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GROWTH, YIELD AND ECONOMICS PERFORMANCE OF BLACK GRAM *(VIGNA MUNGO* [L.] HEPPER*)* AS INFLUENCED BY ORGANIC AND INORGANIC SOURCE OF NUTRIENTS UNDER SODIC SOIL CONDITIONS

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Abstract

The aim of the present study was to evaluate the performance of black gram as influenced by organic and organic source of nutrient under sodic soil condition. The experiment was laid down in randomized block design (RBD) with three replications. Total of 8 treatments encompassing of different organic and inorganic sources of nutrients including control were used in the present investigation to study their individual as well as interaction effect on growth, yield and economics of different lines of black gram under sodic soil conditions. Supply of the required NPK nutrient was done through Urea, DAP, FYM and VC. The details of treatment specification used in present study are T_0 (control), T_1 (100% RDF), T_2 (100% FYM), T_3 (100% VC), T_4 (50% FYM+50% VC), T_5 (50% RDF + 50% FYM), T_6 (50% RDF + 50% VC) and T_7 (T_7 50% RDF + 25% FYM + 25% VC). Data recorded on growth parameters (plant height, dry weight, number of root nodules, number of branches plant^{-1} and number of flowers plant^{-1}), grain yield as well as on economics of black gram (net return and B:C Ratio) were subjected to different statistical analysis as per method of analysis of variance. Appraisal of the data indicated that treatment-T_6 (50% recommended doses of fertilizers (RDF)+ 50% vermicompost) significantly improved the growth parameters *viz.,* plant height (43.10 cm), dry weight (24.00gm), number of root nodules (22.36), number of branches plant^{-1} (4.86) and number of flowers plant^{-1} (48.66), Same treatment also recorded significant enhancement in grain yield (7.32 q/ha) as well as in economics *viz.,* net returns (Rs. 28167) and B:C Ratio (2.09) of black gram over rest of the treatments under study. Based on present investigation it can be inferred that combined application levels of organic and inorganic fertilizers have positive impact by improving the soil fertility and crop production. From the current study, application of 50% RDF along with 50% VC was found more impressive by improving the growth, yield and economic of black gram than rest of the treatments including control.

Key words: Blackgram, growth parameters, yield and yield contributing characters, economics

Introduction

Nutrients (NPK) availability in plants can be added either by applying organic or inorganic forms of fertilizers or both in combination. The organic and inorganic forms of fertilizers are available through a variety of sources *viz.,* organic matter/manures, bio fertilizer, green manures and chemical fertilizers. Both organic and inorganic fertilizers provide plants with the nutrients needed to grow healthy and strong. However, each contains different ingredients and supplies these nutrients in different ways. Organic fertilizers work over time to create a healthy growing environment, while inorganic fertilizers provide rapid nutrition. Determining which is better for your plants depends largely on the needs of your plants and your preferences in terms of cost and environmental impact. Organic fertilizers contain only plant- or animal-based materials that are either a byproduct or end product of naturally occurring processes, such as manures, leaves, and compost. Inorganic fertilizer, also referred to as synthetic fertilizer, is manufactured artificially and contains minerals or synthetic chemicals. For example, synthetic nitrogen fertilizers are typically made from petroleum or natural gas. Phosphorus, potassium and other trace elements in inorganic fertilizers are often mined from the earth. Organic fertilizers release nutrients only when the soil is warm and moist, which tends to correspond with your plants' times of greatest need. However, they rely on soil organisms to break down organic matter, so

nutrients are released more slowly than they are from inorganic fertilizers. This slow-release method reduces the risk of nutrient leaching, but it takes time to supply nutrients to plants. In contrast, inorganic fertilizers provide this nutrition in plant-ready form immediately. However, the concentration of nutrients increases the risk of burning the plant, and the rapid release of nutrients may leach them deeply into the soil and water table where plants cannot access them. It is now well realized that to protect soil health, use of judicious combination of organic and inorganic sources of nutrients is essential (Mohan and Chandaragiri, 2007). Integration of recommended dose of chemical fertilizers along with farmyard manure or vermicompost would result in better yield of crop plants including black gram under rainfed condition. Slow and steady release of nutrients from organic and inorganic sources would increase the availability of nutrients which will result in translocation of more photosynthates from source to sink and finally improve the growth, yield and yield attributing characters. Keeping the above considerations, the present investigation has been undertaken to study the effect of organic and inorganic sources of nutrients on growth, yield and economics of black gram.

