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Research Communication

Effect of sowing dates and varieties on growth, yield and nutrient uptake of summer mungbean (*Vigna radiata*)

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ABSTRACT

An experiment was conducted during the summer of 2013 at Jammu, Jammu and Kashmir, to study the effect of sowing date and variety on growth, yield and nutrient uptake of mungbean [*Vigna radiata* (L.) Wilczek]. The experiment was laid-out in a split-plot design, consisting of 4 sowing dates (20 March, 5 April, 20 April and 5 May) as main-plot treatments and 4 varieties 'SML 668', 'Samrat', 'Meha' and 'IPM 02-3' as subplot treatments, with 3 replications. Among the sowing dates, the highest grain yield (0.93 t/ha) of summer mungbean was recorded when the crop was raised on 20 March, which was statistically at par with 5 April, but significantly higher than 20 April and 5 May. Among the mungbean varieties, the highest grain yield was observed in 'Samrat', being statistically at par with 'SML 668' and significantly superior to 'IPM 02-3' and 'Meha'. The sowing dates and varieties had significant influence on the pods/plant, grains/pod and 1,000-seed weight. The highest pods/plant (17.3), grains/pod (7.3) and 1,000-seed weight (37.8 g) were obtained with 20 March sowing, which was significantly higher than that obtained with 5 May sowing. Among the varieties, the maximum pods/plant (16.6) were recorded with 'IPM 02-3', being statistically at par with 'Samrat'. However, the highest grains/pod (7.4) were with 'Samrat' which was at par with 'SML 668'. The growth parameters, viz. plant height, dry-matter accumulation and leaf-area index, were increased with the delay in sowing from 20 March to 5 April. The protein content in grain was not influenced by sowing dates and varieties.

Key words : Growth, Quality, Sowing dates, Summer-mungbean, Varieties, Yield

Pulses are the main source of protein, particularly for vegetarians and contribute about 14% of the total protein of an Indian average diet. In Jammu and Kashmir, the area under pulses is 28.91 thousand hectares with production of 162 thousand quintals (DES, 2012). Mungbean is one of the most important pulse crops in India and ranks third after chickpea and pigeonpea. India ranks first in the world concerning area as well as production of mungbean. In India, mungbean occupies 3.38 million hectares area and contributes to 1.61 million tonnes in pulse production (DES, 2015). It is considered to be the hardiest among all pulse crops. It is primarily a rainy-season crop but it is also suitable as a summer crop under irrigated conditions. The agro-climatic conditions of sub-tropical plains of Jammu division can provide an option of growing summer-season mungbean. Among the various production practices, sowing date and varieties are considered as the important factors which are having the vast potential to explore the maximum yield. Since no work has been done in this direction in sub–tropical climatic conditions of Jammu region in particular, it became imperative to identify suitable sowing dates and varieties, of summer mungbean.

The field experiment was conducted during the summer season of 2013 at research farm, Division of Agronomy, Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu, Chatha. The soil of experimental field was sandy clay loam, having initial *p*H 7.38, organic carbon (3.9 g/kg) and available N, P and K of 215.7, 16.26 and 172.2 kg/ha, respectively. The experiment was laid-out in a split–plot design, consisting of 4 sowing dates (20 March, 5 April, 20 April and 5 May) as main-plot treatments and 4 varieties 'SML 668', 'Samrat', 'Meha' and 'IPM 02-3' as subplot treatments, with 3 replications. All agronomic practices were except those under study were kept uniform for all the treatments. All the necessary ob-

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servations were recorded as per the established norms. Data obtained from the experiment were subjected to statistical analysis by following Analysis of variance technique as suggested by Panse and Sukhatme (1985).

Significantly higher plant height was observed 60 days after sowing (DAS), with 20 April and 5 May sowing dates than 20 March and 5 April (Table 1), which might be owing to the favourable environment like rainfall at later sowing dates. Similar findings were reported by Miah *et al*. (2009). Non-significant variation in plant height was recorded by different varieties which may be attributed to genetic character of the variety (Tomar and Tiwari, 1991). Increase in leaf-area index was noticed when sowing delayed from 5 April. This might be because of better vegetative growth due to abundant rainfall and utilization of more heliothermal units at later stages in delayed sowings. The variety Meha recorded the highest leaf-area index. Higher nodules/plant were observed with early dates of sowings (20 March, 5 April and 20 April) than delayed date of sowing (5 May) which might be because of favourable dry weather for a longer period at early sowing dates. Similar differences among sowing dates with respect to nodules were observed by Ram *et al*. (2011). Among the varieties, the variety 'Meha' produced significantly highest nodules/plant as compared to 'SML 668', 'Samrat' and 'IPM 02-3'.

The 20 March sowing produced maximum pods/plant, which was statistically at par with sowing date 5 April and significantly superior to 20 April and 5 May (Table 1). This was owing to favourable environmental conditions and better partitioning of photosynthates between pod formation and growth at early sowing date. At later dates of sowings, pod-formation stage coincided with rainfall events, resulting in poor pod formation. These results confirm the findings of Rabbani *et al.* (2013). Among the varieties, 'IPM 02-3' recorded the maximum pods/plant which was statistically at par with variety 'Samrat' and significantly superior to 'Meha' and 'SML 668'. The crop sown on 20 March produced significantly higher grains/pod which was statistically at par with 5 April and 20 April (Table 1). At 5 May sowing date, grain formation stage coincided with rainfall events, resulting in simultaneous vegetative and reproductive growth causing poor grain formation. Similar differences among sowing dates were observed by Singh *et al.* (2012). Among the different mungbean varieties, 'Samrat' produced higher grains/pod which was statistically at par with SML 668 and significantly superior to 'Meha' and 'IPM 02-3' (Table 1). The highest 1,000-seed weight was observed with 20 March sowing date which was statistically at par with sowing dates 5 April and 20 April (Table 1). This might be owing to favourable environmental conditions, resulting increased translocation of photosynthates towards grain at these sowing dates. 'SML 668' with 43.93 g test weight recorded its significant superiority to all the other varieties. The highest grain yield was recorded when sown on 20 March, which was statistically at par with 5 April and significantly superior to sowing dates 20 April and 5 May sowing. The more yield-attributing characters at 20 March and 5 April sowing dates, contributing the higher yield. Among the different mungbean varieties, the highest grain yield was observed in Samrat, which was statistically at

