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Influence of Integrated Nutrient Management on Soil Nutrient Status, Nutrient Uptake and Quality of Okra (*Abelmoschus esculentus* (L). Moench.) cv. Arka Anamika under Drip Irrigation

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ABSTRACT

A field experiment was conducted to study influence of integrated nutrient management on soil nutrient status, nutrient uptake and quality of okra(Abelmoschus esculentus (L). Moench.) Cv. Arka Anamika under drip irrigation at College of Horticulture, UHS Campus, GKVK Post, Bengaluru during karif 2016. The experiment was laid out in Randomized Complete Block Design with Nine treatments and three replications. The results revealed that the application of different sources of integrated nutrient management did not show any significant effects on residual status of available nitrogen and phosphorous. However there is the maximum available potassium content was recorded in the treatment T_9-50% RDF + 25% Nitrogen through Vermicompost + 25% N through Neemcake + Panchagavya + 5% cow urine at 30 and 40 DAS. The highest nutrient uptake of nitrogen, phosphorous and potassium and quality characters viz., TSS, Ascorbic acid, Crud protein and Crude fiber was also recorded in treatment T_9 -50% RDF + 25% nitrogen through vermicompost + 25% N through neemcake + Panchagavya + 5% cow urine which was at par with T_8 -50% RDF + 50% nitrogen through neemcake + 5% cow urine at 30 and 40 days after seed sowing.

Key words: *Available Nutrient, Uptake By Plant, Quality, Arka Anamika*

INTRODUCTION

The Okra is also known as lady's finger and locally known as behindi (*Abelmos chus esculents* L. Moench.) is one of the most important rainy and summer season vegetable crop, belongs to the family Malvaceae which is believed to be native of Africa. Okra is one of the cheapest green vegetable of tropical and sub-tropical regions of India. To get higher yield and better quality of fruits, it needs proper and required inputs. It is well known that organic manure and inorganic fertilizers are essential to increase the yield of vegetable crops.

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Day by day the cost of fertilizer has grown up and ultimately farmer receives only the marginal profit and the chemical fertilizers leads to affect the the soil physical, chemical properties. Therefore, it is imperative that chemical fertilizers in combination with organic manures are utilized properly and not only for the source of nutrient but also for increasing nutrient use efficiency without adversely distributing the soil health.

The basic concept underlying the principle of integrated nutrient management (INM) is the maintenance and possibly improvement of soil fertility for sustaining crop productivity.This may be achieved through combined use of all possible sources of nutrients. Integrated nutrient management is not a new concept but an age-old practice. It has now assumed great significance, mainly because of two reasons first; to supply the nutrient for continued increase in agricultural production, present level of fertilizers production in India is not enough to meet the total plant nutrient requirement. Second results of large number of experiments on manures and fertilizers conducted in India and other countries revealed that neither the chemical fertilizers achieve production sustainability under highly intensive cropping system[4].The interactive advantages of combining organic and inorganic sources of nutrients in INM have proved superior to use of its each component separately.Organic manures contain plant nutrients; they have direct effect on plant growth.

The nutrient needs of Indian agriculture are so large that no single plant sources, be it fertilizer, organic manure, green manure or biofertilizer, is in a position to meet the entire plant nutrient demand. The complementary use of fertilizer and organic manure referred to integrated nutrient management (INM) is an ideal approach to supply nutrient need of plants and solve the problem of nutrient mining and it plays an important role in sustaining soil health. Accordingly the present study was undertaken with a view to study the influence of INM on soil nutrient status, nutrient uptake, and quality of okra Cv. Arka Anamika under drip irrigation.

