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INFLUENCE OF ORGANIC MANURES AND BIO FERTILIZERS ON GROWTH AND YIELD OF BHENDI

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Abstract: The experiment was conducted at the APAC farm, Adhiparasakthi Horticultural College, Kalavai during Jan - April (2017) to evaluate the influence of organic manures and bio fertilizers on growth and yield of Bhendi.The experimental design was in a Randomized Block Design (RBD), block of 10 treatment replicated 3 times. The treatment details are as follows, T_1 - FYM 25 t ha^{-1}, T_2 - Poultry manure 5 t ha^{-1}, T_3 - Vermicompost 5 t ha^{-1}, T_4 - Panchgavya 500 lit ha^{-1}, T_5 - Sheep and Goat manure - 5 t ha^{-1}, T_6 - Azospirillum 2 kg ha^{-1}, T_7 - FYM 12.5 t ha^{-1} + Poultry manure 2.5 ha^{-1}, T_8 - Sheep and Goat manure 2.5 t ha^{-1} + Vermicompost 2.5 t ha^{-1}, T_9 - FYM 6.25 t ha^{-1} + Sheep and Goat manure 1.25 t ha^{-1}+ Poultry manure 1.25 t ha^{-1}+ Vermicompost 1.25 t ha^{-1}, T_{10} - Absolute Control. Therecommended dose of fertilizer (RDF) 100:50:50 kg of NPK ha^{-1} is applicable for all treatments.The growth characters, viz., plant height, No. of leaves $plant^{-1}$, no. of branches $plant^{-1}$, No. of flowers $plant^{-1}$ and yield attributes viz., pod length (cm), No. of pods $plant^{-1}$, pod weight (g), yield (t ha^{-1})were significantly increased by the application of FYM 6.25 t ha^{-1} + Sheep and Goat manure 1.25 t ha^{-1}+ Poultry manure 1.25 t ha^{-1} + Vermicompost 1.25 t ha^{-1}followed by FYM 12.5 t ha^{-1}+ Poultry manure 2.5 t ha^{-1}. The same treatment had significantly higher grain yield of 5.6 t ha^{-1}. It was followed by FYM 12.5 t ha^{-1} + Poultry manure 2.5 t ha^{-1} was registered 5.4 t ha^{-1}. Over all, from the experimental results, it could considered that application of FYM 6.25 t ha^{-1}+ Sheep and Goat manure 1.25 t ha^{-1} + Poultry manure 1.25 t ha^{-1}+ Vermicompost 1.25 t ha^{-1}as a better option for achieving higher productivity and profitability of Bhendi.

Keywords: Bhendi, Poultry manure, Vermicompost, Sheep and Goat manure, Growth, Yield attributed, Yield.

Introduction

Vegetable cultivation is one of the major enterprises in horticulture which is becoming more popular due to the greater appreciation of their food values. Vitamins and minerals. Vegetables contribute an important part of the diet to many people in the tropics more especially in India. Okra, (*Abelmoschusesculentus*, L. (Moench) belongs to the *malvaceae*family. Okra plays an important role in the diet by supplying carbohydrate, protein, fat, minerals and vitamins that are usually deficient in the staple food (Savello *et al*, 1982). India ranks first in the world with 35 million tons (70% of the total world production)

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of okra produced from 0.35million hectares of land (FAOSTAT, 2010). The major bhendi producing states in India are Uttar Pradesh, Bihar, West Bengal, Orissa, Assam, Andhra Pradesh, Tamil Nadu and Karnataka. Bhendi yields high in warm humid tropical condition. Use of organic manures to meet the nutrient requirement of crop would be an inevitable practice in the years to come for sustainable agriculture since, organic manures generally improve the soil physical, chemical and biological properties along with conserving the moisture holding capacity of soil and thus resulting in enhanced crop productivity along with maintaining the quality of crop produce (Maheswarappa *et al*., 1999). Bio-fertilizers are eco-friendly and supply the nutrient input of biological origin for plants. They are not only important for the reduction of quality chemical fertilizers but also for providing better yield in sustainable agriculture and also to increase soil fertility for crop production in sustainable farming. Although the organic manures contain plant nutrients in small quantities as compared to the fertilizers, the presence of growth promoting principles like enzymes and hormones, besides plant nutrients make them essential for improvement of soil fertility and productivity (Bhuma, 2001).

