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# Effect of plant growth regulators and micronutrients on flower and fruit retention in mango (*Mangifera indica.* L) CV. Kesar

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**Abstract**
The experiment was carried out at Central Nursery Farm, VNMKV, Parbhani on 10 years old mango plants to assess the effect of plant growth regulators and micronutrients on flower retention and fruit retention in mango (*Mangifera indica.* L) Cv. Kesar. The experimental results indicated that the lowest flower drop (89.13%) and the highest flower retention (10.87%) was recorded in the treatment $T_7$ which was 7.57 per cent decreased and 62.04 per cent increased as compared to control. It was found that fruit retention at pea stage per panicle (47.21%), fruit retention at marble stage per panicle (11.08%) and fruit retention at maturity stage per panicle (4.02%) were found maximum in treatment $T_{12}$ which was, respectively 11.06 per cent, 42.06 per cent and 66.92 per cent increased over control. Among the thirteen treatments, highest number of fruits per tree (283.33) and yield (31.43 kg/tree) were observed in treatment $T_{11}$ which was 38.24 per cent and 24.06 per cent increased over control. Among the all the treatments $T_{12}$ i.e. NAA (75 ppm) + $ZnSO_4$ (0.8%) + $FeSO_4$ (0.8%) sprayed at flowering and pea stage showed the best fruit retention and yield. Foliar spray of PGR's and micronutrients at flowering and pea stage found to be better for fruit retention as well as yield in mango.

**Keywords:** Plant growth regulators, NAA, $GA_3$, CPPU, $ZnSO_4$, $FeSO_4$

## Introduction
Mango (*Mangifera indica* L.) is the most important fruit of India and is one of the choicest fruit of our country belonging to the family Anacardiaceae. Mango is called as King of Fruits (Purseglove, 1972) [14] due to its captivating flavour, irresistible taste and sweetness. India is the major producer in the world with an area of 2.262 Million hectares with annual production 19.686 Million tonnes and productivity of 8.7 Metric tonnes/ha (Anonymous, 2018) [1]. One of the most important bottleneck in the production of mango is the heavy drop of fruits (99.9%) during different developmental stages. The various stages of drop occur naturally. In addition to that it will be due to some natural calamities. Naturally occurring hormones plays a major role in fruit growth and fruit drop of mango (Ram, 1992) [16]. Deficiency of Auxins, Gibberellins, Cytokinins coupled with a high level of growth inhibitors i.e. Abscisic acid and Ethylene cause fruit drop (Ram, 1983) [15]. There are several causes of fruit drop including unfavourable climatic conditions, poor fruit set, competition between developing fruitlets, drought or lack of irrigation, nutrient deficiency, incidence of serious pests and diseases (Majumder and Sharma, 1990) [9]. Foliar sprays of growth regulators (NAA, $GA_3$ and CPPU) could be used as one of these horticultural practices that reduce fruit drop and enhance the yield (Anila and Radha, 2003) [2]. Micronutrients also play a key vital role in various enzymatic activities and synthesis of assimilating hormones. The deficiency of micronutrients in mango crop (especially Zinc and Iron) resulted in low fruit set, poor fruit quality along with excessive fruit drop at various stages of development.
In view of these, the present investigation was carried out to study the effect of plant growth regulators and micronutrients on fruit retention, fruit drop and yield in mango Cv. Kesar.

## Materials and Methods
The experiment was conducted at Central Nursery Farm, VNMKV, Parbhani in the year 2018 on 10 years old, healthy, vigorous and uniformly grown mango trees of Cv. Kesar planted at 10 × 10 m spacing. The plants were uniform in growth and vigour.

