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RESEARCH PAPER

Effect of organics on growth, yield and economics of black gram (*Vigna mungo*)

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Abstract: A field experiment was conducted at IFS Unit, College of Agriculture, Vijayapur, during *kharif* 2019 to study the effect of organic amendments on growth, yield and economics of blackgram (*Vigna mungo*). The study which was conducted during *kharif* 2019 have shown that application of vermicompost + ghanajeevamrutha based on 100 % RDP + *Rhizobium* + PSB recorded significantly higher seed yield (701 kg ha^{-1}), haulm yield (2038 kg ha^{-1}) and other growth parameters including plant height (87.67 cm) compared to all other treatments. Gross monetary returns (₹ 54461), net monetary returns (₹ 23083) and B:C (1.74) significantly higher with the application of 100 % RDP equivalent of vermicompost + ghanajeevamrutha +*Rhizobium* + PSB compared to all other treatments.

Key words: Economics, Ghanajeevamrutha, *Rhizobium,* Vermicompost

Introduction

Pulses play an important role in Indian agriculture for sustainable production, improvement in soil health and environment safety. India is the largest producer and also consumer of pulses in the world and it is a cheaper source of protein to overcome malnutrition among vegetarians. Pulses are more responsive to organic manures. Pulses contain high percentage of quality protein nearly three times more than in cereals. Indiscriminate and continuous use of chemical fertilizers have deleterious effect on soil physical, chemical and biological properties there by affecting the sustainability of crop production, besides causing environmental pollution. There is a scope to improve the productivity of pulses by enhancing the soil fertility and its productivity through increasing soil organic carbon, soil moisture storage capacity and adopting integrated nutrient management practices. The crop productivity under organic production system can be enhanced through optimizing the nutrient requirement of crop at different stages.

Blackgram [*Vigna mungo* (L) Heppear] is one of the most important pulse crops in India, being an excellent source of high-quality protein, in is grown in an area of 35.15 lakh ha with the production of 21.0 lakh tonnes and the productivity is 655 kg ha^{-1-} which is low compared to other pulse crops owing to its cultivation on marginal lands known to be poor in fertility (Anon., 2018).

Intensive farming techniques, together with the heavy use of chemical inputs over the last four decades, have led not only in a loss of natural ecosystem balance and soil health, but also in many hazards such as soil salinization, soil erosion, reduction in the groundwater levels and desertification, pesticide and fertilization contamination, ecological damage, genetic erosion, redness. The soil and climatic conditions in the drylands are well adapted to organic farming. The real potential of organic farming can be witnessed in rainfed areas and where the soil organic matter and organic carbon content is lesser. Low soil fertility is a major constraint to achieve sustainable blackgram production and productivity (Wagadre *et al.,* 2010). In view of this, the present investigation was carried out to know the effect of soil organic manures on crop growth, seed yield and economics of blackgram.

Material and methods

The field experiment was conducted during *kharif* 2019 at College of Agriculture, Vijayapur, Karnataka; India.The texture of soil at the experimental site was clayey in nature with pH of about 7.82 with low organic carbon of 0.57 %. The soil was low in N (262 kg ha^{-1}), medium in P_2O_5 (32.5 kg ha^{-1}) and higher K_2O (390 kg ha^{-1}) content respectively.

