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Studies on effect of different organic manures on growth and yield of radish (*Raphanus sativus* L.)

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Abstract

The field experiment was conducted at Research field, Department of Horticulture, School of Agriculture, ITM University Gwalior during the year 2016-17. The experiment was laid out in randomized block design with three replications. The experiment comprised of the ten treatments T₁-Control, T₂- FYM 100 per cent, T₃-Vermicompost 100 per cent, T₄- Poultry manure 100 per cent, T₅-FYM 75%+ Vermicompost 25%, T₆- FYM 50%+ Poultry manure, T₇- FYM 75%+ Poultry manure 25%, T₈- FYM 50% + Poultry manure 50%, T₉- Vermicompost 75% + Poultry manure 25% and T₁₀-Vermicompost 50%+ Poultry manure 50%. The results revealed that among the different sources of nutrients applied, treatment T₁₀- Vermicompost 50%+ Poultry manure 50% perform better than all other treatments for vegetative growth and yield parameters. It was followed by T₆ - FYM 50%+ Poultry manure 50%.

Keywords: Vermicompost, poultry manure, radish, organic manure

Introduction

Radish (*Raphanus sativus* L.) belongs to the family Brassicaceae. It is a popular root vegetable in both tropical and temperate regions. It can be cultivated under cover for early production but large-scale production in field is more common in India. Radish is grown for its young tender tuberous root, which is consumed, either cooked or raw. It is a good source of vitamin C (ascorbic acid) and minerals like calcium, potassium and phosphorus. It has refreshing and diuretic properties. In homeopathy, it is used for neurological, headache, sleeplessness and chronic diarrhoea. The roots are also useful in urinary complaints and piles. The leaves of radish are good source for extraction of protein on a commercial scale and radish seeds are potential source of non-drying fatty oil suitable for soap making illuminating and edible purposes. Being a short duration and quick growing crop, the root growth should be rapid and uninterrupted (Choudhary *et al.* 2002) [2]. Per 100g Radish root has 94.4 per cent moisture, 3.4 g Carbohydrates, 0.7 g protein, 0.06 mg thiamine, 0.02 mg riboflavin, 15 mg vitamin C, 35 mg Calcium and 0.04 mg iron (Daliwal, 2014) [3]. Organic agriculture is gaining movement in India due to the individual as well as group efforts to conserve environments and avoid contamination of the farm produce from the use of chemical fertilizers and pesticides. The use of organic matter such as animal manures, food wastes, yard wastes, sewage sludge and composts has long been recognized in agriculture as beneficial for plant growth and yield and the maintenance of soil fertility. Herbert (1998) [5] reported that animal manures are an excellent source of plant nutrients. Approximately 70-80 percent of the nitrogen, 60-85 percent phosphorus and 80-90 percent of potassium in feeds are excreted in the form of manure. He further added that manure contains all the plant nutrients needed for crop growth including trace elements. The availability of efficiency of manure utilization by a crop is determined by the method of its application, time to incorporate and the rate of manure decomposition by microorganisms in soil. The new approaches to the use of organic amendments in farming have proven to be effective means of improving soil structure, enhancing soil fertility and increasing crop yields.

Material and Method

The present research work entitled "Studies on the effect of organic manures on growth and yield of radish (*Raphanus sativus* L.)" was conducted at Research field, Department of

Horticulture, School of Agriculture, ITM University Gwalior (M.P.) during the winter season of 2016-2017. The soil of the experiment field was sandy loam with high pH (more than 8.0). The organic manure applied, were arranged in 10 treatments and replicated thrice following Randomized Block Design. Seeds were dibbled half way down the ridges at the distance of 15 cm in the soil. Thinning was done at 15 days after sowing by retaining one seedling per hill. The organic manures under study were FYM, vermicompost, poultry manure and their combinations. These manures were applied during field preparation 7 days before sowing. In order to keep the soil porous and also free from weeds, hand hoeing and earthing up was done twice, once at 30 days after sowing and another at 40 days after sowing. The irrigations were given at an interval of 7 to 8 days depending upon the weather and soil conditions. The observations were taken on their vegetative growth and yield parameter. Statistical analysis of data recorded in all observation was computed by method of analysis, of variance and treatments were compared with the help of vertical difference as suggested by Panse and Sukhatme (1989) [6] and the mean value were compared at 50% level of significance.

Table 1: Effect of organic manures on plant height, number of leaves and length of leaves of radish

Treatments	Plant Height (cm)			Number of leaves			Length of leaves (cm)		
	15 DAS	30DAS	At Harvest	15 DAS	30DAS	At Harvest	15DAS	30DAS	At Harvest
T ₁ - Control	2.42	29.82	41.16	3.96	5.65	7.87	6.13	14.22	26.86
T ₂ - Farm Yard Manure	2.55	31.13	41.77	4.17	6.64	8.40	6.17	14.31	32.65
T ₃ - Vermicompost	2.69	34.94	42.68	4.52	7.03	8.90	6.37	14.74	34.88
T ₄ - Poultry Manure	2.67	34.17	42.50	4.23	6.77	8.60	6.30	14.48	33.58
T ₅ -FYM (75%) + Vermicompost (25%)	3.02	35.79	45.58	4.80	7.40	10.33	7.27	16.33	35.68
T ₆ - FYM (50%) + Vermicompost (50%)	3.04	37.26	49.23	5.63	8.00	10.83	9.67	18.05	36.13
T ₆ - FYM (75%) + Poultry Manure (25%)	2.92	35.24	45.28	4.63	7.33	9.83	7.20	15.69	35.02
T ₇ -FYM (50%) + Poultry Manure (50%)	3.03	36.01	45.97	5.13	7.83	10.33	8.17	17.14	36.00
Vermicompost (75%) + Poultry Manure (25%)	2.82	35.22	43.98	4.56	7.23	8.97	6.43	14.93	35.02
Vermicompost (50%) + Poultry Manure (50%)	3.05	39.04	51.74	6.20	8.83	11.33	9.93	18.53	37.39
SEm [†]	0.143	1.705	1.693	0.297	0.439	0.623	0.435	0.954	1.800
CD@ 5%	0.423	5.064	5.029	0.883	1.294	1.851	1.292	2.834	5.347

