Archives of Current Research International

Volume 25, Issue 9, Page 242-248, 2025; Article no.ACRI.143306
ISSN: 2454-7077

Response of Transplanted Finger Millet to Integrated Nutrient Management under Central Malwa Region of Madhya Pradesh, India

Manoj Korade [a++], V. V. Panchal [a#], A.A. Kawade [a#*], Tirunima Patle [a#] and Hiral Gundaniya [a#]

[a] *Shri Vaishnav Institute of Agriculture, SVVV, Indore, India.*

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: https://doi.org/10.9734/acri/2025/v25i91491

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://pr.sdiarticle5.com/review-history/143306

Original Research Article

Received: 29/06/2025
Published: 09/09/2025

ABSTRACT

Vermicompost technology for composting of organic wastes is remarkably effective for reducing the processing time of decomposition and producing good quality compost in terms of nutrients. It serves as an important component of an integrated plant nutrient supply system for balanced fertilization, along with maintaining health to sustain the productivity of soils. This study aimed to find out the best combination of organic and inorganic fertilizers for maximum production of transplanted finger millet. The experiment was conducted during *kharif*, 2024, at a new experimental cum demonstration field, SVIAg, SVVV, Indore. The field experiment was carried out

---

[++] *M.Sc. Agronomy;*
[#] *Assistant Professor of Agronomy;*
**Corresponding author: Email: kawde.archana@gmail.com;*

Cite as: *Manoj Korade, V. V. Panchal, A.A. Kawade, Tirunima Patle, and Hiral Gundaniya. 2025. "Response of Transplanted Finger Millet to Integrated Nutrient Management under Central Malwa Region of Madhya Pradesh, India". Archives of Current Research International 25 (9):242–248. https://doi.org/10.9734/acri/2025/v25i91491.*

in randomized block design with eight treatments consisted of T_1 – Absolute control, T_2 – RDF, T_3 – 75% RDF + 25% RDN through FYM, T_4 - 50% RDF + 50% RDN through FYM, T_5 - 75% RDF + 25% RDN through vermicompost, T_6 - 50% RDF + 50% RDN through vermicompost, T_7 - 75% RDF + 25% RDN through poultry manure, T_8 - 50% RDF + 50% RDN through poultry manure and each experimental unit was replicated thrice having the gross plot size of 3.60 x 4.50 m^2 and net plot 2.15 x 4.30 m^2. This experiment tested the recommended finger millet variety, Dapoli 3. Treatment, 75% RDF + 25% RDN through poultry manure recorded significantly maximum growth characters *viz*., plant height (99.33 cm), number of leaves (16.27) plant^{-1} at 90 DAT, number of tillers hill^{-1} (13.97) and dry matter accumulation plant^{-1} (59.97 gm) at harvest, yield contributing character such as number of effective tillers (11.73), number of fingers earhead^{-1} (7.83) and finger length (7.07 cm) grain yield (12.56 q ha^{-1}), straw yield (25.28 q ha^{-1}) and biological yield (37.84 q ha^{-1}) over rest of the treatments and was on par with treatment 50% RDF and 50% RDN through poultry manure and RDF. While the lowest values were observed under absolute control. Consequently, this treatment resulted in higher growth, yield attributes and yield as compared to the remaining treatments. Hence, it is advisable to apply 75% RDF + 25% RDN through poultry manure to get the maximum yield of finger millet.

Keywords: Poultry manure; finger millet; climate change mitigation; food security.

