



Combined effect of organic manures with inorganic plant nutrients on major and secondary nutrient uptake of okra (*Abelmoschus esculentus* L.) crop

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Abstract : A field experiment was conducted at Agricultural college and research institute, Tamil Nadu Agricultural university, Madurai to evaluate the response of bhendi (*Arka anamika*) with organic sources like goat manure and pig manure combined with inorganic fertilizers on availability of soil available nutrients. There were ten treatment combinations replicated thrice in Randomized Block Design (RBD) in Maddukkur soil series (*Typic Haplustalf*). The results showed that the plots received 50 per cent RDF combined with goat manure @ 6.5 t ha⁻¹ recorded highest nitrogen, phosphorus and potassium uptake (37.54, 9.32 and 36.72 kg ha⁻¹) and the lowest value registered in control plot (24.68, 3.85 and 24.00 kg ha⁻¹), respectively.

Key Words : Uptake of nutrients, Organic and inorganic manures, Okra

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INTRODUCTION

Okra (*Abelmoschus esculentus* L.) is one of the most important vegetable grown in India. It is an annual crop grown mainly as fruits and leafy vegetables in both green and dried state in the tropics. Okra is cultivated under rainfed and irrigated areas on a wide range of soils. The production is seriously affected by the use of local varieties (low yielding), sub-optimal and inappropriate manure doses. The use of inorganic fertilizer has not been helpful under intensive agriculture because it is often associated with reduced crop yield, soil acidity and nutrients imbalance. Sole application of organic manures or inorganic fertilizers are not able to sustain the soil fertility and crop productivity. Integrated nutrient management, the best combination of available nutrient management technologies would facilitate in achieving the

required productivity and sustainability by the use of soil and applied plant nutrients. The main aim of the integrated approach is to tap the different sources of nutrient in a judicious way for their efficient use. However, their integration has proved superior than individual components with respect to yield, quality and nutrient uptake. With this view, study was conducted to evaluate the effects of organic and inorganic sources on soil nutrient uptake of major and secondary nutrients in okra crop.

MATERIAL AND METHODS

A field experiment was conducted at Agricultural college and research institute, Tamil Nadu Agricultural university, Madurai. The test crop was okra (*Arka anamika*). The experimental soil was sandy loam texture and belongs to

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madukkur soil series (Typic Haplustalf). The initial soil sample collected from the experimental site before the commencement of experiment was analyzed for the various physico-chemical properties. From the textural composition of soil it was inferred that the soil was sandy loam. The cation exchange capacity of the soil was 22.50 C mol (P⁺) kg⁻¹. The pH was 7.5 with EC of 0.42 dSm⁻¹. The organic carbon content was 0.49 per cent. The available nitrogen, phosphorus and potassium content of the soil were 266.5, 12.3 and 265.3 kg ha⁻¹, respectively recording low, medium and medium status in soil fertility. Goat manure and pig manure were collected from cattle shed from Agricultural College and Research Institute, Madurai, Tamil Nadu Agricultural University. Collected animal waste were composted in compost shed. Composted animal manures and recommended dose of fertilizers were applied basally in the field. There were 10 treatments which included T₁-Control, T₂-Recommended dose of fertilizer (RDF), T₃-100per cent Pig manure @ 7.5t ha⁻¹, T₄-100 per cent goat manure @ 6.5t ha⁻¹, T₅-75 per cent RDF + pig manure @ 7.5 t ha⁻¹, T₆-50 per cent RDF + pig manure @ 7.5 t ha⁻¹, T₇-75 per cent RDF + goat manure @ 6.5 t ha⁻¹, T₈- 50 per cent RDF + goat manure @ 6.5 t ha⁻¹, T₉- Pig manure @ 7.5 t ha⁻¹ + goat manure @ 6.5 t ha⁻¹, T₁₀-50 per cent RDF + pig manure @ 7.5 t ha⁻¹ + goat manure @ 6.5 t ha⁻¹ were replicated thrice in a Randomised Block Design. The crop was raised and grown up to 130 days and harvested. The nutrient uptake of okra crop was recorded and statistically analysed.

