Pak. J. Agri. Sci. Vol.38(1-2), 2001

EFFECT OF DIFFERENT LEVELS OF PHOSPHORUS ON AGRONOMIC TRAITS OF TWO MASHBEAN GENOTYPES (*Vigna mungo* L.)

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A study in a sandy clay loam field to investigate the effect of phosphorus rates on the agronomic traits of two mashbean genotypes (Mash-97 and Mash-88) was conducted at the University of Agriculture, Faisalabad during 1998. The phosphorus rates were 0, 50, 7S and lOO kg P205 ha-I. Mashbean genotypes did not differ significantly regarding number of plants m-2, plant height, number of seeds pod-I, total number of seeds plant-I, lOoo-seed weight, seed yield and harvest index. However, Mash-97 gave significantly more seeds per plant than that of the Mash-88. Phosphorus application @ 75 kg ha-I gave significantly the highest seed yield of 1832 kg ha-I against the minimum of 1390 kg ha-I without phosphorus.

Key Words: mashbean, genotypes, phosphorus, agronomic traits.

INTRODUCTION

Grain legumes are an excellent and cheap source of plant protein. When eaten in combination with wheat, rice and other cereals, they provide a balanced diet for the people. Pulses are known as poor man's meet in the developing world. Being leguminous, they maintain soil fertility. Pulses are also an important source of animal feeds and their *dry* straw is used as hay.

In Pakistan, mashbean is an important grain legume crop grown on 49 thousand hectares with annual production of 25.8 thousand tonnes of grain and average yield of 526 kg ha-I (Anon., 1999). It is grown all over the country, but Punjab is the major mash producing province. There has beeq. no improvement in its productivity due to low potential of cultivars and poor nutrient management. Hence there is a need to develop varieties with high yield potential and fairly responsive to fertilizers.

Nitrogen and phosphorus are the two essential plant nutrients. Nitrogen increases vegetative growth while phosphorus favours root development, reproductive growth and fastens maturity. Moreover, it over comes the effect of excessive nitrogen. Application of N alongwith adequate amount of P improves the grain yield (Tomar , 1984). Sharma and Sing (1993) reported highest seed yield of mungbean cv. PM-2 with application of 50 kg P ha-I. However, there is need to determine the appropriate dose of phosphorus for different genotypes of mashbean recently released for general cultivation in Punjab. Consequently, the present study was planned to determine the response of two mash genotypes to phosphorus application under the agro-ecological and irrigated conditions of Faisalabad.

MATERIALS AND MEmODS

The effect of different levels of phosphorus on agronomic traits of two genotypes of mashbean (Vigna mungo L.) was studied in a sandy clay loam at University Of Agriculture, Faisalabad during 1998. Experiment waS laid out according to Randomized Complete Block Design with split arrangements. The net plot size was 1.8 m 5 m. Soil samples taken at random from the experimental plot had 0.0~9% nitrogen, 7.35 ppm available phosphorus and 125 ppm potassium. The experimental treatments comprised two mashbean genotypes (mash-88 and mash-97) in main plots and phosphorus levels (0, 50, 75 and 100 kg P205 ha-1) in subplots. Nitrogen @ 25 kg ha-I as urea was applied to all the treatments during seedbed preparation. Mashbean genotypes were sown on August 15, 1998 using a seed rate of 20 kg ha-I. Sowing was done with the help of a single row hand drill in 30 cm spaced rows. Just after sowing, the whole P205 as triple super phosphate in the respective treatments was drilled in between the rows. The crop was thinned 8 days after the completion of germination maintaining a plant to plant distance of about 6 cm. Hoeing with the help of kasula to control the weeds was done, only once, three weeks after sowing. Three irrigations were given to mature the crop which was harvested on November 4, 1998. Observations on different agronomic traits were recorded using standard procedures. The data were analysed Statistically by using Fisher's analysis of variance technique and Least significant difference (L.S.D.) test was applied to compare the differences among treatment means (Steel and Torrie, 1984).

RESULTS AND DISCUSSION

Number of plants m^{-2}

Plant density per unit area (Table 1) remained statistically non-significant for both the genotypes. However, the plant density on an average varied from 41.75 to 41.87 m-2.

The levels of phosphorus had non-significant effect on plant density at harvest and No. of plants ranged between 41.50 and 42.37 m-2.

