



# Effect of Plant Spacing on the Growth and Yield of Blackgram (*Vigna mungo*)

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## ABSTRACT

Experiments were conducted to determine the optimum plant spacing for different varieties of blackgram during *Rabi* 2015-16 season. The experiments comprised of three varieties *viz.* VBN (Bg) 4, VBN (Bg) 6 and MDU 1 and five different crop spacing *viz.*, 15 cm × 10 cm, 15 cm × 15 cm, 20 cm × 10 cm, 20 cm × 15 cm and 30 cm × 10 cm and laid out in a factorial randomized complete block design (FRBD) with three replications. Varieties showed significant difference for plant height, total number of pods per plant, seed weight per plant, seed yield, haulm yield and harvest index while different crop spacing showed significant difference for plant height, seed yield, haulm yield and harvest index. Pooled analysis exhibited a significant variation among three varieties. VBN (Bg) 6 revealed the highest seed yield of 741 kg/ha while the lowest seed yield of 590 kg/ha in MDU1. Interaction also produced significant effect on seed yield. The crop spacing of 20 cm x 10 cm showed highest seed yield 714 kg/ha when compared with other crop spacing treatments. Low potential varieties and improper crop spacing are serious causes low productivity in pulses. The interaction of variety VBN (Bg) 6 and 20 cm x 10 cm crop spacing exhibited significantly higher seed yield and harvest index than other treatments. Optimum plant spacing of 20 cm x 10 cm enhanced seed yield by 20.3 percent and harvest index by 29.4 percent compared with recommended crop spacing of 30 cm x 10 cm. The higher harvest index varieties showed wider adaptability and higher stable yield over environments and therefore can be recommended for cultivation by the farmers.

**Key Words:** Harvest index, Seed yield, Spacing and Varieties.

## INTRODUCTION

The pulses are grown on 304 lakh ha area in India with production of 14.77 million tones with a productivity of 617 kg/ha. The total area under pulses in Tamil Nadu is 8.32 lakh ha with total production of 3.67 lakh tones and productivity of 441 kg/ha. In Tamil Nadu blackgram occupies an area of 2.0 lakh ha with total production of 0.88 lakh tones and the productivity of 425 kg/ha. The average yield obtained at farmers' field is low, because no systematic efforts have been made in the past to develop a package of technology, which may ensure high seed yield of this crop. Important reasons for low average yield of black gram at farmers' field were the continuous cultivation of traditional low potential cultivars, use of low seed rate and improper agronomic practices. Among

many crop production constraints, appropriate varieties and crop spacing are the most important, which contribute substantially to the seed yield of blackgram. Many research studies have revealed that most of the growth and yield contributing attributes were significantly and positively correlated with the seed yield of crop plants *viz.*, blackgram (Siddique *et al*, 2006), soybean (Malik *et al*, 2007) and sunflower (Vahedi *et al*, 2010).

Plant density can have a major effect on the final yield of most of the legumes and the general response of yield to increasing population is well documented. The low productivity is due to decreasing day by day yielding ability and non use of improved varieties and proper spacing. To realize the maximum yield potential of black gram grown during summer and rainy season, maintenance of

optimum space made available to individual plant is of prime importance. A compromising balance between the variables of row and plant spacing has to be worked out to get desired spacing. The spacing requirement depends upon the growth behavior of genotype. So it is required to maintain spacing and variety for higher yield. Therefore present studies were carried out to look into the production potential and growth behavior of three blackgram varieties to different crop spacing under the prevailing environmental conditions, with a aim to determine optimum crop spacing and identify the best variety to North Eastern Zone of Tamil Nadu.

## MATERIALS AND METHODS

The experiment was carried out at Agricultural Research Station, Tamil Nadu Agricultural University, Virinjipuram, Tamil Nadu during *Rabi* season 2015-16. The experiment was laid out in factorial randomized complete block design (FRBD) and replicated three times. The gross plot size was 5m x 4 m and net plot size 4.7m x 3.8. Details of the treatment along with symbols summarized as Factor I (Varieties)  $V_1$  - VBN (Bg) 4  $V_2$  - VBN (Bg) 6  $V_3$  - MDU (Bg) 1. Factor II (Spacing)  $S_1$  - 15 x 10 cm  $S_2$  - 15 x 15 cm  $S_3$  - 20 x 10 cm  $S_4$  - 20 x 15 cm  $S_5$  - 30 x 10 cm. Recommended dose of fertilizer for black gram is 25 kg N/ha and 50 kg  $P_2O_5$ /ha. Being short duration and leguminous crop, the complete dose of nitrogen and phosphorous was applied at the time of sowing to each plot as a starter dose. Before sowing, the seed was treated with Rhizobium @ 4 g/kg of seed followed by thirum @ 4g/kg of seed. The sowing was done by line sowing, keeping distance as per treatments. All other agronomic practices were kept normal and uniform in all treatments. Observations like plant height, number of branches per plant, dry matter production per plant, number of plants per plot at harvest, number of pods per plant, number of seeds per pod, seed weights per plant, seed yield, haulm yield and harvest index were recorded. Data were analyzed statistically using Fisher's analysis of variance techniques and Least Significant Difference (LSD) test at 5% probability

level was employed to test the significance among treatment's means.

