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Effect of Plant Growth Regulators on Fruit Retention and Fruit Drop of Mango (*Mangifera indica L.*) cv. Dashehari

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Abstract: ***The present investigation entitled "Effect of plant growth regulators on fruit retention and fruit drop of mango (Mangifera indica L.) cv. Dashehari." was carried out at the instructional Farm, Deptt. of Horticulture, College of Agriculture, IGKV, Raipur (C.G.) during the year 2017-18 employing Randomized Block Design with three replications. Three levels of NAA i.e., 15, 25 and 35 ppm, three levels of GA_3 i.e. 15, 25 and 35 ppm and three levels of 2, 4-D i.e. 15, 25 and 35 ppm were sprayed at pea and marble stage of fruit development. All the treatments significantly influenced the number of fruits retained at pea, marble and harvesting stage of fruit growth and development as compared to the control. Foliar application of 35 ppm GA_3 at pea and marble stage of fruit development increased the fruit retention percentage (15.23 %) and reduced the fruit drop percentage (84.77 %).***

1. Introduction

Mango (*Mangifera indica* L.) is the native of Indo-Burma region (De Candole,1904 and mukherjee,1951), belongs to the family Anacardiaceae. It is one of the most cultivated and favourite fruit of the tropics and has developed its own importance all over the world. Being a useful and delicious fruit, it is the part of culture and religion since time immemorial. Besides taste and its good qualities, it is called "The King of Fruits". Mango (*Mangifera indica* L.) is cultivated in the Indian subcontinent for well over 4000 years (De Candole, 1904). The fruit is highly nutritive and delicious with excellent flavour. It is an excellent source of vitamin A and C (4800 IU and 13mg/100mg) respectively, as well as good source of calories, protein, total carbohydrate, fat, cholesterol, sodium, potassium. The pulp is a rich source of beta carotene, sucrose, glucose and fructose. Mango fruit is utilized at all stages of its development both in its immature and mature or ripe stage and can also be processed into products such as jams, juices, cut fresh fruit, dried chips, fruit concentrate and fruit leather. Mango is one of the most extensively exploited fruits for food, juice, flavor, fragrance and color. (Bayarri *et al.*, 2001).

In India flowering period starts from January and extended up to April. The flowering period of mango is usually of short duration of 2 to 3 weeks; low temperature may extend it, whereas higher temperature may shorten it. The numbers of flower in one panicle varies between 1000-6000, depending upon the cultivars and age of the tree. The time it takes for mango trees to produce mature, harvest-ready fruit from the time of flowering ranges from 100 to 150 days, depending on the cultivar, growing region and various weather factors. Fruit varies according to cultivar variety and growing location. Most varieties bear fruit between May and September. Fruit production is heaviest during June and July.

Foliar spray of growth regulators (NAA and GA_3) could be used as one of these horticultural practices that reduce fruit drop, enhance yield and fruit quality of mangoes (Anila and Radha, 2003). NAA application induced high positive effect in reducing fruit drop (Chattha *et al*. 1999). Moreover, NAA application reduced flowers drop and gave high flowers retention and increased yield as well as improved fruit quality of mango (Haidery *et al*., 1997 and Vejendela *et al*., 2008). Many investigators found that spraying mango trees with NAA at different concentrations (20, 25 and 40 ppm) respectively, increased fruit set and fruit retention (Oksher *et al*., 1980 and Singh and Ram, 1983). Auxin is well known as inhibitors of ethylene action in a number of plants (Beyer, 1976).

2. Material and methods

Twenty two years old mango trees, planted at 10 x 10 m spacing were used for experiment, which was carried out during the year 2017-18 at instructional farm, Deptt. of Horticulture, College of Agriculture, IGKV, Raipur. Chhattisgarh is reputed for producing early maturing and best quality of Dashehari mango. Therefore, above said variety was selected for the present investigation. Thirty healthy, vigorous and uniform,disease free, bearing trees of about twenty years of age were selected for the experiment. Selected trees were kept under uniform cultural practices, i.e. irrigation, weeding and hoeing etc. Plant growth regulators were sprayed on 25th February and 11th March 2017 from 9.00 a.m. to 2.00 p.m. Three levels of NAA i.e., 15, 25 and 35 ppm, three levels of GA_3 i.e. 15, 25 and 35 ppm and three levels of 2, 4-D i.e. 15, 25 and 35 ppm were sprayed at pea and marble stage of fruit development. In all the treatments, solutions were sprayed on fruit and foliage of the tree.

