Pak. J. Bot., 38(3): 837-841, 2006.

SOME UREDINALES FROM NORTHERN AREAS OF PAKISTAN

[1]MUHAMMAD ASIM SULTAN, [1]IKRAM-UL-HAQ, [2]A.N. KHALID AND [3]RUKHSANA BAJWA

[1]Department of Botany, G.C. University Lahore, Pakistan, E-mail: asim418@yahoo.com [2]Department of Botany, University of the Punjab, Lahore, Pakistan and [3]Department of Mycology and Plant Pathology, University of the Punjab, Lahore, Pakistan.

Abstract

During a survey of rust flora of the Northern Areas of Pakistan, *Melampsora chelidonii-pierotii*, *Phragmidium bulbosum*, *P. mysorense*, *Puccinia ambigua*, *P. arthraxonis-ciliaris*, *P. sonchii* and *P. pimpinellae* have been found infecting different plant species. Out of these *Melampsora chelidonii-pierotii* and *P. arthraxonis-ciliaris* are addition to our rust flora. The aecial stages of *P. pimpinellae*, *Phragmidium bulbosum* and *P. mysorense*, uredinial stage of *Puccinia ambigua* and telial stage of *P. sonchii* are reported for the first time from Pakistan.

Introduction

The Northern Areas of Pakistan are well known for their biodiversity. About 3000 species of plants exist in these areas, out of which approximately 124 species have medicinal properties. Most parts of Northern Areas lie within the watershed of the Himalayas, Hindukush and Karakoram mountains ranges. The main watershed runs southwards, draining into the river Indus. Climatic conditions vary widely in the Northern areas ranging from the monsoon-influenced moist temperate zone in the western Himalaya, to the arid and semi-arid cold desert in the Northern Karakoram and Hindu Kush (Sugong, 1990; Jacobose, 1993; Anon., 1994).

The Northern Areas of Pakistan have not been thoroughly surveyed uredinologically and only a few rust records have been published (Ahmed, 1956; Gjaerum & Iqbal, 1969; Kaneko, 1993; Ahmed *et al.*, 1997).

During June to October each year from 2001 to 2003 different Northern areas were surveyed uredinologically. Infected plants were collected, pressed and brought to the lab. Specimens have been deposited in the herbarium, Department of Botany, University of Punjab, Lahore, Pakistan.

Description of Taxa

1. *Melampsora chelidonii-pierotii* Matsumoto, 1926
Fig. 1, A-D

Spermogonia and aecia not found. Uredinia hypophyllous, scattered or grouped, yellow, pulverulent and irregular in shape. Urediniospores globose, ellipsoid, oblong-pyriform, smooth, 17-20 × 13-19µm, paraphyses 19-22 ×15-21µm, paraphyses wall often slightly thickened at the apex. Telia amphigenous, subcuticular, scattered or grouped, reddish brown, irregular in shape, prismatic in surface view of telium; teliospores 38-44 × 7-9 µm, oblong and rounded at both ends, arranged in single layer, not thickened at the apex.

