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Studies on Effect of Different Organic Manures on Growth and Yield of Radish (*Raphanus sativus* L.)

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A B S T R A C T

The present investigation entitled "Studies on effect of different organic manures on growth and yield of radish (*Raphanus sativus* L.)" was carried out during kharif season at the college Research Farm, Department of Agricultural Engineering. Aditya Engineering College. Surampalem. The radish Pusa Chetki' variety was used for this study. The experiment was laid out in Randomized Block Design (RBD) with three treatments of different organic manures comprises Control 100% N through poultry manure (T1). 100% N through FYM (T2). 50%% N through poultry manure + 50% N through farm yard manure (T3) are replicated thrice. The periodical observations on growth yield parameters were recorded. The results of the present investigation indicated that, the farm yard manure has significant influence on growth and yield parameters of radish. As regards to the growth parameters the treatment farm yard manure (T2) was found superior for most of the traits under study and it was followed by control treatment. The maximum values of growth parameters like shoot length (36 cm), number of leaves per plant (19). The yield contributing characters like average weight of whole plant (1320g), Root weight (1072g), Root shoot ratio (2.52), Root yield per plot (19.400 kg), Root yield per hectare (35.53 t) and the diameter of root (6.63cm), and dry matter (5.7l per cent) were recorded in treatment 100% N through farm yard manure (T2) and significantly superior over other treatments. The minimum values of cracked roots weight 0.60 per cent were observed.

Introduction

Radish (*Raphanus sativus* L.) belongs to genus Raphanus of family Brassicaceae or Cruciferae originated from the Central and Western China and India. In India, it is grown over an area 40,675 ha with an annual production of 8.05 lakh tonnes. The average productivity of radish is 19.79 t/ha (Thamburaj and Singh, 2003).

Radish is grown for its young tender tuberous root which is consumed either cooked or raw. It is a good source of Vitamin C (ascorbic acid) and minerals like calcium, potassium and phosphorus. It has got refreshing and

diuretic properties. In homeopathy, it is used for neurological, headache, sleeplessness and chronic diarrhea. The roots are also useful in urinary complaints and piles. The leaves of radish are good source for extraction of protein on a commercial scale and radish seeds are potential source of non-drying fatty oil suitable for soap making illuminating and edible purposes (George, 1999).

Radish is predominantly a cool season vegetable crop. But, Asiatic types can tolerate higher temperature than European varieties. Being a cool season crop, it is sown during winter from September to January in northern plains. In the mild climate of peninsular India, radish can be grown almost all the year round except for few months of summer. It is an annual or biennial crop depending upon the type for the purpose it is grown (PCARRD, 2009).

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. Among the Agro-techniques, nutrition is one of the main factors which govern the growth and yield of radish. Nutrition requirement of the crop varies with soil type, soil fertility, agro-climatic conditions and varieties. Being a short-duration and quick growing crop, the root growth should be rapid and uninterrupted. Hence, to produce good quality radish optimum fertilization through organic, inorganic and biofertilizers are essential (Dhanajaya, 2007).

To solve the problem of high cost of chemical fertilizers to meet out nutrient requirement of crop by single source and to reduce the soil health problem use of integrated nutrient management by using organic sources like farm yard manure, vermicompost, poultry manure and neem cake uses has become necessary. In recent years, use of these organic manures for improving productivity of crops and maintaining soil fertility and productivity of soil are gaining prominence. The organic manure has positive influence on soil texture and water holding capacity (Kale *et al.,* 1991). It also provides food for soil microorganisms. It increases the activity of microbes which is in turn helps to convert unavailable plant nutrients in available form. Organic manures releases nitrogen slowly and leaching and volatization losses are also very less as compared to inorganic fertilizers.

Thus, this study was conducted to evaluate the effect of different organic manures on the growth and yield of radish. Specifically, it aimed to determine the horticultural parameters as affected by inorganic fertilizer and effective combination of organic manures for higher yield.

Materials and Methods

Experimental site

The experiment was conducted in the Department of Agricultural Engineering, Aditya Engineering College, Surampalem, East Godavari, India.

Crop and variety

The radish variety Pusa Chetki popularly grown in this region was utilized for the present study.

Experimental design

This study was laid-out using a Randomized Complete Block Design (RCBD) with three (3) treatments and three (3) replications. The different treatments are as follows: T1 – 100 % Poultry, T2 – 100 % Farm Yard Manure (FYM) and T3 – 50 % FYM + 50 % Poultry.

Methods

The field was thoroughly ploughed and divided into plots of 9 m X 6 m then the various sources of organic manures viz., Poultry, FYM and FYM + Poultry were incorporated at the time of last ploughing as per the treatments (Table 1).