1. INTRODUCTION

"The basic concept of integrated nutrient management is the maintenance or adjustment of soil fertility and plant nutrient supply to an optimum level for sustaining the desired crop productivity through optimization of benefits from all possible sources of plant nutrients in an integrated manner. Application of chemical fertilizer can boost up crop yields, but it impairs soil properties. Therefore, an integrated use of different sources of plant nutrients is required to check nutrient depletion, maintain soil fertility and crop productivity" (Behera et al., 2025; Gautam et al., 2025). Millets have been accorded a prominent position as a superfood in the budget (Agriculture Budget 2023 presented by Finance Minister Mrs. Nirmala Sitharaman in parliament on February 1) and are now renamed as "Shree-Anna'' due to their importance as healthy food. The United Nations declared 2023 the International Year of Millets to increase the production and consumption of millets. Earlier, 2018 was declared the National Year of millets. They are excellent crops for more intensive cropping systems because of their quick maturation and all-season growth characteristics. These may thrive in arid and unfavourable weather conditions, can grow in relatively poor soils, and need comparatively fewer external inputs than major cereals. Millets are nutrient-dense staple foods that may be used as both food and fodder. The cultivation of ecologically sound and hardy millets may be a prudent alternative for optimum output with food and nutritional security in the changing scenario of global warming and climate change. "Millets can help contribute to some of the biggest global challenges, such as nutrition and health needs, climate change mitigation and adaptation, and livelihoods of smallholders, particularly in resource-constrained dryland areas. Millets are considered nutritious-cereals due to their high nutritional content, and their potential to address climate change and food security is not entirely realized. The consumption of millets by the people is increasing in recent times due to its nutritional benefits" (Prabhakar et al., 2023; Boruah et al., 2024).

Finger millet originated in Africa, from where it was domesticated in Asian regions around 5000 BC. It belongs to the Poaceae family and is locally called ragi or *marua* in India. Finger millet (*Eleusine coracana* L.), also known as African millet and bird's foot millet, is a major millet that ranks third in India in terms of area and production. It is a versatile crop with a high nutrient profile of protein (6-8%), fat (1.3%), calcium (70-76%), lysine (2.86%), tryptophan (1.39%), methionine (2.86%), vitamins, minerals, and fibre (Aparna and Ansari, 2017). It has the highest iodine level of all the food grains and the highest calcium content of all the cereals.

Finger millet has the distinction of having the highest productivity among millets, accounting for nearly 85 per cent of the production in India (Sakamma *et al.,* 2018). In India, the area, production, and productivity are 10.37 lakh ha, 13.86 lakh tonnes and 1336 kg ha^{-1}, respectively (Anonymous, 2023).

The application of higher levels of chemical fertilizers causes health hazards and reduces microbial population in soil. Also, the because of higher application could lead to residues in grains, fruits and vegetables. There is also a problem of loss of applied fertilizer through leaching, volatization and denitrification of nitrogen. To overcome this, the use of organic sources is the solution, which aims at cooperating rather than confronting sustainable productivity.

Among organic sources of nutrients, nitrogen plays an important role. It can be applied through organic sources, *viz*. FYM, vermicompost and poultry manure are the major sources which play a vital role in organic nutrient management, and it is a form of nutrient recycling. FYM increase the adsorptive power of soil for cations and anions, particularly phosphates and nitrates. These adsorbed ions are released slowly for the benefit not only of the current crop but also to succeeding crops (Singh *et al.,* 2013). FYM supplies all major nutrients, *i.e.* (N, P, K, Ca, Mg, S) necessary for plant growth as well as micronutrients (Fe, Mn, Zn and Cu). FYM also improves soil water holding capacity.

"Vermicompost technology for composting of organic wastes is remarkably effective for reducing the processing time of decomposition and producing good-quality compost in terms of nutrients. It serves as an important component of an integrated plant nutrient supply system for balanced fertilization, along with maintaining health to sustain the productivity of soils" (Chaudhary *et al*. 2004). by providing nutrients such as N, K, Ca, Mg, P and micro elements such as Fe, Mo, Zn and Cu, which can easily be taken up by plants.

Poultry manure is an excellent bulky organic manure, as it contains high nitrogen, phosphorus, potassium and other essential nutrients. In contrast to chemical fertilizer, it adds organic matter to soil, which improves soil structure, nutrient retention, aeration, soil moisture holding capacity and water infiltration. It is a good source of nutrients for crops. The judicious use of an organic and inorganic combination of fertilizers will maintain long-term soil fertility and sustained higher levels of productivity. In this context, this study aimed to find out the best combination of organic and inorganic fertilizers for maximum production of transplanted finger millet.

