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IMPACT OF VARIOUS NUTRIENT SUBSTANCES THROUGH FOLIAR SPRAY ON GROWTH AND REPRODUCTIVE ATTRIBUTES IN MANGO (*MANGIFERA INDICA* L.) CV. MALLIKA

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ABSTRACT

The present study titled Impact of Various Nutrient Substances Through Foliar Spray on Growth and Reproductive Attributes in Mango (*Mangifera indica* L.) cv. Mallika was conducted at Kittur Rani Channamma College of Horticulture, Arabhavi, during the year 2023-24. Mango trees, were planted at a spacing of 10 m × 5 m, with eight treatments involving various concentrations of nutrient solutions like Novel organic liquid (Navsari) @ 1 and 2 per cent, Multi micronutrient fertilizer for mango (Multiplex) @ 0.25 and 0.5 per cent, Sea weed extract (IFFCO) @ 1 and 2 per cent, and Mango special (IIHR) @ 0.50 per cent in a Randomized Complete Block Design (RCBD) with three replications. Four foliar sprays were administered according to the treatments. Among the various nutrient treatments, T₂- Novel organic liquid (Navsari) @ 2 per cent showed the most significant improvement in tree height (6.86 m and 7.66 m) at three months and six months after spray respectively with an incremental increase of 1.52 m. Canopy volume (6.09 m³), early flowering (77 days), greater number of panicles (86.66), maximum hermaphrodite flowers (29.92%), highest fruit set (14.95%), fruit retention (8.64%) and minimum fruit drop (91.36%) also recorded in treatment T₂ compared to the other treatments.

Keywords : Mango, Foliar spray, Micronutrients, Vegetative and

Introduction

Mango (*Mangifera indica* L.) is a premier fruit crop of India considering its area, production, popularity among the people and designated as the 'National Fruit of India'. It is the King of fruits grown in India for over 4000 years. Mango is a fleshy stone fruit belonging to the genus *Mangifera*, belonging to family Anacardiaceae. India's share is about 65 per cent of total mango production in the world (Kacha *et al.*, 2021). It is highly nutritive fruit crop, suitable for pickling, chutney preparation, excellent table fruits and also can be transformed into a variety of products (Radha and Mathew, 2019).

Among the commercially grown cultivars, Mallika is a hybrid variety known for its high yield, consistent fruiting and a late-season cultivar with promising export potential. The fruit is medium to large in size (307 to 600 grams), exhibits a cadmium-yellow color, has a high total soluble solid (TSS), a pleasant aroma and good shelf life (Vidyashree *et al.*, 2021). In spite of adequate flowering, low fruit yield in mango orchards has been experienced because of low fruit set and subsequently higher fruitlet abscission (Kumar *et al.*, 2023). These may be due to the deficiency of micronutrients. In plants, micronutrients are required for different physiological and metabolic

processes contribute to an increase in the number of hermaphrodite flowers, enhance fruit set, improve fruit retention and reduce flower and fruit drop. Foliar application is the common practice and may be 6 to 12 times more effective than soil application (Rangare *et al.*, 2022). Therefore, the present study, titled “Impact of Various Nutrient Substances on Growth and Reproductive Attributes Through Foliar Spray in Mango (*Mangifera indica* L.) cv. Mallika” aims to investigate the effects of foliar nutrition on both vegetative and reproductive parameters.

Material and Methods

Location of research plot and treatment details

The present investigation was carried out at Kittur Rani Channamma College of Horticulture, Arabhavi, during the year 2023-24. Basal application of manures and fertilizers, were followed according to the recommended schedule of UHS Bagalkot. A Randomised Complete Block Design (RCBD) was used to set up the experiment with eight treatments and three replications [T₁ - Novel organic liquid (Navsari) @ 1%, T₂ - Novel organic liquid (Navsari) @ 2%, T₃ - Multi micronutrient fertilizer for mango (Multiplex) @ 0.25%, T₄ - Multi micronutrient fertilizer for mango (Multiplex) @ 0.50%, T₅ - Sea weed extract (IFFCO) @ 1%, T₆ - Sea weed extract (IFFCO) @ 2%, T₇ - Mango special (IIHR) @ 0.50%, T₈ - Control (water spray)]

Method of foliar spray

Four foliar sprays were applied according to the treatments. The first and second foliar application was done in October and December 2023, prior to panicle emergence. The third and fourth foliar application was carried out at the pea-size and lemon-sized fruits in March and April 2024, respectively.