Plant height

Mash-97 produced taller plants (43.87 cm) than mash-88, (43.69 cm). This slight difference in plant height may be due to variability in growth pattern of the genotypes. The plant height was not affected significantly by phosphorus levels and varied from 43.23 to 44.04 cm.

Number of seeds pod-!

Both mashbeaa genotypes produced statistically similar number of seeds per pod which varied from 5.56 to 5.74. The phosphorus treatments also had no significant effect on number of seeds per pod which on the average varied from 5.49 to 5.74. The similar results have been reported by Ali (1993) that number of seeds pod-l were significantly affected by phosphorus level up to 84 kg P2 05 ha-I.

Total number of seeds plant-¹-

Greater number of seeds .per plant (83.48) was recorded for mash-s? than mash-88. Statistically the highest number of seeds per plant (87.58) was obtained with the application 75 kg P205 ha-I which was at par with that obtained with 100 kg ha-I.. The lowest number of seeds per plant (70.28) was recorded without phosphorus application. The variability in number of seeds per plant in mashbean genotypes might be attributed to their genetic variability. These results are in conformity with those of Ali (1993).

lOOO-Seedweight

There was non-significant differences in 1000-seed weight of mashbean genotypes. However, mash-97 produced more 1000-seed weight than mash-88. Statistically the highest 1000-seed weight (49.46 g) was obtained with phosphorus @ 75 kg ha-I which was at par with 100 kg ha-I. The lowest 1000-seed weight (44.83 g) was recorded with *put* phosphorus application. These results are in harmony with the findings of Ali (1993) who observed that 1000-seed weight was significantly affected by application of 84 kg P2 05ha-I..

Seed yield

There was non-significant difference in seed yield of mash bean genotypes (Table 1). However, Mash-97 yielded higher (1718 kg ha-I) than Mash-88 (1621 kg ha-I). The crop fertilized with 75 kg P205 ha-I gave significantly higher seed yield (1832 kg ha-I) than all the other treatments except 100 kg P205 ha-I.. The lowest seed yield (1390 kg ha-I) was obtained from control treatment. The differences in seed yield among the different phosphorus levels might be due to their variable effects on seed yield components. Similar results were reported by Rao et al., (1990) and Sing and Tripathi (1992). They concluded that application of 40-60 kg P2 05 ha-I increased the seed yield up to 916 kg ha-I.

Harvest index

The harvest index of both the cultivars was statistically the same which varied from 32.10 to 32.58 %. Non-significant differences might be attributed to non-significant variation in biological yield and seed yield. The harvest index in response to phosphorus differed significantly from one another. The harvest index (34.76 %) for 75 kg P205 ha-l was significantly higher from that of 50 kg P205 ha-I but was statistically at par with the 100 kg ha-I. However, the lowest harvest index (29.22 %) was recorded for the control treatment.. The differences in the harvest index among the phosphorus treatments might be due to differences in their biological yield and seed yield. These results are in conformity with the findings of Sudhakar et al. (1989) who reported that the application of 20-40 kg P2 05ha-l increased the harvest index.

Conclusion

Maximum seed yield of autumn sown mashbean under the agro-ecological conditions of Faisalabad on sandy clay loam soil can be achieved with the application of 75 kg P205 ha-I. Variety mash-97 proved better than Mash-88 for seed yield ha-I.

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Table 1. Effect of pbospborus on tbe yield and yield components of masbbean

Treatment	Plants m? (No.)	Plant height (an)	Seed pod:'-	Total no. of seeds plant!	l000-seed weight (g)	Seed yield (kg ha'')	Harvest III:Jex ("10)
A: Genotypes (V)							
Mash-88	41,75	43.69	5.S6	76.94b'	47.24	1621	32.58
Mash-97	41,87	43.87	5.74	83.483	·47.42	1718	32.10
LSD	NS	NS	NS	••	NS	NS	NS
B: Phosphorus (F)							
Control 41,50	43.23	5.49	70.28c	44.83c	l390c	29.22c	
50 kg P205	41,75	43.93	5.69	78.04b	45.77b	163Sb	32.75b
75 kg P205	41,62	43.90	5.74	87.5Sa	49.400	1832a	34.700
100 kg P205	42.37	44.04	5.71	84.94a	49.200	1820a	34.62a
LSD	NS	NS	NS	••	••	••	••