2. MATERIALS AND METHODS

The experiment entitled "Response of transplanted finger millet to integrated nutrient management under the central Malwa region of M.P." was carried out at a new experimental cum demonstration field, Shri Vaishnav Institute of Agriculture, Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore, during *Kharif* 2024. The topography of the experimental field was levelled and well-drained. The soil type was medium black clay in texture with low available nitrogen (208.45 kg ha^{-1}), medium in phosphorus (16.54 kg ha^{-1}) and high in potassium (436.12 kg ha^{-1}). The soil organic carbon content, pH, and EC were 0.50 per cent, 7.37, and 0.78 $dSm^{-1,}$ respectively. The field experiment was carried out in randomized block design with eight treatments consisted of T_1 – Absolute control, T_2 – RDF, T_3 – 75% RDF + 25% RDN through FYM, T_4 - 50% RDF + 50% RDN through FYM, T_5 - 75% RDF + 25% RDN through vermicompost, T_6 - 50% RDF + 50% RDN through vermicompost, T_7 - 75% RDF + 25% RDN through poultry manure, T_8 - 50% RDF + 50% RDN through poultry manure, and each experimental unit was replicated thrice having the gross plot size of 3.60 x 4.50 m^2 and net plot 2.15 x 4.30 m^2. This experiment tested the recommended finger millet variety, Dapoli 3. A 150 m^2 nursery area was required for raising seedlings for a ha area. The land was ploughed, and beds were prepared with a bed size of 2.0 x 2.0 m^2 with a height of 10 cm. 2 kg FYM and ½ kg urea were applied and incorporated into the soil bed before sowing. The seeds were broadcast evenly on the beds. Powdered FYM over the beds was evenly sprinkled to cover the seeds, and watering was done in the evening hours. Seedlings were ready for transplanting at 21 DAS. One ploughing with a tractor, followed by one harrowing, was done with provisions for irrigation channels and a path. The experimental field was laid out as per the plan of layout. Further, levelling of individual plots was done before transplanting with the help of rakes to facilitate uniform distribution of water and nutrients. One or two seedlings were transplanted on each hill at different distances as per the treatment. The gap filling was carried out as soon as the mortality was noticed after planting to maintain the optimum plant population. Five representative plants were selected randomly from each net plot to monitor the periodical growth and development stages of the crop. The selected plants were fixed with wooden sticks and labelled with tags. The same plants were harvested separately for recording biometric observations. The standard method of analysis of variance was used for analysing the data for the Randomised Block Design (Panse and Sukhatme,1985). The F-test of significance was used for testing the null hypothesis and the appropriate standard error of mean (SE±) for each treatment effect and where the treatment effect was significant, a critical difference (C.D.) at a 5 per cent probability level was worked out for testing the significance of treatment differences.

3. RESULTS AND DISCUSSION

3.1 Growth Attributes

Treatment, 75% RDF + 25% RDN through poultry manure recorded significantly maximum growth characters *viz*., plant height (99.33 cm), number of functional leaves (16.27) plant^{-1} at 90 DAT, number of tillers hill^{-1} (13.97) at harvest and dry matter accumulation plant^{-1} (59.97 gm) at harvest, as compare to all other treatments and was at par with treatment 50% RDF and 50% RDN through poultry manure and RDF. The lowest growth characters *viz*., plant height (73 cm), number of functional leaves (12.27) plant^{-1} at 90 DAT, number of tillers hill^{-1} (10.13) at harvest and dry matter accumulation plant^{-1} (40.67 gm) at harvest, were recorded under treatment absolute control.

The treatment with integration of inorganic and organic sources provided enough nutrients and organic matter, which ultimately positively influenced the soil environment for the development of more plant growth and ultimately leaves count and other growth parameters. Similar results were reported by Saunshi *et al*., (2012), Nigade and More (2013), Aziz *et al*., (2020) and Vighnesh *et al.,* (2023).

3.2 Yield Attributes

In a similar vein, noticeably higher yield contributing character such as number of effective tillers (11.73), number of fingers earhead^{-1} (7.83) and finger length (7.07 cm) was recorded in treatment 75% RDF + 25% RDN through poultry manure than rest of the treatments and was on par with treatment 50% RDF and 50% RDN through poultry manure and RDF. Whereas, the minimum number of effective tillers (7.50), number of fingers earhead^{-1} (5.33) and finger length (5.20 cm) were recorded under treatment absolute control.

