

## Effect of organic and inorganic manures on biometric and yield parameters of radish (*Raphanus sativus* L.) cv. PUSAPHEPKI

■ B.VIJAYAKUMARI, V. SASIKALA AND C. P. POORNIMA

### SUMMARY

An investigation was carried out in radish (*Raphanus sativus* L.) cv. PUSAPHEPKI at Avinashilingam deemed university, Coimbatore. The study was conducted to analyse the effect of farm yard manure (FYM), phosphobacteria, *Azospirillum*, vermicompost, humic acid and NPK on growth and yield of radish. The pots having 7 kg capacity were filled with soil and sand in the ratio 1:1. Fifteen seeds were sown in each pot containing red loamy soil and sand and mixed with the above ameliorants. The dosage was as per the recommendations of Tamil Nadu Agricultural University, Coimbatore. Each treatment consisting of three replications were used for the experiment. The experiment was set up in completely randomized design. To elucidate the effect of organic and inorganic manures, germination percentage, biometric observations and yield parameters of radish were analysed. The effect of organic manures on seed germination of radish on 7, 14, 21 and 28 DAS (Days after sowing) recorded. The best germination percentage was observed in NPK treatment. The tuber weight and tuber length were maximum in vermicomposted treated plants. Tuber diameter was maximum in NPK treated plants. From this investigation it is inferred that the potting mixture containing, farmyard manure, vermicompost, humic acid and NPK could be ideal and suitable for better production of radish.

**Key Words :** Inorganic, Organic, *Raphanus sativus*, Radish

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Generally agricultural land gets impoverished after long term cultivation, if not supplemented properly with inputs. To supplement the soil nutrient content under conventional farming system, we need to apply high doses of agrochemicals, which in turn pollute the ecosystem. Therefore, in order to make agriculture sustainable it is necessary to implement a balanced and responsible use of organic agriculture. Application of chemical fertilizers increases the fertility of the soil thereby improves the yield but at the same time the high doses of chemicals cause damage to plants and

plant products and in turn it may affect the life of human beings and animals. The only method to overcome the utilization of agro-chemicals is the use of organic manures. Organic farming system in India is not new and is being followed from ancient time. It is a method of farming system which primarily aimed at cultivating the land and raising crops in such a way, as to keep the soil alive and in good health by use of organic wastes (crop, animal and farm wastes, aquatic wastes) and other biological materials along with beneficial microbes (biofertilizers) to release nutrients to crop, for increased sustainable production in an ecofriendly pollution free environment. Radish belonging to the family Cruciferae botanically named as *Raphanus sativus* L. is an important root crop extensively grown throughout the year in the country. Radish is more popular and widely grown pungent vegetable for its fleshy edible roots rich in Ca, K, P and vitamin C. The most commonly eaten portion is the fusiform taproot, although the entire plant is edible and the tops can be used as

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a leaf vegetable. The juice of the fresh leaves is diuretic and laxative. Radishes are used in salads or cooked as vegetable appetizing. Radishes are suggested as an alternative treatment for a variety of ailments including whooping cough, cancer, coughs, gastric discomfort, liver problems and kidney stones.

## MATERIALS AND METHODS

The study was conducted to analyze the effect of farm yard manure (FYM), phosphobacteria, *Azospirillum*, vermicompost, humic acid and NPK on growth and yield of radish (*Raphanus sativus* L.) var. PUSAPHEPKI.

The radish seeds were collected from Rasipuram (Tamilnadu). The seeds were sown in pots. The red loamy soil collected from Power House, Coimbatore was used for the study. The pots having 7 kg capacity were filled with soil and sand in the ratio 1 : 1. Fifteen seeds were sown in each pot containing red loamy soil and sand and mixed with the following ameliorants. The dosage was as per the recommendations of Tamil Nadu Agricultural University, Coimbatore.

