http://www.pjbs.org

PJBS

ISSN 1028-8880

Pakistan Journal of Biological Sciences

ANSInet
Asian Network for Scientific Information
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

Pakistan Journal of Biological Sciences 3 (10): 1571-1573, 2000

Yield Potential of Blackbean (*Vigna mungo* (L.) Hepper) Germplasm

Amanullah and Mir Hatam
Department of Agronomy, NWFP Agricultural University Peshawar, Pakistan

Abstract: An experiment consisting of 11 blackbean (*Vigna mungo* (L.) Hepper) germplasm was carried at the Research Farm of NWFP Agricultural University Peshawar on June 9, 1999, to know the yield potential of these germplasm in relation to other important agronomic characters. Germplasm BB14 ranked first by producing maximum grain yield of 844 kg ha^{-1}, followed by germplasm BB7 (755 kg ha^{-1}). Average values of grain yield decreased in descending order from 799 kg ha^{-1} in group I to 375 kg ha^{-1} in group II and then further decreased to 243 kg ha^{-1} in group III. Similarly, the average values of days to maturity, plant height, branches and pods per plant, 100 seeds weight, dry matter yield and harvest index decreased in descending order, and showed positive association with grain yield.

Key words: Blackbean, vigna mungo, yield and yield components

Introduction

Blackbean, *Vigna mungo* (L.) Hepper, known as mash, urdbean or black gram is one of the most important leguminous crop for South and Southeast Asia. Blackbean is very nutritious grain legume and is popular in Asia where it is eaten whole or split, husked or unhusked, and parched. Blackbean occupies an important position in Pakistan's Agriculture. It grows on marginal land where other crop perform poorly. Blackbean is highly adaptive to wide range of ecological and climatic conditions. Thus, it could be grown in most areas where other food legumes cannot be grown well. Average yield of blackbean in Pakistan is very low at present. Therefore, high yielding cultivars are needed. Early maturing and day neutral cultivars are also essential for different cropping systems. The present study was therefore initiated to study and compare yield and yield components, to identify the desirable traits, to maintain and conserve the selected germplasm to prevent their possible extinction, and to supply the selected germplasm to users for various research purposes. Pinhero *et al.* (1983) reported that Co-4, KMU-3, plant-U-19 and BP-3 are best suited to the kharif while Co-3, KM-1 and Ajanur are best suited to the summer. Ramaswami and Oblisami (1984) reported that seed yield increased with duration. However, the increase in seed yield was not proportional to that of the total biological yield as harvest index was significantly higher in the short duration entries. Singh and Sharma (1986) reported that blackgram (*V.mungo* L.) cv. plant-U-35, developed from a cross between UPU-3 and Plant-U-19 has a plant height of 100 cm, 1000-seed weight of 40 g, protein content of 24%, mature in 75-85 days, is resistant to mungbean yellow mosaic virus and tolerates *Cercospora* leaf spot and *Rhizoctonia* infection. It has a seed yield potential of 1-1.5 t ha^{-1}. It gave average yields of 1.08 t ha^{-1} compared with 0.86-0.88 t ha^{-1} for 2 other cv. in the kharif seasons of 1980-84. Khan *et al.* (1988) reported that the correlation of grain yield with pods/plant was positive and highly significant, while the association of yield with days to maturity and flower drop percentage were negative. Ghafoor *et al.* (1989) worked on the evaluation, classification and usefulness of 152 germplasm of urdbean (*V. mungo* L.). Out of 11 selections, 6 accessions viz. S-55, S-16, S-221, S-222, S-242 and S-381 were marked high yielding with desirable erect plant type. Out of total germplasm, 43 were erect, 9 spreading and 100-semierect/semispreading. They recommend erect plant type for selection and improvement of urdbean. Gupta *et al.* (1993) reported that the phenotypic and genotypic coefficients of variation were high for pods/plant and yield/plant and moderate for plant height, pod length, seed/pod and 100 seed weight. All traits showed high heritability estimates, ranging from 0.43 (pod length) to 0.69 (seeds/pod). Genetic advance was only high for pods/plant and yield/plant. The selected genotypes viz. JKU12, JKU25 and JKU45 which were resistant to yellow mosaic, bigeminivirus and had high yield potential.

