

# Effect of Inorganic Fertilizers and Organic Manures on the Growth and Yield of Radish (*Raphanus sativus* L.)

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**Abstract:** A field experiment was conducted at farmer's field in Alagoundam palayam village, Namakkal district, Tamilnadu with radish as the test crop in sandy loam soil to study the effect of inorganic fertilizers and organic manures on the growth and yield of Radish (*Raphanus sativus* L.). Inorganic fertilizers, organic manures viz., farm yard manure, poultry manure, goat manure were applied in different combinations. The results of the experiment revealed that the combined application of 75% RDF + goat manure @ 2.5 t ha<sup>-1</sup> + poultry manure @ 2.5 t ha<sup>-1</sup> (T<sub>7</sub>) recorded the maximum leaf length, leaf breadth, number of leaves plant<sup>-1</sup>, tuber length, tuber diameter, tuber weight and yield of radish.

**Keywords:** Inorganic NPK fertilizers, FYM, goat manure, poultry manure, growth, tuber yield, radish

## INTRODUCTION

Radish (*Raphanus sativus* L.) is one of the most important edible root vegetable. It comes under the family cruciferae. It is grown both in tropical and temperate regions of the world. Radish is mostly consumed raw as a crunchy salad vegetable. It is a fast growing, annual, cool season crop. Potassium is the most prevalent mineral in radish but it also contains calcium, magnesium, copper, manganese, phosphorus and sodium in smaller amounts while iron, zinc, molybdenum are present in trace amounts. Fresh raw radish is a good source of vitamin C and B vitamins, especially folic acid, riboflavin, thiamin and B6. In India, radish is mostly cultivated in the states of West Bengal, Haryana, Punjab, Bihar, Assam.

There is a vast scope for improving the production potential of radish by judicious fertilizer management. The use of chemical fertilizers alone adversely affects the physical and chemical properties of soil. In view of these problems, use of organic manures to meet the nutrient requirements of crop would be an inevitable practice in the years to come for sustainable agriculture since organic manures not only improve yield but also maintain the physical, chemical and biological properties of soil.

Organic manures like farm yard manure, poultry manure and crop residues etc are considered as a store house of various nutrients and are essential for the plant growth. Farmyard manure is a decomposed mixture of dung and urine of farm animals along with litter and left over material from roughages or fodder fed to the cattle. On an average well decomposed farmyard manure contains 0.5 per cent N, 0.2 per cent P<sub>2</sub>O<sub>5</sub> and 0.5 per cent K<sub>2</sub>O. The entire amount of nutrients present in farmyard manure is not available immediately. About 30 per cent of nitrogen, 60 to 70 per cent of phosphorus and 70 per cent of potassium are available to the first crop. The droppings of sheep and goats contain higher nutrients than farmyard manure and compost. On an average, the sheep and goat manure contains 3 per cent N, 1 per cent P<sub>2</sub>O<sub>5</sub> and 2 per cent K<sub>2</sub>O. The poultry manure or chicken manure is the organic waste from poultry composed of mainly faeces and urine of chickens. The mixture of poultry manure with spilt feed, feathers and bedding materials like wood savings or sawdust is referred as poultry litter. Poultry manure contains higher nitrogen and phosphorus compared to other bulky organic manures. The average nutrient content is 3.03 per cent N, 2.63 per cent P<sub>2</sub>O<sub>5</sub> and 1.4 per cent K<sub>2</sub>O. Poultry manure has been found to decrease the bulk density, increase the water holding capacity, organic matter content, oxygen diffusion rate and aggregate stability of soils. Poultry manure is capable of improving the biological fertility of the soil.

Use of organic manures alone cannot fulfill the crop nutrient requirements. The availability of organic manures is also limited. Integrated nutrient management practice is the only answer for the production of good quality of tuber yield and maintaining soil health. Keeping in view the above facts in mind, the present study has been planned to use organic, inorganic sources as source of nutrient for improving growth and yield of radish.

## MATERIALS AND METHODS

A field experiment was conducted during 2019 at Alagoundam palayam village in farmers's holding, Namakkal district, Tamilnadu to find the effect of inorganic fertilizers and organic manures on growth and yield of Radish variety Daikon, as the test crop under irrigated condition with seven treatments laid out in randomized block design with three replications. The experimental soil was sandy loam. The inorganic NPK fertilizers, organic manures viz., FYM, poultry manure and goat manure were applied in different combinations as per the treatment schedule. The treatments details include

T<sub>1</sub> - 100 % RDF (control)

T<sub>2</sub> - 75 % RDF + farm yard manure @ 25 t ha<sup>-1</sup>

T<sub>3</sub> - 75 % RDF + goat manure @ 5 t ha<sup>-1</sup>

T<sub>4</sub> - 75 % RDF + poultry manure @ 5 t ha<sup>-1</sup>

T<sub>5</sub> - 75 % RDF + Farm yard manure @ 12.5 t ha<sup>-1</sup> + goat manure @ 2.5 t ha<sup>-1</sup>

T<sub>6</sub> - 75 % RDF + Farm yard manure @ 12.5 t ha<sup>-1</sup> + poultry manure @ 2.5 t ha<sup>-1</sup>

T<sub>7</sub> - 75 % RDF + goat manure @ 2.5 t ha<sup>-1</sup> + poultry manure @ 2.5 t ha<sup>-1</sup>

Growth attributes and yield attributes were recorded at different stages of plant growth and yield was recorded at harvest.

