Eco. Env. & Cons. 29 (4) : 2023; pp. (1790-1794)
Copyright@ EM International
ISSN 0971–765X

DOI No.: http://doi.org/10.53550/EEC.2023.v29i04.056

Studies on Nutrient Management in Radish (*Raphanus sativus* L.) for Growth, Yield and Quality Traits

Poluka Lahari and Vishal Tripathi*

Department of Horticulture, Lovely Professional University, Phagwara 144 411, Punjab, India

(Received 21 April, 2023; Accepted 3 June, 2023)

ABSTRACT

The experiment described in this study was conducted at the vegetable research farm located at the School of Agriculture, Lovely Professional University in Phagwara, Punjab. The study took place from October to December 2022, with the objective of evaluating the effects of nutrient management on the growth, yield, and quality traits of radish (*Raphanus sativus* L.). The experiment was designed using a Randomized Block Design, with a total of 14 different treatment levels of integrated nutrients. Each treatment level was replicated three times to ensure statistical validity and reliability of the results. The results obtained from the experiment indicated that the application of varying levels of integrated nutrients had a significant effect on the yield parameters of the crops. This suggests that the combination and dosage of these integrated nutrients played a crucial role in influencing the overall yield of the plants. T9 gave maximum plant height (38.77 cm), T13 gave maximum numbers of leaves (16.43). Among yield traits maximum root length (25.78cm) in T2, root diameter (4.30 cm) in T9, Fresh weight of roots and Dry weight of roots gave maximum in T2 (211.55g), while Plant yield per plot (kg) and Plant yield (q/ha) recorded maximum yield in T2. Among quality traits TSS (5.55^0 Brix) observed in T9, and Chlorophyll content (43.82 SPADE value) observed maximum in T9. This study demonstrates the potential benefits of integrating vermicompost and synthetic fertilizer for the growth and yield of radish. The results indicated a significant enhancement in both growth and yield of the radish crop. This combined approach of utilizing vermicompost and synthetic fertilizer proved beneficial in optimizing radish production.

Key words : *Radish, FYM, NPK, Vermicompost, Poultry manure.*

Introduction

Radish (*Raphanus sativus* L.) is a well-known vegetable from the Cruciferae family. It goes by different names like Mula, Mullangi, Mullo, Mooli, and Milli across various regions and originated in China and India, radish is a popular and widely consumed vegetable. Radish holds the distinction of being one of the oldest cultivated vegetables that have been cultivated and consumed by humans for thousands of years. Its main significance is that it can be grown throughout the year. It can be grown in a variety of soil types, but it favours light friable sandy loam soil. Radish is generally formed in fusiform shape, it can be consumed both raw and cooked, whole plant of radish is edible, young leaves are used as cooked vegetables, salads, topping, side dishes, meals as well it's a source of Vit A and C and its leaves are rich in minerals. When the roots and leaves of the radish are cooked together, it has a cooling effect, avoids constipation, enhances appetite, and is delicious, radish has been recommended as a remedy for ailments such as piles, digestive disorders, and jaundice.

Radish is known for its short duration and rapid growth as a cropwith rapid and uninterrupted root growth. To achieve good quality roots and higher yields, it is essential to provide optimal fertilization, especially nitrogen, phosphorus, and potassium. Nitrogen is particularly crucial for the growth of radish plants, and the lack of this nutrient can significantly reduce growth. Phosphorus and potassium are also necessary for radish growth, and their deficiency can hinder plant growth and development, (Lacas and De Frietas, 1960). With the current state of the environment, which is threatening sustainability, it is critical to implement agricultural practices that maintain the health of soil, humans, animals, and the ecosystem. With increasing awareness about health and safety, consumers are increasingly opting for organically cultivated foods. These foods are known to offer a healthier and safer option, free from harmful pesticides and chemicals. As a result, the organic food industry is experiencing significant growth, expanding at an impressive rate of 12-15 percent annually.

