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INFLUENCE OF ORGANIC INPUTS IN AUGMENTING THE GROWTH AND YIELD ATTRIBUTES OF OKRA (*ABELMOSCHUS ESCULENTUS* (L.) MOENCH.)

T. Uma Maheswari and M. RajKumar

Department of Horticulture, Faculty of Agriculture, Annamalai University, Annamalainagar-608002 (Tamil Nadu) India.

Abstract

An investigation was carried out to study the influence of organic inputs in okra in Vegetable Unit, Department of Horticulture, Faculty of Agriculture, Annamalai University. The field experiment was conducted in randomized block design with 12 treatments in three replications. Among the various treatments tried, application of 12.5 t.ha^{-1} of FYM + 2.5 t.ha^{-1} of vermicompost + @ 2 kg.ha^{-1} of biofertilizers consortium + 1 t.ha^{-1} of neem cake along with 0.2 % humic acid (foliar spray) resulted in increasing the growth and yield attributes of okra. This was followed by the treatment which received application of 12.5 t.ha^{-1} of FYM + 2.5 t.ha^{-1} of vermicompost + 2 kg.ha^{-1} of biofertilizers consortium + 1 t.ha^{-1} of neem cake along with 3% panchakavya and the treatment which received application of chemical fertilizers.

Key words: Okra, panchakavya, humic acid, biofertilizers and vermicompost.

Introduction

Okra (*Abelmoschus esculentus* (L.) Moench.) is one of the most popular vegetable crop widely grown under varying climatic condition and in almost all parts of India throughout the year. It requires heavy manuring for its potential production. However increased expenditure on fertilizers has been a major constraint of recurrent nature to the farmers. Moreover, the ill effects caused by continuous and over use of chemical fertilizers to soil, water and environment cannot be under estimated. Hence there is a need to develop sustainable practices which requires higher use of organic inputs in cultivation. Organic cultivation promises a balanced environment and quality food to people. Organic vegetable production is now a commercial venture, on a small scale in several developed countries. Use of organic manures not only increases the moisture holding capacity of the soil, but also plays an important role in soil and water conservation by binding and aggregation properties. They also help in balancing the availability of all essential plant nutrients to the growing plant, not only to maintain high yield, but also the quality of produce (Ajari *et al.*, 2003). Therefore, an investigation was undertaken to study the influence of organic inputs in okra. Under the present circumstances of awareness on organic farming, this study brings light on the effective utilization of some of the organic inputs *viz.*, FYM, vermicompost, neemcake, biofertilizers, panchakavya and humic acid to augment the growth and yield attributes of okra.

Materials and Methods

A field experiment was conducted in randomized block design with 12 treatments in three replications at Vegetable Unit, Department of Horticulture, Faculty of Agriculture, Annamalai University. The treatments include bulky organic manures, concentrated organic manure, biofertilizer consortium, foliar organic nutrients and chemical fertilizers. The bulky organic manures used were FYM (12.5 and 25 t.ha^{-1}) and vermicompost (2.5 and 5 t.ha^{-1}). The concentrated organic manure used was neem cake (1 t.ha^{-1}). Panchakavya (3%) and humic acid (0.2%) were tried as foliar nutrition. Farmyard manure, vermicompost, biofertilizers consortium and neem cake were applied basally a week before sowing. Foliar spray was given three times starting from two weeks after sowing at 15 days interval. The observations recorded were plant height, number of branches, stem girth and number of leaves, number of fruits per plant, fruit length, fruit girth, weight of fruits and yield per plant.

Results and Discussion

The growth characters increased significantly with the combined application of organic inputs. Application of FYM (12.5 $t.ha^{-1}$) + VC (2.5 $t.ha^{-1}$) + BFC (2 $kg.ha^{-1}$) + NC (1 $t.ha^{-1}$) along with HA @ 0.2%, as foliar spray recorded the maximum plant height (109.20 cm), number of branches (4.62), stem girth (3.71 cm) and number of leaves (21.55) (Table 1). The results of the present study are in agreement with findings of Akanbi *et al.,* (2010). In general, organic manures improve the soil physical conditions and promotes soil organic matter. This in turn produces organic acids, which inhibits particularly IAA oxidase enzyme, resulting in enhancing the promotive effect of auxin - IAA, which has direct effect on plant growth. The most likely explanation is that presence of major nutrients in the farmyard manure, vermicompost, neem cake and humic acid would have increased the growth characters. Application of FYM (12.5 $t.ha^{-1}$) + VC (2.5 $t.ha^{-1}$) + BFC (2 $kg.ha^{-1}$) + NC (1 $t.ha^{-1}$) along with HA @ 0.2% enhanced the yield attributes of okra (Table 2). The increase in number of fruits per plant may be due to the partitioning efficiency *viz.,* increased allocation of photosynthates towards the economic part and also due to the hormonal balance in the plant system. Higher yield attributes might be due to improved aeration and water-holding capacity of FYM applied soil and the efficient utilization of nutrients in the FYM applied plants. Anburani, (2000) reported that the increase in fruit weight may be due to the accelerated mobility of photosynthates from the source to sink as influenced by the growth hormones, released or synthesized due to the organic sources, as well as K uptake which helped in the mobility of photoassimilates to sink. Organic manures provided sufficient quantity of carbonaceous material for decomposition by microorganisms and converting them into mineralized organic colloids, besides adding them to soil reserves. Premsekhar and Rajashree, (2009) in okra in which they reported that higher yield response of crops due to organic manure application could be attributed to improved physical and biological properties of the soil resulting in better supply of nutrients to the plants. Further higher yields due to application of vermicompost may be attributed to the high level of nutrients along with growth stimulating substances excreted by earthworms into their casts. Moreover the increased yield over control could be attributed to the presence of quinine groups in humic acid which act as hydrogen acceptors and serve as activators of oxygen during photosynthesis and stimulate the plant growth resulting in higher yield.

