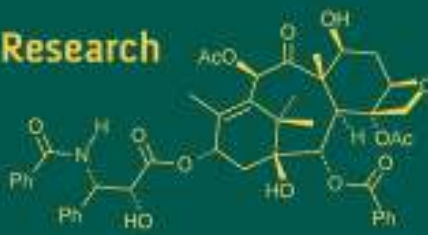
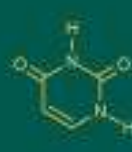


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Effect of integrated nutrient management on growth and yield of tomato (*Solanum lycopersicum* L.) cv. Pusa Ruby

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Abstract

The present study entitled “Effect of integrated nutrient management on growth and yield of tomato (*Solanum lycopersicum* L.) cv. Pusa Ruby” was conducted during *Rabi* season 2023-24 in the Pt. KLS College of Horticulture and Research Station, Rajnandgaon (C.G.). The field experiment was conducted in randomized block design with three replications and ten treatments consisting a control *Viz.* T₀ (No fertilization (control) T₁ (100 % RDF (150: 100:75 N P K kg / ha) T₂ (100% Nitrogen from organic source (Farmyard Manure + Vermicompost + Neem Cake + Azotobacter) T₃ (50% Nitrogen from Farmyard Manure (15 t/ha) + 50 % RDF (75:50: 37.5 NPK kg/ha) T₄ (25 % Nitrogen from Farmyard Manure (7.5 t/ha) +75 % RDF (112.5:75:65.25 NPK kg/ha) T₅ 50 % Nitrogen from Vermicompost (2.5 t/ha) + 50 % RDF (75:50:37.5 NPK kg /ha) T₆ 25% Nitrogen from Vermicompost (1.25t/ha) + 75%RDF (112.5:75: 56.35 NPK kg/ha) T₇ 50 % Nitrogen from Neem Cake (1.44 t/ha) + 50 % RDF (75:50:37.5 NPK kg/ha) T₈ (25 % Nitrogen from Neem Cake (0.721 t/ha) + 75 % RDF (112.5:75:56.5 NPK kg/ha) T₉ Azotobacter Bio-fertilizer + 75 % RDF (112.5:75:56.5 N P K kg / ha). The study evaluated the effects of various nutrient management treatments on vegetative growth and yield parameters. Among the treatments, T₄ 25% Nitrogen from Farm Yard Manure (7.5 t/ha) + 75% RDF (112.5:75:56.5 NPK kg/ha) resulted in the highest plant height (93.83 cm). Treatment T₆ 25% Nitrogen from Vermicompost (1.25 t/ha) + 75% RDF (112.5:75:56.5 NPK kg/ha) showed significant improvements in the number of primary branches per plant (8.41), the number of fruits per cluster (6.90), total number of fruits per plant (28.89) total fruit yield per plant (956.25 g) and total fruit yield per hectare (354.17 q). Treatment T₉ Azotobacter biofertilizer + 75% RDF (112.5:75:56.5 NPK kg/ha) performed best in terms of minimum days to first flowering (24.56 days) and days to first fruiting (40.43 days). Treatment T₂ (100% Nitrogen from organic sources (Farm Yard Manure + Vermicompost + Neem Cake + Azotobacter) produced significantly better results in fruit diameter (9.35 cm), fresh fruit weight (35.40 g).

Keywords: Tomato (*Solanum lycopersicum* L.), pus ruby, RDF, farmyard manure, vermicompost, neem cake and azotobacter, growth and yield

