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Effect of different organic manures on vegetative growth of mango (*Mangifera indica* L.) var. Amrapali

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Abstract
The present field experiment entitled “Effect of different organic manures on vegetative growth of Mango (*Mangifera indica* L.) var. Amrapali” was carried out at the horticulture farm of Sam Higginbottom University of Agriculture Technology and Sciences, Prayagraj during the year 2024-25 to study the performance of different varieties for vegetative growth, reproductive growth, fruit physical parameters, yield parameters, quality of fruits and organoleptic parameters under high density planting. The experiment comprised of 7 (6 + 1) treatments with 03 replications in randomized block design. A field experiment was conducted to evaluate the impact of various nutrient management treatments on the vegetative and physiological growth parameters of the Amrapali mango cultivar. The study included different combinations of organic and inorganic fertilizers, with a focus on plant height, stem girth, plant spread, number of branches and leaves, leaf area index, chlorophyll content, and survival percentage. Among the treatments, T_6 (FYM + Recommended Dose of Fertilizers (RDF) + Vermicompost) consistently recorded the highest values for all observed parameters. Maximum plant height (1.26 m), stem girth (3.84 cm), number of branches (1.27), plant spread (48.07 cm N-S and 53.51 cm E-W), number of leaves (97), leaf area index (58.67), chlorophyll content (41.37), and survival percentage (93.33%) were recorded under T_6. The second-best performance was observed under T_5 (Compost + RDF), while the control treatment T_0 recorded the lowest values across all parameters. These results indicate that the integrated application of FYM, RDF, and vermicompost is the most effective treatment for improving the growth, physiological health, and survival of Amrapali mango plants.

Keywords: Mango, organic manures, Amrapali, vegetative growth, vermicompost, nutrient management

1. Introduction

Mango (*Mangifera indica* L.), with a chromosome number of 2n=40, belongs to the family Anacardiaceae and originated in the Indo-Burma region. Revered as the "King of Fruits" and India's national fruit, mango is cherished for its rich aroma, vibrant color, delicious taste, and high nutritional value, making it popular both domestically and globally. Despite India being the largest producer, contributing about 60% of global mango production, productivity remains low due to factors like traditional planting systems with wide spacing (10-12m) and poor orchard management.

Among the many mango varieties, ‘Amrapali’ stands out as a hybrid of Dashehari and Neelum, developed in 1971 by Dr. P.K. Majumdar. This dwarf, regular-bearing cultivar produces deep orange-red fruits rich in β-carotene, although it has a short shelf life. On average, Amrapali yields about 16 tonnes per hectare. Mangoes are nutrient-dense, offering vitamin A, C, fiber, and essential minerals, and are known for their health benefits such as boosting immunity, aiding digestion, enhancing skin health, and improving vision.

Mango trees grow well in tropical to subtropical climates, tolerating temperatures from 18 °C to 48 °C with proper irrigation. They require low maintenance and thrive in rainfall ranging from 25 to 250 cm annually. Mangoes are used in both raw and ripe forms for chutneys, pickles, juices, jams, and other products. Additionally, mango wood, leaves, and kernels have multiple economic and medicinal uses.

India's mango exports primarily target the UAE, USA, and Middle East, though limited to select varieties like Alphonso and Dashehari.

With increasing global demand, improving mango productivity and quality is vital. High-Density Planting (HDP) is an emerging technique that enhances land use efficiency and yield, particularly with compact varieties like Amrapali. However, without proper pruning, overcrowding can reduce light penetration and increase disease incidence, affecting productivity. Recent research focuses on combining HDP with organic nutrient management and pruning to optimize growth, yield, and fruit quality in rejuvenated orchards.

2. Materials and Methods

The experiment will be carried out during 2024-25 on Horticulture research farm of Department of Horticulture, Naini Agriculture Institute Allahabad, India-211007, (U.P.) India, the experimental site is located at 24.26 N latitude 81.51 E longitude and 98 m above the mean sea level. During the period from July to November 2024, Prayagraj (formerly Allahabad) experienced a typical monsoon-to-autumn transition in its climate. July marked the height of the monsoon season, with average maximum temperatures ranging from 35 °C to 39.6 °C and minimums around 22 °C to 29 °C. Significant rainfall was recorded on certain days, notably 68.2 mm on July 25th, contributing to relatively high humidity levels, often exceeding 60% in the mornings and 50% in the afternoons. In August, temperatures slightly dipped due to consistent rainfall and thick cloud cover, with some days receiving over 70 mm of rain, and sunshine hours were reduced to as low as 0 to 2.2 hours. September saw a gradual retreat of the monsoon, with decreasing rainfall and increasing sunshine. Temperatures remained high, often above 35 °C, but humidity levels began to decline. By October and November, rainfall became negligible, skies cleared up, and evaporation rates increased again, signaling the start of the dry season. Daily sunshine exceeded 8 hours, and maximum temperatures stabilized between 30 °C and 36 °C. This climatic progression reflects the subtropical nature of Prayagraj, with hot, wet summers transitioning into cooler, drier autumn months. The hybrid variety is cross between Dashehari x Neelum and Regular in bearing. The data recorded for different characteristics were subjected to statistical analysis by adopting the method of analysis of variance (ANOVA) as described by Gomez and Gomez (1984). The significance of comparison was tested. The significant difference values were computed for 5% probability of error. Wherever the variance ratio (F value) was found significant, critical difference (CD) values were computed for the comparison among the treatment means.