Observations recorded

Vegetative parameters like tree height were measured from ground level to the tip of the plant, trunk girth at the collar region and canopy spread both in North-South and East-West directions were measured using measuring tape both before and after the foliar sprays. Canopy volume was calculated using Castle's formula and the incremental increase in growth parameters were worked out.

Reproductive parameters like the number of days to flowering after first foliar spray, total number of panicles in a tree was recorded by physical counting. The percent hermaphrodite flowers were determined by calculating the ratio of perfect flowers to the total number of flowers per panicle, percent fruit set at pea stage, percent fruit drop and fruit retention at harvest

was recorded from the randomly tagged five panicles per tree as per the treatments.

The data collected were analysed statistically analysed as described by Fisher and Yates (1963) at a significance level of $p=0.05$ for both the 'F' and 't' tests.

Results and Discussion

Vegetative parameters

The data pertaining to vegetative parameters *viz.*, tree height, trunk girth, canopy spread and canopy volume are depicted in Table 1, 2, 3 and 4.

The analysis revealed a maximum tree height across treatments at both three and six months after the initial foliar application. The highest tree height was achieved with the application of two per cent Novel organic liquid reaching 6.86 m at three months and 7.66 m at six months, which was on par with one per cent of Novel organic liquid and Seaweed extract at two per cent, reaching 6.44 m and 6.38 m at three months and 7.25 m and 7.12 m at six months, respectively. The trees treated with Novel organic liquid at two per cent showed highest incremental increase in tree height (1.52 m) which was on par with Novel organic liquid at one per cent (1.43 m). The control treatment (water spray) recorded the lowest tree height at both three and six months after the initial foliar application, with measurements of 5.18 m and 5.34 m, respectively showing a minimal height increase of 0.18 m.

Three months after the initial foliar spray, the greatest canopy spread in the North-South direction was observed with two per cent Novel organic liquid (7.47 m) which was on par with one per cent Novel organic liquid (7.30 m) and two per cent Seaweed extract (6.92 m). Six months of the initial foliar application, the highest canopy spread in the North-South direction was also achieved with two per cent Novel organic liquid (9.12 m), which was on par with one per cent Novel organic liquid (8.95 m). The maximum incremental increase in canopy spread in the North-South was recorded with Novel organic liquid at two per cent (2.51 m) which is on par with Novel organic liquid at one per cent (2.35 m). In contrast, the minimum was recorded with control (6.87 and 7.28 m) with less incremental increase of 1.60 and 1.44 m, respectively. The experimental results are found in line with the findings of Krishnamoorthy and Hanif (2015) in mango cv. Imampasand [T₃ (T₁+foliar application of mango special @ 0.5 per cent)] recorded maximum tree height and canopy spread, Panwar and Singh (2018) in cv. Langra observed combined foliar spray of boron, zinc, iron and copper increased tree height and canopy spread, Sharma *et al.* (2020) in cv. Dashehari

found that calcium chloride at one per cent + borax at 0.5 per cent followed by application of borax at 0.5 per cent increased tree height, Ram and Bose (2000) in Mandrin orange (Mg + Cu + Zn) showed increased in tree height and canopy spread.

The treatment Seaweed extract at two per cent recorded the maximum canopy volume (21.38 m³) which was on par with Novel organic liquid at two per cent (21.33 m³) and minimum increase in canopy volume was recorded in control (14.59 m³) after three months of first foliar spray. The canopy volume was recorded maximum in two per cent Seaweed extract (24.24 m³) which was found on par with Novel organic liquid at two per cent (23.75 m³), Seaweed extract at one per cent (22.53 m³) and minimum canopy volume

was recorded in control (17.05 m³) after six months of first foliar spray. The plants treated with Novel organic liquid at two per cent showed significantly highest incremental increase in canopy volume (6.09 m³) which was found on par with Novel organic liquid at one per cent, Seaweed extract at two and one per cent with an incremental increase of 5.96, 5.88 and 5.67 m³, respectively. In contrast, the control (water spray) had the smallest increase in canopy volume with only 4.04 m³. These observations corroborated the findings of Panwar and Singh (2018) in cv. Langra (combined foliar spray of zinc + iron), Kumar *et al.* (2020) in pomegranate cv. Bhagwa [KNO₃ (1.0%) + CaCl₂ (1.0%) + H₃BO₃ (0.4%)].

