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"Effect of plant growth regulators on chemical composition of mango (Mangifera indica L.) cv. Dashehari"

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Abstract

The present investigation entitled **"Effect of plant growth regulators on chemical composition 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. Qualitative characters like TSS (21.61%) and ascorbic acid (57.63 mg/100g) increased with the foliar application of 35 ppm 2,4-D and 35 ppm NAA respectively. While, reducing sugar(5.71%) , non-reducing sugar (14.26 %) and total sugar (19.97 %) were increased with 35 ppm foliar application of 2,4-D. Acidity content of fruit (0.17 %) was recorded minimum under the superiority of treatment foliar application of 2,4-D at 35 ppm concentration.

Among the different concentrations of plant growth regulators; the foliar application of 35 ppm 2, 4-D were found to be optimum concentration by which chemical composition of fruits can be significantly influenced.

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).

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.

During harvest, five disease and insect-free, fruits were taken, wrapped in paper and stored at room temperature in a basket up to ripening. Then the peel, pulp and stone of these fruits were separated and were weighed. For biochemical analysis, fruits were peeled and flesh was homogenized in a blender. Biochemical analysis of the fresh fruit juice was carried out. Hand refractometer was used to determine the total soluble solids percentage. The acidity in fruit samples were estimated by titrating against 0.1N sodium hydroxide solution using phenolphthalein as an indicator (Ranganna,1991). Ascorbic acid was estimated by Ruck (1961) method. The titre-metri method of Lane and

Eynon as described by Ranganna (1977) was adopted for estimation of reducing sugars. The percentage of total sugars was estimated by A.O.A.C method (1980). The non-reducing sugars (%) were calculated according to the formula (Total sugar % - Reducing sugars %).

Data pertaining to chemical analysis of fruit (fruit quality assesment) was subjected to statistical analysis by constructing analysis of variance tables. The experiment was laid out in Randomized Block Design. The data of various characters under study were analyzed by as described by Gomez and Gomez (1984).

Results and discussion

Analysis of variance (ANOVA) showed significant difference amongst chemical composition of the treatments (Table 1,2)

Generally, all treatments of plant growth regulators significantly enhanced the biochemical contents of fruits. Physico -chemical composition *i.e.* maximum total soluble sugar percentage (21.61%), reducing sugar percentage (5.71 %), non-reducing sugar percentage (14.26 %), total sugar percentage 19.97 and minimum acidity percentage (0.17 %) was recorded under T_9. Highest ascorbic acid (57.63 mg/100g) was recorded under the treatment T_3 in comparison to rest of treatments and control. These observations were supported by the previous findings by various eminent workers (Sharma (1990), Oosthuyse (1995) and Singh and Singh (1995), Bains *et al.* (1997) and Bhowmick and Banik (2011), Behera (1994) and Ghosh (2016) Veera and Das (1971)). Sugar content was enhanced mainly due to degradation of polysaccharides into simple sugars by metabolic activities, conversion of organic acids into sugars, and loss of moisture which subsequently increases total soluble solids.

Table 1: Total soluble sugar, Acidity and Ascorbic acid as influenced by foliar application of plant growth regulators in mango cv. Dashehari

Notations	Treatments	Total soluble solids (%)	Acidity per cent	Ascorbic acid(mg / 100 g)
T_0	Control	17.72 ^{e}	0.31	38.59 ^{h}
T_1	NAA (15 ppm)	19.63 ^{abc}	0.22	49.54 ^{d}
T_2	NAA (25 ppm)	20.32 ^{ab}	0.19	39.73 ^{h}
T_3	NAA (35 ppm)	20.58 ^{ab}	0.23	57.63 ^{a}
T_4	GA_3 (15 ppm)	20.12 ^{ab}	0.26	41.24 ^{g}
T_5	GA_3 (25 ppm)	18.32 ^{de}	0.21	44.35 ^{f}
T_6	GA_3 (35ppm)	19.37 ^{bcd}	0.22	55.79 ^{b}
T_7	2,4-D (15 ppm)	18.72 ^{cde}	0.23	51.73 ^{c}
T_8	2,4-D (25 ppm)	20.82 ^{ab}	0.19	47.35 ^{e}
T_9	2,4-D (35 ppm)	21.61 ^{a}	0.17	39.35 ^{h}

Table 2: Reducing sugar, Non-reducing sugar and Total sugar as influenced by foliar application of plant growth regulators in mango cv. Dashehari

Notations	Treatments	Reducing sugar (%)	Non Reducing sugar (%)	Total sugar (%)
T_0	Control	4.42 ^{f}	10.45^{f}	14.87 ^{h}
T_1	NAA (15 ppm)	5.65 ^{ab}	13.78 ^{b}	19.43 ^{b}
T_2	NAA (25 ppm)	5.16 ^{c}	12.12 ^{d}	17.28 ^{d}
T_3	NAA (35 ppm)	4.71 ^{ef}	10.55 ^{f}	15.26 ^{g}
T_4	GA_3 (15 ppm)	5.62 ^{ab}	13.66 ^{b}	19.28 ^{b}
T_5	GA_3 (25 ppm)	5.12 ^{cd}	11.1 ^{e}	16.22 ^{e}
T_6	GA_3 (35ppm)	5.33 ^{bc}	12.45 ^{c}	17.78 ^{c}
T_7	2,4-D (15 ppm)	5.04 ^{cde}	10.4 ^{f}	15.44 ^{fg}
T_8	2,4-D (25 ppm)	4.81 ^{de}	10.97 ^{e}	15.78 ^{f}
T_9	2,4-D (35 ppm)	5.71 ^{a}	14.26 ^{a}	19.97 ^{a}

Conclusion

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

Qualitative characters like TSS and ascorbic acid improved with foliar application of 35 ppm 2,4-D and 35 ppm NAA respectively. Whereas, reducing sugar , non-reducing sugar and total sugar were increased with 35 ppm foliar application of 2,4-D. While, 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 2, 4-D were found to be optimum concentration by which chemical composition of fruits can be significantly influenced.

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