PLAIN TALK ABOUT APPLE LENTICEL BREAKDOWN

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Lenticel breakdown (LB) is a skin disorder of apples that appears largely after the fruit have been packed, thus it is a very expensive problem. The postharvest team at WSU – TFREC has been researching LB for the past five years in order to seek a solution. I am sorry to report that there does not appear to be a single solution. Minimizing this costly disorder will take teamwork, including cooperation from the grower, storage operator and packer.

Galas are most susceptible to LB, but it has also been seen to a much lesser extent on Reds and Fujis especially after long-term storage (Figure 1). Mild cases of this problem have the same appearance as chemical burn, which causes the lenticels to turn black (Figure 2). In more serious cases the flesh under the lenticel sinks and the appearance is one of many craters. LB should not be confused with a problem called Lenticel Blotch Pit, which is the drying and browning of the flesh just under the skin, caused by a nutrient imbalance.

Figure 1. Gala is the most susceptible to lenticel breakdown. Mild cases resemble chemical burn, and the lenticels turn black.

Figure 2. In more severe cases, like the Fuji pictured here, flesh under the lenticels sinks, resulting in craters under the skin.

MATURITY

One key to a resolution of this problem is to determine why fruit from certain orchards develop this problem while fruit from other orchards appear to be immune. Harvest maturity plays role.

Growers with less highly colored strains of Gala or Fuji find the fruit downgraded due to lack of red color. Red color is optimized when the nights turn cool, which is not often the case during Gala harvest season in the hotter areas of the state. Thus, the natural reaction is to allow the fruit to remain on the tree to optimize color and size. In our experiments, fruit that is harvested when it is more mature develops more LB than fruit that is harvested at optimum starch levels. Any gain in profit from increased red color is lost when fruit need to be re-packed due to LB.

Although we do not have experimental data, it appears that the time interval between harvest and cooling influences the risk of LB. When cooling is delayed after harvest, it is our experience that the risk of LB increases.

MINERAL CONTENT

Thinking that there might be a connection between mineral content and the risk of LB, last year we examined the mineral content of LB and non damaged fruit. The tissue we used was almost exclusively from the peel of the apple. Most standard fruit mineral testing programs utilize the flesh or whole fruit. We reasoned that since LB is a problem in the skin we would test only that part of the fruit that was affected thus eliminating any extra apple tissue. There was no significant difference in mineral content, re-affirming that LB is different from Lenticel Blotch Pit.

Additional analyses of the mineral content data performed after this paper was published revealed that there WAS a significant difference in LB-damaged fruit and non-affected fruit using the formula: K+Mg/Ca + N/Ca. (See http://postharvest.tfrec.wsu.edu/REP2003B.pdf). Subsequent research in other years has reinforced this observation. Complete results will be available in summer 2009.

SMARTFRESH™

Moving into storage, the application of SmartFresh™ (1-MCP) has provided mixed results. We have applied SmartFresh™ to half our storage samples each year for the last three years. In two years there was no difference in the number of fruit that developed LB, while in one year the SmartFresh™-treated fruit did develop more LB than untreated fruit when they were packed after January. These previous trials were done with a very small number of lots of apples. This year we hope to understand the effect of SmartFresh™ further from a trial we are doing with 24 lots of Gala apples.

STORAGE

It appears from our work that the appearance of LB is affected by the length of time the fruit is in storage. Galas packed within 3-4 months of storage developed less LB than those packed after longer storage periods. When I tour packinglines in other parts of the world they report that there is not a major problem with LB. One of the reasons may be that Galas are packed immediately after harvest and are not held in bins and packed after 6 or more months. When I get reports from the Washington industry on LB of Reds or Fujis it usually is after long-term storage of late-picked fruit.

WATER

During the packing process fruit are first dumped into water. In our experiments, when the fruit and water temperatures are close together there is less LB than when very cold fruit are dumped into hot water.

In other countries, apples do not spend much time in water; they may be dumped into water, but then are moved on belts without brushes. In our trials, we have determined that susceptible fruit held in long-term storage develop more LB when the fruit are pre-sized than when they are not held in water, as on a commit to pack line.

The application of soaps and detergents should be avoided on LB susceptible lots. In other countries, soap is not used and usually the fruit are not waxed. Soaps and detergents are mostly surfactants, and in our trials some types of surfactants cause injury to susceptible apple tissue. Higher concentrations cause more damage.

IRON

Last season we tested whether there is a connection between postharvest exposure to iron and LB. Peaches exposed to the iron in buckets at harvest or iron in postharvest equipment develop skin damage called 'inking'. Gala apples exposed to very high levels of iron sulfate (500 ppm) in solution developed more LB than those that had not been exposed. This does not appear to be a way to solve LB.

TREAT GALA DIFFERENTLY

We continue to work on understanding this disorder, but it has become apparent to me that this industry needs to rethink the way in which we are treating fruit with tender skin. Thus far Washington has had the largest economic problem with LB. Galas are grown wherever apples are able to be grown, including areas of the state that may be too hot for this variety. Harvesting at the proper maturity is one challenge. A second challenge is to reduce the length of time this apple is stored. Gala is essentially a summer apple that is stored long-term because of the huge volume planted. We are using equipment in the packinghouse designed for a much sturdier apple (Red Delicious) that can stand up to long brush lines, repeated immersion in water, soaps and drying tunnels. We are also trying to get Gala to conform to our perceived marketing needs by waxing it, which necessitates the use of soaps and surfactants. Perhaps if the ten large marketing organizations banned together and refused to provide Galas that are waxed, we could eliminate much of the LB problem. It is time to rethink how we treat this delicate variety, since in the near future, if not today, we will be packing and storing new varieties that are even more sensitive to postharvest handling challenges.