

Influence of Different Organic Nutrient Sources on Total Nutrient Uptake, Nutrient Concentration of Okra fruit and Nutrient Use Efficiency in Okra (*Abelmoschus esculentus* L. Moench)

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Abstract

A field experiment was conducted during *kharif* 2024 at the Organic Farming Research and Training Centre, MPKV, Rahuri to investigate the effect of different organic nutrient sources on total nutrient uptake, nutrient concentration of okra fruit and nutrient use efficiency (NUE) in okra (*Abelmoschus esculentus* L. Moench). The experiment was laid out in a randomized block design with 11 treatments and 3 replications, using farmyard manure (FYM), vermicompost, neem cake, and poultry manure as nutrient sources applied either individually or in combinations to meet 100% N requirement. Results revealed that the treatment T₁₀ (50 % N through vermicompost along with 50 % N through poultry manure) significantly improved total nutrient uptake (N, P and K), indicating their superior mineralization and nutrient release. Nutrient concentration of okra fruit (N%, P%, K% and micronutrients) was found maximum in treatment T₁₀ (50% N through vermicompost along with 50% N through poultry manure). Highest Nutrient use efficiency was recorded under treatment T₁₀ (50% N through vermicompost along with 50% N through poultry manure), while among sole application of organic manures treatment T₅ (100% N through Poultry manure) recorded the highest AE and AUE, while treatment T₄ (100% N through Neem cake) recorded the highest IUE. Overall, combined application of 50% N through Vermicompost along with 50% N through poultry manure enhanced total nutrient concentration of okra fruit, total nutrient uptake and nutrient use efficiency, highlighting their potential for sustainable okra production in organic farming.

Key words : Okra, organic manures, fruit quality, nutrient uptake, nitrogen use efficiency, organic farming.

Okra (*Abelmoschus esculentus* L. Moench) is an important vegetable crop widely grown in tropical and subtropical regions. It is valued for its tender green pods, which are rich in vitamins, minerals, and dietary fiber. With increasing consumer preference for safe and chemical-free vegetables, organic production of okra has gained momentum in recent years.

Fruit quality and nutrient uptake are critical components of crop productivity, particularly under organic systems where nutrient release is dependent on mineralization of organic manures. Previous studies have shown that organic nutrient sources such as farmyard manure, vermicompost, neem cake, and poultry manure not only supply essential nutrients but also improve soil health and microbial activity

(Mahmoud *et al.*, 2014; Singh *et al.*, 2020). However, limited information is available on their combined effect on total nutrient uptake, nutrient concentration of okra fruit, and nutrient use efficiency (NUE) in okra.

Therefore, the present study was undertaken with the objective of evaluating the influence of different organic nutrient sources on total nutrient uptake, nutrient concentration of okra fruit, and nutrient use efficiency (NUE) in okra under organic farming conditions.

Materials and Methods

The field experiment was conducted during *kharif* 2024 at the Organic Farming Research and Training Centre, MPKV, Rahuri, situated at 19.38°N latitude, 76.65°E longitude, and 657

m above mean sea level. The soil was classified as Inceptisol with medium fertility status.

Experimental Details

- Design : Randomized Block Design
- Replications : 3
- Treatments : 11
- Crop : Okra (Variety: Exp-HY1)
- Spacing : 60 x 30 cm
- Plot size : Gross: 13.5 x 2.4 m;
Net: 12.5 x 1.2 m

Treatment details - T₁ : Absolute control, T₂ : 100% N through FYM, T₃ : 100% N through Vermicompost, T₄ : 100% N through Neem Cake, T₅ : 100% N through Poultry Manure, T₆ : 50% N through FYM + 50% N through Vermicompost, T₇ : 50% N through FYM + 50% N through Neem Cake, T₈ : 50% N through FYM + 50% N through Poultry Manure, T₉ : 50% N through Vermicompost + 50% N through Neem Cake, T₁₀ : 50% N through Vermicompost + 50% N through Poultry Manure, T₁₁ : 50% N through Neem Cake + 50% N through Poultry Manure.

Nutrient Sources : Manures were characterized before application (FYM: 0.51% N; Vermicompost: 1.39% N; Poultry Manure: 2.80% N; Neem Cake: 4.97% N). The required quantities were applied to meet 100% N requirement as per treatment.

Data Collection : Nutrient uptake: N, P, K uptake calculated from plant nutrient concentration x dry matter yield.

Nutrient concentration of Okra fruit: The dried plant sample was analysed for their total N, P, K and micronutrient content.

