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Influence of organic manure on growth and root yield of radish (*Raphanus Sativus L.*) cv Pusa Gulabi

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Abstract

A field experiment was conducted during 2025-26 at the Instructional Farm, College of Horticulture and Research Station, Sankara-Patan, Durg, Chhattisgarh, to evaluate the effect of different organic manures on the growth and root yield of radish (*Raphanus sativus L.*) cv. Pusa Gulabi. The experiment was laid out in a Randomized Block Design with ten treatments and three replications. Vermicompost, poultry manure, and farmyard manure were applied at 100%, 75%, and 50% nitrogen-equivalent levels, along with an untreated control. Among the treatments, T2 (100% N through poultry manure) recorded the highest plant height, number of leaves, leaf length and breadth. It also produced the maximum root diameter (6.40 cm), root length (14.34 cm), fresh root weight (90.49 g), root yield per plot (10.18 kg), root yield (254.45 q/ha), and harvest index (58.74%). The earliest harvest was obtained with T1 (100% N through vermicompost) at 52.29 days. Overall, poultry manure at 100% nitrogen was most effective.

Keywords: Radish, raphanus sativus, organic manure, poultry manure, vermicompost, farmyard manure, growth parameters, root yield parameters, pusa gulabi

Introduction

Radish (*Raphanus sativus L.*) is one of the most important and widely grown root vegetable crops belonging to the family Brassicaceae, valued for its fast-growing nature, short duration and high nutritive value. It is a rich source of vitamin C, folic acid, potassium and dietary fibre, and its crisp, pungent roots are consumed raw in salads as well as cooked in various culinary preparations. India is among the leading radish-producing countries in the world, and Chhattisgarh contributes a sizeable share to the national production, with radish being cultivated extensively by small and marginal farmers owing to its short crop duration and quick economic returns. Despite its wide adaptability, the growth, root development and ultimate yield of radish remain strongly dependent on the nutrient status of the soil, since the crop has a shallow but highly nutrient-responsive root system and a short vegetative phase within which adequate nutrition must be made available. Continuous and indiscriminate use of chemical fertilizers over the years has led to deterioration of soil health, decline in organic carbon content, disturbance of soil microbial balance and, in several cases, stagnation or reduction in crop productivity. In this context, organic manures such as vermicompost, poultry manure and farmyard manure have gained importance as sustainable alternatives or supplements to inorganic fertilizers. These organic sources not only supply macro- and micro-nutrients in a slow-release form but also improve soil physical properties, enhance water-holding capacity, promote beneficial microbial activity and improve the overall rhizospheric environment, thereby favourably influencing root crops like radish. Among the various organic sources, vermicompost is known for its rich humic substances and plant growthpromoting microorganisms, poultry manure for its comparatively higher nitrogen, phosphorus and potassium content and quick mineralization, and farmyard manure for its long-term soilconditioning effect. Since the response of radish in terms of vegetative growth, root development and final yield varies considerably with the type and level of organic manure applied, the present investigation was undertaken with the specific objective of studying the effect of different organic manures vermicompost, poultry manure and farmyard manure, each applied at 100, 75 and 50 per cent nitrogen-equivalent levels on the growth

parameters and root yield parameters of radish cv. Pusa Gulabi under the agro-climatic conditions of Durg, Chhattisgarh.

Materials and Methods

The present investigation was conducted during the rabi season of 2025-26 at the Instructional Farm, College of Horticulture and Research Station, Sankara-Patan, Durg (Chhattisgarh), situated at 21.03° N latitude and 81.53° E longitude at an average elevation of 280 m above mean sea level. Radish cv. Pusa Gulabi was sown at a spacing of 30 × 20 cm on ridges.

Statistical Analysis

The data recorded on growth and yield parameters were statistically analysed following the analysis of variance (ANOVA) technique applicable to a Randomized Block Design. Treatment means were compared using the critical difference (CD) at 5 per cent level of significance.

Results and Discussion

Growth Parameters

Plant height (CM)

Plant height was significantly influenced by the different organic manure treatments at 30 and 60 DAS (Table 2). At 30 DAS, the tallest plants were recorded under T2, 100% N through poultry manure (19.15 cm), statistically at par with T1, 100% N through vermicompost (17.72 cm), whereas the shortest plants were observed under the control, T0 (10.75 cm). At 60 DAS, T2 again recorded the tallest plant height (28.55 cm), at par with T1 (28.17 cm), T3 (28.12 cm), T5 (27.38 cm), T4 (27.35 cm) and T6 (27.16 cm), while the control recorded the shortest plants (22.42 cm). The superior plant height under poultry manure may be attributed to improved nutrient availability, enhanced microbial activity, continuous nutrient mineralization and the presence of plant growth-promoting substances, whereas the poor performance under the control may be due to limited and slow nutrient release. Similar findings were reported by Kumar and Gupta (2018) ^[9]. and Tonpe *et al.* (2025) in radish.

