polybractea*, respectively. Growth rate of *E. dives* was almost equivalent to *E. camaldulensis*, where as growth of *E. citriodora* and *E. viridis* remaind significantly low as compared to the growth of *E. camaldulensis.*

ICPS-437 - VARIABILITY IN CONTENT/CONSTITUENTS OF VOLATILE OILS IN DIFFERENT OIL BEARING *EUCALYPTUS* SPECIES GROWN AT NIAB, FAISALABAD

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Abstract: Studies were conducted to examine the variability in different oil bearing *Eucalyptus* species for content/constituents of their essential oils. Nursery raised plants of *Eucalyptus* species; *E. polybractea, E. viridis, E. camaldulensis* and *E. citriodora* were grown in NIAB fields since Sept, 2004 at Faisalabad, Pakistan. Their leaf oil, extracted by hydro-distillation (during June-July, 2007) was analyzed by GC/FID on 15% Carbowax 20M, packed glass column. The results, revealed a significant inter and intra species variation in content and composition of their essential oils. Leaves samples of different *Eucalyptus polybractea* plants contained highest amount of oil (2.93 - 4.18%). Where as plant to plant variation in essential oils in *E. camaldulensis* ranged between 0.61-1.03%; *E. citriodora*, 0.52-1.52% and *E. viridis*, 1.68-2.78%. The amount of 1, 8 cineol found in the oils of *E. camaldulensis* ranged, 35-70 %; *E. polybractea*, 89-94% and *E. viridis*, 62-86%, Whereas essential oils extracted from different plants of *E. citriodora* contained highest concentration of citronellal, ranged between 64-89%.

ICPS-438 - MUNGBEAN INCLUSION IN WHEAT-RICE CROPPING SYSTEM TO ENHANCE SOIL FERTILITY AND FARM PRODUCTION

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Abstract: Intensive cultivation of cereals causes depletion of soil fertility. Since replenishment of nutrients through mineral fertilizers is not sufficient, therefore, legumes inclusion to our cropping systems is extremely important to sustain the fertility and productivity of soil. Studies were conducted wherein mungbean (NM-92) was grown during the fallow period to enhance soil fertility as well as farm income through an additional crop. Without fertilizer application, one hectare of mungbean crop produced 1295 kg grain along with 4696 kg of manurial biomass comprising roots, un-harvested/ harvested aerial plant parts. This manurial biomass (containing 54 kg N ha^{-1}) was ploughed under the soil and rice crop was grown by applying different N rates in non-manured/ manured soil. The rice grain yield was significantly increased with the increasing rates of N from 0-120 kg N ha^{-1} under manured and non-manured soil except at maximum N application(160 kg ha^{-1}), and the same trend was observed in case of straw yield. The legume-manured soil produced significantly higher grain (8-16 %), grain N (7-11%) and residual soil N (4-18 %) compared to non-manured soil while there was non significant change in yield of straw and its N content. Under legume-manured soil, the maximum grain (4823 kg ha^{-1}) and straw (6061 kg ha^{-1}) were obtained at 120 kg N ha^{-1}. After rice harvest, the residual effect of legume manuring and fertilizer was studied for the wheat crop. The manured soil produced significantly higher grain (20.5 %) and straw yield (14.8%) compared to non-manured one, with maximum grain

and straw yield (1668 and 3277 kg ha^{-1}, respectively) in plots where highest N rate was applied to the preceding rice crop. The results clearly suggest that the grain legume should be included in wheat-rice cropping system to enhance farm income as well as to improve soil fertility through incorporation of manurial biomass of the legume.

ICPS-439 - INFLUENCE OF EXPLANT AND SUCROSE ON THE INDUCTION OF MICROTUBERS AND SOME PHYSIO-CHEMICAL ASPECTS OF POTATO (*SOLANUM TUBEROSUM* L.)

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Abstract: Studies in collaboration with Government College, Sahiwal, "Potato Tissue Culture Laboratory", Punjab Seed Corporation, Sahiwal, and " Plant Stress Physiology Laboratory", Nuclear Institute for Agriculture and Biology (NIAB), Faisalabad were conducted to produce virus free microtubers from different sources of explants which were taken from green house grown shoots and test tube grown shoots and to test the effect of different concentrations of sucrose on the growth, induction of microtubers and some physio – chemical aspects of two varieties of potato, (Desiree and Cardinal). Among the different sources of explant, the test tube grown shoots were better for microtuber induction. As regards the effect of different concentrations of sucrose, in Desiree, 9% sucrose concentration was better for shoot length (15 cm), nitrate reductase activity (79.34 µ mol NO_2 h^{-1} g^{-1} F. W), soluble protein contents (2.22 mg g^{-1} FW) where as 6% sucrose concentration was better for root length (11.3 cm) and average number of leaves (9.6 after) after 5 weeks of treatment however microtuberization did not occur at any concentration even after 5 weeks. In case of Cardinal, 6% sucrose concentration was better for shoot length (19 cm) and average number of leaves (9.6) where as 9% sucrose concentration was better for root length (8.83 cm), nitrate reductase activity (86.92 µ mol NO_2 h^{-1} g^{-1} F. W) and total soluble proteins (3.14 mg g^{-1}F.W) after 5 weeks of treatment. Microtuberization occurred in Cardinal in 6 and 9% sucrose concentration during fifth week.Sucrose has no significant effect on the nucleic acid contents in both varieties. However, it can be concluded from the above results that sucrose up to 9 % in the growth media accelerated the growth but higher concentration showed inhibitory effect on growth. Over all 9% sucrose concentration was better for Desiree and 6% sucrose concentration was better for cardinal.

ICPS-440 - ASSESSMENT OF SELECTED PERSISTENT ORGANIC POLLUTANTS (POPs) IN SEDIMENTS FROM STREAMS OF SIALKOT DISTRICT

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Abstract: Samples of sediment were collected from the Nullah Aik and Palkhu southern tributaries of River Chanab, Sialkot and were analyzed for eleven Persistent Organic Pollutants (POPs) viz., Beta-HCH, Lindane, Heptachlor, Heptachlor Exoepoxid, Heptachlor Endoepoxid, Dieldrin, DDD, DDE, Endrin, 2, 4-DDT and 4, 4-DDT. Except Heptachlor endoepoxide and DDE, residues of Beta-HCH, Lindane, Heptachlor, DDD, 2, 4-DDT and 4, 4-DDT detected in sediment;. Increasing trend in concentration of POPs was observed from upstream to downstream in sediment samples of both streams. The results of this study highlighted its usefulness in the management of POPs in study area and its catchments.

ICPS-441 - INFLUENCE OF DROUGHT ON MINERAL NUTRIENTS OF DIFFERENTIALLY ADAPTED POPULATIONS OF *CYNODON DACTYLON* (L.) PERS. AND *CENCHRUS CILIARIS* L.

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Abstract: The water famine is one of the major factors for converting huge cultivated land into deserts all over the world. Likewise, in Pakistan, Salt Range due to low rainfall is also converting into uncultivable area. In the present study, a greenhouse experiment was conducted at University of Agriculture, Faisalabad, to assess the extent of water stress adaptability in terms of mineral nutrient status. Two populations of each of grass species i.e., *Cynodon dactylon* (L.) Pers. and *Cenchrus ciliaris* L were used in this experiment. One population of each of grass species was collected from drought-hit area "Salt Range" and other from often irrigated Faisalabad. Each population of these of grass species were subjected to three different levels of water stress (control, 75% and 50% of field capacity. Imposition of water stress astonishingly decreased the shoot and root fresh and dry biomass of all populations. Each population of *C. dactylon* was better in fresh and dry biomass as compared to that of *C. ciliaris*. But drought stress had non-significant effect on leaf and root Na^+, K^+, and root, N, Ca^{2+} concentrations of each of grass species. However, a marked increase in leaf P, Ca^{2+} and root P was observed under drought stress. Both populations of *C. ciliaris* was higher in leaf Na^+ accumulation while leaf K^+ concentration was higher in both populations of *C. dactylon*.

ICPS-442 - EMBRYOGENESIS AND PLANT REGENERATION IN ENDOSPERM CULTURE OF KINNOW MANDARIN

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Abstract: Endosperm culture was used to develop triploid plants for the improvement of Citrus germplasm for seedlessness. The calli induced on Murashige and Tucker (MT) medium supplemented with BA, 2,4-D, KIN, ME and CH in both 'Kinnow' mandarin (*Citrus reticulata* L.) and 'Succari' sweet orange (*Citrus sinensis* L. Osbeck) developed somatic embryos only in 'kinnow' on basal medium modified with higher concentrations of BA and NAA ($10mgL^{-1}$ and $2mgL^{-1}$, respectively). Cytological studies of regenerated plants revealed them as putative triploids (2n=3x=27). Endosperm culture emerged as a promising tool for production of triploid citrus plants, however; morphological as well as genetic characterization of the ploids is suggested for future breeding and biotechnology applications.

ICPS-443 - IMPLICATION OF COMBINING ABILITY AND ITS UTILIZATION IN WHEAT (*TRITICUM AESTIVUM* L.)

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Abstract: A set of 6 x 6 parent complete diallel cross of spring wheat was developed to investigate combining ability in F_1 and F_2 hybrid populations for important agronomical characters. Mean squares for general, specific and reciprocal combining abilities revealed significant difference at $P \leq 0.01$ in both the generations for all the traits. This indicated the presence of additive type of gene actions. The cultivars C-591 produced the tallest plants and proved good general combiner in plant height. The parental variety Jauhar-78 reflected the highest GCA effects in tillers per plant and spike length. While, the Blue silver indicated maximum GCA in seed index and grain yield per plant. The hybrids Pavon x

Jauhar-78, its reciprocal hybrid, Jauhar-78 x Blue silver and C-591 x Blue silver indicated high SCA and reciprocal effects, the same also displayed superior performance in most of the traits. Therefore, such combinations are recommended as promising source material for evolution of high yielding genotypes of wheat.

ICPS-444 - PHYSIOLOGICAL CHARACTERIZATION OF RICE (*ORYZA SATIVA* L.) CULTIVARS AGAINST SALINITY STRESS

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Abstract: Seven newly developed rice cultivars, along with three known (salinity tolerant (KS-282), medium tolerant IR-6 and susceptible (Basmati-385)) cultivars were evaluated for salinity tolerance under glasshouse conditions. Based on the survival at 50 mol m^{-3} Sodium Chloride saline medium imposed at seedling stage rice cultivars; KS-133, Gomal, and DR-83 showed high at survival comparable to that attained by salinity tolerant cultivars like KS-282 so were placed in tolerant range. JP-5, Gomal-6, DR-64, survival percentage remained in medium tolerant range (35 to 38%) as that of IR-6. The rice cultivar BR-601 showed only 13% and was found to be as sensitive towards salinity as Basmati-385. The results of rice survival in saline medium showed good uniformity and the check varieties used showed corresponding results as found elsewhere. Sodium and potassium concentrations in the third leaf showed variation in different rice cultivars under salinity. There was an inverse correlation between varietal leaf Na^+ VS survival percentage (r=-0.808) and Na^+ Vs leaf chlorophyll (r=-0.0.857). The correlation between K^+ and final survival percentage was (r=00.744) and leaf chlorophyll Vs survival was r=0.952. The shoot fresh and dry weights were greater in that rice genotypes having higher final survival under saline conditions.Therefore, in addition to final survival percentage, the higher shoot fresh and dry weight under salinity could also be used as a criterion for evaluation of salinity tolerance of rice.

ICPS-445 - CORRELATION OF ENVIRONMENTAL FACTORS IN RELATION TO PVX AND PVY DISEASE SEVERITY AND APHID POPULATION

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Abstract: Twenty-nine test cultivars/lines, were planted in the research area of department. Disease severity of PVX and PVY and aphid population was recorded on weekly basis and subjected to correlation analysis with different environmental factors. The overall correlation of maximum (24-29^{0}C) and minimum (9-14^{0}C) air temperature and pan evaporation (2.0-3.6 mm) was highly significant but negative with disease severity while positive with relative humidity (45-70%) and aphid population which was correlated with PVY. Thus relative humidity and aphid population seems to play crucial role, especially aphid population in the spread of PVY.

