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PERFORMANCE OF COWPEA GENOTYPES AT HIGHER ALTITUDE OF NWFP

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Abstract

The performance of 24 exotic cowpea genotypes at higher altitude of NWFP was studied at the Agricultural Research Institute (North), Mingora, Swat during kharif 2006. Genotypes were evaluated for days to maturity, plant height, seed pod^{-1}, 100-seed weight and seed yield. The genotype viz., SADANDY was found the early maturing genotype which took 97 days to maturity, while 3 CCP 915 was the late maturing (124 days). Maximum plant height (236 cm) was recorded for check cultivar Malakand Kulat-II, while minimum plant height (52 cm), for genotype 4 CCP927. Maximum number of seed pod^{-1} were counted for 4CCP 928, while fewer number of seed pod^{-1} (7) were recorded for 4CCP 930. Maximum pod length was measured for CP 231 (38 cm), whereas minimum pod length for 4 CCP 928 (10 cm). Highest seed weight (23 g/100 seed) was for 3 CCP 927, while least seed weight (14g/100 seeds) was for 3CCP905, 4CCP 931 and 4 CCP 926. Maximum seed yield of 3550 kg ha^{-1} was recorded for CP 140 while minimum of 317 kg ha^{-1} was recorded for 4CCP 931. The genotype CP 140 ranked first by producing higher yield and was early maturing than other genotypes and check varieties. Genotype CP 140 is therefore recommended to the farmers for getting maximum yield under the climatic conditions of Swat.

Introduction

Cowpea *(Vigna unguiculata*) is an important tropical and subtropical leguminous crop, grown for seed, vegetable, green manure, fodder, medicinal purposes and as cover crop to minimize water losses and maintain soil fertility in rainfed conditions. The cultivated forms of cowpea are known by other common names also like southern peas, black eye peas, black eye beans, China pea, Kaffir beans, asparagus beans, yard long beans and lobia. It is a rich source of protein (22-33%) especially of lysine, folic acid, carbohydrate (53.56 to 57.36%) and low level of anti nutritional and flatulence producing factors than common beans. Cowpea fodder is also a rich source of crude protein i.e., upto 18.4%. It is a versatile crop possessing high adaptability to extreme conditions of temperature, drought, tolerate alkaline soil conditions and posses high potential of biological nitrogen fixation. Pakistan lies in the semi-arid region of the world and its crop husbandry mainly depends on canal irrigation water which is becoming insufficient to meet demands of water for agricultural purpose. Therefore, introduction and evaluation of cowpea performing better in rainfed as well as irrigated conditions and its improvement for yield and its contributing traits are of pivotal importance to get self-sufficiency in pulses. In Pakistan cowpea was grown on an area of approximately 17 thousand hectares with annual production of 8 thousand tons (Anon., 2001) with a production of 553 tons of cowpea from 257 hectares in 2003-04 (Khushk & Laghari, 2007). This poor yield may be due to unavailability of high yielding and stable genotypes

along with appropriate advance agronomic management practices. It has two types i.e. one that grows erect and other has spreading type of growth habits. In NWFP i.e., (Malakand, Swat, Dir, Bunner) both types are cultivated as sole crop or intercrop or in rotation with maize and other crops. Being a minor crop in country, it is usually cultivated for green pods and thus its production and average seed yield is very low. It is therefore very important to develop cowpea varieties that are high and stable yielding, early maturing and insect pest resistant. Keeping in view, to enhancing cowpea production in Pakistan in general and in NWFP in particular, the present study was thus undertaken to find out yield potential of several promising cowpea genotypes for higher yield, early maturity and adaptibility.

