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Performance of improved production technology of blackgram (*Vigna mungo* l.) under rainfed farming

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Abstract: A field experiment was conducted during the *kharif* season of 2012 at the farmers' fields in 10 villages of Sagar district, to evaluate the indigenous cultivars of blackgram with respect to method of sowing and nutrient management in rainfed farming condition under supervision of SAF-BIN programme of Caritas with the help of associate partner of SHIATS, Allahabad. The treatments comprised of two indigenous cultivars, *viz*., '*Khajua'* and '*Chikna'*, two nutrient management practices, *viz*., inorganic (DAP) and INM (FYM + DAP) and two sowing methods *viz*., broadcasting and line sowing. Among them indigenous cultivar '*Khajua*' recorded higher number of nodules (57.70 plant^{-1}), CGR (70.88 g m^{-2}day^{-1}) and stover yield (3870.50 kg ha^{-1}). However, the cultivar '*Chikna'* registered higher number of branches (16.85 plant^{-1}), seed yield (1389.00 kg ha^{-1}) and harvest index (33.37%).

Key words: Rainfed farming, Indigenous cultivars, Line sowing, Broadcasting, INM (Integrated Nutrient Management)

Introduction

Blackgram is the fourth important pulse crop grown in the country on 3.10 million hectares with a total production of 1.40 million tonnes and an average productivity of 451.61 kg ha^{-1}. In Madhya Pradesh, average productivity of blackgram continues to be lower than national average (351.69 kg ha^{-1}), mainly due to its cultivation on marginal lands under poor management and without input except seed (Agropedia, 2011). The major constraints responsible for lower yield are susceptible cultivars (attack of yellow mosaic virus due to change of temperature and uneven rainfall) and inappropriate production technology, *viz*., broadcast method of sowing, no use of fertilizers, greengram yellow vein mosaic virus (MYMV) and inappropriate weed management (Raikwar *et al.,* 2011). Day to day increase in the cost of fertilizers and timely available of fertilizers in desired quantity is always a question mark. Nutrient requirement of crop cannot be fully met through organic sources alone, the conjoint use of organic and inorganic fertilisers must be made for the balanced nutrition, keeping in view the needs of crop and sustainable farming. Suitable sowing time, variety, plant population and spacing are important non monetary input to achieve synchronous maturity and higher production of blackgram. It has the habit of root nodulation, leaf fall and overall low C:N ratio with higher N content play an important role in maintaining soil fertility. In the changing scenario of research, particularly where greater thrust is essential in the real crisis of farming, adaptive farming, which is what the farming community knowingly or unknowingly implements, will flourish better if scaffolding is provided. Thus, in the current experiment, 'on farm adaptive research' approach has been adhered.

Materials and Methods

The on farm adaptive research experiment comprised of two blackgram cultivars (*Khajua* and *Chikna*), two methods of sowing, *viz*., broadcasting and line sowing and nutrient management practices, *viz*., DAP and INM. The Sagar district is situated in AEZ 6 of Vindhya Range. The 10 villages are located at 23^0 83.22" N latitude, 78^0 74.49" E longitude and 567.09 m altitude above the mean sea level. The soil properties of 10 villages had variation, such as in 4 villages there was heavy textured clay, neutral in reaction (pH 7.7), low available organic carbon (0.25%), phosphorus (18.0 kg ha^{-1}) and potassium (336.0 kg ha^{-1}) and in rest of the 6 villages there was red to brown soil having more silt and sand with a soil reaction of pH 8.7, very low available organic carbon (0.15%), phosphorus (9.0 kg ha^{-1}) and potassium (268.0 kg ha^{-1}). A total rainfall of 759.28 mm was recorded during the *kharif* season of 2012. Blackgram cultivars ('*Khajua'* and '*Chikna'*) were sown in two spacing namely 10 × 5 cm (Broadcasting) and 25 × 10 (Line sowing), Pal (2008). The crop was sown in the second week of July in 60 plots spread at 10 villages. The plot size was 5 m × 4 m. Data were recorded after every 15 days interval starting from seeding.

Results and Discussion

Effect of indigenous cultivars, method of sowing and nutrient management are presented in table 1 and 2. The indigenous cultivar '*Khajua'* of blackgram recorded higher number of nodules (57.70 plant^{-1}) and CGR (70.88 g day^{-1} m^{-2}) at 45 DAS. However, cultivar '*Chikna'* registered higher number of branches (16.85 plant^{-1}) at 60 DAS. Further, cultivar '*Chikna'* also recorded higher seed yield (1389.00 kg ha^{-1}) and harvest index (33.37%) respectively. The higher stover yield (3870.50 kg ha^{-1}) recorded was by cultivar '*Khajua'*.

