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Effect of different organic media on growth and quality of Radish (*Raphanus sativus* L.)

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ABSTRACT

An experiment was carried out to study the effect of different organic median on growth, and quality of radish (*Raphanus sativus* L.) in Completely Random Design (CRD) with nine treatments and replicated thrice. In this study, the different organic media comprise of Goat manure, FYM, Vermicompost, Soil + FYM + Cocopeat (2:1:1), FYM + goat manure (1:1), Goat manure + FYM (2:1), FYM+ poultry manure (1:1), Poultry manure +FYM (2:1) and control (garden soil) were used a growing media. The study revealed that the FYM+ goat manure (1:1) recorded significantly the highest germination percentage (88.85), maximum shoot length (21.50 cm), leaf length (17.20 cm), leaf width (6.55 cm) and days required for earliest maturity (40.08). The root characters of root length (16.51cm) and root diameter (3.69cm) was also recorded maximum in treatment FYM + goat manure (1:1) compared to control. The results of the experiment conducted in the present investigation led to the conclusion that that the media of FYM + goat manure (1:1) can be recommended to enhance the growth and quality of Radish (*Raphanus sativus* L.) for pot cultivation.

Key words: *Radish, Organic media, Vermicompost, FYM, Poultry manure and Goat manure*

Introduction

Radish (*Raphanus sativus* L.) is a member of the genus Raphanus and family Brassicaceae. It is a popular root vegetable in temperate and tropical climates regions. It is a vegetable crop that is grown for both annual and biennial purposes, depending on the intended use. Tender young tuberous roots, which can be eaten raw or cooked, are the reason radish is grown. Minerals like calcium, potassium, and phosphorus are also present in good amounts, along with vitamin C, or ascorbic acid.

It is used in homeopathy to treat neurological conditions, headaches, insomnia, and persistent diarrhea. Additionally, the roots help with piles and bladder issues. Radish leaves can be used to extract protein on a large scale, and the seeds of the radish plant may contain non-drying fatty oil that can be used to make edible and illuminating soap. Radish is mostly a vegetable crop for the chilly season. However, Asian variants are more temperature tolerant than European ones. Since it is a cool-season crop, northern plains farmers seed it in the winter, from September to January. With the exception of a

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few summer months, radish may be cultivated virtually year-round in the temperate environment of the Indian peninsula. Soil and climatic factors have a major impact on radish growth and production. The ideal conditions for each kind vary according on the soil and climate. It is now necessary to look for less expensive and environmentally friendly fertilizers due to the high cost of these inorganic fertilizers. Due to the issue of chemical fertilizers being too expensive to fully supply a crop's nutritional requirements from a single source, integrated nutrient management, which includes using organic materials like farmyard manure, vermicompost, poultry manure, and biofertilizer has become essential (Jagadish Timsina, 2018).

Poultry manure can raise soil carbon, nitrogen, porosity, and microbial activity. It is also a relatively cheap source of macronutrients (N, P, K, Ca, Mg, S) and micronutrients (Cu, Fe, Mn, B). Poultry manure has the highest nutrient levels and may supply significant amounts of all the important plant nutrients when added to soil for horticultural crops. Additionally, it enhances the chemical composition, tilth, and biological activity of the soil.Owing to fast mineralization, the estimated 60% of organic N in poultry manure. It has been recognized that poultry manure is an excellent source of plant nutrients for all the crops (Boateng *et al.,* 2006). Vermicompost is an organic substance characterized by high porosity, microbial activity, aeration, and water holding capacity. It is an incredibly effective plant growth medium that accelerates the growth of many different types of plants (Kumaresan *et al*., 2023). Vermicompost provides major plant essential macronutrients (N, P_2O_5, K_2O, Ca and Mg) and micronutrients Fe, Mn, Zn and Cu). The chemical analysis of vermicompost reveals that the N, P_2O_5, K_2O content was 0.8, 1.1, 0.5, respectively (Giraddi *et al.,* 1993).

Farmyard manure, being a large organic substance, increases the amount of organic matter and plant nutrients available to the soil, improves aeration, and releases compaction in the soil. This leads to a greater amount of humus content building up in the soil and microbial establishment. Cattle dung with agricultural residue that has been composted is called farmyard manure. It's enhanced the soil by increased aeration, water-holding capacity, and nutrient content. Along with activating the biomass of soil microorganisms, it releases nutrients gradually. In India, cow dung manure is the most commonly used organic manure, which contains 0.5 – 0.7 % N, 0.3 – 0.9 % P_2O_5 and 0.4 – 1.0 % K, depending upon the type of animals and nature of feed. Goat manure is a rich soil supplement that is beneficial for plant growth but poor in nitrogen when compared to other animal media. It is however abundant in potassium and phosphorus. It's frequently utilized as mulch because it's naturally occurring slow-releasing manure. Due to the increased expense of inorganic fertilizers and their role in poor soil and water quality, it is necessary to look for less expensive alternatives, such as organic media, in order to reduce the costs and meet crop requirements. Since radishes are short-lived and quick-growing crops, their roots should grow quickly and continuously. Therefore, optimal nutrition from organic, inorganic, and biofertilizers is necessary for sustainable development of high-quality radish.

