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Response of black gram genotypes to different fertilizer levels during summer season

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ABSTRACT : A field experiment was conducted during summer 2010 at PG research farm of Agronomy Department, MKV, Parbhani (M.S.) to study the response of black gram genotypes to different fertilizer levels during summer season. The experiment was conducted in split plot design with two genotypes *viz*., BDU-1 and TAU-1 in main plot and four levels of fertilizer *viz*., F_1 – 100 per cent RDF – (25 kg N, 50 kg P_2O_5 ha^{-1}), F_2 –75 per cent RDF – (18.75 kg N, 37.50 kg, P_2O_5 ha^{-1}) + 2 per cent DAP foliar spray at flowering stage, F_3 – 100 per cent RDF – (25 kg N, 50 kg P_2O_5 ha^{-1}) + 2 per cent DAP foliar spray at flowering stage and F_4 – 125 per cent RDF – (31.25 kg N, 62.50 kg P_2O_5 ha^{-1}) + 2 per cent DAP foliar spray at flowering stage in sub plot with eight treatment combinations and three replications. Based on present investigation it can be concluded that application of 25 kg N, 50 kg P_2O_5 and 2 per cent DAP foliar spray at flowering stage (F_3) was found optimum for achieving higher yield in respect of summer black gram. Performance of black gram genotype BDU-1 during summer season was found highly productive as compared to TAU-1.

Key Words : Black gram, Genotypes, Fertilizer levels, Summer

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Black gram (*Vigna mungo* L.) being legume crop responds well to phosphorus application. Phosphorus is the major essential nutrient required by the crop. In legumes, nitrogen requirement is less as compared to phosphorus because major protein is supplied through nitrogen fixation. Therefore, phosphorus is a key nutrient for increasing productivity of pulses in general and black gram in particular. Legumes as such have a relatively high phosphorus requirement being utilized by plant and bacteria. The crop also responds to foliar application of DAP.

The productivity of black gram in Maharashtra is very low (299 kg ha^{-1}). The probable reason for this may be the negligence in adopting the recommended package of practices by the farmers coupled with its low yielding ability. Secondly, the harvesting of black gram during *Kharif* mostly coincides with September rainfall, which ultimately results into low yield and poor quality of seed. Thus, supply of quality seed to the farmer is arising as a big constrained in low productivity of black gram.

Therefore, to overcome such problem, cultivation of black gram during summer season can be one of the best alternatives for enhancing the productivity and improving the seed quality. Taking into consideration the above fact, the present investigation was undertaken to identify the suitable genotypes of black gram for cultivation during summer season and their response to different fertilizer levels.

RESEARCH PROCEDURE

The experiment was conducted during summer 2010 at PG research farm of Agronomy Department, Marathwada Krishi Vidyapeeth, Parbhani (MS) on clay loam soil. The soil had pH 7.7, organic carbon 0.26 per cent and available phosphorus 15.6 kg ha^{-1}. The available N and K contents were 212 kg ha^{-1} and 578 kg ha^{-1}, respectively. On the basis of N, P and K status, the soil could be classified low in N, medium in P and high in K. The experiment was laid out in Split Plot Design wherein the main plots were assigned to two genotypes *viz*. BDU-1 and TAU-1 whereas sub plots were allotted to four levels of fertilizer *viz*., F_1 – 100 per cent RDF – (25 kg N, 50 kg P_2O_5 ha^{-1}), F_2 –75 % RDF – (18.75 kg N, 37.50 kg, P_2O_5 ha^{-1}) + 2 per cent DAP foliar spray at flowering stage, F_3 – 100 per cent RDF – (25 kg N, 50 kg P_2O_5 ha^{-1}) + 2 per cent DAP foliar spray at flowering stage and F_4 – 125 per cent RDF – (31.25 kg N,

62.50 kg P_2O_5 ha^{-1}) + 2 per cent DAP foliar spray at flowering stage. These eight treatment combinations were replicated thrice. The nitrogen (N) and phosphorus (P) requirement were supplied through urea and DAP as per the treatments at the time of sowing. Seeds of black gram genotypes *viz*., BDU – 1 and TAU-1 before sowing were treated with carbendenzim @ 4g per kg of seed for controlling seed borne disease. Thereafter, seed were inoculated with *Rhizobium* and PSB (Phosphate Solubilizing Bacteria) culture and the sowing was carried out on 25th February 2010.

RESEARCH ANALYSIS AND REASONING

The results obtained from the present investigation have been discussed in the following sub heads:

Yield attributes:

Cutting across the data furnished in Table 1 revealed that performance of genotype BDU-1 in respect of yield attributing characters *viz*. number of pods per plant, number of seeds per pod, pod length, pod weight per plant, seed yield per plant and test weight (Table 1) was significantly superior as compared to TAU-1. The probable reason for this may be the genetic makeup of the variety that has helped in improving the photosynthetic activity due to increased source capacity and efficient translocation of photosynthates to the sink. Similarly, Yadahalli *et al*. (2006) also observed yield differences in black gram varieties having different genetic makeup.

