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APPLICATION OF NUTRIENTS AND GROWTH SUBSTANCES INCREASE RETENTION OF FRUITS IN "Langra" MANGO

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ABSTRACT

Two foliar sprays of growth substances viz. 2,4,5-T and GA both at 50 and 100 ppm, MH at 500 and 1000 ppm and mineral nutrients viz. urea at 1% and 2% and borax at 0.5% and 1% dilutions once at just after fruit set and another at ten days before harvesting were carried out on 21 years old mango plants of Langra cultivar. All the treatments significantly decreased the fruit drop and thereby increased the fruit retention as compared to control (no spraying). Among the treatments, GA at 50 ppm was the best to reduce fruit drop and enhance fruit retention, 18.8% of the total set.

Additional Key Words: *Mangifera indica* L., cultivar, fruit drop, urea, borax, growth regulators

INTRODUCTION

Mango is one of the highly prized and choicest fruits of tropics and sub-tropics, characterized by delicious taste, pleasant flavor and multifarious uses. Langra is one of well-established leading mid-season cultivar of mango due to its wide adaptability, high yield potentiality and excellent fruit quality. However, commercial mango orcharding is heavily confronted with serious problems like excessive fruit drop resulting less profit to the farmers.

A mango tree producing several thousands of panicles yields only a few hundred fruits, most of the flowers abscise soon after full bloom and shed enormous young fruits. In many cultivated varieties of mango, only 1-2 percent of fruits are retained while over 98 % shed at various stages. Sen (1939) reported that in the commercial varieties of mango like Langra, Bombai and Fazli, a 13-28 % of the hermaphrodite flowers set fruits; out of this only 0.1 to 0.25 % attained maturity. Mukherjee (1949) claimed that there is a heavy drop of hermaphrodite flowers and young fruits in mango, amounting up to 99 % or more. In mango, generally 0.1% or even less bisexual flowers develop fruits to maturity (Naik and Rao, 1943; Singh, 1954)

Abscission of fruits occurs at different stages of fruit and in a series of waves, the number of which varies with varieties and localities. In Langra variety, the first three weeks after fruit set are reported to be crucial from shedding point of view (Naik and Rao, 1943). Chadha and Singh (1964) reported that about 57 % of the fruits initially formed dropped during this pin-head stage in the Langra variety. May drop that extends almost over the entire month of May and sometimes up to a part of June is economically significant as it reduces fruit yield drastically. Some other investigators have also opined that the drop during the first 3 weeks of fruit set is drastic which declines gradually but continues till maturity in different varieties of mango (Mallik, 1957; Roy *et al.*, 1963).

Deficient nutrition of many developing embryos may be the internal factor leading to the post fertilization drop in mango (Mukherjee, 1953). Degeneration of the embryo in the initial stage of development may yet be another cause of fruit drop. The endogenous hormonal level of fruit especially in abscission zone is probably the most important governing factor affecting fruit drop. Ram (1983) opined that deficiency of auxins, gibberellins and cytokinins coupled with a

high level of inhibitors caused fruit drop in mango. Preventing or delaying the formation of such abscission layer may minimize fruit shedding in mango.

A careful review of the past research works has revealed that foliar application of mineral nutrients and growth substances significantly improves fruit retention in many fruit crops including mango. Considering these facts, present investigation was carried out to work out a possible effect of mineral nutrients like nitrogen and boron through urea and borax respectively as well as growth substances viz. 2,4,5-T, GA and MH on fruit retention in Langra cultivar of mango.

MATERIALS AND METHODS

This investigation was conducted in the horticultural orchard of Bihar Agricultural College, Sabour, Bhagalpur, India during the cropping season of 1997. It is situated between 25°15'40'' North latitude and 87° 2'42''East longitude, with an altitude of 45.72 m above the mean sea level in the vast alluvial gangetic plain. This place has a semi-arid, sub-tropical climate with desiccating hot summer, cold but frostless winter. The soil of the experimental site was sandy loam, deep, fertile and well drained having 6.6 pH. The experiment was carried out on 21 years old trees of "Langra" mango prepared by inarching, spaced 8 m apart which were healthy and uniform and were receiving uniform cultural operations during the field trial. The experiment was laid out on Randomized Block Design with 11 treatments replicated thrice. A single tree was considered as an experimental unit, therefore, 33 trees were selected for this experiment. The chemicals used for foliar application as treatments were urea at 1% and 2%, borax at 0.5% and 1%, 2,4,5-T and GA both at 50 and 100 ppm and MH at 500 and 1000 ppm. Teepol B-200 was used as sticker. Ten liters of solutions of each were sprayed to plants to run-off condition. Two sprayings were done, first on 22.03.1997 (just after fruit set) and next on 10.06.1997 (ten days before harvesting) early in the mornings when dew had evaporated. After the completion of fruit set and just before first spraying of chemicals, total numbers of fruits on tagged panicles were recorded under each treatment and replication. Number of fruits dropped from tagged panicles under each treatment and replications were recorded at fortnightly intervals. The total numbers of fruits reached up to maturity and harvesting were also counted. From this, percentage of fruit drop and retention was calculated.

