

ORIGINAL ARTICLE

Response of different organic manures on growth and yield of radish (*Raphanus sativus* L.) cv. Punjab Safed Mooli-2

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ABSTRACT

An Investigation was undertaken on Radish var. Punjab Safed Mooli-2 during the Rabi 2017 in sandy loam soil with eleven treatments comprising different sources of organic-fertilizer i.e.(T₁: 100% RDF, T₂: Four sprays of vermiwash, T₃: Four sprays of jeevamrut, T₄: Two sprays of vermiwash + Two sprays of jeevamrut, T₅: VC + Four sprays of vermiwash, T₆: FYM + Four sprays of jeevamrut, T₇: vermicompost + Four sprays of jeevamrut, T₈: FYM + Four sprays of vermiwash, T₉: vermicompost+ Two sprays of vermiwash + Two sprays of jeevamrut, T₁₀: FYM + Two sprays of vermiwash + Two sprays of jeevamrut, T₁₁: Control) with three replications. The treatments having the combined application of vermicompost along with four foliar spray of vermiwash proved to be most effective in increasing the vegetative growth and yield characters of radish cultivar Punjab Safed Mooli-2 under Amritsar conditions, than that of other included treatments.

Keywords: Radish, Vermicompost, Vermiwash, Jeevamrit and Yield.

Received 07.01.2019

Revised 18.03.2019

Accepted 11.05.2019

How to cite this article:

A Singh, A Kaur, A Singh and K Singh. Response of different organic manures on growth and yield of radish (*Raphanus sativus* L.) cv. Punjab Safed Mooli-2. Adv. Biores., Vol 10 [4] July 2019.115-118.

INTRODUCTION

Radish (*Raphanus sativus* L.) a member of the family Cruciferae is one of the most ancient vegetable. It has 2n= 18 chromosome number. Radish is grown both as annual and biennial and belongs to the genus *Raphanus* and species *sativus*. It is originated in Europe and Asia. It is mainly cool season crop and popular in both tropical and temperate regions. Radish is grown throughout the country and throughout the year. West Bengal, Bihar, Punjab, Uttar Pradesh, Karnataka, Haryana and Rajasthan are the major growing states. It is easily grown as a companion crop or intercrop between the rows of other vegetable. The problem of high cost of chemical fertilizers and its contribution to poor health of soil and water it becomes imperative to go for alternative source like organic fertilizers such as organic matters like farmyard manure, vermicompost, poultry manure, Vermiwash, jeevamrut and bio fertilizer uses has become necessary. In recent years use of organic manures like FYM, vermicompost and neem cake for improving the productivity of crop and maintaining soil fertility and productivity of soil is gaining prominence. Vermicompost is a rich source of micro and macro nutrients, vitamins, growth hormones and enzymes. FYM contain lower amount of nutrients as compare to vermicompost but it increases organic carbon content of the soil and improves soil physical properties [6]. Keeping above points in view the present investigation on "Effect of organic manures on growth and yield of radish (*Raphanus sativus* L.)" was under taken.

MATERIAL AND METHODS

The present investigation was carried out at the field site of Khalsa College Amritsar, Punjab, India during Rabi season of 2017-18. The layout was under Randomized Block Design with eleven treatments and randomized in three replication. There were altogether thirty three plots each of 3m X 3 m size. Sowing was done on 1 October, 2017. The treatment combination were T₁: 100% RDF, T₂: Four sprays of VW, T₃: Four sprays of JA, T₄: Two sprays of VW + Two sprays of JA, T₅: VC + Four sprays of VW, T₆: FYM + Four

sprays of JA, T₇: VC + Four sprays of JA, T₈: FYM + Four sprays of VW, T₉: VC + Two sprays of VW + Two sprays of JA, T₁₀: FYM + Two sprays of VW + Two sprays of JA, T₁₁: Control.