ICPS-446 - EVALUATION OF ANTIMICROBIAL ACTIVITY OF SEED EXTRACTS OF *MORINGA OLEIFERA*

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Abstract: The seed extracts (crude, supernatant, residue and dialyzed samples) of *Moringa oleifera* were assayed for antimicrobial activity against bacterial (*Pasturella multocida, Escherichia coli, Bacillus subtilis* and *Staphlocuccus aureus*) and fungal (*Fusarium solani*, *Rhizopus solani, Aspergilus niger and Metarhizium aniscoplae*) strains. The extracts inhibited the growth of all microbs, at various extents. Results showed the zones of inhibition with greater sensitivity for bacterial strains as compared to fungal strains. The extracts worked in dose dependent manner and resulted in crippled and distorted hyphae and apical branching in the fungi, and plasma membrane leakage in bacteria causing metabolic inactivity. Minimum inhibitory concentrations (MIC) of these extracts were determined by mircodilution method. *Staphlocuccus aureus and Bacillus subtilis* were most sensitive strains having MIC values of dialyzed samples 18.2 mg/ mL and 16.7 mg/ mL respectively. However, the activity of the extracts antagonized by cations (Na^+, K^+, $Mg^{2+}$and $Ca2^+$), pH and temperatures. Maximum activity was found between temperature 4ºC-37ºC and pH 7.

ICPS-447 - EFFECT OF SALICYLIC ACID ON GROWTH, CHLOROPHYLL AND SUGAR CONTENT IN SALT STRESSED WHEAT (*TRITICUM AESTIVUM* L.) SEEDLINGS

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Abstract: The interactive effect of salicylic acid and NaCl salinity on wheat (*Triticum aestivum* L.) cv. Inqlab-salt sensitive and S-24-salt tolerant was studied in sand culture pot experiment in net house. Wheat seed soaked in water and 100 ppm salicylic acid solution for 6 h was sown in sand salinized at 0, 50 and 100 m*M* NaCl. Pots were irrigated with ¼ strength Hoagland nutrient solution. Fourteen days old seedlings were harvested and growth parameters (shoot, root length and shoot, root dry weight) recorded and chlorophyll *a* and *b* content and soluble sugars (reducing and non reducing) content were estimated in leaves. NaCl salinity significantly reduced growth parameters. Salicylic acid treatment alleviated the adverse salinity effect on growth. Salinity decreased the chlorophyll *a* and *b* content and chlorophyll a/b ratio in both the varieties; but decrease in chlorophyll a/b ratio was lower in salt tolerant wheat variety (S-24), which could be a useful marker for selecting salt tolerant variety. Salinity (NaCl) stress considerably increased the accumulation of reducing sugars non reducing sugars and total soluble sugars in leaves of 14 days old wheat seedlings of both the varieties. Salt tolerant variety (S-24) accumulated higher sugar content which could also be a useful marker for selecting salt tolerant variety for slat affected areas.

ICPS-448 - STUDIES ON BIODEGRADATION OF DIRECT DYES BY A WHITE ROT FUNGUS

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Abstract: Environmental pollution has increased with increasing industrial developments. Contamination of water by a wide range of textile dyes is a serious environmental problem due to their potential human toxicity. Different technologies are in practice for industrial waste water treatment, but bioremediation using white rot fungi leads to complete degradation to non toxic products. Three direct dyes (Solar golden yellow R, Solar brilliant red BA and Solar orange RSN) were decolourized using white rot fungus *Pleurotus ostreatus*. The best decolorized dye Solar golden yellow R was selected for subsequent optimization studies. *Pleurotus ostreatus* decolourized Solar golden yellow R (0.1mg) by 95% within two days in shaking incubator under optimized conditions. Spectrophotometric analysis of culture supernatants showed that Solar golden yellow was decolourized but complete degradation of

dye did not occur due to accumulation of metabolites. Optimum conditions were pH 3.5, temperature 30 ^{o}C, 1 % starch and 0.01% ammonium sulphate as carbon and nitrogen source, respectively. Ligniniolytic enzyme activity was directly related to decolourization %. Laccase activity was measured in culture supernatants after every 24 h, the activity reaching a maximum of 356.23 U/ml after 48 h in pre optimized conditions. Best dye concentration level for optimum dye decolourization and dye adsorption (in absence of nutrients) by the *Pleurotus ostreatus* were at 0.01% and 0.01% respectively. The results suggest great potential of local white rot fungus *Pleurotus ostreatus* for direct dye decolourization.

ICPS-449 - EXPRESSION OF A *TRICHODERMA HARZIANUM* XYLANASE GENE IN *ESCHERICHIA COLI*

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Abstract: Plant cell walls are the most abundant renewable source of fermentable sugars on earth and are the major reservoir of fixed carbon in nature. Hemicelluloses are the major constituents of plant cell wall polyaccharides and are the second most abundant fraction available in nature. Xylanases are the enzymes that break down xylan and are the most widely studied group of hemicellulases due to their numerous biotechnological applications. A 750 bp xylanase gene from *Trichoderma harzianum* E-58 was inserted into pUC18 and pFLAG-ATS expression vectors and transformed in *E. coli* for expression. Congo red staining showed the presence of clear zones of hydrolysis around colonies suggesting that xylan hydrolysis was obtained. Extracellular and intracellular xylanase activity from pUC18-*xyn* was 2.25 $\pm$ 0.10 IU/mL and 1.70 $\pm$ 0.80 IU/mL, respectively. pUC18 expression plasmid resulted in lower xylanase activity as compared to xylanase activity of *T. harzianum*. pFLAG ATS expression vector was then used for the expression and secretion of xylanase protein in periplasm. The pFLAG-ATS vector containing the xylanase gene designated as pFLAG- *xyn* resulted in high level expression of recombinant xylanase (133.78 IU/mL) after IPTG induction. This study is a significant contribution to *T. harzianum* xylanase and several steps forward in the molecular biology of xylanase from *T. harzianum*.

ICPS-450 - BIOACTIVE COMPOUNDS AND ANTIMICROBIAL ACTIVITIES OF ENDEMIC *ORIGANUM HYPERICIFOLIUM* O. SCHWARTZ & P.H. DAVIS IN THE EAGEAN REGION OF TURKEY

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[Pamukkale University, Science and Arts Faculty, Biology Department, Denizli]

Abstract: In present study, bioactive compounds and antimicrobial activity of the essential oils from Turkish endemic species, *Origanum hypericifolium* was investigated. Hydrodistillation was used to isolate the essential oils and chemical analyses were performed by GC and GC-MS. The antimicrobial activity was tested by agar disc difusion method against *Staphylococcus aureus* ATCC 25923, *Cowan liyofilii*, *Yersinia enterecolitica* RSKK1501, *Yersinia enterecolitica* RSKK1501, *Proteus vulgaris* RSKK 96026, *E. coli* ATCC25322, *E. coli* ATCC11230, *Micrococcus luteus* MRLL B-43975, *Bacillus subtilis, Pseudomonas aeruginosa* ATCC27853, *Micrococcus flavus* and *Morganella morganii*. Carvacrol (61, 27%), p-cymene (19,1 %), γ-terpinene (10,13%) were indentified as major components in *O. hypericifolium*

ICPS-451 - REPORT OF POWDERY MILDEW OF NASTURTIUM (*TROPAELUM MAJUS*) CAUSED BY *LEVEILLULA TAURICA* IN JIROFT AREA

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Abstract: In the winter of 2005, typical symptoms of powdery mildew were observed on nasturtium (an ornamental flower) in Jiroft area, Kerman province, southeast of Iran. Conspicuous sings of the disease were angular and white-colored patches on the lower surface of leaves composed of superficial mycelia, conidiogenous structures and conidia typical of form genus *Oidiopsis*. The telemorph was absent. Hyaline, singel-celled primary and secondary conidia were borne on conidiophores. Primary conidia were lanceolate with distinct apical points, 12.2-16.5×57.3-76.7µm. secondary conidia were cylindrical or clavate,9-15.3×45.9-75.3µm. Anamorphic features resembeled closely those of L. *taurica*. To confirm pathogenicity, diseased leaves were pressed against lower sides of leaves of nasturtium plants. After 3 to 4 weeks, powdery mildew developed on all plants and symptoms were identical to those of diseased plants. No symptoms developed on control plants. Infected plants became more sensitive to cold temperature. This disease can cause significant losses on nasturtium. This is the first report of powdery mildew on nasturtium in southeast of Iran.

ICPS-452 - EVALUATION OF GENETIC IMPROVEMENT OF DROUGHT RESISTANCE IN CROP PLANTS

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Abstract: Drought is the most important limitative factor in production of crop plants. Three mechanisms, namely drought escape, drought avoidance and drought tolerance are involved in drought resistance. Various morphological, physiological and biochemical characters confer drought resistance. Morphological and physiological characters show different types of inheritance pattern (monogenic and polygenic) and gene action (additive and non-additive), whereas the genes responsible for biosynthesis of different compatible solutes have been identified and cloned from plants, yeast, mouse and human. Different breeding approaches for drought resistance have emerged, with their merits and demerits. Efficient screening techniques are pre-requisite for success in selecting desirable genotype through any breeding programme. Genetic engineering has been successfully applied to identify and transfer different genes responsible for biosynthesis of different metabolites such as proline, trehalose and polyamines from different organisms to crop plants through a targeted approach. Barley *hva1* gene responsible for late embryogenesis abundant (LEA) proteins has been transferred to rice to produce drought-resistant transgenics through a shotgun approach. Lack of multidisciplinary approach and precise screening techniques, incomplete knowledge about genetic basis of drought resistance, negative correlation of drought resistance traits with productivity and unavailability of appropriate genes to obtain transgenic plants are the main constraints for genetic improvement of drought resistance. Exploration of wide genetic variation of relevant characters, consideration of more genes at a time to transfer through breeding or genetic engineering method, application of antisense RNA technique, assessment of polypeptides induced under drought and multidisciplinary approach should be included in the future research programmes for drought resistance.

CPSI-453 - DETERMINATION OF PLANTING DATE IN YIELD AND YIELD COMPONENT OF RAPESEED (*BRASSICA NAPUS* L.) CULTIVARS IN BIRJAND

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Abstract: To determine the best planting date for rapeseed cultivars in Birjand, Experiment is conducted in agricultural research station of Birjand in 2006-2007 growing season. In this experiment, planting date is main factor with 5 level (contains: 28 Sep., 8 Oct. 18 Oct. 28 Oct and 7 Nov.) and rapeseed cultivars is subordinate factor with 5 level (contains cultivars: Zarfam, Talaye, Hayolla 405, Okapi and RGS003), in split plot with complete block design module with 4 replication. Consideration characters contains: grain yield, 1000-grain weight, number of pods per plant, number of kernels per pod, days from sowing to flowering and maturity. Results indicated that have not significant difference between first to third planting dates but first planting date have the highest yield with 1.72 ton/hectare. Not been observed significant difference between Hayola 405, RGS003 and Zarfam, but Hayola 405 have the highest yield with 1.48 ton/hectare. With regard to results, Hyola 405 cultivar is the best cultivar and first planting date is the best planting date in Birjand.

ICPS-454 - INVESTIGATION OF ETHYLENE PRODUCTION IN INFECTED BUNCHES IN RESPONSE TO DATE BUNCH DRY ROT DISORDER

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Abstract: Bunch dry rot of date palm has become the most damaging disorder of fruit crop in date palm growing areas of southern Iran. Losses are estimated at tens of thousand tons annually. Dates drop prematurely and the bunches start shriveling and drying following the onset of hot dry winds periods as the dates approach maturity. Attempts to isolate a pathogenic organism from the diseased bunches have thus far failed and the disease is suspected to be a non-pathogenic disorder. Efficacy of the some plant growth regulators and an inhibitor of ethylene production was tested on infected Mazaffati cultivar by injection into stalk in Jiroft area, southeast of Iran in summer 2005. A complete randomized block design with three replications and eight treatments was used. Treatments were ethephon, indole acetic acid (IAA), cytokinin, gibberellic acid (GA3), silver nitrate, IAA+cytokinin+GA3 at a ratio of 400:300:100 ppm and IAA+cytokinin+GA3 at a ratio of 400:100:300 ppm. Ethylene of infected bunches was quantified by gas chromatography (Porapak Q column, flame ionization detector at 100ºc) and expressed as ppm/Kg fresh bunch weight. A maximum ethylene production was obtained with ethephon treatment as opposed to minimum levels of ethylene being generated with both IAA and IAA + cytokinine + GA3 treatments. Ethylene (as a phytotoxin) is known to be responsible for many physiological disorders on plants including wilting. Further investigation is needed to unravel the role of ethylene in date bunch dry rot disorder. Silver nitrate as an ethylene inhibitor can decrease loss of date palm bunch dry rot disorder.

