

“Exploding” Fruits not Unique to Watermelon: Fruit Cracking in *Cucurbita moschata*

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In May 2011, a Chinese TV station carried reports of “exploding” watermelons in Danyang in Jiangsu province in eastern China. This report was picked up by a number of internet news services (4,7,12). The use of the growth regulator forchlorfenuron too late in the season and under rainy conditions was cited as the cause.

Ruptures occurring in either the rind or cuticle are reported in a number of fruit including tomato (14), cherry (9,10), grape (3), pepper (2,5) and noni (*Morinda citrifolia*) (6). Two types of cracking are generally mentioned: radial (beginning at the stem) and concentric (circular). In pepper, small fissures (russeting) can also occur (5). In the case of the “exploding” Chinese watermelons, both radial and concentric cracking are seen in photographs posted to the web (4,7,12).

Most researchers attribute fruit cracking to the amount of water available to the plant as the fruit is ripening (1, 3, 5, 6, 9, 10, 11). Cracking appears to be the result of the buildup of internal turgor pressure caused by excess water availability. It may be especially common when insufficient water availability is followed by excess irrigation or rainfall. In pepper, Aloni et al. (2) proposed that the nighttime reduction in transpiration results in the high turgor pressure that causes cracking in peppers. A number of authors mention that the incidence of fruit cracking can vary among cultivars (1, 3, 9, 10, 11).

One of the goals of the tropical pumpkin (*Cucurbita moschata*) breeding program in Puerto Rico is to develop semi-bush cultivars with high dry matter content and deep orange color. The genetic materials used in this program derive from crosses between temperate (primarily ‘Bush Butternut’) and tropical material (13). We have often noticed that some of the derived lines are susceptible to fruit cracking. ‘Taína Dorada’, a cultivar released from this program, is appreciated by growers for its fruit quality, especially its deep orange color and high dry matter content. Percent dry matter and °Brix in ‘Taína Dorada’ is much higher than that of the Puerto Rico standard cultivar ‘Soler’. Despite these positive attributes, growers complain that they regularly encounter cracked fruit. Both radial and concentric cracks occur (Figure 1).

This problem has never been observed in ‘Soler’, even when both varieties have been planted in fields where irrigation management and rainfall is the same. Cracking usually occurs just as the fruit is maturing (>30 days post-anthesis) and can be up to 3 cm deep. The fruit cavity is not affected, the exposed flesh quickly suberizes, and fruit rotting does not occur. However, these fruits are no longer marketable.

Splitting or cracking of squash fruit, particularly butternut types, is not an uncommon problem judging by the number of home gardeners sending questions or comments to internet gardening forums or blogs (for examples, see <http://www.no-dig-vegetablegarden.com/butternut-squash-splitting.html> and <http://www.idigmygarden.com/forums/archive/index.php/t-10379.html>). According to a technical bulletin for Sakata Seed (1) all squash fruit have the potential to crack and susceptibility varies among cultivars. ‘Taína Dorada’ has both the thin rind and high sugar content that, according to this bulletin, make a variety more susceptible to fruit cracking. High sugar levels result in a higher osmotic potential in the fruit, thus favoring greater uptake of water. The result is that fruit cells swell causing the fruit to crack. The bulletin notes that mature fruit are particularly affected and that over fertilization may play a role.

Strang et al. (11) evaluated 24 squash and pumpkin varieties in Kentucky during a very wet season. Several cultivars had cracked fruit, including one that continued to crack when exposed to rain after harvesting. Included in this trial was the tropical pumpkin cultivar ‘La Estrella’ which is very closely related to ‘Taína Dorada’. However, no fruit cracking was reported in ‘La Estrella’ in this trial.

Selection against fruit cracking might not be effective if, at the same time, one wishes to select for increased fruit sugar and dry matter content. The best approach for minimizing this problem is likely to be good water management and prompt harvesting of mature fruit.

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Figure 1: Fruit cracking in *Cucurbita moschata* cv. Taína Dorada. This planting, in Mayagüez, Puerto Rico, was drip irrigated; however, extremely heavy rains occurred late in the season. Cracks are up to 2.5 cm deep. The variety 'Soler' planted in the same field did not show fruit cracking.