## RESULTS AND DISCUSSION

### Number of pods per plant

Number of pods per plant is a key factor for determining the yield performance in leguminous plants. The productive capacity of black gram plant is ultimately considered by the number of pods per plant. A perusal of data (Table 2) show that varieties significantly differed for number of pods per plant. The maximum number of pods per plant (11.5) was produced by VBN (Bg) 6. The lowest numbers of pods per plant (10.1) were produced by variety MDU 1. The effect of crop spacing was non-significant on the number of pods per plant. The interaction of varieties and inter-row spacing also non significantly affected the number of pods per plant.

### Seed yield

Dry matter production and its transformation into economic yield is the ultimate outcome of various physiological, biochemical, phenological and morphological events occurring in the plant system. Seed yield of a variety is the result of interplay of its genetic makeup and environmental factors in which plant growth. The data (Table 1) elucidate that varieties, crop spacing and combinations of these significantly affected the seed yield of black gram. Maximum seed yield (741kg/ha) was obtained from variety VBN (Bg) 6. The lowest seed yield (590 kg/ha) was obtained from variety VBN (Bg) 4 which was statistically at par with MDU 1, which produced 621kg/ha. It might be due to genetic differences among the varieties. These findings were in line with the findings of Abbas (2000) who had reported significant differences in the yield of various cultivars.

Crop sown at crop spacing of 20 x 10 cm gave maximum seed yield (714 kg/ha) while lowest seed yield (482 kg/ha) was obtained at inter-row spacing of 30 x 10 cm. These results were in line with the

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**Table 1. Effect of different varieties and spacing on yield components of black gram.**

Treatment	No. of Pods/plant	Seed Yield (kg/ha)	Haulms yield (kg/ha)	Harvest index (%)
<b>Variety (V)</b>				
V <sub>1</sub>	10.4	590	1312	31
V <sub>2</sub>	11.5	741	1187	40
V <sub>3</sub>	10.1	621	1570	28
Mean	10.7	651	1356	33
SEd	0.37	32.8	44.6	1.05
CD(P=0.05)	0.77	67.3	91.4	2.16
<b>Spacing (S)</b>				
S <sub>1</sub>	7.5	538	2142	31
S <sub>2</sub>	8.3	644	1642	33
S <sub>3</sub>	11.8	714	1367	36
S <sub>4</sub>	9.1	518	1875	32
S <sub>5</sub>	9.0	482	1741	33
Mean	9.36	579	1753	34
SEd	0.48	42.4	57.6	1.4
CD(P=0.05)	0.99	56.9	118.0	2.8
<b>Interaction (V x S)</b>				
SEd	0.84	73.52	99.80	2.36
CD(P=0.05)	1.72	150.61	204.40	NS

findings of Ali *et al* (2010). Interactive effect of varieties and crop spacing was also found to be significant. The highest seed yield (876 kg/ha) was obtained when variety VBN (Bg) 6 sown at crop spacing of 20 x 10 cm while the lowest seed yield (402kg/ha) was obtained when MDU 1 was sown at crop spacing of 30 x 10 cm. The plant population per unit area was the prime factor in determining the yield. It also indicated that the fewer yields per plant in case of high density were compensated by increased number of plants. Higher grain yield at closer spacing might be due to the higher plant population, there was increase in the proportion of number of pods produced more seed yield. Similar results were also reported by Bhairappavar *et al* (2005). It is prime necessity to maintain optimum plant population by maintaining inter and intra row spacing properly. Hence appropriate plant spacing with adequate plant population may increase crop yield of black gram. Increase in seed yield as

population density is increased has been reported by many workers in black gram (Sekhan *et al* 2002) and in soybean (Graterol and Montilla, 2003).

### Harvest index (%)

Harvest index is a measure of physiological productivity potential of a crop variety. It is the ability of a crop plant to convert the dry matter into economic yield. It is the ratio of seed yield to biological yield and those varieties that had more seed yield and less biological yield than other would have higher harvest index value. Higher the harvest index value more will be the production efficiency or vice versa. The calculated values of Harvest index (Table 1) indicate that varieties differed significantly on account of conversion efficiency of assimilate. The maximum value of harvest index (40 %) was obtained with the variety VBN (Bg) 6. The minimum harvest index value (28 %) was obtained from variety MDU 1. Crop sown at

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crop spacing of 20 x 10 cm gave maximum highest harvest index (36 %) while lowest harvest index (31 %) was obtained at crop spacing of 15 x 10 cm.

### CONCLUSION

From the present studies it can be concluded that the variety VBN (Bg) 6 out crossed the other varieties in the performance and the crop spacing of 20 x 10 cm showed significantly better results towards seed yield and harvest index. Hence it can be recommended that black gram variety VBN (Bg) 6 should be grown preferably in crop spacing of 20 x 10 cm under the north eastern agro-climatic zone of Tamil Nadu in order to achieve higher black gram yield.

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