ICPS-455 - PLANT SHOOT AND ROOT BEHAVIOUR STUDIES IN CHICKPEA (*CICER ARIETINUM* L.) UNDER DIFFERENT MOISTURE LEVELS

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Abstract: The shoot and root behaviour of two chickpea varieties, Sheenghar-2000 (*desi*) and Lawaghar-2000 (*kabuli*), were examined under well watered and moisture stress conditions in split drainpipes in the greenhouse during 2006. Shoot and root data and soil moisture percentage were recorded at the late flowering stage. The only significant difference between varieties was in days to flower initiation. Shoot fresh weight (SFW) was significantly greater in well watered conditions, but there was no effect of stress on shoot dry matter content, suggesting that high SFW was mostly due to water in the shoots which evaporated after drying. Fresh root weight was only significantly affected at 30 cm depth level due to varieties and 45 cm depth level due to treatments. The root moisture percentage was only significantly affected at 15, 30 and 45 cm depth level due to varieties-cum-treatment interaction, varieties and treatments respectively. There was no significant difference in root dry weight of any of the three sampled depths. The cultivar Sheenghar-2000 retained higher root moisture content (7.57%) at 15 cm depth level under well watered.

ICPS-456 - DEVELOPMENT OF FIELD TECHNIQUE FOR MASS SCREENING OF CHICKPEA (*CICER ARIETINUM* L.) GERM PLASM ADAPTED TO DROUGHT PRONE ENVIRONMENT

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Abstract: In Pakistan more than 95% chickpea production comes from rainfed lands where drought is the major abiotic constraint. Chickpea screening for drought under natural environment is not usually reliable due to risk of uncertain rainfall. Studies for developing germ plasm screening technique are more reliable under controlled environment. A Glass house experiment was therefore, conducted at CAZS Natural Resources, University of Wales, Bangor, UK during 2006-07. Four chickpea varieties/lines two each from desi and kabuli group were planted in Bench top raised bed measuring 50 x 50 x 30 cm. The experiment was laid out in RCBD with Split Plot arrangements having six replications. The crop was maintained under various artificial moisture stresses imposed at different plant growth stages. Treatments include well watering (control), moisture stress to 40 days old seedlings (FOS), stress at pre-flowering stage (SPF), stress at flowering stage (SFS) and stress at 25% pod formation stage (TDS). The results revealed highly significant variation in yield contributing traits. Among various treatments, the moisture stress at pre-flowering stage was found to be more damaging to yield and yield contributing variables in both the types of chickpea with maximum loss of 41.29% in grain yield as compared to control. Beside poor yield, the crop was also harvested late under SPF as compared to check. The moisture stress to chickpea plant at pre-flowering (PFS) stag was found quite harmful and detrimental, suggesting the more critical stage for germ plasm screening against drought prone environment.

ICPS-457 - IN VITRO REGENERATION STUDIES IN *CAPSICUM* CULTIVARS

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Abstract: Different Capsicum cultivars were studied for their in vitro regeneration potential. The regeneration behavior was found independent of genotype. Maximum embryogenic callus (83%) was induced in cotyledon explant on MS medium containing 2,4-D (1 mgL^{-1}). Somatic embryos developed when calli were sub-cultured on medium without 2,4-D. Highest shoot regeneration potential (59%) was observed in leaf disc explant induced calli on MS medium containing BAP and Kinetin ($3mgL^{-1}$ + $1mgL^{-1}$, respectively). The plantlets developed from the regenerated embryos and shoots were transplanted in soil and placed in the greenhouse for further genetic analysis.

ICPS-458 - PCR AMPLIFICATION OF β-ACTIN GENE FROM *TRICHODERMA HARZIANUM*

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Abstract: Actin is one of the most conserved proteins in eukaryotic organisms. Actin protein is involved in cellular processes, such as motility, regulation of cell growth and differentiation, endocytosis, exocytosis and structural stability. *Trichoderma harzianum* is an industrially important mesophilic filamentous fungus. *T. harzianum* was grown in Vogel's medium with glucose as a carbon sources. Genomic DNA was isolated from the fungus. PCR was done on the genomic DNA of *T. harzianum* for the amplification of β-actin gene. The amplified gene was visualized on agarose gel electrophoresis and was purified by Qiagen gel extraction kit. PCR purified product was ligated into pTZ57 R/T vector and transformed into *E. coli* and sequenced. These results will help to study cellulases and xylanases gene regulation in the fungus in future.

ICPS-459 - RESPONSE OF TWO DIFFERENTIALLY ADAPTED POPULATIONS OF *CENCHRUS SETIGERUS* VAHL TO DROUGHT STRESS

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Abstract: A greenhouse experiment was conducted in the Botanical Garden of the University of Agriculture Faisalabad to assess the comparative adaptability among different populations of *Cenchrus setigerus* Vahl collected from different localities i.e., one from Kallar Kahar (Salt Range), a drought-hit area and other from Faisalabad region as a check. Both populations were subjected for 88-days to three varying water stress treatments (control, 75% or 50% of the field capacity). Water stress remarkably reduced the shoot and root fresh and dry weights of both populations of *C. setigerus* collected from different localities. However, population of Salt Range was better in fresh and dry weights as compared to that of Faisalabad. Reduction was high at 50% of field capacity in both populations of *C. setigerus*. Water stress significantly decreased the chlorophyll *a, b,* photosynthetic rate, transpiration rate and stomatal conductance of both populations. While a considerable increase was observed in chlorophyll *a/b, Ci/Ca* ratios and water use efficiency. Among both, *C. setigerus* of Salt Range was better in growth and gas exchange at all water stress levels as compared to the others.

ICPS-460 - EFFECT OF PLANTING RATES AND DATES ON YIELD, YIELD COMPONENTS OF ISABGOL IN RAINFED CONDITIONS OF GOLESTAN PROVINCE, IRAN

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Abstract: A field experiment was conducted at Maraveh-Tapeh station in 2004-2005 to determine the effect of planting rates and dates on seed yield and yield components in isabgol (*Plantago ovata* Forsk.). It is an annual herb cultivated as a medicinal plant. The experiment was laid out in a split plot arrangement using randomized complete block design within three replications. There were three planting rates including 2, 4 and 6 kg ha^{-1} and 5 dates including 22 December, 5 and 21 January, 9 and 24 February. Seed yield and yield components, namely: number of spikes per plant (SP), spikes length (SL), number of seed per spike (SEP) and 1000-seeds weight (SW) were measured. Results indicated that planting rates effect were significant on seed yield ($p<0.05$), SP ($p<0.01$), SEP ($p<0.01$) and SL ($p<0.05$). Planting dates were not significant on seed yield and on the measuring components SP, SEP,

SL and SW. As planting rates increased, biological yield and seed yield were increased from 1216 to 2213 kg ha^{-1} and 272 to 555 kg ha^{-1} on 9 Feb. and 1699 to 2611 kg ha^{-1} and 370 to 609 kg ha^{-1} on 24 Feb. respectively.

ICPS-461 - TRADITIONAL MEDICINAL PLANT USE IN CHOLISTAN DESERT, PAKISTAN

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Abstract: The roots of traditional healing practices in Cholistan desert are centuries old. This paper examines the traditional use of medicinal plants in this desert. 64 plant species belonging to 36 families used for medicinal purposes were collected, identified and their vernacular names, traditional uses, preparations and mode of administration recorded. The families best represented were Zygophylaceae with 5 species, Euphorbiaceae (4), Poaceae (4) and Capparidaceae (4). Solanaceae, Asclipiadaceae and Cucurbitaceae had three species in each family, and rest of the families represented one or two plant species. The highest number of species were used for the treatment of Gastrointestinal tract disorders (23 species), followed by the species used as antibacterial and skin diseases (17), common fever (16) respiratory tract problems (15), rheumatism (14), infections of male organs (14), problems of female organs (13), as antifungal and antiviral (12), as anti-diabetic (7) and as antihyperlipidemia (4). Fresh plants, often collected wild, were used in all cases, and the most common applications included the ingestion of herb decoctions or the application of plant material as poultices.

ICPS-462 - SOMATIC EMBRYOGENESIS AND PLANT REGENERATION IN CUCUMBER CULTIVARS

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Abstract: Different explants excised from *in vitro* raised cucumber seedling were cultured on MS basal medium containing various plant growth regulators (PGRs) for plant regeneration. Genotypic differences were observed among cultivars for callus induction and plant regeneration as Bethalpha>Marketmore. Cotyledon explant induced more calli on 2,4-D compared to other explant types and PGRs. However, only leaf disc explant induced calli on 2,4-D was embryogenic and developed somatic embryos upon transfer to medium devoid PGRs. Shoot regeneration was obtained in leaf disc explant derived calli at higher levels of NAA compared to BAP and their combinations. Reducing PGR concentration established roots in the cultured shoots. Regenerated plantlets were transplanted in pots containing garden soil and sand for hardening and were shifted to the greenhouse.

ICPS-463 - AN ETHNOBOTANICAL STUDY OF THE TRADITIONAL MEDICINE OF QUETTA CITY

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[Balochistan University, Quetta]

Abstract: The ethnobtanical knowledge of medicinal plants from local herbal healer was documented after an interview survey of 30 pansar stores in Quetta city. Sixty plant samples were collected that were used locally for medicinal purposes i.e. digestive problem, tonic, pain killer, fever, diabetese,

kidney stones, chest infection, inflammation and refrigerant. The people living in Quetta city are quite familiar with medicinal plants available at pansar stores. They preferred them due to their low price as compared to doctors and their traditional believes on hakims. It was observed that herbal healers were using the medicines that were brought from different places of Pakistan and India. They did not totally depend on local resources. Unfortunately very little attention has been paid to specific part used, storage and quality monitoring.

ICPS-464 - STUDIES OF FOLK USES OF SOME PLANTS OF QUETTA

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[[1]Botany Department, Balochistan University, Quetta, [2,3]Sardar Bahadur Khan Women University, Quetta]

Abstract: The investigative visits were made at Chiltan National Park Hazar Ganji, Karakhassa and Hanna Lake during 2006 – 07. In total 125 plants were collected, identified and preserved. They are mostly belonging to families: Asteraceae, Fabaceae, Brassicaceae, Liliaceae, Laminaceae, Chenopodiaceae, Boraginaceae. The remaining families had one or two species each. The ethnobotanical study revealed that out of 125 species, 60 plants were palatable and used as fodder species, 40 have medicinal values, 18 can be used as fuel wood species, while timber wood (2), roof thatching (5), vegetables (3), gums and resins (2), wood tool (2), ornamental 92), and poisonous and for evil repellent species one each. It was observed that protected areas had more plant cover and abundance than open areas.

ICPS-465 - VARIETALS VARIABILITY OF WINTER RAPES (*BRASSICA NAPUS* L.) FOR THEIR SUSCEPTIBILITY TO GREEN APHID *MYZUS PERSICAE* (HOMOPTERA: APHIDIDAE)

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Abstract: The green aphid *Myzus persicae* (Sulz.), is an important and serious insect pest of crops, field experiments were conducted to determine the resistance of 30 rapes genotypes (*Brassica napus* L.) against the aphid grown during 2 consecutive crop seasons. The pest tolerance of genotypes was assessed by quantitative traits such as number of aphids on each infested genotype and mean dry weight of seeds per genotype. Studies on the susceptibility of various trialed rape genotypes to the pest invasion, showed differences in the overall rates of aphid development and seed yield. Among the entire rape genotypes tested W-97-0.75/11 and Hyola-42 were somewhat resistant to pest and showed low contamination but increased pods yield. The highest pest population accommodating and yield suffering genotypes were Can-5-4 and Abasin-10. Experiments showed a marked mode of damage inflicted by green aphid to plant at different growing stages of crop. With the availability of this information on host plant resistance and pest damage, the future strategies could be focused on the creation of virtual immunity in winter rapes for development of new high yielding varieties.