The experiment was laid out in randomised block design with thirteen treatments and three replications. The treatments were as follows $T_1$ i.e. CPPU (3 and 4 ppm) + $FeSO_4$ (0.8%), $T_2$ i.e. $GA_3$ (20 and 40 ppm) + $FeSO_4$ (0.8%), $T_3$ i.e. NAA (25 and 50 ppm) + $FeSO_4$ (0.8%), $T_4$ i.e. CPPU (3 and 4 ppm) + $ZnSO_4$ (0.8%), $T_5$ i.e. $GA_3$ (20 and 40 ppm) + $ZnSO_4$ (0.8%), $T_6$ i.e. NAA (25 and 50 ppm) + $ZnSO_4$ (0.8%), $T_7$ i.e. CPPU (3 ppm) + $ZnSO_4$ (0.8%) + $FeSO_4$ (0.8%), $T_8$ i.e. CPPU (4 ppm) + $FeSO_4$ (0.8%) + $ZnSO_4$ (0.8%), $T_9$ i.e. $GA_3$ (20 and 30 ppm) + $FeSO_4$ (0.8%) + $ZnSO_4$ (0.8%), $T_{10}$ i.e. $GA_3$ (40 and 60 ppm) + $FeSO_4$ (0.8%) + $ZnSO_4$ (0.8%), $T_{11}$ i.e. NAA (25 and 50 ppm) + $ZnSO_4$ (0.8%) + $FeSO_4$ (0.8%), $T_{12}$ i.e. NAA (50 and 75 ppm) + $ZnSO_4$ (0.8%) + $FeSO_4$ (0.8%) and $T_{13}$ i.e. control (water spray) were sprayed at flowering and pea stages. Before spray, four panicles per experimental tree from each direction were tagged and number of fruits on each panicle were counted. Data on number of fruits retained on the tagged panicle was counted at pea, marble and mature stages. Furtherly, fruit drop and fruit retention was calculated. At maturity, when the shoulders of the fruit were swelled out, harvesting was done, leaving 6 cm stalk intact of fruit to avoid the exudation of cell sap. After harvesting, number of fruits per tree and yield (kg/tree) were recorded.

## Results and discussion

### Flowering characters

The data presented on Table-1 indicates that the lowest flower drop (89.13%) and highest flower retention was recorded in the treatment $T_7$ i.e. CPPU (3 ppm) + $ZnSO_4$ (0.8%) + $FeSO_4$ (0.8%) which was 7.57 per cent decreased and 62.04 per cent increased as compared to control, however, it was at par with treatment $T_8$ which was 6.98 per cent decreased and 61.03 per cent increased as compared to control and minimum was observed in control.

### Fruiting characters

The different treatments of PGR's and micronutrients had statistically significant effect on fruiting characters such as number of fruits at pea stage, marble stage and maturity stage per panicle, fruit drop at pea stage, marble stage and maturity stage per panicle and fruit retention at pea stage, marble stage and maturity stage per panicle.

The data presented on Table-2 indicates that the maximum number of fruits at pea stage per panicle (20.00) in treatment $T_4$ i.e. CPPU (4 ppm) + $ZnSO_4$ (0.8%). The maximum number of fruits at marble stage (12.67), maturity stage (2.00) per panicle, the highest fruit retention pea stage (47.21%) marble stage (11.08%) and maturity stage (4.02%) per panicle and the lowest fruit drop at pea stage (52.79%) marble stage (88.92%) maturity stage (95.98%) was maximum in treatment $T_{12}$ i.e. NAA (75 ppm) + $ZnSO_4$ (0.8%) + $FeSO_4$ (0.8%) which was, respectively 47.36 per cent, 50.00 per cent, 11.06 per cent, 42.06 per cent, 66.92 per cent increased, 9.88 per cent, 5.24 per cent, 2.80 per cent decreased, however it is at par with treatment $T_7$ and $T_6$ and minimum was found in control.

Guirguis *et al.* (2010) [8]. reported promoting effect on fruit set and fruit retention by reducing ABA content, thus the application of NAA were beneficial to increase the fruit set at pea and marble stages and ultimately for fruit retention at harvest than control. Similar results were obtained by Pujari *et al.* (2016) [13] in Alphonso mango and Bhamare *et al.* (2014) [5] in mango Cv. Mallika. An application of zinc which is involved in auxin synthesis and directly in various physiological process and enzymatic activity. Similar results were observed by Singh *et al.* (2005) [17] and Bhowmick and Banik *et al.* (2011) [6]. Iron helps in formation of chlorophyll and absorption of other nutrient elements resulted more accumulation of sink. The similar results were obtained with Banik *et al.* (1997) [6] and Moazzam *et al.* (2011) [10] in mango.

### Yield characters

The different treatments of PGR's and micronutrients had statistically significant effect on yield characters such as weight of fruit, length of fruit, number of fruits per tree and yield (Kg/tree).