Materials and Methods

An experiment consisting of 11 blackbean germplasm was carried out on June 9,1999 at the Research Farm of NWFP Agricultural University, Peshawar. Each germplasm was considered as treatment and planted in randomized complete block design with three replications by assigning each individual germplasm to a plot of 4 X 1.5 m^2. Each plot consisted of 4 rows, 3 meter long and 0.5 m apart. Seedbed was prepared at proper vattar conditions. A basal dose of 25 kg N and 64 kg P_2O_5 per hectare was applied as DAP and incorporated into the soil during ploughing. Irrigation was applied when required. Weeds were controlled manually at the proper time. Data were collected on days to maturity, plant height (cm), branches per plant, pods per plant, seeds per pod, pod length (cm), 100-seed weight (g), grain yield (kg ha^{-1}), dry matter yield (kg ha^{-1}) and harvest index (%). The data collected on agronomic parameters were statistically analyzed and means were compared using LSD test.

Results and Discussion

Germplasm were first arranged in descending order and then divided into four groups on the basis of grain yield (kg ha^{-1}) to interpret meaningful results. Group I consisted of 2 germplasm i.e.(BB-14 & 7) in which grain yield varied from 755-844 kg ha^{-1}. Group II consisted of 6 germplasm i.e.(BB-2, 3, 4, 5, 1 & 6) in which grain yield varied from 318-448 kg ha^{-1}. Group III consisted of 3 germplasm i.e.(BB-9, 13 & 10) in which grain yield varied from 222-267 kg ha^{-1}.

Response of blackbean germplasm towards maturity was observed statistically significant (Table 1). It varied from 73 (BB-2 &9) to 95 days (BB5). It ranged from 90-94 days in group I, 73-95 days in group II, and 73-76 days in group III. Average values in groups decreased in descending order from 92 days in group I to 86 days in group II and then further decreased to 74 days in group III. In the overall situation 5 germplasm ranged from 73-78 days while 6 germplasm from 89-95 days. Early maturity indicate adoptability of germplasm in a new set of environment which might have resulted early termination of vegetative phase and initiation of reproductive

