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EFFECT OF ROW SPACING ON GROWTH, YIELD AND YIELD COMPONENTS OF MASHBEAN

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ABSRTACT

A field experiment was conducted at Agricultural Research Institute, Quetta in year 2003 to study the influence of six different row spacing i.e., 20, 25, 30, 35, 40 and 45 cm on the growth, yield and yield attributes of mashbean grown under semi-arid climate. Results revealed that except of harvest index all the parameters including growth, yield and yield components were non-significantly ($P>0.05$) influenced by various levels of row spacing. Maximum harvest index (61.44%) was obtained in row spacing of 40 cm which is statistically at par with four other spacing viz; 20, 25, 30 and 35 cm. Results further revealed that number of pods plant^{-1} (0.744) and grain yield plant^{-1} (0.888) were highly-significantly and positively correlated with grain yield. Whereas, other entries do not established any significant associations with plant grain yields. Therefore, these two traits may be exploited in selecting high yielding cultivars in mashbean.

INTRODUCTION

Mashbean (*Vigna mungo* L. Hepper) is an important pulse legume plus protein rich crop, which belongs to popular plant family papillionaceae. This is the native of India, and is well known by the names of black gram, mash kalai, and urid. The crop not only fixing free atmospheric N_2, but also enrich the soil with N for the growth of succeeding crops (Sen, 1996).

Balochistan is one of the four provinces of Pakistan by far the largest (44%) in total area of the country and the smallest in number of inhabitants (Anonymous, 1983). Based upon climate, soil and topography, province is divided into 5 ecological zones. The present field area i.e., Quetta falls in zone 4, a region with Mediterranian climate, having 15 to 30^0 N latitude and 53 to 66 ˚E longitudes (Anees, 1980). In Balochistan mash bean is grown as a kharif crop on an area of 798 hectares with a total production of 639 tones (Anonymous, 2002-03). Based on climatic conditions, researchers obtained differential response of mash bean in relation to row spacing. Singh *et al.* (1994) got seed yields of 1.13, 1.37 and 1.36 t ha^{-1} with 15, 22.5 and 30 cm row spacing. Results obtained by Davi *et al.* (1995) deciphered that grain yield was highest at 15 cm intra-row spacing. Whereas, Nagaraju *et al.* (1995) revealed that seed yield decreased with an increase in row spacing. Mehmud *et al.* (1997) indicated that increased row spacing manifested increase in the seed weight plant^{-1}, pod weight plant^{-1}, and 1000 seed weight, but decreased plant height and seed yield unit area^{-1}. Kumar *et al.* (1997) obtained the highest seed yield with row spacing of 15 cm (1.09 t ha^{-1}). However, Borah (1994), Mishra and Mishra (1995) concluded that seed yield was not affected by row spacing.

MATERIALS AND METHODS

This field experiment on mashbean *(Vigna mungo* L. Hepper) was carried out in 1st week of June, 2003 at Agricultural Research Institute, Quetta under six different row spacing i.e. 20, 25, 30, 35, 40 and 45 cm. Experiment was laid out in a Randomized Complete Block Design (RCBD) with a sub-plot size of 8 x 5 m with three replications. A composite soil sample (before fertilization) for their physicochemical characteristics was also taken at a depth of 0-6, 6-12 and 12-18 cm with the help of soil auger. Before preparing the seed bed, the field was also treated with a constant dose of Di-ammonium Phosphate (DAP) fertilizer @ 50 kg ha^{-1}. Certified seeds of mash bean (local variety) were sown with hand drill machine @ 20 kg ha^{-1} and planted at a depth of 3-4 cm. All the recommended cultural practices were equally followed to maintain a healthy crop stand in the trial. The data were recorded on growth, yield and yield components viz; plant height (cm), number of trifoliate and branches plant^{-1}, harvest index (%), pods plant^{-1}, pod length (cm), 1000 seed weight (g), yield plant^{-1} (g) and yield ha^{-1} (kg).

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Data obtained were statistically analyzed following the procedure as described by Steel and Torrie (1980). MSTAT-C computer software package was used for calculation of analysis of variance (ANOVA) and least significance difference (LSD) test for separation of mean values. Simple correlation coefficients (r) were also worked out for aforementioned entries following the procedure reported by Fisher and Yates (1953).

