



Effect of organic and inorganic fertilizers on growth and yield of radish (*Raphanus sativus* L.)” cv. Pusa Desi

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(Received: 25.06.2019; Accepted: 27.07.2019)

Abstract

The present investigation was conducted during 2016-2017 in the Department of Horticulture, Doon (PG) College of Agriculture Science and Technology, Selaqui, Dehradun (UK). The treatments included inorganic fertilizers (recommended dose of NPK, *i.e.* 120:80:100 kg/ha), inoculation of organic manures (recommended dose of FYM and Vermicompost) and their combinations. There was eight treatment including control. The treatments are T₁ (100% FYM), T₂ (100% Vermicompost), T₃ (100% NPK), T₄ (100% FYM + 100% NPK), T₅ (100% FYM + 100% Vermicompost), T₆ (100% FYM + 50% NPK), T₇ (100% FYM + 50% Vermicompost), T₈ (Control). The highest growth and yield parameters was recorded in T₅ treatments and significantly the lowest was recorded in T₈ (Control). The result of the present investigation demonstrated that among different organic and inorganic fertilizers tried, FYM (100%) combined with Vermicompost (100%) can be considered as the best treatment obtaining higher growth and root yield in radish. Under organic cultivation of radish, for obtaining maximum net returns, vermicompost (100%) may be used as an organic source of nutrient.

Keywords: FYM, fertilizers, vermicompost

Introduction

Radish is predominantly a cool season vegetable crop. Being a cool season crop, it is sown during winter from September to January in northern plains. It is an annual or biennial crop depending upon the type for the purpose it is grown (Pcarrd, 2007). Radish grow best in full sun in light, sandy loams, with a soil pH of 6.5 to 7.0. The INM system approach utilizes a judicious combination of inorganic fertilizers and organic manures in building soil fertility and to increase the production potential of any crop (Yadav *et al.*, 2004). The growth and yield of radish greatly depends on soil and climatic conditions. Different varieties have different soil and climatic requirements for their optimum performance. Hence, for the production of good quality radish optimum fertilization through organic, inorganic and biofertilizers are essential (Dhanajaya, 2007). Vermicast or Vermicompost was identified as the best alternative with regard to industrial and economic viability. It also proved itself as “nature's wonder product” to restore soil health and nutritional value in food. The presence of earthworms in soil ecosystems is an indicator of the well-being of a system. Vermicompost provides vital macronutrients (N, P₂O₅, K₂O, Ca, Mg) and micronutrients Fe, Mn, Zn, and Cu (Tindal, 1993). 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 (Mahokar *et al.*, 2007). FYM improves soil physical properties. Chemical fertilizers deteriorate the quality of produce and are expensive too, leading to reduction in net profit and returns of the farmers. Nitrogen is very essential for

leafy vegetable production. Its application upholds the overall growth, yield of radish. Being a short duration and quick growing crop, the root growth should be rapid and uninterrupted in radish. Hence, for the production of good quality radish, optimum nutrition through organic, inorganic and bio fertilizers are essential for sustainable production. In view of higher cost of synthetic fertilizers and its contribution to poor health of soil and water it becomes imperative to go for alternative and cheaper source like organic manures (Kumar *et al.*, 2014).

Keeping the above facts in view, an experiment is planned with the objective to find out the effect of organic and inorganic fertilizers on growth and yield of radish.

Materials and Methods

A field experiment was conducted at Research Field, Department of Horticulture, DCAST, Dehradun (UK) during the year of 2016-17 with the view to study the effect of different levels of organic and inorganic fertilizers on growth and yield of radish. cv. Pusa Desi. The experiment was laid out in a Randomized Block Design with three replications and consisted of 08 treatments, namely 100% Farmyard manure, 100% Vermicompost, 100% NPK, 100% FYM + 100% NPK, 100% FYM + 100% Vermicompost, 100% FYM + 50% NPK, 100% FYM + 50% Vermicompost and control (water spray). The seeds were dibbled at a distance of 30 X 10 cm between rows and plants. All the recommended agronomic practices and crop husbandry were followed to raise a good crop. Five plants were selected randomly from each net plot to record the observation namely, Plant height (cm), Number of

with treatment T5. While the minimum fresh weight of root was observed with T8(Control). This was attributed due to solubilizing effect of plant nutrients by the addition of vermicompost leading to increased uptake of NPK. Organic manure plays a direct role in plant growth as a source of all necessary macro and micro-nutrients in available forms during mineralization, improving physical and physiological properties of soil. Similar findings have been reported by Kumar *et al.* (2014) in radish and Kumar *et al.* (2014) in carrot. Yield of root of radish significantly affected by treatments.