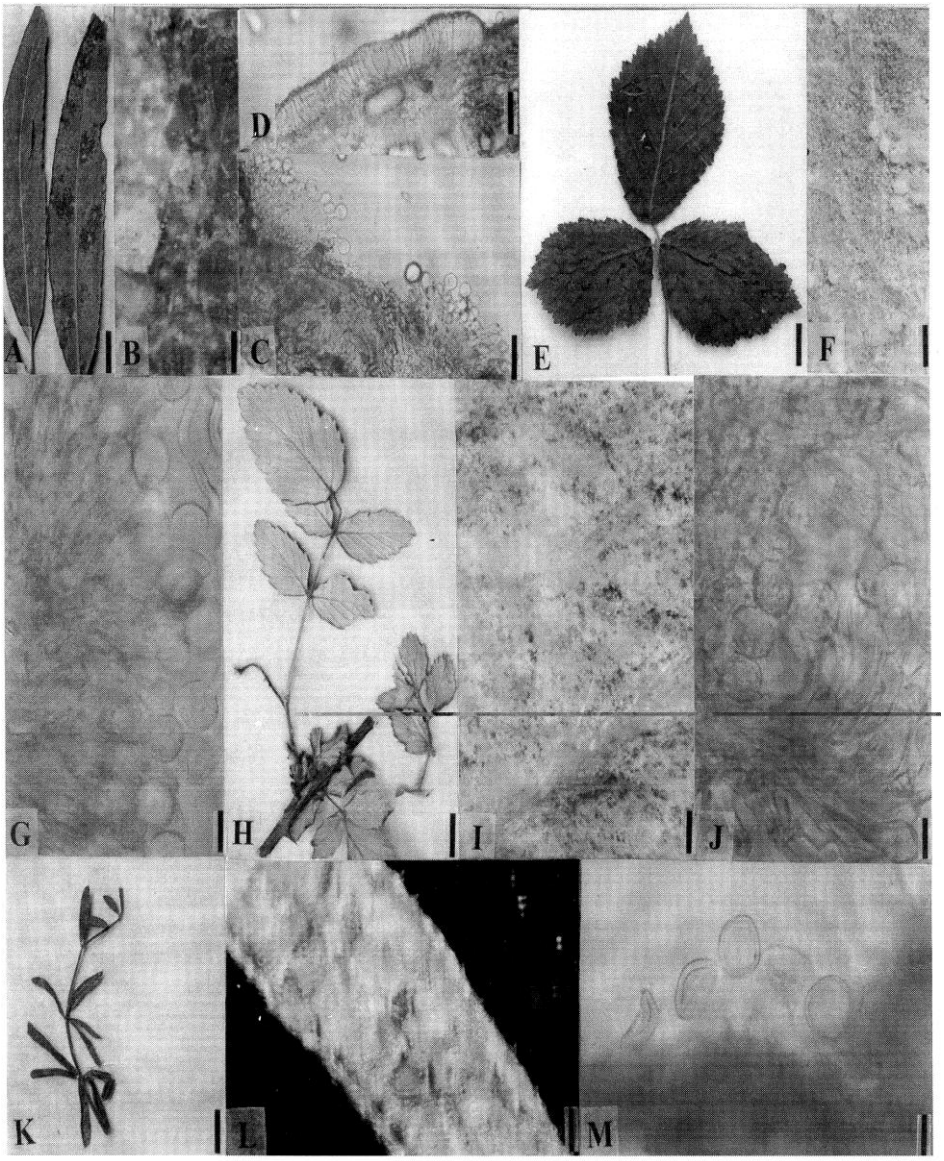

Fig. 1. (A) Infected host (*Salix acmophylla*). Scale bar = 1.0cm, **(B)** Close up of infected leaf showing Uredinia and telia. Scale bar = 0.05µm, **(C)** Cross section of infected leaf showing uredinia containing hyaline uredospores and paraphyses. Scale bar = 60µm, **(D)** Cross section of infected leaf showing telium containing teleutospores arranged in a layer. Scale bar = 40 µm, **(E)** Infected host (*Rubus ulmifolius*). Scale bar = 1.0cm, **(F)** Close up of infected leaf showing scattered aecidia. Scale bar = 0.3 cm, **(G)** Cross section of infected leaf showing aecidium containing hyaline paraphyses and aeciospores. Scale bar = 17.0µm, **(H)** Infected host (*Rubus niveus*). Scale bar = 1.0cm, **(I)** Close up of infected leaf showing scattered aecidia. Scale bar = 0.3 cm, **(J)** Cross section of infected leaf showing aecidium containing hyaline paraphyses and aeciospores. Scale bar = 13.0µm, **(K)** Infected host (*Galium aparine*). Scale bar = 1.0cm, **(L)** Close up of infected leaf showing uredinia. Scale bar = 0.03µm, **(M)** Cross section of infected leaf showing uredinium containing pedicillate uredospores. Scale bar = 7.0µm.

On *Salix acmophylla* Boiss., from Road side near Skardu, October 13, 2002, II & III, # AS 05.

This rust fungus is being reported for the first time from Pakistan.

2. *Phragmidium bulbosum* (Str.) Schlect., Fl. Berol. 2: 156, 1824
Fig. 1, E-G

Spermogonia not found. Aecia on abaxial surface of leaves, scattered, minute, pulverulent, Yellowish white and irregular in shape. Aecial paraphyses thin-walled, hyaline, cylindric to clavate and incurved. Aeciospores subglobose to broadly ellipsoid, hyaline, densely warted, 20-23 × 18-22 µm.

On *Rubus ulmifolius* Schott., from Tatu-Fairy Meadow track, September 7, 2003, II, # AS 09.

This fungus has already been reported from Shogran on *Rubus pungens* Camb., by Ahmed (1969), on *R. hoffmeisteianus* Kunth & Bounche from Kawi by Ono (1992), on *R. ulmifolius* from Qalandarabad (NWFP) by Kaneko (1993) and on *R. ulmifolius* Schott., from Mingora (Swat) by Khalid *et al*., (1995).

Aecial stage of this fungus is reported for the first time from Pakistan.

3. *Phragmidium mysorense* (Thirum. and Mundk.) Petr. In *Sydowia* 8: 162, 1954
Fig. 1, H-J

Spermogonia not found. Aecia hypophyllous, scattered, minute, pulverulent, yellow and irregular in shape, aecial paraphyses thin walled, hyaline, cylindric to clavate and incurved. Aeciospores subglobose to broadly ellipsoid, hyaline, echinulate, 17-19 × 16-17 µm. Uredinia and telia not found.

