

Effect of organic and inorganic fertilizers on growth and yield of radish (*Raphanus sativus* L.) under irrigated conditions of Punjab

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Abstract

A field trial was conducted during 2021-2022 at Campus for Research and Advanced Studies, Dhablan, G.S.S.D.G.S. Khalsa College, Patiala to study the effect of organic and inorganic fertilizers on growth and yield of radish (*Raphanus sativus* L.) under irrigated conditions of Punjab. A field experiment was carried out in Randomized Block Design in which 10 treatments were applied in 3 replication. The plant height (33.31 cm), number of leaves (12.83), leaf length (26.37 cm) and leaf breadth (9.29 cm) was recorded maximum in treatment T₆ (Recommended dose of fertilizers 50 % + Vermi-compost 1.25 t ha⁻¹ + Poultry manure 0.75 t ha⁻¹) and root length (28.09 cm), root diameter (5.85 cm), fresh weight of radish (224.45 g), dry weight of radish (23.11 g) and yield (480.61 q ha⁻¹) was recorded maximum in treatment T₆ (Recommended dose of fertilizers 50 % + Vermi-compost 1.25 t ha⁻¹ + Poultry manure 0.75 t ha⁻¹). Combined application of organic and inorganic manures increased the growth and yield parameters of radish.

Keywords: Fertilizers, Growth, manure, Poultry manure, Radish, Vermicompost and Yield

Introduction

Radish (*Raphanus sativus* L.) is an important root crop which is grown all over the world. It is the member of family Brassicace. It is the native of India and China. The latin word radix, which means root, from where the term “radish” originates. The word ‘Raphanos’ in latin means ‘easily reared’. It is highly cross-pollinated crop and inflorescence of radish is a typical terminal raceme. (Anonymous 2018).

It is grown for its tender, edible, young and fusiform roots as it is consumed in the form of salad as well as cooked vegetable. It contain major sugar as glucose along with low quantities of sucrose and fructose. Radish root contain 94.4 % moisture, 0.7 g protein, 3.4 g carbohydrates, 0.02 mg riboflavin, 0.06 mg thiamine, 15 mg ascorbic acid and 35 mg calcium per 100 g. (Dhaliwal 2018). Radish is an annual or biennial herb depending on type of root. Radish roots grow from both the main root and hypocotyl, which is the edible part. It has different skin colours like red, purple, black, pink and white, while its flesh is typically white. The pink colour of the radish roots is due to the presence of anthocyanin pigment. Radish contains good amount of vitamin C (Ascorbic acid) and minerals such

as phosphorus, calcium and potassium. Radish leaves have more calcium, phosphorus, vitamin C and protein than their roots.

The use of Organic manures such as FYM, vermin-compost and Poultry manure is helpful in improving the productivity of crop and soil properties. The organic source is directly or indirectly increases the update of nutrients from soil and enhances the yield and quality of crops. Farmyard manure is bulky organic substances that provide organic matter and essential plant nutrients while also helping to aerate the soil and remove soil compaction. FYM enhance organic carbon content to the soil which improve the chemical, physical and biological properties of soil (Mengistu and Mekonnen 2012).

Vermi-compost which is a mixture of worm casting organic waste, humus, live earthworms, and other organisms, is also used as organic manure. It is a rich source of macro nutrients and micro nutrients. It supply considerable amount of micronutrients (Fe, Mn, Zn, and Cu) as well as macronutrients (N, P, K, Ca and Mg). It brings positive changes in both productivity and soil quality than chemical fertilizers.

Vermicompost contains N 0.8 %, P_2O_5 1.1 % and K_2O 0.5 % (Giraddi 1993).

Materials and Methods

The field experiment entitled “Effect of organic and inorganic fertilizers on growth and yield of Radish (*Raphanus sativus* L.) under irrigated conditions of Punjab” was conducted at Campus for Research and Advanced Studies, Dhablan, G.S.S.D.G.S. Khalsa College, Patiala during the *Rabi* season of 2021-2022. The experiment was conducted in Randomized Block Design having different application of organic and inorganic fertilizers with 3 replication and 10 treatments. The treatments were assigned randomly in the plot viz., T_1 (Control), T_2 (RDF 100 %), T_3 (Vermi-compost 5 t ha⁻¹), T_4 (Poultry manure 3 t ha⁻¹), T_5 (Farm yard manure 20 t ha⁻¹), T_6 (RDF 50 % + VC 1.25 t ha⁻¹ + PM 0.75 t ha⁻¹), T_7 (RDF 50 % + VC 1.25 t ha⁻¹ + FYM 5 t ha⁻¹), T_8 (RDF 25 % + VC 1.25 t ha⁻¹ + PM 0.75 t ha⁻¹ + FYM 5 t ha⁻¹), T_9 (VC 2.5 t ha⁻¹ + FYM 5 t ha⁻¹ + PM 0.75 t ha⁻¹) and T_{10} (VC 1.25 t ha⁻¹ + FYM 10 t ha⁻¹ + PM 0.75 t ha⁻¹). In this experiment trial Punjab Safed mooli-2 was used as planting material which was developed by PAU, Ludhiana (Punjab) in 2015. The land was prepared by ploughing with tractor drawn disc harrow and two times with cultivar followed each time by planking. The seed was shown on 29th October, 2021 by hand dibbling method. The spacing from ridge to ridge was kept 45 cm and seed to seed 10 cm. The recommended doses of nitrogen (N) and phosphorous (P) was 60 kg ha⁻¹, 30 kg ha⁻¹ respectively for radish crop. Nitrogen in the form of urea and phosphorus in the form of single