phase in the prevailing favorable environment as compared to germplasm which took longer time to flowering, pod initiation and maturity indicating less adoptability in the prevailing environment. Moreover, genetic variability of different germplasm could be the possible reason of this variation. Plant height varied significantly from 51 cm (BB10) to 120 cm (BB14) (Table 1). It ranged from 98-120 cm in group I, 55-103 cm in group II and 51-93 cm in group III. Average values in groups decreased in descending order from 109 cm in group I to 79 cm in group II and III each. As these germplasm were collected from different climatic conditions, so the rate of acclimatization of a germplasm may be considered the possible cause of this variation. Moreover, this variation might be due to the genetic variability of different germplasm. Gupta *et al.* (1993) reported moderate phenotypic and genotypic coefficient of variation for plant height. Branches per plant varied significantly from 2.3 (BB11) to 6.6 (BB-14, 7). It were 6.6 each for both the germplasm in group I while, it ranged from 4-5.3 in group II and 3.3-5.3 in group III. Average values in groups decreased in descending order from 6.6 in group I to 4.6 in group II and then further decreased to 4.2 in III. As these germplasm were collected from different climatic conditions, so the rate of acclimatization of a germplasm may be considered the possible cause of this variation. Moreover, this variation might be due to the genetic variability of different germplasm. The differences in pod length were statistically non-significant (Table 1). However, it varied from 4 (BB-2, 4, 5 & 6) to 4.8 cm (BB7). It ranged from 4.3-4.8 cm in group I, 4-4.5 cm in group II, and 4.3-4.6 cm in group III. Average values in groups decreased from 4.5 cm in group I to 4.4 cm in group III and then further decreased to 4.1 cm in group II. This variation could be due to the genetic variability of different germplasm. Moreover, rate of acclimatization of a germplasm to a new set of climatic conditions could also be considered the possible cause of this variation. Gupta *et al.* (1993) reported moderate phenotypic and genotypic coefficient of variation for pod length. Though differences in seeds per pod were statistically non-significant, however it varied from 6 (BB3) to 7.6 (BB1) (Table 2). It ranged from 6.3-6.6 in group I, 6-7.6 in group II, and 6.6-7 in group III. Average values in groups increased in descending order from 6.4 in group I to 6.7 in group II and then further increased to 6.8 in group III. In the overall situation 6 germplasm ranged from 6-6.6 while 5 germplasm from 7-7.6 seeds per pod. Genetic variability of germplasm might be responsible for this variation. Gupta *et al.* (1993) reported moderate phenotypic and genotypic coefficient of variation for seeds per pod. Blackbean germplasm showed statistically significant seed weight (Table 2) with maximum (4.5 g) and minimum (3.57 g) for BB14 and BB9, respectively. It ranged from 4.3-4.5 g in group I, 3.58-4.09 g in group II, and 3.57-3.75 g in group III. Average values in groups decreased from 4.4 g in group I to 3.66 g in group III and then further decreased to 3.63 g in group III. Seed weight varied according to maturity. Hundred seed weight showed positive association with days i.e. germplasm with delayed maturity produced heavier seeds and vice versa. Moreover, genetic variability of germplasm could be the possible reason of this variation. Data regarding pods per plant (Table 2) revealed that significant variation was observed among different germplasm. Maximum of 42.6 pods were recorded for BB14 while, minimum number of 12 pods were noted in BB10. It ranged from 31-42.6 in group I, 16.3-22.3 in group II, and 12-19.3 in group III. Average values in groups decreased in descending order from 37 in group I to 18 in group II and then further decreased to 17 in group III. The rate of acclimatization of a germplasm may be considered the possible cause of this variation. Moreover, this variation could be due to the genetic variability of different germplasm. Gupta *et al.* (1993) reported high heritability and high genetic advance for pods per plant. All germplasm were statistically different in gaining dry matter yield (Table 2). Germplasm BB7 produced maximum and BB15 produced minimum dry matter yield of 10963 and 3111 kg ha^{-1}, respectively. It ranged from 10369-10963 in group I, 4740-7555 in group II and 3259-6221 in group III. Average values in groups decreased from 10666.4 in group I to 6419 in group II and then further decreased to 4987 kg ha^{-1} in group III. Dry matter yield positive association with days to maturity, plant height and branches per plant. Grain yield was

Table 1: Days to maturity, plant height (cm), branches per plant, pod length (cm) and seeds per pod of blackbean germplasm.

Group	Acc.No	Days to maturity	plant height (cm)	Branches per plant	pod length (cm)	Seeds per pod
	BB14	94 a	120 a	6.6 a	4.3	6.6
I	BB7	90bc	98 bc	6.6 a	4.8	6.3
Mean Group I		92	109	6.6	4.5	6.4
	BB2	73e	88 cd	5.3 b	4.0	7.0
	BB3	93ab	75 de	4.6 bc	4.2	6.0
II	BB4	89c	55 f	4.0 cd	4.0	6.6
	BB5	95a	91 bc	4.3 bcd	4.0	6.3
	BB1	89c	103 b	5.0 bc	4.5	7.6
	BB6	78d	63 ef	4.6 bc	4.0	7.0
Mean Group II		86	79	4.6	4.1	6.7
	BB9	73e	93 bc	5.3 b	4.6	7.0
III	BB13	74e	93 bc	4.0 cd	4.3	6.6
	BB10	76de	51 f	3.3 d	4.5	7.0
Mean Group III		74	79	4.2	4.4	6.8
LSD at 5%		3.517	14.365	1.129	ns	ns

Mean values in the same column carrying similar letters do not differ significantly at 5% level of probability using LSD test.

