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EFFECT OF INTEGRATED NUTRIENT MANAGEMENT ON GROWTH OF STRAWBERRY (*FRAGARIA X ANANASSA*) UNDER CENTRAL TELANGANA CONDITIONS

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ABSTRACT

A field experiment on the strawberry was conducted to evaluate the effect of integrated nutrient management on plant growth under central telangana conditions, using a Randomized Block Design. Throughout the experiment, plant height varied significantly, with a maximum of 21.50 cm recorded in treatment T₄ (RDN @ 75% + FYM 10 t/ha + Enriched biochar 3 t/ha + Biofertilizers 5 kg/ha) at 120 days after transplanting, while the control (T₁₀) resulted a minimum of 17.67 cm. Similarly, treatment T₄ recorded the maximum plant spread, with 35.35 cm in the E-W direction and 35.80 cm in the N-S direction, compared to the control 31.00 cm and 29.53 cm. The maximum number of runners per plant (5.93) was observed in treatments T₇ (FYM10t/ha + Biofertilizerskg/ha) and T₉ (FYM5t/ha+Vermicompost2.5t/ha+Biofertilizers 5kg/ha), while the control had the lowest (3.70). Runner formation was earliest in treatment T₈ (Vermicompost5t/ha+Biofertilizers5kg/ha) at 30.80 days and highest days taken from the control (45.80 days).

Key words: Strawberry, Integrated Nutrient Management (INM), Plant Growth, Biofertilizers, FYM

Introduction

The modern cultivated strawberry (*Fragaria × ananassa* Duch.) is a hybrid crop developed from the cross breeding of *Fragaria chiloensis* and *Fragaria virginiana*, belonging to the family Rosaceae. It is an herbaceous perennial with a prostrate growth habit, typically growing as a perennial in temperate regions and behaving as an annual in subtropical regions. Strawberry is one of the most economically important soft fruits worldwide and all cultivated varieties are octoploid, with a chromosome number of $2n = 8x = 56$. The fruit is a rich source of essential minerals and bioactive compounds, including ellagic acid, which has anti-cancer properties, as well as vitamins B, C, E, carotenoids and phenolics. (Kumar *et al.* 2012).

Strawberry fruits have great demand in fresh market, in processing industries as well as in preserve and

confectionaries industries. It's phenomenal increases in production during the recent years shows the popularity of strawberry fruit cultivation. Strawberry production in India has been steadily increasing in recent years, although it is still considered a niche crop compared to other fruits. In India, Mahabaleshwar is responsible for about 85% of the country's strawberry production, Haryana 31.5%, Kashmir 20.93%.

Materials and Methods

A field experiment titled "Effect of Integrated Nutrient Management on Growth of Strawberry (*Fragaria × ananassa* Duch.) Under Central Telangana Conditions" was carried out during the *Rabi* season of (October 2024 to February 2025) at the Postgraduate Institute of Horticultural Sciences, SKLTGHU, Mulugu. In this presents a detailed account of the materials used and the methodologies employed throughout the

experimentation period. The experimental site is located at the Post-Graduate Institute of Horticultural Sciences, SKLTGHU, in Mulugu, Siddipet. Situated in the sub-tropical zone, it lies at a latitude of 17°21' North, a longitude of 78°25' East, and an altitude of 526 meters. The experiment was laid out in a Randomized Block Design (RBD) and replicated thrice with plot size: 3×1 m² and spacing: 60cm×30cm. The Winter dawn variety of strawberry (*Fragaria × ananassa* Duch.) planting material was collected from the Pune kumar floret nursery. Strawberry crop was planted in *Rabi* season, 2024 on Last week of October, with maintaining optimum soil moisture. Plant height (cm), from to primary leaf apex, was measured in centimetres using a measuring scale, plant spread was measured in two orthogonal directions (E-W, N-S) for five tagged plants per treatment and replication. The average spread was calculated and expressed in centimetres. Runner production was assessed monthly from 30 to 120 days after transplanting (DAT) by counting the runners on five randomly selected and tagged plants. The runners were removed after each count and the average number of runners per plant was then calculated.

Results

In the present study, all the growth parameters at different stages showed significant variations

Plant height (cm)

Throughout the experiment, plant height measurements varied significantly across different DAT. The maximum plant height of 21.50 cm was recorded in

treatment T₄ (RDN @ 75% + FYM 10 t/ha + Enriched biochar 3 t/ha + Biofertilizers 5 kg/ha) 120 days after transplanting, while the minimum plant height (17.67 cm) at 120 DAT was recorded in T₁₀ (control). Treatment T₄ applied for an overall duration of 30 to 120 days, significantly enhanced soil health by increasing organic carbon levels, improving available NPK, elevating dehydrogenase activity. These synergistic improvements in soil conditions could have increased the plant height, were similarly reported by Beer *et al.* (2017), Chandramohan Reddy and Goyal (2020) and Kumar Rajeev (2023).

