

Mango Malformation – A Mystery

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Introduction

Mango (*Mangifera indica*) is one of the leading fruit crops of our country and considered to be the ‘‘King of fruits’’ in India because of its great utility and it occupies a pre – eminent place amongst the fruit crops grown in India. Amir Khusrau has stated The Mango is the ‘‘pride of the garden’’ and the ‘‘Choicest fruit of Hindustan’’. The details of mango cultivation, cultivars and its quality were discussed in ‘‘Ain – I – Akbari’’ a master piece of Persian literature, written by Abul Fazl during the reign of Emperor Akbar. Emperor Akbar, established the ‘‘Lakh Bagh’’ (A mango orchard having 100,000 plants) in Darbhanga, Bihar. The mango fruit is the favourite of the kings and the commoners because of its luscious taste and captivating flavour. Hiuen Tsang was the first foreigner to bring mango to the notice of outside world. Amir Khusrau sung its praise during the time of Mohammad Bin Tughlaq. Mango malformation was first reported for the first time in India from Darbhanga (Bihar) by Maries in 1891.

Symptoms of the malady

Mango malformation usually appears in two forms

a. Vegetative malformation

1. The incidence of vegetative malformation may be upto 80 % in the seedling or grafted plants than in the bearing plants.
2. The affected seedlings or grafts produce small shoot lets, bearing small scaly leaves with a bunch like appearance on the shoot apices.
3. The vegetative buds in the axils or shoot apices swell, affecting the apical growth of the plant.
4. The shootlets and their branches are not distinguishable due to overcrowding and the whole mass of rudimentary leaves give a bunch like appearance, resembling witch’s bloom structure, which is also called as ‘‘Bunchy top’’.

5. The root system of the affected seedlings does not develop properly.

b. Floral malformation

1. This type of malformation adversely affects the bearing potential of the tree.
2. It appears in bearing trees when they start flowering.
3. The inflorescence or panicles get deformed due to enlargement of flowers.
4. Malformed flowers are usually male and rarely hermaphrodite.
5. Embryo abortion takes place at a faster rate in malformed flowers.
6. The malformed panicles rarely set fruits.

Factors associated with mango malformation

1. Varietal factors

Almost all the varieties of mango, except Bhadauran, Abib, Amin, Dhudiya Langra in India are susceptible to malformation. In Egypt, Zebba, Hiendi and Anshas are resistant to malformation.

2. Association of mites

Aceria mangiferae and *Tyrophagus castellani* cause malformation.

3. Association of fungi

Fusarium moniliformae, *Fusarium moniliformae* var. *subglutinans*, *Fusarium oxysporum* and *Fusarium solani* cause malformation.

4. Association of viruses

5. Nutritional factors

- a. Malformed tissues had lower levels of nitrogen than the healthy tissues.
- b. Leaves of vegetative malformed seedlings had higher proportion of ash, silica and calcium than the healthy seedlings.

6. Physiological factors

a. Chlorophyll content

The leaves of malformed shoots had higher amount of chlorophyll a, b and total chlorophyll content.

b. Phytohormones

A low level of auxins and high level of gibberellins, cytokinins, ethylene and ABA have been reported in the malformed tissues than in the healthy tissues.

c. Carbohydrates

The levels of carbohydrates were higher in the malformed shoots than in the healthy shoots.

7. Biochemical factors

a. C / N ratio

Low C / N ratio was observed in the malformed panicles.

b. Phenolic compounds

i. Malformin

Ram and Bist (1984) for the first time isolated Malformin like substances from the malformed panicles and seedlings.

ii. Mangiferin

Mangiferin, a non – toxic polyphenols from the malformed tissues, establishing the fact that high content of phenols and steroids have strong correlation with the intensity of malformation.

iii. Fusicoccin

Scientists at IARI reported that ‘Fusicoccin’, a phytotoxin produced either by the insect injury or fungi, has been reported to be one of the causes of malformation.

c. Enzyme activities

Enzymes like IAA oxidase and Polyphenol oxidase are higher in healthy panicles.

d. Nucleic acids, amino acids and proteins

Healthy panicles contain higher content of RNA, DNA, Soluble proteins and total amino acids.

e. Regular bearing varieties

like Neelum, Amrapali, Pusa Arunima, Mallika, Sensation, Eldon, Tommy Atkins and Edward are highly susceptible to malformation.



a. Vegetative malformation



b. Floral malformation

Control measures

1. Application of growth regulators

- a. NAA @ 200 ppm prior to flower bud differentiation in October is effective in reducing the incidence of floral malformation.
- b. Ethrel spray @ 400 ppm at bud inception stage during February control the incidence of malformation.

2. Use of phenolic compounds

Catechol @ 1000 ppm during the first week of October reduces floral malformation.

3. Use of Malformin antagonists

Glutathione @ 2250 ppm, Ascorbic acid @ 2110 ppm and Silver nitrate @ 600 ppm gives fruitful yield from malformed panicles.

4. Deblossoming

Deblossoming at bud burst stage alone or in combination with the application of NAA @ 200 ppm during flower bud differentiation effectively reduces malformation.

5. Selective pruning

- a. Selective pruning of the malformed panicles helps in reducing the incidence of malformation.
- b. Application of fungicides (Captan or diazinon) is essential after removal of the malformed panicles.

6. Use of pesticides or fungicides

Spraying of pesticides (Phosphomidon @ 0.03 %) and fungicides (Bavistin @ 0.01 %) minimize the incidence of malformation.

Conclusion

Mango malformation is of two types i.e. Vegetative and Floral malformation. Both can be observed during nursery and bearing stages. It can be controlled by adopting the above stated control measures and one spray of 200 ppm NAA in October, followed by deblossoming at bud burst stage during December – January reduces the incidence. Chemical deblossoming may be attempted with cyclohexamide.