

Effect of Different Organic Manures on Growth, Yield and Quality of Radish (*Raphanus sativus* L.) Under Clayey Soils of Punjab

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Abstract

The field experiment entitled “Effect of different organic manures on growth, yield and quality of radish (*Raphanus sativus* L.) under clayey soils of Punjab” was carried out at the Campus for Research and Advanced Studies, GSSDGS Khalsa College, Patiala during the rabi season of 2021-2022. The experiment was laid out in randomized block design comprising of eleven treatments and three replications. The results revealed that the growth parameters like plant height (35.84 cm), no. of leaves plant⁻¹ (12.65), leaf length (26.26 cm), leaf width (9.52 cm) and yield parameters like root length (20.70 cm), root diameter (5.76 cm), fresh weight (240.59 g), dry weight (24.60 g) and root yield (488.87 q ha⁻¹) were recorded maximum in treatment T₉- 1.5 t ha⁻¹ Vermicompost + 0.5 t ha⁻¹ Poultry manure which was at par with the treatment T₁₁- 5 t ha⁻¹ Farm yard manure + 1 t ha⁻¹ Vermicompost + 0.5 t ha⁻¹ Poultry manure and the minimum values recorded in the treatment T₁. The quality parameters were non- significant due to similar values obtained in all treatments and no variations occur.

Key Words: Radish, Organic manures, Growth, Yield, Quality

Introduction

Radish (*Raphanus sativus* L.) belongs to Brassicaceae family having 2n@.18 chromosome number. It is highly cross-pollinated crop. The word radish is derived from the Latin word ‘radix’ which means root. It is originated from western china. The inflorescence of radish is racemose. The flesh of radish is usually white, but the root colour ranges from white to red, pink, purple. Roots attain their colour from anthocyanins. The length of radish depends upon different cultivars, but generally it may vary from 25cm-30cm (Anonymous 2020).

Radish has gained popularity because of its wide use and high nutritive values and per 100 g radish root contains moisture 94.4 %, carbohydrates 3.4 g, protein 0.7 g, thiamine 0.06 mg, riboflavin 0.02 mg, vitamin C 15 mg, calcium 35 mg and iron 0.04 mg (Dhaliwal 2018). It is more suitably grown in sandy loam soil, which is characterized by low water holding capacity, high aeration, low nutrient content, lower cation exchange capacity and low buffering capacity as compared to loam and clay soil. For the best quality of roots and for better growth, flavour and texture, it

required optimum temperature about 10 to 15.5 °C. The soil pH range for radish crop is 5.5-6.8 (Brady and Weil 2013).

The total dependence on inorganic fertilizer have effect on soil and the higher prices of chemical fertilizers effect on environment, human health and thus encouraged the farmers to adopt organic manures that maintains the fertility of soil. There are several factors like variety, nutrition, season of planting and irrigation which plays an important role in growth, yield and quality production. For the good quality of radish, nutrition through organic manures is crucial to the sustainable production. Organic practices are recycling of crop residues, animal manure and farm organic residues.

Organic manures such as farm yard manure, vermicompost and poultry manure has positive effect on crop production. It helps in improving the soil structure and soil texture which is beneficial for crops. It increases the activity of microbes which is in turn helps to convert unavailable plant nutrients in available form. Organic manures slowly release nitrogen and

volatilization losses less as compared to inorganic fertilizers (Anonymous 2020).

Methodology

The Experiment was conducted at Campus for Research and Advanced Studies, Dhablan, GSSDGS Khalsa College in October 2021. The experimental plot was homogenous in fertility having assured irrigation and other required facilities. The experiment was laid out in randomized block design allocating three replications and comprising eleven treatment combinations with different application of organic manures. The total number of plot was 33 and row to plant spacing was 45 cm × 10 cm. The experiment was laid out in *rabi* season. The variety in experimental field was Punjab Safed Mooli-2, which was sown in the month of October. For sowing, manual technique i.e. hand dibbling is done to put the seed and sown on ridges. The experiment consist three organic manures viz., T₁ (Control), T₂ (20 t ha⁻¹ Farm yard manure), T₃ (2 t ha⁻¹ Vermicompost), T₄ (2 t ha⁻¹ Poultry manure), T₅ (15 t ha⁻¹ Farm yard manure + 0.5 t ha⁻¹ Vermicompost), T₆ (10 t ha⁻¹ Farm yard manure + 1 t ha⁻¹ Vermicompost), T₇ (15 t ha⁻¹ Farm yard manure + 0.5 t ha⁻¹ Poultry manure), T₈ (10 t ha⁻¹ Farm yard manure + 1 t ha⁻¹ Poultry manure), T₉ (1.5 t ha⁻¹ Vermicompost + 0.5 t ha⁻¹ Poultry manure), T₁₀ (1 t ha⁻¹ Vermicompost + 1 t ha⁻¹ Poultry manure), T₁₁ (5 t ha⁻¹ Farm yard manure + 1 t ha⁻¹ Vermicompost + 0.5 t ha⁻¹ Poultry manure). The five plants randomly selected from each plot to recode the data on plant height (cm), number of leaves plant⁻¹, leaf length (cm),