RESULTS AND DISCUSSION

Data presented in Table I showed that in response to different row spacing, most of the growth, yield and yield contributing components were statistically found non-significant ($P \leq 0.05$). However, harvest index was found slightly significant.

Growth

Plant Height

Results pertaining to mean separation values (Table II) showed that in response to different row spacing, the plant height values were statistically non-significant with each other. However, moderate row spacing viz., 30 and 35 cm numerically produced the highest plant height i.e., 49.89 and 49.22 cm respectively. Similar results were also obtained by Ihsanullah *et al.* (2002), but are in contradiction with those explained by Mehmud *et al.* (1997). They stated that increase in row spacing decreases the plant height in black gram.

Number of Trifoliate and Branches Plant^{-1}

Observations recorded in Table II deciphered that in respect of various row spacing, number of trifoliate and branches plant^{-1} does not significantly different from each other. However, numerically a maximum number of trifoliate (24.33) and branches plant^{-1} (3.12) were obtained with spacing of 45 cm.

Yeild

Data regarding mean values of that yield plant^{-1} and yield ha^{-1} responded insignificantly in response to various levels of row spacing (Table II). However, numerically a maximum grain yield plant^{-1} (12.73 g) and yield ha^{-1} (2516 kg) were obtained from 35 cm row spacing. Though data are statistically not significant, but there is a trend that as row spacing increases, grain yield also increases. In this respect present results to some extent are in conformity with the results obtained by some workers (Borah, 1994; Mishra and Mishra, 1995; Mehmud *et al.* 2002), but are in contradictory with the achievements observed by other research workers (Rajput *et al.* 1984; Nagaraju, 1995; Ihsanullah *et al.* 2002).

Yield Components

Pod Length

Data pertaining to mean values (Table II) showed that in relation to different row spacing, pod length have not responded significantly. However, numerically highest value for pod length (4.88 cm) was obtained for 25 cm row spacing. Therefore, maximum pod length was given by narrower row spacing, while in wider rows minimum pod length was obtained. Thus data suggests that pod length decreases by increasing the row spacing. These findings are in contradiction with the results of some researchers (Mehmud *et al.* 1997; Kumar *et al.* 1997) and are in conformation with Ihsanullah *et al.* (2002).

Harvest Index (%)

Data concerned about harvest index (Table II) predicted that it was significantly, but inconsistently influenced by varying level of row spacing. Maximum and statistically at par harvest index of 61.44, 60.71, 57.08 and 56.59% were obtained from row spacing viz; 40, 20, 45 and 30 cm, respectively. Minimum harvest index (48.76%) was provided by 25 cm row spacing. The data suggests that increased level of row spacing generally increases the harvest index. The results are also in line with the findings obtained by Shrivastav *et al.* (1996).

Pods Plant^{-1}

Data concerned about mean values (Table II) showed that different level of row spacing does not significantly influenced the total number of pods plant^{-1}. However, numerically a maximum number of 45 pods plant^{-1} was noted in row spacing of 45 cm. This is also in conformity with Mehmud *et al.* (1997) but in contrast with the results explained by Ihsanullah *et al.* (2002).

1000 Seed Weight

Data regarding 1000 seed weight (Table II) enunciated that it was not significantly influenced by different row spacing. However, heaviest 1000 seed weight (63.94 g) was recorded 25 cm row spacing. Similar results were also obtained by Ihsanullah *et al.* (2002).

Correlation

The correlation coefficient (r) studies revealed that all the growth and most of the yield contributing attributes exhibited non-significant correlation with the grain yield of mashbean. However, number of pod plant^{-1} (0.743) and yield plant^{-1} (0.888) exhibited highly significant positive correlation with their grain yield, and in future these traits may be exploited in selecting high yielding cultivars in mashbean. Number of trifoliates plant^{-1} were also having significant positive correlation with yield plant^{-1}. These results are also in corroboration with correlation studies of many researchers like Shrivastav *et al.* (1996), Garton and Sood (1996), Ghavami and Rezai (2000) and Sing and Singh (2000), but are not in association with few others (Kasundra *et al.* 1995; Mahto and Mahto, 1997; Achakzai and Kayani, 2004).

