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Effect of Sowing Dates and Planting Patterns on Growth and Yield of Mungbean (*Vigna radiata* L) cv. M-6

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ABSTRACT

A field study was carried out to evaluate the effects of sowing dates (3rd week of June ,1st week of July & 3rd week of July) and planting patterns (30 cm apart flat sowing, 30 cm apart ridge sowing & 20 cm apart bed sowing 40 cm wide beds) on growth and yield of mungbean. The results revealed that higher number of pods per plant, number of grains per pod, 1000-grain weight and harvest index were produced by 3rd week of July and 20 cm apart 40 cm wide beds. Similarly maximum biological and grain yield (4530.86, 1259.26 kg ha^{-1}) was produced by 3rd week of July and in case of planting pattern maximum biological and grain yield (4302.47, 1117.28 kg ha^{-1}, respectively) was produced by 20 cm apart 40 cm wide beds.

Key Words: Mungbean; Sowing dates; Planting patterns; Yield and yield components

INTRODUCTION

Mungbean (*Vigna radiata* L.) commonly known as green gram is an important pulse crop in many Asian countries including Pakistan, where the diet is mostly cereal based. It's per hectare yield is very low as compared with the yield potential of existing cultivars. Various factors responsible for low yield of mungbean at the farmer's field are: un-awareness of farmers about optimum date of sowing, improper planting patterns, insufficient plant protection measures and imbalanced use of fertilizers. Among these factors, proper sowing time and planting patterns are of great importance. Early sowing invites a large number of insect pests and diseases, while late sowing fetches lesser grain yield due to short growing season and ultimately lesser accumulation of photosynthates (Quresh & Rahim, 1987). Increase in yield can be ensured simply, by maintaining appropriate plant population through different planting patterns. Planting pattern influences radiation interception and utilization of moisture from soil (Rehman, 2002). Broadcasting is still the principal method of mungbean raising, which is one of the major yield limiting factor. It is well documented that line sowing in appropriate rows is the best strategy for higher production (Ansari *et al.*, 2000).

The present study was conducted to determine a suitable sowing time and planting pattern for higher mungbean production under agro-climatic conditions of Faisalabad (Pakistan).

MATERIALS AND METHODS

The experiment was conducted during kharif season 2003 - 04 at the Agronomic Research Area, University of Agriculture, Faisalabad. Randomized complete block design (RCBD) in split plot arrangement was used to carry out the experiment, randomizing the sowing dates in main plots and planting patterns in subplots. The experiment was replicated thrice maintaining a net plot size of 1.8 m x 5.0 m. The experiment was comprised of the following treatments D_1 = 3rd week of June, D_2 = 1st week of July and D_3 = 3rd week of July and P_1 = 30 cm apart flat sowing, P_2 = 30 cm apart ridge sowing and P_3 = 20 cm apart 40 cm wide beds. A basal dose of fertilizer @ 30 kg N and 60 kg P_2O_5 ha^{-1} was side drilled immediately after seeding.

All other practices were kept normal in all plots as per recommendations. By thinning plant to plant distance was kept at about 10 cm. At maturity, data for number of plants m^{-2}, number of pods per plant, number of grains per pod, 1000-grain weight, biological yield, seed yield and harvest index were recorded by following the standard procedures. Analysis of variance technique was employed to analyze the data. Differences among the treatment means were compared using least significant difference (LSD) at 5% probability level (Steel & Torrie, 1984).

RESULTS AND DISCUSSION

The results of analysis of variance (Table I) revealed that number of plant m^{-2} was significantly affected by sowing dates; whereas, planting patterns had non-significant effect. Their interaction had no effect on number of plants m^{-2}. Maximum plants (28.15) were recorded in 3rd week of July, which is statistically at par with 1st week of July (27.66).

These results confirm the findings of Steele and Grabau (1997), who observed low initial stands of plants in early sowing. In case of interactions (D x P) though non-significant but maximum number of plants per m^2 29.63 were recorded at (D_3 x P_3). The probable reason for this might be due to mortality of plants caused by heavy rains and Yellow Mosaic Virus.

Sowing dates and planting patterns had significant effect on number of pods per plant and their interaction had non-significant effect. Maximum number (34.58) of pods plant^{-1} was recorded for those plots grown on 3rd week of July. These results are quite similar to the findings of Gebolghu *et al.* (1996), who reported higher number of pods per plant in late sowing as compared to early sowing. In planting pattern maximum number of 30.40 pods plant^{-1} was recorded in 20 cm apart 40 cm wide beds followed by 29.20 in 30 cm apart ridge sowing. These results are quite in line with the findings of Rajput *et al.* (1984), who reported that number of pods per plant was significantly affected by planting geometry. All the sowing dates showed significant effect for number of grains per pod. Maximum number (11.17) of grains pod^{-1} was observed in D_3 treatment against the minimum number (8.52) of grains pod^{-1} in D_1 treatment. This might be due to decrease vegetative growth and increased reproductive growth, which favored the number of grains pod^{-1}. These results are in support of Kil *et al.* (1998).

However, in case of planting patterns the number of grains pod^{-1} for P_3 treatment (20 cm apart on 40 cm wide beds), P_2 treatment (30 cm apart ridge sowing) and P_1 treatment (30 cm apart flat sowing) were 10.17, 9.82 and 9.38, respectively which were significantly different from one another. The results are in line with those of Khan *et al.* (2001) in case of mungbean, who reported that different planting and row spacings significantly affected the number of grains pod^{-1}. Interaction between the sowing dates and planting patterns (D x P) was found to be non-significant.