Material and Methods

The study was conducted at the Agricultural Research Institute (North) Mingora, Swat during kharif 2006. The experiment was laid out in randomized complete block design (RCBD) with three replications keeping a plot size of 2 m x 3 m. Each plot consisted of four rows with row length of 3 meter and row to row of 50 cm distance. A basal dose of nitrogen and phosphorous @ 25 kg ha^{-1} and 50 kg ha^{-1} was applied during seed bed preparation. Irrigation was uniformly applied according to the requirement. The following 24 genotypes and two check varieties studied during the experiment are; CP 140, CP 182, CP 185, CP 231, CP 390, SADANDY, 4 CCP 909, 4 CCP914, 4 CCP926, 4 CCP927, 4 CCP928, 4 CCP929, 4 CCP930, 4 CCP 931, 3 CCP 905, 3 CCP 908, 3 CCP 909, 3 CCP 910, 3 CCP 911, 3 CCP 912, 3 CCP 915, 3 CCP 916, 3 CCP 918, 3 CCP 927, Malakand Kulat-I (check) and Malakand Kulat-II (check). The data was recorded on the following quantitative parameters; Days to maturity, Plant height (cm), Seeds pod^{-1}, Pod length (cm), 100 seed weight (g) and Seed yield (kg ha^{-1}). The data recorded were statistically analyzed using MSTATC, a computer software package (Bricker 1991). Upon obtaining significant differences Least Significant Difference (LSD) test were employed to signify the varietal differences.

Results and Discussion

Analysis of variance for days to maturity revealed highly significant ($p \leq 0.01$) differences among different genotypes (Tables 1 and 2). Days to maturity among cowpea genotypes ranged form 97 to 124 days. The SADANDY took fewer days to maturity (97 days) and was the early maturing genotype followed by 4CCP 914 (98 days). The 3 CCP 915 was observed the late maturing genotype took (124 days). Cowpea genotype SADANDY was 23 days early in maturity than check varieties Malakand Kulat-I, Malakand Kulat-II. Days to maturity an important aspect as breeder and farmers always require the early maturing genotypes for crop improvement and yield. The genotypes studied showed variation in maturity. Such variation in maturity of different genotypes may be due to climatic conditions or genetic make up of the tested genotypes. These results are in confirmation with those of Amanullah *et al*., (2000), who studied 20 genotypes at under the climatic condition of Peshawar and found significant variations for days to maturity.

Table 1. Analysis of variance for days to maturity, plant height, seed pod^{-1}, pod length, 100-seed weight and seed yield of cowpea genotypes evaluated at Agricultural Research Institute (N), Mingora Swat during 2006-07.

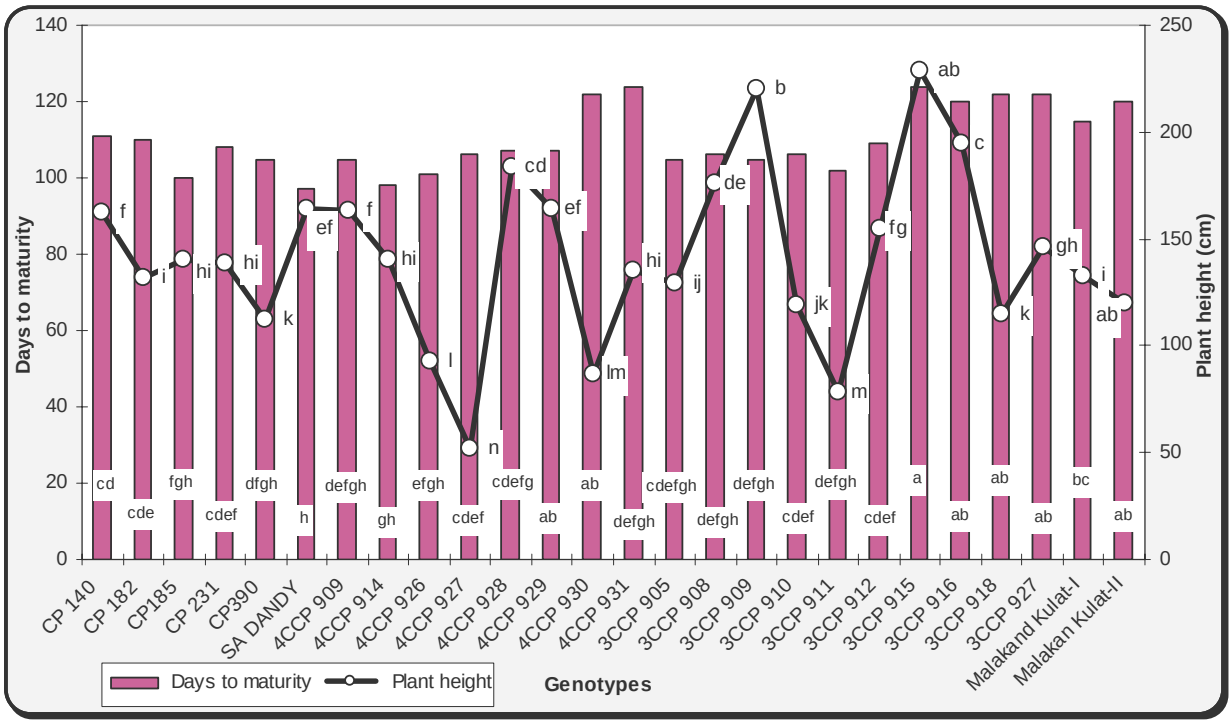
Parameter	Replication	Mean square	Error mean square	C.V
Days to maturity	655.43	216.91**	32.22	5.17
Plant height	64.81	6000.43**	56.42	5.14
Seed pod^{-1}	13.18	21.37*	4.05	17.22
Pod length	0.35	101.13**	0.35	2.28
100-seed weight	111.29	24.76**	2.76	8.84
Seed yield	140262.51	1774422.25**	20074.25	10.09