Materials and Methods

The present investigation was conducted at Adhiparasakthi Horticultural College, Kalavai, Ranipet District. Geographically, it is located at an elevation of 216 meters above mean sea level, lies between 12.934 N latitude and 79.146 E longitude, and experiences tropical weather. The experiment was carried out in Completely Random Design (CRD) with nine treatments and replicated thrice. In this study, the different organic media comprise of Goat manure (T_1), FYM (T_2), Vermicompost (T_3), Soil + FYM + Cocopeat (2:1:1) (T_4), FYM + goat manure (1:1) (T_5), Goat manure + FYM (2:1) (T_6), FYM+ poultry manure (1:1) (T_7), Poultry manure +FYM (2:1) (T_8) and control (garden soil) (T_9). The weather condition of Ranipet during the experimental period was moderately warm with hot early summer months during March-May. In open conditions, the maximum temperature varied from 25^0 C and 35^0 C with a mean of 30^0C. The minimum temperature ranged between 17^0 C and 24.5^0 C with a mean of 20^0 C. The Pusa Chetkivariety of radish seeds was collected. In accordance with the treatment plan, various organic media were added to the grow bag. The radish seeds were soaked in cold water for a whole day, and then they were treated with 2.5 g/kg of bavistin and allowed to dry. The sowing of seeds was done on the center of grow bag. A statistical analysis was performed on the experimental data for each parameter to ensure accurate interpretation. The conventional approach for randomized block

design provided by Panse and Sukhatme (1985) was followed in the statistical analysis of the data about the growth, and quality components of radish.

Results and Discussion

Germination percentage

The FYM + goat manure (1:1) media significantly recorded the highest germination percentage of 88.85. The lowest percentage of germination (10.02) was recorded in control. The increased percentage of seed germination in the media mixture containing FYM and goad manure may be due to the availability of optimum moisture and proper aeration, which favor early germination and higher percentage of germination.

Plant height

The data in respect of plant height is influenced due to different sources of organic media presented in Table 1. The media consist of FYM + goat manure (1:1) recorded maximum shoot length (32.46 cm) and minimum plant height of 13.23 cm was recorded in control. The increased plant height may be due to the presence of macro and micro nutrients in the FYM media in easily available forms. The goat manure is rich in potassium and phosphorus, which resulted to boost the plant height of radish.

Leaf length

The data in respect of leaf length per plant as influenced due to different organic media recorded at 15, 30 and 45 days after seed sowing are presented in Table 1. At 15 days after seed sowing the media FYM recorded significantly maximum leaf length of 5.87 cm and minimum leaf length (1.23 cm) was recorded in control. FYM+goatmanure(1:1) recorded significantly maximum leaf length (19.35 cm) and minimum leaf length (5.46 cm) was reordering oat manure +FYM (2:1) at 30 days after seed sowing. At 45 days after seed sowing, the media FYM +goat manure (1:1) recorded maximum leaf length (26.71 cm) followed by FYM (20.88 cm). The minimum leaf length of 9.14 cm was recorded in control (garden soil). The increased leaf length in the media combination of FYM and goat manure may be due to the better nutrient absorption, which resulted in cell division and elongation.

Leaf width

The data in respect of leaf width per plant as influenced due to different sources of organic media recorded are presented in Table 1. At 45 days after seed sowing, the media vermicompost recorded significantly maximum leaf width (9.57 cm) followed by (8.99 cm) FYM + goat manure (1:1). The minimum leaf width of 4.21 cm was recorded in control. Well-decomposed FYM manure contains a high amount of nitrogen and other essential nutrients, which help with high nutrient absorption. Goat manure contains a high level of prosperous and potassium, which enhances root growth and nutrient uptake. The increased nutrient uptake enhances cell division and cell expansion may be a reason for increased leaf width.

Number of leaves per plant

FYM + goat manure (1:1) recorded maximum leaves

Table 1. Effect of different organic media on vegetative parameters of Radish (*Raphanus sativus* L)