leaf width (cm), root length (cm), root diameter (cm), fresh weight of plant (g), dry weight of plant (g), yield (q ha⁻¹), ascorbic acid (mg 100 g⁻¹) and TSS (°Brix).

Results and Discussion

The results was clearly shown in the Table 1 that the application of 1.5 t ha⁻¹ Vermicompost + 0.5 t ha⁻¹ Poultry manure (T₉) gave maximum value of plant height (35.84 cm), no. of leaves plant⁻¹ (12.65), leaf length (26.26 cm) and leaf width (9.52 cm) which stays at par with the application of 5 t ha⁻¹ Farm yard manure + 1 t ha⁻¹ Vermicompost + 0.5 t ha⁻¹ Poultry manure (T₁₁). The minimum values were recorded under the treatment control (T₁).

The (T₉) treatment was best due to the higher nutritional value of vermicompost and poultry manure as compared to other manures. These manures gave nutrients to crop during its whole life cycle because these manure released the nutrients slowly which leads to increase the vegetative growth of radish plant. In the vermicompost and poultry manure there was presence of micro and macro supplements in plant which helps to increase the number of leaves plant⁻¹. These manures perform best in all growth parameters because of least carbon-nitrogen ratio that was quickly decomposed and faster released of nutrients than other organic sources. The comparable outcomes of radish crop shows by Kumar *et al.* (2014) and Singh *et al.* (2016) was higher with the use of vermicompost and poultry manure.

The data in Table 2 showed that application of 1.5 t ha⁻¹ Vermicompost + 0.5 t ha⁻¹ Poultry manure

Table 1: Effect of different organic manures on growth parameters of radish

Treatments	Plant height (cm)	No. of leaves plant ⁻¹	Leaf length (cm)	Leaf width (cm)
T ₁ : Control	25.42	9.63	18.35	6.12
T ₂ : 20 t ha ⁻¹ Farm yard manure	29.16	10.32	22.28	7.25
T ₃ : 2 t ha ⁻¹ Vermicompost	30.82	10.72	23.47	7.72
T ₄ : 2 t ha ⁻¹ Poultry manure	30.19	10.49	22.76	7.38
T ₅ : 15 t ha ⁻¹ FYM + 0.5 t ha ⁻¹ VC	34.71	11.53	25.76	8.87
T ₆ : 10 t ha ⁻¹ FYM + 1 t ha ⁻¹ VC	33.12	11.37	24.57	8.74
T ₇ : 15 t ha ⁻¹ FYM + 0.5 t ha ⁻¹ PM	31.94	11.22	24.30	8.46
T ₈ : 10 t ha ⁻¹ FYM + 1 t ha ⁻¹ PM	31.12	10.75	23.88	7.87
T ₉ : 1.5 t ha ⁻¹ VC + 0.5 t ha ⁻¹ PM	35.84	12.65	26.26	9.52
T ₁₀ : 1 t ha ⁻¹ VC + 1 t ha ⁻¹ PM	34.32	11.39	24.83	9.17
T ₁₁ : 5 t ha ⁻¹ FYM + 1 t ha ⁻¹ VC + 0.5 t ha ⁻¹ PM	35.22	11.71	25.85	9.32
SE(d)±	0.55	0.54	0.27	0.33
CD at 5 %	1.16	1.13	0.57	0.71