Number of leaves per plant

The number of leaves per plant was also significantly influenced by the organic manure treatments at both growth stages (Table 3). At 30 DAS, the highest number of leaves was recorded under T2 (8.47), at par with T1 (7.88), T3 (7.42) and T5 (7.30), while the control recorded the minimum value (5.98). At 60 DAS, T2 produced the maximum number of leaves (13.53), at par with T1 (12.82) and T3 (12.16), whereas the lowest number of leaves was recorded under the control (8.04). The increased leaf production under poultry manure may be attributed to better nitrogen availability, resulting in enhanced vegetative growth and continuous nutrient release supporting leaf initiation and expansion. Similar results were reported by Khatri *et al.* (2019) ^[6]. and Basnet *et al.* (2021) ^[2]. in radish.

Leaves length and leaves breadth (CM)

Leaves length and leaves breadth were significantly influenced by the organic manure treatments (Table 4). The maximum leaves length (26.57 cm) was recorded under T2, statistically at par with T1 (25.79 cm), T3 (24.60 cm), T5 (24.54 cm) and T4 (24.11 cm), while the minimum leaves

length was recorded in the control (18.03 cm). Similarly, the highest leaves breadth (8.55 cm) was recorded under T2, at par with T1 (7.41 cm) and T3 (7.09 cm), and these treatments significantly outperformed the control (5.26 cm). Enhanced leaf expansion under poultry manure may be attributed to balanced nutrient availability and increased photosynthetic efficiency. These findings are in close conformity with those of Gautam *et al.* (2025) ^[3] in radish.

Days to first harvesting

Days to first harvesting were significantly influenced by the organic manure treatments (Table 5). The earliest harvesting (51.43 days) was recorded under T2 (100% N through poultry manure), statistically at par with T1, 100% N through vermicompost (52.29 days), whereas the maximum days to first harvesting (57.81 days) was recorded under the control. Earlier harvest maturity under poultry manure and vermicompost may be attributed to faster nutrient availability, rapid vegetative growth and quicker root development, whereas the delayed harvesting in the control may be due to inadequate nutrient supply resulting in slower crop growth. Similar findings were reported by Sujatha *et al.* (2020) in radish.

Yield Parameters

Diameter of the root and length of the root (CM)

Root diameter and root length were significantly influenced by the different organic manure treatments (Table 6). The maximum root diameter (6.40 cm) was recorded under T2, statistically at par with T1 (6.19 cm) and T3 (5.99 cm), whereas the smallest root diameter was recorded in the control (3.36 cm). Similarly, the highest root length (14.34 cm) was recorded under T2, at par with T1 (13.70 cm), T3 (13.14 cm), T4 (12.48 cm), T5 (12.57 cm) and T6 (12.06 cm), while the lowest root length was recorded in the control (8.33 cm). Improved nutrient availability and favourable soil conditions under poultry manure enhanced root enlargement, while continuous microbial activity and better soil physical properties promoted deeper root penetration and elongation. Similar results were reported by Kumar *et al.* (2023) ^[10]. and Pathak *et al.* (2020) ^[18]. in radish.

Fresh weight of plant and fresh weight of root (G)

Fresh weight of plant and fresh weight of root were significantly influenced by the different organic nutrient sources (Table 7). The highest fresh plant weight (154.07 g) was recorded under T2, statistically at par with T1 (151.34 g), T3 (148.76 g), T5 (127.85 g), T4 (123.36 g) and T6 (120.49 g), whereas the lowest fresh plant weight was recorded in the control (89.44 g). Likewise, the maximum fresh root weight (90.49 g) was recorded under T2, at par with T1 (88.19 g), T3 (85.02 g) and T5 (71.53 g), while the minimum fresh root weight (41.12 g) was observed in the control. The higher fresh weight under poultry manure may be due to its rich nutrient content, especially nitrogen, phosphorus and potassium, which promoted vigorous vegetative growth and efficient translocation of photosynthates towards the storage root. Similar observations were reported by Khede *et al.* (2019) ^[7]. in radish.

