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Effect of plant growth regulators on fruit retention and physico-chemical properties of mango cv. Amrapali gown in laterite soil at close spacing

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ABSTRACT

The experiment was carried out at the farmer's field at Jhargram, Paschim Medinipur, West Bengal on 12 years old mango plant to assess the effect of growth regulators on fruit retention and physico-chemical properties of mango cv. Amrapali. The experiment was laid out in randomized block design with five treatments and four replications. The treatments were as follows- Two times spray of NAA @ 15 ppm (T_1), 25 ppm (T_2) and 50 ppm (T_3) at 21st day interval during pea stage; NAA @ 25 ppm at pea stage followed by NAA @ 50 ppm at marbel stage (T_4) and control (water spray) (T_5). It was found that total number of fruits (216.50), fruit weight (224.58 g) and fruit retention (14.25 %) was highest in T_3 (NAA @50 ppm) followed by T_2 (NAA @25 ppm) and T_1 (NAA @25 ppm) over control. Among the five treatments highest TSS was observed in T_2 (19.38 °Brix) and lowest in T_5 (15.95 °Brix), though the TSS/acid ratio was highest in T_3 (149.05). It can be concluded that two times application of NAA @50 ppm during pea stage at 21 days interval was beneficial for improving the fruit retention, total number of fruits, fruit weight and quality of mango cv. Amrapali under red and laterite zone of West Bengal.

Keywords: Fruit retention, growth regulators, laterite soil, mango

Mango *(Mangifera indica* L.), belongs to Anacardiaceae family, is the world's most luscious fruit has been recognized as the 'King of fruits' in India long back. The nutritional and economic importance makes mango very popular over the world. Amrapali is a mango hybrid (Dashehari x Neelum), gaining popularity for its dwarf stature and regular bearing in nature. Amrapali has already occupied a major area in newly planted mango orchard in West Bengal and replacing the traditional cultivars. In spite of profuse flowering and very high fruit set, the ultimate retention and marketable produce of mango is phenomenally low primarily due to heavy fruit drop. The natural fruit drop in mango is rather too high, amounting to about 99% at various stages of fruit growth. The fruit drop is heavy during first three weeks of fruit set when the rate of fruit development is rapid and it continues up to the 5th week (Ram, 1983). Three distinct phases of fruit drop in mango are pin head drop, post setting drop and May drop (Chadha and Singh, 1964). There are several causes of fruit drop including nutrient deficiency, competition between developing fruitlets, drought or lack of irrigation, unfavorable climatic conditions during fruit development period (winds and hail storms), incidence of serious diseases like powdery mildew and anthracnose and pests like hopper and mealy bug (Majumder and Sharma, 1990). Naturally occurring hormones play a major role in fruit growth and fruit drop of mango (Ram, 1992). An increase in auxin level corresponds with a period of rapid growth while a high level of inhibitor corresponds with high rate of fruit drop. In fact, when the concentrations of abscissic acid and ethylene increase in the panicle, as a result abscission layer is formed at the site of fruit attachment, which ultimately drops down. Many investigators found that spraying mango trees with plant growth regulator like NAA at different concentrations increased fruit set percentage and fruit retention (Singh and Ram, 1983). It has already been proved that efficacy and concentration of plant growth regulators to a plant species for flowering, fruit set and its retention are varied in different agro-climatic condition. Meager information is available about effect plant growth regulators on Amrapalli variety of mango grown in laterite soil at close spacing. Keeping these views in mind the present investigation was carried out to study the effect of plant growth regulator like NAA on fruit retention, yield and physico-chemical properties of mango cv. Amrapali grown in laterite soil at close spacing.