Table 2: Effect of different organic manures on yield parameters of radish

Treatments	Root length (cm)	Root diameter (cm)	Fresh weight (g)	Dry weight (q ha ⁻¹)	Root yield (g)
T ₁ : Control	14.20	2.23	135.67	13.56	193.19
T ₂ : 20 t ha ⁻¹ Farm Yard Manure	16.69	3.36	191.96	19.92	371.03
T ₃ : 2 t ha ⁻¹ Vermicompost	17.92	3.84	205.18	20.58	428.56
T ₄ : 2 t ha ⁻¹ Poultry Manure	17.43	3.68	198.20	21.18	361.24
T ₅ : 15 t ha ⁻¹ FYM + 0.5 t ha ⁻¹ VC	19.16	4.42	225.65	22.56	428.97
T ₆ : 10 t ha ⁻¹ FYM + 1 t ha ⁻¹ VC	19.50	4.64	227.74	22.78	440.07
T ₇ : 15 t ha ⁻¹ FYM + 0.5 t ha ⁻¹ PM	18.53	4.22	219.87	21.82	423.95
T ₈ : 10 t ha ⁻¹ FYM + 1 t ha ⁻¹ PM	18.15	3.95	213.46	21.64	420.69
T ₉ : 1.5 t ha ⁻¹ VC + 0.5 t ha ⁻¹ PM	20.70	5.76	240.59	24.60	488.87
T ₁₀ : 1 t ha ⁻¹ VC + 1 t ha ⁻¹ PM	19.95	4.87	232.65	23.26	441.10
T ₁₁ : 5 t ha ⁻¹ FYM + 1 t ha ⁻¹ VC + 0.5 t ha ⁻¹ PM	20.24	5.25	236.88	23.68	470.45
SE (d)±	0.23	0.29	2.29	0.45	10.05
CD at 5%	0.48	0.61	4.79	0.94	20.96

Table 3: Effect of different organic manures on quality of radish

Treatments	TSS (°Brix)	Ascorbic acid (mg 100 g ⁻¹)
T ₁ : Control	3.98	14.02
T ₂ : 20 t ha ⁻¹ Farm Yard Manure	4.12	14.12
T ₃ : 2 t ha ⁻¹ Vermicompost	4.22	14.36
T ₄ : 2 t ha ⁻¹ Poultry Manure	4.18	14.24
T ₅ : 15 t ha ⁻¹ FYM + 0.5 t ha ⁻¹ VC	4.51	14.55
T ₆ : 10 t ha ⁻¹ FYM + 1 t ha ⁻¹ VC	4.55	14.60
T ₇ : 15 t ha ⁻¹ FYM + 0.5 t ha ⁻¹ PM	4.46	14.49
T ₈ : 10 t ha ⁻¹ FYM + 1 t ha ⁻¹ PM	4.32	14.41
T ₉ : 1.5 t ha ⁻¹ VC + 0.5 t ha ⁻¹ PM	4.78	14.85
T ₁₀ : 1 t ha ⁻¹ VC + 1 t ha ⁻¹ PM	4.60	14.68
T ₁₁ : 5 t ha ⁻¹ FYM + 1 t ha ⁻¹ VC + 0.5 t ha ⁻¹ PM	4.63	14.74
SE (d)±	0.04	0.07
CD at 5%	NS	NS

(T₉) gave maximum value of root length (20.70 cm), root diameter (5.76 cm), fresh weight (240.59 g), dry weight (24.60 g), root yield (488.87 q ha⁻¹) with at par values with the application of 5 t ha⁻¹ Farm yard manure + 1 t ha⁻¹ Vermicompost + 0.5 t ha⁻¹ Poultry manure (T₁₁). The minimum value recorded under the treatment control (T₁).

Application of vermicompost and poultry manure makes the soil granular which helps the root of radish to easily penetrate into the soil which leads to increase the length of the root and width. Similar results found in radish by Mani and Anburani (2018), Ghimire *et al.* (2020) and Gyewali *et al.* (2020).

It improves the soil structure, texture and drainage conditions of the soil which was also helpful in the growth of the root under the soil surface. Nitrogen helped in building of amino acids in the growing region of meristematic tissue which was incorporated into complex protein and helped in promoting the development of radish. There is more nitrogen content in vermicompost and poultry manure hence fresh weight and dry weight was higher with the application of these manures. Fresh weight, root length and root diameter also contributed in the root yield of the radish.

By the accordance of Khede *et al.* (2019) and Debbarma *et al.* (2018) in radish revealed the same

results with the current work i.e. use of combination of different organic manures.

The Table 3 showed that the quality parameters like TSS ($^{\circ}$ Brix) and Ascorbic acid ($\text{mg } 100 \text{ g}^{-1}$) was non- significant which was due to similar values obtained in all treatments and no variations occur among the different treatments. In TSS ($^{\circ}$ Brix) the values lies between (3.98-4.78 $^{\circ}$ Brix) and ascorbic acid between (14.02-14.85 $\text{mg } 100 \text{ g}^{-1}$). The research findings of radish were near to the current findings which were gives by Khede *et al.* (2019) and by the Khan *et al.* (2016).

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