Sowing time treatments showed that D_3 (3rd week of July) gave the maximum 1000-grain weight (44.88 g) against the minimum 1000- grain weight (36.56 g) in D_1 (3rd week of June). This may be the result of short vegetative period of growth and comparatively long reproductive and grain filling period, which significantly raised 1000- grain weight. These results are supported by that of Heatherly (1988) in case of soybean, who reported that average seed weight from irrigated late planting was greater than that from irrigated early planting. Similarly, maximum 1000-grain weight (41.77 g) was recorded in P_3 treatment (20 cm apart 40 cm wide beds) as compared to P_2 treatment (30 cm apart ridge sowing) having (40.76 g) and P_1 treatment (30 cm apart flat sowing), which produced 39.61 g. These results are in line to the findings of Younas (1993), who viewed that planting patterns have a significant influence on 1000- grain weight.

Biological and seed yield show similar behaviour and was significantly affected by different sowing dates and planting patterns, while their interactions had no significant effect on biological and seed yield (Table I). Maximum biological yield of 4530.86 kg ha^{-1} and seed yield of 1259.26 kg ha^{-1} was recorded in 3rd week of July. These results are contradictory to those of Quresh and Rahim (1987), who found that earlier planting gave significantly higher mean biological yield. The probable reason for this might be the less plant population in early sowing and heavy rains, which adversely affected the mungbean production.

In case of planting pattern, maximum biological yield

Table I. Results of Analysis of Variance For various traits

Sourses of variation	df	F-value No. of plants m^{-2}	No. of pods plant^{-1}	No. of grains pod^{-1}	1000-grain weight (g)	Biological yield (kg ha^{-1})	Seed yield (kg ha^{-1})	Harvest index (%)
Replications	2	2.01	0.44	3.8	34.91	0.08	2.28	2.59
Factor A (sowing dates)	2	30.23**	1033.25**	1204.21**	2576.57**	220.59**	569.75**	220.95**
Error-I	4							
Factor B (planting patterns)	2	1.05^{ns}	18.04**	55.16**	49.58**	9.23**	17.19**	5.21*
D x P	4	0.17^{ns}	0.36^{ns}	0.39**	1.49^{ns}	0.28^{ns}	0.48**	0.59^{ns}
Error II	12							

** Significant at 1% level of probability * significant at 5% level of probability ns Non-significant

Table II. Effect of sowing dates and planting patterns on growth, yield and yield components

Treatments	No. of plants m^{-2}	No. of pods plant^{-1}	No. of grains pod^{-1}	1000-grain weight (g)	Biological yield (kg ha^{-1})	Seed yield (kg ha^{-1})	Harvest index (%)
Sowing dates							
D1=3rd week of June	19.88 b†	22.42 c	8.52 c	36.56 c	3598.76 c	814.81 c	22.63 c
D2=1st week of July	27.66 a	30.96 b	9.69 b	40.71 b	4339.51 b	1098.77 b	25.31 b
D3=3rd week of July	28.15 a	34.58 a	11.17 a	44.88 a	4530.86 a	1259.26 a	27.78 a
Planting patterns							
P1=30cm apart flat sowing	24.82	26.36 c	9.38 c	39.61 c	3981.48 c	993.83 c	24.76 b
P2=30cm apart ridge sowing	24.82	29.20 b	9.82 b	40.76 b	4185.19 a	1061.73 b	25.20 ab
P3=20cm apart 40cm wide beds	26.05	30.40 a	10.17 a	41.77 a	4302.47 a	1117.28 a	25.76 a
Interaction among all the treatments for all parameters mentioned above is non-significant.							

† = Means not sharing a letter in common in a column differ significantly at 0.05 probability

of 4302.47 kg ha^{-1} and seed yield of 1117.28 kg ha^{-1} was recorded in 20 cm apart 40 cm wide beds followed by biological yield of 4185.19 kg ha^{-1} and seed yield of 1061.73 for 30 cm apart ridge sowing. These results are in accordance with the results of Khan *et al.* (2001), who found that planting geometry had significant effect on both biological and seed yield. Maximum biological yield and seed yield produced in P_3 treatment might be due to better availability of mineral nutrients over flat sowing, which produced minimum biological yield and seed yield.

Similar behavior is also observed in the harvest index because it is the ratio between the seed yield and the biological yield. Maximum of 27.78 harvest index was recorded for 3rd week of July followed by 25.31 in 1st week of July. This might be the result of short vegetative period of growth and comparatively long reproductive and grain filling period, which significantly raised this character. Seijoon *et al.* (2000) also found similar results and suggested that the increased harvest index with late sowing could be related to high assimilate use efficiency due to increased sink capacity; whereas, in planting pattern maximum of 25.76 harvest index was recorded for 20 cm apart on 40 cm wide beds. In interaction maximum number harvest index of 28.12 was recorded at (3rd week of July x 20 cm apart 40 cm wide beds), while minimum of 22.05 harvest index was recorded for (3rd week of June x 30 cm apart flat sowing). Hussain (2003), who found that sowing methods affected the harvest index and maximum harvest index was recorded with bed sowing.

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