superphosphate was applied.

Results and Discussion

The data concerned with plant height, number of leaves, leaf length and leaf breadth of radish is presented in Table 1. The application of organic and inorganic fertilizers shows better results on growth characteristics of radish. The maximum plant height (33.31 cm), number of leaves (12.83), leaf length (26.37 cm) and leaf breadth (9.29 cm) was observed with the treatment T_6 (RDF 50 % + Vermi-compost 1.25 t ha⁻¹ + Poultry manure 0.75 t ha⁻¹) which was statistically at par with treatment T_7 (RDF 50 % + Vermi-compost 1.25 t ha⁻¹ + Farm yard manure 5 t ha⁻¹) whereas minimum value was observed with the treatment T_1 (Control). The maximum growth parameters were observed due to combined application of organic and inorganic fertilizers that supply all the essential nutrients in balanced dose and improves the soil fertility and aeration. Fertilizers were more effective due to readily available and quick release of nutrients in the initial stage. Vermicompost provides vital macro nutrients (N, P_2O_5 , K_2O , Ca and Mg) and micro nutrients (Fe, Mn, Cu and Zn). From the findings of present experiment it can be concluded that the application of organic manure and inorganic fertilizers had positive effect on growth parameters. Similar result was observed by Debbarma *et al.* (2018), Shahu *et al.* (2018), Khede *et al.* (2019) and Khushwah *et al.* (2020) in radish and also noticed in broccoli by Singh *et al.* (2021).

The maximum root length (28.09 cm), root diameter (5.85 cm), fresh weight of radish (224.45 g),

Table 1: Effect of organic and inorganic fertilizers on growth parameters of radish

Treatments	Plant height (cm)	No. of leaves plant ⁻¹	Leaf length (cm)	Leaf breadth (cm)
T_1 : Control	23.42	7.79	17.29	5.83
T_2 : RDF 100 %	29.27	11.25	22.63	7.25
T_3 : Vermicompost 5 t ha ⁻¹	28.48	9.94	21.37	6.71
T_4 : Poultry manure 3 t ha ⁻¹	27.64	9.56	20.69	6.51
T_5 : Farm yard manure 20 t ha ⁻¹	27.43	9.27	20.35	6.27
T_6 : RDF 50 % + VC 1.25 t ha ⁻¹ + PM 0.75 t ha ⁻¹	33.31	12.83	26.37	9.29
T_7 : RDF 50 % + VC 1.25 t ha ⁻¹ + FYM 5 t ha ⁻¹	32.97	12.68	25.54	9.05
T_8 : RDF 25% + VC 1.25 t ha ⁻¹ + PM 0.75 t ha ⁻¹ + FYM 5 t ha ⁻¹	32.68	12.36	25.32	8.87
T_9 : VC 2.5 t ha ⁻¹ + FYM 5 t ha ⁻¹ + PM 0.75 t ha ⁻¹	31.74	11.92	23.77	7.93
T_{10} : VC 1.25 t ha ⁻¹ + FYM 10 t ha ⁻¹ + PM 0.75 t ha ⁻¹	31.38	11.74	22.82	7.52
SE (d)±	0.50	0.07	0.54	0.11
CD at 5%	1.14	0.17	1.22	0.26

Table 2: Effect of organic and inorganic fertilizers on yield parameters of radish

