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Performance of cowpea (*Vigna unguiculata* L.) genotypes under field conditions

Yousaf Ali[1], Zahoor Aslam[1] and M. Salah-ud-Din[2]

[1]Nuclear Institute of Agriculture and Biology, P. O. Box 128, Faisalabad, E-mail:- yousaf-ali5@hotmail.com and [2]Ayub Agriculture Research Institute (AARI), Faisalabad, Pakistan

Abstract

Cowpea varieties IT-97K 1042-8, IT-97k-499-4, IT-95k-1156-3, IT-97K-4979-2, S-A Dandy and Elite were raised at NIAB and ARRI, Faisalabad selected for plant height (46-72cm) days taken to 95 % flowering and for diseases resistance (1-2 rating). Infestation was maximum on IT-97K-461-4, 1068-7, IT-97K 1042-8 and IT-98k-558-1 and were graded as susceptible. Maximum grain yield was recorded in Elite (550 Kg/ha) and lowest grain yield was observed in IT-95K-1156-3 (332.3 Kg/ha). Yield and yield contributing characters of twenty four entries tested revealed that they differ significantly from each other.
Key Words: Cowpea, Yellow mosaic virus, Agronomic characters.

Introduction

The cowpea (*Vigna unguiculata. L*) commonly known as Lobia is an annual legume. This important tropical and subtropical legume is grown for forage green pods and grains. It is an excellent source of protein. White seeded varieties and black eyed types are commonly grown for grain and table use. While ving varieties that mature late are proffered for forage cowpea and can be grown on wide range of soil types and under a diversity of climatic and cultural condition. Highest yields of forage are obtained in sandy loam soils supplemented with proper irrigation. However, for seed purpose, cowpea reasonably performs well on soil with low fertility. High rates of nitrogen and excessive moisture are detrimental and can result in excessive vegetative growth, delayed maturity and poor shattering.

Desirable varieties of cowpea verities are vigorus, erect and tolerant to insects, pests and diseases. These verities are leafier and retain leaf late in the season. The vinyl habit is considered more desirable when intercropped with other forage crops. The cowpea are often grown in mixtures with sorghum sudengrass and maize and produce a high yield of forage in combination, When grown under drought may produce HCN poisoning to Livestock, but when these forages crops are grown in mixture with cowpeas lead to low HCN formation in the green fodder for the livestock.

In Pakistan cowpea is grown on an area of approximately 17 thousand hectares with annual production of 8 thousand tones (Bashir *et al*. 1999). The improvement work on cowpea mainly remained confined to pure line selection from heterogeneous material grown by the farmers. However, the success of a breeding programme always rests on the magnitude and nature of genetic variability and its proper manipulation in generating more efficient population. Sexual reproduction is the major mechanism to transmit and augment genetic variation for sustained improvement through hybridization in cowpea is tedious and difficult due to delicate floral structure, cleistogamic nature of fertilization and unsuitable environmental conditions. Mutation breeding, which has played a significant role in the development of many varieties (Micke, 1988; Anonymous, 1989), could be instrumental in enhancing the genetic variability and to tailor an ideal plant type having high yield potential.

The objective of this study was to identify new ideotype having higher yield potential, early and erect plant habit and their use in further breeding programme.

Materials and Methods

Cowpea varieties were evaluated during the post-rainy season after maize at the different locations of Ayub Agriculture Research Institute, Faisalabad (AARI) and Nuclear Institute of Agriculture and Biology, Faisalabad (NIAB) during the last week of August, 2001 (Table 1). Due to insufficient seeds, each cu1tivar was planted only in 4 rows of 5 meters long. Cultivars were planted at 15 cm plant to plant 30 cm row to row distance. Fertilizer at the rate of 20: 20: 20 Kg ha^{-1} N_2, P_2O_5 and K_2O were applied before planting. Insect pests and diseases were recorded throughout the cropping period. Scoring of yellow mosaic virus (YMV) was recorded as mentioned

by Shukla (1978) on 4-5 week old plants. Agronomical data such as number of days to 95 % flowering, 95 % maturity, plant height (cm), number of pods per plant, number of seeds per pod and pod length was recorded. Green pod yield (kg/ha), grain yield kg/ha and dry biomass yield (kg/ha) was recorded in few entries (Table-3), from the two control rows while the green pod yield was recorded from the other two rows. The data were subjected to analysis of variance to determine the significance of differences between genotypes (Steel and Torrie, 1980).

