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Effect of Method of Planting, Plant Density and Phosphorus Fertilization on Yield of Blackgram in Irrigated System*

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Field experiments were conducted to study the effect of method of planting, plant density and phosphorus fertilization on blackgram variety (Co. 2) with a view to increase its yield under irrigated conditions. While methods of planting did not influence the grain yield, higher plant density (5,00,000 plants/ha) gave 22 and 40% more grain yield than lower density in the first and second year respectively. Foliar application of 6.25 and 12.5 kg phosphorus/ha gave about the same yield. It would be inferred that application of 6.25 kg/ha is quite sufficient in a soil of medium phosphorus status to get higher yields in blackgram.

Blackgram (Vigna mungo (L) Hepper) is a very important pulse crop as it forms an essential component of vegetarian diet in India. But its production is far below the requirement due to its low per hectare yield mainly because it is grown in marginal and submarginal lands with poor management practices. A study was undertaken to study the effect of method of planting, plant density and phosphorus fertilization on blackgram with a view to increase its yield under irrigated conditions.

MATERIAL AND METHODS

Field experiments were conducted for two years in a moderately drained clay loam soil of Tamil Nadu Agricultural University farm having low, medium and high available nutrient status for N (228.0 kg/ha) P_2O_5 (20.0 kg/ha) and K_2O (482.0 kg/ha) respectively. Short duration blackgram variety Co. 2 with a duration 65 to 70 days released from Tamil Nadu Agricultural University, Coimbatore was chosen for the study. Methods of planting (Bed method and Ridge method) and plant density (5,00,000 plants/ha and 3,33,333 plants/ha) formed the mainplot Treatments while the rates and method of application (No P_2O_5 25kg P_2O_5/ha as basal soil application, 50 kg P_2O_5/ha as basal soil application, 6.25kg P_2O_5/ha and 12.5kg P_2O_5/ha as foliar application were tested in sub-plot treatments. Nitrogen at 20kg/ha (half as basal and the other half 30 days after sowing) was applied uniformly for all the plots but no potassium was applied. There were 20 treatment combinations laid out in split-plot design replicated four items. Dibbling of rhizobial culture treated seeds in bed and on either sides of the ridges was done as per schedule of treatments with reference to plant density. Irriga-

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tion was given as and when necessary Foliar application of phosphorus was given as per schedule of treatments in two splits, one at blooming (35 to 40 days) and the other at early pod formation stages (45 to 50 days). The concentration of superphosphate (to supply P) in spray solution was 6.5 per cent. Spray solution was prepared two days ahead of spraying and kept undisturbed Supernantant solution was decanted and filtered through glasswool to get a clear solution. Then it was neutralised to a PH of 6.0 by adding calcium hydroxide. Spraying was done in the evening avoiding dripping. All the routine practices were followed and plotwise, grain and stover yields were recorded.

RESULTS AND DISCUSSION

The grain and stover yields are presented in Table I

a. *Grain yield*

The method of planting did not cause any significant effect on yields Under this condition moisture was not limitting and so planting in ridges or beds did not make such difference in yield In the two years of experimentation no heavy rainfall was received during the cropping period causing water logging and so there was no difference between the ridge and bed methods of planting.

Plant densities had appreciable influence on grain yield. higher plant population registering 895kg and 710kg /ha in the first year and second year respectively compared to 733 and 507 kg/ha obtained with lower density. The analysis of the grain yield pooled over two years also indicated the superiority of the higher plant density with 29.3% increased yield over the lowe densi Pod number per plant was slight higher (1.1 and 0.5 in the first ar second year respectively) in higher plar density. This along with higher numb of pods per unit area due to increase population contributed to higher yiel at higher density. Several workers hav reported increased yields due to increase population in pulses (Rajagopalan, 197 in blackgram; Yadahalli and Jayaram, 1976 and Arora *el al.*, 1971 in greengram).

Application of phosphorus increased the yields significantly. All the phosphorus levels tested were found to be on par indicating that foliar application of 6.25 or 12.5 kg P_2O_5/ha was as good as soil application of 25 or 50kg P_2O_5/ha. Among the phosphorus levels foliar application of 12.5kg P_2O_5/ha recorded 18.8 and 20.5% higher yield than control in the first and second year respectively and foliar supply of 6.25 kg P_2O_5/ha gave 12.0 and 16.3% more yield in those two years than control. The pooled analysis of grain yield also showed a similar trend. Foliar application of6.25 kg P_2O_5/ha was statistically on per with foliar application of 12.5 kg/ha recording 719 and 775 kg of grain/ha respectively as compared to 631 kg/ha recorded in control plots. This indicated the efficient utilisation of foliar supplied phosphorus especially at the most needed time, blooming and pod formation stages. Increased number of pods per plant (13.4-14.6, 11.5-12.2 in the first year and second year and hundred grain weight (3.9 g) due to phosphorus application were the main contributing factors to higher yield. Response to foliar appli-

tion of phosphorus has been reported or other crops such as gram by Sharma *et al.*, (1975).

A quadratic response function was fitted to yield data and this again clearly indicated the superiority of foliar application of phosphorus. The response equation for soil application was $Y=668.75+4.25\times0.0651\times^{2}$ and for foliar application was $Y=668.75+9.100\ x-0.1792\ X^{2}$. For soil application, the optimum dose was found to be 32.62 kg of P_2O_5/ha recording an estimated grain yield of 738.03 kg/ha. For foliar application, the optimum dose was 25.39 kg/ha which would give an yield of 784.23 kg/ha.

b. *Stover Yield*:

The effect of method of planting on stover yield was not significant. This treatment did not influence either the dry matter production or the grain yield. Hence no difference could be obtained in stover yield, also.

Plant densities influenced the stover yield, the higher plant density giving as much as 1443 and 987 kg/ha in the first and second year respectively, The effect of plant density on stover yield was similar to that of grain yield and higher stover yield was due to higher leaf area index (2.52 and 1.95) and greater dry matter production.

Phosphorus application did not influence the stover yield appreciably. Doraisamy Reddy(1975) found no difference in stover yield due to application of phoshorus in greengram.

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TABLE: Grain and stover yields of blackgram (kg/ha)

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	Grain yield kg/ha			Stover yield kg/ha	
	1975	1976	Pooled over two years	1975	1976
Methods of planting					
Bed Method	772	613	692	1158	882
Ridge Method	857	605	731	1333	886
SEB	48.1	33.0	23 7	95.3	65.2
CD (P=0.05)	N.S	N.S	N.S	N.S	N.S
Density					
5,00,000 Plants/ha (20×10cm)	895	710	892	1443	987
3.33,333 Plants/ha (10×15cm)	733	507	620	1048	781
SC_D	48.1	33.0	23.7	95.3	65 2
CD (P=0.05)	108.8	74.6	53.5	215.7	147.5
P. Fertilization					
Control (No P)	723	539	631	1135	899
26 kg P_2O_5/ha Basal soil application	838	630	734	1341	809
50 kg P_2O_5/ha " " "	839	598	719	1290	931
6.25 " foliar application	810	627	719	1208	866
12.5 " " "	859	650	755	1255	914
SE_D	41.0	34.4	25.9	103 4	61.2
CD (P=0.05)	81.6	69.5	52.2	N.S	N.S