RESULTS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

Nitrogen uptake :

The results indicate that organic source of nutrients combined with inorganic fertilizer had better response in nutrient uptake of the plant. In this field experiment, various

levels of treatment combinations were tried. Among them, the interaction effect was best in the plot that received 50 per cent RDF combined with goat manure @ 6.5 t ha⁻¹ than other levels of treatment. The highest nitrogen uptake of the plant was recorded in the plot which received 50 per cent RDF along with goat manure @ 6.5 t ha⁻¹ (37.54 kg ha⁻¹) and it was at par with 75 per cent RDF + goat manure @ 6.5 t ha⁻¹ (35.23 kg ha⁻¹) and lowest value was registered in control plot (24.68 kg ha⁻¹) (Table 1). It might be due to the greater availability of nitrogen in soil which enhanced the growth of plants and ultimately lead to higher accumulation of nutrients in their parts along with highest total uptake. The enhanced release of nitrogen from the organic sources increased the nitrogen uptake by okra plants. This is in accordance with the findings of Gupta (1995), Takur *et al.* (1990) and Balyan *et al.* (2006).

Phosphorus uptake :

The uptake of phosphorus by plant was maximum in the plot that received 50 per cent RDF combined with goat manure @ 6.5 t ha⁻¹ (9.32 kg ha⁻¹) compared to other treatments. The next best source was 75 per cent RDF combined with goat manure @ 6.5 t ha⁻¹ (8.50 kg ha⁻¹) and lowest value was recorded in control plot (3.85 kg ha⁻¹) (Table 1).

The increase in uptake of P might be due to the complexing properties of organic materials which prevented the precipitation and fixation of nutrients and kept them in soluble form. Further the solubilization action of organic acids produced during the degradation of organic materials results in better release of the native and applied P to crop. These results are in accordance with those of Swarup (1993).

Potassium uptake :

The potassium uptake by okra plant was significantly influenced by the combined application of organic and inorganic sources. The highest K uptake was observed in the treatment which received 50 per cent RDF combined with goat manure @ 6.5 t ha⁻¹ (36.72 kg ha⁻¹) and was found to be more

Table 1 : Effect of organic and inorganic sources on major nutrient uptake (kg ha⁻¹) of okra crop at post harvest stage

Treatments	N uptake (kg ha ⁻¹)	P uptake (kg ha ⁻¹)	K uptake (kg ha ⁻¹)
T ₁ -Control,	24.68	3.85	24.00
T ₂ -Recommended dose of fertilizer (RDF)	32.20	7.78	31.45
T ₃ -100% pig manure @ 7.5t ha ⁻¹	29.73	4.79	29.72
T ₄ -100% goat manure @ 6.5t ha ⁻¹	31.15	5.09	30.83
T ₅ -75% RDF + pig manure @ 7.5 t ha ⁻¹	32.96	7.69	31.30
T ₆ -50% RDF + pig manure @ 7.5 t ha ⁻¹	33.01	7.72	31.35
T ₇ -75% RDF + goat manure @ 6.5 t ha ⁻¹	35.23	8.50	34.18
T ₈ - 50 % RDF + goat manure @ 6.5 t ha ⁻¹	37.54	9.32	36.72
T ₉ - Pig manure @ 7.5 t ha ⁻¹ + goat manure @ 6.5 t ha ⁻¹	29.31	4.70	28.74
T ₁₀ % RDF + pig manure @ 7.5 t ha ⁻¹ + goat manure @ 6.5 t ha ⁻¹	34.12	7.80	31.45
S.E. +	0.581	0.312	0.542
C.D. (P=0.05)	1.222	0.655	1.139

effective. The lowest uptake was recorded in control plot (24.00 kg ha⁻¹) (Table 1). Cumulative effect of organic manure with NPK seems to be adequate for nutrients as reflected by the higher uptake of K. Similar findings were observed by Vijayashankar Babu *et al.* (2007).