Plant Spread (E-W) (cm)

In the present study, plant spread (E-W) shows that treatment T₄ (RDN @ 75% + FYM 10 t/ha + Enriched Biochar 3 t/ha + Biofertilizers 5 kg/ha) recorded the maximum plant spread (E-W) of 35.35 cm. Significantly the minimum plant spread (E-W) 31.00 cm was recorded at 120 DAT in T₁₀ (control). The increased plant spread in strawberries treated with vermicompost, FYM and biofertilizers can be attributed to the enhanced availability of plant growth regulators and humic acid. These beneficial compounds arise from increased microbial activity in the soil, a finding consistent with observations from Singh *et al.* (2015) and Tripathi *et al.* (2020).

Plant spread (N-S) (cm)

Examining the plant spread (N-S), treatment T₄ (RDN @ 75% + FYM 10 t/ha + Enriched Biochar 3 t/ha + Biofertilizers 5 kg/ha) recorded the maximum plant spread (N-S) of 35.80 cm, while significantly lowest plant spread

Table 1: Effect of integrated nutrient management on plant growth in strawberry.

Treatment	Plant height	Plant spread (E-w)	Plant spread (N-S)
T ₁ : RDN @ 100% + FYM (10t/ha)	20.00	33.00	34.13
T ₂ : RDN@75%+ FYM (10t/ha) + Biofertilizers (5kg/ha)	20.70	33.07	34.07
T ₃ : RDN@50% + FYM(5t/ha) + Vermicompost (2.5t/h) + Biofertilizers (5kg/h)	20.80	34.10	34.93
T ₄ : RDN @ 75% + FYM (10t/h) + Enriched Biochar (3t/h) + Biofertilizers(5kg/h)	21.50	35.35	35.80
T ₅ : RDN @ 50% + FYM(5t/h) + Vermicompost (2.5t/h) + Enriched Biochar (3t/h) + Biofertilizers (5kg/h)	21.30	34.17	35.13
T ₆ : FYM (10t/h) + Enriched Biochar (3t/h) + Biofertilizers (5kg/h)	19.50	32.10	32.57
T ₇ : FYM (10t/h) + Biofertilizers (5kg/h)	18.83	31.23	31.67
T ₈ : Vermicompost (5t/h) + Biofertilizers (5kg/h)	18.87	31.67	32.37
T ₉ : FYM (5t/h) + Vermicompost (2.5t/h) + Biofertilizers(5kg/h)	19.67	32.53	32.70
T ₁₀ : Control	17.67	31.00	29.53
GRANDMEAN	19.88	32.82	33.29
SE m (±)	0.591	0.894	0.965
CD at 5%	1.756	2.656	2.866
CV	5.148	4.718	5.019

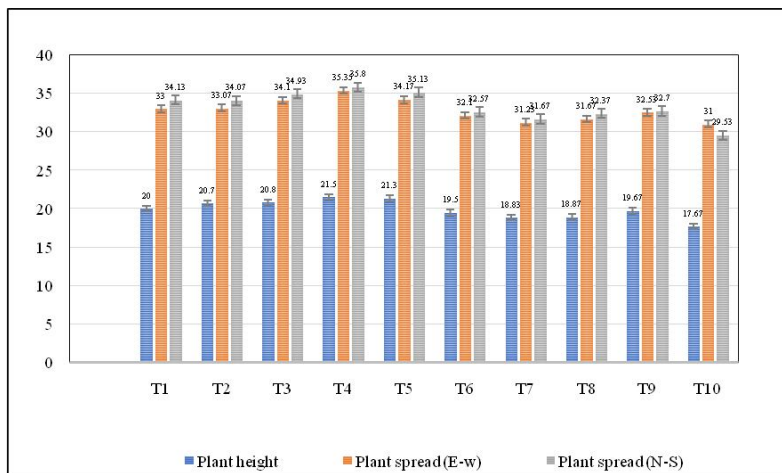


Fig. 1: Effect of integrated nutrient management on plant growth in strawberry.

(N-S) 29.53 cm was recorded at 120 DAT in T₁₀ (control). Thus applying organic manures and inorganic fertilizers with bio-fertilizers significantly increased strawberry plant spread and vegetative development. These treatments improved soil health by increasing organic carbon content, enhancing the availability of nitrogen, phosphorus and potassium (NPK), increasing microbial biomass, and stimulating dehydrogenase activity. This improvement in soil conditions directly translated to enhanced plant growth. The soil, characterized by increased organic matter, showed better structure and water retention capabilities. More available nutrients and active microbes facilitated more efficient nutrient uptake and cycling by the plants. These findings align with reports from Soni *et al.* (2018) and also using of vermicompost, poultry

manure, Azotobacter and PSB on strawberry growth similar results were found by Jain and Kumar (2021) and Singh *et al.* (2022).