1. Introduction

Tomato (*Solanum lycopersicum* L.) having chromosome number 2n= 24, belong to family Solanaceae. It was originated from South America). Tomato is warm season crop and considered as a herbaceous, annual and self-pollinated vegetable crop that reproduced sexually by seed. India ranks second in area and production of tomato in the world. It is cultivated tropic and sub-tropic of the world. It is top most “protective food” because of most nutritive value. It is grown for both fresh consumption and processing. It is eaten raw vegetable in sandwiches, salad, cooked etc. Several processed items like paste, puree, ketchup, sauce, syrup, drinks and juice on large scale etc. It is a good source of Fe and vitamins A, B and C. An edible portion of ripe fruit tomatoes per 100 g contains water (93.5 %), total sugars (2.49 g), vitamin A (900 I.U) vitamin C (22.8 mg), ascorbic acid (16-65 mg) and amino acid (100-350 mg) (Thamburaj and Singh, 2023) [19]. It is rich sources of lycopene, minerals and vitamins such as ascorbic acid and beta carotene which are anti-oxidants and promote good health. Vitamin A helps to improve the vision and help to prevent the development of night blindness (Ganesan *et al.*, 2012) [24]. In India accounting for about 11.4 percent of the total vegetable production in country. Leading producers of tomato

in the World are China (67.63 MT), accounting for 26 % of the total production, followed by India (21.18 MT). In India under tomato, reported area and production during 2021-22 was 841 thousand hectare and 20336 MT (NHB). Total area and production under tomato in Chhattisgarh 61.635 thousand hectare and 1070.054 MT. Cultivated in the Rajnandgaon area 2.357 thousand hectare and production 32.748 MT. (Directorate of Horticulture and Farm Forestry-2022-23).

The growth, yield and fruit quality of tomato largely depended on a number of various interacting factors. Among them, integrated nutrient management is the most crucial as well as basis factor. Integrated nutrient management comprises organic and inorganic components and microorganisms that are highly beneficial for sustainable crop production as they ameliorate the soil environment, maintain adequate levels of nutrients and provide favourable conditions for high tomato yield with desired quality. Bio organic nutrition also improves the quality of the product. To maintain sustainability is important in the production and quality of tomato. Its objective is to maximize the utilization of synthetic and organic soil nutrients to maintain soil fertility for future generations and boost agricultural yield (FAO, 1995). High nutrient usage efficiency is achieved under INM methods by reducing losses through leaching, volatilization, immobilization, runoff and emissions. Vermicompost, known to increase protein synthesis in tomato plant that have definite influence on plant growth and yield of tomato. Vermicompost improves soil fertility, resulting in higher yields and higher quality, as well as increased nutritive value. It reduces soil erosion and improves soil texture and structure. The earthworm *Eisenia fetida* is commonly used to convert organic waste into nutrient rich organic fertilizer (Garg and Sharma, 2012) [23]. It contains macronutrients as well as micronutrients, such as nitrogen (1.6%), potassium (0.7-0.8%), zinc, manganese and phosphorous (0.7%). Farmyard manure contains 0.5% nitrogen, 0.2% phosphorus, 0.5% potassium and aids in improving soil fertility and plant growth by containing beneficial microorganisms that secrete growth regulators. It is a decomposing mixture of farm animal dung and urine. It reduces soil erosion and improves soil texture and structure.

Nitrogen is the key nutrient, which is the part of protein and improves the photosynthetic efficiency of the plant and ultimately the yield. Phosphorus is an essential element as it is a constituent nucleic acid, phospho lipid and coenzymes, most important in energy transfer and root development, plant growth, yield and quality of tomato. Potassium gives plants strength and disease resistance, potassium activate the fat producing enzyme and increase the oil content. The use of biofertilizers in conjunction with inorganic fertilizer may result in a higher yield and better quality of produce, allowing farmers to increase their profit margins. Biofertilizers contain living microorganisms that are both environmentally friendly and cost effective. They aid in atmospheric nitrogen fixation, phosphorous solubilization and plant growth hormone stimulation. It is suitable for use as manure and compost. Under favorable conditions, Azotobacter and Azospirillum are important bacteria that fix N, P and K. They can boost not only plant growth and development, but also production and productivity in a variety of areas. Plants benefit primarily from root development, increased water uptake, and nitrogen fixation.

