

COMPARATIVE EFFECT OF PLANT GROWTH REGULATORS WITH ZINC AND BORON ON YIELD AND YIELD ATTRIBUTES OF MANGO FRUITS CV.

CHHATTISGARH NANDIRAJ

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ABSTRACT

The field experimental was conducted during 2020-21 at experimental Horticultural Farm of CoA, IGKV, Raipur (C. G.). In exponential was spray of plant growth regulators with micro nutrients zinc and boron in mango cv. Chhattisgarh Nandiraj. Combination of NAA 400 ppm + ZnSO₄ 0.5% was found most effective treatment among various treatments in yield attributing characteristics. Highest yield of 52.43 kg plant⁻¹, maximum fruit length (102.23 mm), maximum fruit breadth (80 mm), maximum fruit weight (244.43 g) and maximum fruit volume (239.40 cc) and specific gravity (1.017) was also observed by the same the treatment.

(Key words: Plant growth regulators, mango, yield, attributing, zinc, boron)

INTRODUCTION

Mango (*Mangifera indica* L.) is a premier fruit crop of India considering its acreages, production, and popularity among the people and designated as the 'National Fruit of India' (Bhowmick and Banik, 2012). India is first in rank in production of mango; out of world area under mango cultivation in India was 2.291 million hectares with the production of around 20.444 million tonnes accounting 42.02 per cent of the total world production, (Anonymous, 2020). Currently, UAE is the largest market for Indian mangoes contouring with largest share of 67.98 per cent of total mango export earnings. The major growing states are Uttar Pradesh, Andhra Pradesh, Gujarat, Bihar, Karnataka, Tamil Nadu, Kerala, Maharashtra, Orissa and West Bengal. Mango is almost grown in all states of India but Uttar Pradesh is leading state in total production, whereas, Andhra Pradesh is leading in area under mango. Besides delicious taste, excellent flavour and attractive fragrance, it is rich in vitamin A (4800 IU/100g⁻¹ pulp) and C (16 mg/100g⁻¹ pulp). Mango fruit is excellent source of flavonoids like beta-carotene, alpha-carotene and beta-cryptoxanthin. These compounds have been known to have antioxidant properties and are essential for vision. Consumption of natural fruits rich in carotenes is known to protect from lung and oral cavity cancers. This is due to the foliar application of NAA promotes the cell division and cell elongation and zinc involve in bio chemical reactions and enhances the enzymatic activity, enhances fruit growth and causes increase in fruit length. GA₃ also promotes the cell elongation in mesocarp leads to increase in fruit size and ultimately to fruit length. Findings agree with Shinde *et al.* (2000). In case mango

production many problems are associated with fruit set, yield and quality due to some parameters like- imbalance supply of nutrients, hormonal unbalance, biotic factor etc. due to this it resulted in poor health of tree, increase in fruit drop, fruit quality and unhealthy plants than more attack of insect- pest and diseases. Foliar sprays of the growth regulators are supplemently dose to providing plant for increasing plant growth and health. Some plant growth regulators like- (NAA 40 ppm, GA₃ 50 ppm) with ZnSO₄ 0.5%, Borax 0.2%) at mustard, pea and marble stage of fruit development of mango cv. "Chhattisgarh Nandiraj" prevented premature pre-harvest drop of fruits and as a consequence increased the number and quality of fruits over control (Bhowmick and Banik, 2011). Chhattisgarh Nandiraj is a clonal selection of local mango from Nayapara, Jagdalpur, Chhattisgarh. It has nice shape, attractive appearance and pleasing aroma. Its average productivity is 280 kg tree⁻¹ and average fruit weight is 200-250 g with acid blend has TSS up to 21.30 °Brix, total sugar 17.87 % and acidity 0.30 %. It has good keeping quality and good for processing as its fibre free up to 70 %.