Results and Discussion

The data on plant height and other agronomic characters of two experiments are presented in table -1. Plant height was found from 42.33- 137.6 cm. Yellow mosaic virus infection score was between 0.66-7.00, days taken to 95% flowering were from 61.6-79.0, number of pods per plant was observed from 12.6-17.0, and numbers of seeds per pod were from 7.6-11.3 and pod length ranged from 8.3-12.0 cm.

Significant differences was observed for plant height, yellow mosaic virus infection and days taken to 95 % flowering in the twenty four test entries where as number of pods per plant, seeds per pod and pod length (cm) were non-significant.

The study was mainly confined to select lines having short stature, disease resistance early maturity and high yield. Six genotypes viz.1 T -97K-1 042-8, 1 T -97K-499- 4, 1T.95K-1156-3, 1T-97K-497-2, S.A. Dandy and Elite were selected for plant height (46.3-71.67cm) and days taken for 95 % flowering (64.33-73.33).

Aphid *(Aphis craccivora),* pod sucking bug (*Riptortus* sp.) and tobacco caterpillar (*Spodoptera litura*) were identified as major insect pests, while grasshoppers were recorded as minor insect pests on this crop. The aphids were serious before and after flowering, while the tobacco caterpillar was serious during the early stage of the crop. The pod sucking bug did a considerable damage on young pods, which could not develop well, the infested grains were so shriveled and hence were useless for human food and animals feed. No chemical was sprayed. Grain yield ranged from 648.7-332.3 kg ha^{-1}, green pod yield varied from 1425-1021 kg ha^{-1} while total dry biomass yield ranged from 766.7-456.3 kg ha^{-1} (Table-2).

Reaction of 24 genotypes of cowpea cultivars to yellow mosaic virus disease varied at both locations. It is evident from the data that cowpea genotypes under study vary in reaction against yellow mosaic virus disease (Table-1). Genotypes IT-97K-461, IT-97-K-1021-15 showed moderately tolerant to susceptible reaction and IT-95-1156-3, IT-94K-137-6, IT-97K-1042-8,IT-97K-499-4, IT-97K-497-2, IT-93K-452, IT-97K-350-4, SA dandy, P-518, Elite, No.44 and IT-84-552 showed highly resistant to resistant reaction . Cowpea has the distinction of carrying more seed borne viruses than any other crop species (Hampton, 1983). Establishment and distribution of virus free cowpea breeding material and germplasm is suggested to control or avoid the introduction of new viruses (Bashir *et al*., 1999). There are many other viruses i.e., BICMV, CABMV and potyviruses are reported to be cowpea also virulent (Bashir and Hampton 1996a, Bashir and Hampton, 1996b, Zia-ul-Hassan *et al.* 1999).Cowpea cultivars identified in this study have also higher yielding ability. Correa and Zeigler (1995) suggested that selecting high levels of resistance when diverse sources are combined can be used to develop a cultivar with stable resistance against diseases.

Maximum grain yield was recorded in Elite followed by 1 T -97K-497-2 and 1 T- 97K-1042-8 i.e.550.7 and 545 Kg ha^{-1} respectively. Lowest grain yield was noted in 1 T- 95k-1156-3 which was only 332.3 kg ha^{-1}. Highest green pod yield was observed in 1 T- 97k-497-2 (1425) and S.A. Dandy 1401kg ha^{-1}. Lowest green pod yield was noted IT -95k (l156-3kg ha^{-1}). Maximum biomass was produced by Elite i.e. 766.7 kg ha^{-1} followed by S.A. Dandy and 1T-97k-497-2 (671.7) and 622.3 kg ha^{-1}. Lowest total dry biomass yield was noted in 1 T -95k-1156-3 (456.3kg ha^{-1} yield, Table-3). Yield And yield attributing characters of twenty four cultivars tested reveal that they differed significantly from each other.