*= Significant, **= Highly significant

Plant height showed highly significant differences among different genotypes at ($p \leq 0.01$) (Tables 1 and 2). The data for plant height ranged from 11-236 cm. The genotype 4 CCP 927 was dwarf (52 cm) whereas Malakand Kulat–II (check) plants were taller (236 cm). On the basis of phenotypic observation plant height showed positive relationship with maturity. Genotypes with early maturity produced dwarf plants, while genotypes with late maturity showed highest plant height. This variation might be attributed to the differences in the genotypes or might be due to environmental fluctuation. Similar results were reported by Ram *et al*., (1994). Plant height reflects the canopy of plant spread contributing inactive photosynthetic activity of the plant, having indirect effect on seed yield. Plant with the spreading nature covers the ground and thus less or no moisture loss occurs. Thus plants having tall stature and spreading canopy are desirable for the area where there is scarcity of water. Our results are also supported by Thiyagarajan & Rajasekaran (1993) who studied seven cultivars and their F_1 for yield and found that dwarf to medium plants produced low yield as compared to medium to tall plants. Similarly Amanullah *et al*., (2000) observed significant variation for plant height among 20 cowpea genotypes.

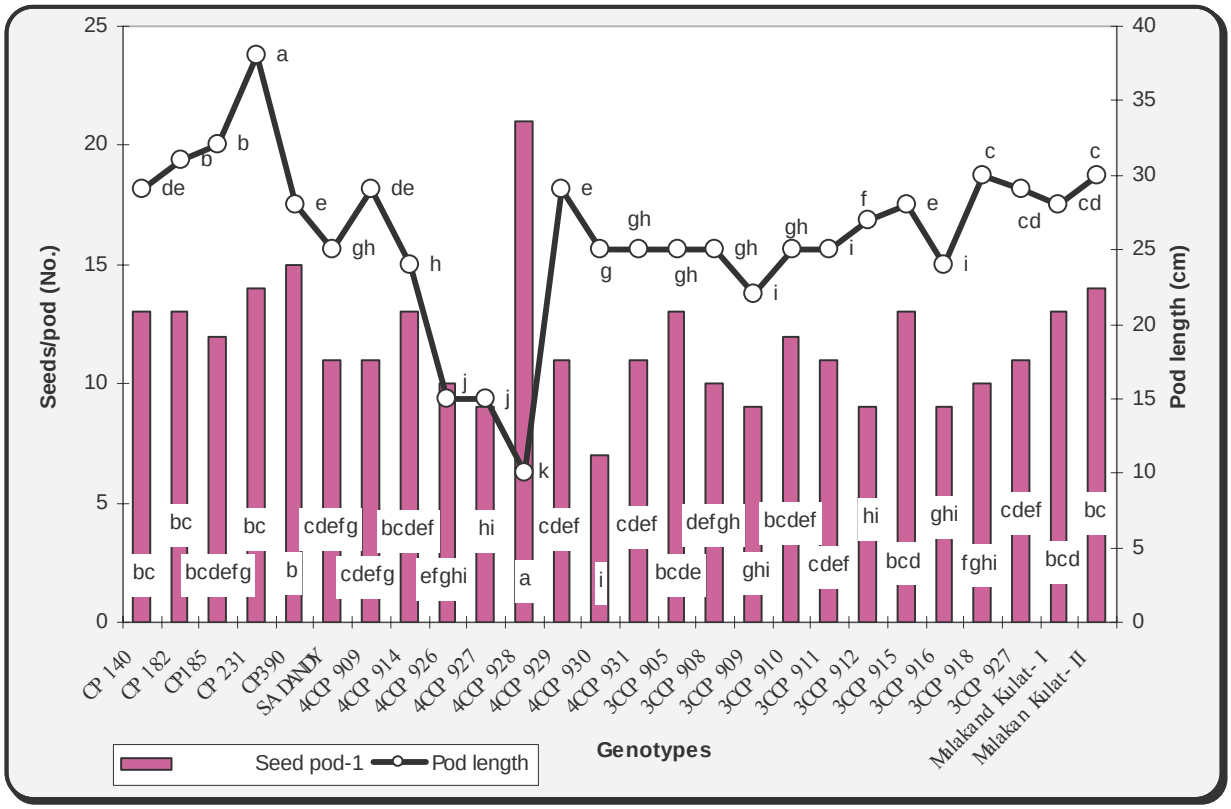
Seed pod^{-1} is an important yield component contributing to the final yield. Analysis of data regarding seed pod^{-1} indicated significant ($p \leq 0.05$) variation that ranged from 7 to 21 seeds pod^{-1}among different genotypes (Tables 1 and 3). A genotype 4CCP 928 produced maximum number of seeds pods^{-1}(21), while genotype viz., 4CCP 930 produced the lowest number of seeds pod^{-1} (7). The check cultivars produced fewer seeds than the tested genotypes. Larger pods produced maximum number of seed pod^{-1}, while shorter less. Moreover this variation might be due to different genotypes or due environment which promote early maturity thus minimum time was available for seed setting and development. Similar results were reported by Muhammad *et al*., (1994) and Amanullah *et al*., (2000). Thiyagarajan & Rajasekaran (1993) found that plant height also affect seed pod^{-1}. Similer results were also reported by Damarany (1994).