In addition, it secretes ammonia into the rhizosphere, which aids plant nutrient uptake (Narula and Gupta, 2000) [5]. Azotobacter inoculants in tomato crops has been significant; they not only fix atmospheric nitrogen but also produce growth-promoting substances like gibberellins, IAA folic acid, etc., which enhance the growth of the tomato.

2. Material and Method

The present study entitled "Effect of integrated nutrient management on growth and yield of tomato (*Solanum lycopersicum* L.) cv. Pusa Ruby" was conducted during Rabi season 2023-24 in the Pt. KLS College of Horticulture and Research Station, Rajnandgaon (C.G.). The field experiment was conducted in randomized block design with three replications and nine treatments consisting a control Viz. T₀ (No fertilization (control) T₁ (100 % RDF (150: 100:75 N P K kg / ha) T₂ (100% Nitrogen from organic source (Farmyard Manure + Vermicompost + Neem Cake + Azotobacter) T₃ (50% Nitrogen from Farmyard Manure (15 t/ha) + 50 % RDF (75:50: 37.5 NPK kg/ha) T₄ (25 % Nitrogen from Farmyard Manure (7.5 t/ha) + 75 % RDF (112.5:75:65.25 NPK kg/ha) T₅ 50 % Nitrogen from Vermicompost (2.5 t/ha) + 50 % RDF (75:50:37.5 NPK kg /ha) T₆ 25% Nitrogen from Vermicompost (1.25t/ha) + 75% RDF (112.5:75: 56.35 NPK kg/ha) T₇ 50 % Nitrogen from Neem Cake (1.44 t/ha) + 50 % RDF (75:50:37.5 NPK kg/ha) T₈ (25 % Nitrogen from Neem Cake (0.721 t/ha) + 75 % RDF (112.5:75:56.5 NPK kg/ha) T₉ Azotobacter Bio-fertilizer + 75 % RDF (112.5:75:56.5 N P K kg / ha).

3. Result and Discussion

3.1 Growth parameter of tomato

3.1.1 Plant height (cm)

The mean data recorded on number of branches per plant as influenced by integrated nutrient management during experiment are shown in Table 1. The plant height the treatments varied from 93.83 cm to 75.50 cm. Among different treatment T₄ {(25 % N form Yard Manure (7.5 t ha) + 75 % RDF (112.5: 75: 65.25 NPK kg/ha)} gave significantly maximum plant height (93.83 cm) at 120 DAT, which was statistically at par with the treatment T₂ {(100% N from Organic Source (Farmyard Manure + Vermicompost + Neem cake + Azotobacter)} (87.68 cm) at 120 DAT. While treatment T₀ {(No fertilization (control)} observed minimum plant height (75.50 cm). Plant height increased also due to improvement in the physio-chemical properties of soil, increase in enzymatic activity, increase in microbial population, diversity and activity, easy availability of soil macro- and micronutrients and also increased the photosynthetic activity, chlorophyll formation, nitrogen metabolism and auxin contents in the plants by application of inorganic Source and biofertilizer. This result is in close agreement with the findings of Barman (2024) [3], Patel *et al.* (2010) [14], Mohit *et al.* (2019) [12], Thakur (1996) [22], Naidu *et al.* (2001) [13], Kumar *et al.* (2017) [10] and Renuka and Ravishanker (2001) [18] in tomato.

3.1.2 Number of primary branches per plant

The mean data recorded on number of branches per plant as influenced by integrated nutrient management during experiment are shown in Table 1. The number of primary branches per plant from the treatments varied from 8.41 to 4.93. Among different treatment T₆ (25% N from (Vermicompost (1.25t/ha) +75% RDF (112.5: 75: 56.25