The data presented on Table-3 indicates that the highest fruit weight (168.57 g) and fruit length (168.57g) was recorded in the treatment $T_6$ i.e. NAA (50 ppm) + $ZnSO_4$ (0.8%).The highest number of fruits per tree (283.33) and yield (31.43 kg/tree) was recorded in the treatment $T_{11}$ i.e. NAA (50 ppm) + $ZnSO_4$ (0.8%) + $FeSO_4$ (0.8%) which was 38.24 per cent and 24.06 per cent increased as compared to control, however, it was at par with $T_1$ which was 36.83 per cent and 22.33 per cent increased over control and minimum was observed in control.

It is due to reason that application of auxin accelerated the fruit growth and fruit size by increasing, elongation and enlargement (Nkansah *et al.* 2012, Chauhan *et al.* 2014, and Naleo *et al.* 2018) [12, 7, 11] in mango. It is also due to zinc is associated with protein synthesis, carbohydrate metabolism, tryptophan synthesis and also acts as catalyst in oxidation reduction process, its sprays seem to have benefitted all those activities which result in more photosynthates being available for fruit development. These findings are in alignment with the findings of Bhatt *et al.* (2008) [4] and Singh *et al.* (2005) [17] in mango.

**Table 1:** Effect of plant growth regulators and micronutrients on flowering attributes of mango cv. Kesar.

| Treat No. | Details of treatment | * Flower drop (%) | | Flower Retention (%) | |
|---|---|---|---|---|---|
| $T_1$ | CPPU - 3ppm $FeSO_4$ - 0.8% | 91.00 | (5.36) | 8.07 | (48.95) |
| $T_2$ | $GA_3$ - 20ppm $FeSO_4$ - 0.8% | 93.01 | (3.08) | 6.99 | (41.06) |
| $T_3$ | NAA - 25ppm $FeSO_4$ - 0.8% | 92.04 | (4.17) | 7.96 | (48.25) |
| $T_4$ | CPPU - 3ppm $ZnSO_4$ - 0.8% | 94.36 | (1.61) | 5.64 | (26.96) |
| $T_5$ | $GA_3$ - 20ppm $ZnSO_4$ - 0.8% | 91.20 | (5.13) | 8.80 | (53.19) |
| $T_6$ | NAA - 25ppm $ZnSO_4$ - 0.8% | 90.47 | (5.97) | 9.53 | (56.77) |
| $T_7$ | CPPU - 3ppm $FeSO_4$ - 0.8% $ZnSO_4$ - 0.8% | 89.13 | (7.57) | 10.87 | (62.04) |
| $T_8$ | CPPU - 4ppm $FeSO_4$ - 0.8% $ZnSO_4$ - 0.8% | 89.62 | (6.98) | 10.57 | (61.03) |
| $T_9$ | $GA_3$ - 20ppm $FeSO_4$ - 0.8% $ZnSO_4$ - 0.8% | 90.27 | (6.21) | 9.73 | (57.66) |
| $T_{10}$ | $GA_3$ - 40ppm $FeSO_4$ - 0.8% $ZnSO_4$ - 0.8% | 93.12 | (2.96) | 6.88 | (40.12) |
| $T_{11}$ | NAA - 25ppm $FeSO_4$ - 0.8% $ZnSO_4$ - 0.8% | 92.41 | (3.75) | 7.59 | (45.72) |
| $T_{12}$ | NAA - 50ppm $FeSO_4$ - 0.8% $ZnSO_4$ - 0.8% | 90.37 | (6.09) | 9.63 | (57.22) |
| $T_{13}$ | Control (Water spray) | 95.88 | | 4.12 | |
| | S. E ± | 0.20 | | 0.23 | |

| | | | | | |
|---|---|---|---|---|---|
| | C. D. (5%) | 0.58 | | 0.67 | |

(Figures in parenthesis indicates the values in per cent increased over control)
(*Figures in parenthesis indicates the values in per cent decreased over control)