Materials and Methods

The experiment was conducted at the APAC farm, Adhiparasakthi Horticultural College, Kalavai during Jan - April 2017.Seeds of bhendi variety ArkaAnamika was collected and utilized for the study.Seed were planted at a spacing of 45cm x 30cm.The experimental design was in a Randomized Block Design (RBD), block of 10 treatment replicated 3 times.The experiment consisted of ten treatments. The treatment details are as follows, T_1 - FYM 25 t ha^{-1}, T_2 - Poultry manure 5 t ha^{-1}, T_3 - Vermicompost 5 t ha^{-1}, T_4 - Panchgavya 500 lit ha^{-1}, T_5 - Sheep and Goat manure - 5 t ha^{-1}, T_6 - Azospirillum 2 kg ha^{-1}, T_7 - FYM 12.5 t ha^{-1} + Poultry manure 2.5 t ha^{-1}, T_8 - Sheep and Goat manure 2.5 t ha^{-1} + Vermicompost 2.5 t ha^{-1}, T_9 - FYM 6.25 t ha^{-1} + Sheep and Goat manure 1.25 t ha^{-1}+ Poultry manure 1.25 t ha^{-1} + Vermicompost 1.25 t ha^{-1}, T_{10} - Absolute Control. Therecommended dose of fertilizer (RDF) 100:50:50 kg of NPK ha^{-1} is applicable for all treatments.Statistical analysis was done as recommended by Panse and Sukhatme (1961). Wherever necessary the values were transformed approximately prior to analysis. The critical difference (CD) was worked at 5 percent (P= 0.05) level.

Results and Discussion

The results of the experiment conducted to study The "Influence of Organic Manures and Biofertilizeron growth and yield of Bhendi (*Abelmoschusesculentus* (L))" are presented below (Table 1).

Growth parameters

Plant height (cm)

The plant height was found to vary significantly as influenced by organic manures and biofertilizer. Among the various treatments T_9 (FYM 6.25 t ha^{-1} + Sheep and Goat manure 1.25 t ha^{-1}+ Poultry manure 1.25 tha^{-1}+ Vermicompost - 1.25 tha^{-1}) recorded the highest plant height of 102.8 cm followed by T_7 (FYM 12.5 tha^{-1} + Poultry manure 2.5 tha^{-1}) which recorded 101.5 cm. The plant height was found to be less in T_{10} control which recorded as 74.1 cm.This might be due to application of organic manuresalso would have helped in the plant metabolic activity through the supply of micronutrients in the early growth phase which inturn encouraged vigorous growth (Pawar *et al,* 1977).

Number of leaves per plant

Among the various treatments T_9 (FYM 6.25 t ha^{-1}+ Sheep and Goat manure 1.25 tha^{-1}+ Poultry manure 1.25 tha^{-1} + Vermicompost - 1.25 tha^{-1}) recorded more number of leaves 14 followed by T_7 (FYM 12.5 t ha^{-1}+ Poultry manure 2.5 tha^{-1}) which recorded 13.4 number of leaves. On the other hand T_{10} control recorded the least number of leaves of about 8.5. This might be due to the application of organic manure which increased synthesis of chlorophyll and amino acids (Nimje and Seth, 2006).

Number of branches per plant

Among the various treatments T_9 (FYM 6.25 tha^{-1} + Sheep and Goat manure 1.25 tha^{-1}+ Poultry manure 1.25 tha^{-1}+ Vermicompost 1.25 tha^{-1}) recorded more number of branches 7 followed by T_7 (FYM 12.5 tha^{-1} + Poultry manure 2.5 tha^{-1}) which recorded 6.8 number of branches. On the other hand T_{10} control recorded the least number of branches of about 4.2. This might be due to the application of organic manure which improve physical condition and promotes microbial growth and build up in soil organic matter, which in turn produces organic acid, which inhibits IAA oxidase enzymes, resulting in enhancing the promotive effect of auxin- IAA which has direct effect on growth of number of branches (Arumugam Shakila and Anbumani, 2008).

