



EFFECT OF ORGANIC MANURES ON GROWTH, YIELD AND QUALITY OF RADISH (*Raphanus sativus* L.) CV. PUSA DESI

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ABSTRACT : A field trial was conducted during 2014-15 in winter season at Horticultural Research Centre, Chauras Campus, H.N.B Garhwal University, Srinagar (Garhwal), Uttarakhand to study the effect of organic manures on growth, yield and quality of radish cv. Pusa Desi. The experiment consisted of 19 treatments with control, laid out in Randomized Block Design with three replications. The quantitative parameters were recorded at 15 days interval. The maximum plant height (36.13 cm) number of leaves (16.88) at 60 days, leaf length (17.17 cm), total plant height (58.68 cm) and root length (20.04 cm) were recorded with the combined application of organic manures (Vermicompost 50% + Poultry manure 50%). Whereas, the total plant weight (305.04 g), fresh weight of leaves (134.77 g), root weight (197.07 g), root diameter (5.74 cm) and yield/ha (36.42 t/ha) were significantly maximum with with the combined use of (FYM 100% + Vermicompost 100% + Poultry manure 100%). The quality parameters like T.S.S (6.15 °B) and Vit.C (18.13 mg/ 100g) were recorded maximum in combined application of FYM 50% + Poultry manure 50% and acidity (0.64) was maximum due to the FYM 100%. The study suggested that the combined application of Vermicompost 50% + Poultry manure 50% or (F.Y.M + Vermicompost + Poultry manure) were highly beneficial for all of the growth, yield and quality parameters.

Keywords : Radish, organic manures, growth, yield, quality.

Radish (*Raphanus sativus* L.) is one of important root crop of family Brassicaceae. It is a popular root vegetable in both tropical and temperate regions of world. It is grown throughout the country, being a quick growing crop; it is easily grown as a companion crop or inter-crop. It may also be planted on ridges of the beds, this way vacant area can be utilized profitably. Radish is grown for its tender root which is consumed either cooked or raw. Radish root develops from both the primary root and the hypocotyls. Roots vary greatly in size, shape and other external characteristics as well as in the length of time they remain edible. Radish is a cool season vegetable but can tolerate high temperature. The best quality roots are produced at temperature between 10.0 to 15.5° C. Roots may acquire a repulsive flavour and become more fibrous and mature early at higher temperature. Radish contains glucose as the major sugar and smaller quantities of fructose and sucrose. It is also good source of vitamin- A and C and also rich source of minerals like calcium, potassium and phosphorus. Pink-skinned radishes are generally richer in ascorbic acid than white-skinned ones. The vitamin C content of

radish roots is greatly influenced by light conditions and fertilizer (Sadhu, 8).

Leaves and pods of some cultivars can be boiled and eaten as a vegetable. It has refreshing, diuretic and cooling properties. It is also used for neurological headache, sleeplessness and chronic diarrhoea. The roots are also useful in urinary complaints, piles, liver and gall bladder complaints (Hadley, 3). The leaves of radish are good source for extraction of protein on a commercial scale and radish seeds are potential source of nondrying 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. Hence, for the production of good quality radish, optimum nutrition through organic manures is essential for sustainable production. Organic agriculture practices rely upon recycling of crop residues, animal manure, farm organic residues and wastes etc. 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. With these conditions, the present investigation was carried out to study the effect of organic manures on growth, yield and quality of radish under valley condition of Garhwal, Uttarakhand.

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MATERIALS AND METHODS

The experiment was carried out at Horticultural Research Centre, Chauras Campus, H.N.B Garhwal University, Srinagar (Garhwal), Uttarakhand during *rabi* season in 2014-2015. The experiment consisted of four organic manures *viz.*, T₁ (Farmyard manure), T₂ (Vermicompost), T₃ (Poultry manure), T₄ (Mustard oil cake) and their combinations *i.e.*, T₅ (F.Y.M 75% + Vermicompost 25%), T₆ (F.Y.M 50% + Vermicompost 50%), T₇ (F.Y.M 75% + Poultry manures 25%), T₈ (F.Y.M 50% + Poultry manure 50%), T₉ (F.Y.M 75% + Mustard oil cake 25%), T₁₀ (F.Y.M 75% + Mustard oil cake 50%), T₁₁ (Vermicompost 75% + Poultry manures 25%), T₁₂ (Vermicompost 50% + Poultry manure 50%), T₁₃ (Vermicompost 75% + Mustard oil cake 25%), T₁₄ (Vermicompost 50% + Mustard oil cake 50%), T₁₅ (Poultry manure 75% + Mustard oil cake 25%), T₁₆ (Poultry manure 50% + Mustard oil cake 50%), T₁₇ (F.Y.M 100% + Vermicompost 100% + Poultry manure 100%), T₁₈ (Vermicompost 100% + Poultry manure 100% + Mustard oil cake 100%) and T₁₉ (Control). The experiment was laid out in Randomized Block Design with three replications. The entire experimental field was divided into three blocks of equal size and each block possessed 19 plots. The seeds of Pusa Desi were collected from IARI New Delhi; seeds were dibbled 2 cm down the ridges at a distance of 15 cm in the soil. Thinning was done at 15 days after sowing by rotation one seedling per hill. Seeds were sown in rows at 30 × 15 cm spacing. All organic manures were applied during the field preparation, 15 days before sowing. All the intercultural operations and plant protection measures recommended for the successful crop growth were followed and timely irrigation was given to maintain the proper moisture in the field for better growth and development of the plants. Randomly five plants from each plot were selected to record the data on plant height (cm), number of leaves/plant, leaf length (cm), total plant height (cm), total plant weight (g), root length (cm), roots diameter (cm), root weight (g), fresh weight of leaves (g), yield/ha (q), ascorbic acid content (mg/100g), acidity and TSS (°Brix). The obtained data were statistically analyzed according to the procedure of Panse and Sukhatme (7). The significance of variation among the treatments was observed by applying ANOVA and critical difference at 5% level was calculated to compare the mean values of treatments for all the characters.

