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Response of Green Gram and Black Gram Genotypes to Plant Density

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A field experiment was conducted at Zonal Agricultural Research Station, Morena during late spring seasons of 1983 and 1984 to find out suitability of green gram and black gram crops, their genotypes and plant density to achieve higher yields in northern Madhya Pradesh. The soil of experimental plot was sandy loam in texture, having pH 7.8, 205 kg available nitrogen, 23.20 kg P_2O_5 and 400 kg K_2O/ha. Four genotypes each of green gram (Pusa baisakhi, K 851, PS 16 and ML 131) and black gram (PU 19, JU 77-41, RU 2 and GWLS-1) were evaluated under four plant densities viz., 4, 6, 8 and 10 lakh plants/ha in inter and intra row spacing of 25 x 10 cm, 30 x 5.6 cm, 25 x 5 cm and 20 x 5 cm, respectively. The treatments were replicated thrice in split plot design. Keeping genotypes in main plot and plant density in sub plot. The crop was sown on 20 March during both the years. The intra row spacing was maintained by thining out extra plants after 10 days of sowing as per plant densities treatments. The crops were raised with recommended package of practices for the zone. Effect of green gram and black gram genotypes and plant density on growth, yield attributes and yield are given in Tables 1 and 2.

It is evident from the Table 1 that green gram produced significantly more plant height, seeds/pods, harvest index (in 1984 only) and seed yield (Table 2) than black gram in both the years. Green gram gave 12.50% higher seed yield over black gram.

Green gram genotype K 851 was found comparatively taller than other genotypes during both the years (Table 1). K 851 recorded significantly higher number of pods/plant (12.9) than PS 16 (10.0) in 1983. Pusa baisakhi and K 851 produced significantly higher number of seeds/pod than ML 131 and PS 16 in both the years. In 1984, significantly higher harvest index of 32.4% was recorded by K 851 over other genotypes (25.3 to 28.0%).

In case of seed yield, K 851 was found significantly higher yielder (921 kg/ha) than Pusa baisakhi, PS 16 and ML 131 genotypes (Table 2). Pusa baisakhi (807 kg/ha) and ML 131 (816 kg/ha) were at par in yield. Rajpu (1993) also reported the highest seed yield from K 851 when sown in Middle of March.

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TABLE 1
Growth and yield attributes of green gram and black gram as influenced by genotypes and plant densities.

Treatment	Plant height		Pods/plant		Seeds/pod		Harvest index (%)	
	1983	1984	1983	1984	1983	1984	1983	1984
Green gram (GG)								
Pusa baisakhi	28.6	28.3	10.3	8.7	7.6	6.4	38.1	28.0
K 851	29.0	29.0	12.9	8.1	7.7	5.9	36.4	32.4
PS 16	27.2	29.1	10.0	7.0	6.2	5.2	37.0	25.3
ML 131	27.7	25.8	12.2	7.6	6.4	5.5	24.4	27.0
Mean (GG)	27.9	28.0	11.3	7.8	7.0	5.8	36.5	28.2
CD at 5 %	1.8	2.3	2.7	NS	0.9	0.6	NS	4.1
Black gram (BG)								
PU 19	15.2	12.9	11.2	9.5	5.6	4.3	33.8	23.8
JU 77-41	16.2	14.5	10.9	8.9	4.9	3.5	30.9	29.0
RU 2	12.8	13.1	14.1	8.6	5.3	4.2	37.4	24.1
GWLS - 1	16.2	14.4	11.7	7.5	5.1	3.4	32.1	21.5
Mean (BG)	15.1	13.7	11.8	8.6	5.2	3.9	33.6	24.6
CD at 5%	1.8	NS	NS	NS	NS	0.6	NS	4.1
CD at 5% for GG and BG	0.9	1.2	NS	NS	0.4	0.3	NS	2.0