Number of flowers per plant

Significant influence on the number of flowers was observed in different treatment. Among the treatments T_9 (FYM 6.25 t ha^{-1} + Sheep and Goat manure 1.25 t ha^{-1}+ Poultry manure 1.25 t ha^{-1} + Vermicompost 1.25 t ha^{-1}) produced the highest number of flowers per plant 25.1 followed by T_7 (FYM 12.5 t ha^{-1} + Poultry manure 2.5 t ha^{-1}) which produced 24.1 flowers per plant . The least number of flowers was recorded in T_{10} control of about 17.2 flowers. This might be due to organic manures and biofertilizer application could be attributed to factors such as higher productions of flowers per plant and increased fruit set. (Patil *et al.* 2010)

Yield attributes

Pod length (cm)

The maximum pod length of 16.3 cm was recorded in T_9 (FYM 6.25 tha^{-1} + Sheep and Goat manure 1.25 tha^{-1}+ Poultry manure 1.25 tha^{-1} + Vermicompost1.25 tha^{-1}) followed by T_7 (FYM 12.5 tha^{-1} + Poultry manure 2.5 tha^{-1}) which recorded 15.5 cm. The least pod length of 11.2 cm was recorded in T_{10} control.This might be attributed to be increased microbial biomass nitrogen mineralization for the development of floral organ leading to increased pod length (Sharma and Kanaujia, 1992).

Number of pods per plant

The treatments differences were statistically significant for this trait. The highest number of pods per plant 22.9 was recorded T_9 (FYM 6.25 tha^{-1} + Sheep and Goat manure 1.25 tha^{-1}+ Poultry manure 1.25 tha^{-1} + Vermicompost 1.25 tha^{-1}) followed by T_7 (FYM 12.5 tha^{-1} + Poultry manure 2.5 tha^{-1}) which recorded 22.4 pods. The least number of pods (15.1) was recorded in T_{10} control. It might be due to organic manures and biofertilizer application could be attributed to factors such as higher productions of flowers and fruits per plants. The marked effect of organic manures and biofertilizer on yield and related attributes have been reported by a number of research workers in Bhendi (Varma *et al*. 2010).

Pod weight (g)

The treatments Influence was statistically significant for this trait. All treatment was superior to control. Among them T_9 (FYM 6.25 t ha^{-1} + Sheep and Goat manure 1.25 t ha^{-1}+ Poultry manure 1.25 t ha^{-1} + Vermicompost - 1.25 t ha^{-1}) recorded the highest pod weight of 17.8 g followed by T_7 (FYM 12.5 t ha^{-1} + Poultry manure 2.5 t ha^{-1}) with a fruit weight of 17.2 g. On the other hand the lowest pod weight was recorded in T_{10} of about 12.2 g.This might be due to the increased supply of all essential nutrients by the application of organic manures

which would have been used by the bhendi to produce fruits. (Manikandan and Subramanian, 2010).

Yield

The estimated yield per hectare (Table 2) and (Fig 1) also showed similar trend where the T_9 (FYM 6.25 t ha^{-1} + Sheep and Goat manure 1.25 t ha^{-1} + Poultry manure 1.25 t ha^{-1} + Vermicompost 1.25 t ha^{-1}) recorded yield of 5.6 t ha^{-1}followed by T_7 (FYM 12.5 t ha^{-1} + Poultry manure 2.5 t ha^{-1}) with 5.4 t ha^{-1}. T_{10} control registered the lowest yield of 3.6 t ha^{-1}. This might be due to supply of all essential nutrients by the application of organic manures, which would have enhanced the uptake of nutrients resulting in improved yield (Jeevan Rao and Ramalaxhmi, 2009).

Conclusion

Based on the results of the above study, it is concluded that application of FYM 6.25 t ha^{-1} + Sheep and Goat manure 1.25 t ha^{-1} + Poultry manure 1.25 t ha^{-1} + Vermicompost 1.25 t ha^{-1}followed by FYM 12.5 t ha^{-1} + Poultry manure 2.5 t ha^{-1} was recommended to get profitably higher yield besides improving the quality of Bhendi. Over all, from the experimental results, it could considered that application of FYM 6.25 t ha^{-1} + Sheep and Goat manure 1.25 t ha^{-1} + Poultry manure 1.25 t ha^{-1} + Vermicompost 1.25 t ha^{-1} as a better option for achieving higher productivity and profitability of Bhendi.

