



## DISORDERS OF TOMATO: Blossom End Rot (BER)



### SYMPTOMS:

- Light tan, water-soaked areas which can then enlarge and turn black and leathery in appearance (**Figure 1**).
- Usually occurs at the blossom end of the fruit.
- Occasionally occurs on the side of the fruit or internally with no visible symptoms on outside of fruit (**Figures 2 & 3**).

### CAUSES:

- Blossom-end rot (BER) is caused by a localized Ca deficiency in the developing fruit.
- The following conditions may increase BER: low soil Ca, high N rates, using ammoniacal sources of N, high concentrations of soluble K and Mg in the soil, high salinity, low humidity, inadequate soil moisture, damage to root system by nematodes, disease, mechanical means or heavy pruning.
- In greenhouse production not cycling the irrigation system at night can increase BER, since night is an important time of Ca uptake.

### PREVENTION:

- Proper fertilization and good water management.
- In Florida, adequate soil Ca is considered to be 300 ppm or higher by Mehlich-1 index. Foliar applications of Ca materials have not proven to reduce BER since very little Ca is taken up by the fruit and that taken up by the leaves can not be translocated to the fruit.

### The following conditions may increase BER:

- Low soil Ca
- High N rates
- Ammoniacal sources of N
- High concentrations of soluble K and Mg in the soil
- High salinity
- Low humidity
- Inadequate soil moisture
- Damage to root system by nematodes, disease, mechanical means or heavy pruning

### PHOTOS:

**Figure 1.** Fruit showing symptoms of BER, top left fruit showing mild BER, others showing severe BER. Photograph by: Steve Olson.

**Figure 2.** Several fruit showing sidewall BER. Photograph by: Steve Olson.

**Figure 3.** Cross-section of fruit showing internal BER. Photograph by: Steve Olson.



### SYMPTOMS:

- Catfacing is a generic term used to describe a tomato fruit that has a gross deformity and is usually not marketable.
- The defect is usually located on the blossom end of the fruit (**Figure 1**).

### CAUSES:

The deformity is caused by something (internal or external) that occurs during the formation of the flower that results in the fruit not developing normally. There is little published information as to the exact cause and there actually may be more than a single cause. Increases in catfacing occur when:

- Cool or cold temperatures about 3 weeks before bloom.
- Heavy pruning in indeterminate varieties.
- Drifts of herbicides such as 2,4-D (**Figure 2**).
- Heavy thrips feeding on young fruit.
- Plants that are mildly affected by Tomato little leaf have severely catfaced fruit (**Figure 3**).

### PREVENTION:

- Select varieties that historically have had little problem for catfacing.
- Prevent spray drift from undesirable chemicals.
- Prevent soils from becoming waterlogged (**see Tomato Little Leaf, pp. 109-110**).

### PHOTOS:

**Figure 1.** Fruit showing catfacing on blossom end. Photograph by: Steve Olson.

**Figure 2.** Fruit damage due to exposure to 2,4-D. Photograph by: Steve Olson.

**Figure 3.** Distorted fruit due to Tomato little leaf. Photograph by: Steve Olson.



### Cracking



#### SYMPTOMS:

- Two different forms of cracking occur in tomato fruit. Radial cracking originates from the stem end and progresses toward the blossom end. Concentric cracking occurs in a ring or rings around the stem scar. It is possible to have both types on the same fruit.
- Cracking is more of a problem in a vine-ripe operation versus a mature green operation.

#### CAUSES:

- Cracking occurs when the internal expansion is faster than the expansion of the epidermis and the epidermis splits.
- Can occur at all stages of fruit growth but as fruit matures they become more susceptible, especially as color develops.
- Wide fluctuation in air temperature can also increase cracking.

#### PREVENTION:

- Select tolerant varieties.
- Reduce fluctuations in soil moisture.
- Maintain a good foliage cover, since exposed fruit are more susceptible.

Photograph by: Steve Olson.

### Graywall (blotchy ripening)



#### SYMPTOMS:

- Internally graywall is characterized by dark necrotic areas usually in the vascular tissue of the outer walls.
- Necrosis is sometimes present in the cross-walls and very infrequently in the center pith area of the fruit.
- Outward symptoms show up as grayish in appearance caused by partial collapse of the wall tissue hence the term graywall.
- It typically develops on green fruit prior to harvest but can show up later. Fruit affected are typically not marketable due to a blotchy appearance as fruit ripens.

#### CAUSES:

- Cause is not completely understood.
- Graywall is more of a problem during cool and short days.
- High N may increase problem and adequate K may reduce the problem.