RESULTS AND DISCUSSION

The results showed that application of organic manures improved all the growth, yield and quality characters in comparison to the control (Table 1 and 2). Among the various organic manures and their combinations, the combination of vermicompost 50% + poultry manure 50% (T₁₂), FYM 100% + Vermicompost 100% + Poultry manure 100% (T₁₇) and FYM 50% + Poultry manure 50% (T₈) were highly effective for most of the growth, yield and quality parameters. Among the different treatments the combination T₁₂ (Vermicompost 50% + Poultry manure 50%) showed maximum plant height at 60 DAS (29.79 cm). Number of leaves/plant was recorded maximum (16.88) in T₁₂ (Vermicompost 50% + Poultry manure 50%) at 60 DAS. Minimum number of leaves/plant (9.92) was recorded under T₁₉ (control). The similar results were also reported by Kumar *et al.* (4). Treatment T₁₂ (Vermicompost 50 + Poultry manure 50%) showed the maximum leaf length (7.17 cm) followed by T₁₁ (7.07 cm) and T₇ (7.01 cm) and the minimum leaf length (13.56 cm) was recorded under control. The combination of Vermicompost 50% + Poultry manure 50% highly affected the number of leaves and leaf length of radish. The similar results were also observed by Lingaiah *et al.* (5). The results clearly indicated that radish responded well to combined use of Vermicompost 50% + Poultry manure 50%. In general, the treatment with Vermicompost 50% + Poultry manure 50% had significant effect on the number of leaves. The number of leaves may be increased due to the Vermicompost (Giraddi, 2). The treatment with Vermicompost 50% + Poultry manure 50% recorded higher values of growth parameters followed by other combinations in this crop. The maximum effect on total plant height (58.68 cm) was showed by T₁₇ (Vermicompost 50% + Poultry manure 50%) followed by T₁₀ (55.79 cm) and T₁₇ (55.78 cm). The minimum total plant height (45.27 cm) was recorded in T₁₉ (control). The maximum total plant weight (305.04 g) was recorded in T₁₇ (FYM + Vermicompost + Poultry manure) followed by T₁₂ (303.94 g) and 130.23 g respectively) and minimum was in T₁₉ (control). The similar results were recorded by Kumar *et al.*, (4). Maximum fresh weight of leaves (134.77 g) and was the results are inline of reports of Babalad (1) and Kumar *et al.* (4). The maximum root weight (197.07 g) was recorded in T₁₇ (FYM + Vermicompost + Poultry manure) followed T₁₁ (191.39 g) and T₇ (188.24 g) and minimum (96.36 g) root weight was observed in T₁₉ (control). Maximum root length (20.04 cm) follow was recorded in (Vermicompost 50% + Poultry manure

Table 1 : Effect of organic manures on growth, yield and quality of radish cv. Pusa Desi.

Treatment	No. of leaves after 60 days	Leaf length (cm)	Total plant height (cm)	Total plant weight (g)
T ₁ : FYM	13.40	16.55	49.55	225.47
T ₂ : Vermicompost	14.52	15.86	50.37	235.31
T ₃ : Poultry manure	14.02	14.47	52.36	285.37
T ₄ : Mustard oil cake	14.54	16.61	49.84	220.56
T ₅ : FYM 75% + VC 25%	14.88	15.16	53.77	295.31
T ₆ : FYM 50% + VC 50%	15.82	14.12	53.70	299.92
T ₇ : FYM 75% + PM 25%	16.09	17.01	54.22	302.65
T ₈ : FYM 50% + PM 50%	15.23	15.84	51.18	303.27
T ₉ : FYM 75% + MC 25%	15.81	15.46	51.08	283.52
T ₁₀ : FYM 50% + MC 50%	13.55	16.91	55.79	284.72
T ₁₁ : VC 75% + PM 25%	14.19	17.07	55.16	301.78
T ₁₂ : VC 50% + PM 50%	16.88	17.17	55.78	303.94
T ₁₃ : VC 75% + MC 25%	14.29	15.94	53.22	278.72
T ₁₄ : VC 50% + MC 50%	13.65	14.15	51.92	287.19
T ₁₅ : PM 75% + MC 25%	13.28	15.00	47.15	291.44
T ₁₆ : PM 50% + MC 50%	13.16	14.10	46.36	292.59
T ₁₇ : FYM + VC + PM	14.42	15.87	58.68	305.04
T ₁₈ : VC + PM + MC	12.49	14.25	47.53	285.74
T ₁₉ : Control	9.92	13.56	45.27	179.35
C.D. (P = 0.05)	0.26	0.14	0.16	0.44