NUE : Calculated as ratio of fruit yield per unit N applied.

Statistical Analysis : Data were analyzed using ANOVA for RBD as per Panse and Sukhatme (1967). Treatment means were compared using critical difference (CD) at 5% level of significance.

Results

Nutrient Uptake : The total uptake of nitrogen (N), phosphorus (P), and potassium (K) by okra plants varied significantly across

Table 1. Effect of different organic nutrient sources on total nutrient uptake of okra

Treatment details	Total nutrient uptake (kg ha ⁻¹)		
	N	P	K
T ₁ - Absolute control	97.72	11.68	169.36
T ₂ - 100% N through FYM	102.30	13.30	181.21
T ₃ - 100% N through Vermicompost	99.79	13.96	181.03
T ₄ - 100% N through Neem cake	130.90	13.62	182.65
T ₅ - 100% N through Poultry manure	132.73	14.01	183.83
T ₆ - 50% N through FYM + 50% N through Vermicompost	135.12	13.74	183.76
T ₇ - 50% N through FYM + 50% N through Neem cake	136.95	14.08	184.11
T ₈ - 50% N through FYM + 50% N through Poultry manure	139.15	14.75	190.33
T ₉ - 50 % N through Vermicompost + 50% N through Neem cake	138.60	14.79	188.59
T ₁₀ - 50% N through Vermicompost + 50% N through Poultry manure	141.17	15.16	192.61
T ₁₁ - 50% N through Neem cake + 50% N through Poultry manure	139.52	14.82	193.29
SE(m)±	1.37	0.13	0.26
CD at 5%	4.05	0.39	0.77

different nutrient management treatments, as shown in Table 1. Nitrogen uptake ranged from 97.72 kg ha⁻¹ in the control (T₁) to a maximum of 141.17 kg ha⁻¹ in T₁₀ (50% N through Vermicompost + 50% N through Poultry manure). Similarly, phosphorus uptake increased from 11.68 kg ha⁻¹ (T₁) to 15.16 kg ha⁻¹ (T₁₀), and potassium uptake increased from 169.36 kg ha⁻¹ (T₁) to 192.61 kg ha⁻¹ (T₁₀). The higher nutrient uptake could be due to better nutrient availability and improved root growth in organically enriched soils. Vermicompost in particular enhances microbial activity and releases plant growth-promoting substances, thereby improving nutrient absorption (Kumar *et al.*, 2017). These results are in align with the findings of Ghosh *et al.* (2018), who reported higher nutrient uptake in okra with integrated organic sources.

Total Nutrient concentration of okra fruit : Significant differences in fruit nutrient concentration of okra were observed among the treatments (Table 2). Among individual application of manures treatment T₅ (100% N

through Poultry manure) recorded maximum N, P, K concentration in fruit (2.41, 0.32, 2.14% respectively). While, among treatments with combined application treatment T₁₀ (50% N through Vermicompost + 50% N through poultry manure) enhanced N, P, K concentration in okra fruit (2.57, 0.37, 2.42% respectively). This may be attributed to the higher nutrient content and faster mineralization of poultry manure and vermicompost, which ensured adequate nutrient supply during pod development. Similar improvements in fruit quality under organic manures were reported by Mahmoud *et al.* (2014) and Singh *et al.* (2020).

Nutrient Use Efficiency (NUE) : NUE values varied significantly among treatments (Table 3). The treatment with combined application of 100% N through Vermicompost along with 50% N through Poultry manure (T₁₀) recorded the highest NUE, followed by the treatment with 50% N through Neem cake along with 50% N through poultry manure (T₁₁). In contrast, FYM alone (T₂) exhibited the lowest NUE due to its wider C:N ratio and

Table 2. Effect of different organic nutrient sources on nutrient concentration of okra fruit

Treatment details	Nutrient concentration of okra fruit (%)		
	N	P	K
T ₁ - Absolute control	1.68	0.25	1.29
T ₂ - 100% N through FYM	1.86	0.30	1.78
T ₃ - 100% N through Vermicompost	1.80	0.31	1.72
T ₄ - 100% N through Neem cake	2.38	0.31	1.88
T ₅ - 100% N through Poultry manure	2.41	0.32	2.14
T ₆ - 50% N through FYM + 50% N through Vermicompost	2.46	0.33	2.15
T ₇ - 50% N through FYM + 50% N through Neem cake	2.49	0.34	2.18
T ₈ - 50% N through FYM + 50% N through Poultry manure	2.53	0.35	2.34
T ₉ - 50% N through Vermicompost + 50% N through Neem cake	2.52	0.34	2.26
T ₁₀ - 50% N through Vermicompost + 50% N through Poultry manure	2.57	0.37	2.42
T ₁₁ - 50% N through Neem cake + 50% N through Poultry manure	2.54	0.36	2.38
SE(m) ±	0.027	0.01	0.027
CD at 5%	0.081	0.03	0.082