ICPS-466 - EFFECT OF EXOGENOUS SALICYLIC ACID ON GERMINATION AND EARLY SEEDLING GROWTH OF WHEAT (*TRITICUM AESTIVUM* L.) UNDER NaCL STRESS

F. JAVED AND Z. MAHMOOD

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Abstract: The experiment was carried out to study the effect of NaCl (control, 100 and 200 mol m^{-3}) salinity on germination and at early seedling stage, of two wheat (*Triticum aestivum* L.) genotypes S-24 and Potohar). Seeds were imbibed in 0.05 M Salicylic acid and sown in Petri dishes lined with double filter paper. The Petri dishes were incubated in growth room under controlled conditions. Salt salinity significantly reduced the all the growth parameters, while, salicylic acid treated induced seedling showed relatively lower the effect of NaCl in all the tested parameters. It is concluded that salicylic acid reduced the toxic effect of salt salinity, but the extent was elevation low in both the genotypes.

ICPS-467 - EFFECT OF EXOGENOUS PROLINE ON CALLUS GROWTH AND PROLINE CONTENT IN WHEAT UNDER DIFFERENT NaCL STRESSES

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Abstract: Proline is an important component of abiotic stress responses of plants. In this study the role of proline as part of salt-stress in two wheat (Triticum aestivum L.) genotypes (S-24 and MH-97) callus tissues differencing in their salt tolerance was examined. Callus was established on LS- salt solidified medium supplemented with 5 mg L^{-1} 2,4-D. One month old calli of both the genotypes were treated with three levels of NaCl (control, 100 and 200 mol m^{-3})in liQuaid LS-medium supplemented with same concentration of 2,4-D.for fifteen days. The data showed that salt-stress brought about a reduction of the relative growth rate (fresh), K and Ca contents, while protein content and free proline content increased in both the genotypes, particularly at 200 mol m^{-3} NaCl. Exogenously added proline showed significant effects on all the observed attributes, particularly proline content that was increased 7-fold than that of their respective level. Genotype S-24 perform better than MH-97 in all the attributes

ICPS-468 - ZINC TOXICITY TOLERANCE IN HEXA- AND TETRAPLOID WHEATS CALLUS TISSUES

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Abstract: Heavy metal accumulation is a world wide problem of increasing concern. The use of In vitro selection for the improvement of cultivated crop plants to abiotic stresses and metal toxicity has a complex impact on plant physiology. The present study revealed the effects of Zn on callus growth of two wheates species (S-24 and D-249/2). The callus was established on LS-solidified medium supplemented with 5mg L^{-1} 2,4-D. One month old calli of both the species were transferred to LS- liquid medium supplemented with the same concentration of 2,4-D and four levels of Zinc metal (control, 0.05 m*M*, 0.1 m*M* and 0.2 m*M*). Data revealed that Relative growth rate (fresh), K and Ca contents decreased, while callus dry weight, Zn, and total soluble proteins contents increased and the extent of toxicity was more at 0.1 and 0.2 m*M* Zn in the culture medium. Durum performed better than S-24 against Zn toxicity.

ICPS-469- EFFECT OF SUCROSE INDUCED OSMOTIC STRESS ON CALLUS GROWTH AND BIOCHEMICAL ASPECTS OF TWO WHEAT GENOTYPES

S. IKRAM AND F. JAVED

Abstract: The research work was carried out to study the effect of sucrose induced osmotic stress on callus growth and biochemical aspects of two wheat genotypes (S-24 and MH-97). The seeds were cultured in Linsmaier and Skoog medium containing 30g sucrose, 8g agar, 5mg L^{-1} thiamine HCl and

3mg L^{-1} 2, 4-Dichlorophenoxyacetic acid. One month old calli produced were subcultured onto liquid LS-medium supplemented with same concentration of thiamine HCl and 2,4-D. and 0%, 2%, 4%, 6% and 8% sucrose concentration. The study revealed that average growth rate and K^{+1}, Ca^{2+}, Mg^{2+}, Mn^{2+}, Fe^{2+} contents decreased, while dry weight, and proline content and water relation parameters (more negative) increased at higher concentration of sucrose (4 to 8 %). It is concluded that sucrose concentration in the medium above 3% cause osmotic stress

ICPS-470 - CALLUS INDUCTION AND REGENERATION IN TOMATO (*LYCOPERSICON ESCULENTUM* M.)

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Abstract: The aim of the present study was to develop the reproducible protocol for callus induction and regeneration of tomato (*Lycopersicon esculentum* M.) cultivar; Riogarandi. Research work was conducted at Agricultural Biotechnology Programme (ABP) National Agricultural Research Center (NARC), Islamabad during March to June 2007. The maximum percentage of callus size (20%), granular calli (65%) and embryogenic calli (70%) for hypocotyl and leaf disc were observed on CIM_2. The CIM_2 contained MS salts and vitamins with Biotin (0.5 ml/l) and Kinetin (0.1 ml/l). Among the different regeneration media, RM_3 proved to be the best which gave the maximum (45%) regeneration from callus. Riogarandi gave 45% regeneration from callus. It was followed by RM_2 which gave 35% regeneration in Riogarandi.

ICPS-471 - *IN VITRO* CALLUS INDUCTION AND REGENERATION IN WHEAT (*TRITICUM AESTIVUM* L.) VARIETY WAFAQ-2001

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Abstract: Utilization of modern tools of biotechnology and genetic engineering in crop improvement depends upon the availability of reproducible system for regeneration of plants. A suitable callus induction and regeneration system of wheat is therefore, necessary for the application of many biotechnological methods. *In vitro* response of wheat variety Wafaq-2001 was tested as a source of callus induction and regeneration. The callus induction was achieved on MS medium containing different concentrations of 2, 4-D (1.5, 2, 2.5, 3 and 3.5 mg/L). It was observed that concentration of 2 mg/L produced maximum (32%) whereas 3.5 mg/L gave minimum (2%) number of embryogenic calli. After the callus formation calli was transferred to regeneration media composed of MS media with addition of IAA at 0.1 mg/L and BAP with different concentrations (0, 0.2, 0.4, 0.5, 0.6, 0.7, 0.8 and 1 mg/L). It was found that combination of 0.1 mg/L IAA and 1 mg/L BAP produced maximum (88.02 %) regeneration percentage. The control media with no BAP and IAA showed no regeneration for this wheat variety.

ICPS-472 - CONTRIBUTIONS OF BETASATELLITES TO BEGOMOVIRUS INFECTIONS

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Abstract: Begomoviruses are a major constraint to agricultural productivity in all tropical and subtropical regions of the world, including Pakistan. Although a small number of begomoviruses occurring in Asia have bipartite genomes (components designated DNA A, involved in viral DNA replication and transmission between plants, and DNA B, involved in movement within plants), the vast majority have monopartite genomes (consisting of only a component homologous to the DNA A of bipartite viruses) and associate with a class of symptom modulating satellites known as betasatellites. The most prominent begomovirus-betasatellite complex is that causing cotton leaf curl disease in Pakistan and India Betasatellites were first identified in 2000 and have since been shown to be involved in many geminivirus diseases occurring in the Old World. Recently major advances have been made in determining the interactions of DNA β satellites with their helper begomoviruses and in characterizing the multitude of functions that betasatellites provide to assist their helper viruses. These advances will be presented and their significance discussed. Determine the changes in germination, production of embryonic tissues, level of H_2O_2 and expression of stress protein. Data revealed that heat stress substantially reduced the rate of seedling emergence, length, fresh and dry weight of radical and plumule, whilst exogenously applied H_2O_2 significantly improved all these attributes under heat stress. Level of H_2O_2 in the seedlings did not change much in the control (H_2O_2-treated or untreated) seedlings. However, in heat stressed seedling receiving no H_2O_2 pretreatment, the level of H_2O_2 in the radical and plumule was about twofold higher than that noted in the controls, while this level in H_2O_2-pretreated and heat-stressed seedlings was much lower but slightly greater than controls. There was a strong expression of two stress protein bands with apparent molecular weight of 27 and 63 kDa in the plumule of H_2O_2 pretreated seedlings under heat stress. These data strongly suggest that pretreatment of seed with H_2O_2 signals the activation of ROS-scavenging system in the seedlings together with expression of stress proteins under heat stress. Such changes appear to confer heat tolerance as evident from improved emergence and growth characteristics of seedling.

ICPS-473 - SOME NEW FUNGAL RECORDS ON *SYZYGIUM CUMINI (EUGENIA JAMBOLANA) FROM* FAISALABAD PAKISTAN-2007

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Abstract: *Syzygium Cumini* (Jaman) is a common plant in Pakistan. It grows mainly in moist localities. Frequently it is planted for fruit and timber. *Syzygium Cumini* has received far more recognition in folk medicine and in the pharmaceutical trade than in any other field. Previously 4 fungi have been reported from it, viz. *Ciliochorella Mangiferae* Syd. A, Sydow.P. & Mitter., *Dictyosporium Hepatosporum* (Gar.) Damon, *Gyrothrix Podosperma*, (Corda) Rabenh., *Pilidiella Jambolana*, Ahmad *et al* (1997). In the present studies, 11 fungi are new record from Pakistan, *Bidenticula Cannae*, Deighton, *Chuppia sarcinifera* Deighton, *Chuppia* sp., *Cytosporella sycina* Sacc., *Pestalotiopsis guepinii* (Desm) Stey., *Phaeoisaria clavulata* (Grove) Mason & Hughes, *Phaeoisaria clematidis* (Fuckel) Hughes, *Rhinocladiella cellaris* (Pres.) Ellis, *Stagonospora cercinella*, Brunaud, *Torula terrestris* P.C. Misra, *Ulocladium alternariae* (Cooke). 4 fungi viz. *Lasiodiplodia undolata* (Berk & Curt) Abbas, Sutton, Ghaffar & Abbas, *Memnoniella echinata* (Riv.) Galloway, *Monodictys paradoxa* (Corda) Hughes, *Monochatinula terminaliae* (Bat & Bezerra), Muthumary, Abbas & Sutton are reported first time on *Syzygium Cumini* from Pakistan.

ICPS-474 -SOME NEW FUNGAL RECORDS ON *BOMBAX CEIBA* FROM FAISALABAD PAKISTAN-2007

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Abstract: *Bombax ceiba* is an ornamental plant and famous for its silky fiber and commonly known as cotton tree. Previously seven fungi have been reported on *Bombax ceiba* from Pakistan Ahmad *et al* (1997). In the present studies, ten fungi viz. *Dematophora necatrix* Hartig, *Stachbotrys kampalensis* Hansf, *Bideticula cannae* Deighton, *Alternaria clamadospora* Mouchcca, *Memnoniella echinata* (Riv.) Galloway, *Cheatomium aureum* Chivers, *Phaeisaria clematidis* (Fuckel) S. Hughes, *Lasiodiplodia undulta* (Berk & Curt) Abbas, Sutton, Ghaffar & Abbasi, *Torula graminis* Desm, *Triadelphia inquinans* (Sacc.) S. Hughes & Piroz reported first time on *Bombax ceiba*. seven fungi viz. *Dematophora necatrix* Hartig, *Stachbotrys kampalensis* Hansf, *Bideticula cannae* Deighton, *Alternaria clamadospora* Mouchcca, *Phaeisaria clematidis* (Fuckel) S. Hughes, *Torula graminis* Desm, *Triadelphia inquinans* (Sacc.) S. Hughes & Piroz reported first time on *Bombax ceiba* are new reports from Pakistan.