2.1 Treatments

Treatment no.	Treatment combinations
T_0	Control
T_1	Compost
T_2	FYM
T_3	RDF (20 t/ha.)
T_4	Compost + FYM
T_5	Compost + RDF
T_6	FYM + RDF + Vermicompost

Plate 1: Field Preparation and Transplanting of Amrapali Mango in Department field, Department of Horticulture, NAI, SHUATS.

3. Results and Discussion

The present investigation on “Effect of different organic manures on vegetative growth on growth of mango (*Mangifera indica* L.) var. Amrapali” was carried out at at Horticulture research farm, central orchard Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology & Sciences, Prayagraj U.P. during 2024-2025.

3.1 Vegetative Characteristics

The vegetative growth parameters *viz*., Plant height (m), Stem girth (cm), Plant spread N-S and E-W (cm), No. of leaves were recorded at an interval of 30 Days and also recorded number of tertiary branches. All the vegetative growth parameters differed significantly among the treatments and are furnished below.

3.1.1 Plant Height (m)

Among all treatments, T_6 demonstrated superior performance in promoting plant height, reaching 1.26 meters indicating optimal growth conditions. It was closely followed by T_5 (1.24 m) and T_3 (1.22 m), which also showed enhanced vegetative development. In contrast, the control treatment T_0 recorded the lowest height (0.81 m), reflecting the limited growth under untreated conditions. This clear gradient in plant height emphasizes the positive impact of improved treatments on plant vigor, with T_6 emerging as the most effective strategy for maximizing vertical growth.

3.1.2 Stem Girth (cm)

Stem T_6 recorded the highest stem girth of 3.84 cm, indicating robust structural development and enhanced nutrient translocation capacity. T_5 followed closely with 3.79 cm, also reflecting significant stem thickening. In contrast, the lowest stem girth of 3.00 cm was observed in the control treatment T_0, highlighting the adverse effect of the absence of interventions. This trend underscores the efficacy of advanced treatments in promoting stem growth, with T_6 standing out as the most beneficial.

3.1.3 Number of tertiary branches
The final result was recorded T_6 recorded the highest number of tertiary branches (1.27), closely followed by T_1 (1.20), indicating a strong positive response to organic manure application in promoting lateral growth. The increased branching suggests improved nutrient availability and hormonal stimulation under treated conditions. In contrast, the control treatment T_0 exhibited the lowest number of tertiary branches (0.67), reflecting poor structural development. These results highlight the significant role of organic inputs in enhancing plant architecture, with T_6 and T_1 showing notable advantages.

3.1.4 North-South plant spread
At 150 Days After Planting (DAP), T_6 exhibited the maximum plant spread of 48.07 cm, followed closely by T_5 at 47.33 cm, indicating vigorous lateral growth under improved treatment conditions. In contrast, the control treatment T_0 recorded the lowest spread of 34.67 cm, highlighting restricted canopy development. These findings underscore the effectiveness of organic and nutrient-enriched treatments in enhancing plant spread and overall growth performance.

3.1.5 East-West plant spread
At 150 Days After Planting (DAP), T_6 recorded the highest plant spread of 53.51 cm, closely followed by T_5 at 52.47 cm, indicating superior canopy expansion under enhanced treatment conditions. In contrast, the lowest spread of 27.33 cm was observed in the control (T_0), reflecting limited lateral growth without intervention. This clearly demonstrates the positive impact of improved treatments on horizontal plant development and overall vigor.

3.1.6 Number of Leaves
The final result was recorded T_6 recorded the highest number of leaves (97), followed closely by T_5 with 95.67 leaves, reflecting enhanced foliage development under improved treatment conditions. In contrast, the control treatment T_0 produced the fewest leaves (43), indicating restricted vegetative growth. These results emphasize the crucial role of nutrient-rich treatments in promoting leaf production and overall plant vigor.