Treatments	Germination (%)	Plant height (cm)			Leaf length (cm)			Leaf width (cm)			Number of leaves per plant		
		15	30	45	15	30	45	15	30	45	15	30	45
T_1 - Goat manure	68.42	7.86	12.84	18.62	4.00	12.47	19.52	3.15	4.74	5.98	3.54	6.58	12.75
T_2 -FYM	86.17	10.58	21.34	24.24	4.40	12.85	20.88	3.44	5.69	9.57	4.00	7.00	13.45
T_3 - Vermicompost	75.32	8.52	15.74	22.77	5.87	13.42	17.20	2.45	6.54	7.86	4.58	7.66	13.21
T_4 -Soil + FYM + Cocopeat (2:1:1)	77.86	9.10	18.42	26.54	4.25	11.89	16.35	2.19	6.25	7.56	4.22	7.58	12.04
T_5 -FYM + goat manure (1:1)	88.85	12.58	24.87	32.46	5.48	19.35	26.71	3.59	7.55	8.99	5.00	8.44	14.52
T_6 - Goat manure + FYM (2:1)	58.69	10.25	22.51	27.42	6.30	17.25	22.17	3.51	4.89	7.58	5.63	10.13	13.27
T_7 -FYM+ poultry manure (1:1)	45.68	9.28	18.73	25.71	5.21	15.72	20.89	3.18	4.31	8.07	4.87	8.66	14.26
T_8 -Poultry manure +FYM (2:1)	42.87	7.89	12.58	21.74	4.50	13.78	19.26	1.25	4.00	7.52	4.50	7.26	13.77
T_9 - Control (Garden soil)	10.02	6.74	11.91	13.23	1.23	5.46	9.14	2.68	2.26	4.21	3.27	5.20	7.33
Mean	61.54	9.20	17.66	23.64	4.58	13.58	19.12	2.83	5.14	7.48	4.40	7.61	12.73
SEd	1.262	0.894	1.223	1.541	0.745	1.581	1.689	0.945	2.196	2.224	0.654	1.324	2.003
CD (0.5%)	2.454	1.925	2.501	2.860	1.201	2.614	3.120	2.023	4.210	4.521	1.282	2.645	4.213

per plant (14.52) and minimum leaves per plant (7.33) were recorded in control (garden soil) at 45 days after seed sowing. The increased number of leaves and leaf area in Bhunmyalaki (*Phyllanthus amarus Schum*) with the application of FYM or goat manure and alongwith biofertilizers were reported by Chezhiyan *et al.* (2003). The results obtained in this study clearly indicate that radish varieties respond well to organic media.

Days required for horticultural maturity

The days required for horticultural maturity was recorded and presented in Table 2. The media FYM+ goat manure (1:1) recorded the earliest maturity with 40.08 and the maximum days taken for maturity (52.42) were recorded in control (garden soil). The early maturity in FYM along with goat manure may be due to the high availability of potassium and phosphorus. High level of phosphorus in goat manure favours the root development of radish.

Length of root

The significant differences were observed in root length of different treatments. The maximum root length of 16.51 cm was recorded in FYM + goat manure (1:1) followed by (15.67 cm) FYM and minimum root length of 6.54 cm was recorded in treatment control (garden soil). This might be due to FYM and goat manure contains uric acid and nitrogen rapidly changes ammonium from causing its immediate and efficient utilization for better development of roots. Similar results were obtained by Bodlche (2006), Uddain *et al.* (2010), Islam *et al.* (2011) and Shama *et al.* (2012).

Diameter of root

The significant differences were observed in root diameter of different treatments. The maximum root diameter (6.69 cm) was recorded in treatment FYM + goat manure (1:1) which was on par with (5.48 cm) FYM and minimum root diameter of 2.32 cm was recorded in control (garden soil). The maximum diameter of root in the treatment might be due to the contribution of balanced C: N ratio and enhanced availability of essential plant nutrients hence increased rate and efficiency of metabolic activities resulting in increasing cell division, high assimilation of protein and carbohydrates. Applying goat manure may have increased root size (length and diameter) because it enhanced the physical, chemical, and biological conditions of the soil, which allowed for greater root growth and development.The similar results were also reported by Bodkhe (2006), Jilani *at al.* (2010), Uddain *et al.* (2010) and Sharma *et al.* (2012) in radish.

Weight of single radish

The maximum weight (152.32 g) was recorded in treatment FYM + goat manure (1:1) and minimum weight of 40.48 g was recorded in control (garden soil). The increased weight of radish may be due to increased root length and diameter of roots in the media.

Conclusion

The results of the experiment carried out to study

Table 2. Effect of different organic media on yield parameters of Radish (*Raphanus sativus* L)

Treatments	Days Required for Horticultural Maturity	Root length (cm)	Root diameter (cm)	Weight of single radish (g)
T_1- Goat manure	45.41	13.58	3.24	82.36
T_2-FYM	42.75	15.67	5.48	104.28
T_3- Vermicompost	44.28	12.89	3.54	54.28
T_4 -Soil + FYM + Cocopeat (2:1:1)	50.89	13.48	4.89	62.48
T_5 -FYM + goat manure (1:1)	40.08	16.51	6.69	152.32
T_6- Goat manure + FYM (2:1)	41.75	15.23	4.56	105.28
T_7-FYM+ poultry manure (1:1)	45.94	14.78	3.33	94.56
T_8-Poultry manure +FYM (2:1)	43.57	15.31	3.58	60.79
T_9- Control (Garden soil)	52.42	6.54	2.35	40.48
Mean	45.23	13.78	4.18	84.09
SEd	2.356	1.561	1.423	2.574
CD (0.5%)	**4.621**	**2.892**	**2.845**	**3.120**

the effect of different organic media on growth and quality of radish (*Raphanus sativus* L.) indicated that the media consist of FYM + goat manure (1:1) significantly increases the growth and quality characters of Radish. For pot cultivation, it's recommended that the media combination of FYM along with goat manure is the best media for the home garden as well as in terrace cultivation.

Conflict of Interest – None

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