T<sub>0</sub> - Control – Red soil (3.5 kg) and sand (3.5 kg)

T<sub>1</sub> - Farm yard manure 17.5 g / pot

T<sub>2</sub> - Phosphobacteria 18 g / pot

T<sub>3</sub> - *Azospirillum* 18 g / pot

T<sub>4</sub> - Vermicompost 15 g / pot

T<sub>5</sub> - Humic acid 2.5 per cent

Each treatment consisting of three replications were used for the experiment. The experiment was set up in completely randomized design. The seeds were sown at half inch deep and watered regularly with frequent weeding. The germination per cent was noted on 7, 14, 21 and 28 days after sowing. The biometric and biochemical parameters were analyzed on 30, 50 and 70 days after sowing. The yield parameters were taken on 70 days after sowing.

### Biometric observations :

- Germination percentage
- Root length
- Shoot length
- Fresh weight
- Dry weight
- Vigour index

On 7, 14, 21 and 28 days after sowing the number of seeds germinated was counted and the germination percentage was calculated using the following formula (ISTA, 1993).

$$\text{Germination percentage} = \frac{\text{Number of seeds germinated}}{\text{Number of seeds sown}} \times 100$$

The farm yard manure was collected from Rasipuram. Phosphobacteria and *Azospirillum* were collected from the Department of Microbiology, Tamil Nadu Agricultural University, Coimbatore. Vermicompost and NPK were

procured from R.S.Puram, Coimbatore. Humic acid was collected from Agri Infotech, R.S.Puram, and Coimbatore.

One plant was selected from each treatment per replication and washed to get rid of adhering soil particles. The length of the root was measured with a scale from root collar point to main tap root tip which represents the length of the root and expressed in cm. The length of the shoot was recorded from the root collar point to shoot apex with a measuring scale and expressed in cm.

The plant was then used for taking the fresh weight. The fresh weight was expressed in g. The plant used for fresh weight was wrapped in butter paper and placed in a hot air oven at 70°C for 12 hours. The weight of the dried plant was taken and recorded in g. The vigour index was calculated adopting the procedure of Abdul Baki and Anderson (1973) and expressed in whole number.

$$\text{Vigour index} = \text{Germination percentage} \times (\text{Root length} + \text{Shoot length})$$

### Yield parameters :

- Single tuber weight
- Tuber length
- Tuber diameter

### Single tuber weight :

The weight of a single tuber from each plant was taken and expressed in g.

### Tuber length :

The length of the tuber is measured with scale and expressed in cm.

### Tuber diameter :

The diameter of the tuber was measured using a thread and recorded in cm.

## RESULTS AND DISCUSSION

The experimental findings of the present study have been presented in the following sub heads:

### Germination percentage :

Statistically significant difference was observed among the treatments. The germination percentage recorded on 7, 14, 21 and 28 days after sowing are presented in Table 1. Among the treatments the highest germination percentage was recorded in the pot containing NPK (T<sub>5</sub>) on 7 DAS (9 per cent), 14 DAS (12 per cent), 21 DAS (12 per cent) and 28 DAS (13.33 per cent). The lowest germination percentage was observed in control (T<sub>0</sub>) on 7, 14, 21 and 28 DAS (4, 8, 6.66 and 7.33 per cent), respectively. Similar results were obtained by Kathiravan *et al.* (2008) who observed that NPK combination at 12: 18: 18 NPK pit<sup>-1</sup> as basal with 6 N and 8 kg pit<sup>-1</sup> as top

**Table 1 : Effect of farmyard manure, biofertilizers, vermicompost, humic acid and npk on the germination percentage of radish (*Raphanus sativus* L.)**

Treatments	7 DAS (%)	14 DAS (%)	21 DAS (%)	28 DAS (%)
T <sub>0</sub> – Red soil + sand	4	8	6.66	7.33
T <sub>1</sub> – Farmyard manure	7.66	9.66	10.66	11.33
T <sub>2</sub> – Phosphobacteria	7	10	11	12.23
T <sub>3</sub> – <i>Azospirillum</i>	8	11.33	11.66	12
T <sub>4</sub> – Vermicompost	6	9.33	8.66	9.66
T <sub>5</sub> – Humic acid	8	12	11.66	12
T <sub>6</sub> – NPK	9	12	12	13.33

dressing, 30 days after sowing increased the germination percentage of lablab.