This ensured continuous availability of nutrients throughout the crop growth stages due to steady transformation, mineralisation, solubilization, decomposition of minerals and nutrients that might have helped in ensuring superior yield attributing characters by organics. Similarly, this could be because organic manure application provided a favourable environment for microorganisms, which helped in the fixation, assimilation and absorption of nutrients and thus resulting in higher yield attributes and yield. Similar findings were observed with Ullasa *et al*., (2020), Patil *et al*., (2018), Harika *et al*., (2019), Monish *et al*., (2019).

3.3 Yield

The grain yield, straw yield, biological yield and harvest index of finger millet were significantly influenced by different treatments.

Table 1. Growth attributes of finger millet as influenced by different treatments

Treatments	Growth attributes of finger millet			
	Plant height (cm)	**No. of leaves plant^{-1}**	**No. of tillers hill^{-1}**	**Dry matter plant^{-1} (gm)**
T_1 : Absolute control	73.00	12.27	10.13	40.67
T_2 : RDF (40:40:20 N, P_2O_5, K_2O kg ha^{-1})	95.00	14.67	12.47	55.00
T_3 : 75% RDF + 25% RDN through FYM	87.33	13.50	11.73	50.33
T_4 : 50% RDF + 50% RDN through FYM	83.67	13.33	11.30	49.33
T_5 : 75% RDF + 25% RDN through VC	90.33	14.23	12.00	53.67
T_6 : 50% RDF + 50% RDN through VC	89.33	13.60	11.90	52.33
T_7 : 75% RDF + 25% RDN through PM	99.33	16.27	13.97	59.97
T_8 : 50% RDF + 50% RDN through PM	97.08	15.00	12.80	56.67
S. Em. (±)	2.24	0.56	0.49	1.83
CD at 5%	6.80	1.70	1.50	5.56
General mean	**89.38**	**14.11**	**12.04**	**52.25**

Table 2. Yield attributes of finger millet as influenced by different treatments

Treatments	Yield attributes of finger millet			
	No. of effective tillers hill^{-1}	No. of fingers ear head^{-1}	Test weight (gm)	Finger length (cm)
T_1 : Absolute control	7.50	5.33	2.63	5.20
T_2 : RDF (40:40:20 N, P_2O_5, K_2O kg ha^{-1})	10.20	6.73	2.72	6.63
T_3 : 75% RDF + 25% RDN through FYM	9.47	6.23	2.82	6.17
T_4 : 50% RDF + 50% RDN through FYM	8.97	6.00	2.75	5.93
T_5 : 75% RDF + 25% RDN through VC	9.63	6.67	2.85	6.40
T_6 : 50% RDF + 50% RDN through VC	9.60	6.27	2.81	6.20
T_7 : 75% RDF + 25% RDN through PM	11.73	7.83	2.85	7.07
T_8 : 50% RDF + 50% RDN through PM	10.45	7.23	2.83	6.70
S. Em. (±)	0.52	0.44	0.11	0.15
CD at 5%	1.59	1.33	NS	0.44
General mean	9.69	6.54	2.78	6.29

Table 3. Grain yield, straw yield, biological yield and harvest index of finger millet as influenced by different treatments

Treatments	Grain yield (q ha^{-1})	Straw yield (q ha^{-1})	Biological yield (q ha^{-1})	Harvest index
T_1 : Absolute control	5.66	11.00	16.66	33.66
T_2 : RDF (40:40:20 N, P_2O_5, K_2O kg ha^{-1})	11.32	22.82	34.14	33.19
T_3 : 75% RDF + 25% RDN through FYM	9.85	19.62	29.47	33.36
T_4 : 50% RDF + 50% RDN through FYM	9.35	19.25	28.60	32.70
T_5 : 75% RDF + 25% RDN through VC	10.22	20.85	31.07	32.82
T_6 : 50% RDF + 50% RDN through VC	10.09	20.36	30.45	33.14
T_7 : 75% RDF + 25% RDN through PM	12.56	25.28	37.84	33.02
T_8 : 50% RDF + 50% RDN through PM	12.06	23.31	35.37	34.18
S. Em. (±)	0.66	0.83	1.28	1.83
CD at 5%	2.00	2.51	3.88	NS
General mean	**10.14**	**20.31**	**30.45**	**33.26**

