

Understanding and Managing Major Physiological Disorders in Mango Cultivation in India

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Introduction

Mango (*Mangifera indica*) holds a special place in Indian agriculture and culture, being one of the most popular and widely cultivated fruit crops in the country. However, mango cultivation in India faces various challenges, including physiological disorders that can affect fruit quality and yield. This comprehensive guide aims to explore the common physiological disorders encountered in mango cultivation in India and provide practical management strategies to address them effectively.

Overview of Mango Cultivation in India

Mango cultivation in India is diverse, with a wide range of varieties grown across different agro-climatic regions. Major mango-growing states include Uttar Pradesh, Andhra Pradesh, Karnataka, Bihar, and Maharashtra. The mango season in India typically spans from March to July, with different varieties ripening at various times during this period. India is the largest producer of mangoes globally, contributing significantly to both domestic consumption and export markets.

Common Physiological Disorders in Mango Cultivation

1. Fruit Split in mango: Cracks or splits on the fruit skin, rendering fruits unmarketable.

Causes: Fluctuations in moisture levels, irregular watering.

Remedies: Provide consistent irrigation to maintain soil moisture. Apply mulch to regulate soil temperature and moisture. Harvest fruits at the appropriate stage.

2. Sunburn in mango: Browning or discoloration of fruit skin due to excessive sunlight exposure.

Causes: High temperatures, intense sunlight.

Remedies: Provide shade for sensitive fruit clusters. Prune trees to improve canopy density. Apply protective coatings to mitigate sunburn. Provide shade through canopy management or temporary shading materials during peak sun exposure. Maintain adequate soil moisture to prevent water stress, which can exacerbate sunburn. Apply a protective coating or sunblock spray on fruits to reduce direct sunlight impact.

3. Spongy tissue: Here the fruit pulp patch fails to ripen. This is caused by inactivity of ripening enzymes due to high temperature, convective heat and post-harvest exposure to sunlight. Spongy tissue in mangoes is characterized by soft, mushy flesh caused by physiological disorders like internal breakdown. Alphonso (Hapus), Totapuri and Dasher varieties known to be more prone to spongy tissue.

Causes: Spongy tissue in mango is primarily caused by calcium deficiency and fluctuations in environmental conditions such as temperature and humidity during fruit development.

Remedies: Spongy tissue in mangoes can be addressed by applying calcium supplements during fruit growth, optimizing orchard irrigation to maintain consistent moisture levels, and implementing careful post-harvest handling practices to minimize physical damage and stress on the fruit.

4. Biennial Bearing: The term biennial, alternate or irregular bearing generally signifies the tendency of mango trees to bear a heavy crop in one year (On year) and very little or no crop in the succeeding year (Off year). Most of the commercial varieties of north India, namely, Dashehari, Langra and Chausa are biennial bearers. When a tree produces heavy crop in one season, it gets exhausted nutritionally and is unable to put forth new flush thereby failing to yield in the following season.

Causes: The problem has been attributed to the causes like genetical, physiological, environmental and nutritional factors

Remedies: For overcoming biennial bearing, deblossoming is recommended to reduce the crop load in the 'On' year so that it is balanced in the 'Off' year. Proper maintenance of orchard by way of effective control of pests and diseases and regular cultural operations may also result in better performance of the tree every year. Soil application of Paclobutrazol (PP) @ 4 g/tree in the month of September resulted in early flowering with higher fruit set and yield.

5. Fruit drop: The intensity of fruit drop varies from variety to variety. Among the commercially grown varieties, Langra is more susceptible to drop, while Dasher is the least. The

fruit drop is more or less a continuous process and can be classified into three phases, viz. (i) pinhead drop, (ii) post-setting drop and (iii) May-month drop. The fruit drop in first two phases is insignificant compared to the third phase which affects the final yield significantly and needs more attention.

Causes: Embryo abortion, climatic factors, disturbed water relation, lack of nutrition, attack of disease/pest and hormonal imbalances are the major factors that lead to fruit drop.

Remedies: The foliar application of Alar (B-nine) @ 100 ppm or NAA 20 ppm at pea stage of fruit was found effective in controlling fruit drop in mango.

6. Black tip: Black tip disorder in mango, also known as blossom end rot or anthracnose, manifests as dark, sunken lesions at the blossom end of the fruit. The affected fruits become unmarketable and reduce the yield to a considerable extent. The damage to the fruit gets initiated right at marble stage with a characteristic yellowing of tissues at distal end. Gradually, the colour intensifies into brown and finally black. At this stage, further growth and development of the fruit is retarded and black ring at the tip extends towards the upper part of the fruit.

Causes: Black tip disorder has generally been detected in orchards located in the vicinity of brick kilns. It is primarily caused by fungal pathogens such as *Colletotrichum* species. Contributing factors include fluctuating weather conditions, inadequate calcium uptake, and poor cultural practices

Remedies: Prevention involves maintaining proper orchard hygiene, managing irrigation to prevent water stress, applying fungicides if necessary, and ensuring balanced nutrition with sufficient calcium levels. The incidence of black tip can also be minimized by spraying Borax (1%) or other alkaline solutions like caustic soda (0.8%) or washing soda (0.5%). The first spray of Borax should be done positively at pea stage followed by two more sprays at 15 days interval.

7. Mango Malformation: Mango Malformation disorder in India is a serious issue in mango orchards. This disease affects the inflorescence of mango trees, resulting in malformed and sterile flowers, stunted shoots, and distorted growth patterns.

In India, Mango Malformation disorder manifests in several types, primarily categorized as follows:

Vegetative Malformation: Characterized by the abnormal growth of shoots and leaves, resulting in stunted and bushy appearance of affected branches.

Floral Malformation: Affects the inflorescence, causing malformed and sterile flowers that fail to develop into healthy fruits.

Mixed Malformation: Combines symptoms of both vegetative and floral malformation, affecting the overall growth and fruiting potential of mango trees.

Causes: The complexity of the disorder is attributed to cultural, nutritional and factors like, mites, fungal, viral, hormonal imbalance etc

Remedies: Prune infected branches and remove malformed flowers promptly. Apply fungicides during the flowering period to control fungal spread. Improve orchard hygiene and nutrient management practices to enhance tree vigor and reduce susceptibility to the disease. Spraying of Planofix (200 ppm) during the first week of October followed by deblossoming at bud burst stage is also recommended as a remedial measure against malformation.

General Management Strategies for Physiological Disorders

Cultural Practices

- Optimize irrigation and fertilization schedules based on soil and plant needs.
- Maintain orchard hygiene through regular pruning and sanitation practices.
- Monitor orchards for signs of stress and address them promptly.

Pest and Disease Management

- Implement IPM strategies to manage pests and diseases effectively.
- Rotate pesticides to prevent pest resistance.
- Train farmers on pest and disease identification and management techniques.

Environmental Controls

- Install shade nets or structures to protect fruits from sunburn.
- Use windbreaks to reduce wind damage and stress on trees.
- Implement micro-irrigation systems for efficient water management.

Post-Harvest Handling

- Harvest fruits carefully to minimize bruising and damage.
- Pack fruits in ventilated containers to prevent spoilage.
- Transport fruits under proper temperature and humidity conditions to maintain quality.

Conclusion

Understanding and managing physiological disorders in mango cultivation are crucial for sustaining and enhancing mango production in India. By implementing

appropriate management strategies and adopting sustainable agricultural practices, farmers can mitigate the impact of these disorders and achieve higher yields and better fruit quality. Continued research, extension services, and farmer

training programs are essential for disseminating knowledge and promoting best practices in mango cultivation across India.

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