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## PHYSIOLOGICAL DISORDERS OF TOMATO

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Tomato is one of the most popular protective foodstuffs because of its high lycopene content and widely grown vegetables in the world, ranking second in importance to potato in many countries. Though widely grown, tomatoes are subject to a number of pests, diseases and physiological disorders. Environmental stresses produce several common physiological disorders of tomatoes. Any deviation from the normal behaviour of the plant is known as disorder, which is caused either due to the deficiency or excess of any of the nutrients essentially required by the plant for its normal growth and development or due to exposure of the plant to any of the factors *i.e.* nutritional, environmental and cultural in suboptimal or supra-optimal range. Any kind of abnormality in economically important part of vegetables or other parts that contribute to yield and quality of vegetable is termed as a physiological disorder. Physiological disorder is the abnormal growth pattern or abnormal external or internal conditions of vegetables due to adverse environmental conditions such as deviation from normal state of temperature, light, moisture, nutrient, harmful gases and inadequate supply of growth regulators. Separately from living organisms, there are a number of non-living factors that contribute disorders of vegetable crops. These are the biotic factors such as environmental extremes, nutrient deficiencies and toxicities, damage crop production steps, soil and water conditions. Below are descriptions of the different physiological disorder symptoms, causes and possible remedy of tomatoes.

### 1. Blossom End Rot (BER)

Symptoms

- BER is an important physiological disorder in tomato.
- Fruits are generally more sensitive to BER 7-10 days to 21 days after anthesis.
- The lesions appear at blossom end of fruit when it is green.

- The water soaked spots that appear at the point of attachment of the senescent petals later enlarge rapidly.
- The affected portion of the fruit becomes sunken, leathery and later dark coloured due to the attack of several microorganisms.
- This disorder never develops at stem end due to more calcium since it is supplied through stem.



**Fig. 1:** Blossom End Rot (BER) on tomato

#### Reason

- It is due to deficiency of calcium, water deficit, excess of moisture and use of ammonium sulfate fertilizers.

#### Remedy

- Conservation and maintenance of uniform supply of water.
- A single foliar spray of 0.5 per cent calcium chloride solution at the time of fruit development.
- Application of nitrogenous fertilizers in the form of urea.

## 2. Fruit Cracking

#### Symptoms

- There are four types of fruit cracking viz., radial, concentric, circular and burst.
- Radial cracking mostly occurs at ripe stage while, concentric cracking occurs at mature green stage around the shoulder of the fruit.



**Fig. 2:** Fruit cracking on tomato

#### Reason

- Cracking is very common during rainy season, especially when the rains follow a long dry spell.
- The presence of water on the surface makes the fruit more conducive to cracking than soil moisture.
- Radial cracking is associated with high elasticity of fruit skin.
- Cracking is also associated with wider spacing.

#### Remedy

- Fruit cracking can be minimized by growing resistant varieties like, Punjab Chuuahara and Sioux.
- Picking fruits before full ripe stage.
- Application of 10-15 kg ha<sup>-1</sup> borax in soil at planting or spraying boran @0.25 per cent at fruiting stage.
- Maintaining proper soil moisture particularly at ripening stage.

### 3. Cat face

#### Symptoms

- Distortion of blossom end of the fruit. Such fruits have ridges and furrows, indentations, blotches and malformation at blossom end.



**Fig. 3:** Cat face on tomato

#### Reason

- Internal external stress at the time of critical development of tissues causes cat facing.
- Faulty pollination and fertilization.
- Low or high temperature.
- It is associated with uneven distribution of seeds in locules of fruit.

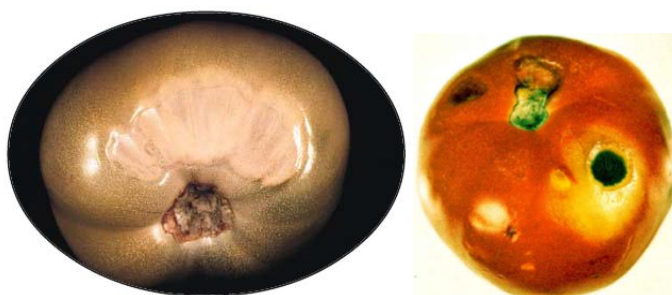
#### Remedy

- Cat face can be minimized by delaying pruning, balancing the internal nutrients and regulating the temperature.

### 4. Sunscald

#### Symptoms

- Fruits with blistered and water-soaked appearance. These patches may have a secondary infection of fungus, which show black dark spots.