The farmers prefer high yielding, early maturing and having erect growth habit improved varieties of cowpea but all these characteristics are not present in any cultivar of cowpea approved as commercial varieties in Punjab. A cultivar 82-E-8 identified by AARI, Faisalabad is an early maturing, erect growth habit is being tested and improved through radiation techniques to get a cultivar better suited to inter cropping. This line is not high yielding. Efforts are being made to improve its yield and yield components. The major cropping systems in Pakistan are wheat-rice, wheat-cotton, wheat-maize or fellow fields preceding major crops such as cotton. Crops such as mungbean and cowpea can also be profitable intercropped with sugarcane, maize, sorghum, vegetables and fruit gardens. This is possible provided very early maturing, high yielding cultivars of these crops become available so that the crop can be lifted in time leaving sufficient time period for succeeding crop. This study was

also conducted to select a genotype which can fulfill the requirements of the poor farmer and increasing the farm productivity.

Although the growth pattern in all the cultivars in six cultivars tested for grain yield and total biomass was almost similar but this was not reflected in the final yield. For establishing definite relation with short stature and earliness with economic yield further studies are in progress with this basic informations.

Table l: Agronomic characters of twenty four cowpea genotypes

Sr.#	Variety Name	Plant height (cm)	Yellow mosaic virus (score)	Days taken to 95 % flowering	No. of pods per plant	No. of seeds per pod	Pod length (cm)
301	1T-97k-461-4	106.6	7.00	65.3	15.00	10.3	12.00
302	1T-98k-469-11	86.00	6.3	64	12.6	10.3	11.00
303	1T-97k-1068-7	128.00	7.00	62	16.3	9.6	9.00
304	1T-94k-440-3	116.3	5.3	65	15.00	9.00	8.6
305	1T-95k-627-34	79.3	5.6	64.33	15.6	11.3	8.6
306	1T-95k-1093-5	135.6	6.3	62.66	15.3	10.00	9.00
307	1T-97k-1021-15	129.3	7.00	66.3	15.3	9.00	8.6
308	Lobia-2000	101.3	5.00	64.3	15.00	9.6	9.3
309	1Tk-238-3	117.6	5.00	61.6	15.6	9.6	11.00
310	1T-98k-463-6	104.6	6.3	68.6	15.00	10.3	11.00
311	1T-97k-529-14	77.3	6.3	63.00	15.00	7.6	10.6
312	1T-98k-558-1	44.3	7.00	63.00	16.00	11.3	9.6
313	1T-95k-1156-3	62.6	2.3	73.3	13.3	9.00	10.6
314	1T-94k-137-6	86	2.00	79.00	14.00	10.00	10.00
315	1T-97k-1042-8	71.6	1.66	71.00	14.3	9.6	11.3
316	1T-97k-499-4	70.6	2.00	71.0	15.6	8.00	9.3
317	1T-97k-497-2	54	1.00	65.00	14.3	8.00	9.3
318	1T-93k-452	113	1.00	64.00	14.6	11.3	8.3
319	1T-97k-350-4	137.6	1.00	74.00	15.3	8.6	9.3
320	S.A Dandy	66	1.00	64.3	15.00	9.6	10.00
p-518	P-518	127.3	1.00	67.3	17.00	10.6	10.3
Elite	Elite	46.33	1.00	68.6	15.00	11.00	9.00
No.44	No.44	52	1.00	75.6	16.00	8.6	9.00
It-84-552	It-84-552	42.33	0.66	77.00	16.3	9.6	9.33

Table 2: Agronomic characters of twenty four cowpea genotypes

Sr.#	Variety Name	Plant height (cm)	Days Taken To 95 % Flowering	Disease Reaction
301	1T-97k-461-4	106.7 BCD	65 EFJ	7.0 A
302	1T-98k-469-11	86.00 DEFG	64 FJ	6.3 AB
303	1T-97k-1068-7	128.00 ABC	62 G	7.0 A
304	1T-94k-440-3	116.3 ABC	65 FG	5.3 AB
305	1T-95k-627-34	79.3 EFGH	64 FG	5.6 AB
306	1T-95k-1093-5	135.7 A	63 FG	6.3 AB
307	1T-97k-1021-15	129.3 AB	66 DEFG	7.0 A
308	Lobia-2000	101.3 CDEF	64 FJ	5.0 B
309	1Tk-238-3	117.7 ABC	62 G	5.0 B
310	1T-98k-463-6	104.7 BCDE	69 CDEFG	6.3 AB
311	1T-97k-529-14	77.3 FGHI	63 FG	6.3 AB
312	1T-98k-558-1	44.3 KL	63 FG	7.0 A
313	1T-95k-1156-3	62.67 GHIJKL	73 ABCDE	2.3 C
314	1T-94k-137-6	86.00 DEFG	79 A	2.0 C
315	1T-97k-1042-8	71.67 GHIJK	71 BCDEF	1.6 C

