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Research Note :

EFFECT OF MICRO NUTRIENTS AND FUNGICIDE APPLICATION ON INTERNAL FRUIT NECROSIS, CRACKING AND FRUIT DROP IN BAEL (*Aegle marmelos* Correa.)

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ABSTRACT : An experiment was conducted at Horticultural Research Centre, SVP university of Agriculture and Technology, Meerut during 2009-10 and 2010-11 to investigate the effect of micro-nutrients and fungicide on internal fruit necrosis, cracking and fruit drop in bael. Out of six treatments applied, combined application of boron (1%) + copper sulphate (0.25%)+ carbendazim (0.1%) was found to be most effective in reducing internal fruit necrosis (17.00% reduction over control), fruit cracking (15.00% reduction over control) and fruit drop (14.70% reduction over control).

Keywords : *Bael, boron, copper sulphate, carbendazim*

Bael (*Aegle marmelos* Correa.) is an important deciduous aromatic fruit tree. It is widely grown and distributed throughout the country. It belongs to family Rutaceae and subfamity- Aurantiodeae. The genus 'Aegle' has two or three species. Of these species, marmelos is very prestigious due to its hardiness and grown under different agro-climatic conditions. The generic name is of Greek origin, whereas the species "marmelos" is of Portuguese origin (Singh and Roy, 8).

In India fruits are grown in an area of 7216 (000 ha), with production and productivity of 88977 thousand metric tones and 12.3 metric tone per hectare, respectively (Anon., 1). Bael is grown mostly in Uttar Pradesh, Bihar, Madhya Pradesh, West Bengal and Rajasthan (Teaotia *et al.,* 11). However, being the minor fruit, the authentic data about the area, production and productivity of bael are not available. Bael can be with stands in extreme cold and hot weather condition due to the hardy nature of tree. Similarly, it is well suited for problematic soils *i.e.,* saline and alkaline soils and can tolerate the salinity level of up to 9 dsm^{-1} and sodicity up to 30 ESP (Anon., 1).

The fruit of bael is having hard shell and a central core inside the fruit and 8 to 20 faintly defined triangular segments. The fruit contains thin dark-orange walls filled with aromatic pale-orange, pasty, sweet, resinous, more or less astringent, pulp. A major constituent of the fruit is the mucilage and marmelosin (0.5%). In addition to that the minor constituents like reducing sugar, essential oils, ascorbic acid and various minerals are also found in fruit pulp. The seed residue contains 70% protein (Benergee and Maiti, 2). All the parts of bael tree (roots, bark, leaves, branches, fruits) are used to form of 'Panchang' for curing various diseases like ulcer, dysentery and diarrhoea, etc. It has 'marmelosin' constituent in fruits which protects our stomach from various stomach diseases. It has various essential nutrients like vitamin-A (186 IU), riboflavin (0.03 mg), niacin (1.10 mg), acidity (0.25-0.36%), minerals (1.70 g), fibre (2.90 g), mucilage (12.7-19.0 %), iron (0.60 mg), carbohydrates (31.80 g), etc. in abundant quantity (Gopalan *et al.,* 5). Fruit pulp is used for preparing sherbat and value added products such as jam, squash, nectar, toffee, etc. Now-a-days, it is gaining popularity day-by-day due to its medicinal and economical importance. The fruit grower of Eastern Uttar Pradesh have much interested to plant a new orchard in form of absolute plantation of bael. Similarly, Western Uttar Pradesh has great potential to popularize the cultivation of bael at commercial scale.

Bael tree has gaining popularity in terms of socio-economic impact in large part of the country. It has significant contribution to improvement of economic status of orchardist through orcharding of bael nursery and processing of herbal product. Among the diseases and physiological disorders infecting bael fruit, internal fruit necrosis, fruit cracking and pre-mature fruit drop are the most serious one.

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Effective control measures of these problems are not available. Keeping in view of above facts, an experiment was formulated to study the effect of micronutrients and fungicide on these problems.