#### Root length :

The root length of seedlings showed significant variation in different treatments. The data on root length are depicted in Table 2. Among the treatment NPK treated plants (T<sub>6</sub>) showed longest root on 30 DAS and 70 DAS (27.16 cm and 29.83 cm, respectively). Vermicompost treated plants (T<sub>4</sub>) showed longest root on 50 DAS (30.67 cm). The lowest root length was recorded in control plants on 30 DAS (9.27 cm), 50 DAS (15.63 cm) and 70 DAS (13.07 cm), respectively.

Combined application of fish meal, urea and NPK significantly increased root length and shoot length of okra and mung bean plants (Irshad, 2006). Omotoso and Shittu (2007) reported that application of NPK significantly increased root length, plant height and number of leaves, yield and yield components with optimum yield of okra.

#### Shoot length :

The longest shoot was shown by NPK treated plants, T<sub>6</sub> on 30 and 70 DAS (18.17 cm and 18.67 cm, respectively). On 50 DAS it was in humic acid treatment (T<sub>5</sub>) (15.67 cm). Among all the treatments the control plants (T<sub>0</sub>) exhibited shortest shoots on all the days (Table 2).

Veronica Mora *et al.* (2010) observed that humic substances increased shoot growth in different plant species cultivated under diverse growth conditions. According to Reddy *et al.* (1998) the constant and optimal supply of nutrients through NPK has influenced better growth.

#### Fresh weight :

The fresh weight of radish was more in NPK treatment (T<sub>6</sub>) on 30 and 70 DAS (156.67 and 266.67 g) and in vermicompost applications on 50 DAS (T<sub>4</sub>) (194.33 g). The lower fresh weight was recorded in control plants (T<sub>0</sub>) on 30, 50 and 70 DAS (1.93, 4.31 and 3.18 g, respectively) (Table 2).

**Table 2 : Effect of farmyard manure, biofertilizers, vermicompost, humic acid and NPK on the growth attributes of radish (*Raphanus sativus* L.)**

Treatments	Root length (cm)			Shoot length (cm)			Fresh weight (g)			Dry weight (g)			Vigour index		
	30 DAS	50 DAS	70 DAS	30 DAS	50 DAS	70 DAS	30 DAS	50 DAS	70 DAS	30 DAS	50 DAS	70 DAS	30 DAS	50 DAS	70 DAS
T <sub>0</sub> – Red soil + sand	9.27	15.63	13.07	1.23	1.23	1.37	1.93	4.31	3.18	0.19	1.03	0.32	30.16	98.67	124.67
T <sub>1</sub> – Farmyard manure	13.70	19.33	14.83	1.40	1.83	1.80	2.97	8.36	5.21	0.83	1.11	0.57	169.26	157.07	181.80
T <sub>2</sub> – Phosphobacteria	12.03	25.00	20.40	1.43	5.17	4.00	4.99	56.33	31.00	0.47	4.57	8.29	130.46	281.17	278.80
T <sub>3</sub> – <i>Azospirillum</i>	18.67	21.33	22.33	2.90	3.17	3.67	22.75	53.12	86.00	4.43	9.08	6.98	249.53	283.50	201.83
T <sub>4</sub> – Vermicompost	23.33	30.67	26.33	4.33	6.50	17.00	48.33	194.33	71.67	5.30	7.15	5.15	329.00	191.93	413.33
T <sub>5</sub> – Humic acid	23.33	24.33	22.00	14.00	15.67	11.50	29.33	35.33	26.67	7.22	1.56	4.39	452.67	495.67	399.50
T <sub>6</sub> – NPK	27.16	21.67	29.83	18.17	15.50	18.67	156.67	33.33	266.67	1.21	1.52	7.97	363.17	424.17	188.30
SE ±		3.146			1.203			38.942			2.168			53.016	
CD (0.05)		6.349			2.427			78.584			4.375			106.986	
CD (0.01)		8.488			3.245			105.064			5.849			143.037	