## RESULTS AND DISCUSSION

### Growth attributes (Table 1)

#### Number of leaves plant<sup>-1</sup>

The application of inorganic fertilizers and organic manures in different combinations influenced the number of leaves plant<sup>-1</sup> at all stages of growth. The maximum number of leaves plant<sup>-1</sup> was recorded in the treatment with combined application of 75 % RDF + 2.5 tonnes of goat manure ha<sup>-1</sup> + 2.5 tonnes of poultry manure ha<sup>-1</sup> (T<sub>7</sub>). This was followed by application 75 % RDF + 12.5 tonnes of farm yard manure ha<sup>-1</sup> + 2.5 tonnes of poultry manure ha<sup>-1</sup> (T<sub>6</sub>) which recorded a mean value of 12.6 at harvest stage. The maximum number of leaves plant<sup>-1</sup> 5.05,10.03,13.1 (Mean value) at 15,30 DAS and at harvest stage, respectively in the treatment T<sub>7</sub>. The lowest was registered in the treatment with application of 100% RDF which recorded 9.33 (Mean value) at harvest stage.

#### Shoot length

Plant height was significantly influenced by application of inorganic fertilizers and organic manures at all stages of growth. At harvest, the highest plant height (15.07, 22.12, 31.28 (Mean value) at 15, 30 DAS and at harvest stage, respectively) was recorded with application of 75 % RDF + 2.5 tonnes of goat manure ha<sup>-1</sup> + 2.5 tonnes of poultry manure ha<sup>-1</sup> followed by application 75 % RDF + 12.5 tonnes of farm yard manure ha<sup>-1</sup> + 2.5 tonnes of poultry manure ha<sup>-1</sup>.

#### Leaf length and leaf breadth

The application of inorganic fertilizers and organic manures in different combinations influenced the leaf length and leaf breadth plant<sup>-1</sup> at all stages of growth. At harvest, the maximum leaf length plant<sup>-1</sup> (14.88, 22.22, 30.25 cm (Mean value) at 15,30 DAS and at harvest stage, respectively) was recorded with combined application of 75 % RDF + 2.5 tonnes of goat manure ha<sup>-1</sup> + 2.5 tonnes of poultry manure ha<sup>-1</sup> and the leaf breadth plant<sup>-1</sup> (5.6, 9.77,11.93 cm at 15,30 DAS and at harvest stage respectively) was recorded with combined application of 75 % RDF + 2.5 tonnes of goat manure ha<sup>-1</sup> + 2.5 tonnes of poultry manure ha<sup>-1</sup>. At harvest stage the lowest leaf length (24.03 cm) and lowest leaf breadth (9.64 cm) was recorded in the control (100% RDF).

### Yield attributes (Table 2)

#### Tuber length and diameter

The application of inorganic fertilizers and organic manures in different combinations influenced the tuber length and tuber diameter. The highest tuber length (19.24 cm) was recorded with combined application of 75 % RDF + 2.5 tonnes of goat manure ha<sup>-1</sup> + 2.5 tonnes of poultry manure ha<sup>-1</sup> and the highest tuber diameter (9.01cm) was recorded with combined application of 75 % RDF + 2.5 tonnes of goat manure ha<sup>-1</sup> + 2.5 tonnes of poultry manure ha<sup>-1</sup>.

#### Tuber weight

Among the different treatments, the maximum tuber weight (184.3 g) was recorded with application of 75 % RDF + 2.5 tonnes of goat manure ha<sup>-1</sup> + 2.5 tonnes of poultry manure ha<sup>-1</sup>. The least tuber weight (143.0 g) was recorded with application of 100% RDF (Control).

#### Tuber Yield

Among the all treatments, the highest tuber yield ( 32.11 tonnes ha<sup>-1</sup>) was recorded in the treatment T<sub>7</sub> (75 % RDF + goat manure @ 2.5 t ha<sup>-1</sup> + poultry manure @ 2.5 t ha<sup>-1</sup>). This treatment was followed by T<sub>6</sub> (75 % RDF + 12.5 tonnes of farm yard manure ha<sup>-1</sup> + 2.5 tonnes of poultry manure ha<sup>-1</sup>) registering a tuber yield of 30.98 tonnes ha<sup>-1</sup>. The least tuber yield was registered in the treatment with 100% RDF (Control).