Methods and Materials

The present investigation was carried out during *kharif* season of 2018 at Crop Research Farm, Department of Agronomy, School of Agriculture, Suresh Gyan Vihar University, Jaipur (Rajasthan). The experiment was laid down in Randomized Block Design with three replications, comprising of 8 treatments that consists of individual as well as interaction effect of both organic and inorganic source of nutrients including control. Treatments were randomly arranged in each replication, divided into 24 plots. To study the effect of organic and inorganic sources of nutrients on growth, yield and economics of black gram, supply of the required NPK nutrient was done through Urea, DAP, FYM and VC. The details of treatment specification used in present study are T_0 (control), T_1 (100% RDF), T_2 (100% FYM), T_3 (100% VC), T_4 (50% FYM+50% VC), T_5 (50% RDF + 50% FYM), T_6 (50% RDF + 50% VC) and T_7 (T_7 50% RDF + 25% FYM + 25% VC). Data recorded on growth parameters (plant height, dry weight, number of root nodules, number of branches plant^{-} and number of flowers plant^{-1}), grain yield as well as on economics of black gram (net return and B:C Ratio) were subjected to different statistical analysis as per method of analysis of variance (Skeleton). The significance and non-significance of the treatment effect were judged with the help of 'F' variance ratio test. Calculated 'F' value (variance ratio) was compared with the table value of 'F' at 5% level of significance. If calculated value exceeded the table value, the effect was considered to be significant.

Results and Discussion

Growth parameters

It was observed from the data presented in table 1 that all the growth parameters *viz.,* plant height, dry weight, number of root nodules, number of branches plant^{-1} and number of flowers plant^{-1} recorded significant difference when subjected to different treatments levels of organic and inorganic nutrient sources including control.

Table 1: Effect of organic and inorganic source of nutrients on growth attributes of black gram *Vigna mungo* L.

	Treatments	Plant height (cm)	Dry weight (gm)	Number of root nodules	Number of branches plant^{-1}	Number of flowers plant^{-1}
T_0	Control	30.99	14.88	16.56	1.93	24.80
T_1	100% RDF	39.38	17.81	19.93	3.06	29.94
T_2	100% FYM	34.63	15.81	16.21	2.80	20.06
T_3	100% VC	39.70	16.56	16.25	2.93	20.60
T_4	50% FYM+ 50% VC	40.84	18.41	18.09	3.66	31.93
T_5	50% RDF + 50% FYM	39.22	17.35	20.85	3.60	34.46
T_6	50% RDF + 50% VC	43.10	24.00	22.36	4.86	48.66
T_7	50% RDF + 25% FYM + 25% VC	41.53	20.62	21.79	3.80	38.53
F- test		S	S	S	S	S
S. Ed.(±)		3.26	0.45	0.89	0.35	1.61
C. D. (P = 0.05)		7.02	0.99	1.94	0.78	3.47

RDF=Recommended dose of fertilizers, VC= Vermicompost, FYM= Farmyard manure.