The seed were sown by means of dibbling two seeds per hill at a spacing of 30 cm X 15 cm and 30 seeds were sown on each ridge. Immediately after sowing light irrigation was given and followed alter three days. Thereafter, irrigations were given as per the requirement. Irrigation was given with rose can which is about 8 litres. The irrigation was also given one day before the harvesting. Thinning was done on tenth day of sowing.

Removal of weeds from the area was done along with cultivation to facilitate proper aeration and growth of experimental area. Labeling on the experimental plots on treatment combinations was done before planting.

Cultural control methods including cultivation and hand weeding were used to prevent the occurrence of pests and diseases. No pesticide was used during the conduct of the study.

The crop was harvested at proper stage of horticultural (commercial) maturity stage. The care was taken to keep the soil moisture at optimum level. The plants were pulled out without damaging the roots from the field. The soil adhering to the roots was removed. Harvesting was done at 40 – 45 days from sowing.

Among the data gathered were the plant height, length of root, diameter of root, number of leaves per plant, shoot length per plant, weight of whole plant, Root weight, Shoot weight and Root: shoot ratio and Root yield per plot.

The analysis of variance (ANOVA) in Randomized Complete Block Design (RCBD) was used to determine the level of significance.

Results and Discussion

Pre-harvest observations

Shoot length per plant (cm)

The data in respect of shoot length per plant as influenced due to different sources of organic manures recorded at 45 days after sowing are presented in the graph.

At 45 days after sowing, the maximum shoot length per plant was recorded in the treatment 100%N through farm yard manure (T2). This might be attributed to farm yard manure contains 33 per cent nitrogen form causing its immediate and efficient utilization for better growth and development and improvement in plant growth.

Number of leaves per plant

At 45 days after sowing, the maximum number of leaves per plant was recorded in the treatment farm yard manure (T2) and minimum numbers of leaves per plant were recorded in the treatment of 100% N through Poultry (T1). This might be attributed to the release of nitrogen from farm yard manure in comparison to other nutrient sources, efficient utilized for better growth. The lower number of leaves per plant in the treatment 100% N through poultry (T1) might be due to slow availability of N availability in the succeeding season.

Post-harvest observations

Weight of whole plant (g)

The data showed that the significant differences in weight of whole plant were

observed in different treatments. The treatment 100% N through farm yard manure (T2) significantly highest weight of whole plant (1320 g). The minimum weight of whole plant (190g) was recorded in treatment 100% N through poultry manure treatment (T1). The maximum weight of whole plant in the treatment (T2) might be attributed to the application of organic manures improves the soil physical conditions, promotes microbial activities and soil organic matter, which in turn produces organic acids, resulted in enhancing the promotive effect on plant growth.

Root weight (g)

The treatment 100% N through farm yard manure (T2) recorded significantly maximum weight of root (1075g) .The minimum weight of root (105g) was recorded in treatment 100% N through poultry manure (T1). The maximum weight of root in the treatment T2 might be because of rapid availability and utilization of nitrogen for various internal plant processes for carbohydrate production.

Shoot weight (g)

The significant differences in weight of shoot were observed indifferent treatments. The treatment 100% N through Farm Yard Manure (T2) recorded significantly maximum weight of shoot (425g). The minimum weight of shoot (50g) was recorded in treatment 100% N through poultry (T1). The maximum weight of shoot in the treatment (T2) could be due to FYM which increased the soil organic carbon by 0.03% and improved the physical properties of the soil and increases the number of leaves and efficiently utilized for better growth of shoots (Table 2).

Root: shoot ratio

The treatment 100% N through Farm yard manure (T2) recorded significantly maximum root: shoot ratio (2.52). The minimum root: shoot ratio (1.049) was recorded in treatment 50% N through poultry manure and 50% through farm yard manure (T3). The maximum root: shoot ratio in the treatment (T2) might be due to increase in weight of roots because of rapid availability and utilization of nitrogen for various internal plant processes for carbohydrate production.

Yield parameters

The data with respect to different yield parameters like root yield per plot, root yield per ha, weight of marketable roots and weight of unmarketable roots is presented in the below table.

Root yield per plot (kg)

The data clearly showed that, there were significant differences in root yield per plot among different treatments. The higher root yield (19.400 kg/plot) was obtained in treatment 100% N through farm yard manure (T2). The minimum root yield (11.805kg/plot) was recorded in .treatment 100% N through poultry manure (T1). The maximum root yield in treatment (T2) might be attributed to character of organic manures, the addition of which has solubilizing effects on soil nutrients as well as chelating effects on metal ions and hence increased availability of the nutrients to the plants.

