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Fruit Cracking and Splitting

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Introduction

Cracking of sweet cherry fruit due to rain near harvest is a major source of crop loss in the cherry industry. The disorder is characterized by a splitting of the outside layer of the cherry skin called the cuticle. The splitting most commonly appears around the stem bowl, where water can accumulate, but is also seen on other areas of the cherry cuticle. The results are the same, fruit which can no longer be sold for the fresh market.

Cracking susceptibility varies with cherry variety. Bing cherries have a higher incidence of cracking while Van, Sweetheart, Lapins, Rainier and Sam are lower. Researchers are attempting to explain these differences by studying the factors which appear to be involved in the cherry cracking process.

Current Theory

As the cherry fruit ripens, it experiences growth spurts, starch to sugar conversions, solar heating fluctuations, water content variations, and cuticle morphology changes. Hydrostatic/osmotic pressure within the cherry varies according to these changes. Late season rain or humidity accompanied by higher temperatures can cause this pressure to increase to a point beyond the expansion capability of the cherry cuticle. This occurs when water is transported into the cherry through the cuticle driven by the difference in the osmotic potentials of the rain water outside and the sugars and other chemicals inside the cherry flesh.

There are several theories which attempt to explain the mechanism of water absorption by cherries exposed to rain or high humidity. It is thought that different varieties of cherries have cuticle differences which allow more or less water to enter and that the elastic properties of the cuticle are also variety dependent. Some studies have looked at the physical differences in specific regions of the cherry which may allow water to enter the cherry fruit more directly to equalize the difference in osmotic potential. Other studies have shown that “micro-cracks” may be present in the cuticles of cracking-prone cherries and that these cracks are the eventual source of the splitting that occurs.

Prevention

Several methods or farming practices have been developed to combat cherry cracking during late season rain exposure. The following is a summary of current strategies is use:

Physical removal of water from cherry surface—helicopters or orchard sprayers are used to blow the rain water off the cherry fruit surface. These methods are expensive and must by used in a timely manner.

Physical barrier—canopies are constructed over rows of cherry trees providing a protective cover which prevents rain water from coming in contact with the cherry fruit surface. This method is effective, but very expensive and may result in delay of fruit maturity and color development.

Osmoticum sprays—solutions of mineral salts, most commonly $CaCl_2$, are applied by orchard sprayers or through overhead irrigation systems prior to and during rain periods. Cell wall integrity may be increased as the mineral is incorporated into the cell wall and the osmotic potential of the relatively pure rain water is increased in the hope of reducing absorption of the rain water across the cherry cuticle. This method is moderately expensive, depending on the number of applications necessary to keep the osmoticum concentration at an effective level as the rain continues and washes the salt off the cuticle. This treatment can also leave the cherry with an unsightly appearance as the mineral salt dries, necessitating additional post-harvest washing.

Protectants—various formulations have been developed to add a chemical barrier to the surface of the cherry fruit, thereby preventing or reducing water movement across the cherry cuticle. These treatments have shown mixed results to date in reducing cherry cracking and may have drawbacks in reducing the rate of gas exchange and the development of soluble solids (sugars) in the cherry fruit. Scientists at the WSU Tree Fruit Research and Extension Center in Wenatchee have promising results with a new formulation of this nature which has shown no disadvantages while helping to prevent cracking and has also shown an ability to increase firmness and moisture retention during post-harvest storage.

Other chemical treatments—surfactants, plant hormones, copper and other chemical substances have been used with mixed results at best and often have resulted in unattractive fruit surface appearance.

Researchers and cherry breeders continue to search for cherry varieties which are less prone to cracking while maintaining consumer appeal in taste, appearance, and storability. As the actual mechanism of cherry cracking is further defined, better methods or treatments will likely be developed which will further insure protection for farmers facing losses from this seasonal threat to cherry production.