On *Rubus niveus* Wall., from Nalter Valley, September 1, 2003, II, # AS 10.

This fungus has already been reported from Nathia Gali and Changla Gali by Ahmed (1956) and Khalid *et al*., (1993).

Aecial stage of this fungus is being reported for the first time from Pakistan.

4. *Puccinia ambigua* (Alb. & Schw.) Lagh. In Sydow, Uredineen no: 1036, 1897
Fig. 1, K-M

Spermogonia and aecia not found. Uredinia hypophyllous, scattered, yellow, pulverulent and irregular in shape. Urediniospores subglobose, ellipsoid, obovoid, light yellow, smooth, 26-29 × 19-21µm. Telia not found

On *Galium aparine* L., from Nalter Valley, August 30, 2003, II, # AS 13.

Ahmed (1956) has reported telial stage on the same host from Murree Hills but uredinial stage is reported for the first time from Pakistan.

5. *Puccinia arthraxonis-ciliaris* Cumm., Uredineana 4: 16, 1953
Fig. 2, A-C

Spermogonia and aecia unknow. Uredinia scattered, on te leaves, as reddish brown lesions; urediniospores globose, subglobose, ellipsoid to ovoid, echinulate, yellowish brown, 29-31 x 21-28 µm. Telia not found.

On *Arthraxon* sp., from Bashu Jungle near Skardu, October 11, 2002, II, # AS 15.

This rust is a new record for Pakistan.

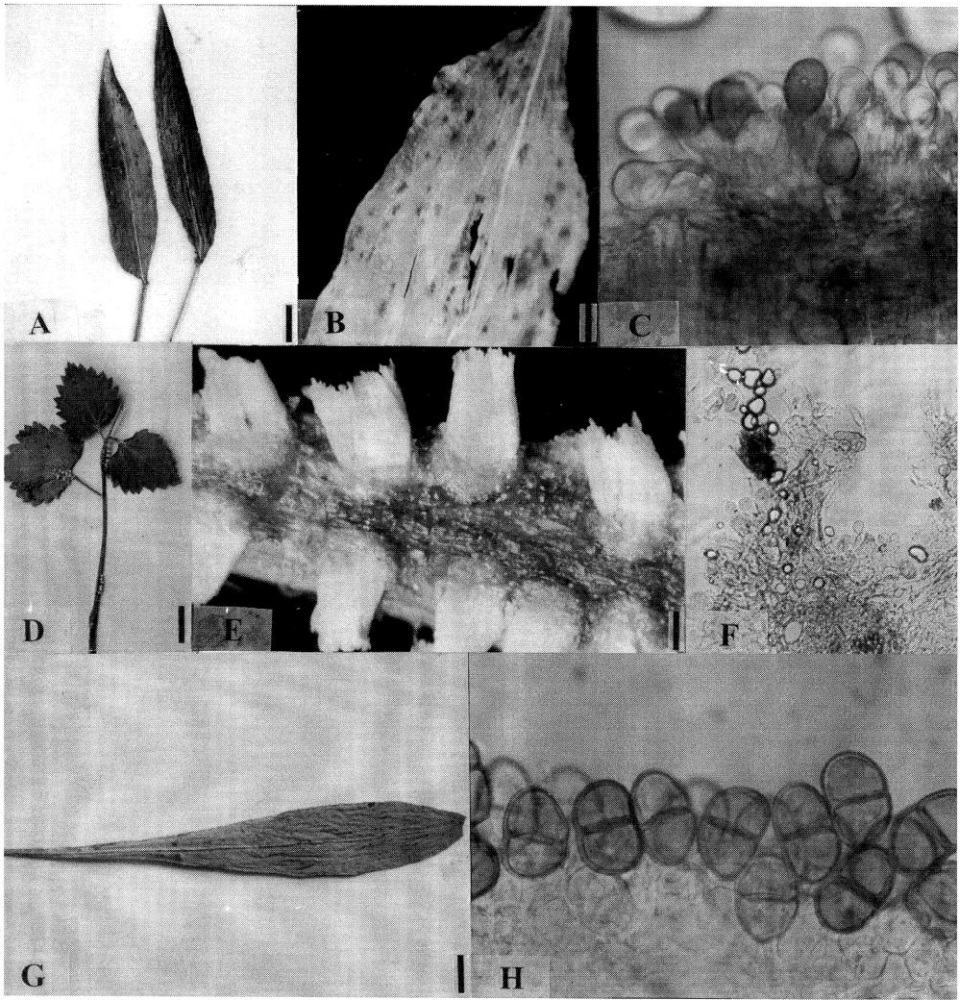

Fig. 2. (A) Infected host (*Arthraxon* sp.). Scale bar = 1.0cm, **(B)** Close up of infected leaf showing Uredinia. Scale bar =0.03µm, **(C)** Cross section of infected leaf showing uredinia containing hyaline urediniospores Scale bar = 20.0µm, **(D)** Infected host (*Pimpinella diversifolia)*. Scale bar = 1.0µm, **(E)** Close up of infected stem showing "cluster cup" type aecidia. Scale bar = 0.03cm, **(F)** Cross section of infected leaf showing aecidium containing aeciospores. Scale bar = 58µm, **(G)** Infected host (*Sonchus* sp.). Scale bar = 1.0cm, **(H)** Cross section of infected leaf showing telium containing teleiospores. Scale bar = 36µm.