Integrated Nutrient Management is more cost-effective when compared to chemical fertilizers. It also meets the nutrient requirement of the crop by a single source, so this is the reason nutrient management becomes more necessary. Various components of INM include FYM, Poultry manure, Vermicompost, Cow dung, goat manure, sheep manure, Crop residues, Biochar, rabbit manure, compost, straws, and inorganic fertilizers. INM helps in obtaining high crop yields that are agronomically feasible, economically viable, and environmentally sound (Kafle, 2019). To ensure successful radish production, a balanced supply of essential nutrients is crucial (Sandeep, 2014). This can be achieved through the use of various sources such as organic fertilizers, vermicompost, compost, biofertilizers, and low-dose chemical fertilizers. The incorporation of these practices has been shown to enhance the quality of radish production (Kiran, 2016).

Radish is a widely cultivated vegetable that is known for its adaptability to various growing conditions, including tropical regions. Among the factors that can influence its yield, adequate nutrition and appropriate plant spacing are crucial for success. To promote optimal growth and yield of radish plants, it is advisable to utilize fertilizers containing essential nutrients like nitrogen, phosphorus, and potassium. Additionally, incorporating organic manures such as farmyard manure (FYM) and vermicompost has proven beneficial. Studies have shown that the application of these fertilizers and organic manures contributes to increased leaf area, leaf count, root length, root diameter, and overall root yield of radish plants (Velmurugan, 2005).

Materials and Methods

In a study titled "Study on Nutrient Management on Radish (*Raphanus sativus* L.) for Growth, Yield, and Quality Traits," conducted at the vegetable research farm of Lovely Professional University, Phagwara (Punjab), the experiment conducted from October 2022 to December 2022. The experiment followed a Randomized Block Design, consisting of 14 different treatment levels of integrated nutrients. Each treatment was replicated three times to ensure accuracy and reliability of the results. i.e. T0(Control),T1(100 % RDF+ FYM 15t/ha), T2(100%RDF + Vermicompost (2.5t/ha)), T3(100%RDF + Poultrymanure (2.5t/ha)), T4(FYM(15t/ha)), T5 (Vermicompost (2.5t/ha)), T6(Poultrymanure (5t/ha), T7(Poultrymanure (2.5t/ha) + Vermicompost (2.5t/ha)+FYM(7.5t/ha)), T8(RDF75 % + Poultry manure (2.5t/ha)), T9(RDF 75% + Vermicompost (2.5t/ha)), T10(RDF 75% + FYM (10 t/ha)), T11(RDF 50% + FYM (15t /ha), T12(RDF 50% + Vermicompost (2.5t/ha)), T13(RDF 50% + Poultry manure (2.5t/ha)).

Results and Discussion

Growth parameters

For the growth parameters the plant height at 30 days after sowing (DAS), the maximum plant height of 14.42 cm was recorded in treatment T2, which consisted of 100% RDF along with vermicompost at a rate of 2.5 tons per hectare. At 45 DAS, the significantly highest plant height of 23.88 cm was observed in treatment T9, which consisted of 75% RDF along with vermicompost at a rate of 2.5 tons per hectare. Similarly, at 60 DAS, the significantly maximum plant height of 38.77 cm was observed again in treatment T9, which included 75% RDF along with vermicompost at a rate of 2.5 tons per hectare. These findings support the previous studies conducted by Khadse *et al*., (2021) and Aswathi *et al*., (2021) which also reported the stimulatory effects of vermicompost NPK and FYM. For the number of leaves per plant according to the study results, the

number of leaves exhibited a significant increase as the crop growth period progressed. At 30 days after sowing (DAS), the maximum number of leaves (7.60) was recorded in treatment T3, which consisted of 100% RDF along with poultry manure applied at a rate of 2.5 tons per hectare. At 45 DAS, the significantly highest number of leaves (13.57) was observed in treatment T8, which included 75% RDF along with poultry manure applied at a rate of 2.5 tons per hectare. Similarly, at 60 DAS, the significantly maximum number of leaves (16.43) was recorded in treatment T13, which comprised 50% RDF along with poultry manure applied at a rate of 2.5 tons per hectare. These findings support the previous studies conducted by Basnet *et al*., (2021) and Subedi *et al*., (2018), which also reported the stimulatory effects of poultry manure NPK and FYM.

