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Effect of Different Dates of Sowing on Growth, Yield Attributes and Yield of Various Cultivars of *Kharif* Blackgram (*Vigna mungo* L.) under Amritsar Conditions

Karan Kumar, Rakesh Kumar

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ABSTRACT

Background: Among pulses, blackgram is one of most important crop. Blackgram has originated from Indian sub-continent where it has been cultivated from ancient times and standout amongst most expensive pulse crop in India. Being observed, the productivity of blackgram is low in India as well as in Punjab due to lack of knowledge regarding various agronomic implementations, among them, time of sowing and selection of suitable cultivar are one of the major limiting factors in production, especially during *kharif* season.

Methods: The research was carried out to investigate the effect of different dates of sowing on growth, yield attributes and yield of various cultivars of *kharif* blackgram (*Vigna mungo* L.) during *kharif* season 2019 at Student's Research Farm, Department of Agriculture, Khalsa College, Amritsar. The experiment was laid-out in split-plot design, consisting of four dates of sowing (8th July, 18th July, 28th July and 8th August) as main-plot treatments and three cultivars (Mash114, Mash 338 and KUG 479) as sub-plot treatments, with four replications.

Result: Among the sowing dates, the higher seed yield (10.27 q/ha) of blackgram was recorded when crop was raised on 8th July, which was significantly 12.6%, 20.3% and 30.5% higher than 18th July, 28th July and 8th August sown crop respectively. Among blackgram cultivars, the higher seed yield was observed in Mash 114 (10.19 q/ha) which was significantly 14% and 32% superior over Mash 338 and KUG 479 respectively. The sowing dates and cultivars had significant effect on the pods/plant, seeds/pod and seed weight/plant. The significantly higher number of pods/plant (24.3), seeds/pod (6.8) and seed weight/plant (3.2 g) were obtained with 8th July sown crop as compared to 28th July and 8th August sown crop. Among the cultivars, the significantly higher number of pods/plant (23.6), seeds/pod (6.4) and seed weight/plant (3.2 g) were recorded with Mash 114. The growth parameters viz. Plant height, nodules/plant, leaf area index and dry matter accumulation, were shown decreased trend by 29.2%, 19.13%, 12.2% and 25.4% respectively with the delay in sowing from 8th July to 8th August.

Key words: Cultivars, *Kharif* blackgram, Sowing dates.

INTRODUCTION

Pulses have great importance in Indian agriculture as they are rich source of protein (17 to 25%) as compared to cereals (6 to 10%) their ability to fix atmospheric nitrogen and maintain soil fertility. Among pulses, blackgram is one of most important crop. Blackgram has originated from Indian sub-continent (De Candolle, 1986) where it has been cultivated from ancient times and standout amongst most expensive pulse crop in India. It provides a major share of the protein requirement of the vegetarian population of the country (Shobanadevi *et al*., 2021). It is widely used in Punjabi cuisine and frequently alluded to as *"Maah di Daal"* in local language. In Punjab, Blackgram was grown on 2.0 thousand ha area with total production of 1.1 thousand ton during 2018-19 (Anonymous, 2020). Amritsar being an integral blackgram producing district in Punjab contributing 9.1% to total production and standing at 4th position (Anonymous, 2019). Blackgram is highly sensitive to abiotic stresses. Being observed, the productivity of blackgram is low in India as well as in Punjab due to lack of knowledge regarding various agronomic implementations, among them, time of sowing and selection of suitable cultivar are one of the major limiting factors in production, especially during *kharif* season. The optimum time of sowing ensures the complete harmony between the vegetative and reproductive phases on one hand and climatic rhythm on the other and helps in realizing the potential yield. Varietal adaptation is the important factor which is generally associated with low productivity of this crop. The new improved cultivars have high yield potential, resistant to disease and insect pests as compared to old and degenerated cultivars. Keeping this in

P.G. Department of Agriculture, Khalsa College, Amritsar-143 001, Punjab, India.

Corresponding Author: Rakesh Kumar, P.G. Department of Agriculture, Khalsa College, Amritsar-143 001, Punjab, India. E-mail: rakeshvirgo@yahoo.co.in

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view the present investigation was initiated to find out a suitable date of sowing and cultivar for higher *kharif* blackgram production under the agro-climatic conditions of Amritsar.

MATERIALS AND METHODS

A field experiment was undertaken at Student's Research Farm, Department of Agriculture, Khalsa College, Amritsar during *kharif* season 2019 to study the effect of different dates of sowing on growth, yield attributes and yield of various cultivars of *kharif* blackgram (*Vigna mungo* L.). The soil of experimental site described as sandy loam in texture, normal in pH (7.9), medium in organic carbon (0.66 %), low in nitrogen (216 kg/ha), medium in phosphorus (12.5 kg/ha) and medium in potassium (126 kg/ha). The experiment was laid in split plot design with four replication where as main plots were assigned to four dates of sowing *viz.* 8th July, 18th July, 28th July and 8th August and sub-plots to three cultivars *i.e.* Mash 114, Mash 338 and KUG 479. Recommended uniform dose of N and P_2O_5 was 5:10 kg/acre. The entire quantity of these fertilizers was applied as basal at the time of sowing. The seed @ 20 kg/ha were dibbled at 30 × 10 cm^2 spacing on raised beds. Before sowing seeds were treated with Rhizobium culture @ 250 g/acre to ensure nodulation. The weeds were managed by pre-emergence application of Stomp 30 EC (Pendimethalin) herbicide applied after sowing on the same day in evening. Hand weeding was carried out twice at 30 and 45 DAS. Crop was harvested with sickle and threshed manually. The growth parameters were recorded at 30, 45 and 60 DAS whereas the yield attributing and yield parameters were recorded at harvest. The collected data were subjected to statistical analysis with CPCS-1 software developed by Punjab Agricultural University, Ludhiana.

