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COMPARATIVE STUDY OF INORGANIC FERTILIZERS AND ORGANIC MANURES ON GROWTH AND YIELD COMPONENTS OF BLACK GRAM (*VIGNA MUNGO L.*)

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ABSTRACT

The present study was undertaken to assessment of organic and inorganic source of nutrients on yield and yield traits of black gram (*Vigna mungo L.*) cultivar "ADT 6". An investigation was taken up during kharif season of 2019 at SRS Institute of Agriculture and Technology, Vedasandur Taluk, DIndigul district, Tamil Nadu. The experiment was laid down in randomized block design (RBD), consisting of eight treatments which were replicated thrice for comparing the performance of black gram (*Vigna mungo L.*) cultivar "ADT 6" treated with different levels of organic and inorganic source of nutrients that were applied individually as well as in combination. The results indicates that treatment T6 that consists of 50%recommended doses of fertilizers (RDF) in combination with 50% vermicompost (VC) were far better than rest of treatments under study. It recorded significantly highest number of pods plant⁻¹ (49.60), numbers of grains pod⁻¹ (5.53), 1000 grain weight (36.76 gm), harvest index (45.39%), grain yield (7.53 q ha⁻¹) and straw yield (13.97 q ha⁻¹) over rest of the treatments.

Keywords : Organic manures; Inorganic fertilizers; Black gram, Vermicompost.

Introduction

Black gram (*Vigna mungo L.*) is one of the important pulse crops of India. It is cultivated mostly on marginal lands in mono/ mixed cropping system without any fertilizers under rainfed conditions of southern Tamil Nadu. Its productivity is very low in Tamil Nadu (575 kg ha⁻¹) (DOA, 2013) as compared to yield potential. One of the important reasons of low productivity is poor fertility of soil. The problem is compounded by the fact that the majority of the farmers in rainfed areas are resource poor with low risk bearing capacity and they generally do not apply recommended dose of fertilizers, either through organic or inorganic sources. Farmers of south and south-eastern Tamil Nadu grow black gram without application of fertilizers or use less than recommended dose of macro and micro nutrients. This imbalanced nutrient supply adversely affects the seed yield of black gram, soil health and even the profit to the farmers. It is known to increase nitrogen percentage in the soil by fixing atmospheric nitrogen. Therefore, it plays an important role in maintaining soil fertility. But, the average productivity of the crop is far below.

Major hurdles in increasing the productivity are the poor soil in which the crop is grown and improper fertilization. Mineral nutrition plays a key role in exploiting the genetic potential of pulses crops. Phosphorus is an important mineral element for grain legumes as it helps in root development, participates in synthesis of phosphate and phosphoproteins and takes part in energy fixing and releasing process in plants. Significant response of legumes to

phosphate nutrition has been reported by several workers (Singh and Yadav, 2008). Most of the applied P gets fixed and only 10-18% is utilized by the current crop (Subehia and Sharma, 2002).

Use of both FYM and vermicompost are best remedies for maintaining of soil health as well as productivity of crop plants along with the application of chemical fertilizers under non pesticide-practices of controlling insect pest and diseases by using bio-pesticides. Such practices to some extent will help to overcome the ill effect of continuous use of chemical pesticides and fertilizers. Thereby helps in preventing environmental pollution. It is now well realized that to protect soil health, use of judicious combination of organic and inorganic sources of nutrients is essential (Hussain *et al.*, 2011).

Integration of recommended dose of chemical fertilizers along with farmyard manure or vermicompost would result in better yield of 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 photosynthesis from source to sink and finally improve the yield attributing characters (Prasad *et al.*, 2015). Keeping the above considerations, the present investigation was undertaken to study the effect of organic and inorganic sources of nutrients on yield and yield attributes of black gram and to find out the suitable organic and inorganic nutrient management for black gram.