MATERIALS AND METHODS

The experiment was conducted at the farmer's field at Jhargram, Paschim Medinipur West Bengal in two successive years of 2011-12 and 2012-13 on 12 years old mango plants cv. Amrapali planted at 5 x 5 x 5 m triangular system. The plants were uniform in growth and vigour. The orchard soil was laterite having pH 5.5. The experiment was laid out in randomized block design with five treatments and four replications. The treatments were as follows- Two times spray of NAA @ 15 ppm (T_1), 25 ppm (T_2) and 50 ppm (T_3) at 21st day interval during pea stage; NAA @ 25 ppm at pea stage followed

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by NAA @ 50 ppm at marbel stage (T_4) and control (water spray) (T_5). Before spray, 10 panicles on each experimental tree were tagged and number of fruits on each panicle was counted. Data on number of fruits retained on the tagged panicle was counted on 60 days after 2nd spray. The experiment was repeated following year. Fruit weight (10 fruits) was measured by using electronic (digital) balance. Total soluble solids content of fruits was determined with the help of a hand refractometer and acidity was estimated by following the standard methods (AOAC, 1984). The data obtained were analysed statistically by the analysis of variance method as suggested by Panse and Sukhatme (1985) and the significance of different source of variation was tested by error mean square by Fisher's 'F' test of probability level of 0.05 percent. The trees were maintained under uniform cultural practices.

RESULTS AND DISCUSSION

Table 1: Effect of different concentrations of NAA on fruit retention, yield, fruit weight and quality of mango cv. Amrapali

Treat-ments	Fruit retention (%)*	Yield plant^{-1} (kg)*	Fruit weight (g)*	TSS (°Brix)*	Acidity (%)*	TSS: Acid ratio*
T_1	13.05	31.3	183.03	17.74	0.141	128.15
T_2	13.90	39.2	198.75	19.38	0.140	140.12
T_3	14.25	48.6	224.58	18.65	0.130	149.05
T_4	12.00	33.5	177.00	16.70	0.157	109.82
T_5	10.08	24.0	159.00	15.95	0.165	97.33
SEm (±)	**0.21**	**0.47**	**3.03**	**0.29**	**0.002**	**2.4**
LSD(0.05)	**0.65**	**1.52**	**9.45**	**0.89**	**0.007**	**7.48**

Note: *Average of two years

T_1- NAA at 15 ppm –two sprays during pea stage at 21st day interval.

T_2- NAA at 25 ppm –two sprays during pea stage at 21st day interval.

T_3- NAA at 50 ppm -two sprays during pea stage at 21st day interval.

T_4- NAA was sprayed at 25 ppm at pea stage followed by NAA at 50 ppm at marbel stage

T_5 - Control (water spray)

The results presented in table 1, clearly revealed that the application of growth regulator (NAA) showed significant influence on the fruit retention, fruit yield, fruit weight and TSS of mango cv. Amrapali over control. It was found that fruit retention (14.25 %), fruit yield (48.6 kg/plant), and fruit weight (224.58 g) were highest in T_3 (NAA @50 ppm) followed by T_2 (NAA @25 ppm) and T_1 (NAA @25 ppm) over control. These findings are in close conformity with the findings of Vejendla *et al*. (2008) and Nkansah *et al*, (2012). According to Ram (1983) deficiency of auxins, gibberellins and cytokinins coupled with a high level of growth inhibitors i.e. abscisic acid and ethylene cause fruit drop, while, application of NAA (Singh and Ram, 1983), have been found effective in reducing the fruit drop and increase fruit retention. The exogenous application of this growth regulator increases their concentration in the panicle and antagonises the adverse effects of endogenous inhibitors. The total soluble solids content was found high (19.38 °Brix) where the plants received the treatment of NAA @25 ppm followed by NAA @50 ppm over control (15.95 °Brix). Similar result was also found by Haidry *et al*. (1997) in Cultivar Langra. TSS/acid ratio in the present experiment was calculated and ranged between 97.33 and 149.05. The highest TSS/acid ratio was obtained in T_3 and lowest in T_5, though the highest TSS was observed in T_2. This is due to the lower titratable acidity (0.130 %) content of fruits among the other treated fruits. Wills *et al.* (1981) opined that the taste of fruits was usually a blend of balance of sweet and sour and TSS/acid ratio was often better related to palatability of the fruit than with TSS or acid alone.

From the result of present investigation, it can be concluded that two times application of NAA @50 ppm during pea stage of fruit development at 21st day interval was beneficial for improving the fruit retention capacity, fruit yield, fruit weight and quality of mango cv. Amrapali under red and laterite zone of West Bengal.

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