Pod length is important for the seed pod^{-1} and thus affect seed yield. Highly significant ($p \leq 0.01$) variations were observed for pod length among the tested genotypes (Tables 1 and 3). Pod length ranged from 10–38 cm. Minimum pod length (10 cm) was recorded for 4CCP 928 followed by 4CCP 927 (15 cm) while maximum was recorded for CP 231 (38 cm). As compared to the tested genotypes check cultivars were observed relatively shorter. Similar results were reported by Muhammad *et al*., (1994), who studied six different genotypes under medium rainfall conditions and reported significant variation for pod length among the genotype. That is the conformation of genotypic and environmental effect. Damarany (1994) tested 36 genotypes during summer and found significant variation for pod length. That is conformation of genotypic affect.



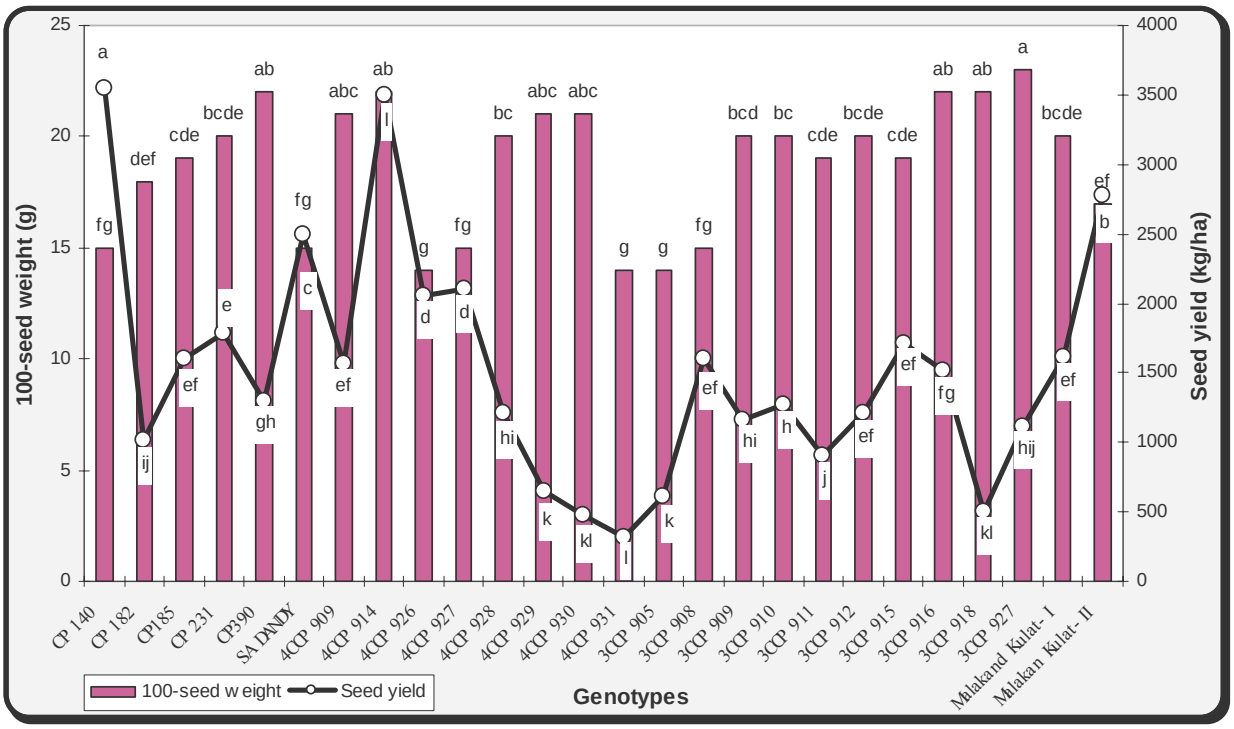
$LSD_{0.05}$ for days to maturity = 9.30, $LSD_{0.05}$ for plant height = 12.32

Fig. 1. Means for days to maturity and Plant height of cowpea genotypes evaluated at Agricultural Research Station, Mingora, Swat during 2006-07.



$LSD_{0.05}$ for seed pod-1 = 3.29, $LSD_{0.05}$ for pod length = 0.96

Fig. 2. Means for Seed pod^{-1} and pod length of cowpea genotypes evaluated at Agricultural Research Station, Mingora, Swat during 2006-07.



$LSD_{0.05}$ for 100-seed weight = 2.72, $LSD_{0.05}$ for seed yield = 232.4

Fig. 3. Means for 100-seed weight and seed yield of cowpea genotypes evaluated at Agricultural Research Station, Mingora, Swat during 2006-07.