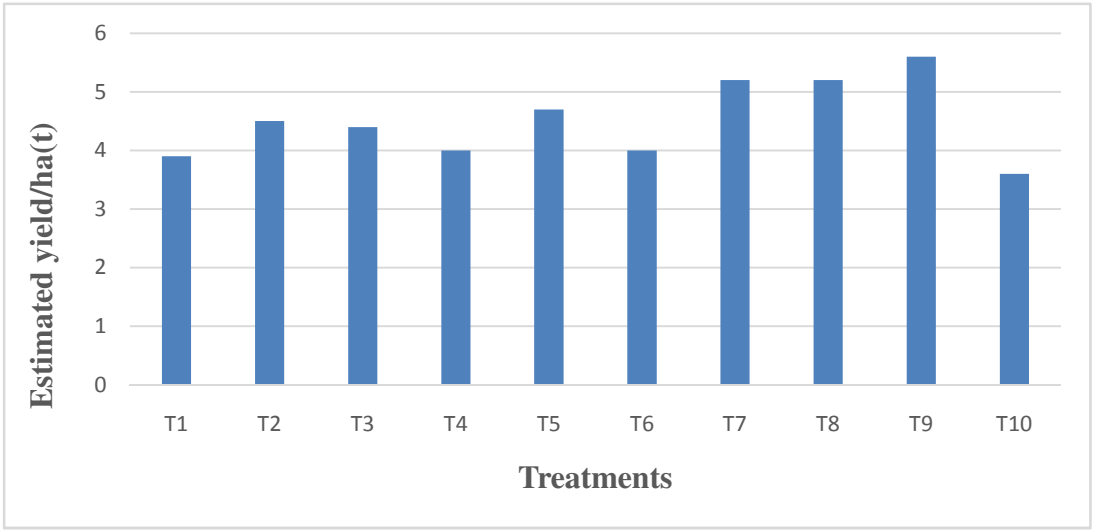
Table 1: Influence of organic manures and biofertilizer on growth parameters of Bhendi

Treatments	Plant height (cm)	No of leaves $Plant^{-1}$	Number of branches$Plant^{-1}$	Number of flowers$Plant^{-1}$
T_1 - FYM 25 t ha^{-1}	96.9	10.2	4.9	19.4
T_2- Poultry manure 5 t ha^{-1}	98.6	10.8	5.4	22.8
T_3–Vermicompost5 t ha^{-1}	94.3	9.5	4.8	21.7
T_4 -Panchakavya 500 lit ha^{-1}	79.0	9.0	4.3	19.1
T_5- Sheep and Goat manure - 5 t ha^{-1}	99.8	11.0	6.0	23.8
T_6- Azospirillum 2 kg ha^{-1}	81.2	9.2	4.7	17.7
T_7- FYM 12.5 t ha^{-1} + Poultry manure 2.5 t ha^{-1}	101.5	13.4	6.2	24.8
T_8- Sheep and Goat manure 2.5 t ha^{-1} + Vermicompost2.5 t ha^{-1}	100.0	11.0	6.1	24.1
T_9- FYM 6.25 t ha^{-1} + Sheep and Goat manure 1.25 t ha^{-1} + Poultry manure 1.25 t ha^{-1} + Vermicompost1.25 t ha^{-1}	102.8	14.0	7.0	25.1
T_{10}- Control	74.1	8.5	4.2	17.2
S.Ed	**0.6**	**0.3**	**0.1**	**0.1**
CD (p=0.05)	**1.3**	**0.8**	**0.3**	**0.3**

Table 2: Influence of organic manures and biofertilizer on yield attributes of Bhendi

Treatments	Pod length (cm)	No. of pods plant^{-1}	Pod weight(g)	Yield (t ha^{-1})
T_1 - FYM 25 t ha^{-1}	13.6	17.7	16.3	3.9
T_2- Poultry manure 5 t ha^{-1}	13.8	20.0	15.2	4.5
T_3–Vermicompost5 tha^{-1}	13.4	19.2	14.6	4.4
T_4 -Panchakavya 500 lit ha^{-1}	12.4	15.5	13.2	3.6
T_5- Sheep and Goat manure - 5 t ha^{-1}	14.1	20.8	15.5	4.7
T_6- Azospirillum2 kg ha^{-1}	12.3	17.1	13.7	4.0
T_7- FYM 12.5 t ha^{-1} + Poultry manure 2.5 t ha^{-1}	15.5	22.4	17.2	5.4
T_8- Sheep and Goat manure 2.5 t ha^{-1} + Vermicompost2.5 t ha^{-1}	14.3	21.1	16.4	4.9
T_9- FYM 6.25 t ha^{-1} + Sheep and Goat manure 1.25 t ha^{-1} + Poultry manure 1.25 t ha^{-1} + Vermicompost1.25 t ha^{-1}	16.3	22.9	17.8	5.6
T_{10}- Control	11.2	15.1	12.2	4.0
S.Ed	**0.4**	**0.2**	**0.3**	**0.1**
CD (p=0.05)	**0.9**	**0 .6**	**0.7**	**0.3**

Figure 1: Influence of organic manures and biofertilizer on yield (t ha^{-1}) of Bhendi



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