6. *Puccinia pimpinellae* (Strauss) Rohling, Deutschl. Fl. Ed. 2(3): 131, (1813) Fig. 2, D-F

Spermogonia scattered among the aecia, yellowish to hyaline, 68.4 x 130 µm. Aecia hypophyllous, in groups, on stem, petiole and along the veins of the leaf, causing hypertrophy, cup-shaped, yellowish. Peridial cells unequal and irregularly arranged, outer wall thicker than inner wall, 314-320 x 272-276 µm. A aeciospores globose, sub-globose, ellipsoid, hyaline, verrucose, 23-29 x 18-22 µm. Uredinia and telia not found.

On *Pimpinella diversifolia* (Wall) DC., from Rama, August 22, 2002, O and I, # AS 26.

The uredinial and telial stages of *Puccinia pimpinellae* have already been reported on *Pimpinella diversifolia* by Ahmed (1956) from Kalam (Swat), Pakistan. The spermogonial and aecial stages are reported here for the first time on the same host from Rama, Pakistan.

7. *Puccinia sonchii* Rob. ex Desm., Ann. Sci. Nat. Bot. III, 11: 274, 1849
Fig. 2, G-H

Spermogonia, aecia and uredinia not found. Telia hypophyllous, scattered and in groups, mostly along the midrib, irregular in shape and dark brown; teleiospores ellipsoid, rounded at both ends, slightly constricted at septum, smooth, chestnut brown, 31-40 x 24-29 µm, pedicel short and hyaline.

On *Sonchus* sp., from Astore, Rama, July 25, 2001, III, # AS 28.

Ahmed (1956) has reported uredinial stage of this fungus from Quetta and Murree, Pakistan on *Sonchus arvensis* L.

The telial stage of this fungus is reported on *Sonchus* sp., for the first time from Rama, Pakistan.

Acknowledgement

We sincerely thank Prof. Dr. S.H. Iqbal for his help in the identification of rust fungi and his valuable comments for improving the manuscript. We extend our thanks to Ch. Hamid Mukhtar**,** Department of Botany, G.C. University and Mr. A.R. Niazi for their help in the fields and lab.

References

Ahmed, S. 1956. Uredinales of West Pakistan. *Biologia*, 2(1): 29-101.

Ahmed, S. 1969. Fungi of Pakistan. *Biological Society Pakistan, Lahore, Monograph*, 5: Suppl. I: 110.

Ahmed, S., S.H. Iqbal and A.N. Khalid. 1997. *Fungi of Pakistan*. Sultan Ahmed Mycological Society of Pakistan, Department of Botany, University of Punjab, Lahore, Pakistan.

Gjaerum, H.B. and S.H. Iqbal. 1969. Some rust fungi from west Pakistan. *Nytt Magsin fur Botanik*, 16: 221-223.

Anonymous. 1994. Declaration of some Wilderness Areas as National Park in Northern Areas, Islamabad. Kashmir Affairs and Northern Areas Affairs Division, Government of Pakistan.

Jacobose, J.P. 1993. Climatic records from Northern Areas of Pakistan. In: Culture Area Karakorum Newsletter, 3: 13-17. Tubingen, Germany.

Kaneko, S. 1993.Parasitic fungi on woody plants from Pakistan. *Cryptogamic Flora of Pakistan, vol* 2 (Eds.): T. Nakaike and S. Malik, pp.149-168. Nat. Sci. Mus., Tokyo, Japan.

Khalid, A.N., S.H. Iqbal and B. Parveen. 1993. Rust flora of Pakistan. II. Genus *Phragmidium* Link., on *Rubus* spp. *Pakphyton*, 5: 133-136.

Khalid, A.N., S.H. Iqbal and A. Masood. 1995.New records of Uredinales from Pakistan. *Science International (Lahore)*, 7(4): 531-532.

Ono, Y. 1992. Uredinales collected in the Kaghan Valley, Pakistan. *Cryptogamic flora of Pakistan*, 1: 217-240.

Sugong, W.U. 1990. General characteristics of flora of the Karakorum-Kunlun Mts. Conservation, Exploitation and Utilization of the plant resources, 5(4): 376-382.

(Received for publication 20 February 2006)