Yield and yield attributes

The study results indicate that the significantly largest root length of 25.78 cm was recorded in treatment T2, which consisted of 100% recommended dose of fertilizer (RDF) along with vermicompost applied at a rate of 2.5 tons per hectare. These findings are consistent with the results reported by Shrivastava *et al*., (2022) and Dulall *et al*., (2021), who also observed the stimulatory effects of vermicompost and RDF on root length. For the root diameter (cm) maximum root diameter of 4.30 cm was recorded in treatment T9, which consisted of 75% recommended dose of fertilizer (RDF) along with vermicompost applied at a rate of 2.5 tons per hectare. These findings align with the results reported by Shrivastava *et al*., (2022) and Meena *et al*., (2022), who also observed the stimulatory effects of vermicompost and RDF on root diameter. For the fresh weight of roots (gm) and the dry weight of roots the maximum fresh weight of roots, measuring 211.55g(FW) and 35.68(DW) was recorded in treatment T2. This treatment comprised 100% recommended dose of fertilizer (RDF) along with vermicompost applied at a rate of 2.5 tons per hectare. These results are consistent with the findings reported by Mishra *et al*., (2020) and Meena *et al*., (2022), who also observed the stimulatory effects of vermicompost and RDF on the fresh weight of roots. For the Plant yield per plot (kg) and Plant yield (q/ha) the treatment T2, which consisted of 100% recommended dose of fertilizer (RDF) along with vermicompost applied at a rate of 2.5 tons per hectare, recorded a significantly maximum plant yield per plot of 62.50 kg and 492.52 q/ha This observation is consistent with the statement made by Meena *et al*., (2022), Khede *et al*., (2019) and Jat *et al*., (2017).

Quality parameters

The study findings reveal that the T9, which consisted of 75% recommended dose of fertilizer (RDF) along with vermicompost applied at a rate of 2.5 tons per hectare, recorded a significantly maximum

Table 1. Studies on nutrient management on growth parameters

Treatments		Plant height(cm)			Number of leaves		
		30 days	45 days	60 days	30 days	45 days	60 days
T0	Control	7.13	12.47	23.27	5.67	9.67	13.50
T1	100 % RDF+ FYM 15 t/ha	14.17	17.26	30.30	7.27	12.20	15.40
T2	100 % RDF+ Vermicompost (2.5t/ha)	14.42	21.97	36.98	6.83	11.90	14.43
T3	100 % RDF+Poultry manure (2.5 t/ha)	13.04	21.93	29.33	7.60	11.60	14.46
T4	FYM (15 t/ha)	13.21	20.40	32.73	6.00	12.47	14.20
T5	Vermicompost (2.5t/ha)	13.47	21.81	36.40	6.83	11.93	13.93
T6	Poultry manure (5t/ha)	13.44	21.17	34.30	6.20	12.60	15.43
T7	Poultry manure (2.5t/ha) +Vermicompost (2.5t/ha) +FYM (7.5t/ha)	13.60	20.45	29.00	6.40	13.47	15.40
T8	RDF 75% + Poultry manure(2.5t/ha)	13.15	18.80	31.93	6.77	13.57	14.60
T9	RDF 75% +Vermicompost (2.5 t/ha)	13.17	23.88	38.77	7.47	11.47	14.57
T10	RDF 75% + FYM (10 t/ha)	13.09	21.35	29.37	6.20	12.13	12.80
T11	RDF 50% + FYM (15 t /ha)	12.87	20.71	25.74	6.30	12.20	14.37
T12	RDF 50% +Vermicompost (2.5t/ha)	13.47	21.77	30.40	5.63	12.03	13.70
T13	RDF 50% + Poultry manure(2.5t/ha)	12.69	17.77	32.45	5.90	11.27	16.43
	CD@5%	0.59	2.53	3.13	0.78	1.10	1.55
	S. Em ±	0.20	0.88	1.08	0.27	0.38	0.54