MATERIALS AND METHODS

The present study was carried out during 2020-21 in ten to twenty years -old mango plant at research farm of Horticulture, Department of Fruit Science, College of Agriculture, IGKV, Raipur, (C.G.), India. The experiment comprised of eight treatments were different PGR's and micro nutrients viz., T₁ NAA @ 40 ppm, T₂ GA₃ @ 50 ppm, T₃ zinc sulphate @ 0.5% and T₄ borax @ 0.2 % and combined treatments i.e. T₅ NAA @ 40 ppm + ZnSO₄ 0.5 %, T₆ NAA @

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40 ppm + Borax 0.2%, T₇ GA₃ @ 50 ppm + ZnSO₄ 0.5%, T₈ GA₃ @ 50 ppm + Borax 0.2% and one control T₀ applied as foliar spray at mustard, pea and marble stage of fruit growth. The experiment was laid out in Randomized Block Design with nine treatments and three replications. As the plants selected in the orchard were maintained under uniform cultural practices (disk harrow pouching, check basin irrigation, use of Imidachloprid to control hopper and mealy bug). The total yield of fruits harvested tree⁻¹ was counted at harvest and expressed as yield of fruit in kg tree⁻¹. From each of the treatments five marketable fruits were selected randomly from each treatment and their weight was measured with the help of electronic digital weighing balance and expressed as gram (g). Fruit length and breadth were measured with the help of digital vernier calliper and expressed in centimetre (mm). Fruit volume was measured by water dispersal method and expressed in cc and specific gravity was calculated by using following formula.

Statistical analysis

$$\text{Specific gravity} = \frac{\text{Fruit weight (g)}}{\text{Fruit volume (cc)}}$$

The statistical analysis was carried out for each observed character under the study by using MS-Excel, OPSTAT. The data generated from these investigations were analysed as described by Gomez and Gomez (1983) by applying randomized block design (RBD).

RESULTS AND DISCUSSION

The data pertaining to various yield and fruit characteristics of mango cv. "Chhattisgarh Nandiraj" are presented in Table I.

The fruit yield was observed maximum (52.34 kg tree⁻¹) under the treatment T₅ (NAA @ 40 ppm + ZnSO₄ @ 0.5 %) followed by treatment T₆ (NAA @ 40 ppm + Borax @ 0.2 %) (51.04 kg tree⁻¹). However, minimum yield of fruit (40.94 kg tree⁻¹) was observed under the treatment T₀ Control. Rajeev Kumar *et al.* (2020) reported that maximum fruits plant⁻¹ was obtained with the pre-harvest application of NAA @ 40 ppm + ZnSO₄ @ 0.5% followed by treatment NAA @ 40 ppm + ZnSO₄ @ 1.0% (226 fruits tree⁻¹). These two treatments were found significantly superior over remaining treatments, whereas, the minimum fruits plant⁻¹ was recorded under control. Jondhale *et al.* (2021) conducted study to estimate the potentiality of exogenously application of tocopherol and zinc on yield and yield attributes of green gram. Results have shown that application of 100 ppm tocopherol + 0.5% ZnSO₄ significantly increased all the parameters viz., number of pods plant⁻¹, number of seeds plant⁻¹, 100 seed weight, seed yield plant⁻¹, seed yield plot⁻¹,

seed yield ha⁻¹ and harvest index under study. Akula Venu *et al.* (2014) study the effect of zinc, boron and iron (Z₁ B₁ F₁) on acid lime and found significantly more yield attributing characters like number of flowers shoot⁻¹ (22.37), fruit set (49.33%) with minimum fruit drop (24.33%), while number of fruits shoot⁻¹ (8.53), number of fruits plant⁻¹ (925.00), fruit yield plant⁻¹ (27.07 kg) and hectare⁻¹ (74.97qt) were having higher quality attributing characters like volume of fruit (29.67 ml), fruit weight (42.67 g), fruit girth (13.20 cm), fruit length (4.80 cm), TSS (8.90° Brix), ascorbic acid (33.83 mg 10 ml⁻¹ of juice), reducing sugars (0.83%), non-reducing sugars (0.51%). Total sugars (1.32%) were also found more with minimum peel weight (5.17g) and acidity (1.32%).