The maximum yield of root recorded under the treatment T6. While the minimum yield of root was observed with T8. An important feature of vermicompost is that during the processing of the various organic wastes by earthworm, many of the nutrients that it contains are changed to forms that are more readily taken by plants (Degwale, 2016). Similar findings have been reported by Mahokar *et al.* (2007) and Kumar *et al.* (2014) in radish, Kumar *et al.* (2014) in carrot, Rao *et al.* (2009) in onion, Barman *et al.* (2014) and Narayan *et al.* (2014) in potato.

Table 1. Effect of different combination of FYM and vermicompost on morphological and yield parameters

S.No.	Treatments	Plant height (cm)	Number of Leaves per plant	Length of leaves (cm)	Fresh weight of shoot (g)	Dry weight of shoot (g)	Length of root (cm)	Diameter of root (cm)	Day to harvest	Average weight of root (g)	Root yield (q/ha)	Harvest index (%)
1	T1 100% FYM	27.73	11.13	24.27	77.03	7.64	17.07	2.88	59.67	91.19	303.97	56.80
2	T2 100% Vermicompost	28.20	11.30	24.56	79.33	7.73	17.67	2.99	59	93.53	311.89	55.45
3	T3 100% NPK	27.90	11.23	24.45	77.18	7.67	17.30	2.96	59.17	93.57	311.75	54.56
4	T4 100% FYM + 100% NPK	32.53	12.47	27.49	85.87	8.47	18.30	3.48	57.87	101.21	337.34	54.53
5	T5 100% FYM + 100% Vermicompost	35.23	13.50	29.97	91.50	9.20	19.97	3.84	55.17	117.8	392.83	54.52
6	T6 100% FYM + 50% NPK	29.10	11.37	25.20	80.30	7.77	17.83	3.03	58.33	98.78	329.30	54.18
7	T7 100% FYM + 50% Vermicompost	29.67	11.43	25.21	80.33	7.87	17.83	3.11	58	101.08	336.88	54.15
8	T8 Control	26.93	10.93	23.19	76.67	7.43	16.97	2.81	60.33	90.11	300.08	53.99
9	Sem±	0.30	0.36	0.16	0.15	0.17	0.9	0.04	0.04	0.04	0.05	0.05
10	C.D at 5%	0.66	0.78	0.35	0.33	0.36	0.20	0.09	0.09	0.08	0.10	0.11

Harvesting index of radish significantly affected by treatments. The maximum Harvesting index recorded under the treatment T5. While the minimum harvesting index was observed with T8. The response of vermicompost might be due to insufficient amount of organic matter to amend physical and chemical properties of soil at the soil at the experiment site (Degwale, 2016). Similar findings have been reported Shrinivas and Naik (1990) and Narayan *et al.* (2014) in potato.