NPK kg/ha) gave significantly maximum number of branches per plant (7.93) at 120 DAT, which was statistically at par with the treatment T₂ (100% N from Organic Source (Farmyard Manure+ Vermicompost + Neem cake + Azotobacter) (8.21) and T₅ {(50 % N from Vermicompost (2.5 t/ha) + 50 % RDF (75: 50: 37.5 NPK kg/ha)} (7.75). While treatment T₀ {(No fertilization (control))} observed minimum number of branches per plant (4.93). The number of branches per plant increase might be due to the implementation of integrated nutrient management may have improved the physical and chemical characteristic of the soil, resulting in an adequate supply of nutrients to the plants, which may have promoted the maximum vegetative growth while the minimum plant growth was caused by nutrient scarcity. Similar findings were reported by Barman (2024) [3], Patel *et al.* (2010) [14], Mahto *et al.* (2009) [8], Prabhu *et al.* (2010) [15] in tomato.

3.2 Flowering / fruiting parameters

3.2.1 Days taken to first flowering

The mean data recorded on days taken to first flowering as influenced by integrated nutrient management during experiment are shown in Table 1. The days taken to first flowering from the treatments varied from 24.56 to 34.13 DAT. Among different treatment T₉ {(Azotobacter Biofertilizer + 75% RDF (112.5: 75: 56.25 NPK kg/ha)} taken significantly minimum days to first flowering (24.56 days), which was closely followed by treatment T₂ {(100 % N from Organic Source (Farm Yard Manure + Vermicompost +Neem cake +Azotobacter)) (25.08 days). While treatment T₀ {(No fertilization (control))} recorded maximum days (34.13 days) taken to first flowering. The earliness to flowering in treatment T₂ might be due to the better translocation of nutrients to the aerial parts. The earliness in flowering could be attributed to the faster enhancement of vegetative growth and storing sufficient reserved food materials for differentiation of buds into flower buds, whereas the delayed flowering recorded by the inorganic fertilizer treatment and control could be due to extended vegetative phase of the plant by the availability of inorganic nitrogen. Similar results were also reported by Barman (2024) [3], Patel *et al.* (2010) [14] Prativa and Bhattarai (2011) [16] in tomato.

3.2.2 Days taken to first fruiting

The mean data recorded on days taken to first fruiting as influenced by integrated nutrient management during experiment are shown in Table 1. The statistical analysis revealed that the days taken to first fruiting range from 40.93 to 52.93. However, the significantly minimum days to first fruiting was obtained in the treatment T₉ {(Azotobacter Biofertilizer + 75 % RDF (112.5: 75: 56.25 NPK kg /ha.))} (40.93), which was closely followed by treatment T₂ {(100 % N from Organic Source (Farm Yard Manure + Vermicompost + Neem cake +Azotobacter))} (41.60). While treatment T₀ {(No fertilization (control))} recorded maximum days (52.93) taken to first fruiting. The better availability of nutrients and growth promoting effects from the inorganic fertilizer and bio-fertilizers would have been responsible for early flowering, higher number of flowers per plant and early fruiting and early harvesting. The similar results were obtained with Barman (2024) [3], Patel *et al.* (2010) [14], Yephtho *et al.* (2012) [23].

3.2.3 Number of fruits per cluster

The mean data recorded on number of fruits per cluster as influenced by integrated nutrient management during experiment are shown in Table 1. The statistical analysis revealed that the number of fruits per clusters range from 6.90 to 3.1. However, the significantly maximum number of fruits per cluster (6.90) was obtained in the treatment T₆ {(25 % N from Vermicompost (1.25 t/ha) + 75 % RDF (112.5: 75: 56.25 NPK kg/ha)}, which was closely followed by treatment T₂ {(100% N from Organic Source (Farmyard Manure+ Vermicompost + Neem cake + Azotobacter)) (5.75). While treatment T₀ {(No fertilization (control))} recorded minimum number of fruits per cluster (3.1). This might be due to increased supply of major plant nutrients with combination of inorganic fertilizers, and vermicompost. Nitrogen accelerates the development of growth and reproductive phases and protein synthesis. Consequently, fruit set appear more quickly as compared to control plots. Vermicompost enhances photosynthesis efficacy which might have enhanced food accumulation resulting in better plant growth and subsequently higher number of flowers per plant ultimately increased the number of fruits. Similar results were also reported by Barman (2024) [3].