MATERIAL AND METHODS

The experiment was conducted at Vegetable Science Research Block, College of Horticulture, UHS campus, GKVK, Bengaluru during *kharif* 2016. The soil of the experimental area is red sandy loam having good physical and chemical properties and PH of the soil was 6.65. This experiment was undertaken to find out the best nutrient sources to obtain good growth, yield and yield attributes in okra. The experimental design followed was RCBD (Randomized Complete Block Design) with nine treatments and three replications. The treatments included under the study were,T_1 – 100 % RDF (125: 75: 63 NPK kg/ha + FYM 25 t/ha), Control, T_2–50% RDF +50% Nitrogen through vermicompost+ vegetable special at 30 and 40 day after seed sowing, T_3–50% RDF + 50% Nitrogen through neemcake + vegetable special at 30 and 40 days after seed sowing, T_4–50% RDF + 25% nitrogen through neemcake + 25% nitrogen through vermicompost, T_5–75% RDF + 25% nitrogen through vermicompost, T_6–75% RDF + 25% nitrogen through neemcake, T_7–50% RDF + 50% nitrogen through vermicompost + Panchagavya at 30 and 40 days after seed sowing, T_8–50% RDF + 50% nitrogen through neemcake + 5% cow urine at 30 and 40 days after seed sowing, T_9– 50% RDF + 25% nitrogen through vermicompost + 25% N through neemcake + Panchagavya + 5% cow urine at 30 and 40 days after seed sowing. The crop was raised a spacing of 60 cm x 45 cm. Standard cultural practices recommended for okra was followed uniformly for all the treatments.

RESULTS AND DISCUSSION

Residual nutrient status in soil

The application of different sources of integrated nutrient management did not show any significant effects on residual status of available nitrogen and phosphorous.

Whereas, data pertaining to application of different source of integrated nutrient management through different sources showed significant effect on residual status of available potassium presented (Table 1).The highest residual available potassium in soil (196.00 kg/ha^{-1}), was recorded in T_8– 50% RDF + 50% nitrogen through neemcake + 5% cow urine at 30 and 40 days after seed sowing,which was on par with T_5,(192.00 kg/ha)T_9, (188.00 kg/ha) andT_3,(184.00 kg/ha)Whereas, T_1(Control) recorded the lowest residual available potassium in soil (178.00 kg ha^{-1}). The organic carbon status of soil at initial level was 0.58 per cent. The statistical analysis of the data the study showed no marked effect on organic carbon content as the results were found non-significant. But, it is clear from the present study that the organic carbon level of the soil can be increased gradually to a reasonable extent by addition of organic manure[5,9].

Uptake of nutrients by plant

The data presented in the Table 2 showed that the total uptake of nitrogen (58.92 kg/ha), phosphorous (8.78 kg/ha) and potassium (42.28 kg/ha) by okra was found statistically significant in the treatment T_9–50% RDF + 25% Nitrogen through Vermicompost + 25% N through Neemcake + Panchagavya + 5% cow urine at 30 and 40 DAS and which was on par with treatment T_8–50% RDF + 50% Nitrogen through Neemcake + 5% cow urine at 30 and 40 DAS. The lowest uptake of nutrients (N, P and K) was found in treatment T_1–control. The total uptake of nutrients by okra was influenced by integrated plant nutrient these results are supplied by. Singh and Kallo[8]. In okra whereas vermicompost in combination of neem cake was the source of nutrients. This might be due to higher concentration of nutrients in the vermicompost and neem cake and its easy availability by okra Rajkhowa*et al.*[7] and Abusaleha[1] , Balle Gowda *et al.*[3] in okra.

Quality parameters

The quality of fruit is judged on many chemical parameters, here only four aspects are considered i.e. Total soluble solids (TSS %), ascorbic acid (mg/100 g), crude protein (%) and crude fiber (%) in okra pods. It is general observed that maximum TSS, ascorbic acid and crude protein and minimum crude fiber containing okra pods have better adaptability. Hence, these parameters were analyzed to know the effect of integrated nutrient management on quality of okra. The highest Total soluble solids (TSS %), ascorbic acid (mg/100 g), crude protein (%) and minimum crude fiber (%), was observed in the treatmentT_9 followed by treatment T_8 (Table 2). The Application of organic form of nitrogen in combination with inorganic form reduced the crude fibre content[2,6].