References

- Barman, K.S.; Ram, B. and Verma, R.B. 2014. Effect of Integrated nutrient management on growth and tuber yield of potato (*Solanum tuberosum*) cv. Kufri Ashoka. *Trends Biosci.*, 7 (9): 185-187.
- Bhattarai, B. P. and Maharjan, A. 2013. Effect of organic nutrient management on the growth and yield of carrot (*Daucus carota* L.) and soil fertility status. *Nepalese J. Agric. Sci.*, 11:16-25.
- Degwale, A. 2016. Effect of vermicompost on growth, yield and quality of garlic (*Allium sativum* L.) In enebesarmidir district, Northwestern Ethiopia. *J. Natural Sci. Res.*, 6 (3): 2224-3186.
- Dhananjay, J. 2007. Organic Studies in Radish(*Raphanus sativus* L.) varieties. Department of Horticulture College of Agriculture, Dharwad university of Agriculture Science, Dharwad-580005.Pp.12-13.
- Khalid, M.; Yadav, B.K. and Yadav, M.P. 2015. Studies on the effect of integrated nutrient management on growth and yield attributes of radish (*Raphanus sativus* L.). *Ann. of Hort.* 8 (1): 81-83.
- Kumar, P.; Meghwal, P. R. and Painuli, D. K. 2014. Effect of organic and inorganic nutrient sources on soil health and quality of carrot. *Indian J. Hort.*, 71 (2): 222-226.
- Kumar, S.; Maji, S.; Kumar, S. and Singh, H.D. 2014. Efficacy of organic manures on growth and yield of radish (*Raphanus sativus* L.) cv. Japanese White. *Inter. J. Plant Sci.*, 9(1): 57-60.
- Mahokar, V.K.; Bodkhe, V. A.; Ingle, V.G.; Jadhao B.J. and Gomase, D.G. 2007. Effect of various organic manures on growth and yield of radish. *Asian J. Horti.*, 2(1): 155-157.
- Malik, M.F. and Kumar, V. 2009. Influence of INM on growth and yield of tomato. *Ann. Hort.* 2 (2): 221- 223.
- Narayan, S., Kanth, R.H., Narayan, R., Khan, F.A., Saxena, A. and Hussain, T. 2014. Effect of planting dates and integrated nutrient management on productivity and profitability of potato (*Solanum tuberosum*) in Kashmir valley. *Indian J. Agron.*, 59 (1): 145-150.
- Panase, V.G. and Sukhatme, P.V. 1985. Statistical methods for agricultural workers. IInd Ed., ICAR, Pub. New Delhi. pp: 258-260.
- Pearrrd 2007. Philippine Recommends for Radish Production <http://mboard.pearrrd.dost.gov.ph/forum/viewtopic.php?id=11385>.
- Rao, K. R.; Mushan, L. C.; Mulani, A. C.; Khatavkar, R. S.; Parlekar, G. Y. and Shah, N.V. 2009. Effect of vermicompost on the growth yield of onion (*Allium cepa*). *Karnataka J. Agric. Sci.*, 23 (2): 361-363.

leaves of plant, Leaf length (cm), Fresh weight (g) of shoot, Dry weight (g) of shoot, Root length (cm), Root diameter (cm), Days to harvest, Fresh root weight (g/plant), Root yield per hectare (q) and Harvest index (%). The data recorded on different parameter during investigation were statically analyzed as per the statistical methods described by (Panse and Sukhatme, 1985).

Result and Discussion

The findings of the investigation has been described and explained with support of relevant research work published by earlier workers on the subject as follows:

Growth parameters

The findings pertaining to growth parameters viz., plant height, number of leaves per plant, leaf length, fresh weight of shoot and dry weight of shoot were observed at 30, 45 days after sowing and at the final harvesting stage. There was significant effect of organic manures, inorganic fertilizers and their combinations on all the growth parameters. Among the treatments, T5(100 % FYM + 100 % vermicompost) recorded the maximum value of plant height(cm), during the different stages followed by T4(100% NPK + 100 % FYM), T7(100 % FYM + 50% Vermicompost), T6(100 % FYM + 50 % NPK), T2(100 % Vermicompost), T3(100 % NPK), T1 (100 % FYM), T8(Control). While the minimum value of plant height was observed with T8(Control) at all the stages of crop growth. The increase in height of plant by the use of vermicompost with integration of NPK may be due to beneficial influence of nitrification inhibition properties of vermicompost in the soil. Besides, it may also be due to rapid elongation and multiplication of cell in the presence of adequate quantity of nitrogen (Barman *et al.*, 2014). Similar results were reported by Mahokar *et al.* (2007) and Kumar *et al.* (2014) in radish and Bhattarai and Maharjan (2013) in carrot.

Application of nutrients resulted in significant variation among different treatments for number of leaves per plant during all the growth stage. Highest number of leaves were observed with T5(100 % FYM + 100 % vermicompost) and as same mention the above for plant height. Present studies clearly indicated that vermicompost in combination with 100% recommended dose of FYM played significant role in increasing the growth and ultimately number of leaves in radish. Highest number of leaves in T5 (100 % FYM + 100 % vermicompost) due to slow release of nutrients through vermicompost thus enriching available nutrient pool of the soil that resulting in more number of leaves per plant (Bhattarai and Maharjan, 2013). Similar findings have been reported by Mahokar *et al.* (2007), Kumar *et al.* (2014) and Khalid *et al.* (2015) in radish.

