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Influence of Organic, Inorganic and Biofertilizers on Growth, Yield, Quality, and Economics of Okra [*Abelmoschus esculentus* (L). Moench] under Assam Condition

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A B S T R A C T

A field experiment was conducted at the Experimental Farm, Department of Horticulture, Assam Agricultural University, Jorhat during March to July 2016 to study the "Influence of organic, inorganic and biofertilizers on growth, yield, quality and economics of okra". The results indicated that application of RDF (T_1) recorded the highest branches plant^{-1} (1.80), Leaves plant^{-1} (14.66), Leaf area index (1.36), Chlorophyll content of leaf (0.210 mg/g), Fruit length (14.62 cm), Fruit girth (4.64 cm), fruit weight (12.56 g), Fruit yield plant^{-1} (190.96 g) with the B:C ratio of 3.89 followed by followed by T_2 [75% RD of NPK + Vermicompost @ 1 t ha^{-1} (mixed with microbial consortium)]. However, among the quality parameters the highest carbohydrate (6.98 g/100g) and the lowest fiber (14.30 %) content of fruit recorded in T_3. It was found that with lesser fiber content the quality of okra fruit increased. The present investigation revealed that most of the growth, yield and yield attributes were found highest in treatment receiving RDF. Whereas superior value regarding the quality of fruit observed in the treatment receiving the combination of organic, inorganic and biofertilizers. Considering the adverse effect on soil health and environment it is not advisable to use chemical fertilizers at a higher quantity. A study led to the conclusion that good growth, yield with better quality of okra can be achieved by judicious application of organic, inorganic and biofertilizers.

Introduction

Okra [*Abelmoschus esculentus* (L). Moench] is one of the most important vegetable crop in India and grown over a wide range of soil and climatic condition. It is a warm season crop and prefers a temperature between 22°C and 35°C. Okra is susceptible to frost at temperatures below 12°C.The climatic condition of Assam is subtropical humid with a hot summer experienced during May to August suitable for okra cultivation. Use of High Yielding Variety (HYV) and intensive agriculture depleted the nutrient status of the soil. Excessive use of chemical fertilizers to obtained high yield resulted in several hazards to the soil, deficiency of micronutrients (Kanwar and Randhawa, 1978) and nutrient imbalance (Singh *et al.*, 1989), ultimately resulting in the reduction of crop yield.

Organic manures are very cheap and easily available, apart from partially fulfilling the nutrient demand, improve soil structure,

enhance fertility and promote biological activity. The organic manure gives better quality produce as compared to those grown with the inorganic source of fertilizer (Abusaleha and Shanmugavelu, 1988). But the release of nutrients from organic sources is much slower than chemical fertilizers, for which rapid demand of crop needs cannot be met through organic manures alone.

Biofertilizers such as *Azospirillum*, PSB, VAM, have potential practical applications, which contribute to increasing crop productivity through increased biological nitrogen fixation, increased availability or uptake of nutrients through phosphate solubilization or increased absorption, stimulation of plant growth or by rapid decomposition of organic residues.

Several researchers reported that there is no single source of nutrient which can meet the nutrient demand of crops. Therefore all the nutrient sources *i.e.*, organic, inorganic and biofertilizer should be applied in appropriate combination. Good nutrient management often involves a combination of organic and inorganic sources of nutrients. The organic material maintains and improves soil productivity, whereas chemical fertilizers are often needed if production is to increase. Combination of organic, inorganic and biofertilizer contributes to better farm management, minimizing environmental pollution, reducing the cost of chemical fertilizers, improving soil productivity, and the production of safe food and feed.

Materials and Methods

A field experiment was conducted at the Experimental Farm, Department of Horticulture, Assam Agricultural University, Jorhat during March to July 2016. The experiment was laid out with Randomized Block Design and replicated three times. There were seven treatments consisting of T_1 [RDF(50:50:50 kg NPK ha^{-1} + FYM @ 10 t ha^{-1})], T_2 [75% RD of NPK + Vermicompost @ 1 t ha^{-1} (mixed with microbial consortium)], T_3 [50% RD of NPK + Vermicompost @ 2 t ha^{-1} (mixed with microbial consortium)], T_4 [75% RD of NPK + Microbial consortium as seed coat + Vermicompost @ 1 t ha^{-1}], T_5 [50% RD of NPK + Microbial consortium as seed coat + Vermicompost @ 2 t ha^{-1}], T_6 [FYM @ 10 t ha^{-1} (mixed with microbial consortium)] and T_7 [Microbial consortium as seed coat + FYM @ 10 t ha^{-1}]. The crop was raised with a spacing of 45 cm × 30 cm and plot size of 2.7 m × 1.5 m. Standard cultural practices recommended for Okra was followed uniformly for all the experimental plots. Organic manures, inorganic fertilizers, and biofertilizers were applied at different doses as per the treatment requirement. FYM was applied @ 10 t ha^{-1} and vermicompost was applied @ 1 t ha^{-1} and 2 t ha^{-1} after final land preparation. Microbial consortium was applied through inoculation in two ways *i.e* with seed and with organic manures (FYM and vermicompost). Consortium applied at the rate of 500 g per 10 kg of seed as a seed treatment and along with organic manures at the rate of 3.5 kg ha^{-1}. Inorganic fertilizers *i.e.* Urea, SSP, and MOP were applied three days before sowing as a basal application. Half of Urea, full dose of SSP and MOP was applied as basal. The second half of Urea was applied at 30 days after sowing. The growth, yield attributes, and quality were recorded in five randomly selected plants in each plot were tagged to arrive mean values. The data were subjected to statistical scrutiny.