RESULTS AND DISCUSSION

Effect of sowing dates

The results (Table 1) revealed that there is no significant effect on days taken to emergence due to dates of sowing. The plants under 8th July sowing took higher number of days to achieve 50% flowering as compared to the other dates. Delay in sowing resulted in early flowering. Singh and Kumar (2014) also reported reduction in days taken to 50% flower with delayed sowing. Plant height, an index of growth, was found markedly influenced by planting dates. Significantly higher plant height was recorded in 8th July sown crop at 30, 45 and 60 DAS as compared to other three sowing dates. It was mainly due to early sowing dates had longer growing period. These findings are in line with earlier finding by Singh *et al.* (2011). Similarly, 8th July sown crop produced maximum leaf area index from 30 to 60 DAS it was significantly superior over all other sowing dates. Crop sown on 8th July showed significantly higher dry matter accumulation at 30, 45 and 60 DAS than other 28th July and 8th August sowing dates but at par with 18th July sown crop. The highest DMA in early sown crop might be due to availability of more time for

Table 1: Effect of sowing dates and cultivars on the phenology and growth parameters of *kharif* blackgram.

Treatment	Days taken to emergence	Days taken to 50% flower	Plant height (cm)			Root nodules /plant			LAI			Dry matter accumulation (g/plant)		
			30 DAS	45 DAS	60 DAS	30 DAS	45 DAS	60 DAS	30 DAS	45 DAS	60 DAS	30 DAS	45 DAS	60 DAS
Sowing dates														
8th July	5.83	43.2	25.3	36.0	47.0	35.7	61.7	27.2	0.54	1.38	2.78	1.86	5.03	7.02
18th July	5.66	41.1	24.3	33.7	45.6	34.4	58.9	25.5	0.50	1.29	2.56	1.43	4.62	6.71
28th July	5.58	40.8	22.7	32.8	35.1	33.5	55.0	19.3	0.47	1.25	2.51	1.22	4.16	6.05
8th August	5.50	35.8	20.9	28.4	33.3	32.9	49.9	12.3	0.45	1.17	2.44	0.88	3.61	5.24
CD (p=0.05)	NS	1.6	2.3	4.2	5.6	NS	4.7	3.3	0.03	0.08	0.11	0.45	0.44	0.44
Cultivars														
Mash 114	5.50	39.3	25.5	37.4	46.7	35.0	59.3	22.8	0.51	1.31	2.63	1.63	4.93	6.76
Mash 338	5.62	39.8	23.2	32.8	39.4	34.2	56.0	20.9	0.49	1.27	2.57	1.38	4.22	6.25
KUG 479	5.81	41.6	21.2	28.0	34.7	33.3	53.9	19.6	0.48	1.23	2.52	1.03	3.91	5.75
CD (p=0.05)	NS	1.2	0.93	1.3	1.2	NS	3.0	2.2	0.02	0.04	0.06	0.23	0.28	0.27

vegetative growth (Singh and Singh, 2015). The higher values of LAI in early sown crop resulted in increased production of photosynthates contributing to higher total dry matter production. These results agreed with the findings of Yadahalli *et al.* (2006) and Dwivedi *et al.* (2018). The variation in number of nodules by different sowing dates was non-significant at 30 DAS whereas at 45 and 60 DAS it was significant. 8th July sown recorded significantly higher number of nodules per plant as compared to 18th July, 28th July and 8th August sowings. Nodulation was reduced with delayed sowing.

Yield data (Table 2) revealed that 8th July sown crop produced significantly maximum number of pods/plant, seeds/pod, pod length, seed weight/plant which was significantly higher than 28th July and 8th August and statistically at par with 18th July sown crop. All these yield attributes were decreased notably with delay in sowing up to 8th August sowing date. The rapid increase in yield attributes was due to more vigorous growth in early planting, resulting in more translocation of photosynthates from leaves to the reproductive parts. Similar results were obtained by Patidar and Singh (2018) and Jha *et al.* (2015). Crop sown on 8th July recorded maximum seed yield (10.27 q/ha) and straw yield (26.52 q/ha) which was significantly higher than the other sowing dates. Seed yield was progressively declined with delay in sowing mainly due to reduction in number of pods/plant, seeds/pod and seed weight/plant. Higher grain yield of 8th July sown blackgram as compare to remaining dates was probably due to favourable source-sink relationship together with favourable weather conditions around 8th July which caused better growth of plant. Similar results were also advocated by Gangwar *et al.* (2012). The harvest index and 1000-seed weight was found to be non-significant for different dates of sowing. Similar trend was observed by Singh and Kumar (2014).