3.2.6 Total number of fruits per plant

The mean data recorded on total no. of fruits per plant as influenced by integrated nutrient management during experiment are shown in Table 1. The statistical analysis revealed that the total no. of fruits per plant range from 28.89 to 16.85. However, the significantly maximum total no. of fruit per plant (28.89) was obtained in the treatment T₆ {(25 % N from Vermicompost (1.25 t/ha) + 75 % RDF (112.5: 75: 56.25 NPK kg/ha)}, which was statistically at par with treatment T₃ (27.37), T₄ (26.46), T₅ (26.90) and T₉ (27. 70). While treatment T₀ {(No fertilization (control))} recorded minimum total no. of fruit per plant (16.85). This might be due to increased supply of major plant nutrients with combination of inorganic fertilizers, vermicompost enhances photosynthesis efficacy which might have enhanced food accumulation resulting in better plant growth and subsequently higher number of flowers per plant ultimately increased the number of fruits. Similar results were also reported by Barman (2024) [3], Mohit *et al.* (2019) [12].

4. Fruit character and yield parameters

4.1 Fruit diameter (cm)

The mean data recorded on fruit diameter as influenced by integrated nutrient management during experiment are shown in Table 2. The mean data recorded on fruit diameter as influenced by integrated nutrient management during experiment are shown in Table 4.1 and graphically displayed in Figure 4.3.1 The statistical analysis revealed that the fruit diameter ranges from 5.40 to 9.35 cm. However, the significantly maximum fruit diameter (9.35 cm) was obtained in the treatment T₂ {(100 % N from Organic Source (Farm Yard Manure + Vermicompost +Neem cake +Azotobacter))}, which was statistically at par with treatment T₃ (8.72 cm), T₅ (8.72 cm) and T₆ (9.25 cm) While treatment T₀ {(No fertilization (control))} recorded minimum fresh fruit weight (5.40 cm). The increase of fruit diameter might be due to increased supply of major plant nutrients. Nitrogen accelerates the development of growth

and reproductive phases and protein synthesis, thus promoting fruit diameter of tomato. The findings are in close agreement with the findings of Yephtho *et al.* (2012) [23], Meena *et al.* (2014) [11] and Biswas *et al.* (2015) [4] in tomato.

4.2 Fresh fruit weight (g)

The mean data recorded on fresh fruit weight as influenced by integrated nutrient management during experiment are shown in Table 2. Statistical analysis revealed that the fresh fruit weight ranges from 26.50 to 35.40g. However the significantly maximum fresh fruit weight was obtained in the treatment T₂ (100% Nitrogen from organic source (Farmyard Manure + Vermicompost + Neem Cake + Azotobacter) (35.30 g), which was statistically at par with treatment T₁ (32.95g), T₃ (32.57g), T₅ (32.55g) and T₆ (33.10g). While treatment T₀ {(No fertilization (control))} recorded minimum fresh fruit weight (26.50g). The increase in fruit weight might be due to fact that vermicompost enhances the microbial enzymatic activity in soil, which stimulated root growth and induced changes in root morphology, which in turn affected the assimilation of the nutrients. Such boosting effect also might be due to higher accumulation of carbohydrates in flower heads with the supplementation of organic fertilizers and increased average fruit weight. Higher fresh weight of fruit was obtained with T₂ which may be due to better canopy development and higher photosynthetic efficiency in the treatment. The similar findings were also noted by Barman (2024) [3], Patel *et al.* (2010) [14], Gupta and Sengar (2000) [5], Sengupta *et al.* (2002) [20].