As regards to fertilizer levels, the yield attributing characters *viz*., numbers of pods per plant, pod weight per plant and seed yield per plant were significantly influenced by different treatments of fertilizers. The application of 125 per cent RDF + 2 per cent DAP foliar spray at flowering stage had augmented effect on the yield attributes *viz*., numbers of pods per plant, pod weight per plant and seed yield per plant and found significantly superior over 75 per cent RDF + 2 per cent DAP foliar spray at flowering stage and 100 per cent RDF but at par with 100 per cent RDF + 2 per cent DAP foliar spray at flowering. These sorts of favourable effect of fertilizers on yield attributes were noticed by Rathore *et al.* (2010). However, pod length and test weight were not influenced significantly due to different fertilizer levels.

Seed yield, biological yield and harvest index:

Perusal of data furnished in Table 2 revealed that black gram genotype BDU-1 recorded significantly 33.51 per cent higher seed yield over TAU-1. This increase in seed yield might be due to the higher production efficiency that has been reflected through improvement in different yield attributing characters. These findings are in conformity with the earlier findings reported by Patel *et al.* (1992). Similar, trend was observed in respect of biological yield and harvest index. The higher biological yield of BDU-1 might be due to accumulation of more dry matter and higher biomass potential.

Seed yield, biological yield and harvest index of black gram were significantly influenced by different fertilizer levels. The application of 125 per cent RDF – (31.25 kg N, 62.50 kg P_2O_5 ha^{-1}) + 2 per cent DAP foliar spray at flowering recorded the highest seed yield and biological yield which was significantly superior over 75 per cent RDF – (18.75 kg N, 37.50

Table 1 : Number of pods per plant, number of seed per pod, pod length, pod weight per plant, seed yield per plant and test weight of black gram as influenced by various treatments

Treatments	No. of pods $plant^{-1}$	No. of seed pod^{-1}	Pod length (cm)	Pod weight $plant^{-1}$ (g)	Seed yield $plant^{-1}$ (g)	Test weight (g)
Genotypes (G)						
G_1 (BDU-1)	21.26	5.6	5.15	10.47	6.17	34.55
G_2 (TAU-1)	17.69	3.8	3.52	8.49	4.90	34.41
S.E. ±	0.17	0.11	0.029	0.13	0.14	0.22
C.D. (P=0.05)	0.54	0.36	0.092	0.59	0.43	NS
Fertilizer levels (F)						
F_1 : 100 % RDF	17.33	4.50	4.11	0.27	4.91	34.1
F_2 : 75 % RDF + 2 % DAP foliar spray at flowering	18.63	4.48	4.28	8.84	5.48	34.32
F_3 : 100 % RDF + 2 % DAP foliar spray at flowering	20.28	4.81	4.36	9.69	5.71	34.49
F_4 : 125% RDF + 2 % DAP foliar spray at flowering	21.66	5.01	4.55	11.11	6.03	35.00
S.E. ±	0.99	0.22	0.20	0.41	0.2	0.71
C.D. (P=0.05)	3.05	NS	NS	1.27	0.62	NS
Interaction (G x F)						
S.E. ±	1.40	0.27	0.26	0.58	0.28	1.00
C.D. (P=0.05)	NS	NS	NS	NS	NS	NS

NS=Non-significant

Table 2 : Grain yield, biological yield and harvest index of black gram as influenced by various treatments

Treatments	Seed yield (kg ha^{-1})	Biological yield (kg ha^{-1})	Harvest index (%)
Genotypes (G)			
G_1 (BDU-1)	555	2011	27.59
G_2 (TAU-1)	369	1641	22.48
S.E. ±	20.24	27.61	0.22
C.D. (P=0.05)	62.27	84.97	0.68
Fertilizer levels (F)			
F_1 : 100 % RDF	381	1602	23.78
F_2 : 75 % RDF + 2 % DAP foliar spray at flowering	413	1655	24.95
F_3 : 100 % RDF + 2 % DAP foliar spray at flowering	521	2022	25.77
F_4 : 125% RDF + 2 % DAP foliar spray at flowering	532	2030	26.21
S.E. ±	17.76	47.88	0.50
C.D. (P=0.05)	54.76	147.32	1.56
Interaction (G x F)			
S.E. ±	25.12	67.71	0.72
C.D. (P=0.05)	NS	NS	NS

NS=Non-significant

kg P_2O_5 ha^{-1}) + 2 per cent DAP foliar spray at flowering and 100 per cent RDF – (25 kg N, 50 kg P_2O_5 ha^{-1}) but was at par with 100 per cent RDF – (25 kg N, 50 kg P_2O_5 ha^{-1}) + 2 per cent DAP foliar spray at flowering stage. The probable reason for this might be the combined effect of nitrogen and phosphorus application which has enhanced the photosynthetic activity and thus helped in food accumulation in seed at maturity and ultimately resulted in better seed formation and its development. Such increase in seed yield was reported by Bhairappanavar *et al.* (2005).

Conclusion:

Performance of black gram genotype BDU-1 during summer season was found highly productive as compared to TAU-1. Application of 25 kg N, 50 kg P_2O_5 and 2 per cent DAP foliar spray at flowering stage was found optimum for achieving higher seed yield of summer black gram.

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