CONCLUSION

It can be safely concluded that different row spacing non-significantly influenced the growth, yield and yield components (except harvest index). However, number of pods and grain yield plant^{-1} exhibited highly significant positive correlation with grain yield ha^{-1}. Therefore, in future these agronomic traits could be exploited in selecting high yielding cultivars in mashbean.

Table I ***Analysis of variance (ANOVA) for growth, yield and yield components of mashbean during 2003***

Variable analyzed	Sum of Squares	Mean Squares	F-Values	Probabilities
1. Plant height (cm)	20.329	4.066	0.3389	ns
2. Number of trifoliate	35.706	7.141	0.3944	0.3642 ns
3. Branches plant^{-1}	0.427	0.085	0.2911	ns
4. Pod length (cm)	0.888	0.178	0.9786	ns
5. Harvest index (%)	307.899	61.579	3.4280*	0.0461
6. Pods plant^{-1}	371.993	74.399	0.2995	ns
7. 1000 seed weight (g)	87.751	17.550	0.3892	ns
8. Yield plant^{-1} (g)	24.958	4.992	0.2880	ns
9. Yield ha^{-1} (kg)	885427.111	177085.422	0.3109	ns

* slightly significant at P≤0.05 and ns stands for non-significant.

Table II ***Effect of various row spacings on the growth, yield and yield components of mashbean during 2003***

Row spacing (cm)	Plant height, (cm)	Number of trifoliate	Branches plant^{-1}	Pod length, (cm)	Harvest index (%)	Pods plant^{-1}	1000 seed weight (g)	Yield plant^{-1} (g)	Yield (kg ha^{-1})
20	47.22	22.66	3.11	4.33	60.71 a	30.00	60.57	8.51	2255
25	47.22	21.00	2.88	4.88	48.76 b	37.22	63.94	10.21	1853
30	49.89	23.55	2.99	4.50	56.59 a	36.88	56.85	10.31	1964
35	49.22	22.33	2.66	4.25	55.82 ab	38.11	61.60	12.73	2516
40	47.33	20.89	2.88	4.23	61.44 a	33.88	62.67	10.71	1987
45	47.67	24.33	3.12	4.35	57.08 a	45.00	60.72	12.15	2208
Grand Mean	48.091	22.13	2.941	4.42	56.73	36.85	61.06	10.77	2130.5
CV (%)	7.20	19.23	18.42	9.63	7.47	42.75	11.00	39.27	35.42
LSD(P≤0.05)	6.302	7.741	0.9864	0.776	7.711	28.67	12.22	7.575	1373
LSD(P≤0.01)	8.963	11.010	1.401	1.104	10.970	40.78	17.38	10.77	1953

Figures designated by no any letter(s), and or followed by the same letter(s) within a column are statistically non-significant (P≤ 0.05) using LSD test.

Table III ***Correlation coefficient (r) studies of various agronomic traits of field-grown mashbean during 2003***

Variables Number	1	2	3	4	5	6	7	8	9
1	1.000								
2	0.344 ns	1.000							
3	0.214 ns	0.784 **	1.000						
4	0.054 ns	0.041 ns	0.049 ns	1.000					
5	0.134 ns	0.597 **	0.245 ns	0.070 ns	1.000				
6	0.036 ns	0.054 ns	0.016 ns	-0.292 ns	-0.198 ns	1.000			
7	-0.182 ns	-0.657 **	-0.448 ns	-0.235 ns	-0.695 **	0.295 ns	1.000		
8	0.054 ns	0.483 *	0.060 ns	0.142 ns	0.945 **	-0.174 ns	-0.573 *	1.000	
9	-0.010 ns	0.412 ns	0.008 ns	0.224 ns	0.743 **	-0.168 ns	-0.403 ns	0.888 **	1.000

*and ** significant at P≤0.05 and P≤0.01 respectively, and ns stands for non-significant. Variables number (1) plant height, cm (2) number of trifoliate plant^{-1}, (3) number of branches plant^{-1}, (4) harvest index, %, (5) pods plant^{-1} (6) pods length, cm (7) 1000 seed weight, g (8) yield plant^{-1} g, and (9) yield kg ha^{-1}.

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