The increase in plant height and number of leaves may also be attributed to higher metabolic activity because of optimum nitrogen application resulting in higher production of carbohydrates and phytohormones which were manifested in the form of enhanced growth. The increase in number of leaves due to the vital macro and micronutrient availability with vermicompost has been reported Girardi (1993) [4]. Enhanced plant growth and leaf production obtained by manure application with poultry manure and vermicompost might indicate availability of balanced plant nutrients and obvious favourable growing conditions. Increased leaf production in okra attributed to beneficial effect of poultry manure has been reported by Umoetok *et al.* (2007) [8]. Thannunathan *et al.* (1997) [7] reported that application of vermicompost appears to be very effective amendment in onion. The increased number of leaves and leaf area.

Results and Discussion

Growth attributing character

The use of organic manures in soil not only increase the fertility and moisture holding capacity of soil, but also plays an important role in soil water conservation by their binding and aggregation properties. Moreover, they are helpful in balancing nutrient availability to the growing plants and boost of production and quality of the crops.

The results obtained in this study clearly indicate that radish respond well to organic manures and their combinations. In general, the treatment T₁₀ (vermicompost @ 6.5 t/ha (50%) + poultry manure @ 4 t/ha (50%)) recorded maximum plant height, number of leaves and leaf length followed by the treatment T₆ (FYM @ 9t/ha (50%) + Vermicompost @ 6.5 t/ha 50%). This might be due to the steady release of nutrients throughout the crop growth period. Plants grew taller than other plants possibly because more concentrated nutrients or minerals were made readily available and easily absorbable by the receiving plants leading to faster growth and development.

Yield attributing characters

The application of vermicompost 50%+ poultry manure 50% recorded significantly greater values for higher fresh weight of leaves, dry weight of leaves, root length, diameter of root, fresh weight of root and yield of root. The results are in conformity with the findings of Babalad (2005) [1] in respect of dry weight and total dry matter recorded highest by applying poultry manure and other green manures in chilli. The increase in fresh and dry weight of leaves, length of leaf might be due to rapid elongation and multiplication of cells in presence of adequate quantity of nitrogen supplied by vermicompost and poultry manure and also to increase in nitrogen constituent of cell sap in the form of protein, amides and amino acid in the growing regions of meristematic tissues. Yadav *et al.* (2003) [9] also reported that fresh weight and dry weight of plants was higher in vermicompost and NPK in chilli.

Table 2: Effect of organic manures on fresh weight of leaves, dry weight of leaves, fresh weight of root, root length, root diameter, yield kg ha⁻¹

Treatments	Leaf weight		Fresh weight of root	Root length	Root diameter	Yield kg ha ⁻¹
	Fresh weight	Dry weight				
T ₁ - Control	54.00	11.24	76.66	18.83	3.73	25089
T ₂ - Farm Yard Manure	61.56	12.72	111.48	19.83	4.02	33227
T ₃ - Vermicompost	66.60	14.07	127.72	21.73	4.27	37313
T ₄ - Poultry Manure	62.28	12.98	118.06	21.00	4.10	34629
T ₅ -FYM (75%) + Vermicompost (25%)	92.22	19.46	144.35	24.67	4.60	45427
T ₆ - FYM (50%) + Vermicompost (50%)	99.42	21.70	151.01	26.59	4.69	48088
T ₆ - FYM (75%) + Poultry Manure (25%)	82.62	18.09	139.37	24.17	4.52	42627
T ₇ .FYM (50%) + Poultry Manure (50%)	95.58	20.27	147.04	26.40	4.65	46588
Vermicompost (75%) + Poultry Manure (25%)	73.80	14.67	138.61	22.83	4.39	40787
Vermicompost (50%) + Poultry Manure (50%)	107.81	23.32	152.05	27.17	4.88	49898
SEm ⁺	6.532	1.735	12.429	1.279	0.176	27.189
CD@ 5%	19.406	5.156	36.929	3.801	0.523	80.784

The diameter and length of roots contribute considerably towards weight and finally yield of radish. The size of root was directly influenced by the enhanced vegetative growth on the plants resulted in increase in plant height, and number of green leaves. This might have accumulated more carbohydrate resulting in to increased diameter of root. Increase in root length and diameter due to the combined application of vermicompost and poultry manure can be attributed to improved nutrient availability and improvement in physical condition of the soil which in turn provides a balanced nutritional environment both in soil rhizosphere and plant system.

Conclusion

From the present study it was concluded that the application of organic manures significantly affected the growth and yield of radish. Treatment T₁₀- 50% Vermicompost + 50% Poultry manure was found to be the best among the various treatments applied in reference to growth and yield parameter. It was followed by T₆-FYM 50% + Vermicompost 50% and FYM 50% + Poultry manure 50%. The cost benefit ratio B:C was found to be best in T₁₀-50% Vermicompost + 50% Poultry manure. Since the conclusions are drawn on the basis of the results of one year experiment the study should be repeated for at least one more year to confirm the aforesaid Finding

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