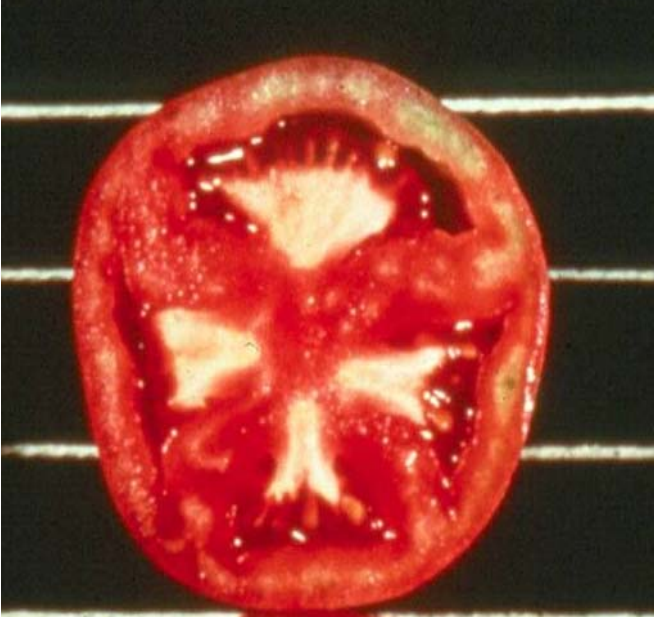
#### PREVENTION:

- There are variety differences in susceptibility.

Photograph by: Steve Olson.



### Internal White Tissue



#### SYMPTOMS:

- Fruit affected by this disorder usually show no outward symptoms.
- When ripe fruit are cut, white hard areas especially in the vascular region are present in the outer walls. Under severe conditions, fruit may also show white tissue in cross-walls and center of fruit.
- Problem may be so severe that fruit are unmarketable.

#### CAUSES:

- The problem is more of a concern with vine-ripe or u-pick producers since fruit picked mature-green and gassed rarely show the problem.
- High temperatures during the ripening period in the field seem to trigger this disorder.

#### PREVENTION:

- Adequate K fertilization has shown to reduce but may not eliminate it.
- Some varieties are more resistant to the problem, especially the highly colored varieties.

Photograph by: Steve Olson.

### Tomato Irregular Ripening (TIR)



#### SYMPTOMS:

- Green fruit show no symptoms but as fruit ripens, color fails to develop uniformly.
- Color often develops along locule walls with intermediate areas remaining green or yellow, producing a star-burst appearance.
- With sufficient time, nearly normal external color develops on most fruit but internal areas remain hard with little or no color development.
- Fruit affected are unmarketable.

#### CAUSES:

- Feeding of nymphs of the Silverleaf whitefly (*Bemisia argentifolii*) on the tomato foliage induces irregular ripening.
- Can occur with as few as four Silverleaf whitefly nymphs per terminal leaf.

#### PREVENTION:

- Use multiple approaches to manage *Bemisia tabaci* populations (**see Sweetpotato Whitefly, pg. 81**).

Photograph by: Steve Olson.



### Pox and Fleck



In most cases when a fruit is affected, both disorders are found together but are considered separate problems.

#### **SYMPTOMS:**

- Pox is described as small cuticular disruptions found at random on the fruit surface. The number can vary from a few to many.
- Fleck, also known as Gold Fleck, shows up as small irregular shaped green spots at random on the surface of immature fruit which turn to a gold color as fruit ripens. Number of spots can vary from few to many.
- Fruit severely affected with pox and fleck are not marketable.

#### **CAUSES:**

- Both conditions seem to be genetic in nature, but are difficult to breed out of a variety since the symptoms only show up under certain environmental conditions. There seems to be some differences of opinion as to the conditions for the problem to show up. There are differences between varieties as to susceptibility to pox and fleck.

#### **PREVENTION:**

- Keep a record of field observations.

#### **PHOTOS:**

**Fig. 1.** Several fruit showing severe pox and fleck. Photograph by: Steve Olson.

**Fig. 2.** Closeup of pox and fleck. Photograph by: Steve Olson.

### Puffiness



#### **SYMPTOMS:**

- When this problem is slight, it may be impossible to detect puffiness until fruit are cut.
- Severe puffy fruit will appear to be flat sided or angular in nature.
- When fruit are cut, open cavities are observed between the seed gel area and the outer wall. Fruit also weigh little in relation to size.

#### **CAUSES:**

- Any factor that affects fruit set: inadequate pollination, fertilization or seed development
- Most common causes in Florida are too low or high of temperatures during fruit set.
- Other factors such as high N, low light or rainy conditions can also cause seed set problems.