RESULT AND DISCUSSION

Leaf length (cm)

Length of leaf indicates vegetative growth of crop and directly plays an important role to determine crop growth and also an important growth parameter of a radish plant. The mean length of leaf as affected by different treatments is given in Table 1. The different organic manures proved to be significantly effective with respect to length of the leaf. Among the different treatments highest leaf length (47.21 cm) was found in treatment T₅ (VC + Four sprays of VW) followed by T₁ (100 % RDF) with leaf length of 46.74 cm. The treatment T₅, T₁, T₉ and T₇ were at par with each other. The minimum leaf length (30.37 cm) was found in treatment T₁₁ (Control). The increase in leaf length showed that by using vermicompost the microbial activity became high due to the presence of fungi, bacteria, actinomycetes. Increase in leaf length with vermiwash treated plants may be due to increased availability of more exchange of nutrients in the application of vermiwash [4].

Number of leaves per plant

Number of leaves per plant is also an important growth parameter. It exhibits the vigour of the plants. The data regarding number of leaves per plant are presented in Table 1. Different organic manures significantly affected the number of leaves at harvest. The maximum number of leaves (14.70) were observed in T₅ (VC + Four sprays of VW) followed by treatment T₁ (100% RDF) with number of leaves per plant (14.47) were at par with each other. The minimum number of leaves (10.20) was recorded in the untreated plants. Samadhiya *et al* [10] reported that the vermiwash and vermicompost increase the number of leaves due to the impact of microbes and biofertilizers. Use of vermiwash and vermicompost showed significant increase in nitrogen of the soil due to the presence of nitrogen fixing bacteria, which increase the nitrogen content of the soil.

Fresh weight of leaf per plant (g)

Fresh weight of leaf per plant plays a vital role in growth attribute of a radish plant. The data regarding fresh weight of leaf per plant are presented in Table 1. The presented data revealed that maximum fresh weight of leaf per plant (107.18 g) was observed under treatment T₅ (VC + Four sprays of VW) and the minimum fresh weight of leaf per plant (73.34 g) was found in control. Kumar *et al* [5] reported that the increase in fresh weight of leaf (139.96 g) per plant due to increased level of nitrogen. The nitrogen is also synthesized into amino acids which are built into complex proteins and help in promoting the luxurious growth of the crop.

Leaf area per plant (cm²)

Leaf area is an important plant growth indices determining the capacity of plant in trapping sun energy for photosynthesis and has marked influence on growth and development of radish crop. Data depicted in table 1 revealed that at harvesting highest leaf area (365.21cm²) was recorded in Treatment T₅ (VC + Four sprays of VW). However T₅, T₁ were at par with each other. The minimum leaf area 242.14 cm² was recorded in control. The increase in leaf area due to different organic manure may be attributed due to release of most of nitrogen in nitrate form readily available for the plant uptake even for prolonged periods. This selective usage of minerals for stabilization of plants during early period of plant growth and establishment of higher leaf chlorophyll content following prolonged period of growth of plants [9].

Root length (cm)

Root length is an essential yield parameter which results in better yield. Data depicted in table 1 revealed that at harvesting highest root length (37.07 cm) was observed in treatment T₅ (VC + Four sprays of VW) followed by T₁ (100% RDF) with root length (36.20 cm). The minimum root length (14.77 cm) was found in control treatments. Increase in root length by vermicompost might be due to favourable physical condition of soil and availability of plant nutrient in sufficient quantities [7]. Increase in root length with vermiwash treated plants indicates efficient absorption of water followed by transport and conduction [3]. Inorganic manures provide nutrients more readily than organic ones but if organic manures are applied through spraying in liquid form on the leaves from time to time as there is less loss like fixation, deposition and leaching, which is seen in the inorganic ones then they show more beneficial effects. So organic manures show more root length as compare to the other ones.

Root diameter (cm)

The root diameter is also considered in yield of radish was recorded and has presented in Table 1. Different organic manures significantly affect the root diameter at harvesting stage. The maximum root diameter (5.98 cm) was observed in T₅ (VC + Four sprays of VW) followed by treatment T₁ (100% RDF) with root diameter (5.85 cm). However T₅, T₁, T₉ and T₇ were at par with each other. The minimum root

diameter (3.52 cm) was recorded in the control. Ansari [1] reported that increase in root diameter due to increased bioavailability of phosphorus by the application of organic amendments in the form of vermicompost. And vermiwash along with vermicompost highly significant due to increased availability of more exchangeable nutrients in the soil.

