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Impact of Integrated Nutrient Management on Yield Attributes of Okra [*Abelmoschus esculentus* (L.) Moench] cv. Arka Anamika

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ABSTRACT: The modern nutrient management strategy has shifted its focus toward the concept of sustainability and eco-friendliness. Integrated use of various soil fertility amendment inputs aims at alleviating the limiting nutrients problem and improving their availability. During the Kharif season from July to November 2019, the present study has been conducted in the College of Horticulture, Rajendranagar, Sri Konda Laxman Telangana State Horticultural University to determine the impact of integrated nutrient management on the yield characteristics of okra. The results showed that the different treatments had a substantial impact on yield characteristics. The okra crop supplied a combination of 75 per cent RDF + 12.5 per cent RDN via FYM + 12.5 per cent RDN via vermicompost + *Azotobactor* + Phosphorus solubilizing bacteria [PSB] (T7) influenced growth characters positively, registering superior values for yield attributes like minimum days to first fruit set (47 days), number of fruits per plant (20.40), dry matter yield of the pods (989 kg/ha), fruit length (15 cm), average fruit (18.8 g), pod yield per plant (0.4 kg) and pod yield per plot (10.03 kg).

Keywords: Okra, RDF, RDN, Yield.

INTRODUCTION

Okra [*Abelmoschus esculentus* (L.) Moench], known colloquially as lady's finger is a major vegetable crop in India. It is native to tropical and subtropical Africa and has a diploid chromosomal number of 2n=130. Numerous investigations have revealed that neither synthetic fertilizers nor organic sources (or) biofertilizers alone can't produce long-term productivity. Inorganic fertilizer costs are also rising, making them unaffordable for small and poor farmers. Inorganic fertilizers give nutrients, while organic fertilizers primarily enhance soil organic matter and improve soil structure and buffering capacity, making a combination of inorganic and organic fertilizers the ideal method for soil fertility management. Conjunctive use of organic manures, bio-fertilizers and chemical fertilizers has positive impact on fruit yield (Bharthy *et al.,* 2017; Ferdous *et al.,* 2017; Jat *et al*., 2017). Integrated nutrient management, or the use of inorganic, organic, and biofertilizers in combination, is widely recognised as a long-term technique of raising yield and enhancing soil productivity. Integrated nutrient management has been found in several studies to help minimise secondary and micronutrient deficiencies. The goal of INM is to integrate the use of all-natural and man-made sources of plant nutrients, so that crop productivity increases in an efficient and environmentally benign manner, without sacrificing the soil productivity of future generations (Maruthi *et al*. 2014).

MATERIALS AND METHODS

The study was carried out at the College of Horticulture, Rajendranagar, SKLTSHU from July to November 2019. The experiment was laid out in a Randomized Block Design with ten treatments, namely, T_1 -Control (no fertilizer use), T_2 -100 percent Recommended dose of fertilisers (RDF), T_3 -75 percent RDF + 25 percent RDN through FYM + *Azotobacter* + Phosphorus solubilizing bacteria [PSB], T_4 -50 percent RDF + 50 percent RDN through FYM, T_5 -75 per cent RDF + 25 per cent RDN through vermicompost +

Azotobacter + Phosphorus solubilizing bacteria [PSB], T_6-50% RDF + 50% RDN through vermicompost, T_7-75% RDF + 12.5% RDN through FYM + 12.5% RDN through vermicompost + *Azotobacter* + Phosphorus solubilizing bacteria [PSB], T_8 -50 percent RDF + 25% RDN via FYM + 25% RDN via vermicompost + *Azotobacter* + Phosphorus solubilizing bacteria [PSB], T_9 -100 percent RDN via FYM, and T_{10} -100 percent RDN via vermicompost. These treatments were repeated three times.

Observed yield attributes of okra

Days to first fruit set: Days to 1st fruit initiation were recorded visually in each plot, and the results were averaged.

The number of fruits per plant: The number of fresh fruits harvested from five randomly selected plants was recorded at each harvesting, and the average number of fruits harvested per plant was calculated.

Dry matter yield of fruit (kg/ha): Two fruits were collected at random from each treatment and brought to the laboratory once a week. Just after the recording of the new weight, it was cut into small pieces with the aid of a stainless steel knife. The fruit samples were air-dried for the first two days before being placed in a hot air oven at 60 ± 5°C temperatures for drying until a constant weight was obtained and then ground in a stainless steel grinder. Fruit dry matter yield was converted to kg/ha.

Fruit length (cm): The length of five randomly selected fruits was measured in centimetres from the base to the apex using a centimetre scale, and mean values were calculated.

Average weight of fruit (g): The weight of 10 fresh fruits was taken from randomly selected and tagged five plants during harvesting, and the average weight of fruit was calculated by dividing the weight of ten fruits.

Fruit yield per plant (kg): The total weight of the fruits from the five randomly selected plants was recorded, and the average yield of fruits per plant was calculated in kilogrammes (kg) by adding all of the pickings together.

Fruit yield per plot (kg): At each picking, the fruit from each net plot was weighed separately and recorded in kilogrammes (kg). The total fruit yield was calculated by adding the yields of all pickings.

Statistical analysis of variance and significance testing was performed on the experimental data using Panse and Sukhatme's Randomized Block Design technique (1989). For treatment comparisons where the "F" test was found significant at the 5% level of significance, the crucial difference was determined.