Further, from table 1, it was found that among all the treatments including control, treatment T_6 that constitutes 50% RDF + 50% VC showed significantly maximum plant height (43.10cm), dry weight (24.00gm), number of root nodules (22.36), number of branches plant^{-1} (4.86) and number of flowers plant^{-1} (48.66) at 60 DAS against minimum recorded in control. However, T_6 was Statistically at par with T_7 treatment (50% RDF + 25% FYM + 25% VC). The combined application of 50% recommended dose of fertilizer RDF+ %50 vermicompost to the black gram improved accessibility of major and minor nutrient to plant might have enhanced early root growth and cell multiplication leading to more absorption

of other nutrients from deeper layers of soil ultimately resulting in increased plant growth attributes and finally increase plant growth rate. The increased yield attributes and yield might be due the increase supply of the major nutrients by translocation of photosynthesis accumulation under the influence of sources of inorganic nutrients. Further, the translocations and accumulation of photosynthesis resulted in increased seed, straw and biological yield and net return of black gram significantly increased with the application of 50% RDF+ % 50 % vermicompost.

The absorption of nutrient might have helped the plant in greater photosynthesis, nitrogen metabolism and synthesis of carbohydrates. Thus, there beneficial effect of vermicompost and RDF brought about a substantial improvement in yield attributes and untimely in seed and straw yield of black gram. Our findings are in conformity with the result obtained by Bakthavathsalam and Deivanayaki (2007) Geetha and Velayutham (2009), Bhattacharya *et al.,* (2019), Hussain, *et al*., (2011). Shashi kumar, *et al*., (2013).

Yield

Grain yield

Grain yield data presented in table 2 showed significant variation when treated with different levels of organic and inorganic source of nutrients applied individually as well as in combination. Significantly the highest grain yield (7.32 q ha^{-1}) was recorded in treatment T_6 *i.e.* combine application of 50% recommended dose of fertilizers along with 50% vermicomposting. The second highest grain yield was recoded in treatment t_7 (50% rdf + 25% fym + 25% vc) followed by treatment t_5 (50% rdf + 50% fym). Similar findings were also reported by Kumar and Jat (2010). The combined application of organic and inorganic fertilizers have positive impact in enhancing yield because organic fertilizers helps in reducing the risk of nutrient leaching even after the application of inorganic fertilizers in the soil. In addition, vermicompost are best remedies for maintaining of soil health as well as productivity of crop plants especially when applied in combination with chemical fertilizers. Such results are in conformity with Parthasarathi, *et al*., (2008), Dhyani, (2011), Sunil Kumar and Yadav (2018).

Table 2: Effect of organic and inorganic source of nutrients on yield and economy of black gram (*Vigna mungo* L.).

	Treatments	Grain yield (q/ha)	Net returns (Rs.)	B:C Ratio
T_0	Control	3.80	7287	1.33
T_1	100% RDF	4.92	12115	1.49
T_2	100% FYM	5.51	17676	1.75
T_3	100% VC	5.50	14237	1.52
T_4	50% FYM+ 50% VC	6.01	19848	1.78
T_5	50% RDF + 50% FYM	5.35	16221	1.67
T_6	50% RDF + 50% VC	7.32	28167	2.09
T_7	50% RDF + 25% FYM + 25% VC	5.19	10818	1.39
	F- test	s		
	S. Ed.(±)	100.46		
	C. D. (P = 0.05)	215.50		

RDF=Recommended dose of fertilizers, VC= Vermicompost, FYM= Farmyard manure.

Economics of the treatments

The production cost refers to the total amount of funds used in production. In the present study, the total cost of farm were work out Summation of all the individual costs represents per hectare total costs for production of black gram, Net return is a useful tool to evaluate the professional effectiveness or performance/ financial solvency of any kind of farming. It was estimated by deducting total cost from total return. Significantly higher net return (Rs. 28167 ha^{-1}) and the benefit cost ratio (2.09) were recorded with treatment T_6 (50% RDF+ % 50 % vermicompost) over rest of the treatment and control table 2. This was at par with Treatment T_7 (50% RDF + 25% FYM + 25% VC) over rest of the treatment including control respectively. These results support the findings of Gupta *et al.,* (2007).

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