1.	2.	3.	4.	5.	6.	7.	8.	9.
Plant densities (Plants/ha)								
4 lakh	20.9	20.6	13.7	8.9	6.4	5.9	36.5	26.9
6 lakh	22.0	21.4	12.4	8.5	6.1	4.9	35.8	26.6
8 lakh	22.1	21.3	10.4	7.9	5.9	4.8	34.6	26.2
10 lakh	21.0	20.8	9.9	7.7	5.9	5.7	33.3	25.7
CD at 5 %	1.1	NS	1.4	NS	0.4	NS	NS	NS

Black gram, GWLS-1, JU 77-41 and PU 19 were significantly taller (16.2 to 15.2 cm) than RU 2 (12.8 cm) in 1983 only. Higher number of seeds/pod were produced by PU 19 (5.6 and 4.3) and RU 2 (5.3 and 4.2) than JU 77-41 (4.9 and 3.5) and GWLS-1 (5.1 and 3.4) during both the years. Higher harvest indices were recorded in RU 2 (37.4%) and PU 19 (33.8%) in 1983 and in 1984, it was higher in JU 77-41 (29.0%) and RU 2 (24.1%).

Genotype RU 2 (798 kg/ha) gave significantly higher seed yield than PU 19 (650 kg/ha) and GWLS-1 (700 kg/ha). JU 77-41 was superior over PU 19 (Table 2).

In 1983, higher plant densities of 6 and 8 lakh plants/ha recorded significantly taller plant height than 4 lakh plants/ha (Table 1). Lowest plant density of four lakh plants/ha gave significantly higher number of pods/plant (13.7) than 8 lakh (10.4) and 10 lakh plants/ha (9.9).

TABLE 2

Seed yield (kg/ha) of green gram, black gram and its genotypes as influenced by plant densities and their interactions (Mean of two years).

Crops/Genotypes	*Plant densities (lakh plants/ha)*				
	4	*6*	*8*	*10*	*Mean*
Green gram (GG)					
Pusa baisakhi	754	840	844	790	807
K 851	839	916	977	948	921
P S 16	638	668	750	735	698
ML 131	765	768	830	904	816
Mean (GG)	745	798	850	844	810
Black gram (BG)					
PU 19	590	639	641	729	650
JU 77-41	671	672	715	886	735
RU 2	761	755	832	845	798
GWLS-1	654	666	710	772	700
Mean (BG)	669	683	724	808	720
Mean over GG & BG	709	740	787	826	765
CD 5% for crop (GG & BG)					36
CD 5% for genotypes					73
CD 5% for plant density					38
CD 5% for interaction (Genotypes x plant density)					106

Four lakh plants/ha also produced significantly higher number of seeds/pod (6.4) than highest plant density of 10 lakh plants/ha (5.9). In 1984, similar trend was observed for all these characters, though the differences were not significant. The number of pods/plant, seeds/plant and harvest indices decreased with increasing plant density. The lower expression of yield attributes at higher plant densities may be due to more competition between plants for space, rediation, nutrients etc. Reduction at higher plant population in pods/plant and seeds/pod was also reported by Tomar *et al.* (1993) in mung bean.

In case of seed yield, interaction between green gram and balck gram crops x plant density was found significant (Table 2). Green gram recorded significantly higher seed yield of 850 kg/ha with a plant density of 8 lakh plants/ha (25 x 5 cm spacing) than 4 lakh (745 kg/ha) and 6 lakh (798 kg/ha) plants/ha. In black gram 10 lakh plants/ha (20 x 5 cm spacing) produced signifi- itly higher seed yield of 808 kg/ha than 4 lakh (669 kg/ha), 6 lakh (683 kg/ha) and 8 lakh (724 kg/ha) plants density/ha. Similar results have been reported by Ali (1986) in case of mung bean and Singh *et al.* (1986) in case of urid bean.

Another interaction due to genotypes of green gram, black gram x plant density was also found significant in seed yield (Table 2). Green gram K 851 produced significantly higher seed yield of 977 kg/ha with 8 lakh plants/ha than 4 lakh plants/ha (839 kg/ha). In black gram JU 77-41 (886 kg/ha) and RU 2 (845 kg/ha) gave significantly higher seed yield with 10 lakh plants/ha over 4 lakh plants/ha.

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