The present experiment on effect of micro-nutrients and fungicide application on internal fruit necrosis, cracking and fruit drop in bael (*Aegle marmelos* Correa.) was conducted at Horticultural Research Centre, Department of Horticulture, Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut (UP) during the two consecutive years 2009-10 and 2010-11. The experimental bael trees were randomly selected in a randomized block design with four replications. The details of treatments are as follow: - T_1- Boron (1 %), T_2- Copper sulphate (0.25 %), T_3- Potassium sulphate (0.25%), T_4-Carbendazim (0.1%), T_6- Boron (1.0%) + Copper sulphate (0.25%) + Carbendazim (0.1%) and T_7- Control. The micro-nutrients and fungicide were applied on the trees at the initial stage of fruit growth. First spray was applied at pea stage followed by second spray one month after first application. The data on internal fruit necrosis, cracking and fruit drop were recorded at fruit maturity and same were statistically analyzed using statistical method as suggested by Gomez and Gomez (4).

Data presented in Table 1 revealed significant affect of micro-nutrients and fungicide on the reduction of internal fruit necrosis, fruit cracking and fruit drop during both the years of experimentation. Minimum fruit necrosis (15.10%) was found with foliar application of boron (1%) + copper sulphate (0.25%) + carbendazim (0.1%) followed by boron (1%) and copper sulphate (0.25%), while maximum incidence of fruit necrosis (51.00%) was observed with control. The reduction of fruit necrosis due to micro-nutrient application might be because of the fact that boron acts as sugar translocation and hormone movement in fruit, resulting improvement in fruit quality. When copper sulphate and carbendazim were applied along with boron in the present study, the incidence of internal fruit necrosis was significantly reduced. This may be due to the anti-fungal activity of carbendazim and copper sulphate in fruit pulp and fruit shell. The significant reduction in the incidence of physiological disorders following foliar application of micro-nutrients and fungicide was also reported by Prakash (6), Singh *et al.* (9), Singh *et al.* (10) and Singh (7). In the present study, the minimum incidence of fruit cracking (17.00 % reduction over control) was observed with a combined application of 1 % boron + 0.25% copper sulphate + 0.1% carbendazim followed by 1% boron and 0.25% copper sulphate fruit cracking. The reduction of fruit cracking due to these treatment might be due to the optimum level of boron in fruit because, it is a key plant nutrient responsible for photosynthesis, hormonal status in fruit and translocation of sugar resulting minimum cracking in bael fruits. However, boron application along with copper sulphate and carbendazim had given more pronounced effect in reducing the incidence of fungal attacks in fruit pulp. The similar observation was also made by Singh *et al.* (9) in mango. The combined application of boron (1%) + copper sulphate (0.25%) + carbendazim (0.1%) in the present study was also found significantly effective in reducing the fruit drop as compared to control and other treatments. For instance, the minimum fruit drop (14.70%) was noticed with combined application of boron (1%) + copper sulphate (0.25%) + carbendazim (0.1%) followed by 1% boron and 25% copper sulphate, while maximum fruit drop(36.30%) was recorded in control. The significant response of micro-nutrients and fungicide application in reducing the fruit drop intensity might be due to the fact that boron plays an important role in translocation of carbohydrate and auxin synthesis. As a result, the fruit drop was reduced. The copper sulphate and carbendazim application along with boron was also found to reduce the pathogenic infestation (Chandra and Singh, 3; Verma *et al.* 12; and Yadav *et al.,* 13).

CONCLUSION

On the basis of results obtained, it is concluded that the an application of boron (1%) + copper sulphate (0.25%) + carbendazim (0.1%) was found significantly superior to reducing the incidence of fruit necrosis, cracking and fruit drop in bael as compared to control and other treatments.

Table 1 : Effect of micro-nutrients and fungicide application on internal fruit necrosis, cracking and fruit drop in bael.

Treatments	Fruit necrosis (%)	Fruit cracking (%)	Fruit drop (%)
T_1 – Boron (1.0%)	22.60	25.00	21.00
T_2 – Copper sulphate (0.25%)	24.00	28.50	25.60
T_3- Potassium sulphate (0.25%)	47.80	42.00	34.80
T_4- Carbendazim (0.1%)	42.30	31.40	31.30
T_5- Boron (1%) + Copper sulphate (0.25%) + carbend- azim (0.1%)	15.10	17.00	14.70
T_6- Control	51.00	43.20	36.30
C.D. (P=0.05)	11.20	9.10	13.40

*(Pooled data of year, 2009-10 and 2010-11)

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