Root weight (g)

Fresh root weight was directly affected by the plant height, number of leaves and root diameter. The data of Table 1 revealed that the maximum root weight (204.15 g) was found in T₅ (VC + Four sprays of VW) followed by treatment T₁ (100% RDF) with root weight (199.71 g), while, the minimum root weight (129.01 g) was recorded in the control. Moreover T₅, T₁, T₉ and T₇ were not differing significantly. Increased root weight may be due to the influence of combined effect of various ingredients of vermicompost such as macro and micro nutrients, plant growth hormones, vitamins, enzymes and many beneficial microbes such as nitrogen fixation bacteria and hormones synthesizing microbes such as *Azospirillum brasilense*, *Pseudomonas putida*. Rammamurthy *et al* [8]. Another reason might be that as the leaf area increases, there would be more photosynthesis which leads to store more food that is translocated in the radish roots. This automatically increases the root weight.

Total yield (q/ha)

Total yield is the manipulation of various yield components. The data pertaining to effect of various treatments on root yield is presented in Table 1. The data revealed that the maximum total yield (691.85 q) were recorded in treatment T₅ (Vermicompost + Four spray of vermiwash) followed by treatment T₁ (100% RDF) with total yield (678.76 q). However T₅ and T₁ acquired a difference of almost 13 q, whereas, T₉ and T₇ showed a difference of approximately 12 q and all the four treatments were at par with each other. The minimum root weight (418.40 q) was recorded in the control. Dauda *et al* [2] reported that addition of vermicompost in soil develops soil microbial activity results more addition of nutrients for crop growth which ultimately result more yield. Foliar spray of vermiwash increased yield due to increasing chlorophyll and nitrogen contents in the leaf [11]. Liquid organic manures provide nutrient more easily that increases the root length and leaf area of radish crop plants that results in an increases in the total yield of the root crop as compare to the inorganic soil application of fertilizers.

Table 1: Effect of different organic sources on growth and yield parameters.

Treatments	Leaf length (cm)	Number of leaves per plant	Fresh weight of leaf / plant (g)	Leaf area per plant (cm ²)	Root length (cm)	Root diameter (cm)	Root weight (g)	Total yield (q/ha)
T1 (100% RDF)	46.74	14.47	105.73	358.15	36.20	5.85	199.71	678.76
T2 (Four sprays of VW)	38.82	11.76	85.24	283.29	26.87	4.05	154.45	521.53
T3 (Four sprays of JA)	35.05	11.13	80.95	270.64	24.72	3.81	144.00	477.65
T4 (Two sprays of VW + Two sprays of JA)	36.77	11.42	83.20	277.17	25.84	3.93	149.20	500.89
T5 (VC + Four sprays of VW)	47.21	14.70	107.18	365.21	37.07	5.98	204.15	691.85
T6 (FYM + Four sprays of JA)	40.80	12.03	90.96	303.38	30.83	4.79	168.92	568.62
T7 (VC + Four sprays of JA)	44.11	13.22	101.43	343.01	34.95	5.71	191.91	651.86
T8 (FYM + Four sprays of VW)	42.70	12.93	95.64	325.19	32.85	5.00	178.09	608.95
T9 (VC + Two sprays of VW + Two sprays of JA)	45.00	13.89	103.20	350.48	35.57	5.79	195.70	664.21
T10 (FYM + Two sprays of VW + Two sprays of JA)	41.27	12.45	93.33	315.24	31.81	4.92	172.21	590.08
T11 (Control)	30.37	10.20	73.34	242.14	14.77	3.52	129.01	418.40
Mean	40.80	12.56	92.74	312.17	30.14	4.85	171.58	579.35
CD at 5% level	4.34	1.79	5.72	23.14	2.33	0.69	13.03	41.69

CONCLUSION

It can be concluded from the present investigation that with the combined application of vermicompost along with Four foliar spray of vermiwash proved to be most effective in increasing the vegetative growth and yield characters of radish cultivar Punjab Safed Mooli-2 under Amritsar conditions in terms of leaf length, number of leaves per plant, leaf area per plant, fresh weight of root, root length, root diameter,

root weight, total yield and marketable yield followed by 100% RDF. As the data based on 1 year performance, so to confirm it, the same experiment may be repeated for 3-4 years on different varieties.

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