Table 1 : Effect of foliar nutrients on tree height and trunk girth in mango cv. Mallika

Treatment	Tree height (m)				Trunk girth (cm)
	Before foliar spray	3 months after 1 st spray	6 months after 1 st spray	Incremental increase	
T ₁ - Novel organic liquid @ 1%	5.82	6.44	7.25	1.43	71.67
T ₂ - Novel organic liquid @ 2%	6.14	6.86	7.66	1.52	87.37
T ₃ - Multi micronutrient fertilizer for mango @ 0.25%	5.12	5.28	5.84	0.72	77.21
T ₄ - Multi micronutrient fertilizer for mango @ 0.50%	5.30	5.50	6.11	0.81	71.62
T ₅ - Seaweed extract @ 1%	5.86	6.11	6.81	0.95	81.78
T ₆ - Seaweed extract @ 2%	6.07	6.38	7.12	1.05	76.18
T ₇ - Mango special @ 0.5%	5.15	5.25	5.75	0.60	75.13
T ₈ - Control (water spray)	5.14	5.18	5.34	0.18	74.70
S. Em±	0.15	0.22	0.25	0.03	3.64
C.D. at 5%	0.46	0.68	0.77	0.10	NS
CV (%)	8.20	11.46	11.82	10.97	

NS- Non significant

Table 2 : Effect of foliar nutrients on canopy spread (N-S) (m) in mango cv. Mallika

Treatment	Canopy spread (N-S) (m)			
	Before foliar spray	3 months after 1 st spray	6 months after 1 st spray	Incremental increase
T ₁ - Novel organic liquid @ 1%	6.60	7.30	8.95	2.35
T ₂ - Novel organic liquid @ 2%	6.61	7.47	9.12	2.51
T ₃ - Multi micronutrient fertilizer for mango @ 0.25%	5.56	6.04	7.68	2.12
T ₄ - Multi micronutrient fertilizer for mango @ 0.50%	5.58	6.10	7.75	2.17
T ₅ - Seaweed extract @ 1%	6.09	6.69	8.30	2.21
T ₆ - Seaweed extract @ 2%	6.02	6.92	8.27	2.25
T ₇ - Mango special @ 0.5%	5.26	5.56	7.22	1.96
T ₈ - Control (water spray)	5.27	5.32	6.87	1.60
S. Em±	0.18	0.21	0.26	0.06
C.D. at 5%	0.57	0.65	0.80	0.20
CV (%)	9.60	10.10	9.87	9.57

It was observed that the significantly incremental increase in plant height, plant spread both in North-South and East-West direction and canopy volume was found to be in Novel Organic Liquid at two per cent. As the Novel organic liquid rich in nutrients, growth hormones, biochemicals and biofertilizers, may

promote enhanced plant growth. Growth hormones such as cytokinins and gibberellins may stimulate cell division, regulate plant development and promote stem elongation. This results in increased vegetative growth during the spring, leading to higher chlorophyll levels, improved photosynthesis and greater carbohydrate

accumulation due to adequate micronutrient availability, hence increases the tree height, canopy spread and canopy volume. Additionally, the presence of urease, which aids in nitrogen recycling, along with total phenols, further contributes to the overall vegetative growth of the plants.