Secondary nutrients uptake :

Application of organic sources in combination with inorganic fertilizers resulted in higher calcium and magnesium uptake. The calcium and magnesium content and uptake was highest in the plots that applied with 50 RDF combined with goat manure @ 6.5 t ha⁻¹ (29.20 and 14.53 kg ha⁻¹) followed by 75 per cent RDF + goat manure @ 6.5 t ha⁻¹ (28.25 and 13.64 kg ha⁻¹) and the lowest value found in control plot (20.47 and 6.51 kg ha⁻¹), respectively (Fig.1).

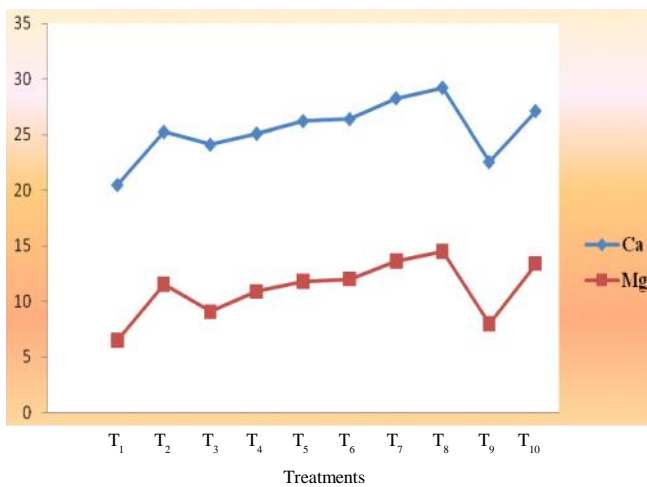


Fig. 1 : Effect of organic and inorganic sources on secondary nutrient uptake (kg ha⁻¹) of okra crop at post harvest stage

This was due to the synergistic effect of nitrogen on calcium and antagonistic effect on magnesium. Similar result

was noticed by Manjanbu *et al.* (1986).

Addition of any form of organics has been found to improve the soil health soil buffering capacity, water retention capacity, chelation and release of micronutrient, microbiological process etc. They increased the crop yields during the year of application and also found beneficial in sustaining the crop yield as well as soil fertility over longer periods. Intergrated nutrient management using the animal waste along with the chemical fertilizer has been found very effective in sustaining the crop production. In this concern an attempt was made by conducting the field trial experiment which showed that the application of 50 per cent RDF combined with goat manure @ 6.5 t ha⁻¹ recorded highest nitrogen, phosphorus and potassium uptake.

REFERENCES

- Balyan, J.K., Singh, P., Kumpawat, B.S. and Jain, L.K. (2006).** Effect of integrated management on maize (*Zea mays*. L.) growth and nutrients uptake. *Curr. agric.*, **30**(1-2) : 79-82.
- Gupta, S.K. (1995).** Effect of organic manures on rice yield and moisture retention in alfisol. *J. Holl. Res.*, **8**(2) : 169-193.
- Manjanbu, I.S., Ogunlela, V.B. and Ahmed, M.K. (1986).** Response of two Okra varieties to fertilizers : growth and nutrient concentration as influenced by nitrogen and phosphorus application. *Fert. Res.*, **8**(3) : 297-306.
- Swarup, A. (1993).** Integrated nutrient supply and management system for sustained crop production alkali soils. *Ferti. News*, **38** (9) : 27-34.
- Takur, D., Singh, K. and Takur, R.C. (1990).** Effect of weed and fertilizer management on nutrient uptake by weeds and maize (*Zea mays*) under rainfed conditions. *Indian J. Agron.*, **35** : 357-360.
- Vijayashankar Babu, D., Subhash Singh, R.K. and Yadav, D.S. (2007).** Correcting nutrient imbalances or sustaining crop production. *Indian J. Fertilizer*, **2** : 37-44.

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