4.3 Total fruit yield per plant (g)

The mean data recorded on total fruit yield per plant as influenced by integrated nutrient management during experiment are shown in Table 2. Statistical analysis revealed that the total fruit per plant range from 446.52 to 956.25 g. However the significantly maximum total fruit

yield per plant was obtained in the treatment T₆ {(25 % N from Vermicompost (1.25 t/ha) + 75 % RDF (112.5: 75: 56.25 NPK kg/ha)) (956.25g), which was statistically at par with treatment T₃ (891.44g) and T₅ (875.59kg). While treatment T₀ {(No fertilization (control))} recorded minimum total fruit yield per plant (446.52g). The increase in total fruit yield per plant might be due to fact that Nitrogen accelerates the development of growth and reproductive phases and protein synthesis, thus promoting yield attributing characters. Fruits yield per plant depends up on the number of fruits and size of the fruits per plant. There both the characters are higher in treatment of T₆ {(25 % N from Vermicompost (1.25 t/ha) + 75 % RDF (112.5: 75: 56.25 NPK kg/ha))}. Similar results have been reported Barman (2024) [3], Meena *et al.* (2014) [11] and Biswas *et al.* (2015) [4] in tomato.

4.4 Total fruit yield per ha (q)

The mean data recorded on total fruit yield per hectare as influenced by integrated nutrient management during experiment are shown in Table 2. The statistical analysis revealed that total fruit yield per hectare range from 165.37 to 354.17q per ha. However the significantly maximum total fruit yield per hectare was obtained in the treatment T₆ {(25 % N from Vermicompost (1.25 t/ha) + 75% RDF (112.5:75:56.25 NPK kg/ha)) (354.17q), which was statistically at par with treatment T₃ (330.09q) and T₅ (324.29q). While treatment T₀ {(No fertilization (control))} recorded minimum fruit yield per hectare (165.38q). The increase in fruit yield per hectare may also be due to their contribution (organic manures) on more balanced C / N ratio and greater uptake of nutrients for physiological effects. This may lead to better metabolic activities in the plant which ultimately lead to high protein and carbohydrate synthesis. These results are in close conformity with the findings of Barman (2024) [3], Patel *et al.* (2010) [14], Hedau (1998) [6], Singh *et al.* (2010) [14], Soumya *et al.* (2009) [21] in tomato.

Table 1: Effect of integrated nutrient Management on growth and yield of tomato (*Solanum lycopersicum* L.) cv. Pusa Ruby

Treatment	Treatments details	Plant height (cm)	Number of primary branches per plant	Days taken to first flowering	Days taken to first fruiting	Number of fruits per cluster	Total number of fruits per plant
T ₀	No Fertilization (control)	75.50	4.98	34.13	50.13	3.1	16.85
T ₁	100%RDF(150: 100:75 NPKkg/ha))	83.74	5.44	32.23	52.93	3.48	21.76
T ₂	100% N from Organic Source (Farmyard Manure+ Vermicompost + Neem cake + Azotobacter)	87.68	8.21	25.08	40.95	5.75	24.54
T ₃	50% N from Farmyard Manure (15t/ha) + 50% RDF (75: 50: 3.5 NPK kg/ha)	81.98	7.43	25.74	41.60	5.40	27.37
T ₄	25% N formyard Manure (7.5tha) + 75% RDF (112.5: 75: 65.25 NPK kg/ha)	93.83	7.33	26.93	42.80	4.88	26.46
T ₅	50% N from Vermicompost (2.5t/ha) + 50% RDF (75: 50: 37.5 NPK kg/ha)	84.48	7.75	26.33	42.20	5.00	26.90
T ₆	25 % N fromVermicompost (1.25t/ha) + 75% RDF (112.5: 75: 56.25 NPK kg / ha)	81.20	8.41	28.56	44.43	6.90	28.89
T ₇	50% N from Neem Cake (1.44t/ha) + 50% RDF (75: 50: 37.5 NPK kg /ha)	80.69	6.82	29.33	49.87	4.20	23.40
T ₈	25 % N from Neem Cake(0.721t/ha) +75% RDF (112.5: 75: 56. 25 NPK kg /ha)	79.41	6.31	31.13	51.40	3.70	22.30
T ₉	Azotobacter Biofertilizer + 75% RDF (112.5:75: 56.25NPK kg / ha.	84.40	6.98	24.56	40.43	4.34	27.70
SE(m±)		3.06	0.29	1.15	1.86	0.20	0.99
C.D.at5%		9.08	0.86	3.43	5.51	0.61	2.95
CV		6.36	7.23	7.04	7.04	7.56	6.99