Fruit retention (%)

The total numbers of fruits per panicle of 5 tagged panicles per tree were counted at the pea stage just before the

application of plant growth regulators and subsequently at 15 days interval till fruit harvest. Fruit retention (%) per panicle was calculated using the below mentioned formula.

Fruit retention (%)= No. of fruits per panicle x 100
No. of fruits at initial stage

Fruit drop (%)
Just before the foliar application of plant growth hormones the numbers of fruits were counted on the panicle at pin head stage and subsequently at 15 days interval, continued till fruit harvest and the final retention was being calculated. Fruit drop can be calculated by calculating the the difference between total number of fruits and final retention.

Fruit drop % = Total No. of fruit at initial stage – No. of fruits per panicle X 100
Total No. of fruits at initial stage

3. Results and Discussion

Analysis of variance (ANOVA) showed significant difference amongst, fruit drop (Table 1,2)

Generally, all treatments of plant growth regulators significantly enhanced the fruit retention and reduced fruit drop of fruits. However, the maximum transformed fruit retention percentage 22.96 (inverse of transformed value 15.23) was found under T_6 and the minimum transformed fruit drop percentage 67.04 (inverse of transformed value 84.77) was recorded under the treatment T_6 (35 ppm foliar application of GA_3) (Table 1,2). The increased fruit retention upto maturity might be due to proper supplementation of the nutrients and prevention in the formation of an abscission layer by inhibiting the enzymatic activities with the application of GA_3. The reduction in fruit drop may be due to an increase in initial growth of ovaries, ultimately reduced magnitude of the peak of abscission.

Table 1: Fruit retention per cent as influenced by foliar application of plant growth regulators in mango cv. Dashehari

Notations	Treatments	Fruit Retention (%)
T_0	Control	12.44 ^{e} (4.68)
T_1	NAA (15 ppm)	14.99 ^{cd} 6.72)
T_2	NAA (25 ppm)	16.53 ^{c} (8.12)
T_3	NAA (35 ppm)	21.57 ^{ab} (13.53)
T_4	GA_3 (15 ppm)	20.11 ^{b} (11.83)
T_5	GA_3 (25 ppm)	20.55 ^{b} (12.34)
T_6	GA_3 (35ppm)	22.96 ^{a} (15.23)
T_7	2,4-D (15 ppm)	13.36 ^{de} (5.38)
T_8	2,4-D (25 ppm)	21.48 ^{ab} (13.42)
T_9	2,4-D (35 ppm)	22.69 ^{a} (14.89)

1) Figures in parenthesis () are inverse transformed values, in per cent unit, corresponding to the mean arcsine transformed values.
2) The superscript letter indicates that the treatment means with same letters are at par at 5% level of significance, while the means with different letters are significantly different at 5% level. These letters have been affixed based on CD-value comparison of treatment means.