The experiment with 12 treatments consisting of organic amendments was laid out in RCBD with three replications. The black gram variety TAU-1 was sown with a spacing of 45 cm x 10 cm. The recommended dose of phosphorus for black gram was supplemented with different combinations of soil organic manures with equal proportions based on their P content.The required quantity of organic manures *viz.,* Farm yard manure, Vermicompost, Ghanajeevamrutha were applied uniformly as per the treatments and incorporated into the soil three weeks before sowing. The quantity of organic manures was worked out as equivalent to RDF *i.e.*, 20 kg N + 50 kg P_2O_5 + 0 kg K_2O ha^{-1}. Treatments were T_1: application of FYM + vermicompost based on 100 % RDP, T_2: application of vermicompost + ghanajeevamrutha based on 100 % RDP, T_3: application of FYM + ghanajeevamrutha based on 100% RDP,T_4: application of FYM + vermicompost based on 50% RDP,T_5: application of vermicompost + ghanajeevamrutha based on 50% RDP,T_6: application of FYM + ghanajeevamrutha based on 50 % RDP,T_7: application of FYM + vermicompost based on 100% RDP+*Rhizobium*+PSB, T_8: application of vermicompost + ghanajeevamrutha based on 100% RDP + *Rhizobium* + PSB,T_9:application of FYM + ghanajeevamrutha based on 100% RDP + *Rhizobium* + PSB,T_{10}: application of FYM + vermicompost based on 50% RDP + *Rhizobium* + PSB,T_{11}: application of vermicompost + ghanajeevamrutha based on 50% RDP + *Rhizobium* + PSB,

T_{12}: application of FYM + ghanajeevamrutha based on 50% RDP + *Rhizobium* + PSB.

The growth and yield parameters were recorded as per norms. Gross returns was computed on the basis of market price of the produce during the harvest and was expressed in rupees per hectare (₹ ha^{-1}).The net return was calculated by deducting the cost of cultivation from gross return per hectare and was expressed in rupees per hectare (₹ ha^{-1}).

Results and discussion

The results revealed that among the organic manures, application of P as vermicompost + ghanajeevamrutha based on 100 % RDP + *Rhizobium* + PSB resulted in higher growth, seed and haulm yield. Significantly higher plant height (87.67 cm), seed yield (701 kg ha^{-1}) and haulm yield (2038 kg ha^{-1}) compared to other treatments (Table 1). The increased plant growth, seed and haulm yield of black gram may be due to the application of organic manures which resulted in prolonged and steady availability of major nutrients during the crop growth period. Inclusion of nutrient rich organics *viz*. FYM, Vermicompost, Ghanajeevamrutha shows the pivotal role of *Rhizobium* in fixation of atmospheric nitrogen which might have enhanced the supply and translocation of N which isknown to influence the photosynthetic activity and inoculation of PSB which solubilize the insoluble P by the production of organic acids and some augmenting effect on native population of *Rhizobium*which playing a vital role in nodule formation in blackgram. The results are in conformity with the findings of Luikham *et al*. (2005), Wagadre *et al.* (2010) and Tyagi P. K. and Singh V. K. (2018).

Results also revealed that application of vermicompost + ghanajeevamrutha based on 100 % RDP + *Rhizobium* + PSB recorded significantly higher gross monetary returns (₹ 54461 ha^{-1}), net monetary returns (₹ 23,083 ha^{-1}) and B:C (1.74) in blackgram production (Table 2). The higher gross income, net income and benefit cost ratio was mainly because

Table 1. Effect of organics on plant height, seed yield and haulm yield in black gram

Treatments	Plantheight (cm)	Seed yield (kg ha^{-1})	Haulm yield (kg ha^{-1})
T_1 : Application of FYM + vermicompost based on 100 % RDP	81.47	610	1707
T_2 : Application of vermicompost + ghanajeevamrutha based on 100 % RDP	83.33	634	1807
T_3 : Application of FYM + ghanajeevamrutha based on 100 % RDP	82.03	622	1728
T_4 : Application of FYM + vermicompost based on 50 % RDP	74.70	408	1390
T_5 : Application of vermicompost + ghanajeevamrutha based on 50 % RDP	75.07	491	1432
T_6 : Application of FYM + ghanajeevamrutha based on 50 % RDP	74.80	411	1426
T_7 : Application of FYM + vermicompost based on 100 % RDP + *Rhizobium* + PSB	84.60	659	1838
T_8 : Application of vermicompost + ghanajeevamrutha based on 100 % RDP + *Rhizobium* + PSB	87.67	701	2038
T_9 : Application of FYM + ghanajeevamrutha based on 100 % RDP + *Rhizobium* + PSB	85.43	680	1890
T_{10}: Application of FYM + vermicompost based on 50 % RDP + *Rhizobium* + PSB	78.00	537	1480
T_{11}: Application of vermicompost + ghanajeevamrutha based on 50 % RDP + *Rhizobium* + PSB	78.87	592	1631
T_{12}: Application of FYM + ghanajeevamrutha based on 50 % RDP + *Rhizobium* + PSB	80.57	573	1532
S.Ed.±	2.83	30.5	60.8
C.D. (p=0.05)	8.30	89.6	178.3