Treatment, 75% RDF + 25% RDN through poultry manure, recorded significantly higher grain yield (12.56 q ha^{-1}), straw yield (25.28 q ha^{-1}) and biological yield (37.84 q ha^{-1}) over the rest of the treatments and was on par with treatment 50% RDF and 50% RDN through poultry manure and RDF. While the lowest seed yield (5.66 q ha^{-1}), straw yield (11 q ha^{-1}), and biological yield (16.66 q ha^{-1}) at harvest were observed under treatment absolute control.

Higher grain yield due to the combined application of inorganic fertilizers and organic manures might have been attributed to sustained nutrient supply and, as a result of better utilisation of applied nutrients through improved micro-environmental conditions, especially the activities of soil micro-organisms involved in nutrient transformation and fixation. The increased dry matter production in plants may have enhanced the growth and yield characteristics when using the optimum amount of fertilizers and integrated nutrient management treatments, leading to higher finger millet stover yields. These findings are in agreement with those obtained by Marwein *et al.,* (2019), Amarghade and Singh (2021), Ledhan *et al*., (2021) and Kumari *et al*., (2025).

4. CONCLUSION

The application of 75% RDF + 25% RDN through poultry manure demonstrated comparable outcomes. Consequently, this treatment resulted in higher growth, yield attributes and yield as compared to the remaining treatments. Hence, it is advisable to apply 75% RDF + 25% RDN through poultry manure for getting maximum yield of finger millet (*cv*. Dapoli 3) under the central Malwa region of M. P.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of this manuscript.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

Amarghade, N., & Singh, R. (2021). Impact of nutrient management on yield and economics of pearl millet (*Pennisetum glaucum* L.). *Biological Forum - An International Journal*, 13(3a), 649-652.

Anonymous. (2023). Department of Agriculture and Farmers Welfare, Ministry of Commerce and Industry, APEDA.

Aparna, K., & Ansari, Z. G. (2017). Evaluation of ragi genotypes on growth parameters and physiological attributes under kharif rainfed conditions. *International Journal of Chemical Studies*, 5(6), 1899-1901.

Aziz, A., Khan, B. A., Tahir, M. A., Nadeem, M. A., Amin, M. M., Ain, Q. T., Adnan, M., Munawar, N., Hussain, A., Khisham, M., Toor, M. D., & Sultan, M. (2020). Effect of poultry manure on growth and yield of forage sorghum (*Sorghum bicolor* L.). *International Journal of Botany Studies*, 5(3), 401-406.

Behera, R. D., Sahu, S., Priyadarshini, S., Biswal, S., Das, I., Mishra, P., ... & Jena, D. (2025). Optimizing nutrient management for finger millet (*Eleusine coracana*) in lateritic soils of Odisha: Effects on growth, yield and economics. *International Journal of Plant & Soil Science*, 37(2), 164-169.

Boruah, A., Saikia, M., Harsha Sarma, H., Kamal, N., & Kumar, M. (2024). Impact of integrated nutrient management practices on chemical properties of soil under finger millet cultivation in Assam, India. *Journal of Advances in Biology & Biotechnology*, 27(8), 836–841. https://doi.org/10.9734/jabb/2024/v27i81202.

Chaudhary, D. R., Bhandari, S. C., & Shukla, L. M. (2004). Rate of vermicompost in sustainable agriculture: A review. *Agriculture Research*, 25(1), 29-39.

Gautam, A., Mahajan, S., Priyanka, Dikshesh Rai, Shilpa Kumari, Navneet Jaryal, & Sankhyan, N. K. (2025). Integrated nutrient management effects on yield and profitability of finger millet (Eleusine coracana) in the North-Western Himalayas. *Asian Journal of Soil Science and Plant Nutrition*, 11(3), 1–12. https://doi.org/10.9734/ajsspn/2025/v11i3546.