SE ± Standard error deviation; CD – Critical difference; DAS – Days after sowing

**Table 3 : Effect of farmyard manure, biofertilizers, vermicompost, humic acid and NPK on the yield parameters of radish (*Raphanus sativus* L.)**

Treatments	Single tuber weight (g)	Tuber length (cm)	Tuber diameter (cm)
	70 DAS	70 DAS	70 DAS
T <sub>0</sub> – Red soil + sand	22.33	10.16	5.16
T <sub>1</sub> – Farmyard manure	28.00	17.66	6.50
T <sub>2</sub> – Phosphobacteria	28.00	18.83	5.33
T <sub>3</sub> – <i>Azospirillum</i>	64.33	15.66	6.33
T <sub>4</sub> – Vermicompost	211.66	24.50	10.33
T <sub>5</sub> – Humic acid	53.66	15.00	5.83
T <sub>6</sub> – NPK	175.66	15.50	17.00
SE ±	233.290	2.432	2.599
CD (0.05)	71.404	5.216	5.574
CD (0.01)	99.095	7.238	7.736

SE ± Standard error deviation; CD – Critical difference; DAS – Days after sowing

According to Abou EI-Magd *et al.* (2008) vermicompost treatment increased all the vegetative growth parameters as plant height, leaf number, fresh and dry weight of the total plant and yield, nutrient contents of the leaves and bulbs in sweet fennel.

#### Dry weight :

The dry weight of plant was more in humic acid (T<sub>5</sub>) on 30 DAS (7.22 g), *Azospirillum* (T<sub>3</sub>) on 50 DAS (9.08 g), phosphobacteria (T<sub>2</sub>) on 70 DAS (8.29 g). The lower dry weight was recorded in control plants (T<sub>0</sub>) on 30, 50 and 70 DAS (0.19, 1.03 and 0.32 g, respectively) (Table 2). Sener Akinci *et al.* (2009) observed that application of humic acid caused significant increase in fresh and dry weights of broad bean.

#### Vigour index :

Vigour index was more in humic acid (T<sub>5</sub>) on 30 and 50 DAS (452.67 and 495.67, respectively) on 70 DAS it was in vermicompost (T<sub>4</sub>) (413.33). Lower vigour index was recorded in control plants (T<sub>0</sub>) on 30, 50 and 70 DAS (30.16, 98.67 and 124.67, respectively) (Table 2). According to Gupta *et al.* (2010) vermicomposting coconut leaf litter + cow dung substance by *Eudrillus* sp. significantly increased the seedling vigour index of cowpea and paddy.

#### Yield parameters :

The yield parameters were observed on 70 DAS as single tuber weight, tuber length and tuber diameter and protein and ascorbic acid content (Table 3). The weight of single radish and tuber length were maximum in (T<sub>4</sub>) vermicompost treatment, 211.67 g and 24.50 cm, respectively The tuber diameter was maximum in NPK treatment (T<sub>6</sub>) 17.00 cm.

#### Conclusion :

Experiment was conducted to study the effect of farmyard

manure, biofertilizers, vermicompost, humic acid and NPK on the growth and yield of radish. The treatment consisting of NPK showed significant increase in root length, shoot length and fresh weight on 30 and 70 DAS. Phosphobacteria showed significant increase in dry weight on 70 DAS. Vermicompost treated plants showed higher vigour index on 70 DAS. From this investigation it is inferred that the potting mixture containing, farm yard manure, vermicompost, humic acid and NPK could be an ideal and suitable potting mixture for better production of radish.

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