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Response of Mungbean Cultivars to Different Seeding Densities at Dry Land Conditions

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Abstract: Significant differences in the five cultivars of mungbean namely NM-92, NM-19-19, NM-121-25, N-41 and a local were observed in all the characters studied. Cultivar NM-121-25 had maximum: number of pods plant^{-1} (18.18), grain pod^{-1} (9.79), harvest index (16.87%) and grain yield kg ha^{-1} (466) and minimum shattering (3.5%). Seed rate of 10 kg ha^{-1} had maximum: pods plant^{-1} (19.70), grain pod^{-1} (10.40), harvest index (22.01) and minimum Shattering of 4.55%, but lowest grain yield of 413 kg ha^{-1} mainly because of substandard plant population. Seed rate of 20 kg ha^{-1} seems optimum as it although ranked second in all traits studied here but gave highest grain yield of 486 kg ha^{-1} and could be due to the most desirable population in the existing environment.

Key words: Mungbean, pods, cultivars, seed rate, harvest index

Introduction

Mungbean (*Vigne radiate* L. Welczek) is among those crops which are grown on light soils having marginal fertility and very low moisture availability. Some cultivars are not able to survive when grown on dry land, while other can withstand the adverse condition mainly because of its genetic makeup, although the gap between potential yield and actual yield widens. Yield of 1200-1500 kg ha^{-1} due to promising cultivars of mungbean have been reported by Pahlwan and Hussain (1983) from Bangladesh and Muthoka and Shakoor (1987) from arid zone of Kenya against our national average yield which is less than 1/3rd of the above values. These studies have indicated that choosing of cultivars according to the prevailing condition of environment can substantially increase yield per unit area.

Among crop management practices seeding densities or plant population greatly affect crop growth and finally yield. Therefore the flexibility and yielding ability of the cultivars can be assessed by using different seed densities. Using high seed rate on dry land leads to total failure of the crop because it impose further stress of moisture due to dense population just at germination or emergence stage, while in case of lower seed rate, substandard population is the major cause of low yield, although all other yield components or characters are in favor of high yield. Increase in yield with increase in plant population from 200,000 to 800,000 ha but decrease in number of pod plant^{-1} in wet season have been reported by Pookpakdi and Pataradilok (1993). Singh and Singh (1990) found no change in grain yield in range of 400,000-600,000 plant population ha^{-1}. Panwar and Sirobi (1987) observed increase in yield with increase in plant population from 150,000 to 300,000 ha^{-1} but yield plant^{-1}, number of pod plant^{-1} decreased in all the four cultivars tested.

Realizing the importance of mungbean as cheep source of protein as pulse and acclimatized to rainfed area, the present experiment was designed to evaluate the five cultivars (including one local), using different seed rate at dry land condition, on sandy soil with aim to determine optimum seed rate and select th'b best cultivars.

Materials and Methods

The Experiment was laid out in Randomized Complete Block (RCB) design with split plot arrangement replicated four times. Cultivars were allotted to main plot while seed rates were allotted to subplot. The subplot size was 4 m × 1.8 m having six rows with row to row distance of 30 cm. N arid P were applied at rate of 25 and 60 kg ha^{-1} as basal dose before sowing. Sowing was done on 17th July 1998 on proper moisture on the onset of monsoon season. The data were recorded on number of pods plant^{-1}, number of grains pod^{-1}, shattering percentage, grain yield (kg ha^{-1}),1000-grain weight (g) and harvest index (%). The cultivars used were: NM-92, NM-19-19, NM-121-25, N-41 and Local having a seed rate of 10, 20, 30 and 40 kg ha^{-1}. The observation recorded were statistically analyzed according to the method appropriate for RCBD with split plot arrangement. Least significant test was applied to test the significance at 5% probability level, The experiment was carried out at Ahmadwala Research Station Karak during summer, 1998 which is located at an elevation of approximately 600 meter. The climatic data of the current growing season is given in Table 1.

Results and Discussion

Mean values for number of pods plant showed (Table 2) significant variation among cultivars. Cultivars NM- 121-25 had maximum number of pods plant^{-1} (18.18) while cultivar N-41 had minimum number of 13.68 pod plant^{-1}. Significant differences in number of pods plant among cultivars have been reported by Khalil *et al.* (1987). Number of pods plant^{-1} significantly decreased with increase in seed rate (Table 2). Maximum of 19.70 pods plant^{-1} were noticed in plot seeded at the rate of 10 kg ha^{-1} as compared with the plots seeded at the rate of 20 kg, 30 kg and 40 kg per hectare. The plots with lower seed rate produced more pods plant^{-1} was

Table 1: Meteorological Data recorded at Agricultural Research Station Ahmedwala Karak during summer (July 1998 to October 1998)