3.1.7 Chlorophyll Content (SPAD)
The maximum chlorophyll content (41.37) was recorded under T_6 (FYM + RDF + Vermicompost), indicating the highest levels of chlorophyll and potentially reflecting enhanced vegetative health and growth.

3.1.8 Leaf Area Index (LAI)
The maximum LAI (58.67) was recorded under T_6 (FYM + RDF + Vermicompost). This indicates that this treatment was the most effective in promoting leaf growth, enhancing the overall vegetative development of the mango trees.

Plate 2: Weeding and Data measurement in Amrapali Mango in Department field, Department of Horticulture, NAI, SHUATS.

Table 1: Vegetative parameters of different organic manures on vegetative growth on Mango (*Mangifera Indica* L.) Var. Amrapali at 150 DAP

Treatments	Plant Height (m)	Stem Girth (cm)	Number of Tertiary Branches	North South Plant Spread	East West Plant Spread	Number of Leaves	Chlorophyll Content (SPAD)	Leaf Area Index (LAI)
T_0	0.81	3.00	0.67	34.67	27.33	43	27.47	48.67
T_1	1.2	3.67	1.2	47.2	47.4	88	32.53	52.67
T_2	1.19	3.71	1	46	46.87	91	33.90	56.00
T_3	1.22	3.71	1.13	46.2	48	91.6	37.00	54.87
T_4	1.2	3.78	0.8	46.9	51.53	94	37.33	53.00
T_5	1.24	3.79	1.16	47.33	52.47	95.67	38.67	56.67
T_6	1.26	3.84	1.27	48.07	53.51	97	41.37	58.67
F test	S	S	S	S	S	S	S	S
SEm±	0.02	0.05	0.21	0.86	0.73	2.23	1.23	1.11
CD @ 5%	0.07	0.15	0.66	2.66	2.24	6.87	3.78	3.42
CV (%)	3.36	2.31	36.51	3.31	2.70	4.55	6.05	3.51

3.2 Economics of the Treatments
3.2.1 Survival Percentage (%)
The **survival percentage** of mango trees under different treatments was evaluated, and the results are summarized below:

The maximum survival percentage (93.33%) was recorded under T_6 (FYM + RDF + Vermicompost), the second highest survival percentage (86.67%) was observed under T_5 (FYM + RDF) and the minimum survival percentage (67.00%) was recorded under T_0 (Control) indicating that this combination of organic treatments had the most positive effect on the survival rate of the mango trees.

Table 2: Survival Percentage on different organic manures on Mango (*Mangifera Indica* L.) Var. Amrapali

Treatments	Survival percentage (%)
T_0	67.00%
T_1	73.33%
T_2	73.33%
T_3	80.00%
T_4	80.00%
T_5	86.67%
T_6	93.33

Overall, the study highlights the significant role of integrating organic manures with recommended fertilizers to enhance the growth and survival of mango trees. The combination of FYM, RDF, and Vermicompost (T_6) emerged as the most effective treatment for promoting vegetative growth, improving plant health, and ensuring a high survival rate. The results also underscore the importance of organic inputs in mango cultivation, as they improve soil fertility, nutrient availability, and plant resilience. The findings from this study are valuable for developing sustainable agricultural practices aimed at improving the productivity and longevity of mango orchards.

4. Conclusion
On the basis above findings, it is be concluded that use of organic resources and RDF drastically enhance of different organic manures on vegetative growth, the plant height, number of branches per plant, fruit parameter, yield parameter and quality parameter, stem diameter of mango fruit plants respectively. From the application of organic manures and fertilizers significantly enhances the survival and growth of mango trees across all observed parameters. Treatment T_6 (FYM + RDF + Vermicompost) consistently yielded the highest values for plant height, stem girth, number of tertiary branches, plant spread (both north-south and east-west), number of leaves, chlorophyll content, and Leaf Area Index, demonstrating the superior efficacy of this combined organic treatment in promoting vegetative growth and survival. Treatment T_5 (FYM + RDF) ranked second in most growth parameters, showcasing the positive impact of farmyard manure and recommended fertilizers, albeit slightly less effective than T_6 due to the absence of vermicompost. On the other hand, the control treatment (T_0), which lacked organic amendments, consistently showed the lowest performance across all growth stages, highlighting the critical role of nutrient supplementation in enhancing the growth and survival of mango trees. The survival percentage data further emphasized the effectiveness of T_6, with the highest survival rate of 93.33%, followed by T_5 at 86.67%. RDF treatments (T_3 and T_4) exhibited a survival rate of 80%, while the control (T_0) recorded the lowest survival at 67%. These findings underscore the importance of integrating organic manures and fertilizers for improved growth, survival, and overall health of mango trees.

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