Line sowing increased the higher number of branches (17.15 plant^{-1}) at 60 DAS and number of nodules (56.62 plant^{-1}) at 45 DAS. Further, broadcast method recorded higher seed yield (1389.00 kg ha^{-1}), stover yield (3870.50 kg ha^{-1}) and harvest index (30.63%). Adoption of INM (FYM = 5000 kg ha^{-1} + DAP= 62.5 kg ha^{-1}) played important role in increasing the number of nodules (59.60 plant^{-1}) at 45 DAS and crop growth rate (78.40 g m^{-2} day^{-1}) at 45 DAS. Both treatments were at par with regard to number of branches (16.85 plant^{-1}) at 60 DAS. Further, INM recorded maximum seed yield of 1581.50 kg ha^{-1} and stover yield of 4400.00 kg ha^{-1}. However, harvest index was higher (30.63%) under the inorganic nutrient management.

Table-1: Effect of indigenous cultivars, method of sowing and nutrient management on growth attributes, yield attributes, yield and economic of blackgram

Treatments	Number plant^{-1}		CGR	Seed
	Branches (60 DAS)	Nodules (45 DAS)	(g m^{-2} day^{-1}) (45 DAS)	yield (kg ha^{-1})
Indigenous cultivars				
V_1: *Khajua*	15.55	57.70	70.88	1113.50
V_2: *Chikna*	16.85	54.05	69.58	1389.00
SEd (±)	1.42	4.59	5.74	146.68
CD (P = 0.05)	-	-	-	-
CV (%)	7.89	13.72	15.32	92.72
Method of sowing				
S_1: Broadcasting	16.85	54.05	69.58	1389.00
S_2: Line sowing	17.15	56.62	21.25	1378.00
SEd (±)	2.25	2.62	12.10	178.12
CD (P = 0.05)	-	-	27.38	-
CV (%)	12.21	7.89	40.16	107.08
Nutrient management				
N_1: INM (INM = DAP 62.5 kg ha^{-1} + FYM 5000 kg ha^{-1})	16.85	59.60	78.4	1581.50
N_2: Inorganic (DAP 62.5 kg ha^{-1})	16.85	56.62	69.58	1389.00
SEd (±)	1.72	3.08	8.32	169.93
CD (P = 0.05)	-	-	-	-
CV (%)	9.35	9.03	21.63	99.00

Table-2: Effect of indigenous cultivars, method of sowing and nutrient management on growth attributes, yield attributes, yield and economic of blackgram

Treatments	Stover yield (kg ha^{-1})	Net return (₹ ha^{-1})	H I %	B:C Ratio
Indigenous cultivars				
V_1: *Khajua*	3870.50	10532.50	26.29	1.39
V_2: *Chikna*	3369.00	18122.50	33.37	1.68
SEd (±)	838.54	-	3.80	-
CD (P = 0.05)	-	-	-	-
CV (%)	311.65	-	15.57	-
Method of sowing				
S_1: Broadcasting	3870.50	18632.50	30.63	1.69
S_2: Line sowing	3627.00	19104.50	27.41	1.74
SEd (±)	896.02	-	4.60	-
CD (P = 0.05)	-	-	-	-
CV (%)	327.23	-	19.11	-
Nutrient management				
N_1: INM (INM = DAP 62.5 kg ha^{-1} + FYM 5000 kg ha^{-1})	4400.00	21762.50	29.09	1.74
N_2: Inorganic (DAP 62.5 kg ha^{-1})	3870.50	18632.50	30.63	1.70
SEd (±)	1091.48	-	5.27	-
CD (P = 0.05)	-	-	-	-
CV (%)	379.53	-	21.57	-

In the present study, the rapid growth of cultivars, more branches, high CGR and varietal response of grain, straw, *etc*, also reported in indigenous cultivars (Gupta *et al*., 2006). In case of line sowing, higher branches and dry matter accumulation on crop growth may be due to greater light interception and less competition between plants (Parihar *et al*., 2005). Biswas *et al*. (2002), also observed that high density gave more seed yield. The increase have been on account of stimulation of root growth of crop as phosphorus play an important role in various physiological processes including root development, nodulation and N-fixation (Mehra *et al*., 2009) and (Parihar *et al*., 2005). This increase may be due to enhanced organic matter content in soil, conserved soil moisture for longer time and slow release of nutrients from FYM and the initial nutrient supply through DAP reported by Sharma and Abraham (2009) and Sharoar *et al*., (2006). Phosphorus plays an important role in root proliferation and thereby atmospheric nitrogen assimilation, as reported by Singh and Tripathi (1999). Broadcast method registered significantly higher of CGR (69.58g day^{-1} m^{-2}) at 45 DAS.

Economics: The economic viability of improved technologies over traditional farmers practices was calculated by taking into consideration the prevailing prices of input and output. It was observed that treatment **N_1:** INM (INM = DAP 62.5 kg ha^{-1} + FYM 5000 kg ha^{-1}) gave higher net return ₹ 21762.50 ha^{-1} and 1.74 benefit cost ratio, which were 106.62% and 25.17% higher than the lowest value in treatment V_1 (*Khajua*). The results from the current study clearly brought out the potential of improved production technologies in rainfed condition.

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