Table 2. Studies on nutrient management on yield and yield attributes

Treatments		Fresh wt. of roots (gm)	Dry wt. of roots (gm)	Length (cm)	Diameter (cm)	Plot per (Kg)	Yield (q/ha)
T0	Control	140.03	22.16	18.21	2.71	37.87	298.40
T1	100 % RDF+ FYM 15 t/ha	195.20	25.10	24.33	2.81	50.86	400.82
T2	100 % RDF+ Vermicompost (2.5t/ha)	211.55	35.68	25.78	3.11	62.50	492.52
T3	100 % RDF+Poultry manure (2.5 t/ha)	166.47	28.96	20.26	3.60	44.90	353.85
T4	FYM (15 t/ha)	170.53	26.80	21.97	3.25	53.34	420.35
T5	Vermicompost (2.5t/ha)	156.32	28.94	21.81	3.76	48.78	384.36
T6	Poultry manure(5t/ha)	174.55	27.50	20.81	3.47	54.61	430.31
T7	Poultry manure (2.5t/ha) +Vermicompost (2.5t/ha) +FYM (7.5t/ha)	209.09	34.77	23.21	3.66	57.42	452.46
T8	RDF 75% + Poultry manure (2.5 t/ha)	153.27	26.15	19.57	3.17	51.01	401.95
T9	RDF 75% +Vermicompost (2.5 t/ha)	177.07	32.25	24.23	4.30	56.28	443.51
T10	RDF 75% + FYM (10 t /ha)	164.04	27.69	21.59	3.38	44.97	354.36
T11	RDF 50% + FYM (15t /ha)	157.04	27.22	20.77	2.88	53.74	423.47
T12	RDF 50% +Vermicompost (2.5t/ha)	165.33	26.95	18.56	3.57	49.53	390.33
T13	RDF 50% + Poultry manure(2.5t/ha)	163.68	27.39	19.49	3.11	44.34	349.43
	CD@5%	15.42	2.80	1.01	0.29	2.33	18.39
	S. Em ±	5.34	0.97	0.35	0.10	0.81	6.37

Table 3. Studies on nutrient management on quality parameters

Treatments		TSS (0.Brix)	Chlorophyll (SPADE Values)
T0	Control	3.17	27.06
T1	100 % RDF+ FYM 15 t/ha	4.61	43.49
T2	100 % RDF+ Vermicompost (2.5t/ha)	4.58	35.50
T3	100 % RDF+Poultry manure (2.5 t/ha)	4.60	41.23
T4	FYM (15 t/ha)	4.51	33.32
T5	Vermicompost (2.5 t/ha)	4.42	37.86
T6	Poultry manure (5t/ha)	4.49	40.34
T7	Poultry manure (2.5t/ha) +Vermicompost (2.5 t/ha) +FYM (7.5 t/ha)	5.11	40.32
T8	RDF 75% + Poultry manure(2.5t/ha)	5.03	31.90
T9	RDF 75% +Vermicompost (2.5t/ha)	5.55	43.82
T10	RDF 75% + FYM (10t /ha)	4.61	30.61
T11	RDF 50% + FYM (15t/ha)	4.58	34.64
T12	RDF 50% +Vermicompost (2.5t/ha)	4.46	28.91
T13	RDF 50% + Poultry manure(2.5t/ha)	4.63	30.55
	CD@5%	0.27	2.15
	S. Em ±	0.09	0.75

total soluble solids (TSS) content of 5.55 and the chlorophyll content of 43.82. These findings are consistent with the findings reported by Kushwah *et al*., (2019) who also observed the significantly maximum TSS and chlorophyll content with the same treatment.

Conclusion

The present investigation concluded that the Pusa Swetha radish variety exhibited positive responses in terms of growth, yield, and quality parameters. The application of RDF 75% +Vermicompost (2.5t/ha) at T9 resulted significant improvements in plant height, root diameter. Moreover, this treatment also positively impacted quality parameters such as total soluble solids (TSS) and Chlorophyll content. By the application of 100% RDF+ Vermicompost (2.5 t/ha) at T2 resulted significant improvements in yield parameters like root length, fresh weight of roots, dry weight of roots, yield kg per/plot and yield q/ha.

References

Aswathi, P., Prasad, V. M. and Deepanshu, V. B. 2021. Integrated nutrient management in radish (*Raphanus sativus* L.) cv. scarlet red globe.

