

# FRUIT CRACKING IN GREENHOUSE TOMATOES

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Fruit cracking can be a significant problem for a greenhouse tomato grower. In recent years, many New England growers have reported problems with fruit cracking. In northern New England, growers frequently report that visible cracks appear on fruit following heavy morning fogs in the valleys where the greenhouses were located. These conditions frequently occur late in the crop when cool nights follow hot humid days.

There are several distinct types of cracking, including fruit bursting (longitudinal cracking), concentric cracking, crazing or russetting, star or radial cracking, lenticular cracking and core failure. In the greenhouse, concentric cracking can be a problem when a chronic water stress problem exists. For most growers this is not a problem. Radial cracking and crazing are problems that most commonly occur in local greenhouses. Radial cracking begins at the calyx scar and involves the splitting of the skin and outer wall of the fruit between the locules. Crazing is an irregular series of shallow breaks in the skin that may form a network covering the entire surface of the fruit.

Fruit cracking is not a well understood phenomenon. Many environmental, cultural and genetic or varietal factors are believed to play a role in tomato fruit cracking. As many greenhouse tomato growers know, cracking tends to be episodic in nature, occurring with great severity one year and not at all the next year.

In general, tomato fruit cracking is associated with a rapid movement of water and sugars into the tomato fruit at a time when the skin of the tomato is losing elasticity and strength. The skin on tomato fruit typically loses elasticity and strength during ripening. However, cracks may even develop on green fruit as skin strength changes in response to certain environmental conditions. There are a number of theories that attempt to explain the physiological basis of tomato fruit cracking. In the following article, I will review some of the possible causes of cracking and some of the possible solutions to this problem.

Irregular watering, especially a rapid change from very dry to very wet soil conditions, has been associated with cracking. As soil moisture levels increase, tomato skin strength decreases. High soil moisture levels also tend to cause the fruit to swell. This combination—expanding fruit and decreased skin strength—can result in the formation of many minute cracks in the skin of the fruit. If cracks develop on green fruit, visible cracks may not develop until the ripening process begins. However, these minute cracks represent weaknesses in the skin where additional stresses may cause the skin to split or where moisture can enter the fruit directly, causing the fruit to swell and crack.

Fruit cracking is also associated with high light and high temperature conditions. It has been observed that sudden high temperatures will cause fruit to crack in the greenhouse. As fruit temperature increases, gas and water pressures rise inside the fruit, putting added strain on the skin to expand. At the same time, high temperatures reduce skin strength and stiffness.

High light not only affects fruit temperature (especially on unshaded fruit, but also increases the level of available sugars. As the sugar content of the fruit increases, water movement into the fruit increases and cracking becomes more prevalent.

High fruit growth rates also favor cracking. There may be a relationship between skin crazing and high fruit growth rates. Fruit expand rapidly when light and temperature levels are high and nutrient solution electrical conductivity (EC) is low. Topping plants and removing sucker growth also tends to increase the growth rates of the fruit that remain on the plant.

High day/night temperature differences may also favor cracking, especially crazing. It is believed that as the fruit cools at night, it contracts and draws in moisture from the plant and even from the fruit surface through minute cracks. As the fruit heats up rapidly during the day, pressure

builds within the fruit, forcing the skin to expand and sometimes crack.

High humidity or changes between day and night time humidity may also increase cracking.

Not all cultivars are equally prone to cracking under greenhouse conditions. Anatomical differences between cultivars are believed to be partially responsible for crack resistance. Cultivars least likely to crack are usually small fruited varieties with thick skins, thick side walls (the pericarp) and a cuticle layer that penetrates deep into the skin.

Overall, cracking is most likely to occur with large fruited varieties when relatively few fruit are on the plant and when the skin on the fruit lacks elasticity and the soluble solid (sugar) content of the fruit is high.

Cultural conditions that most favor cracking include wide plant spacing and harvesting fruit at the red ripe rather than the breaker stage. Also, removing side shoots and pruning fruit, practices

that increase fruit size, and removing leaves, a practice that allows the sun to heat the fruit directly

The incidence of fruit cracking will also increase when nutrient solution EC is low and when soil moisture is high, or is initially low and then suddenly becomes high. Low night temperatures and high daytime humidity and temperature will also favor fruit cracking. Moisture on the surface of the fruit will almost always increase the incidence of cracking.

To prevent fruit cracking, growers should use cultivars which are most resistant to cracking under their conditions. Plants should be maintained at a moderate to slightly low water status and watering should be consistent. Less water should be provided at each irrigation as the fruit number on the plant decreases. Rapid, large fluctuations in day/night temperatures should be avoided, and good calcium nutrition should be maintained.

**Reference**

Pect, M.M. 1992. Fruit cracking in tomato. HortTechnology 2(2):216-219, 222-223.



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