316	1T-97k-499-4	70.67 GHIJK	71 BCDEF	2.0 C
317	1T-97k-497-2	54.00 HIJKL	65 FG	1.0 C
318	1T-93k-452	113.00 ABC	64 FG	1.0 C
319	1T-97k-350-4	137.7 A	74 ABCD	1.0 C
320	S.A Dandy	66.00 GHIJKL	64 FG	1.0 C
p-518	P-518	127.3 ABC	67 DEGF	1.0 C
Elite	Elite	46.3 JKL	69 CDEFG	1.0 C
No.44	No.44	52.00 IJKL	76 ABC	1.0 C
It-84-552	It-84-552	42.3 L	77 AB	0.66 C

In a column means followed by the same letter are not significantly different at 5 % level of DMRT

Table 3: Mean grain yield and other agronomic characters of six varieties of cowpea

Varieties	Grain yield (kg/ha)	Green pod yield (kg/ha)	Biomass yield (kg/ha)
Elite	648.7 A	1088 D	766.7 A
S.A Dandy	396.0 C	1401 A	671.7 B
1T-97k-497-2	550.7 B	1425 A	622.3 BC
1T-97k-499-4	370.7 CD	1342 B	591.3 CD
1T-97k-1042-8	545.0 B	1153 C	549.3 D
1T-95k-1156-3	332.3 D	1021 E	456.3 E

In a column means followed by the same letter are not significantly different at 5 % level of DMRT.

References

Anonymous, 1989. Plant breeding for better crops. In: Nuclear strategies in food and Agriculture (25 years of progress, 1969-89), pp.21- 26.

Bashir M, Hampton RO, 1996a. Identification of cowpea (*Vigna unguiculata*-L Walp) cultivars and lines immune to variants of black eye cowpea mosaic potyrus. *Plant Pathol*. **454**: 984-989.

Bashir M, Hampton RO, 1996b. Sources of genetic resistance in cowpea (*Vigna unguiculata*-L Walp) to cowpea aphid born mosaic potyvirus. *Europ. Plant Pathol*., **102**: 411-4119.

Bashir M, Ahmad Z, Iqbal T, 1999. Detection and identification of two seed- born potyviruses from imported seeds of cowpea (*Vigna unguiculata* L Walp) from Nigeria. In: Proceeding of 2nd National Conference of Pl. Pathol., sept. 27-29, 1999, Univ. Agric., Faisalabad, Pakistan, pp.41-46.

Correa-Victoria JF, Zeigler RS, 1995. Stability of partial and complete resistance in rice to phyriculariagrisea under rain fed upland condition in Eastern Columbia. *Phytopath*., **85**: 977-982.

Hampton RO, 1983. Seed-born viruses in crop germplasm resources: disease dissemination risks and germplasm reclamation technology. *Seed Sci. Technol*., **11**: 536-546.

Micke A, 1998. Genetic improvement of grain legumes using induced mutations', In: Improvement of grain legumes production using induced mutations, pp. 1-51 IAEA. Viena 511/PUB/766.

Shukla GP, Pandya BP, Singh DP, 1978. Inheritance of resistance to yellow mosaic in mungbean. *Indian J. Genet.PIant Breed*., **38**: 358-360.

Steel RGD, Torrie JH, 1980. *Principles and procedures of statistics*. McGraw Hill Book Co. Inc. New York.

Zia-ul-Hassan, Latif, Riaz Ahmad, Inam-ul-Haq M, 1999. Effect of seed treatment with neem cake, neem oil and Latex of Aak on the germination of cowpea and its vulnerability, root-knot nematode *Melodogyne incognita*. *Pak. J. Phytopath*., **11**: 52-53.