**Table 2:** Effect of plant growth regulators and micronutrients on fruiting attributes of mango cv. Kesar.

| Treat No. | Details of treatment | Number of fruits at pea stage per panicle | Number of fruits at marble stage per panicle | Number of fruits at maturity stage per panicle | * Fruit drop at pea stage per panicle (%) | * Fruit drop at marble stage per panicle (%) | * Fruit drop at maturity stage per panicle (%) | Fruit retention at pea stage per panicle (%) | Fruit retention at marble stage per panicle (%) | Fruit retention at maturity stage per panicle (%) |
|---|---|---|---|---|---|---|---|---|---|---|
| $T_1$ | CPPU - 4ppm $FeSO_4$ - 0.8% | 10.6 (9.38) | 7.33 (9.01) | 1.67 (40.12) | 54.79 (5.87) | 90.99 (2.84) | 97.08 (1.63) | 45.21 (7.13) | 9.01 (28.75) | 2.92 (54.4) |
| $T_2$ | $GA_3$ - 40ppm $FeSO_4$ - 0.8% | 14.67 (34.09) | 12.33 (45.91) | 1.24 (19.36) | 56.48 (2.70) | 91.90 (1.82) | 98.35 (0.32) | 43.52 (3.52) | 8.10 (20.75) | 1.65 (19.40) |
| $T_3$ | NAA - 50ppm $FeSO_4$ - 0.8% | 12.67 (23.68) | 7.33 (9.01) | 1.67 (40.12) | 54.16 (7.10) | 90.39 (3.52) | 97.33 (1.37) | 45.84 (8.40) | 9.61 (33.20) | 2.67 (50.19) |
| $T_4$ | CPPU - 4ppm $ZnSO_4$ - 0.8% | 20.00 (51.65) | 10.67 (37.49) | 1.33 (24.82) | 55.17 (5.14) | 90.26 (3.67) | 97.41 (1.29) | 44.83 (6.34) | 9.74 (34.09) | 2.59 (48.65) |
| $T_5$ | $GA_3$ - 40ppm $ZnSO_4$ - 0.8% | 16.00 (39.57) | 9.33 (28.52) | 1.24 (19.36) | 57.05 (1.68) | 91.49 (2.28) | 97.95 (0.73) | 42.96 (2.26) | 8.51 (24.56) | 2.05 (35.13) |
| $T_6$ | NAA - 50ppm $ZnSO_4$ - 0.8% | 10.00 (3.30) | 8.33 (19.93) | 1.33 (24.82) | 53.20 (9.04) | 91.06 (2.76) | 96.86 (1.86) | 46.80 (10.28) | 8.94 (28.19) | 3.14 (57.65) |
| $T_7$ | CPPU - 3ppm $FeSO_4$ - 0.8% $ZnSO_4$ - 0.8% | 11.00 (12.10) | 7.33 (9.01) | 1.33 (24.82) | 54.26 (6.91) | 90.00 (3.97) | 96.02 (2.75) | 45.74 (8.20) | 10.00 (35.80) | 3.98 (66.59) |
| $T_8$ | CPPU - 4ppm $FeSO_4$ - 0.8% $ZnSO_4$ - 0.8% | 13.00 (25.62) | 9.33 (28.52) | 1.67 (40.12) | 54.54 (6.36) | 90.78 (3.08) | 96.18 (2.58) | 45.46 (7.64) | 9.22 (30.37) | 3.82 (65.19) |
| $T_9$ | $GA_3$ - 30ppm $FeSO_4$ - 0.8% $ZnSO_4$ - 0.8% | 17.00 (43.12) | 10.67 (37.49) | 1.24 (19.36) | 55.02 (5.43) | 91.05 (2.77) | 98.11 (0.57) | 44.98 (6.65) | 8.95 (28.27) | 1.89 (29.63) |
| $T_{10}$ | $GA_3$ - 60ppm $FeSO_4$ - 0.8% $ZnSO_4$ - 0.8% | 13.00 (25.62) | 7.67 (13.04) | 1.33 (24.82) | 56.72 (2.27) | 91.96 (1.76) | 97.15 (1.56) | 43.28 (2.99) | 8.04 (20.15) | 2.85 (59.34) |
| $T_{11}$ | NAA - 50ppm $FeSO_4$ - 0.8% $ZnSO_4$ - 0.8% | 10.33 (6.39) | 10.00 (33.30) | 1.67 (40.12) | 54.09 (7.24) | 90.56 (3.33) | 96.90 (1.82) | 45.91 (8.54) | 9.44 (32.00) | 3.10 (57.10) |
| $T_{12}$ | NAA - 75ppm $FeSO_4$ - 0.8% $ZnSO_4$ - 0.8% | 14.00 (30.93) | 12.67 (47.36) | 2.00 (50.00) | 52.79 (9.88) | 88.92 (5.24) | 95.98 (2.80) | 47.21 (11.06) | 11.08 (42.06) | 4.02 (66.92) |
| $T_{13}$ | Control (Water spray) | 9.67 | 6.67 | 1.00 | 58.01 | 93.58 | 98.67 | 41.99 | 6.42 | 1.33 |
| | S. E ± | 0.66 | 0.47 | 0.268 | 0.29 | 0.12 | 0.11 | 0.29 | 0.12 | 0.11 |
| | C. D. (5%) | 1.93 | 1.39 | 0.78 | 0.85 | 0.37 | 0.33 | 0.85 | 0.37 | 0.33 |