Table 3 : Effect of foliar nutrients on canopy spread (E-W) (m) in mango cv. Mallika

Treatment	Canopy spread (E-W) (m)			
	Before foliar spray	3 months after 1 st spray	6 months after 1 st spray	Incremental increase
T ₁ - Novel organic liquid @ 1%	7.16	7.61	9.58	2.42
T ₂ - Novel organic liquid @ 2%	7.35	7.85	9.85	2.50
T ₃ - Multi micronutrient fertilizer for mango @ 0.25%	5.75	5.96	7.62	1.87
T ₄ - Multi micronutrient fertilizer for mango @ 0.50%	5.97	6.26	7.88	1.90
T ₅ - Seaweed extract @ 1%	7.47	7.82	9.44	1.97
T ₆ - Seaweed extract @ 2%	7.54	7.94	9.56	2.02
T ₇ - Mango special @ 0.5%	5.78	5.93	7.50	1.72
T ₈ - Control (water spray)	5.84	5.89	7.28	1.44
S. Em±	0.23	0.25	0.26	0.07
C.D. at 5%	0.72	0.76	0.79	0.22
CV (%)	10.78	10.99	9.16	11.35

Table 4 : Effect of foliar nutrients on canopy volume (m³) in mango cv. Mallika

Treatment	Canopy volume (m ³)			
	Before foliar spray	3 months after 1 st spray	6 months after 1 st spray	Incremental increase
T ₁ - Novel organic liquid @ 1%	15.39	18.64	21.35	5.96
T ₂ - Novel organic liquid @ 2%	17.66	21.33	23.75	6.09
T ₃ - Multi micronutrient fertilizer for mango @ 0.25%	13.24	15.62	18.51	5.27
T ₄ - Multi micronutrient fertilizer for mango @ 0.50%	12.34	14.82	17.68	5.34
T ₅ - Seaweed extract @ 1%	16.86	19.73	22.53	5.67
T ₆ - Seaweed extract @ 2%	18.36	21.38	24.24	5.88
T ₇ - Mango special @ 0.5%	11.50	13.48	16.15	4.65
T ₈ - Control (water spray)	13.01	14.59	17.05	4.04
S. Em±	0.43	0.52	0.68	0.19
C.D. at 5%	1.32	1.60	2.07	0.57
CV (%)	8.85	9.10	10.19	10.67

Reproductive parameters

The reproductive traits, including number of days to flowering, number of panicles per tree, percentage of hermaphrodite flowers, fruit set, fruit retention and fruit drop percentage were recorded and are presented in Tables 5 and 6.

Early flowering was noticed in Novel organic liquid at two per cent (77 days) which is on par with Novel organic liquid at one per cent (80 days) and Seaweed extract at 2 per cent (85 days) and maximum days was taken in control (102 days) after the first foliar application. The experimental results are accordance with Anusuya *et al.* (2018) in mango cv. Bangalora [PBZ (paclobutrazol) at 0.75 g per m² + KNO₃ (1%) + NAA (20 ppm)], Pavithra *et al.* (2021) in mango (Agricol at 5 g). The number of panicles were found maximum with the treatment Novel organic liquid at two per cent (86.66) which was on par

with Novel organic liquid at one per cent (84.03), Seaweed extract at two per cent (81.18) and Seaweed extract at one per cent (80.03) and was found minimum in control (water spray) (56.37). The maximum hermaphrodite flowers were recorded with Novel organic liquid at two per cent (29.92%) which was on par with Novel organic liquid at one per cent (27.83) and minimum was recorded with control treatment (18.30%). This improvement may be attributed to the presence of biofertilizers such as Azotobacter and phosphate-solubilizing bacteria (PSB), along with growth hormones that enhance panicle initiation and flowering while ensuring a strong micronutrient profile. The treatments containing these biofertilizers-where Azotobacter aids in atmospheric nitrogen fixation and PSB facilitates phosphate solubilization in the soil effectively compensate for the reduced NPK dosage. This results in a healthier soil environment,

which ultimately boosts panicle emergence, increases the number of hermaphrodite flowers and reduces fruit drop. According to the findings of Sudha *et al.* (2012) the higher number of panicles and number of hermaphrodite flowers was obtained with foliar spray of KNO_3 at two per cent, Anusuya *et al.* (2018) observed more of hermaphrodite flowers per panicle and number of panicles when treated with PBZ (paclobutrazol) at 0.75 g per m^2 + KNO_3 (1%) + NAA (20 ppm), Hussein (2023) recorded maximum total number of panicles, perfect flowers in trees when treated with two per cent mono-potassium phosphate plus 2000 ppm calcium in four sprays, along with 1000 ppm amino acids in consecutive years in mango.