#### **PREVENTION:**

- Use of "hot set" varieties can reduce the problem but even these have limitations when night temperatures get above about 75°F.

Photograph by: Steve Olson.



## Rain Check



### SYMPTOMS:

- Tiny cracks that develop on the shoulder of fruit; these cracks can vary from just a few to almost complete coverage of the shoulder.
- The cracks feel rough to the touch and affected areas can take on a leathery appearance and not develop proper color as fruit ripens.
- Green fruit are most susceptible, followed by breakers and ripe fruit are not affected at all.
- Damage occurs most often on exposed fruit after a rain.

### CAUSES:

- Exact cause is not known, but appears to be related to exposure of the fruit to water.
- Problem is more severe when heavy rains occur after a long dry period.

### PREVENTION:

- There are differences among varieties to susceptibility to rain check.
- Also varieties with good leaf coverage usually have less rain check.

Photograph by: Steve Olson.

## Sunscald



Sub lethal scalding

### SYMPTOMS:

#### Two types:

*Sub lethal*— a yellow, hard area usually on the shoulder of the fruit

- Occurs when tissue temperatures rise above 86°F. The high tissue temperatures will not allow the red pigment to develop nor flesh to soften but allows the yellow pigments to develop.

*Lethal*— the tissue turns white and dies; many times the dead tissue will turn black from fungi that grows feeding on the dead tissue

- Occurs when tissue temperatures rise above 104°F.

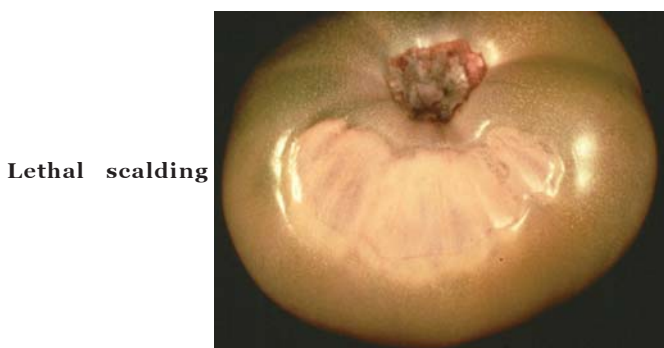
### CAUSES:

- Damage usually occurs when fruit are suddenly exposed to sunlight.
- This most frequently occurs after a harvest or a storm when leaves are moved around and fruit exposed.
- Over pruning can also increase sunscald problems especially with fruit in the upper part of the plant.

### PREVENTION:

- Good spray programs to ensure good foliage cover can reduce problem.
- Growers at times may use a sun screen material such as Snow or Surround to help reduce sunscald.

Photographs by: Steve Olson.



Lethal scalding



## DISORDERS OF TOMATO

### Western Flower Thrips Oviposition Damage



#### **SYMPTOMS:**

- This injury is characterized by a small dimple often with a white halo around the dimple.
- Caused by the female Western Flower Thrips (*Frankliniella occidentalis*) (WFT) inserting an egg into the fruit when the fruit is very small.
- Many times the bloom has not yet shed the corolla when the injury occurs.
- The number of dimples can vary from a few to very many. Numerous dimples can result in the fruit being reduced in grade.
- Damage is mostly on the surface and does not go very deep into the fruit.
- Dimple does persist throughout the life of the fruit but halo area may go away when fruit ripens.

#### **PREVENTION:**

- Control is through management of WFT.

### Zebra Stripe



#### **SYMPTOMS:**

- Characterized as a series of dark green spots arranged in a line from the stem end to the bloom end.
- At times it seems the spots coalesce together and form elongated markings.
- Many times the dark green areas will disappear when fruit ripens.

#### **CAUSES:**

- This problem seems to be variety related.
- It is probably a genetic defect that only shows up under certain environmental conditions.
- Zebra stripe may be linked to pox and fleck.

### Zippering



#### **CONTACT INFORMATION:**

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#### **SYMPTOMS:**

- Described as a fruit having thin scars that extend partially or fully from the stem scar area to the blossom end.
- The longitudinal scar has small transverse scars.
- At times there may be open holes in the locules in addition to the zipper scar.

#### **CAUSES:**

- Cause is usually an anther that is attached to the newly forming fruit causing the scar.
- Some people feel that a zipper is formed when the "bloom" sticks to the fruit and does not shed properly, but this may not be a cause.

#### **PREVENTION:**

- Only control is to select varieties that are not prone to zippering.

Photographs by: Steve Olson.