Table 1: Effect of Inorganic Fertilizers and Organic Manures on the Growth attributes of Radish

Treatment details	No of leaves plant <sup>-1</sup>			Shoot length (cm)			Leaf length (cm)			Leaf breadth (cm)		
	15 DAS	30 DAS	At harvest	15 DAS	30 DAS	At harvest	15 DAS	30 DAS	At harvest	15 DAS	30 DAS	At harvest
T <sub>1</sub> - 100 % RDF (Control)	2.90	6.70	9.33	13.17	18.70	26.10	12.03	17.91	24.03	4.48	7.53	9.64
T <sub>2</sub> - 75 % RDF + farm yard manure @ 25 t ha <sup>-1</sup>	3.37	7.07	10.33	13.53	19.26	26.52	12.34	18.31	24.78	4.66	7.75	9.84
T <sub>3</sub> - 75 % RDF + goat manure @ 5 t ha <sup>-1</sup>	4.03	7.27	11.80	14.08	19.57	26.97	12.66	18.67	25.58	4.85	8.22	9.99
T <sub>4</sub> - 75 % RDF + poultry manure @ 5 t ha <sup>-1</sup>	4.57	8.40	12.20	14.57	20.66	27.70	14.11	19.40	27.51	5.19	8.82	10.40
T <sub>5</sub> - 75 % RDF + Farm yard manure @ 12.5 t ha <sup>-1</sup> + goat manure @ 2.5 t ha <sup>-1</sup>	4.30	8.20	11.91	14.33	20.33	27.35	13.71	19.01	26.47	5.03	8.67	10.25
T <sub>6</sub> - 75 % RDF + Farm yard manure @ 12.5 t ha <sup>-1</sup> + poultry manure @ 2.5 t ha <sup>-1</sup>	4.96	9.20	12.80	14.81	20.92	29.3	14.40	20.60	28.78	5.34	9.54	10.55
T <sub>7</sub> - 75 % RDF + goat manure @ 2.5 t ha <sup>-1</sup> + poultry manure @ 2.5 t ha <sup>-1</sup>	5.05	10.03	13.10	15.07	22.12	31.28	14.88	22.22	30.25	5.60	9.77	11.93
<b>S.Ed</b>	0.037	0.074	0.125	0.108	0.115	0.151	0.109	0.144	0.320	0.050	0.056	0.063
<b>C.D (p=0.05)</b>	0.080	0.162	0.273	0.235	0.250	0.330	0.238	0.315	0.698	0.109	0.112	0.137

**Table 2: Effect of Inorganic Fertilizers and Organic Manures on Yield attributes and Yield of Radish**

Treatment details	Tuber length (cm)	Tuber Diameter (cm)	Tuber Weight (g)	Tuber yield (t ha <sup>-1</sup> )
T <sub>1</sub> - 100 % RDF (Control)	11.63	7.11	143.00	21.60
T <sub>2</sub> - 75 % RDF + farm yard manure @ 25 t ha <sup>-1</sup>	12.30	7.50	152.90	22.40
T <sub>3</sub> - 75 % RDF + goat manure @ 5 t ha <sup>-1</sup>	13.77	7.80	159.66	23.90
T <sub>4</sub> - 75 % RDF + poultry manure @ 5 t ha <sup>-1</sup>	16.76	8.31	173.93	29.50
T <sub>5</sub> - 75 % RDF + Farm yard manure @ 12.5 t ha <sup>-1</sup> + goat manure @ 2.5 t ha <sup>-1</sup>	14.70	8.00	167.59	27.00
T <sub>6</sub> - 75 % RDF + Farm yard manure @ 12.5 t ha <sup>-1</sup> + poultry manure @ 2.5 t ha <sup>-1</sup>	18.03	8.57	178.13	30.98
T <sub>7</sub> - 75 % RDF + goat manure @ 2.5 t ha <sup>-1</sup> + poultry manure @ 2.5 t ha <sup>-1</sup>	19.24	9.01	184.30	32.11
<b>S.Ed</b>	0.14	0.09	1.88	0.20
<b>C.D (p=0.05)</b>	0.30	0.19	4.09	0.44

## CONCLUSION

Combined use of organic manures and inorganic fertilizers resulted in higher growth and yield parameters of radish. Results reveal that combination of 75 % RDF + 2.5 tonnes of goat manure ha<sup>-1</sup> + 2.5 tonnes of poultry manure ha<sup>-1</sup> increased growth and yield attributes, and yield of tuber in radish significantly compared to other treatments experimented.

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