Hundred seed weight of the cowpea tested genotypes showed highly significant ($p \leq 0.01$) variation (Table 1 and 4). Hundred seed weight ranged from 14 to 23 g. Greater seed weight (23 g/100 seed) was recorded for 3 CCP 927, while less seed weight (14g/100 seed) was recorded for 3CCP 905. These differences in seed weight might be due to the time factor for the accumulation of assimilates in the seeds and differences in the genetic make up of different genotypes. Acclimatization factor might also be responsible for higher seed weight. Similar variations were also reported by Amanullah *et al*., (2000). Damarany (1994) tested 36 genotype of cowpea at two season and found significant differences for 100-seed weight. Our results are also supported by Muhammad *et al*., (1994) who found highly significant variation for 100 seed weight in six cowpea cultivars.

Highly significant ($p \leq 0.01$) variation for seed yield of the cowpea genotypes were studied (Table 1). Seed yield ranged from 317 kg ha^{-1} to 3550 kg ha^{-1} (Table 4). Maximum yield of 3550 ha^{-1} was recorded for CP 140 followed by 2500 kg ha^{-1} for SA DANDY, while the lowest yield of 317 kg ha^{-1} was recorded for genotype 4CCP 931. The peculiarity of genotypes is of great importance when we evaluate/ develop genotypes for stability. However, variation in yield was noted, which may be attributed to climatic diversity and genetic make up of the genotypes. Such variations in yield of different genotypes were also reported by Amanullah *et al*., (2000), Muhammad *et al*.., (1994), Ram *et al*., (1994). They found significant differences in seed yield and showed positive relationship with seed pod^{-1}, seed weight, plant height and pod length. It is concluded from the experiment that the genotype CP 140 produced the highest seed yield than the check varieties. Genotypes CP 140 may be used for further evaluation and adaptation study in the diverse pockets for Malakand Division to be released as commercial genotype.

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