(Figures in parenthesis indicates the values in per cent increased over control *Figures in parenthesis indicates the values in per cent decreased over control

**Table 3:** Effect of plant growth regulators and micronutrients on physical characters of fruit and yield attributes of mango cv. Kesar

| Treat. No. | Details of treatment | Weight of fruit (g) | Length of fruit (cm) | Diameter of fruit (cm) | Volume of fruit (ml) | Number of fruits per tree | Yield (kg/tree) |
|---|---|---|---|---|---|---|---|
| $T_1$ | CPPU - 4ppm $FeSO_4$ - 0.8% | 133.10(19.31) | 9.00(0.56) | 5.47(8.41) | 1.20(16.67) | 277.00(36.83) | 30.73(22.33) |
| $T_2$ | $GA_3$ - 40ppm $FeSO_4$ - 0.8% | 128.00(16.10) | 9.05(1.11) | 5.45(8.08) | 1.12(10.72) | 215.33(18.73) | 26.80(10.94) |
| $T_3$ | NAA - 50ppm $FeSO_4$ - 0.8% | 148.17(27.52) | 9.69(7.64) | 5.23(4.21) | 1.20(16.67) | 266.33(34.30) | 29.53(19.17) |
| $T_4$ | CPPU - 4ppm $ZnSO_4$ - 0.8% | 118.53(9.40) | 9.22(2.93) | 5.13(2.34) | 1.22(18.04) | 238.67(26.68) | 26.47(9.83) |
| $T_5$ | $GA_3$ - 40ppm $ZnSO_4$ - 0.8% | 116.53(7.84) | 9.08(1.44) | 5.10(1.77) | 1.26(20.64) | 250.00(30.00) | 27.73(13.92) |
| $T_6$ | NAA - 50ppm $ZnSO_4$ - 0.8% | 168.57(36.29) | 10.34(13.45) | 5.80(13.63) | 1.06(5.67) | 268.33(34.79) | 30.03(20.02) |
| $T_7$ | CPPU - 3ppm $FeSO_4$ - 0.8% $ZnSO_4$ - 0.8% | 130.87(17.94) | 9.12(1.87) | 5.08(1.38) | 1.04(3.85) | 245.67(28.77) | 27.27(14.27) |
| $T_8$ | CPPU - 4ppm $FeSO_4$ - 0.8% $ZnSO_4$ - 0.8% | 148.30(27.58) | 9.67(7.45) | 5.02(0.20) | 1.14(12.29) | 257.33(32.00) | 28.53(16.34) |
| $T_9$ | $GA_3$ - 30ppm $FeSO_4$ - 0.8% $ZnSO_4$ - 0.8% | 114.07(5.85) | 9.19(2.62) | 5.24(4.39) | 1.15(13.05) | 258.33(32.26) | 28.70(16.83) |
| $T_{10}$ | $GA_3$ - 60ppm $FeSO_4$ - 0.8% $ZnSO_4$ - 0.8% | 159.93(32.85) | 9.83(8.96) | 5.71(12.26) | 1.14(12.29) | 266.33(34.30) | 29.50(19.09) |
| $T_{11}$ | NAA - 50ppm $FeSO_4$ - 0.8% $ZnSO_4$ - 0.8% | 131.67(18.44) | 9.43(5.10) | 5.63(11.02) | 1.30(23.08) | 283.33(38.24) | 31.43(24.06) |
| $T_{12}$ | NAA - 75ppm $FeSO_4$ - 0.8% $ZnSO_4$ - 0.8% | 132.10(18.70) | 9.45(5.30) | 5.61(10.70) | 1.05(4.77) | 275.00(36.37) | 30.50(21.74) |
| $T_{13}$ | Control (Water spray) | 107.40 | 8.95 | 5.01 | 1.00 | 175.00 | 23.87 |
| | S. E ± | 13.19 | 0.29 | 0.28 | 0.16 | 18.50 | 0.17 |
| | C. D. (5%) | 38.50 | 0.87 | 0.84 | 0.32 | 54.02 | 0.51 |