RESULTS AND DISCUSSION

From the data, it was clear that there was a significant difference observed among the treatments. Among all the treatments, T_7 -75% RDF + 12.5% RDN through FYM + 12.5% RDN through vermicompost + *Azotobacter* + Phosphorus solubilizing bacteria [PSB] recorded the minimum number of days to first fruit set (47.00 days) and was at par with treatment T_2 (48.00 days), T_5 (50 days) and T_3 (50.5 days). Whereas, treatment T_1 - control (no use of fertilizers) recorded a maximum number of days to the first fruit set (57.00 days). Efficacy of the inorganic fertilizer was pronounced when they are combined with organic manures (Schuphan, 1974).

the maximum number of fruits per plant (20.40) was achieved by conjoint application of 75% RDF + 12.5% RDN through FYM + 12.5% RDN through vermicompost + *Azotobacter* + Phosphorus solubilizing bacteria [PSB] (T_7) and was at par with treatment T_2 (19.82) followed by T_5 (19.07), T_3 (18.08) and T_8 (17.09). However, the minimum number of fruits per plant (15.00) was obtained with the application of T_1 - control (no use of fertilizers). The combined use of NPK + organic manures improved the supply of nutrients in a balanced manner and resulted in better growth and higher yield of okra plants (Abusaleha and Shanmugavelu 1988).

The statistical analysis of the data revealed that different INM treatments had a significant effect on the dry matter yield of the pods (kg/ha). The dry matter yield (kg/ha) of the pods ranged from 620 to 989 kg/ha. The dry matter yield of the pods (kg/ha) was higher (989 kg/ha) with the treatment T_7 - 75 per cent RDF + 12.5 percent RDN through FYM + 12.5 percent RDN through vermicompost + Azotobacter + Phosphorus solubilizing bacteria [PSB] which was comparable to the application of 100 percent RDF (T_2)(977 kg/ha). The beneficial role of organic manures and biofertilizers in improving soil physical, chemical, and biological properties, resulting in better nutrient absorption by plants and higher yield, was well understood (Prabhu *et al.*, 2002).

The higher values for fruit length (15.10 cm) was observed in treatment T_7 consisting of (75% RDF + 12.5% RDN via FYM + 12.5% RDN via vermicompost + *Azotobacter* + Phosphorus solubilizing bacteria [PSB]) and was statistically at par with the treatment T_5 (15.09 cm), T_2 (15.06 cm) and T_3 (14.81 cm).

The maximum weight of okra pod (18.83 g) was recorded in the treatment T_7 (75% RDF + 12.5% RDN through FYM + 12.5% RDN through vermicompost + *Azotobacter* + Phosphorus solubilizing bacteria [PSB]) and was followed by T_5 (17.20 g) and T_2 (16.97 g). while the least weight of okra pod (13.80 g) was observed in treatment T_1 (no use of fertilizers).

The okra crop supplied with 75% RDF + 12.5% RDN through FYM + 12.5% RDN through vermicompost + *Azotobacter* + Phosphorus solubilizing bacteria [PSB] (T_7) recorded higher values of Pod yield/plant (0.4 kg) and pod yield/plot (10.03 kg). With combined fertilizer application, higher pod yield per plot was observed, which was directly attributed to readily available N, P, and K release of macro and micronutrient from FYM and vermicompost. Singh *et al*. (2005); Kulkarni (2004); Wagh *et al*. (2014) discovered similar results.

Table 1: Effect of integrated nutrient management on days to first fruit set, dry matter yield of the pod (kg/ha) and number of fruits per plant.

Treatments	Days to first fruit set	Dry matter yield of the pods (kg/ha)	Number of fruits per plant
T_1	57.00	620.00	15.00
T_2	48.00	977.00	19.82
T_3	50.50	955.00	18.08
T_4	53.40	872.00	16.04
T_5	50.00	970.00	19.07
T_6	53.00	899.00	17.00
T_7	47.00	989.00	20.40
T_8	51.00	920.00	17.09
T_9	55.00	790.00	15.09
T_{10}	54.00	810.00	16.50
SEm ±	1.27	21.62	0.37
CD at 5%	3.76	64.22	1.11

Table 2: Effect of integrated nutrient management on fruit length (cm), average fruit weight (g), fruit yield per plant (kg) and fruit yield per plot (kg).

Treatments	Fruit length(cm)	Average fruit weight (g)	Fruit yield per plant (kg)	Fruit yield per plot (kg)
T_1	12.44	13.80	0.15	3.50
T_2	15.06	16.97	0.35	8.59
T_3	14.81	16.05	0.31	7.75
T_4	13.05	15.09	0.25	6.17
T_5	15.09	17.20	0.34	8.45
T_6	13.09	15.55	0.26	6.06
T_7	15.10	18.83	0.40	10.03
T_8	14.04	16.09	0.29	7.02
T_9	12.08	14.00	0.22	5.06
T_{10}	13.10	14.05	0.24	6.00
SEm ±	0.30	0.36	0.01	0.14
CD at 5%	0.88	1.06	0.02	0.40

CONCLUSION

The bhindi crop treatment applied with 75% RDF + 12.5% RDN through FYM + 12.5% RDN via vermicompost + *Azotobacter* + Phosphorus solubilizing bacteria [PSB] (T_7) favourably influenced the higher values of yield parameters viz. fruit length (15 cm), average fruit weight (18.8 g), pod yield/plant (0.4 kg) and pod yield/plot (10.03 kg) proved superior over other treatments under study.

FUTURE SCOPE

On-farm trials have to be conducted demonstrating the benefits of the use of organic manures and biofertilizers in integrated nutrient management in different agroecological conditions for popularizing the eco-friendly practices among farming communities.

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Conflict of Interest. None.

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