50%) in T₁₃ (18.53 cm) and T₅ (18.49 cm) and minimum (14.06 cm) in T₁₉ (Control). The similar observations were recorded by Kumar *et al.* (4). Maximum root diameter (5.74 cm) was observed in T₁₇ (FYM + Vermicompost + Poultry manure) followed T₁₈ (5.38 cm) and T₁₁ (5.23 cm). The minimum root diameter (2.51 cm) was recorded in T₁₉ (control). The maximum yield (36.42 t/ha), was recorded in T₁₇ (FYM + Vermicompost + Poultry manure), T₁₂ (36.96 t/ha) and T₁₁ (34.74 t/ha) and minimum (23.15 t/ha) yield was in T₁₉ (control). Higher level nitrogen play an a key

role to increase the fresh weight of leaves, root weight and whole plant, because nitrogen is also synthesized in to amino acids which are built into complex proteins and help in promoting the luxurious growth of crop. (Muthuswamy and Muthukrishnan, 6; and Sendur *et al.*, 9). Vermicompost play an important role in good root growth because the vermicompost improves the physical condition of soil as well as nutrients availability for plants. The maximum T.S.S (6.15 °B), was recorded in T₈ (FYM 50% + Poultry manure 50%) respectively. The minimum T.S.S (4.12°Brix) was

Table 2 : Effect of organic manures on growth, yield and quality of radish cv. Pusa Desi.

Treatment	Fresh weight of leaves (g)	Root weight (g)	Root length (cm)	Root diameter (cm)	Yield (t/ha)	T.S.S (° Brix)	Vit.C (mg/100)	Acidity %
T ₁ : FYM	110.10	156.29	16.28	4.01	31.56	5.82	15.42	0.64
T ₂ : Vermicompost	112.20	169.62	17.01	3.90	31.62	5.55	16.18	0.52
T ₃ : Poultry manure	115.68	175.06	15.63	4.19	32.52	5.18	16.88	0.47
T ₄ : Mustard oil cake	105.34	136.69	15.04	3.74	30.59	4.81	15.21	0.50
T ₅ : FYM 75% + VC 25%	120.68	182.38	18.49	4.52	32.28	5.85	16.06	0.47
T ₆ : FYM 50% + VC 50%	121.09	181.42	16.85	4.77	32.37	6.04	15.05	0.33
T ₇ : FYM 75% + PM 25%	125.59	188.24	17.45	5.10	31.85	5.85	16.23	0.27
T ₈ : FYM 50% + PM 50%	123.45	185.48	14.39	4.99	32.57	6.15	18.13	0.24
T ₉ : FYM 75% + MC 25%	112.31	158.41	15.94	4.22	31.51	5.39	13.19	0.48
T ₁₀ : FYM 50% + MC 50%	111.20	159.26	14.41	4.15	30.60	4.75	13.79	0.30
T ₁₁ : VC 75% + PM 25%	128.49	191.39	17.35	5.23	34.74	5.29	17.18	0.36
T ₁₂ : VC 50% + PM 50%	130.23	161.13	20.04	5.31	34.96	4.96	16.72	0.46
T ₁₃ : VC 75% + MC 25%	121.84	160.25	18.53	4.61	31.72	5.46	14.60	0.40
T ₁₄ : VC 50% + MC 50%	122.28	144.79	15.04	4.89	31.47	5.18	16.27	0.41
T ₁₅ : PM 75% + MC 25%	124.16	174.19	16.74	4.03	30.71	4.75	15.25	0.43
T ₁₆ : PM 50% + MC 50%	123.71	155.41	17.37	4.11	30.24	5.11	15.49	0.32
T ₁₇ : FYM + VC + PM	134.77	197.07	16.85	5.74	36.42	4.54	14.86	0.50
T ₁₈ : VC + PM + MC	124.55	112.59	15.31	5.38	29.39	4.25	13.73	0.21
T ₁₉ : Control	71.24	96.36	14.06	2.51	23.15	4.12	12.27	0.15
C.D. (P = 0.05)	0.19	0.27	0.21	0.91	0.46	0.14	0.18	0.29

recorded in T₁₉ (Control). The highest vit. C (18.13 mg/100g) was obtained in T₈ (FYM 50% + Poultry manure 50%) followed by T₁₁ (17.18 mg/100g) and T₃ (16.80 mg/100g). The minimum vit.C (12.27 mg/100g) was recorded in T₁₉ (control). The maximum acidity (0.64%) was recorded in T₁ (FYM 100%) followed by T₂ (0.52%) and T₄ (0.50%) and minimum (0.15%) in T₁₉ (Control).

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