Further, soil applied FYM and neem cake might have acted as nutrient sources resulting in highest uptake of nutrients by plants. This might have resulted in higher photosynthetic activity and higher accumulation of reserved photosynthates, which might have enhanced the flowering, fruit development and ultimately the yield. The favourable effect of FYM and neem cake on yield attributes have been reported by Akande *et al.,* (2006) in bhendi. Apart from this *Azospirillum* is known to produce growth promotic compounds such as gibberllins, cytokinin like substances and auxins such as IAA (Yadav *et al.,* 2005). These phytohormones like auxin and gibberellins in addition with atmospheric nitrogen fixed by *Azospirillum* might have resulted in enhanced cell elongation and thereby growth and yield. Phosphobacteria solubilize and increase the availability of organic phosphorus to the plants and its uptake by the way of

Table 1: Influence of organic inputs on growth and yield attributes of okra *cv.* Arka Anamika (at 90 DAS).

Treat-ments	Plant height (cm)	Stem girth (cm)	Number of branches	Number of leaves	Number of fruits per plant	Fruit length (cm)	Fruit girth (cm)	Fruit weight (g)	Yield per plant (g)	Yield per hectare (T)
T_1	88.64	3.01	3.48	14.07	11.13	14.47	4.47	11.31	122.58	9.08
T_2	90.54	3.14	3.61	14.89	11.70	15.07	4.69	12.16	140.20	10.38
T_3	92.10	3.20	3.69	15.36	12.06	15.80	4.87	13.44	158.76	11.76
T_4	93.17	3.26	3.81	15.87	12.68	16.11	5.28	14.03	174.28	12.91
T_5	94.89	3.34	3.96	16.10	13.24	16.91	5.79	14.32	189.07	14.00
T_6	96.85	3.40	4.17	16.97	13.79	17.28	6.28	14.56	196.63	14.56
T_7	99.18	3.45	4.25	17.43	14.09	17.88	6.41	14.72	203.98	15.11
T_8	101.61	3.51	4.35	18.53	14.85	18.29	6.44	14.93	218.43	16.18
T_9	106.40	3.65	4.52	20.14	15.84	19.02	6.68	15.57	242.26	17.94
T_{10}	109.20	3.71	4.62	21.55	16.35	19.40	6.95	16.88	258.25	19.12
T_{11}	103.63	3.58	4.44	19.21	15.32	18.81	6.55	15.02	224.70	16.64
T_{12}	86.22	2.91	3.25	11.98	9.23	13.86	4.06	9.93	82.02	6.08
S.Ed.	0.52	0.02	0.03	0.11	0.13	0.10	0.05	0.04	3.12	0.22
CD (p = 0.05)	1.05	0.05	0.07	0.22	0.23	0.20	0.10	0.09	6.25	0.45

production of organic acids. The results are in agreement with Uma Maheswari and Deepthi Bershani, (2019) in soursop.

Thus it can be concluded from the present study, application of FYM (12.5 $t.ha^{-1}$) + VC (2.5 $t.ha^{-1}$) + BFC (2 $kg.ha^{-1}$) + NC (1 $t.ha^{-1}$) along with HA @ 0.2% foliar spray was found to have beneficial effect on growth, yield and quality of okra.

Note:

T_1 – FYM (25 $t.ha^{-1}$) + BFC (2 $kg.ha^{-1}$)

T_2 – Vermicompost (5 $t.ha^{-1}$) + BFC (2 $kg.ha^{-1}$)

T_3 – FYM (25 $t.ha^{-1}$) + BFC (2 $kg.ha^{-1}$) + Neem cake (1 $t.ha^{-1}$)

T_4 – Vermicompost (5 $t.ha^{-1}$) + BFC (2 $kg.ha^{-1}$) + Neem cake (1 $t.ha^{-1}$)

T_5 – FYM (25 $t.ha^{-1}$) + BFC (2 $kg.ha^{-1}$) + Neem cake (1 $t.ha^{-1}$) + Panchakavya @ 3%

T_6 – Vermicompost (5 $t.ha^{-1}$) + BFC (2 $kg.ha^{-1}$) + Neem cake (1 $t.ha^{-1}$) + Panchakavya @ 3%

T_7 – FYM (25 $t.ha^{-1}$) + BFC (2 $kg.ha^{-1}$) + Neem cake (1 $t.ha^{-1}$) + Humic acid @ 0.2%

T_8 – Vermicompost (5 $t.ha^{-1}$) + BFC (2 $kg.ha^{-1}$) + Neem cake (1 $t.ha^{-1}$) + Humic acid @ 0.2%

T_9 – FYM (12.5 $t.ha^{-1}$) + Vermicompost (2.5 $t.ha^{-1}$) + BFC (2 $kg.ha^{-1}$) + Neem cake + Panchakavya @ 3%

T_{10} – FYM (12.5 $t.ha^{-1}$) + Vermicompost (2.5 $t.ha^{-1}$) + BFC (2 $kg.ha^{-1}$) + Neem cake + Humic acid @ 0.2%

T_{11} – Recommended dose of fertilizer (30:50:30 NPK $kg.ha^{-1}$)

T_{12} – Absolute control.

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