Harika, J. V., Maitra, S., Shankar, T., Bera, M., & Manasa, P. (2019). Effect of integrated nutrient management on productivity, nutrient uptake, and economics of finger millet (Eleusine coracana L. Garten). *International Journal of Agriculture, Environment and Biotechnology*, 12(3), 273-279.

Kumari, S., Debbarma, V., & Bakshi, K. (2025). Effect of organic manure and plant geometry on growth and yield of finger millet (*Eleusine coracana* L.). *International Journal of Research in Agronomy*, 8(5), 345-349.

Ledhan, S., Singh, V., & Tiwari, D. (2021). Effect of row spacing and poultry manure on the growth and yield of finger millet (*Eleusine coracana* L.). *The Pharma Innovation Journal*, 10(8), 1709-1712.

Marwein, S. B., Singh, R., & Chhetri, P. (2019). Effect of integrated nitrogen management on yield and economics of foxtail millet genotypes. *International Journal of Current Microbiology and Applied Sciences*, 8(8), 2543-2546.

Monish, V., Rathinaswamy, A., Mahendra, P. P., & Kumutha, K. (2019). Influence of integrated nutrient management on growth attributes and yield of foxtail millet in red soil. *International Journal of Chemical Studies*, 7(3), 3536-3539.

Nigade, R. D., & More, S. M. (2013). Performance of finger millet varieties to different levels of fertilizer on yield and soil properties in Sub Mountain Zone of Maharashtra. *International Journal of Agriculture Science*, 9(1), 256-259.

Panse, V. G., & Sukhatme, P. V. (1985). *Statistical Methods for Agricultural Workers* (2nd enlarged ed.). I.C.A.R., New Delhi, 135-136.

Patil, P., Nagamani, C., Pratap Kumar Reddy, A., & Umamahesh, V. (2018). Effect of integrated nutrient management on yield attributes, yield, and quality of pearl millet (Pennisetum glaucum L.). *Indian Journal of Chemical Sciences*, 6(4), 1098-1101.

Prabhakar, M., Gopinath, K. A., Sai Sravan, U., Srasvan Kumar, G., Thirupathi, M., Samba Siva, G., ... & Singh, V. K. (2023). Potential for yield and soil fertility improvement with integration of organics in nutrient management for finger millet under rainfed Alfisols of Southern India. *Frontiers in Nutrition*, 10, 1095449.

Sakamma, S., Umesh, K. B., Girish, M. R., Ravi, S. C., Satishkumar, M., & Veerabhadrappa, B. (2018). Finger millet (*Eleusine coracana* L.) production system: Status, potential, constraints, and implications for improving small farmers' welfare. *Journal of Agricultural Science*, 10(1), 162-170.

Saunshi, S. (2012). Effect of enriched bio-digester liquid manure on growth and yield of organic finger millet (Eleusine coracana L. Garten). M.Sc. (Ag) thesis submitted to University of Agricultural Sciences, Bangalore.

Singh, R., Gupta, A. K., Tulasa, R., Choudhary, G. L., & Sheoran, A. C. (2013). Effect of integrated nitrogen management on transplanted pearl millet (*Pennisetum glaucum* L.) under rainfed condition. *Indian Journal of Agronomy*, 58(1), 81-85.

Ullasa, M. Y., Pradeep, S., Sridhar, S., Sunil, C., Ganapathi, K., & Divya, M. (2020). Long-term effect of different organic nutrient management practices on growth, yield of finger millet (*Eleusine coracana* L.) and soil properties. *Journal of Farm Sciences*, 33(3), 342-347.

Vighnesh, C., Ramachandra, C., Seenappa, G., & Gangadhar, E. R. (2023). Influence of organic sources on growth and yield of finger millet in finger millet-groundnut cropping sequence. *Mysore Journal of Agriculture Science*, 57(4), 393-404.

Peer-review history:
The peer review history for this paper can be accessed here:
https://pr.sdiarticle5.com/review-history/143306