(Figures in parenthesis indicates the values in per cent increased over control)

## Conclusion

There was improvement in flower and fruit retention of mango fruit due to application of plant growth regulators and micronutrients. Among the different plant growth regulators and micronutrients, the foliar application of treatment $T_{12}$ i.e. NAA (75 ppm) + $ZnSO_4$ (0.8%) + $FeSO_4$ (0.8%) at par with $T_{11}$ i.e. NAA (50 ppm) + $ZnSO_4$ (0.8%) + $FeSO_4$ (0.8%) showed the best response in improvement of flower and fruit retention as well as yield of mango.

## References


1. Anonymous. Indian Horticulture Data base, National Horticulture Board, Ministry of Agriculture, Government of India, 2018.
2. Anila R, Radha T. Studies on fruit drop in mango varieties. J Trop. Agri. 2003; 41(1):30-32
3. Banik BC, Sen SK, Bose TK. Effect of Zinc, Iron and Boron in combination with urea on growth, flowering, fruiting and fruit quality of mango Cv. Fazli. Env. Eco. 1997; 15(1):122-125.
4. Bhatt A, Mishra NK, Singh CP, Lal LR. Studies on pre-harvest application of nutrients on yield, quality and shelf life of mango Cv. Dashehari. Prog. Hort. 2008; 40(1):41-47.
5. Bhamare SP, Patel HC, Singh B. Effect of PGR's on reduction of fruit drop in mango Cv. Mallika. Asian J. Hort. 2014; 9(2):510-511.
6. Bhowmick N, Banik BC. Influence of pre-harvest foliar application of growth regulators and micronutrients on mango Cv. Himsagar. Ind. J Hort. 2011; 68(1):103-107.
7. Chauhan P, Singh JP, Indu Arora, Singh RK. Flowering, fruiting, yield and physical character of fruit of mango Cv. Dashehari as influenced by Pre-harvest foliar spray of nutrients and plant bioregulators. Asian J of Hort. 2014; 9(2):459-462.
8. Guirguis NS, Attala ES, Mikhael GB, Gaber MA. Effect of Sitofex (CPPU) on fruit set, yield and fruit quality of 'Costata' persimmon trees. J Agri. Res. Kafer EI- Shiekh Univ. 2010; 36(2):206-219.
9. Majumder PK, Sharma DK. Mango. In: Fruits: Tropical and Sub-Tropical. (T.K. Bose and S.K. Mitra Ed.), Naya Prakash, Culcutta, 1990, 1-62
10. Mozzam A, Tahir FM, Shahzad J, Mahmood N. Effect of foliar application of micronutrients on the quality of mango Cv. Dashehari. Mycopath. 2011; 9(1):25-28.
11. Naleo S, Akali S, Maiti CS. Effect of plant growth regulators and packaging on flowering, fruit quality and shelf life in mango Cv. Amrapali. J Exp. Agri. Int. 2018; 20(6):1-8.
12. Nkansah GO, Ofosu-Anim A, Mawuli A. Effect of $GA_3$ and NAA on fruit retention, yield and quality of Keitt mangoes in the coastal Savanna Ecological Zone of Ghana. Am. J pl. Physiol. 2012; 7(6):243-251.
13. Pujari KH, Malshe AV, Zagade VV, Shedge MS. Effect of SWELL (CPPU) on fruit retention, fruit quality and yield of mango Cv. Alphonso. Pl. Arc. 2016; 16(2):649-653.
14. Purseglove JW. Mangoes West of India. Acta Hort. 1972; 24(1):170-174.
15. Ram S. Hormonal control of fruit growth and fruit drop in mango Cv. Dashehari. Acta Hort. 1983; 134(1):169-178.
16. Ram S. Naturally occurring hormones of mango and their role in growth and drop of fruits. Acta Hort. 1992; 321(1):400-411
17. Singh NP, Malhi CS, Sharma RC. Effect of plant bio-regulators on flowering, fruit yield and quality in mango Cv. Dashehari. Hort. J. 2005; 18(1):10-12.