Materials and Methods

The present investigation was carried out at Crop Research Farm, SRS Institute of Agriculture and Technology, Vedasandur Taluk, Dindigul district, Tamil Nadu during Kharif season of 2019 on sandy loam soil. The region has a semi-arid climate. The soil of the experimental site was clay loam in texture containing 276.30, 20.69 and 427.60 kg ha⁻¹ available nitrogen, phosphorus and potassium, respectively in 0-30 cm soil depth with pH 7.9 and 0.58 per cent organic carbon. The blackgram variety ADT 6 was sown on 10th July 2019 at 30 cm row to row spacing by using recommended seed rate of 16 kg ha⁻¹. The experiment consists of eight treatments including control which were tested under three replications by using randomized block design (RBD). The various treatments used in present study includes T0 (Control), T1 (100% RDF), T2(100% VC), T3 (100% FYM), T4 (50% FYM + 50% VC), T5 (50% RDF + 50% FYM), T6 (50% RDF + 50% VC) and T7 (50% RDF + 25% FYM + 25% VC) Nutrient management was done through Urea, DAP, FYM and VC to supply the required nitrogen and phosphorus. Half dose of nitrogen in the form of inorganic source i.e., urea was applied after first irrigation and the second split dose at the time of pod formation whereas full dose of inorganic source of P₂O₅ in the form of DAP and organic source in the form of FYM (5t ha⁻¹) and VC (2 t ha⁻¹) were applied as basal dressing to fulfil the recommended dosage of nitrogen @20kg ha⁻¹ and 40kg phosphorus ha⁻¹ of black gram. All other agronomic practices were adopted as per need of the crop. The data on yield and yield attributes were recorded in all the treatments and were analyzed statistically.

Results and Discussion

It is an established fact that organic source of nutrients viz., FYM and vermicompost improve the physical, chemical and biological properties of soil including supply of almost all the essential plant nutrients for the growth and development of plants.

Perusal of data presented in Table.1 revealed that all rest of the treatments, the yield contributing characters under study showed significant variation when treated with different levels of organic and inorganic source of nutrients which were either applied individually or in combination.

The maximum number of pods plant⁻¹ (49.60), number of grains pod⁻¹ (5.53), 1000 grain weight (36.76 g) and harvest Index (45.39%) was recorded with treatment T6 which was applied of 50% recommended dose of fertilizers (RDF) in combination with 50% vermicompost as compared to all other treatments and against minimum recorded in control. Our results are in conformity with Rathore *et al.* (2010), Sheikh *et al.* (2012). Application of inorganic fertilizers makes availability of essential nutrients more quickly to crop plants whereas organic fertilizers especially vermicompost helps in enhancing the activity of microorganisms in soils which further helps to improve solubility of nutrients and their consequent availability to plants. Therefore combined effect of both organic and inorganic source of nutrients can have favorable effect in improving the yield attributes of any crop plant including black gram. Kumawat *et al.* (2013), Kokani *et al.* (2014).

The statistical analysis of data showed that there were significant differences between treatment and grain yield. Table 2 of black gram cultivar “ADT 6” showed significant differences when subjected to different levels of organic and inorganic source of nutrients. Significantly maximum grain yield (7.32 q ha⁻¹) was obtained on treatment T6 when plots were treated with i.e., 50% RDF in combination with 50% vermicompost against significantly minimum (3.80 q ha⁻¹) recorded in control. However, it was statistically at par with treatment T7 (50% RDF + 25% FYM + 25% VC). Kannan and Ganesan (2011). It is also a fact that nutrients in organic matters /manures are released to the plants via the activity of soil microbes. This must have occurred in a more efficient and continues manner when a combination of FYM and application of vermicompost was used. Yield is a dependent character that depends upon yield contributing characters. Therefore, any change in any yield contributing character will have direct impact on yield. As both inorganic and organic fertilizers provides readily availability of essential nutrients to crop plant thereby helps in enhancing yield attributes because optimum utilization of solar light and its conversion to starches through photosynthesis resulted higher grain number and weight that resulted in increased seed yield. Our results are in conformity with Kumar *et al.* (2011), Shukla and Tygi (2009).