The percentage of fruit set was found highest in the treatment Novel organic liquid at two per cent (14.95) which was on par with Novel organic liquid at one per cent (13.79%) and was found minimum in control (5.98). The maximum fruit retention was recorded in Novel organic liquid at two per cent (8.64%) and minimum was found in control (1.33%). The minimum fruit drop was recorded with Novel organic liquid at two per cent (91.36%) which was on par with Novel organic liquid at one per cent (92.45%),

Seaweed extract at two per cent (93.14%) and Seaweed extract at one per cent (93.84%) and maximum was recorded with control (98.67%). This result was accordance to the findings of Abd El-Razek *et al.* (2013) who observed spraying sword (KO 25%, Mg 0.5%, Zn 0.5%, salicylic acid 25%, L- ascorbic acid 0.01%, 2 riboflavin 0.01%) at 2 per cent increased fruit set, reduced fruit drop and raising fruit retention in successive year in cv. Hindi, Sankar *et al.* (2013) showed the higher fruit set at pea stage, fruit retention and minimum fruit drop under the foliar spray of boric acid (0.02%) in cv. Alphonso, Momin *et al.* (2016) found the treatment tricentanol at 750 $mg\ l^{-1}$ enhanced fruit set at pea and marble stage per panicle, fruit retention and minimize fruit drop in mango in cv. Kesar. This enhancement can be attributed to improved nutrient efficiency from foliar applications of essential micronutrients like zinc, boron and manganese. Additionally, growth hormones such as cytokinin and gibberellins play a significant role in increasing fruit set and retention while minimizing fruit drop. The presence of these hormones enhances flowering and fruit development by further reducing fruit drop.

Table 5 : Effect of foliar nutrients on reproductive parameters in mango cv. Mallika

Treatment	Days taken for flowering (after 1 st spray)	Number of panicles per tree	Hermaphrodite flowers (%)
T ₁ - Novel organic liquid @ 1%	80	84.03	27.83
T ₂ - Novel organic liquid @ 2%	77	86.66	29.92
T ₃ - Multi micronutrient fertilizer for mango @ 0.25%	94	72.08	21.78
T ₄ - Multi micronutrient fertilizer for mango @ 0.50%	90	74.33	22.56
T ₅ - Seaweed extract @ 1%	87	80.03	23.86
T ₆ - Seaweed extract @ 2%	85	81.18	25.45
T ₇ - Mango special @ 0.5%	98	68.39	20.14
T ₈ - Control (water spray)	102	56.37	18.30
S. Em±	2.73	2.95	0.80
C.D. at 5%	8.30	8.97	2.43
CV (%)	9.21	11.77	10.13

Table 6 : Effect of foliar nutrients on per cent fruit set (at pea stage), fruit retention and fruit drop in mango cv. Mallika

Treatment	Fruit set	Fruit retention	Fruit drop
T ₁ - Novel organic liquid @ 1%	13.79	7.55	92.45
T ₂ - Novel organic liquid @ 2%	14.95	8.64	91.36
T ₃ - Multi micronutrient fertilizer for mango @ 0.25%	8.93	4.92	95.08
T ₄ - Multi micronutrient fertilizer for mango @ 0.50%	9.18	5.02	94.98
T ₅ - Seaweed extract @ 1%	10.98	6.16	93.84
T ₆ - Seaweed extract @ 2%	11.44	6.86	93.14
T ₇ - Mango special @ 0.5%	7.55	2.32	97.68
T ₈ - Control (water spray)	5.98	1.33	98.67
S. Em±	0.42	0.19	0.86
C.D. at 5%	1.30	0.58	2.63
CV (%)	12.45	10.74	10.23

Conclusion

The present study found that foliar application of Novel organic liquid at two per cent was most effective in enhancing plant height, canopy spread, canopy volume, number of panicles per tree, hermaphrodite flowers and fruit set. Additionally, it helped to reduce fruit drop intensity and improved fruit retention compared to other treatments.