ICPS-475 -SOME NEW FUNGAL RECORDS ON *PSIDIUM GUAJAVA* L. FROM FAISALABAD PAKISTAN-2007

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Abstract: Guava (*Psidium guajava* L.) is famous for its fruit and is grown world-wide. This plant is common in Pakistan. Previously four fungi have been recorded on *Psidium guajava* viz. *Diplodia psidii* Ahmad, *Phoma psidii* Ahmad, *Stagonopsis psidii* Ahmad, *Pestalotioposis breviseta* (Sacc.) Steyaert, Ahmad *et al* (1997). In the present studies eight fungi viz. *Alternaria tenuissima* (Kunzeexpers) Wiltshine, *Alternaria dianthicola* Neergaard, *Torula graminis* Desm, *Cladosporium nigrellum* Ellis & Everth, *Gliomastix* state of *Wallrothiella Subiculosa* Hohn, *Lasiodiplodia undulata* (Berk & Curt) Abbas, Sutton, Ghaffar & Abbas, *Aspergillus niger* Van Teigh, *Chalara* State of *Ceratocystis fimbriata* Ellis &Halt reported on *Psidium guajava*. *Lasiodiplodia undulata* is already reported on *Psidium guajava*, while *Aspergillus niger* and *Alternaria tenuissima* are reported from Pakistan on other plants previously but are new reports from *Psidium guajava*. Five fungi viz. *Alternaria dianthicola* Neergaard, *Torula graminis* Desm, *Cladosporium nigrellum* Ellis & Everth, *Gliomastix* state of Wallrothiella Subiculosa Hohn, *Chalara* State of *Ceratocystis fimbriata* Ellis & Halt are new records from Pakistan.

ICPS-476 - OPTIMIZATION OF CULTURAL CONDITIONS FOR DIFFERENT *ASPERGILLUS SPP.* FOR ENHANCED BIOSYNTHESIS OF GLUCOAMYLASES UNDER SUBMERGED FERMENTATION CONDITIONS BY USING VEGETABLE/FRUIT PEEL AS SUBSTRATE

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Abstract: Experiments were conducted at Biotechnology Research Lab., Department of Botany, GC University, Faisalabad. Four isolates *i.e., Aspergillus japonicus, Aspergillus flavus, Aspergillus fumigatus* and *Aspergillus parasiticus* were subjected with various temperature and pH range, under varying concentrations of W/V dried crude mixture of vegetable/fruit peel. All the fungi were different in their response in production of Glucoamylase under different ecological variables. Maximum enzyme production was observed by *Aspergillus fumigatus* at 2.5% W/V substrate concentration at 45ºC after 72 h of incubation.

ICPS-477 - SOME NEW FUNGAL RECORDS ON *AZADIRACHTA INDICA* FROM FAISALABAD PAKISTAN-2007

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Abstract: *Azadirachta indica* (Neem) has a wide range of economic, domestic and medicinal utility. Previously two fungi have been reported from *Azadirachta indica*. Ahmad *et al* (1997). In the present studies eleven fungi are first time reported on *Azadirachta indica* from Pakistan, viz. *Ulocladium chartarum* Preuss, *Trimatostroma betulinum* Hughes, *Cladosporium oxysporum* Berk. & Curt, *Cladosporium nigrrellum* Ellis & Everh, *Lasiodiplodia undulata* (Berk & Curt) Abbas, Sutton, Ghaffar & Abbasi, *Epidermatophyton flocossum* Sabour, *Monochatinula terminaliae* (Bat & Bezerra) Muthumary, Abbas, Sutton, Ghaffar & Abbas, *Didymostilbe coffeae* Hennigs, *Tricothecium pygmaeum* Koerb, *Tiarosporella meedrya* (Sub. & Ramakar) Nagraj *Diplozythiella bambusina* Died. Out of these six fungi *Ulocladium chartarum* Preuss, *Cladosporium nigrrellum* Ellis & Everh, *Tiarosporella meedrya* (Sub. & Ramakar) Nagraj, *Diplozythiella bambusina* Died, *Monochatinula terminaliae* (Bat & Bezerra) Muthumary, Abbas & Sutton, *Didymostilbe coffeae* Hennigs, are first time reported from Pakistan.

ICPS-478 - OPTIMIZATION OF CULTURAL CONDITIONS FOR ENHANCED GLUCOAMYLASE PRODUCTION IN SUBMERGED FERMENTATION BY *TRICHODERMA VIRIDE*

M. RIASAT, S. Q. ABBASS, S. RIAZ, T. IFTIKHAR AND M. NIAZ

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Abstract: Experiments were conducted at Biotechnology Research Lab., Department of Botany, GC, University, Faisalabad. *Trichoderma viride* grown in submerged state fermentation revealed a number of molecular and physiological aspects that are correlated with the growth conditions. Optimum conditions like substrate concentration, pH and temperature were employed. With this integrated approach it aims to expand our basic knowledge of fungal potential for glucoamylase production under optimum conditions in submerged substrates and to exploit the biotechnological applications. Filamentous growth of *Trichoderma viride* in submerged substrates involves secretion of carbohydrate converting enzymes and a substrate specific polarized hyphal growth phenotype. Production potential for enzyme Glucoamylase was estimated by using the vegetable/fruit peel. Optimum conditions for enhanced glucoamylase production were substrate concentration 1.5 % (W/V)*, i.e.,* 0.135U/mL, pH=5*, i.e.,* 0.142U/mL and temperature = 25°C*, i.e.,* 0.519U/mL.

ICPS-479 - OPTIMIZATION OF CULTURAL CONDITIONS FOR ENHANCED GLUCOAMYLASE PRODUCTION IN SUBMERGED FERMENTATION BY *MUCOR MUCEDO* BY USING VEGETABLE/FRUIT PEEL AS SUBSTRATE

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Abstract: Experiments were conducted at Biotechnology Research Lab., Department of Botany, GC, University, Faisalabad. *Mucor mucedo* is known for its capacity to secrete high levels of enzymes in their growth environment. Several of these secreted enzymes, produced in large scale submerged fermentation, have been widely used by the food and beverage industry for decades. From decades, submerged state fermentation with filamentous fungi has been used for production of specific enzymes like glucoamylase enzyme. Filamentous fungi grown in submerged state substrate secretes high titres of enzymes. Here fungal strains of *Mucor mucedo* have been used for their hyper production for glucoamylase enzyme with different optimal conditions of substrate concentration, pH and temperature. Glucoamylase was estimated by using vegetable/fruit peel as substrate. Optimum conditions for enhanced glucoamylase production were substrate concentration 1.5 % (W/V)*, i.e.,* 0.239U/mL, pH=5*, i.e.,* 0.432U/mL and temperature = 25°C*, i.e.,* 0.616U/mL.

ICPS-480 - NEW CROP DIVERSIFICATION PRACTICES IN SASKATCHEWAN, CANADA

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Abstract: Centennial celebration of the agriculture is now taking place in the Canadian Prairies. Agriculture in the province of Saskatchewan is currently undergoing significant structural change in response to changing economic, environmental, and political conditions. Diversification is becoming an agricultural strategy to reduce economic risk on the farm. Deciding on the type of diversification is not easy. The strategy is to integrate environmental concerns into the development process without fettering development itself. Diversification has to improve environmental conditions and to increase productivity, especially on degraded lands. The Canadian Prairies pause to celebrate the centennial year of agriculture. The farmers and scientists look to a bright future as they continue to bring innovative ideas and technologies to crop producers. The farmers are increasingly adopting extended and diversified crop rotations together with conservation tillage practices. Many of these newer cropping systems are recognized as being more environmentally sustainable; however, often there is conflict between achieving the long-term goal of resource sustainability and the short-term goal of economic viability. Adoption of technologies to improve nitrogen use efficiency will have the potential to significantly reduce energy use and GHG. Application of all nitrogen at seeding or split within crop application will reduce the risk of loss of income due to under or over fertilization. Including oilseed and pulse crops in rotations that have traditionally been monoculture and cereal based, and reducing the frequency of summer fallow, contributes to higher net farm incomes in most regions, despite the higher production costs. In general, the profitability of cereal–oilseed–cereal pulse systems is > cereal–oilseed > monoculture cereal rotations in the more humid regions.

ICPS-481 - IDENTIFICATION AND DESCRIPTION OF PROMISING MANGO (*MANGIFERA INDICA* L.) GERMPLASM FOR SELECTION OF NEW SCION CULTIVARS

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Abstract: Production of quality mango is dilapidated in Pakistan due to infestation of pests, diseases, physiological disorders like mango sudden death syndrome (MSDS) and narrow genetic diversity. An explorative study was carried out in three different mango growing districts (Khanewal, Multan and Muzzafargarh) of Punjab. The aim of study was to select new mango scion cultivars to broaden the varietal spectrum, from enormous indigenous germplasm which is at the verge of extinction due to spontaneous domestication and disorders like MSDS. In order to identify prospective new germplasm from farmer fields data was gathered for various characteristics of tree (growth habit, shape), leaf (color, size, shape, orientation, nature), inflorescence (shape, color, size), fruit (skin, shape, size, weight, harvesting season, keeping quality), stone (fibre, body of stone) and pulp bio-chemical analysis (total soluble solids, titratable acidity). Out of seventeen germplasm selected only four (Kala Chaunsa, Sufaid Chaunsa, Late Ratole No. 12 and Faiz Kareem) showed distinctive fruit characters and market potential. The study will lead to the formulation of sound basis for research work to improve mango gene pool and develop suitable varieties for domestic and export markets.

ICPS-482 - NEW MANGO HYBRID SHOWS BETTER SHELF LIFE AND FRUIT QUALITY

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Abstract: Mostly, mango cultivars are the results of selections from open pollinated chance seedlings of indigenous/introduced germplasm from natural crosses. Development of mango hybrid remains a major focus to boost industry needs. Pakistan, being an important mango producing country developed a hybrid 'Faiz Kareem' by making a cross between Anwar Ratole X Chaunsa. These studies were carried out to compare the fruit ripening behavior and quality of a new promising mango hybrid cv. Faiz Kareem with its parents under ambient (28 ± 2°C; 65-70% RH) conditions. Fruits of the three cultivars were harvested randomly from a commercial orchard in District Multan, Punjab. During the period of ripening, data on various physiochemical characteristics were recorded daily up to seven days for fruit weight loss %, firmness, peel color (visual and electronic) titratable acidity, total soluble solids, total sugars, vitamin C, and total carotenoids. Under ambient temperature conditions all the cultivars took seven days to ripe however, Faiz Kareem expressed better firmness, which indicates its potential for extended shelf life. Highest total sugars (25.88%), total soluble solids (26.75°Brix) and total carotenoids (69.99µg/g) were observed in Chaunsa while lowest in Faiz Kareem (23.71%, 25.54°Brix and 24.60µg/g respectively) which can be an advantage for extended storage and sugar conscious consumers. Electronic color data revealed higher L*(57.83), b*(29.99), C*(31.22) and hue angle (73.82) values for Faiz Kareem. Taste panel studies also showed clear preference for hybrid cultivar Faiz Kareem followed by Chaunsa and Anwar Ratole. Results of the study will help to understand the potential of Faiz Kareem for domestic and export markets.

ICPS-483 - PLANTS AND TRADITIONAL HANDICRAFTS ON THE BALKAN REGION

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Abstract: This study focuses on the most common plant-based traditional handicrafts in several Balkan countries (Bulgaria, Romania, Serbia, and Turkey), richness and diversity of plants used as raw, folk botanical knowledge, as well as to give impression about their contemporary state and development in study area, in relation to natural plant resources and national traditions. The study was conducted during 2006-2007 period and the gathered data are largely from literature, analyzing the findings in the existing ethnographic collections as well as field collected data and interviewed informants by non-structured interviews. A high plant species diversity of around 120 taxa of vascular plants in study area is established, belonging to 46 families and 78 genera, including several taxa from fungi (as *Fomes fomentarius*). The predominant number of species is from Poaceae, Cyperaceae, Rosaceae, Fagaceae, Betulaceae, Fabaceae, Tiliaceae, Pinaceae, Linaceae, Cannabaceae, Urticaceae. The percentages different groups are; trees (40%), shrubs (25%) and herbs (31%). These are very common and widespread in the study area. Manufacturing of the various wood articles, knitting of mats and rugs, basketry, straw knitting, rope making, articles related to ritual uses are very common and comprise most ancient handicrafts. All plants or their vegetative parts (leaves, roots or young shoots and twigs, fruits and seeds) are used according to their flexibility, firmness, as well a stableness to wearing out, hardness and the strength of the wood, hard burning properties, etc. A good folk knowledge about

species determination, plant morphology, phenology, and ecology is needed to make plant based articles. The state of plant-based handicrafts in the study area today, their cultural, economical and social significance, the necessity of special protection as well as preservation of old and unique techniques and manual procedures are discussed.

