

A Status Report on Lenticel Breakdown of Gala Apples July 2005

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Research is underway to determine how best to handle Gala apples after harvest so that the fruit do not develop Lenticel Breakdown following packing.

Lenticel Breakdown (LB) has been seen on Gala apples, as well as other varieties (especially Fuji) for at least 6 years. Darkened lenticels, black lenticels or superficial small brown spots constitute LB (Figure 1). LB occurs most seriously on apples following packing and is not seen on many fruit prior to packing. It has become worse in the last three years causing large economic losses to certain growers.

Gala apples vary in susceptibility to LB and each year fruit from specific orchards can be affected, while fruit from other orchards are not affected. The disorder (it is not a disease – there is not evidence of a pathogen) can appear as discrete black spots similar to chemical burn or as small brown spots that become sunken over time and may then invite the invasion of pathogen fungi. Usually the spots are associated with lenticels and are skin deep with no corking in the flesh.

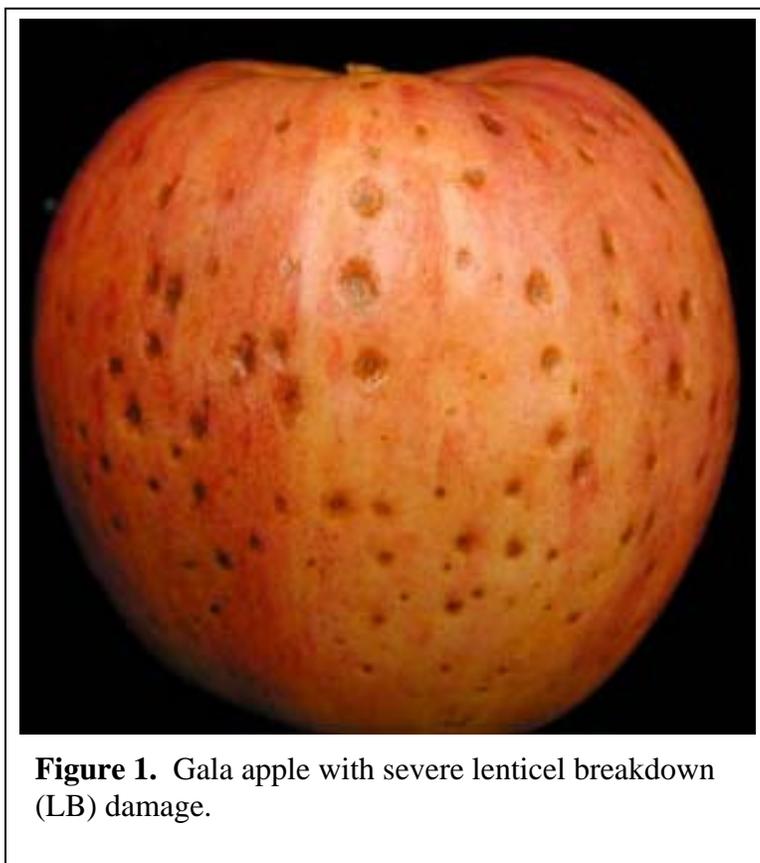


Figure 1. Gala apple with severe lenticel breakdown (LB) damage.

Lenticels are normal parts of the skin of most plants and fruits. Lenticels are thought by some scientists to arise as the hairs of young fruit drop off. A lenticel has two guard cells, is filled with tissue, and underneath is corky. Over time the intercellular space increases and corks over beneath the opening. Dr. Eric Curry (USDA-ARS, Wenatchee) has evidence showing that lenticels crack and heal repeatedly as fruit enlarge. There is evidence that some lenticels have large pockets of open space in the flesh while others are sealed.

Scientists have not determined why fruit from certain orchards are susceptible to LB. Working with Dr. Curry we have examined a number of factors that influence the appearance of LB on

susceptible fruit. We have been working with Dr Curry and others on how to treat LB susceptible apples. Here is summary of the results of our research. This is very much of a research project in progress. I am interested in any comments, questions or experiences relative to LB.

A Summary of Research on Factors Influencing the Appearance of LB on Gala Apples:

1. **Orchard to orchard susceptibility**—unknown.
2. **Maturity**—unknown but research is scheduled for the 2005 crop.
3. **Dye test**—the aniline blue dye test appears to correlate well with the incidence of LB that subsequently develops (see web site for instructions)
4. **Pre-storage treatment with 1-MCP SmartFresh™**—evidence from research with the 2004 crop indicated that susceptible lots of Gala apples treated with SmartFresh™ then stored in CA storage, developed more LB after packing than fruit not treated with SmartFresh™. Treated fruit stored less than four months in air developed the same amount of LB as fruit that was not treated. Tests will be conducted in 2005 to determine whether fruit treated with SmartFresh™, then stored in air, compare with treated fruit stored in CA.
5. **Length of time in storage**—research with the 2004 crop showed that the longer the fruit are in storage the more susceptible they are to develop LB after packing.
6. **Presizing vs. commit to pack**—research with the 2004 crop of Gala and Fuji apples showed that presized fruit is more susceptible to develop LB than fruit that is packed directly. In Gala apples, the interval between the time fruit is presized and packed influences LB incidence. Gala apples packed immediately after presizing had less LB than fruit presized then stored 1 to 3 weeks prior to packing. Fuji apples had the same amount of LB after packing regardless of time delay between presize and packing. We have scheduled a test of bin filling machinery and their effect on LB for 2005.
7. **Dump tank chemicals**—packingline chemicals strongly affect the incidence of LB. Dump tank chemical additives caused significantly more damage when applied at higher than label rates. Delay in packing of 5 to 7 days after dump tank (presize) treatments increased the incidence and severity of LB damage in Gala apples for all treatments, versus fruit packed immediately after the treatments.
8. **Dump tank water and fruit temperature**—cold apples rinsed in cold water had less LB damage than apples warmed in water and waxed.
9. **Hyperclean**—fruit treated with the Hyperclean system did not develop more LB when packed on a commit to pack line.
10. **Soaps or detergents**—applied as line sprays greatly increased the incidence of LB when used at higher than label rates. It was not possible to test all cleaners on the market, but in a test using a single alkaline cleaner, a neutral pH cleaner and an acidic cleaner, the alkaline cleaner did not cause LB damage significantly different from water. The acid and neutral cleaner applied at label rate caused a significant increase in the incidence and severity of LB damage.
11. **Wax type**—the type of wax (carnauba or shellac) did not affect the incidence or severity of LB damage.

12. **Liquid bleach (sodium hypochlorite)**—in solution to provide chlorine did not increase LB over a wide range of concentrations, conductivities or temperatures.
13. Gala apples treated with a fungicide applied in a carnauba wax line spray did not develop more LB damage than fruit treated with wax alone.

In summary:

The following are my thoughts based on the very limited research done thus far on how to handle fruit to minimize losses from LB. Although it is not yet known why fruit from certain orchards are more susceptible than fruit from other orchards packinghouse management could either test all orchards at harvest using the dye test, which it appears will indicate fruit susceptibility or assume all blocks of Gala are susceptible.

Susceptible fruit should be packed early in the season (4 months or less) and marketed. This fruit can be treated with SmartFresh™, stored in air and presized. The time interval between presizing and packing should be less than 7 days. Fruit that must be stored longer should be packed on a commit to pack line.

All fruit should be treated with a minimum of packingline soaps or detergent chemicals used at the lowest concentration possible. When a presize is used the fruit should be packed as soon as possible.

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