Results and Discussion

Growth parameters

In this present investigation growth parameters differs significantly due to the

application of inorganic, organic and biofertilizers (Table 1). The highest number of branches per plant (1.80), number of leaves per plant (14.66), leaf area index (1.36), and chlorophyll content (0.210 mg g^{-1}) was recorded in treatment T_1 (RDF) followed by T_2 and T_4. This might be due to higher level of nutrients added to soil and uptake by the plant, leading to early vegetative growth and increased plant height resulting in more number of branches, leaves per plant which in turn increased the leaf area index because nitrogen has favourable influence to produce large cell with thinner cell wall and its contribution in cell division and cell elongation. Moreover, nitrogen is a structural element of chlorophyll and protein molecules and thereby affects the formation of chloroplasts and accumulation of chlorophyll. Similar finding was reported by Kadlag *et al.*, (2010). Among the treatments T_2 and T_4 increased in growth parameters which might be due to the fact that combine application of organic, inorganic and biofertilizer increased total microbial population that improved the phosphorous and nitrogen availability and uptake by the plant. Thus, increase in nutrient level enhanced vegetative growth and simultaneously increased the number of functional leaves, leaf area index and chlorophyll content of the leaf. These results are in accordance with Ghuge *et al.,* (2015) in okra.

Yield attributing parameters and yield

The combined application of organic, inorganic and biofertilizers could bring significant differences on yield attributing characters *viz.,* fruit length, fruit girth, fruit weight and yield per plant (Table 1). The highest fruit length (14.62 cm), fruit girth (4.64 cm), fruit weight (12.56 g) and fruit yield per plant (190.96 g $plant^{-1}$) was recorded in treatment T_1 (RDF) followed by T_2 and T_4. This might be due to the application of balanced fertilization, which build-up the adequate food reserves for formation and elongation of cells, and enhanced the photosynthetic activity by increasing the leaf area and rate of photosynthesis. The synthesized photosynthates might have translocated to the growing fruits having more demand of assimilates which consequently lead to greater length, thickness, weight of fruit and also yield. Increased yield attributes in T_2 and T_4 might be due to the additive effect of biofertilizers which might have provided better soil conditions inclusive of improved soil fertility, nitrogen fixation, phosphate solubilization, enhanced the efficacy of applied N and P; enhanced the activities of other microbes and also released of growth stimulants and much more. Efficacy of the inorganic fertilizer was pronounced when they are combined with biofertilizers (Dhawale *et al.,* 2011). Similar results were demonstrated by Sharma *et al.,* (2011) and Gayathri and Reddy (2014) in okra.

Quality parameters

Carbohydrate content in okra seemed to be affected by different treatments significantly (Table 1). The highest carbohydrate content (6.98 g 100 g^{-1}) was recorded in T_3 [50% RD of N,P,K + Vermicompost @ 2 t ha^{-1} (mixed with microbial consortium)] and lowest carbohydrate content (6.05 g $100g^{-1}$) was recorded in T_1 (RDF). It might be due to the fact that when a plant is exposed to with more nitrogen, it increases protein production and reduces carbohydrate concentration (Worthington, 2001).

In the present study, it has been observed that crude fiber was lowest under treatment T_3 (Table 1). This might be due to the easy availability of nitrogen leading to balance C: N ratio, enhancing the vegetative growth resulting in high photosynthetic activity.