ICPS-484 - ECOTOXICOLOGICAL EFFECTS OF DIFFERENT CONCENTRATIONS OF ALKALINE METAL SALTS AND AN ACID ON THE SEED GERMINATION OF *PINUS NIGRA* SSP. *PALLASIANA*

ERSIN YUCEL

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Abstract: Ecotoxicological effects of different concentrations of alkaline metal salts (NaCl, KNO_3) and strong acid (H_2S0_4) on the germination of *P. nigra* ssp. *pallasiana* (Black Pine) seeds of different origins were investigated. Seeds were exposed to four different concentrations of NaCl, KNO_3 and H_2S0_4 (0.05% to 3%). The results revealed that seed germination rate and germination speed of the Black Pine seeds collected from 14 origins responded differently to the toxicity of NaCl, H_2S0_4, and KNO_3. The results indicated that, while low NaCl concentrations (0.5 to 1%) had no effects on seed germination rates, high concentrations (2 to 3%) had significant inhibitory effects, all concentrations reduced germination speed of the seeds. 0.5 to 2% concentrations of KNO_3 had no effects, but 3% concentration had significant inhibitory effect on germination rate, it reduced germination speed as well. H_2S0_4 had significant inhibitory effects, reduced both germination percentage and speed, inhibiting or preventing germination altogether.

ICPS-485 - ENTOMOPATHOGENIC FUNGUS AS A BIOLOGICAL CONTROL AGENT AGAINST *RHYZOPERTHA DOMINICA* F. (COLEOPTERA: BOSTRYCHIDAE) ON STORED WHEAT

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Abstract: To evaluate the pathogenicity of *Metarhizium anisopliae* (Metschinkoff) Sorokin (Deuteromycotina: Hyphomycetes) a bioassay was designed under laboratory conditions against *Rhyzopertha dominica* F. (Coleoptera: Bostrychidae) on stored wheat. The fungus was applied at the dose rates of $8x10^3$, $8x10^5$, $8x10^7$ and $8x10^9$ conidia kg^{-1} of wheat and the bioassay was conducted at 25^oC with 60% relative humidity. The data regarding the mortality was recorded after 07 days and 14 days exposure interval. All the treatments gave the significant mortality of *R. dominica* in comparison with the control and *M. anisopliae* at dose rate of $8x10^9$ conidia kg^{-1} was found to be most effective after 14 days exposure interval. There was more production of progeny when the low rate of *M. anisopliae* was applied to wheat. Overall our study showed that *M. anisopliae* is vigorous when applied at high dose rate which revealed an effective control of *R. dominica* and also played a pivotal role in the integrated pest management program (IPM) of stored wheat insect pests.

ICPS-486 - PREDICTING GROWTH, CARBON SEQUESTRATION, WATER USE AND SALINITY IMPACTS OF TREE PLANTATIONS

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Abstract: Farm forestry is an increasingly important form of diversifying farm income and dealing with environmental concerns in Australia. Two important concerns are the management of dryland salinity and the need to sequester carbon dioxide as a means of combating climate change. At the same time, water conservation is critically important as rainfall is predicted to decrease in many parts of southern Australia. We briefly describe the development, calibration, validation and application of different versions of the plantation growth model (3-PG) which has also been used spatially (GIS framework) at catchment and farm scales to identify locations where tree planting on agricultural land would provide the best net commercial and environmental benefits. The example of application provided is from the Corangamite catchment in western Victoria, Australia. The tree species considered are Eucalyptus globulus (blue gum; for sawlogs and pulp), E. cladoclayx (sugar gum; sawlogs), Corymbia maculata (spotted gum; sawlogs) and P. radiata (radiate pine; sawlogs).

ICPS-487 - SYSTEMATIC STUDIES ON GRASS WEEDS OF WHEAT AND COTTON CROPS IN KHAIRPUR DISTRICT, SINDH, PAKISTAN

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Abstract: Taxonomic studies of ten grass weeds collected from wheat and cotton crop fields in Khairpur district, Sindh, Pakistan were carried out. The identification of grasses depends on their growth habits (bunch type, rhizomatous and stoloniferous), certain vegetative features and seed heads. One of the structures used for the identification of grass weeds was the ligule, a membranous hairy structure that is found at the junction of the leaf blade and leaf sheath. Following the plant family Poaceae (Flora of Pakistan), dichotomous keys were prepared for the identification of the genera and taxonomical descriptions were made on personal observations. *Avena fatua*, *Phalaris minor* and *Polypogon fugax* were recorded from wheat crop. While *Brachiaria eruciformis, Cenchrus ciliaris, Dactyloctenium aegyptium, Desmostachya bipinnata* and *Setaria pumila* were noted from the fields of cotton crop. Where as, *Cynodon dactylon* and *Phragmites australis* were found common in both the crops because of their perennial life span. Present taxonomic study of wheat and cotton grass weeds will help in identification of these weeds along with an addition to botanical knowledge.

ICPS-488 - EFFECT OF SALINITY ON GROWTH, NODULATION AND NITROGEN CONTENTS OF COWPEA (*VIGNA UNGUILATA*)

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Abstract: A sand culture experiment was conducted with the collaboration of Ayub Agriculture Research Institute, Faisalabd and Institute of Pure and Applied Biology, Baudin Zakaria University Multan to asses the effect of salinity on growth, nodulation and nitrogen contents of cowpea (*Vigna unguilata*). There were five salinity levels (0, 20, 50,100 and 200 m*M* NaCl with nine replicate for each treatment. There were four harvests i.e. at the start of flowering, at the start of pod formation, at the middle of pod growth and at seed maturity. The results showed that salinity affected the plant height as the salinity levels inceased from 0 to 200 m*M* NaCl. The plant height was more at fourth harvest as compared to first harvest. Fresh and dry weight of shoot, nodule was also affected by increasing salinity levels. Nitrogen percentage in leaves and seed was correlated with increasing salinity concentration. It was concluded that salinity showed an adverse effect on growth, nodulation and nitrogen contents of cow pea.

ICPS-489 - TAXONOMIC REVISION OF THE GENUS *SALICORNIA* L. (CHENOPODIACEAE) IN CENTRAL AND SOUTHERN IRAN

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Abstract: *Salicornia* is a most complicated vascular plant group which its taxonomy and species circumscription is considered as a night-mare. This first revision of Iranian species is based on long-term field studies, co-cultivation of plants in the laboratory, ecological, cytological and molecular studies and determination of carbon isotope composition. In this paper the species of Central and Southern Iran are dealt with which will be followed by another paper on the Northern and Northwestern parts of Iran. In this paper the presence of four species, one subspecies and one putative hybrid in the area is accepted. In addition to recently described *S. persica* Akhani from Central Iran, four more new taxa and one new putative hybrid are described for science (1) *S. iranica* Akhani spec. nov. is a diploid species widespread in central Iranian salines. This is characterized by erect habit and short opposite spikes; (2) *S. khalijefarsica* Akhani spec. nov. is described from Southern Iran in Khuzestan, Bushehr and Hormozgan Provinces along the saline and brackish rivers running to the Persian Gulf and estuaries and coastal habitats. This is a diploid species characterized by yellowish colour and ascending to loosely prostrate and much branched habit; (3) *S. perspolitana* Akhani spec. nov. is a tetraploid species related to *S. persica* which is described from South-Central Iranian salines around Tashk and Bakhtegan hypersaline lakes. This is a prostrate plant with leaf-like bracts, a character which is known for the first time in the genus *Salicornia*; (4) *S. persica* subsp. *rudshurensis* Akhani is a taxon found in North-Central Iran in Tehran province which differs from typical subspecies by slender spikes and obtuse central flowers; and (5) *S.* x *tashkensis* Akhani hybrid nov. is a putative hybrid found only in Task lake in South-Central Iran. The elongate and pendant spikes and absence of seeds in most flowers is distinctive in this taxon. The carbon isotope composition ($\delta^{13}C$) of most species are given and the chromosome numbers (so far investigated) are reported. The ecology, threats and biogeographical importance of the species are discussed and photographs of living plants are provided. An identification key to the known species of Iranian *Salicornia* is given.

ICPS-490 - STRUCTURE DISTRIBUTION AND TAXONOMIC SIGNIFICANCE OF FOLIAR STOMATA IN SIBBALDIA SPECIES OF FAMILY ROSACEAE

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Abstract: The structure, distribution and taxonomic significance of foliar stomata in the species of Genus *Sibbaldia* Linn (Rosaceae) have been examined with Scanning Electron Microscope. Stomata are mostly anomocytic type, usually present on the both surface of the leaves. Difference in shape, size, distribution and the orientation of stomata is observed. Except in 2 species, subsiding cells are mostly covered with non-oriental wax. Both elevated and sunken stomata with elongated to circular Stomatal apparatus are found. This study reveals that structure of foliar stomata can be used as a taxonomic marker for the identification of *Sibbaldia* species.

ICPS-491 - S.E.M studies of Petal structure of corolla of *Sibbaldia* species.

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Abstract: S.E.M studies of the petals of the corolla of eight species of *Sibbaldia* linn of family Rosaceae was carried out. Micro morphological characters observed in petals and their reliability as taxonomic markers is discussed in this contribution. The petal epidermal cells exhibit definite geometrical patterns where cell wall boundaries are usually raised, cell surface is marked with striae, which are ruminate at the projections. This study helps in adjusting the circumscription of the species of *Sibbaldia.*

ICPS-492 - RESISTANCE DETERMINATION OF PROMISING ONION VARIETIES AGAINST THRIPS IN THE AGRO-ECOSYSTEM OF BALOCHISTAN, PAKISTAN

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Abstract: Six onion cultivars (Red Creole, Chiltan-89, Local, Sariab Surkh, White Globe and Local Kandhari) were tested against thrips infestations to determine Varietal resistance. The results of the trial showed that *Thrips tabaci* Lindeman (Thysanoptera: Thripidae) is the species attacking onion in the region. All the varieties were infested by thrips at various degrees. Local Kandhari followed by Sariab Surkh were the most susceptible to thrips infestation while Chiltan-89 was optimum. Maximum yield (11130 Kg ha^{-1}) was obtained by Chiltan-89 and minimum (886.4 Kg ha^{-1}) by Red Creole. Thrips population got its peak (15.42 thrips densities per plant) at 27.94 ^{0}C and 36.33% relative humidity (RH) in the month of August.

ICPS-493 - STUDY OF SOME MORPHOLOGICAL FEATURES OF SIX CULTIVARS OF ONION (*ALLIUM CEPA*) AT QUETTA, PAKISTAN

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Abstract: Chiltan-89, Local and Sariab Surkh are the promising onion (*Allium cepa* L.) varieties of Balochistan, Pakistan. Various plant and bulb morphological features of theses varieties were compared with some imported verities like Red Creole, White Globe and Local Kandhari for the adaptation in the region, during 2002-03 summer seasons. Sariab Surkh attained the maximum height while Red Creole and White Globe the least. Number of leaves of Chiltan-89 and Sariab Surkh and Local and Local Kandhari were same. Local Kandhari followed by Local was the juiciest cultivars. In the dry and hot conditions of Balochistan the varieties take 17-20 weeks to mature. Red Creole and White Globe had smallest while all other four cultivars had medium to large bulbs. Mostly the cultivars had rounded bulbs. Sariab Surkh had dark red, Chiltan-89 had pink, White Globe had White and all other three cultivars had red colored bulbs. Sariab Surkh followed by Red Creole had the most number of whorls. Red Creole, Sariab Surkh and Local Kandhari smell pungent while other three were mild in smell. The Sariab Surkh and Red Creole could store up to 6 months due to their hard texture. Local Kandhari and Chiltan-89 behaved moderately during storage. Sariab Surkh followed by Chiltan-89 and Local Kandhari are good for commercial cultivation. Globe is best for green use because of its soft texture, light green appearance, mild smell and optimum succulence.