RESULTS AND DISCUSSION

The foliar application of mineral nutrients and growth regulators at different concentrations had significant effect on reducing fruit drop and thereby increasing fruit retention in "Langra" mango (Table 1). On the basis of findings, it can be inferred that GA 50 ppm was the best treatment for retaining maximum number of fruits in Langra mango followed by 2,4,5-T 50 ppm that was at par with GA 100 ppm. Such findings are in corroboration with the reports of Singh and Rajput (1991) with GA, Banik (1989) with 2,4,5-T and Singh *et al.* (1991) with urea in mango. Reduced fruit drop in litchi fruit was reported earlier by Brahmachari *et al.* (1996) with MH application and Upreti and Kumar (1996) with borax.

Data regarding the cumulative fruit drop at fortnightly interval indicated that the drop occurred throughout the period of fruit development (Table 2). However, the intensity of drop was higher during early stages of fruit development that diminished with the advancement of maturity. More or less similar trend of drop under different treatments was envisaged on subsequent date of observation. It is also transpired that the drop was at slower pace in all the

treatments during the advanced stage of maturity and least in the last fortnight. Roy *et al.*(1963) also reported the initial few weeks after fruit set was crucial period for the drop.

Table.1. Effect of chemicals on fruit drop and retention in "Langra" mango.

Treatments	Fruit drop (%)	Fruit retention (per cent)
T1 – Urea 1%	87.78 (69.55)	12.22 (20.45)
T2 – Urea 2%	85.20 (67.38)	14.80 (22.62)
T3 – Borax 0.5%	87.13 (68.98)	12.87 (21.02)
T4 – Borax 1%	88.02 (69.75)	11.98 (20.24)
T5 – 2,4,5-T 50 ppm	82.52 (65.29)	17.48 (24.71)
T6 - 2,4,5-T 100 ppm	86.14 (68.14)	13.85 (21.85)
T7 – GA 50 ppm	81.20 (64.32)	18.80 (28.54)
T8 - GA 100 ppm	84.21 (66.61)	15.79 (29.39)
T9 - MH 500 ppm	89.21 (70.83)	10.79 (19.17)
T10 – MH1000 ppm	90.63 (72.19)	9.37 (17.81)
T11 – Control (No spraying)	96.46 (79.16)	3.54 (10.83)
S.E.(m)±	0.4728	0.4836
C.D.(0.05)	1.41	1.3947

Note: Angular transformed values are presented in parenthesis. Statistical analysis was performed after angular transformation.

Table 2. Cummulative fruit drop percentage in " Langra" mango at fortnightly intervals.

Date	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11
06.4.97	55.25	50.75	53.90	54.80	48.85	53.56	48.10	51.89	55.95	56.25	61.25
21.4.97	69.25	64.80	67.90	67.85	62.70	67.36	61.70	64.90	69.90	70.20	75.35
06.5.97	77.25	73.40	76.80	75.90	71.15	75.10	70.00	73.40	78.45	79.00	84.25
21.5.97	83.10	79.50	81.75	82.30	77.50	81.00	76.10	79.55	84.45	85.20	90.40
05.6.97	86.90	83.20	85.45	86.00	80.70	84.60	79.65	83.20	87.80	89.00	94.25
20.6.97	87.78	85.20	87.13	88.02	82.52	86.14	81.20	84.21	89.21	90.63	96.46

The increased retention of fruits with the foliar application of these chemicals suggests that the endogenous level of these chemicals or their analogues were deficient in the developing fruits. Nutritional and hormonal factors significantly influence growth and developmental processes of plant as they regulate various metabolic and enzymatic activities. According to Ram (1983), deficiency of auxins, gibberellins and cytokinins coupled with high level of inhibitors caused fruit drop. Likely, Wright (1956) observed that the fruit drop and endogenous auxin level are correlated and thus existence of high level of internal auxin restricted drop. Manabe *et al.* (1981) opined that GA minimizes fruit drop. Similarly, increased retention of fruits with exogenous application of urea, borax and MH might be due to the physiological activities that check abscission. Addicot and Lynch (1955) opined that nitrogen retards abscission as it is required for the synthesis of auxin.

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