Table 2: Effect of integrated nutrient management on growth and yield of tomato (*Solanum lycopersicum* L.) cv. Pusa Ruby

Treatment	Treatment details	Fruit diameter (cm)	Fresh fruit weight (g)	Total fruit yield per plant (g)	Total fruit yield per ha (q)
T ₀	No Fertilization (control)	5.40	26.50	446.525	165.37
T ₁	100% RDF (150: 100:75 NPK kg/ha))	6.10	32.95	716.99	265.55
T ₂	100% N from Organic Source (Farmyard Manure+ Vermicompost + Neem cake + Azotobacter)	9.35	35.40	868.71	321.74
T ₃	50% N from Farmyard Manure (15t/ha) + 50% RDF (75: 50: 3.5 NPK kg/ha)	8.72	32.57	891.44	330.09
T ₄	25% N form Farmyard Manure (7.5t/ha) + 75% RDF (112.5: 75: 65.25 NPK kg / ha)	7.97	31.80	841.42	311.64
T ₅	50% N from Vermicompost (2.5 t/ha) + 50% RDF (75: 50: 37.5 NPK kg/ha)	8.56	32.55	875.59	324.29
T ₆	25% N fromVermicompost (1.25 t/ha) +75% RDF (112.5: 75: 56.25 NPK kg/ha)	9.25	33.10	956.25	354.17
T ₇	50% N from Neem Cake (1.44 t/ha) + 50% RDF (75: 50: 37.5 NPK kg/ha)	7.50	30.95	724.23	268.20
T ₈	25% N from Neem Cake (0.721 t/ha) + 75% RDF (112.5: 75: 56.25 NPK kg /ha)	7.08	29.40	655.62	242.74
T ₉	Azotobacter Biofertilizer +75% RDF (112.5:75 :56.25NPK kg/ha.	7.80	28.30	783.91	290.33
	SE(m±)	0.31	1.09	28.15	10.82
	C.D.aT ₅ %	1.01	3.25	83.64	32.16
	CV	7.06	6.04	6.25	6.50

Conclusion

- Application of 25 % N from Farmyard manure (7.5 t /ha) + 75 % RDF (112.5:75: 56.35 NPK kg/ha) showed significant effect as compared to other combination of RDF, organic manure over control on growth parameters like plant height (cm).
- Application Azotobacter Bio-fertilizer + 75% RDF (112.5:75:56.5 NPK kg/ha) showed significant effect as compared to other combination of RDF and organic days taken to first flowering and days taken to first fruiting.
- Application of 100 % N from Organic Source (Farm Yard Manure + Vermicompost +Neem cake + Azotobacter) showed significantly effect as compared to other combination of RDF, organic over control on fruit characters parameter like fruit diameter (cm), fruit fresh weight (g).
- Application 25 % N from Vermicompost (1.25 t/ha) + 75 % RDF (112.5:75: 56.35 NPK kg/ha) resulted significantly higher growth and yield attributing characters i.e. number of primary branches per plant, number. of fruits per cluster, total number of fruits per plant, fruit yield per plant (kg) and fruit yield per hectare (q) as compared to other treatments tried in this experiment.
- Thus it can be concluded that the application of 25% N from Vermicompost + 75% RDF (112.5:75:56.5 NPK kg/ha) is better for crop growth, yield as well as quality of tomato as compared to other treatments tried in this experiment to sustain soil fertility and to maintain soil health for the future crop planning.

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