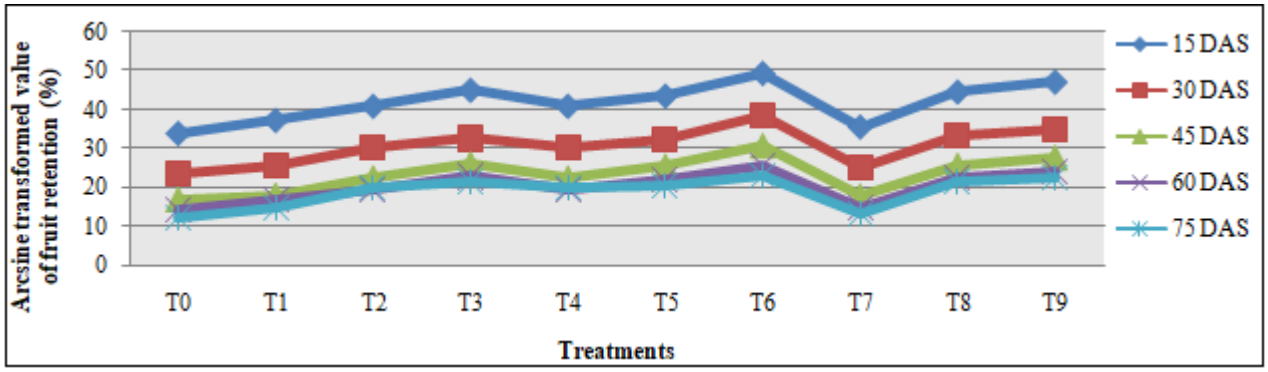
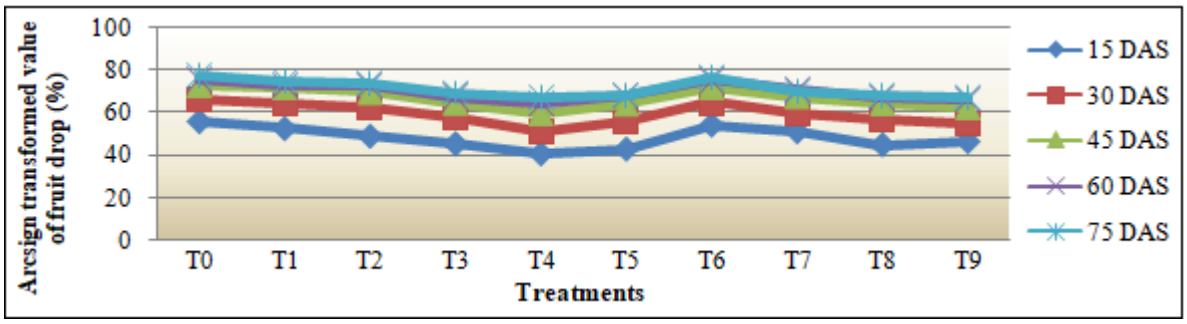


Table 2: Fruit drop per cent as influenced by foliar application of plant growth regulators in mango cv. Dashehari

Notations	Treatments	Fruit Drop (%)
T_0	Control	77.49 ^{a} (95.32)
T_1	NAA (15 ppm)	74.97 ^{bc} (93.28)
T_2	NAA (25 ppm)	69.89^{d} (88.17)
T_3	NAA (35 ppm)	68.41 ^{de} (86.47)
T_4	GA_3 (15 ppm)	73.44^{c} (91.88)
T_5	GA_3 (25 ppm)	69.41^{d} (87.66)
T_6	GA_3 (35ppm)	67.04^{e} (84.77)
T_7	2,4-D (15 ppm)	76.58 ^{ab} (94.62)
T_8	2,4-D (25 ppm)	68.42 ^{de} (86.48)
T_9	2,4-D (35 ppm)	67.3 ^{de} (85.11)

1) Figures in parenthesis () are inverse transformed values, in per cent unit, corresponding to the mean arcsine transformed values.
2) The superscript letter indicates that the treatment means with same letters are at par at 5% level of significance, while the means with different letters are significantly different at 5% level. These letters have been affixed based on CD-value comparison of treatment means.



4. Conclusion

Conclusions drawn on the basis of results obtained from the present investigation are as under:

The yield-contributing characters, foliar application of 35 ppm GA_3 at pea and marble stage of fruit development increased the fruit retention, reduced the fruit drop and gave maximum number of fruits as well as total yield. Length and width of fruits, average fruit weight, fruit weight, volume and pulp weight were also improved with the foliar application of 35 ppm GA_3. Acidity of fruits was reduced with the foliar application of 35 ppm 2, 4-D.

It can also be concluded that the foliar application of 35 ppm GA_3, were found to be optimum concentration by which fruit retention and fruit drop of mango can be significantly influenced.

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