Among treatments, maximum length of leaves per plant was recorded with the treatment T5, which was followed by T4. While, minimum length of leaves per plant was observed under nutrient treatment T8. Highest length of leaves in T5(100% FYM + 100 % vermicompost) due to vermicompost provide the micronutrients such as zinc,

copper, iron and manganese etc. in the adequate amount to the plant (Bhattarai and Maharjan, 2013). Similar findings have been reported by Kumar *et al.* (2014) in radish and Rao *et al.* (2009) in onion.

Treatments indicated significant effect on fresh weight of shoot at all the growth stages. Maximum fresh weight of shoot was observed with T5, followed by T4>T7>T6>T2>T3>T1>T8. While the minimum fresh weight of shoot was observed in T8 (Control) at all the stages of crop growth. It was recorded that weight of shoot increased with the increased in days after sowing. The increase in fresh weight of leaves may be due to higher level of nitrogen. The nitrogen is also synthesized in to amino acids which are built in to complex protein and help in promising the luxurious growth of crop (Kumar *et al.*, 2014). Similar findings have been reported by Uddain *et al.* (2010) in radish.

The maximum dry weight of shoot was recorded with treatment T5,(100 % FYM + 100 % vermicompost) which was followed by T4, T7, T6, T2, T3, T1, T8 in descending order. While the minimum dry weight of shoot was recorded in case of treatment T8(Control). Similar findings have been reported by Uddain *et al.* (2010) and Kumar *et al.* (2014) in radish.

Yield parameters

Yield parameters of the radish viz., length of root (cm), diameter of root (cm), weight of root (g) per plant, days to harvest, harvest index and yield of root (q/ha) were studied to evaluate the impact of effect of organic manures, inorganic fertilizers and their combinations on all the yield parameters and yield.

Maximum length of root was recorded under the treatment T5(100 % FYM + 100 % vermicompost) and it was followed by T4(100 % NPK + 100 %FYM). While minimum length of root was observed under the treatment T8 (Control). The beneficial effect of combined application of organic manure (vermicompost or compost) and fertilizer might be attributed to the increased efficacy of inorganic fertilizers and supply of all the essential nutrients in a balanced amount owing to their control release coinciding with the stage of root growth (Kumar *et al.*, 2014). Similar findings have been reported by Sunandarani and Malareddy (2007) and Kumar *et al.* (2014) in carrot.

Treatments recorded significant effect on diameter of root. Maximum diameter of root was found under the treatment T5, followed by T4, T7, T6, T2, T3, T1 and T8. While the minimum diameter of root radish was observed with T8. These findings are in agreement with those reported by Uddain *et al.* (2010) and Kumar *et al.* (2014) in radish and Kumar *et al.* (2014) in carrot.

Treatments recorded significant effect on days to harvest. Maximum days to harvest was found under the treatment T8(Control) followed by T1,T3,T2,T6,T7,T4 and T5. While the minimum days to harvest was observed with T5(100 % FYM + 100 % vermicompost). These findings are in agreement with those reported by Malik and Kumar (2009) in tomato.

Treatments indicated significant effect on fresh weight of root. Maximum fresh weight of root was observed

- Srinivas.K. and Naik. L.B. 1990. Growth and yield of radish (*Raphinu ssativus* L.) in relation to nitrogen and potash fertilization. *Ind. J. Hortic.*, 47: 114-119.
- Sunandarani, N. and Mallareddy, K. 2007. Effect of different organic manures and inorganic fertilizers on growth, yield and quality of carrot (*Daucus carota* L.). *Karnataka J. Agric. Sci.*, 20 (3): 686- 688.
- Uddain, J.; Chowdhury, S. and Rahman, M.J . 2010. Efficacy of different organic manures on growth and productivity of radish (*Raphanus sativus* L.) *IJAEB.*, 3 (2): 189-193.
- Yadav, B. D., Khandelwal, R, B. and Sharma Y. K. 2004. Ramesh 2013. Effect of INM practices on seed yield and yield contributing characters in radish. P- 74-78.