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

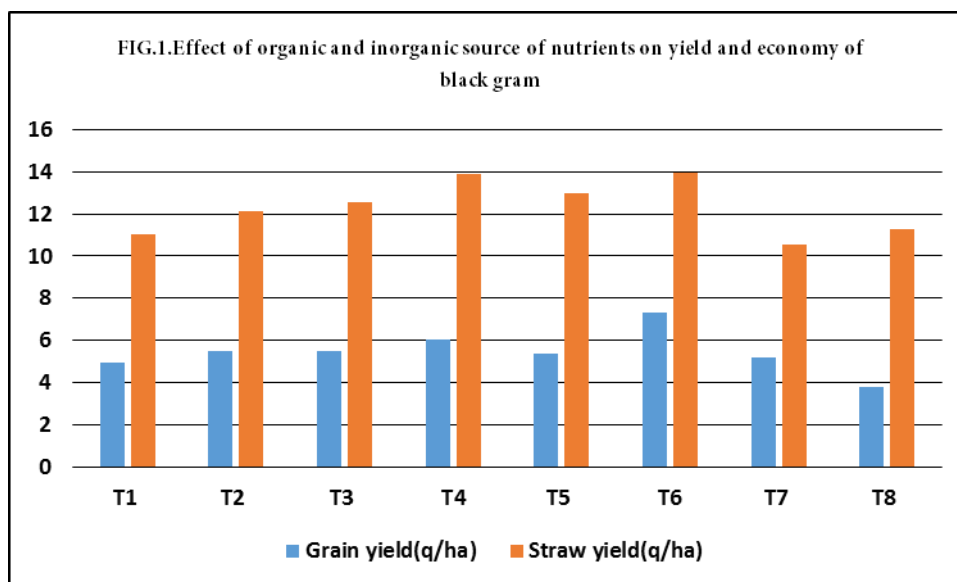
Treatments	Number of pods plant ⁻¹	Number of grains pod ⁻¹	Test weight (gm)	Seeds Harvest Index (%)
T1	24.20	5.13	32.93	32.28
T2	16.86	4.53	34.26	39.38
T3	20.86	4.4	33.5	33.28
T4	29.26	4.26	33.63	31.67
T5	32.93	4.33	33.7	33.59
T6	49.60	5.53	36.76	45.39
T7	37.13	4.66	34.66	43.98
T8	17.80	3.66	31.5	35.89
F -test	S	S	S	S
S. Ed.(±)	1.54	0.28	1.27	4.15
C. D. (P = 0.05)	3.31	0.62	2.73	8.93

T1- 100% RDF ;T2 -100% FYM ;T3- 100% VC; T4- 50% FYM+ 50% VC;T5- 50% RDF + 50% ;T6 -50% RDF + 50% VC;T7- 50% RDF + 25% FYM + 25% VC;T8- Control

Table 2: Effect of organic and inorganic source of nutrients on growth attributes of Black gram (*Vigna mungo* L.)

S.No	Treatments	Plant height (Cm)	Dry matter (g)	Leaf area index
1.	T1	27.00	6.96	1.960
2.	T2	30.28	9.11	2.094
3.	T3	33.69	10.31	2.278
4.	T4	31.18	7.38	2.280
5.	T5	31.10	9.48	2.256
6.	T6	32.00	7.39	2.272
7.	T7	34.89	8.35	2.211
8.	T8	31.13	7.83	2.020
S. Ed.(±)		1.27	0.20	0.054
C. D. (P = 0.05)		3.82	0.61	0.163

T1- 100% RDF ;T2 -100% FYM ;T3- 100% VC; T4- 50% FYM+ 50% VC;T5- 50% RDF + 50% ;T6 -50% RDF + 50% VC;T7- 50% RDF + 25% FYM + 25% VC;T8- Control

**Fig. 1:** Effect of organic and inorganic source of nutrients on yield and economy of black gram (*Vigna mungo* L.)

From the Fig. 1, it was observed that straw yield of black gram cultivar “ADT 6” when treated with different levels of organic and inorganic sources of nutrients showed significant variation. Significantly maximum fodder yield (13.97 q ha^{-1}) was found with treatment T6 (50% RDF + 50% VC) against significantly minimum in control (11.29 q ha^{-1}). Similar findings were also reported by Prasad *et al.* (2015), Amruta, *et al.* (2015), Kokani *et al.* (2015) who observed maximum straw yield in black gram from the treatments with both organic and inorganic fertilizer combination.

Conclusion

From the result narrated above it is concluded that treatment T6 which consists of 50% recommended dose of fertilizers (RDF) in combination with 50% Vermicompost recorded significant improvement in enhancing yield and yield contributing characters of black gram cultivar “ADT 6” over rest of the treatments used in present investigation. It is therefore suggested and recommended that combination of organic and inorganic fertilizers should be adopted by farmers to sustain yield of black gram and soil health in Vedasandur, Dindigul district.

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