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References

- Abd El-Razek E., Abd-Allah A. S. E. and Saleh M. M. S., (2013). Foliar spray of some nutrient elements and antioxidants for improving yield and fruit quality of Hindi mango trees. *Middle East J. Sci. Res.*, **14**(10): 1257-1262.
- Anusuya R., Vijayakumar R. M., Srividhya S. and Sivakumar R. (2018). Comparison of physiological and flowering parameters of main and off season by using different plant nutrients and growth hormone in mango (*Mangifera indica* L.) cv. Bangalora. *J. Agric. Ecol. Res. Int.*, **5**: 76-82.
- Hussein A. M. (2023). Effect of amino acids, mono-potassium phosphate, and calcium foliar application on flowering, yield, and fruit quality of mango "Ewaise" cultivar. *Alex. Sci. Exch. J.*, **44**(2): 225-235.
- Kacha H. L., Patel H. C. and Paradava D. R. (2021). Effect of soil and foliar applications of micronutrients on flowering and yield of mango: Performance of mango influenced by soil and foliar applications of micronutrients. *J. Agri. Search*, **8**(1): 40-44.
- Krishnamoorthy V. and Hanif N. A. (2015). Effect of foliar nutrition on growth, yield and quality of mango. *J. Krishi Vigyan*, **3**(2): 43-47.
- Kumar G., Sharma D. D., Kuchay M. A., Kumar R., Singh G. and Kaushal B. (2020). Effect of foliar application of nutrients on growth, yield and fruit quality of pomegranate (*Punica granatum* L.) cv. Bhagwa. *Curr. J. Appl. Sci. Technol.*, **39**(20): 50-57.
- Kumar M., Kumar D., Yadav K. S., Yadav S. and Kumar S. (2023). Micro nutrient management for enhanced growth, yield, and quality of mango: A Comprehensive Review. *Int. J. Plant Soil Sci.*, **35**(19): 1936-1945.
- Momin S. K., Gaikwad S. S., Patel R. J., Amarcholi J. J. and Sharma K. M. (2016). Effect of foliar application of chemicals on fruiting parameters of mango (*Mangifera indica* L.) cv. Kesar. *J. Agric. Sci.*, **7**(1): 43-144.
- Panwar R. and Singh C. P. (2018). Effect of Pre-harvest foliar spray of micronutrients on growth and fruit characteristics of mango (*Mangifera indica* L.) cv. Langra. *J. Pharmacogn. Phytochem.*, **7**(15): 1460-1465.
- Pavithra G., Alila P., Maiti C. S., Sarkar A. and Sahu A. K. (2021). Effect of mineral boron sources on reproductive, yield and quality characteristics of mango (*Mangifera indica*). *Curr. Hort.*, **9**(2): 41-45.
- Radha T. and Mathew L. (2019). *Fruits crops*. New India Publishing Agency, New Delhi, 221-224
- Ram R. A. and Bose T. K. (2000). Effect of foliar application of magnesium and micro-nutrients on growth, yield and fruit quality of mandarin orange (*Citrus reticulata* Blanco). *Indian J. Hortic.*, **57**(3): 215-220.
- Rangare N. R., Pandey S. K., Sharma T. R., Tagour G. S. and Bhan M. (2022). Effect of foliar application of nutrients and NAA on physical composition of mango varieties. *Ecol. Environ.*, **40**(2): 300-312.
- Sankar C., Saraladevi D. and Parthiban S. (2013). Influence of pre-harvest foliar application of micronutrients and sorbitol on pollination, fruit set, fruit drop and yield in mango (*Mangifera indica* L.) cv. Alphonso. *Asian J. Hortic.*, **8**(2): 635-640.
- Sharma L. K., Sood P. and Yadav D. S. (2020). Effect of foliar application of nutrients on growth, yield and quality of mango under rain-fed conditions of Himachal Pradesh. *J. Krishi Vigyan*, **9**(1): 84-87.
- Sudha R., Balamohan T. N. and Soorianathasundaram K. (2012). Effect of foliar spray of nitrogenous chemicals on flowering, fruit set and yield in mango (*Mangifera indica* L.) cv. Alphonso. *J. Hortic. Sci.*, **7**(2): 190-193.
- Vidyashree K., Sabarad A. I., Nataraja K. H., Naik N., Bhat A. S., Gorabal K. and Lakshmidamma T. N., 2021, Performance of mango (*Mangifera indica* L.) varieties for flowering and yield under high density planting. *J. Pharmacogn. Phytochem.*, **10**(1): 2331-2333.