ICPS-494 - FLORISTIC ENUMERATION OF ROHRI HILLS, SINDH, PAKISTAN

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Abstract: The Rohri Hills are located adjacent of Rohri city of District Sukkur, Sindh, Pakistan, The areas is an archaeological importance and never been explored floristically. Considering the importance of the areas, present study was carried out. One hundred two plant species belonging to 80 genera ad 35 families were collected and identified from the area under study during 1998-2001. Out of them, 15 grass species of Poaceae family have been determined. The areas is covered by herbs (46.08%) followed by shrubs (29.41%), grasses (14.71%) and trees (6.86%). The plant specimens were identified and deposited in the herbarium of Shah Abdul Latif University, Khairpur for record. A Check list of species is presented in this paper.

ICPS-495 - FORAGE SPECIES OF NARA DESERT, PAKISTAN

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Abstract: The Nara Desert, a north eastern part of Thar Desert located in Sindh, Pakistan. This rangeland provides grazing support to livestock which is the only livelihood of the nomads of the study area. The area holds ample of palatable species and has a great potential for livestock grazing. These species are well adapted to extreme climate and can be brought into cultivation in arid to semi-arid environment of the country. Keeping in view, the present study has been carried out during 1998-2001. Local herders and elderly known people were interviewed to record the data of palatability of native species. One hundred and forty eight plant species belonging to 100 genera and 42 families have been recorded as forage from the area under study. Of them, 28 species (18.91%) were classified as highly palatable, 62 (41.89%) as moderately palatable, 27 (18.24%) as less palatable and 24 (16.21%) as rarely palatable. Among these species, highest number of species were consumed by goats (120 species) followed by cow (73 species), sheep (50 species) and camels (47 species). The maximum contribution of forage species were of grasses (Poaceae) with 16 species (10.81%). This was followed by cows (73 species), sheep (50 species) and camels (47 species). The maximum contribution of forage species wee of grasses (Poaceae) with 16 species 24 (10.81%). This was followed by Fabaceae (9.45%), Boranginaceae, Capparidaceae (5.40% each), Amranthaceae (4.05%), Aizoaceae and Asteraceae (3.37 % each). The Number of species were high in summer as compared to other seasons due to receiving heavy rainfall during monsoons. Further research should be carried out to explore nutritional values of native species of the study area.

ICPS-496 - STUDIES ON THE PETRIFIED WOODS FROM RANIKOT FORT AREA, DISTRICT JAMSHORO, SINDH, PAKISTAN

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Abstract: About 30 specimens of petrified fossil woods were selected which were collected from Ranikot fort area district Jamshoro. The following 3 species could be identified as the new species from this locality viz. *Sapotoxylon ranikotensis* sp. Nov,_*Stereospermoxylon ranikotensis sp.nov.* (family Sapotoxylon), *Shoreoxylon ranikotensis* sp. nov. (family Dipterocarpiaceae),_occurring in Sindh are fully described and identified, one new combination have been developed. Every specimen is provided with complete anatomical description, diagnosis and discussion which include the affinities and relationship with living and fossil woods. Taxonomic characters used in the identification of the taxa are assessed and those found to be most significant are discussed in detail with illustration. Biogeography of the fossil wood was discussed and it has been suggested that the fossilized plants were not originated in the study area but, were transported from somewhere else. The size of the fossils indicates that source area was not far from the present study area. The absence of growth ring and presence of diffuse

porous wood character in the fossil wood under investigation indicates the tropical climatic condition in the source area. Most of the living counter parts of these fossil taxa confirm the above distribution. The taphonomic processes are indicating the traumatic necrology and Allochthonous assemblages in bistratnomy before burial. Diagenesis indicationg that wood remains deposited in near-shore marine environments where silica-rich volcaniclastic sediments were weathering.

ICPS-497 - INTER AND INTRA ROW SPACING EFFECT OF ONION (*ALLIUM CEPA*) PLANTS ON THRIPS (*THRIPS* SPP.*)* POPULATION

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Abstract: An experiment was conducted to evaluate inter (row-to-row, R x R) and intra (plant-to-plant, P x P) row spacing effects on thrips population in onion at Quetta. Five treatments of R x R (20, 25, 30, 35 and 40 cm) with constant 20 cm P x P distances were tested in four replications. Indirect relation was found between increased line spacing and thrips population. Maximum mean number of overall thrips (5.55 per plant) was observed on the plants cultivated in 20 cm apart rows with minimum yield (22010 kg ha-1). Minimum mean number of overall thrips (3.32 per plant) was recorded from plants cultivated in 40 cm R x R distance with 21880 kg ha-1 yield. Optimum number of thrips (4.2 per plant) was recorded on plants cultivated in 30 cm apart lines with maximum yield (28640 kg ha-1). Inter row spacing of 25 and 30 cm with 20 cm between plants was observed the best combinations for transplanted onions for minimizing thrips densities and the highest onion yields in Balochistan, Pakistan. This spacing combination could boost the economy of the region, if practiced commercially by the onion growers.

ICPS-498 - Botanical Infusions as an Effective Controlling Agent of Thrips in Onion

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Abstract: To test the efficacy of three botanical infusion treatments (Datura alba Seed Extract Infusion, SEI; Calotropis procera Latex Infusion, LI and Citrullus colocynthus Fruit Extract Infusion, FEI) and a synthetic insecticide (Monocrotophos 40WSL) against onion thrips, a trial was established on the edge of an agricultural farm at Quetta, Pakistan. All of the insecticides provided control of onion thrips at various degrees of significance over the untreated control. The commercial synthetic insecticide, Monocrotophos 40 WSL, provided the best mortality (77.65 %) of onion thrips among the tested insecticides. *D. alba* SEI was also encouraging and provided 21.33 % thrips control. C. colocynthus FEI gave minimal (6.43 %) control of thrips as compared to the other tested insecticides but the results are encouraging because botanical insecticide is a pollution free method of pest control. The Calotropis procera (LI) was as effective as other commercial botanical insecticides against onion thrips that provide 43.88 % control. The frequent use of *C. procera* (LI) could minimize the use of synthetic insecticides, thus can be included in the Integrated Pest Management (IPM) of onion thrips as an effective tool.

ICPS-499 - Different Regimes of Nitrogen and Invasion of Thrips on Onion in Balochistan, Pakistan – II

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Abstract: Effects of six different levels of nitrogen with constant phosphorus and potassium (NPK), on thrips population, were evaluated in onion (*Allium cepa*) in Quetta, Balochistan, Pakistan. The soil of the region is sandy loam, alkaline, moderate in calcium and very poor in NPK. The soil and climate are well suited for onion cultivation. Low and optimum doses of nitrogen have no effect on thrips population. Maximum thrips infestation (13 per plant) was observed at high doses of nitrogen application (250 and 200 Kg ha^{-1}). Crop yield has shown direct relations with increased fertilizer doses up to 200 Kg ha^{-1} nitrogen dose. Beyond that dose a rapid decline in yield was observed. Maximum yield (15250 Kg ha^{-1}) and the best cost benefit ratio (1.43) with optimum thrips infestation (7.6 thrips per plant) was observed by applying 150-100-100 Kg ha^{-1} NPK, respectively.

ICPS-500 - NPK STATUS IN SOIL AND BANANA LEAVES OF BADIN AND THATTA DISTRICTS

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Abstract: The research was conducted to analysis the soil and banana leaves for NPK concentration of the Badin and Thatta Districts, Sindh, Pakistan. Thirty three composite soil samples at 0-15 and 15-30 cm depths and same number of leave samples were collected from the banana field of the said districts. The samples were analyzed for the concentration of N, P, K, Ca, Mg, Zn, Mn and Cl contents. It was observed the surface and sub-surface soils of both the districts were heavy in texture, non-saline, medium alkaline and moderately calcareous in nature. Medium to adequate in Organic Matter (OM), medium in total nitrogen, medium to optimum in available phosphorus, medium to high in exchangeable potassium and deficient in available zinc at both tested depths. The analysis of soluble anions indicated that the carbonate were absent and chloride were dominant as compared to bicarbonates. Nitrogen and zinc concentrations of banana leaves of both the districts were below the critical level. Whereas, P, K, Mn and chloride ion concentration were above the critical levels. The equilibrium relationship of K, Ca and Mg of banana leaves of Badin district indicated that the ions were adequate that ranged from 3.80 to 5.20 %, 0.68 to 0.88 % and 0.33 to 0.52 % respectively. Whereas the relative percentages for K, Ca and Mg were 59.00 to 61.30, 18.57 to 20.00 and 17.3 to 20.00 respectively. The analysis for banana leaves of Thatta district for the equilibrium relationship of K, Ca and Mg were ranged from 3.8 to 5.40 %, 0.74 to 0.86 % and 0.40 to 0.48 % respectively. Whereas the relative percentages for K, Ca and Mg were 57.72 to 61.72, 19.05 to 21.00 and 17.70 to 20.00 respectively.

ICPS-501 - EVALUATION AND ESTIMATION OF HERITABILITY AND GENETIC ADVANCE FOR YIELD RELATED ATTRIBUTES IN WHEAT LINES

WAQAR-UL-HAQ, M. F. MALIK, M. RASHID, M. MUNIR[1] AND Z. AKRAM[1]

[Department of Plant Breeding and Genetics, Lasbela University of Agriculture, Water and Marine Sciences, Uthal, [1]Pir Mehr Ali Shah Arid Agriculture University, Muree Road, Rawalpindi, Pakistan,

Abstract: Ten wheat genotypes were planted in a Randomized Complete Block Design with three replications during 2004-2005 at experimental farm of Department of Plant Breeding and Genetics, Pir Mehr Ali Shah Arid Agriculture University, Rawalpindi. Data were recorded and analyzed on spike length, number of spikes per plant, number of spikelets per spike, number of grains per spike. 1000 grain weight and grain yield per pant. Highly significant differences were found among the genotypes for all the traits. High heritability with high genetic advance values were estimated for number of grains per spike. 1000 grain weight and grain yield per plant.

ICPS-502 - ESTIMATION OF INTERRELATIONSHIPS AMONG YIELD AND YIELD RELATED ATTRIBUTES IN WHEAT LINES

WAQAR-UL-HAQ, M. F. MALIK, M. RASHID, M. MUNIR[1] AND Z. AKRAM[1]

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Abstract: The experimental material was sown in the experimental area of Department of Plant Breeding and Genetics, Pir Mehr Ali Shah Arid Agriculture University, Rawalpindi during 2004-2005, comprised of ten wheat genotypes viz. Chakwal-86, lqbal-2000, Uqab-2000, GA-2002, 00FJ03, IC-001, IC-002 NR-234, 3C061 and 3C062 for determination of interrelationships among yield and yield related characters. Analysis of variance showed highly significant differences among the genotypes for all the traits. The correlation coefficient indicated that spike length, number of spikes per plant, number of spikelets per spike, number of grains per spike, number of tillers per m l000grain weight were significantly and positively correlated with grain yield per plant, while days to heading, days to maturity and plant height showed non significant correlation with grain yield per plant.

ICPS-503 - YIELD RELATED ATTRIBUTES IN WHEAT LINES

WAQAR-UL-HAQ, M. F. MALIK, M. RASHID, M. MUNIR[1] AND Z. AKRAM[1]

[Department of Plant Breeding and Genetics, Lasbela University of Agriculture, Water end Marine Sciences. Uthal, [1]Pir Mehr Au Shah Ali Agriculture University, Muree road, Rawalpindi, Pakistan]

Abstract: Ten wheat genotypes were planted in a Randomized Complete Block Design with three replications during 2004-2005 at experimental farm of Department of Plant Breeding and Genetics, Pir Mehr Ali Shah Arid Agriculture University, Rawalpindi. Data were recorded and analyzed on spike length, number of spikes per plant, number of spikelets per spike, number of grains per spike, 1000 grain weight and grain yield per pant. Highly significant differences were found among the genotypes for all the traits. High heritability with high genetic advance values were estimated for number of grains per spike, 1000 grain weight and grain yield per plant.