Basnet, B., Aryal, A., Neupane, A., Bishal, K. C., Rai, N. H., Adhikari, S. and Basnet, M. 2021. Effect of integrated nutrient management on growth and yield of radish. *Journal of Agriculture and Natural Resources*. 4(2): 167-174.

Dulal, D., Baral, D., Poudel, A., Kafle, K. and Shrestha, B. 2021. Effect of different doses of vermicompost on growth, yield and quality of radish (*Raphanus sativus* L. cv. Mino Early). *Archives of Agriculture and Environmental Science*. 6(3): 354-359.

Jat, P. K., Singh, S. P., Devi, S., Mahala, P. and Rolaniya, M. K. 2017. Performance of organic manures, inorganic fertilizer and plant density of yield and quality of radish. *International Journal of Agricultural Science and Research*. 7(2): 261-266.

Kafle, K., Shriwastav, C. P. and Marasini, M. 2019. Influence of integrated nutrient management practices on soil properties and yield of potato (*Solanum tuberosum* L) in an inceptisol of Khajura, Banke. *International Journal of Applied Sciences and Biotechnology*. 7(3): 365-369.

Khadse, V. A., Mohod, A. A., Chirde, P. N. and Chauhan, A. K. 2021. Response of leafy vegetables under organic and integrated nutrient management. *The Pharma Innovation Journal*. 10(5): 04-06.

Khede, K., Kumawat, A. and Tembare, D. 2019. Effect of organic manures, fertilizers and their combinations on growth, yield and quality of radish (*Raphanus sativus* L.) cv. Japanese white. *International Journal of Current Microbiology and Applied Sciences*. 8(3): 400-405.

Kiran, M., Jilani, M. S., Waseem, K. and Sohail, M. 2016. Effect of organic manures and inorganic fertilizers on growth and yield of radish (*Raphanus sativus* L). Pakistan Journal of Agricultural Research, 29(4).

Kushwah, L., Sharma, R. K., Kushwah, S. S. and Singh, O. P. 2019. Influence of organic manures, inorganic fertilizers and their combinations on growth and quality of radish (*Raphanus sativus* L.). *IJCS*. 7(6): 2972-2974.

Lacas MD, De Frietas FE. The response of radishes to nutritional deficiencies of major and minor elements. *Agron Lustit.* 1960; 22:205-212.

Meena, P. D. and Dhaka, R. S. 2022. Efficacy of organic and inorganic nutrient management on productivity and profitability of Radish. *The Indian Society of Agricultural Science*. 214.

Mishra, A., Singh, S. and Greene, A. 2020. Effect of Integrated Fertilization on Qualitative and Quantitative Traits of Radish (*Raphanus sativus* L.). *Int. J. Curr. Microbiol. App. Sci.* 9(8): 987-995.

Sandeep, S., Manjaiah, K. M., Pal, S. and Singh, A. K. 2016. Soil carbon fractions under maize–wheat system: effect of tillage and nutrient management. *Environmental Monitoring and Assessment.* 188(1): 1-13.

Shanmugasundaram, R. & Savithri, P. 2004. Effect of nitrogen levels, organics andamendments on nitrogen nutrition of carrot. *Agricultural Science Digest.* 24(1): 5-8.

Shrivastava, R., Bisen, R. K., Verma, S. K., Agrawal, H. P., Keshry, P. K., Chaure, N. K., & Thakur, S. (2022). To study the effects of integrated nutrient management on the growth and yield of Radish (*Raphanus sativus* L.). *Journal of Pharmacognosy and Phytochemistry*. 11(5): 120-123.

Subedi, S., Srivastava, A., Sharma, M. D. and Shah, S. C. 2018. Effect of organic and inorganic nutrient sources on growth, yield and quality of radish (*Raphanus sativus* L.) varieties in Chitwan, Nepal. *SAARC Journal of Agriculture*. 16(1): 61-69.

Velmurugan, M., Balakrishnamoorthy, G. and Ananthan, M. 2005. Studies on organic farming practices on growth, yield and quality of radish (*Raphanus sativus* L.) cv. Pusachetki. *South Indian Hort.* 53(1-6) : 337-339.