**Fig. 4:** Sunscald on tomato

### Reason

- The tomato fruits exposed to sunlight either at green mature stage or near ripens are scalded during extreme temperature.
- Continuous falling of sunrays increases the temperature of that portion up to 40-50°C or more.
- High temperature along with high light intensity, favours sunscald.
- In North India sunscald is serious problem in hot summer months (May-June).
- Cultivars with sparse foliage lead to sunscald.

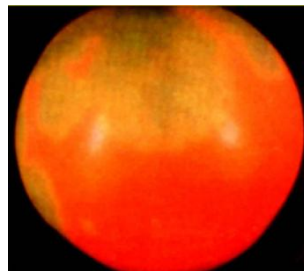
### Remedy

- Growing cultivars with dense foliage.

## 5. Blotchy ripening (BR)

### Symptoms

- Presence of greenish yellow and whitish patches particularly at stem end portion is known as blotchy ripening.
- It is also known as gray wall, vascular browning, cloud, waxy patch, green patch, green back and internal browning.



**Fig. 5:** Blotchy ripening in tomato

### Reason

- Due to an imbalance of nitrogen and potassic nutrients in soil and water deficit.
- Excess of potassium in soil may lead to blotchy ripening.
- It is also due to the collapse of the parenchymatous cell of the pericarp.
- Faulty and uneven pollination also causes blotchy ripening.
- Water deficiency with high transpiration rate also develops this disorder.

### Remedy

- Increment of potassium calcium ratio.
- Regulation of intensity and duration light and temperature.

## 6. Green Shoulder or Green Back

### Symptoms

- The stem end portion of the fruits is turned green.



**Fig. 6:** Green shoulder on tomato

### Reason

- Due to high temperature.
- Genetically governed.

### Remedy

- Reducing the temperature.
- Growing varieties with very dense foliage.
- Green shoulder can be minimized by application of nutrient solution containing potassium.

## 7. Silvering

### Symptoms

- Pale-silvery green patches appear on the leaves, stem and fruits.
- The main shoot is affected more and the growth is checked, as a result, the side shoot grow faster.
- The upper leaves turn silvery and tips of the plants become severely deformed.

- The symptoms appear after the development of 7-8 flower clusters.



**Fig. 7:** Silvering on tomato

#### Reason

- It is due to changes in sub-epidermal layer of apical meristem.

#### Remedy

- Termination of growth of main stem of tomato plants between the third and sixth trusses.

### 8. Puffiness

#### Symptoms

- It is also known as hollowness, tomato puffs, tomato pops and pocket.
- Puffiness is characterized by flattened surface of the fruit and the locules are not filled with pulp, placenta and seeds.
- The affected fruits are light in weight, hollow with flat sides.



**Fig. 8:** Puffiness in tomato

#### Reason

- Puffiness also due to poor fertilization and abortion of ovules.
- It is controlled by more than one gene

### 9. Gold Fleck and Fruit Pox

#### Symptoms

- Gold colour flecks appear on the fruit surface and chlorophyll is not properly disappeared.
- The sub-epidermis or outermost cortex is transformed into spongy mesophyll tissues.
- When fruits ripen, the flecks change from dark green to golden yellow colour.
- Fruit pox is characterized by small lesions on the fruits that usually brown, rough and slightly raised or sunken.



**Fig. 9:** Gold fleck and fruit pox on tomato

#### Reason

- Gold fleck is genetically controlled.

#### Remedy

- Summer shading lowers the incidence of this disorder.



## 10. Cold / Frost / Low-Temperature Injury

### Symptoms

- The injured plants show dark blackish colour.
- The fruits show the symptom of whitish yellow colour, which later become sunken and affected by fungus.
- The injured fruits become soft, water-soaked and dull in colour.



**Fig. 10:** low temperature injury in tomato

### Reason

- It is due to low temperature / cold / severe frost.

### Conclusion

The change in climate is affecting the incidence of physiological disorders in vegetable crops, particularly tomato. Therefore, it is necessary that the growers or farmers should learn to identify the various physiological disorders that occur in their agroecological zones or areas and should be able to manipulate the environment and use locally available resources to control the particular disorders. Evaluating the tomato cultivars suitable to the different agroecological zones/ areas along with manipulating sound horticultural practices, can check the devastating effects of physiological disorders in tomato. Comprehensive knowledge about the causes and management approach of different physiological disorders in tomato will not only aid the quality production to tomato growers, but also it will be useful for researchers to generate innovative ideas to control these disorders through biotechnological interventions, breeding strategies or by understanding a physiological basis to overcome it.

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