Month	Temperature (°C) Mean		Humidity (%) Mean		
	Maximum	Minimum	Maximum	Minimum	Rainfall (mm)
July 1998	36.16	27.00	83.00	48.00	147.2
August 1998	35.90	27.80	84.60	47.80	74.6
September 1998	33.70	23.00	83.00	46.20	53.6
October 1998	31.00	18.00	92.00	49.00	8.0

Table 2: Number of pod plant^{-1}, grains pod^{-1}, shattering %, grain yield kg ha^{-1}. 1000 grain weight(g) and harvest index (%) as affected by cultivars ana seed rate kg ha^{-1} on dry land conditions

Cultivars	#Pods Plant^{-1}	# grains Pod^{-1}	Shattering	Grain Yield (kg ha^{-1})	1000 grain weight (g)	Harvest Index (%)
NM-92	14.75 bc	8.04 b	5.44 h	432.0 b	26.00 c	16.36 b
NM 19-19	16.00 b	8.40 b	5.75 b	428.0 b	26.18 c	16.25 b
NM 121-25	18.18 a	9.79 a	3.50 c	446.0 a	28.75 a	16.87 a
N-41	13.68 c	8.01 b	9.34 a	410.0 c	24.94 d	15.38 c
LOCAL	15.81 h	8.28 b	5.94 b	432.0 b	27.19 b	16.306
LSD	1.017	0.672	1.072	7.613	0.999	0.508
Seed Rate (kg ha^{-1})						
10	19.7 a	10.14 a	4.55 d	413.0 c	30.70 a	22.01 a
20	17.10 b	9.55 b	5.15 c	486.0 a	28.30 b	18.80 b
30	14.55 c	7.69 c	6.45 b	432.0 b	25.35 c	14.27 c
40	11.40 d	6.63 d	7.85 a	384.0	22.10 d	9.84 d
LSD	1.487	0.507	0.569	5.25	0.754	0.324

Means followed by different letters are significantly different as 5% probability level

probably due to vigorous growth, more branches per plant which resulted in more pods plant^{-1}. Similar results were also obtained by MacKenzie *et al*. (1975) who reported that number of pods per plant in mungbean decreased with increase in plant density. Panwar and Sirobi (1987) also reported that by increasing plant density in all cultivars, yield plant^{-1}, number of pods plant^{-1} decreased in all cultivars.

Number of grains pod were significantly different among cultivars. Means values for number of grains pod^{-1} showed that cultivar NM-121-25 had produced more number of grains pod^{-1} (9.79) as compared with others and is supported by Khalil *et al.* (1987) who also found significant variations in number of grain pod^{-1} while comparing different cultivars. The effect of seed rate on grains pod^{-1} was also significant. It can be seen from Table 2 that increasing seed rate there was decrease in grains pod^{-1}. Highest seed rate produced significantly less number of grains per pod (6.63) as compared to lowest seed rate (10.14). The reduction in number of grains per pod in higher seed rate may be due to higher number of plants per unit area where competition for nutrients, space and moisture was very tense as compared with lower seed rate. Similar results were also recorded by Bonari and Macchia (1975) who reported that percent seed set decreased with increasing planting density.

Shattering is one of the serious problem in Mungbean which adversely effect crop yield, was also significantly affected by both the cultivars and seed rates. In case of cultivars N-41 showed highest percentage of shattering (9.34%) while NM-121-25 showed less percentage of shattering (3.50%) may be due to the inherited character of the cultivars. Seed rate had significant effect on shattering%. Increasing the seed rate there was corresponding increase in shattering. Seed rate of 10 kg ha^{-1} had minimum shattering of 4.55% against a shattering of 7.85% in case of 40 kg ha^{-1}. Higher percentage of shattering in case of higher seed rate, while low shattering percentage at low seed rate may be due to the stronger plants in low seed rate plants while in high seed rate plots the plants were tall and weak and therefore were riot able to support Pods for a longer time.

Cultivars in grain yield were also statistically significant. Cultivar NM-121-25 had produced the maximum grain yield of 446 kg ha^{-1}, while minimum grain yield was recorded in cultivar N-41 (410 kg ha^{-1}). Significant differences in yield of cultivars have been reported by Sayao *et al.* (1991). Duque and Pessanha (1990), Yadav and Warsi (1988); Singh and Singh (1990) and Jain *et al.* (1988). As for as the seed rate is concerned, the plots seeded at the rate of 20 kg ha^{-1} had produced maximum grain yield of 486 kg ha^{-1} (Table 2) followed by seed rate of 30 kg ha^{-1}. Minimum grain yield was obtained where maximum seed rate of 40 kg ha^{-1} was used (384 kg). A seed rate of 10 kg ha^{-1} although produced more number of pods plant^{-1}, more number of grains pod^{-1} and 1000 grain weight but its grain yield kg ha^{-1} was not maximum and this was most probably due to substandard plant population while lowest seed yield at the highest seed rate (40 kg ha^{-1}) was due to very dense population. Seed rate of 20 kg ha^{-1} gave maximum grain yield and could be due to the tact that all the requirements of the plants were adequately met as compared with densely populated as in case of 30 or 40 kg seed rate. Similar results were also obtained by Bonari and Macchia (1975) and Panwar and Sirobi (1987) who found that seed yield decreased with increasing plant density.