Table 3. Effect of different organic nutrient sources on nutrient use efficiency (NUE) in okra

Treatment details	Nutrient use efficiency		
	Agronomic efficiency (kg kg ⁻¹)	Internal use efficiency (kg kg ⁻¹)	Apparent utilization efficiency (%)
T ₁ - Absolute control	0.00	28.33	0.00
T ₂ - 100% N through FYM	13.64	31.4	4.58
T ₃ - 100% N through Vermicompost	25.31	36.3	2.08
T ₄ - 100% N through Neem cake	29.01	28.35	33.18
T ₅ - 100% N through Poultry manure	30.49	28.33	35.02
T ₆ - 50% N through FYM + 50% N through Vermicompost	48.57	32.14	37.40
T ₇ - 50% N through FYM + 50% N through Neem cake	52.58	32.62	39.23
T ₈ - 50% N through FYM + 50% N through Poultry manure	72.52	36.73	41.43
T ₉ - 50% N through Vermicompost + 50% N through Neem cake	56.34	33.13	40.88
T ₁₀ - 50% N through Vermicompost + 50% N through Poultry manure	99.45	42.82	43.45
T ₁₁ - 50% N through Neem cake + 50% N through Poultry manure	97.56	41.79	41.80
SE(m) ±	1.14	1.42	1.37
CD at 5%	3.37	4.19	4.05

slower mineralization. Higher NUE under the combined application of vermicompost and poultry manure may be due to synchronized nitrogen release with crop demand. Thakur *et al.* (2019) and Sharma and Banerjee (2021) similarly reported higher NUE under manures with lower C:N ratios.

Discussion

The results clearly indicate that the combined application of poultry manure and vermicompost enhances total nutrient uptake, nutrient concentration of okra fruit and nutrient use efficiency (NUE) in okra. Their combinations enhanced the performance, likely due to complementary nutrient release patterns. Thus, combined organic nutrient application ensures both productivity and sustainability in okra cultivation.

Conclusion

The study revealed that poultry manure and

vermicompost in combination, significantly improved fruit nutrient concentration, nutrient uptake, and nutrient use efficiency in okra under organic farming. Among individual manure treated treatments, 100% N through poultry manure (T₅) was most effective, while among combinations 50% N through Vermicompost along with 50% N through Poultry manure (T₁₀) was found effective. Therefore, combined application of poultry manure and vermicompost is found suitable for achieving higher total nutrient uptake, nutrient concentration of okra fruit and efficient nutrient utilization in organic okra production.

References

- Allison, L. E. and Moodie, C. D. 1965. Carbonate. In C. A. Black (Ed.), Methods of soil analysis. Part 2: Chemical and microbiological properties (pp. 1379-1400). American Society of Agronomy.
- Ghosh, S., Das, S. and Majumdar, B. 2018. Influence of organic nutrient sources on growth, yield and quality of okra. *Journal of Plant Nutrition* 41(15), 1991-2002.

- Kumar, V., Singh, A. and Yadav, R. 2017. Effect of vermicompost on growth, yield and nutrient uptake of vegetables. *International Journal of Agriculture Innovations and Research* 6(2), 2319-1473.
- Mahmoud, E. A., Hassan, H. M. and El-Sharawy, M. A. 2014. Effect of organic manure and sowing date on the growth and yield of okra in Samaru, Nigeria. *International Journal of Agronomy and Agricultural Research* 5(5), 111-117.
- Panse, V. G. and Sukhatme, P. V. 1967. *Statistical methods for agricultural workers*. ICAR, New Delhi.
- Sharma, P. and Banerjee, S. 2021. Effect of organic nutrient management on nitrogen use efficiency in okra. *Vegetable Science* 48(2), 137-142.
- Singh, A. K., Meena, M. D. and Jat, R. K. 2020. Organic nutrient management in vegetable crops: A review. *Indian Journal of Agricultural Sciences* 90(3), 427-434.
- Thakur, R., Singh, M. and Patel, A. 2019. Nitrogen use efficiency under different organic manures in vegetables. *Journal of Soil and Crops* 29(2), 221-227.
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