Root yield per plot (kg) and root yield per hectare (Q)

Root yield per plot and per hectare varied significantly

among the treatments (Table 8). The highest root yield per plot (10.18 kg) was obtained under T2, statistically at par with T1 (10.01 kg), T3 (9.89 kg), T5 (8.57 kg), T4 (8.43 kg) and T6 (8.27 kg), while the lowest yield was recorded in the control (5.13 kg). On a per hectare basis, the maximum root yield (254.45 q) was recorded under T2, at par with T1 (250.25 q) and T3 (247.17 q), while the lowest yield was obtained under the control (128.15 q). The increased yield under poultry manure may be attributed to improved vegetative growth, greater root size and higher fresh root weight resulting from balanced nutrient availability and enhanced nutrient uptake, while vermicompost and farmyard manure also improved yield by enhancing soil fertility, microbial activity and nutrient-use efficiency. Similar findings were reported by Uddain *et al.* (2010) and Sharma *et al.* (2020) in radish.

Harvest index (%)

Harvest index was significantly influenced by the different organic nutrient treatments (Table 9). The highest harvest index (58.74%) was recorded under T2, statistically at par with T1 (58.27%), T3 (57.15%) and T5 (54.85%), while the lowest harvest index was observed in the control (43.71%). The higher harvest index under poultry manure indicates more efficient partitioning of photosynthates towards the economic yield (storage root), owing to adequate nutrient availability and improved physiological efficiency. Vermicompost and farmyard manure also increased the harvest index by improving plant growth, nutrient absorption and assimilate translocation. Similar findings were reported by Meena and Dhaka (2022) in radish.

Table 1: Effect of different organic manure on Vegetative parameter of Radish (*Raphanus Sativus* L.)

Treatment	Treatment	Plant Height 30DAS	Plant Height 60 DAS	No.of leaf/ Plant 30 DAS	No.of leaf /Plant 60 DAS	Leaves length	Leaves Breadh (cm)
T ₀	Control	10.75	22.42	5.98	8.04	18.03	5.26
T ₁	100% N through vermicompost	17.72	28.17	7.88	12.82	25.79	7.41
T ₂	100% N through poultry manure	19.15	28.55	8.47	13.53	26.57	8.55
T ₃	100% N through FYM	17.02	28.12	7.42	12.16	24.6	7.09
T ₄	75% N through Vermicompost	15.45	27.35	7.07	11.35	24.11	6.44
T ₅	75% N through Poutry manure	15.89	27.38	7.3	11.59	24.54	6.56
T ₆	75% N through FYM	15.89	27.16	6.86	10.95	24.07	6.39
T ₇	50% N through Vermicompost	14.59	26.48	6.65	10.19	23.83	6.16
T ₈	50% N through Poutry manure	14.63	26.78	6.74	10.6	23.89	6.28
T ₉	50% N through FYM	14.17	26.43	6.53	9.77	22.93	6.02
SEm±		0.56	0.94	0.3	0.4	0.9	0.23
CD		1.67	2.8	0.88	1.2	2.67	0.69

Table 2: Effect of different organic manure on Yield parameter of Radish (*Raphanus Sativus* L.)

Treatment	Treatment	Days to first harvesting	Diameter of the Root (cm)	Length of the root (cm)	Fresh weight of plant (gm)	Fresh weight of root (gm)	Root yield/ plot (kg)	Root yield/ hac (q)	Harvest Index (%)
T ₀	Control	57.81	3.36	8.33	89.44	41.12	5.13	128.15	43.71
T ₁	100% N through vermicompost	52.29	6.19	13.7	151.34	88.19	10.01	250.25	58.27
T ₂	100% N through poultry manure	51.43	6.4	14.34	154.07	90.49	10.18	254.45	58.74
T ₃	100% N through FYM	53.95	5.99	13.14	148.76	85.02	9.89	247.17	57.15
T ₄	75% N through Vermicompost	54.62	5.6	12.48	123.36	66.68	8.43	210.65	53.66
T ₅	75% N through Poutry manure	54.52	5.65	12.57	127.85	71.53	8.57	214.21	54.85
T ₆	75% N through FYM	55.14	5.02	12.06	120.49	64.19	8.27	206.73	54.88
T ₇	50% N through Vermicompost	55.96	4.21	11.03	113.61	56.98	6.98	174.46	50.15
T ₈	50% N through Poutry manure	55.80	4.76	11.54	115.57	61.22	7.17	179.24	52.97
T ₉	50% N through FYM	56.12	4.06	10.92	110.6	53.94	6.79	169.78	48.77
SEm±		1.61	0.27	0.37	4.19	2.58	0.37	6.2	1.7
CD		4.8	0.8	1.09	12.44	7.67	1.08	18.42	5.06