Root yield (t/ha)

The significant differences in root yield per ha were observed. The treatment 100% N through farm yard manure (T2) recorded maximum root yield (35.92t/ha). The minimum root yield (21.00 t/ha) was recorded in treatment 100% N through poultry manure (T2). The maximum root yield in treatment (T2) might be attributed to sustained availability of nutrients throughout the growing season also the efficacy of inorganic

fertilizers is much pronounced when they are combined with organic manures (Table 3).

Cracked roots (%)

It is seen from data that, the minimum percentage of cracked roots (0.60%) was recorded in control treatment of 100% N through farm yard manure while it was maximum (2.00%) in treatment 100% N through poultry manure (T1).

Physical parameters

Length of root (cm)

The significant differences were observed in root length of different treatments. The maximum root length (42 cm) was recorded in treatment 100% N through farm yard manure (T2).

The minimum length of root (18 cm) was recorded in treatment 100% N through poultry manure (T1). This might be due to farm yard manure contains 33% of nitrogen causing its immediate and efficient utilization for better development of roots.

Girth of root (cm)

The root girth also recorded the significant differences. The maximum root girth (13.80 cm) was recorded in treatment 100% N through farm yard manure.

The minimum girth of root (10.08 cm) was recorded in treatment 100% N through poultry manure (T1).

The maximum root girth was recorded in treatment T2 might be due to the availability of more nitrogen and its slow release in this treatment coinciding with the stage of root development marked with increased in root girth after cessation of root growth.

Diameter of root (cm)

The significant differences were observed in diameter of root of different treatments. The maximum root diameter (6.63cm) was recorded in treatment 100% N through farm yard manure (T2). The minimum diameter of root (2.60 cm) was recorded in treatment 100% N through poultry (T1). The maximum diameter of root in the treatment (T2) might be due to the contribution to the 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.

Dry matter (%)

The significant differences were observed with dry matter content of roots among different treatments. The maximum dry matter content (5.71%) was observed in treatment 100% N through farm yard manure (T2). The minimum dry matter content (3.80%) was recorded in treatment 100% N through poultry manure (T1). This might be due to the organic sources which are rich in humus, hence enable nitrogen fixation by microbes, microbial decomposition regulates nitrogen supply to the plants which augments photosynthetic activity resulting in increased assimilation of photosynthates hence, increased the dry matter.

Organoleptic test

Data regarding scores obtained after evaluation of radish plants of different treatments for Organoleptic test regarding different quality parameters like appearance, colour, size and weight, shoot as vegetable, pungency and average rating.

The scoring was done for each character out of 10 marks, in which ten score was given for

excellent, nine for best, eight for better, six for good and five for average and less then five for poor and average ratings were converted to 10 point scale. The maximum score was obtained in treatment 100% N through FYM. While the lowest score was observed in control treatment of 100% N through poultry (T1). The score for colour character ranged 8.75. The maxi mum score was obtained in treatment 100% N through FYM (T2). Regarding the size and weight character the score was ranged 9.6. The maximum score was obtained in treatment 100% N through FYM (T2), while the lowest score was observed in treatment 100% N through FYM (T2). The values for pungency character ranged 7.33. The maximum value was obtained by T2 while, the lowest value was observed in treatment T1.

Table.1 Compositions of organic manures

S.No1	Organic Manures	NPK Content	Quantity Applied in Plot (Kg)
1	Farm yard manure	3:2:1	3kg
2	poultry manure	0.9:05:0.8	3kg
3	50% FYM+50% Poultry	-	1.5+1.5 (3kg)

Table.2 Shoot and root weight of radish as influenced by different treatments of organic manures

S. No	Treatment details	Weight of the whole plant (g)	Root weight(g)	Shoot weight (g)	Root : shoot ratio
T1	100% N through poultry manure	820	510	310	1.645
T2	100% N through farm yard manure	1320	1075	425	2.52
T3	50% N through poultry manure + 50% N through farm yard manure.	1010	605	405	1.049

Table.3 Root yield of radish as influenced by different treatments of organic manures

Tr.No.	Treatment details	Root yield kg/plot	Root yield t/ha
T1	100% N through poultry manure	11.805	2186.1
T2	100% N through farm yard manure	19.400	3592.5
T3	50% N through poultry manure + 50% N through farm yard manure	16.563	3067.2

Fig.1 Shoot length (cm) of radish as influenced by different treatments of organic manures