Data recorded on 1000 grain weight is presented in Table 2 which showed seed weight was significantly affected by cultivars and seed rate. Maximum 1000 grain weight of 28.75 gram was noticed in cultivar NM 121-25 while minimum of 26.0 gram in case of cultivar NM-92. Seed weight significantly decreased with increase in seed rate as seed rate of 10 kg ha^{-1} had maximum grain weight of 30.70 gram against minimum weight of 22.10 gram at seed rate of 40 kg ha^{-1}.

Maximum harvest index of 16.87% was recorded in mungbean cultivar NM-121-25 and minimum in N-41 (15.38%). This may be due to the fact of maximum grain yield produced by cultivar NM-121-25 and minimum grain yield by N-41 and harvest index is the ratio of grain yield to biological yield and those cultivars which had more grain and less biological than other would have higher harvest index. Significant differences in harvest index among different cultivars have been reported by Malik *et al.* (1986). Low seed rate of 10 kg ha^{-1} had produced maximum harvest index of 22.01% while higher seed rate of 40 kg ha^{-1} had produced minimum harvest index of 9.84% (Table 2). This is due to the fact that in case of low seed rate grain yield was higher and biological yield was less as compared to higher seed rate where grain yield was low and biological yield was maximum. As harvest index is positively correlated with grain yield and negatively correlated with biological yield, therefore harvest index was higher in low seed rate and minimum in high seed rate. Similar results were also obtained by Malik *et al.* (1986) who reported that harvest index was correlated positively with seed yield and negatively with biological yield.

References

Bonari, E. and M. Macchia, 1975. Effect of plant density on yield of bean (*Vicia faba*) minor, spacing back. Indian J. Plant Physiol., 204: 119-121.

Duque, F.F. and G.G. Pessanha, 1990. [Behavior of ten mung bean cultivars during the rainy and dry seasons in field conditions]. Pesquisa Agropecuaria Brasileira, 25: 963-969, (In Portuguese).

Jain, V.K., Y.S. Chauhan and M.P. Khandekar, 1988. Effect of genotype and row spacing on yield and quality of mungbean. Indian J. Pulses Res, 1: 134-139.

Khalil, S.K., S. Rehman, K. Rehman and K. Afridi, 1987. Interrelationship studies among yield and yield attributing parameters in mungbean cultivars. Sarhad J. Agric., 3: 9-15.

MacKenzie, D.R., N.C. Chen, T.D. Liu, H.B.F. Wu and E.B. Oyer, 1975. Response of mungbean (*Vigna radiata* (L.) Wilczek var. *radiata*) and soybean (*Glycine max* (L.) Merr.) to increasing plant density. J. Am. Soc. Hort. Sci., 100: 579-583.

Malik, B.A., M. Tahir, S.A. Hussain and A.H. Choudhary, 1986. Identification of physiologically efficient genotypes in mungbean. Pak. J. Agric. Res., 7: 41-43.

Muthoka, M.S. and A. Shakoor, 1987. Mungbean improvement and production in semiarid areas of Kenya. Proceedings of the 2nd International Symposium on Mungbean, November 16-20, 1987, Bangkok, Thailand.

Pahlwan, A.A. and M.A. Hussain, 1983. Performance of five strains of mungbean (*Vigna radiata*) sown during the Kharif season. Bangladesh J. Agric. Res., 8: 32-36.

Panwar, J.D.S. and G.S. Sirobi, 1987. Studies on the effect of plant population of grain yield and its components in mungbean. Indian J. Plant Physiol., 30: 412-414.

Pookpakdi, A. and H. Pataradilok, 1993. Response of genotypes of mungbean and blackgram to planting dates and plant population densities. Kasetsart J. Nat. Sci., 27: 395-400.

Sayao, F.A.D., P.S.T. Brioso and F.F. Duque, 1991. [Behavior of mungbean strains in field conditions at Itaguai, Rio de Janeiro]. Pesquisa Agropecuaria Brasileira, 26: 659-664, (In Portuguese).

Singh, C.P. and H.P. Singh, 1990. Response of mungbeans to plant population and planting pattern. Narendra Deva J. Agric. Res., 5: 122-124.

Yadav, M. and A.S. Warsi, 1988. Performance of summer planted mungbean in relation to irrigation and plant-density. Indian J. Agron., 33: 19-21.