NOTE: FYM - Farm Yard Manure; RDP - Recommended Dose of Phosphorus (50 kg ha^{-1}); PSB – Phosphorus Solubilizing Bacteria

Table 2. Economics as influenced by organics in Blackgram

Treatments	Cost of cultivation (₹ ha^{-1})	Gross returns (ha^{-1})	Netreturns (ha^{-1})	B:C
T_1 : Application of FYM + vermicompost based on 100 % RDP	29320	45280	15961	1.54
T_2 : Application of vermicompost + ghanajeevamrutha based on 100 % RDP	31320	46963	15644	1.50
T_3 : Application of FYM + ghanajeevamrutha based on 100 % RDP	29320	45635	16316	1.56
T_4 : Application of FYM + vermicompost based on 50 % RDP	20020	25538	5518	1.21
T_5 : Application of vermicompost + ghanajeevamrutha based on 50 % RDP	23320	28327	5008	1.28
T_6 : Application of FYM + ghanajeevamrutha based on 50 % RDP	20120	27386	7267	1.36
T_7 : Application of FYM + vermicompost based on 100 % RDP + *Rhizobium* + PSB	29378	49417	20039	1.68
T_8 : Application of vermicompost + ghanajeevamrutha based on 100 % RDP + *Rhizobium* + PSB	31378	54461	23083	1.74
T_9 : Application of FYM + ghanajeevamrutha based on 100 % RDP + *Rhizobium* + PSB	29378	50727	21350	1.73
T_{10} : Application of FYM + vermicompost based on 50 % RDP + *Rhizobium* + PSB	19549	32585	13036	1.67
T_{11} : Application of vermicompost + ghanajeevamrutha based on 50 % RDP + *Rhizobium* + PSB	23349	31478	8130	1.35
T_{12} : Application of FYM + ghanajeevamrutha based on 50 % RDP + *Rhizobium* + PSB	20149	35505	15357	1.76

NOTE: FYM - Farm Yard Manure; RDP - Recommended Dose of Phosphorus (50 kg ha^{-1}); PSB - Phosphorus Solubilizing Bacteria

of higher seed yield over other treatments. The cost of cultivation of blackgram was higher with higher quantity of FYM, vermicompost and ghanajeevamrutha application. The intensification of organic manures resulted in a steady and progressive increase of seed yield with consequent increase in gross monetary returns and net monetary returns, which resulted in higher benefit cost ratio. The results are in conformity with the findings of Sharma and Prasad *et al*. (2010) and Patra *et al.* (2011).When organics are applied, nutrients will be released slowly and also the nutrient losses will be minimized due to increased absorption of nutrients as a result of increased cation exchange capacity that increased with organic matter application. Thus, plant nutrients will be available for a long period in adequate quantity thereby plant can absorb the required nutrients as per its demand resulting in better growth, development and yield components. Addition of organic matter improves soil structure, porosity, water holding capacity and decreases bulk density and chemical properties such as soil organic carbon and available nutrients will also be improved. All these promote soil health, crop growth and yield on sustained basis.

Conclusion

Soil application of P equivalent to 100 per cent recommended dose of nutrients through vermicompost and ghanajeevamrutha to blackgram improved the crop growth, seed yield, haulm yield and economics. This might have helped in meeting the nutrient demand of black gram through various organic nutrient sources, which will reduce the dependence on chemical fertilizers. The study indicated that application of organic manures is crucial in increasing the seed yield and economics of blackgram crop.

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