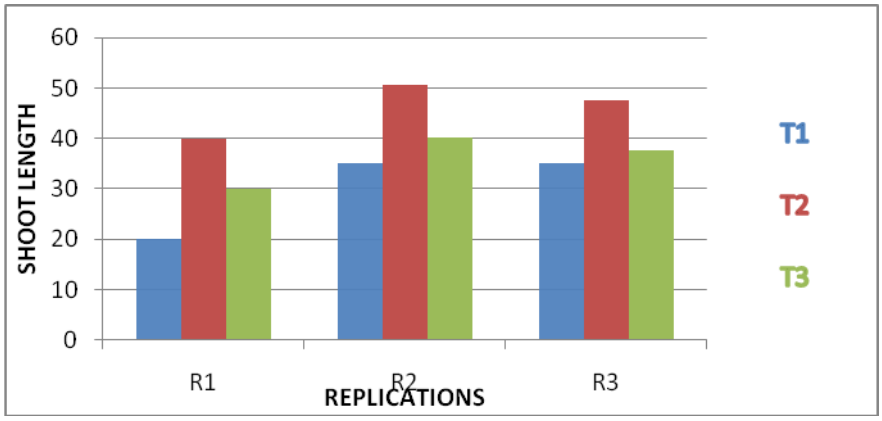

Fig.2 Number of leaves per plant of radish as influenced by different treatments of organic manures

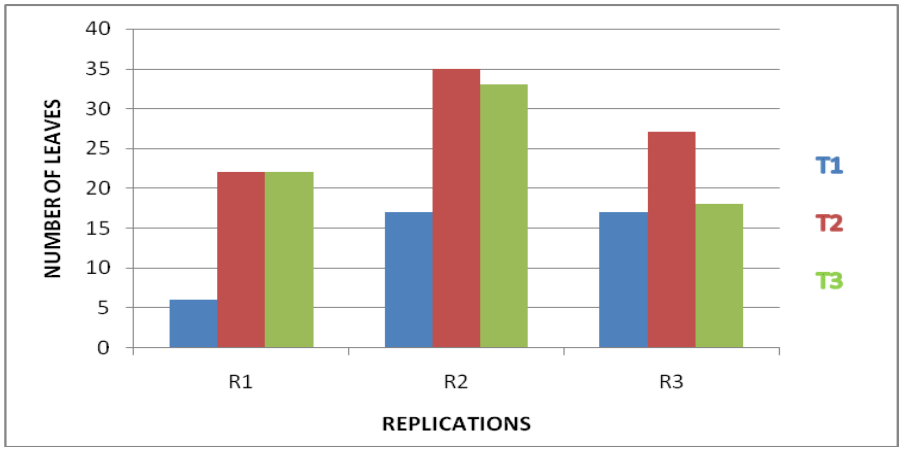

Fig.3 Root: shoot ratio of radish as influenced by different treatments of organic manures

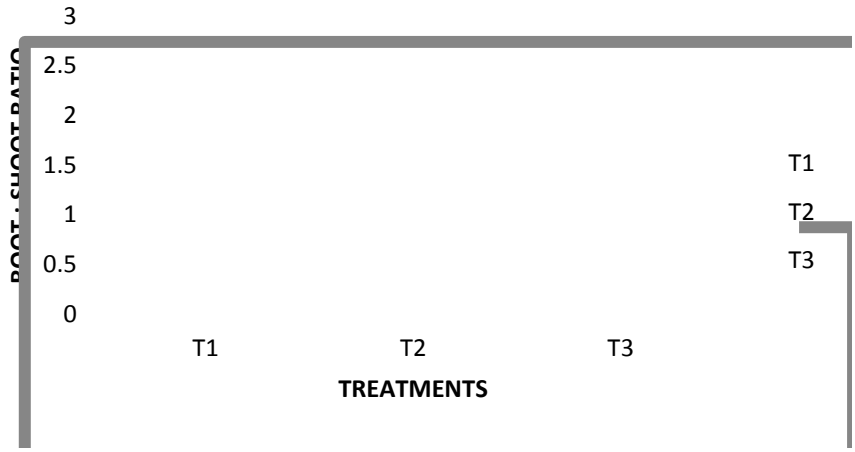

Fig.4 Organoleptic test of radish as influenced due to different treatments of

Cost of cultivation

As regards to the cost of cultivation, the lowest cost of cultivation (Rs.1090) was required in all treatment of 100% N through poultry (T1),100% N through FYM (T2) and 50% poultry +50% FYM (T3). While, minimum cost in 100% N through FYM (T2) treatment may be due to high nutrient contents and comparatively lower cost when compaired with organic sources on nutrient per kg basis.

Conclusions of the study are as follows:

Yield of radish was dependent on the type and dose of organic manure. The highest total and marketable yield was obtained after the application of 100% N through FYM manure (3.592 t/ha).

The performance of some other treatments like T1 (100% N through poultry), T3 (50% N through FYM + 50% N through poultry) and for growth and yield of radish was found at par with the potential treatments showing importance of complementary use of organic manures for improving the level of these parameters of the study.

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