Table 1: Effect of different nutrient levels on residual nutrient status and organic carbon after harvesting of okra

Treatments	Available nitrogen (kg ha^{-1})	Available phosphorus (kg ha^{-1})	Available potassium (kg ha^{-1})	Organic carbon (%)
T_1 (100 % RDF (125: 75: 63 NPK kg/ha + FYM 25 t/ha), Control)	305.23	24.47	178.00	0.55
T_2 (50% RDF +50% Nitrogen through Vermicompost+ Vegetable special at 30 and 40 DAS)	313.60	25.50	188.00	0.65
T_3 (50% RDF + 50% Nitrogen through Neemcake + Vegetable Special at 30 and 40 DAS)	317.78	26.27	184.00	0.64
T_4 (50% RDF + 25% Nitrogen through neemcake + 25% N through Vermicompost)	313.60	26.40	184.00	0.63
T_5 (75% RDF + 25% Nitrogen through Vermicompost)	309.42	27.97	192.00	0.62
T_6 (75% RDF + 25% Nitrogen through Neemcake)	313.60	25.50	188.00	0.61
T_7 (T_7 - 50% RDF + 50% Nitrogen through Vermicompost + Panchagavya at 30 and 40 DAS)	313.60	26.00	188.00	0.66
T_8 (50% RDF + 50% Nitrogen through Neemcake + 5% cow urine at 30 and 40 DAS)	309.42	26.10	188.00	0.66
T_9 (50% RDF + 25% Nitrogen through Vermicompost + 25% N through Neemcake + Panchagavya + 5% cow urine at 30 and 40 DAS)	313.60	28.60	196.00	0.67
SEm±	**3.75**	**1.41**	**5.48**	**0.04**
CD at 5%	**NS**	**NS**	**16.63**	**NS**

NS: Non significant

Table 2: Effect of integrated nutrient management on uptake of nutrients and quality parameter of okra

Treatments	Uptake of Nutrients (kg ha^{-1})			Quality parameters			
	Nitrogen	Phosphorous	Potassium	TSS (%)	Ascor acid (c) (mg/100g)	Crude fiber (%)	Crude protein (%)
T_1 (100 % RDF (125: 75: 63 NPK kg/ha + FYM 25 t/ha), Control)	38.45	7.12	34.41	1.42	18.22	9.75	14.43
T_2 (50% RDF +50% Nitrogen through Vermicompost+ Vegetable special at 30 and 40 DAS)	45.28	7.69	37.36	1.92	20.82	11.10	16.06
T_3 (50% RDF + 50% Nitrogen through Neemcake + Vegetable Special at 30 and 40 DAS)	43.29	7.46	36.78	1.58	20.52	10.99	15.93
T_4 (50% RDF + 25% Nitrogen through neemcake + 25% N through Vermicompost)	42.46	7.42	34.89	1.49	19.94	10.76	1587
T_5 (75% RDF + 25% Nitrogen through Vermicompost)	41.62	7.40	34.83	1.82	19.48	10.44	15.68
T_6 (75% RDF + 25% Nitrogen through Neemcake)	40.15	7.22	32.86	1.78	19.22	10.19	15.50
T_7 (T_7 - 50% RDF + 50% Nitrogen through Vermicompost + Panchagavya at 30 and 40 DAS)	48.23	8.21	41.51	2.00	21.13	11.29	16.31
T_8 (50% RDF + 50% Nitrogen through Neemcake + 5% cow urine at 30 and 40 DAS)	53.18	8.70	41.76	2.04	21.69	11.45	16.62
T_9 (50% RDF + 25% Nitrogen through Vermicompost + 25% N through Neemcake + Panchagavya + 5% cow urine at 30 and 40 DAS)	58.92	8.78	42.28	2.24	21.96	11.68	16.68
SEm±	**0.67**	**0.76**	**1.17**	**0.07**	**0.83**	**0.39**	**0.69**
CD at 5%	**2.37**	**2.47**	**3.80**	**0.21**	**2.46**	**1.15**	**NS**

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