Table.1 Influence of organic, inorganic and biofertilizers on growth, yield, quality and economics of okra under Assam condition

Treatment	Branches Plant^{-1}	Leaves Plant^{-1} (45 DAS)	Leaf Area Index (45 DAS)	Chlorophyll content of leaf (mg g^{-1}) (45 DAS)	Fruit length (cm)	Fruit girth (cm)	Fruit weight (g)	Fruit yield plant^{-1} (g)	Carbohy-drate (g 100g^{-1})	Crude fiber (%)	B:C Ratio
T_1	1.80	14.66	1.36	0.210	14.62	4.64	12.56	190.96	6.05	17.37	3.89
T_2	1.65	12.33	1.20	0.180	13.10	4.44	11.50	176.35	6.60	16.43	3.63
T_3	1.30	9.88	0.94	0.154	11.43	4.15	10.12	140.58	6.98	14.30	2.31
T_4	1.55	12.05	1.12	0.175	13.04	4.36	11.42	168.73	6.51	16.50	3.45
T_5	1.25	9.72	0.90	0.149	11.31	4.00	10.01	132.13	6.90	14.55	2.24
T_6	1.10	8.60	0.73	0.124	9.11	3.79	9.20	108.20	6.26	15.57	2.24
T_7	1.00	8.54	0.70	0.123	9.06	3.69	9.13	96.97	6.20	15.83	2.21
S.Ed(±)	0.06	0.45	0.05	0.008	0.66	0.08	0.31	5.12	0.05	0.13	—
CD at 5%	0.12	0.97	0.10	0.018	1.44	0.17	0.67	11.15	0.12	0.29	—

Addition of organic manure and consortium tended to produce tender fruits with least fiber content due to the action of organic acids secreted by microbes (Evers, 1989). Premsekhar and Rajashree (2009) also reported that better quality fruits were produced with less fiber content in organic manure treatment.

Economics of production

In the present investigation the highest benefit: cost ratio (3.89) was observed in treatment T_1 (RDF) followed by treatment T_2 [75% RD of NPK + Vermicompost @ 1 t ha^{-1} (mixed with microbial consortium)] *i.e.,* 3.63. This might be due to more yield obtained under this treatment.

From the present study, it can be concluded that good vegetative growth, yield, and quality of okra can be produced by combine use of organic, inorganic and biofertilizer. Although more yield was obtained in treatment receiving recommended dose of fertilizer (RDF) but continuous use of chemical fertilizers at higher amount posses negative impact on the soil as well as on the environment. So, it is not advisable to use chemical fertilizers at the higher rate. Combine use of organic, inorganic and biofertilizer not only helps in improving the yield and quality of produce but it also help in reducing soil and environment pollution. Therefore, treatment T_2 [75% RD of NPK + Vermicompost @ 1 t ha^{-1} (mixed with microbial consortium)] was found best considering the above points and recommended for okra cultivation under field condition.

References

Abusaleha and Shanmugavelu, K.G. (1988). Studies on the effect of organic vs. Inorganic sources of nitrogen on growth, yield and quality of okra (*Abelmoschus esculentus*). *Indian J. Hort.* 45(3-4): 312-318.

Dhawale, A.B., Warade, S.D. and Bhangre, K.K. (2011). Integrated nutrient management in Bhindi. *Asian J. Hort.* 6(1): 145-147.

Evers, A.M. (1989). Effect of different fertilization practices on NO_3N, N, P, K, Ca, Mg, ash and dietary fiber content of carrot. *J. Agric. Sci. Finland* 61: 99-11.

Gayathri, K. and Reddy, P.S.S. (2014). Effect of organic manures and inorganic fertilizers on growth and yield of okra (*Abelmoschus esculentus* (L). Moench)

cv. Arka Anamika. *Veg. Sci.* 40(2): 235-237.

Ghuge, M.B., Lekhi, R., Karcho, S. and Kumar, A. (2015). Influence of integrated nutrient management on growth and seed yield of okra (*Abelmoschus esculentus* (L.) Monech) cv. VRO-6. *Environ. Ecol.* 33(3): 1073-1076.

Kadlag, R.R., Kapadiya, P.K., Bhor, P.B., Chandore, H.D. and Joshi, M.D. (2010). Effect of organic, inorganic fertilizer and biofertilizers on growth of okra (*Abelmoschus esculentus* L. (Moench)) cv. Gujarat Okra-2. *Haryana J. Hort. Sci.* 39(3/4): 316-317.

Kanwar, J. S. and Randhawa, N. S. (1978). Micronutrient research in soil and plants in India (Annual Review), Technical Bulletin 50, Indian Council of Agricultural Research, New Delhi.

Premsekhar, M. and Rajashree, V. (2009). Influence of organic manures on growth, yield and quality of okra. *American Eurasian J. Sustain. Agric.* 3(1): 6-8.

Sharma, T.R., Pandey, A.K., Upadhyaya, S.D. and Agrawal, S.B. (2011). Effect of sources of nutrients and their levels on yield, quality and economics of summer season okra. *Indian J. Hort.* 68(4): 498-502.

Singh, A. P., Sakal, R. and Sinha, R. B. (1989). Effect of changing cropping pattern and fertility levels on crop yields and micronutrient status of soil after five cycles of crop rotation. Annals of Agricultural Research 10(4): 361-367.

Worthington, V. (2001). Nutritional quality of organic versus conventional fruits, vegetables and grain. *J. Altv. Complemy. Med.* 7(2): 161-173.

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