Maximum fruit length (102.23 mm) was observed under the treatment T₅ (NAA @ 40 ppm + ZnSO₄ @ 0.5 %) followed by treatment T₆ (NAA @ 40 ppm + Borax @ 0.2 %) (97.36 mm). However, minimum fruit length (71.95 mm) was observed under the treatment T₀ Control. Fruit breadth was observed maximum (75.66 mm) under the treatment T₅ (NAA @ 40 ppm + ZnSO₄ @ 0.5 %) followed by treatment T₆ (NAA @ 40 ppm + Borax @ 0.2 %) (71.21 mm) and minimum fruit breadth (49.89 mm) was observed under the treatment T₀ Control. Shainika and Tambe (2020) noticed highest fruit weight (168.57 g) and fruit length (168.57g) in the treatment T₆ i.e. NAA @ 50 ppm + ZnSO₄ @ 0.8%. The highest number of fruits tree⁻¹ (283.33) and yield (31.43 kg tree⁻¹) was recorded in the treatment T₁₁ i.e. (NAA @ 50 ppm + ZnSO₄ @ 0.8% + FeSO₄ @ (0.8%) which was 38.24 per cent and 24.06 per cent increased as compared to control. The heaviest fruit obtained from the treatment NAA @ 40 ppm + ZnSO₄ @ 0.5 % (T₅) (244.43 g) which was found at par with treatment T₆ (NAA @ 40 ppm + borax 0.2%) (237.53 g), the lightest fruits were produced by the treatment control T₀ (175.58 g). Highest fruit volume (239.40 cc) was observed in treatment T₅ followed by treatment T₆ (233.75 cc) and lowest in treatment T₀ (171.11 cc). Findings supported by Ladhi *et al.* (2021). They conducted an experiment to evaluate the effect of GA₃ on flower yield and quality of tuberose. The quality parameters in respect of length of spike, diameter of spike, length of floret, diameter of floret, length of rachis, diameter of bulb and vase life in tuberose, weight of bulbs plant⁻¹ and weight of bulblets plant⁻¹ were recorded maximum with the application of GA₃ 200 ppm + KNO₃ 1.5% spray. Merwad *et al.* (2016) reported that application of NAA + Zn + Ca + B as had positive and significant effect on fruit weight by fruit set, reduction in fruit drop and more fruit retention as compared to control. It might be due to involvement of NAA in cell expansion, cell division and ultimately increased volume and intercellular spaces in mesocarpic cell. Micronutrient Zinc and boron promotes higher mobilization of food and minerals from source to developing fruit which is extremely active sink.

Table 1. Effect of plant growth regulators with zinc and boron on yield attributes of mango cv. Chhattisgarh Nandiraj

| Treatments | Notation | Fruit yield Plant ⁻¹ (kg) | Fruit Weight (g) | Fruit length (mm) | Fruit breadth (mm) | Fruit volume (cc) | Specific gravity |
|----------------|---|---|------------------------|-------------------------|--------------------------|-------------------------|---------------------|
| T ₀ | Control | 40.94 | 175.58 | 71.95 | 55.89 | 171.11 | 1.023 |
| T ₁ | NAA @ 40ppm | 47.56 | 204.83 | 85.81 | 73.49 | 201.73 | 1.013 |
| T ₂ | GA ₃ @ 50ppm | 46.99 | 230.16 | 89.58 | 73.82 | 226.56 | 1.010 |
| T ₃ | ZnSO ₄ @ 0.5% | 44.96 | 214.26 | 78.64 | 66.23 | 211.03 | 1.010 |
| T ₄ | Borax @ 0.2% | 47.69 | 183.52 | 73.47 | 65.56 | 179.39 | 1.340 |
| T ₅ | NAA @ 40 ppm+ZnSO ₄ 0.5% | 52.34 | 244.43 | 102.23 | 80.00 | 239.40 | 1.017 |
| T ₆ | NAA @ 40 ppm+Borax 0.2% | 51.04 | 237.53 | 97.36 | 76.48 | 233.75 | 1.013 |
| T ₇ | GA ₃ @ 50 ppm+ZnSO ₄ 0.5% | 49.75 | 222.66 | 94.41 | 72.80 | 218.11 | 1.017 |
| T ₈ | GA ₃ @ 50 ppm+Borax 0.2% | 48.54 | 185.68 | 74.76 | 71.00 | 182.52 | 1.013 |
| SE(m)± | | 0.563 | 0.858 | 0.737 | 0.615 | 1.014 | 0.110 |
| CD at 5% | | 1.503 | 2.505 | 2.208 | 1.820 | 3.015 | - |

Form the above observations it can be inferred that application of NAA @ 40 ppm+ZnSO₄0.5% was found effective in increasing fruit yield and quality of mango.

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