Table 1. Effect of sowing dates and varieties on growth parameters and yield attributes of summer mungbean

Treatment	Plant height at 60 DAS (cm)	Leaf area index at 60 DAS	Dry-matter accumulation at 60 DAS (g/plant)	Root nodules/plant at post-flowering	Pods/ plant	Grains/ pod	Pod length (cm)	1,000-seed weight (g)
Sowing date								
20 March	44.0	3.6	6.6	37.0	17.3	7.3	8.3	37.8
5 April	45.8	3.8	6.9	36.4	16.6	7.1	8.3	37.3
20 April	51.0	4.5	7.1	36.4	12.3	7.0	7.9	37.1
5 May	51.6	5.3	7.3	35.9	9.3	5.5	7.0	34.4
SEm±	1.3	0.1	0.3	0.5	0.4	0.2	0.2	0.7
CD (P=0.05)	4.6	0.4	NS	NS	1.2	0.7	0.6	2.3
Variety								
'SML 668'	47.3	4.2	6.9	36.4	10.3	7.1	8.3	43.9
'Samrat'	46.5	4.1	6.5	35.3	15.8	7.4	8.5	33.3
'Meha'	49.5	4.5	7.3	39.0	12.8	6.8	8.1	34.0
'IPM 02-3'	49.1	4.3	7.1	35.0	16.6	5.5	6.6	35.4
SEm±	1.1	0.1	0.2	0.3	0.3	0.2	0.2	0.5
CD (P=0.05)	NS	0.3	NS	0.9	1.0	0.5	0.5	1.4

Table 2. Effect of sowing dates and varieties on yield attributes and yield of summer mungbean

Treatment	Grain yield (t/ha)	Stover yield (t/ha)	Protein (%)	Total nutrient uptake (kg/ha)		
				N	P	K
Sowing date						
20 March	0.93	2.51	21.6	68.8	7.4	50.1
5 April	0.92	2.53	21.2	67.6	7.1	49.2
20 April	0.71	2.79	21.1	62.4	6.6	48.2
5 May	0.40	3.27	21.1	58.5	6.3	48.0
SEm±	0.02	0.08	0.4	1.4	0.1	0.8
CD (P=0.05)	0.07	0.26	NS	4.7	0.5	NS
Variety						
'SML 668'	0.76	2.73	21.0	64.1	7.0	48.7
'Samrat'	0.78	2.66	22.0	65.2	7.1	48.8
'Meha'	0.69	2.88	20.9	63.3	6.5	48.9
'IPM 02-3'	0.73	2.83	21.0	64.6	6.8	49.2
SEm±	0.01	0.06	0.3	1.3	0.2	0.8
CD (P=0.05)	0.04	0.17	NS	NS	NS	NS

par with 'SML 668' and significantly superior to 'IPM 02-3' and 'Meha' (Table 2). This might be owing to higher yield attributes, viz. pods/plant and grains/pod, in variety 'Samrat' and owing to more 1,000-seed weight in case of 'SML 668'. The interaction effect of dates of sowing and varieties was found significant on grain yield (Fig. 1). Significantly higher stover yield was obtained in sowing date 5 May than all other sowing dates (Table 2). Higher stover yield in case of 5 May-sown crop might be owing to more vegetative growth, i.e. plant height and dry-matter accumulation. Among the different varieties, highest stover yield was obtained with variety 'Meha', which was statistically at par with varieties 'IPM 02-3' and 'SML 668' and significantly superior to variety 'Samrat' (Table 2). The sowing dates and varieties did not show any significant difference in protein content. The higher total nitrogen and phosphorus uptake by crop were recorded with early dates of sowings than delayed sowing dates. This was owing to the higher grain yield at early sowing dates. The varieties did not show any significant difference in total nitrogen, phosphorus and potassium uptake by crop.

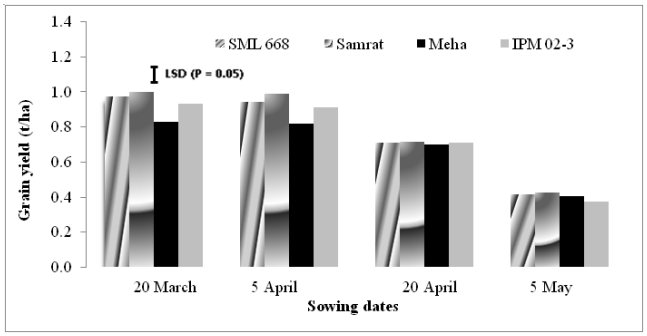

Fig. 1. Interaction effect of sowing dates and varieties on grain yield of summer mungbean

On the basis of 1 year study, it may be concluded that 20 March and 5 April sowing dates have been found more suitable as these gave significantly higher grain yield than 20 April and 5 May sowing dates. Among the tested mungbean varieties, 'Samrat' and 'SML 668' are the most promising cultivars because of their higher yields than 'Meha' and 'IPM 02-3' in subtropical climatic conditions of Jammu, Jammu and Kashmir.

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