Table 2: 100-seed weight (g), pods per plant, dry matter yield (kg ha^{-1}), grain yield (kg ha^{-1}) and harvest index (%) of blackbean germplasm.

S.No	Group	Acc.No	grams/ 100 seeds	pods/ plant (kg ha^{-1})	dry matter yield (kg ha^{-1})	grain yield (%)	harvest index
		BB14	4.50 a	42.6 a	10369 a	844 a	8.1
	I	BB7	4.30 b	31.0 b	10963 a	755 a	6.8
Mean Group I			4.40	37	10666	799	7.4
		BB2	3.86 d	16.6 e	7555 b	448 b	5.9
		BB3	3.80 d	16.3 e	6518 bc	385 bc	5.9
	II	BB4	3.65 ef	18.6 de	4740 cd	377 bcd	7.9
		BB5	4.09 c	16.6 e	7555 d	370 bcd	4.9
		BB1	3.82 d	22.3 c	5926 bcd	355 bcd	5.9
		BB6	3.58 f	20.0 cd	6222 bc	318 cde	5.1
Mean Group II			3.63	18	6419	375	5.9
		BB9	3.57 f	19.3 cde	5481 bcd	267 de	4.8
	III	BB13	3.75 de	19.3 cde	6221 bc	241 e	3.8
		BB10	3.61 ef	12.0 f	3259 d	222 e	6.8
Mean Group III			3.64	17	4987	243	5.1
LSD at 5%			0.157	3.138	2746	111.7	
	ns						

Mean values in the same column carrying similar letters do not differ significantly at 5% level of probability using LSD test.

statistically significant in blackbean germplasm. Germplasm BB14 ranked first by producing maximum grain yield of 844 kg ha^{-1}, followed by germplasm BB7 (755 kg ha^{-1}). Minimum grain yield of 222 kg ha^{-1} was recorded for BB10, followed by BB13 (241 kg ha^{-1}). It ranged from 755-844 kg ha^{-1} in group I, 318-448 kg ha^{-1} in group II, and 222-267 kg ha^{-1} in group III. Grain yield was directly proportional to maturity, plant height, branches and pods per plant. Khan *et al.* (1988) reported that grain yield showed positive association with pods per plant and negative association with days to maturity. Ramaswami and Oblisami (1984) reported positive association of grain yield with days maturity. Harvest index was statistically non-significant among blackbean germplasm. However, it varied from 3.8 (BB13) to 8.1 % (BB14). It ranged from 6.8-8.1 % in group I, 4.9-7.9 % in group II, 3.8-6.8 % in group III. Average values in groups decreased in descending order from 7.4 % in group I to 5.9 % in group II and then further decreased to 5.1 % in group III. In the overall situation 3 germplasm ranged from 3.8-4.9 %, 5 from 5.1-6.8 % and 3 from 6.8-8.1 %. Harvest index showed positive association with grain yield.

References

Ghafoor, A., M.Zubair, S.M. Iqbal and M. Bashir, 1989. Evaluation, classification and usefulness of germplasm of urdbean (*Vigna mungo* (L.) Hepper) Pakistan. J. Agric. Res., 10: 346-349.

Gupta, S.K., S. Acharya and B.S. Jamwal, 1993. Evaluation of local germplasm of Blackbean (*Vigna mungo* (L). Hepper) from Jammu. Indian J. Pulses Res., 6: 198-199.

Khan, I.A., M. Zubair and B.A. Malik, 1988. Various seed rates effect on yield and yield components in mash. Pakistan J. Agric. Res., 9: 165-167.

Pinhero, R.G., A.K.B. Latha, K.R. Lyla and A.I. Thomas, 1983. Comparative performance of blackgram varieties in Chalakudy command area. Agriculture Research Journal of Kerala.

Ramaswami, P.P. and G. Oblisami, 1984. Influence of duration of blackgram (*V. mungo* (L.) Hepper) on the harvest index among different genotypes. Madras Agric. J., 71: 246-248.

Singh, D.P. and B.L. Sharma, 1986. 'Plant-U-35'. A new variety of blackgram. Indian Farming, 36: 4.