ICPS-504 - EVALUATION OF CHEMICAL CHANGES IN FIVE VARIETIES OF GRAPES GROWN IN DIFFERENT AREAS OF BLOCHISTAN

T. KHAN, M. F. MALIK, M. RASHID, WAQAR-UL-HAQ AND S. ALI

[Lasbela Univristy of agriculture water and Marine Sciences, Uthal, balochistan]

Absract: Study for evaluation of chemical changes in the grapes varieties Kishmishi, Sandokhani, Sahibi and Haita grown different grape growing areas Quetta, Kalat, Pashin, Mastung and Kanak was done during august 2007. The results revealed in this study showed that best fruit quality on the basis of biochemical analysis was observed in varieties Kishmishi in grapes grown in Quetta, Sandokhani also

in Quetta. Sahibi variety was best in Fruit quality grown Pashin area and Fruit quality in Haita was also best in the crop grown at Pashin. Averaging Best quality fruit in all four varieties were observed in the areas of Kanak and Mastung while, lowest quality fruits in all grapes varieties were observed in Kalat area.

ICPS-505 - FUNGI ON *EUCALYPTUS* FROM FAISALABAD DISTRICT PAKISTAN (2007)

N. Sadaf, S. Q. Abbas, T. iftikhar, M. Naiz and S Raze

[Department of Botany, Government College University, Faisalabad]

Abstract: Genus *Eucalyptus* is a large genus belongs to family Myrtaceae, containing more than 700 species, most of them are native to Australia. *Eucalyptus* is very imported plant for Pakistan Economically and medicinally, its imported are not neglected due to Environment stability, and reclamation of land, in Pakistan , Total five fungi recorded on *Eucalyptus* species from Pakistan, *Alternaria alternata*, *Cercospora eucalypti Ganoderma lucidum, Aspergillus's niger, Cytospora eucalypticola* and in the present studies eleven fungi have been Recorded on *Eucalyptus* viz. *Acrogenospora Setiformis*, *S. Hughes*, *Alteraria tenuissima* , kunzeexpers *Torula graminis* desm, *Gliomastix novae_zelandia* Hughes & Dikinson, *Triadelphia inquinas* (sacc.) *Baltraniella rhombica Chuppia sariniform*. *Cerebella andropogonis* cesati, *Aspirgillus niger* van teigh, *Ulocladium chartarum preuss, Trimatostroma betulinum Hughes*. *Acrogenospora setiformis*, *Baltraniella Rhombica, Chuppia sariniform Cerebella andropogonis*, *Gliomastix novae_zelandia Ulocladium chartarum preuss, Trimatostroma betulinum* Hughes, are first time recorded from Pakistan .

ICPS-506 - MANGO FRUIT DESAPPING IN RELATION TO TIME OF HARVESTING

M. AMIN[1], A. U. MALIK[1], M. S. MAZHAR[1], ISLAM-UD-DIN[2] AND M. S. KHALID[1]

[[1]Institute of Horticultural Sciences, University of Agriculture, Pakistan, [2]Dept of Mathematics and Statistic, University of Agriculture, Faisalabad, Pakistan]

Abstract: Sap injury is regarded as the most serious threat to external fruit quality of mango. When the stem (pedicel) of a mango fruit is broken, the sap exudes out; spreading over the fruit peel causes serious skin damages. This study was intended to set the best time of harvest and desapping for maximum sap burn control. The performance of lime [$Ca(OH)_2$] was evaluated at different times of the day in comparison with Australian industry Italic product "Mango wash". The fruits were harvested at three different times of the day: morning (7 a.m.), noon (12 p.m.) and evening (5 p.m.) and subjected to lime (@ 0.5%) and mango wash (@ 0.4%) treatments. No sap injury (0 score) was observed in the fruits harvested and de-sapped during morning whereas maximum sap injury was observed at noon in both the cases (0.5 score for lime, 0.75 score for mango wash). Both lime and mango wash showed significantly less sap injury as compared to control for all the three times of treatment application. Almost all of the physico-chemical attributes were non-significantly affected by the desapping treatments. No difference in fruit quality was observed in the fruits harvested and de-sapped at different times of the day. Fruit peel colour was slightly suppressed by mango wash. Lime was found to impart clean and attractive blush yellow appearance to the fruits; however the skin colour was not significantly improved as compared to control. The results led to the conclusion that morning is the best time of harvest and desapping for the mangoes.

ICPS-507 - POSTHARVEST QUALITY OF MANGO (*MANGIFERA INDICA* L.) FRUITS AS AFFECTED BY CHITOSAN COATING

N. A. ABBASI, Z. IQBAL, M. MAQBOOL, I. A. HAFIZ

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Abstract: The effect of coating with irradiated Crab chitosan (CHIirr, Mv = 5.14 × 104), un-irradiated Crab chitosan (CHIun, Mv = 2.61 × 105) as well as irradiated Shrimp chitosan (CHIirr, Mv = 5.14 × 104) on postharvest preservation of mango (*Mangifera indica* L.) was studied. Irradiation at 100 kGy and 200 kGy of both Crab chitosan and Shrimp chitosan were used and the fruits were stored at 15°C ± 1°C and 85% relative humidity for 6 weeks. The effect of various chitosan coatings on fruit ripening behaviour, biochemical and organoleptic characteristics were evaluated during storage. The incidence of disease attack was also observed. The overall results showed the superiority of irradiated Crab chitosan (200 kGy) in extending the shelf-life of mango fruit as compared to control. The irradiated Crab chitosan (200 kGy) treated fruits also maintained their eating quality up to 4 weeks of storage. Only 6.0% disease incidence was observed in fruits coated with irradiated Crab chitosan (200 kGy) as compared to control (25.0%) after 4 weeks of storage. The results of this study showed that irradiated chitosan coatings have an excellent potential to be used on fresh produce to maintain quality and extending shelf-life.

ICPS-508 - MONITORING THE INTROGRESSION OF *G. BARBADENSE* INTO CULTIVATED *G. HIRSUTUM* WITH DNA MARKERS

H. MUMTAZ, M. ASIF, MEHBOOB-UR-RAHMAN AND Y. ZAFAR

[Plant Biotechnology Division, National Institute for Biotechnology and Genetic Engineering (NIBGE), Faisalabad]

Abstract: Despite the spectacular advances made in molecular markers technologies, still the introgression of genes from wild sources into cultivated crop species remains a major challenge. In the present study, Gossypium barbadense L. var PGMB-36, known for high quality lint was utilized for introgressing the high quality fiber traits into *Gossypium hirsutum* L. var FH-1000 by employing DNA markers such as randomly amplified polymorphic DNA (RAPD) and simple sequence repeats (SSRs). A total of 520 random 10-mer (RAPD) were surveyed on the two genotypes, out of which 267 were polymorphic, exhibiting 51% polymorphism. Similarly, 525 genomic SSRs and EST-SSRs were surveyed, of which 120 were polymorphic explicating 22.8% polymorphism. Of the 120 polymorphic SSRs, 75 were surveyed on an F3: 4 populations comprising of 62 lines, of which 16 markers showed introgression from *G. barbadense* into *G. hirsutum*. Initially, 20 markers were used to construct a genetic linkage map, using the MAPMAKER software. 17 markers were grouped in two linkage groups covering around 386 cM of the total genome (8.27% of the total recombinationallength). Seven markers (TMHB80 P1, TMHJ07, JESPR-31, TMHK08, TMHE03, TMHF -09 and CM-68) were grouped in one linkage group while 10 markers (TMHA82-C8, TMHC10-G15, JESPR-236, CM-42, TMHA82-N11, TMHB80-P10, JESPR-180, CM-30, JESPR-78, MGHES-25) were grouped in second linkage group. Three markers (MGHES-2, CM-43 and JESPR-215) could not be linked due to the distorted segregation behavior. The present study is a part of the on going project on cotton fiber, which will provide a starting point for enhancing genetic diversity, initiating marker-assisted selection, development of consensus maps and also the cloning of QTLs related to fiber traits in cotton.

ICPS-509 - MORPHOLOGICAL INVESTIGATIONS AND TRANSPLANTATION ATTEMPTS ON SOME ENDEMIC SPECIES OF NORTHERN CYPRUS

SALIH GÜCEL[1] AND KEMAL YILDIZ[2]

[[1]Near East University, Environmental Sciences Institute, Lefkoşa (Nicosia)-North Cyprus, [2]Celal Bayar University, Faculty of Science & Arts, Dept.of Biology, Manisa-Turkey]

Abstract: The aim of this study was to investigate the morphology of 10 endemic taxa Pimpinella cypria, Ferulago cypria, Limonium albidum subsp. cyprium, Onosma caespitosum, Origanum syriacum

var. bevanii, Salvia veneris, Sideritis cypria, Phlomis cypria var. cypria, Scutellaria sibthorpii and Teucrium cyprium subsp. kyreniae distributed in Northern Cyprus. These belong to the families Apiaceae, Plumbaginaceae, Boraginaceae, and Lamiaceae. All these species are distributed only on the Beshparmak mountains in the northern part of Cyprus and are under a threat of extinction due to severe habitat degradation arising from human activities, forests fires and stone queries. The micrographs of the seeds were taken by means of trinocular stereo dissection microscope, and detailed morphological features recorded from the fresh and dried samples collected during 2001-2004. An attempt has been made for transplantation of these species to some protected sites.

ICPS-510 - AN OVERVİEW OF THE GEOBOTANİCAL STRUCTURE OF TURKİSH *PİNUS SYLVESTRİS* AND *CARPİNUS BETULUS* FORESTS

S. ÇELİK[1], S. GÜCEL[2], K. ÖZKAN[3], M. ÖZTÜRK[4]

[[1] Kirikkale University, Vocational School, Technical Programs,Yahsihan-Kirikkale,Turkey, [2]Near East University, Institute of Environmental Sciences, Nicosia, Northern Cyprus, [3]Süleyman Demirel Univ., Faculty of Forestry, Isparta-Turkey, [4]Ege University, Botany Department, Science Faculty, Bornova-Izmir,Turkey]

Abstract: *Pinus* L. and *Carpinus* L. are the two widely distributed genera of gymnosperms being represented by 80 and 170 species respectively. The former has 5 species in Turkey and latter 2 species namely; *P.pinea, P.halepensis, P.brutia, P.sylvestris, P.nigra ssp.pallasiana, Carpinus betulus* and *C.orientalis*. In this paper an attempt has been made to present an overview of the geobotanical structure of *Pinus sylvestris* L. and *Carpinus betulus* L. in Turkey. Out of 20.2 million hectares of forests in Turkey yellow pine covers nearly 1.3 million ha and hornbeam species around 10 thousand ha. The forests of *P. sylvestris* are found in North, Northeast Anatolia, on Murat mountains around Kutahya and *C. betulus* mainly in Thrace, Marmara, Black Sea and Inner Anatolia. *P.sylvestris* is represented by 9 associations; *Pinus sylvestris - Vaccinum myrtillus , Pinus sylvestris - Daphne glomerata*, *Pinus sylvestis - Astragalus adzharicus, Pinus sylvestris - Lilium ciliatum, Pinus sylvestris - Daphne pontica, Pinus sylvestris -Populus tremula, Populo - Pinetum sylvestris, Pinus sylvestris-Orthilio secundo, Pinus sylvestris f.lazica-Epimedium pinnatum subsp.colchicum, Triseto-Pinetum sylvestris*, whereas *C.betulus* has only 6 associations *Carpinus betulus-Scaligeria tripartita, Carpinus betulus-Acer campestre, Quercus petraea* ssp. *iberica-Carpinus betulus, Carpinus betulus-Quercus petrae* ssp. *iberica, Fagus orientalis-Carpinus betulus. P.sylvestris* associations are floristically rich having 275 taxa as compared to *C.betulus* forests which embody only 121 taxa. The life form spectrum of *P.sylvestris* forests includes 146 chamaephytes, 44 hemicryptophytes, 40 phanerophytes, 28 cryptophytes and 17 therophytes, whereas *C.betulus* forests include 23 phanerophytes, 39 chamephytes, 36 hemicryptophytes,14 cryptophytes and 8 therophytes. Phytogeographically a major part of the taxa in *P.sylvestris* forests are Euro-Siberian elements (24.4 %) followed by the Irano-Turanian (6.4 %) and Mediterranean (1.4 %). In *C.betulus* forests the distribution is as follows; Euro-Siberian-Euxine elements (83 %) followed by Mediterranean (14 %) and Irano-Turanian (3%). These observations stress the fact that geobotanically these forests prefer mainly high altitude moist habitats in the north and northeastern parts of Turkey.

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