Effect of varieties

Data revealed (Table 1) that there is no significant effect on days taken to emergence due to various cultivars. But cultivars differed significantly with regard to number of days taken to reach 50% flowering. The cultivar Mash 114 took considerably less number of days to reach 50% flowering than other cultivars. This could be attributed to genetic variations existing among blackgram cultivars as also reported by Meena and Ram (2016). Mash 114 attained significantly higher plant height at 30, 45 and 60 DAS as

Table 2: Effect of sowing dates and cultivars on the yield attributes and yield of *kharif* blackgram.

Treatment	Pods/ plant (number)	Seeds/ pod (number)	Pod length (cm)	Seed weight/ plant (g)	1000-seed weight (g)	Yield (q/ha)			Harvest Index (%)
						Seed yield	Straw yield	Biological yield	
Sowing dates									
8th July	24.3	6.8	4.6	3.2	38.8	10.27	26.52	36.76	27.8
18th July	22.9	6.4	4.5	2.9	38.1	9.12	24.04	33.17	27.5
28th July	20.9	6.1	4.4	2.8	37.1	8.54	22.46	30.99	27.5
8th July	18.1	5.8	4.2	2.5	36.4	7.87	21.17	29.10	27.2
CD (p=0.05)	2.1	0.3	0.3	0.3	NS	1.12	2.65	2.95	NS
Cultivars									
Mash 114	23.6	6.5	4.5	3.2	38.2	10.19	26.47	36.64	27.7
Mash 338	21.3	6.3	4.4	2.8	37.6	8.94	23.93	32.81	27.1
KUG 479	19.8	6.0	4.3	2.6	37.0	7.72	20.24	27.94	27.5
CD (p=0.05)	1.3	0.2	NS	0.3	NS	0.66	1.98	2.12	NS

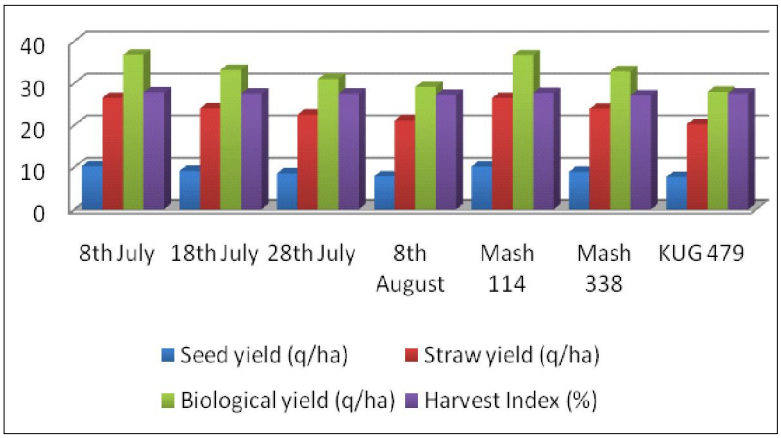

Fig 1: Effect of sowing dates and cultivars on seed yield, straw yield, biological yield and harvest index of blackgram.

compared to Mash 338 and KUG 479. It might be due to genetic character of Mash 114. Singh *et al.* (2011) also found variation in plant height among various cultivars. The cultivar Mash 114 was found significantly superior in LAI at 30 to 60 DAS over Mash 338 and KUG 479 cultivars. Dry matter accumulation per plant was markedly influenced due to cultivars at different crop growth stages. The cultivar Mash 114 was found significantly superior at 30, 45, 60 DAS and over the other cultivars. This might be due to higher biomass potential and high nutrient absorption capacity of the cultivar. These observations are confirmed by the finding of Kumar *et al.* (2018). Mash 114 recorded significantly higher root nodules per plant at 45 and 60 DAS than Mash 338 and KUG 479. This might be due to more number of fibrous roots and larger tap root system of Mash 114 than the other varieties. Similar genotypic differences were observed by Ibrahimi *et al.* (2017).

The performance of Mash 114 as regard to yield attributing characters *viz*. number of pods/plant, seeds/pod and seed weight/plant was significantly superior over the two varieties (Table 2). The probable reason for this may be improved photosynthetic activity due to increased source capacity and efficient translocation of photosynthates to the seed (Jadhav *et al.,* 2014). The blackgram cultivar Mash 114 recorded higher seed yield (10.19 q/ha) and straw yield (26.47q/ha) which was significantly superior over Mash 338 and KUG 479. This increase in seed yield (Fig 1) of Mash 114 cultivar might be due to the higher production efficiency that has been reflected through improvement in different yield attributing characters. Similar findings were reported by Sharma (2015).

CONCLUSION

On the basis of investigation carried out under agro-climatic conditions of the results showed that for higher production and productivity of *kharif* blackgram. The crop sown in early July with cultivar Mash 114 gave higher seed yield and B:C ratio to enhance the area under pulses in Amritsar region.

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