Number of runners per plant

The maximum number of runners per plant, noted at 5.93, was in treatment T₇ (FYM 10 t/ha + Biofertilizers 5 kg/ha) and T₉ (FYM 5 t/ha + Vermicompost 2.5 t/ha + Biofertilizers 5 kg/ha), significantly the minimum number of runners (3.70) was recorded in treatment T₁₀ (control). The number of runners produced by strawberry plants varies due to differences in photosynthate transfer from source to sink, a process largely controlled by genetic factors. The results observed in treatments with Farmyard Manure (FYM), vermicompost and biofertilizers can be attributed to the application of these compounds. These amendments enhance soil fertility and microbial activity, leading to improved nutrient uptake and the production of plant growth regulators. This creates an environment that supports vegetative growth and efficient photosynthate partitioning, thereby promoting increased runner development, as reported by Gowda *et al.* (2017), Singh *et al.* (2016).

Days to runner formation after planting

The control (T₁₀) consistently took the longest to form runners at 45.80 days, in conversely treatment T₈ (Vermicompost 5 t/ha + Biofertilizers 5 kg/ha) showed the earliest runner development at 30.80 days. The number of runners produced by strawberry plants, along

Table 2: Effect of integrated nutrient management on runners characters in strawberry

Treatments	No. of runners per plant	Days to runner fromation after planting
T ₁ : RDN @ 100% + FYM (10t/ha)	5.27	37.60
T ₂ : RDN@75%+ FYM (10t/ha) + Biofertilizers (5kg/ha)	5.13	34.27
T ₃ : RDN@50% + FYM(5t/ha) + Vermicompost (2.5t/h) + Biofertilizers (5kg/h)	4.87	44.20
T ₄ : RDN @ 75% + FYM (10t/h) + Enriched Biochar (3t/h) + Biofertilizers(5kg/h)	4.73	40.40
T ₅ : RDN @ 50% + FYM(5t/h) + Vermicompost (2.5t/h) + Enriched Biochar (3t/h) + Biofertilizers (5kg/h)	4.80	43.07
T ₆ : FYM (10t/h) + Enriched Biochar (3t/h) + Biofertilizers (5kg/h)	5.47	37.27
T ₇ : FYM (10t/h) + Biofertilizers (5kg/h)	5.93	35.73
T ₈ : Vermicompost (5t/h) + Biofertilizers (5kg/h)	5.80	30.80
T ₉ : FYM (5t/h) + Vermicompost (2.5t/h) + Biofertilizers(5kg/h)	5.93	38.00
T ₁₀ : Control	3.70	45.80
GRAND MEAN	5.16	38.71
SE m (±)	0.171	1.194
CD at 5%	0.508	3.547
CV	5.738	5.341

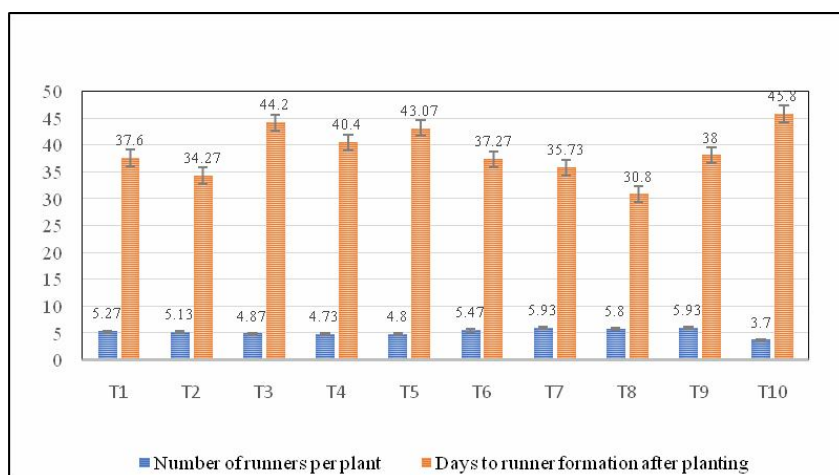


Fig. 2: Effect of integrated nutrient management on runner characters in strawberry.

with their formation time, varies due to factors that cause plants to respond differently even under consistent environmental conditions. The use of Vermicompost and Biofertilizers resulted in the earliest runner development. This accelerated initiation is likely due to the improved nutrient availability, soil health and the production of plant growth regulators by these different amendments, which collectively promote strong plant growth and a shift towards runner production, consistent with findings reported by Gowda *et al.* (2017), Singh *et al.* (2016) and Beer *et al.* (2017).

Conclusion

It can be concluded that a synergistic application of both inorganic and organic amendments is crucial for optimizing strawberry plant growth and vigour. The integrated nutrient management strategy employed in Treatment T₄, which combined Recommended Dose of Nitrogen (RDN) with Farmyard Manure (FYM), enriched biochar, and biofertilizers, consistently resulted in the highest values for key agronomic parameters, including plant height, plant spread. This superior performance is a direct result of the treatment's positive impact on soil health, leading to elevated organic carbon levels, increased nutrient availability, and enhanced microbial activity. While treatments like T₇ and T₉ were very effective at promoting vegetative propagation by increasing runner count and T₈ was notable for its early runner development, the overall findings underscore that a holistic approach to soil fertility and plant nutrition is fundamental for maximizing strawberry crop productivity. Conversely, the control (T₁₀) treatment consistently low performance across all metrics highlights the critical importance of these soil amendments for a successful yield.

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