Treatments	Root length (cm)	Root Diameter (cm)	Fresh weight of radish(g)	Dry weight of radish(g)	Yield (q ha ⁻¹)
T ₁ : Control	17.41	2.54	166.19	15.82	204.53
T ₂ : RDF 100 %	23.65	3.71	191.01	18.78	375.77
T ₃ : Vermicompost 5 t ha ⁻¹	22.35	3.31	188.16	18.16	384.6
T ₄ : Poultry manure 3 t ha ⁻¹	21.81	3.06	181.2	17.33	357.01
T ₅ : Farm yard manure 20 t ha ⁻¹	21.42	2.87	175.42	16.84	331.44
T ₆ : RDF 50 % + VC 1.25 t ha ⁻¹ + PM 0.75 t ha ⁻¹	28.09	5.85	224.45	23.11	480.61
T ₇ : RDF 50 % + VC 1.25 t ha ⁻¹ + FYM 5 t ha ⁻¹	26.56	5.75	223.79	22.95	468.86
T ₈ : RDF25% +VC1.25 tha ⁻¹ +PM 0.75tha ⁻¹ +FYM5tha ⁻¹	25.45	4.86	220.35	21.25	418.86
T ₉ : VC 2.5 t ha ⁻¹ + FYM 5 t ha ⁻¹ + PM 0.75 t ha ⁻¹	24.77	4.42	211.98	20.36	462.57
T ₁₀ : VC 1.25 t ha ⁻¹ + FYM 10 t ha ⁻¹ + PM 0.75 t ha ⁻¹	24.25	4.19	203.03	19.23	412.06
SE (d)±	0.71	0.04	0.30	0.08	7.73
CD at 5%	1.61	0.11	0.67	0.18	17.47

dry weight of radish (23.11 g) and yield (480.61 q ha⁻¹) was observed with the treatment T₆ (RDF 50 % + Vermi-compost 1.25 t ha⁻¹ + Poultry manure 0.75 t ha⁻¹) which was statistically at par with treatment T₇ (RDF 50 % + Vermicompost 1.25 t ha⁻¹ + Farm yard manure 5 t ha⁻¹). The minimum value was observed with the treatment T₁ (Control). The maximum yield parameters was observed because organic and inorganic fertilizers were applied in combinations. The increase in NPK absorption is caused by the addition of vermicompost and the solubilization of plant nutrients in the roots. Organic manure significantly increase the various antioxidant substance such as protein, soluble sugar, amino acids and phenolics. It improve the soil structure and physical conditions of soil. The data concerned root length, root diameter, fresh weight of radish, dry weight of radish and root yield of radish is represented in Table 2. The above investigation result conform with findings by Singh *et al.* (2018) in broccoli crop which shows the similar results by the use of organic manures and inorganic fertilizers. The research findings obtained same results with the present findings which was showed by Debbarma *et al.* (2018), Khede *et al.* (2019) and Khushwah *et al.* (2020).

References

- Anonymous. (2018). *Horticulture Statistics at a glance*. Pp 200. Department of Agriculture Cooperation and Farmers welfare of India.
- Debbarma, B., Jaysawal N, Kanawjia A and Kanojia RK. (2018). Studies on effect of different organic manures on growth and yield of radish. *International Journal of Chemical Studies*. 6(4): 378-380.
- Dhaliwal, M.S. (2018). *Handbook of Vegetable Crops*. Pp 193-195. Kalyani Publisher, Ludhiana.
- Giraddi (1993). Organic manure as a substitute for chemical fertilizers for high yielding radish varieties. *International Journal Agriculture Science*. 49(3): 188-192.
- Khede, K., Kumawat, A. and Tembore, D. (2019). Effect of organic manures, fertilizer and their combinations on growth, yield and quality of radish cv. Japanese white. *International Journal of Current Microbiology and Applied Sciences*. 8(3): 400-405.
- Kushwah, L., Sharma, R.K., Kushwah, S.S. and Singh, O.P. (2020). Influence of organic manures and inorganic fertilizers on growth, yield and profitability of radish. *Annals of Plant and Soil Research*. 22(1): 14-18.
- Mengistu, D.K. and Mekonnen, L.S. (2012). Integrated agronomic crop management to improve the productivity under terminal drought. *Water stress in tech open*. 235-254.
- Sahu, D.K., Nag, K. and Bhardwaj, L.P. (2018). Effect of integrated nutrient management on growth and yield of radish (*Raphanus sativus* L.). *Journal of Pharmacognosy and Photochemistry*. (2): 34-36.
- Singh, D.P., Rajvir, Tomar, S. and Kumari, M. (2021). Integrated nutrient management in broccoli. *Indian Journal of Agricultural Sciences*. 91(11): 79-82.
- Singh, G., Sarvanan, S., Kerketta, K. and Rajesh, J. (2018). Effect of organic manures and inorganic fertilizers on plant growth, yield and flower bud quality of broccoli. *International Journal of Pure and Applied Bio-science*. 6(5): 1338-1342.