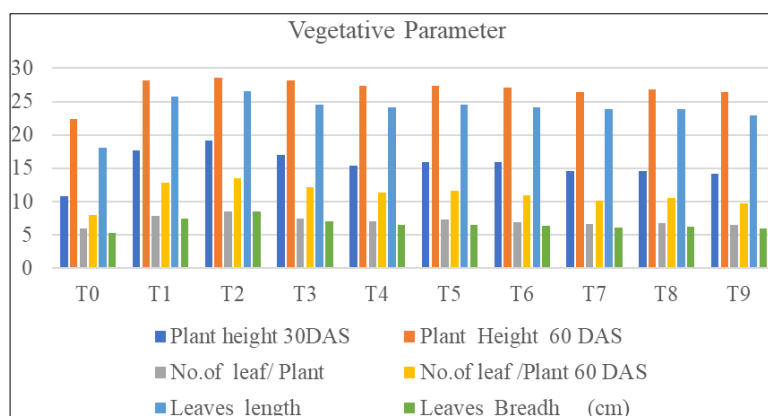


Fig 1: Vegetative Parameter

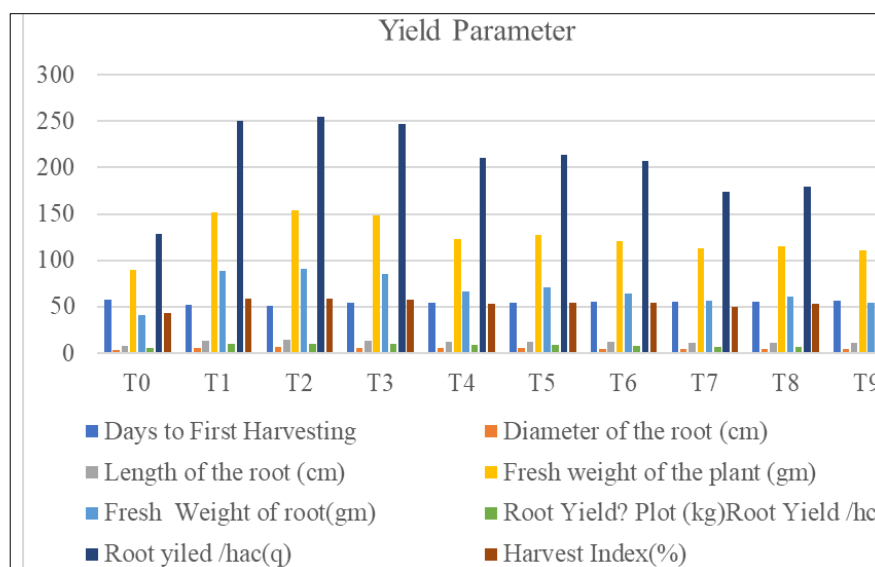


Fig 2: Yield parameter

Conclusion

The present study concludes that organic manure sources significantly influence the growth parameters and root yield parameters of radish cv. Pusa Gulabi. Among all the treatments, T2 (100% N through poultry manure) proved to be the most effective, recording the tallest plant height and the maximum number of leaves per plant at 30 and 60 DAS, the highest leaves length and leaves breadth, the maximum root diameter, root length, fresh weight of plant and root, root yield per plot and per hectare, and the highest harvest index. T1 (100% N through vermicomposting) recorded the earliest days to first harvesting and was statistically comparable to T2 for most of the growth and yield parameters, while T3 (100% N through farmyard manure) also performed at par with T2 for several traits. The 75 per cent nitrogen-equivalent treatments (T4-T6) showed appreciable performance, while the 50 per cent nitrogen-equivalent treatments (T7-T9) produced intermediate values. The unmulched control (T0) consistently recorded the poorest growth and yield performance throughout. Therefore, poultry manure applied at 100 per cent nitrogen equivalent level can be recommended as a highly effective organic manure source for enhancing vegetative growth and root yield parameters of radish under similar agro-climatic conditions, with vermicompost and farmyard manure serving as effective sustainable alternatives.

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