

LATEST RESEARCH ON LENTICEL BREAKDOWN OF APPLES (DECEMBER 2005)

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Research is underway to determine how best to handle Gala apples after harvest so that the fruit does 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 several days after 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.

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.



Figure 1. Severe LB damage on Gala apple following packing (neutral pH line spray cleaner, warm water [100 °F] rinse, carnauba wax) and air storage for 5 days at 33 °F and 2 days at 70 °F.

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 apples that are susceptible to LB. A brief summary of the results of our research to date is provided below. An expanded report on LB can be found on the WSU postharvest web site at <http://postharvest.tfrec.wsu.edu>. 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. **Fruit 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 <http://postharvest.tfrec.wsu.edu/aniline-blue.pdf> for instructions).
4. **Use of SmartFresh™**—research with the 2004 crop indicated that susceptible lots of Gala apples treated with SmartFresh™ and stored in CA developed more LB after packing than fruit not treated with SmartFresh™. Tests will be conducted several times in 2005 and 2006 to compare LB damage after packing in untreated fruit and SmartFresh™ treated fruit from both regular air and CA storage.
5. **Length of time in storage**—research with the 2004 crop showed that the longer the fruit were held in storage the more LB they developed after packing.
6. **Presizing vs. commit to pack**—research with the 2004 crop of Gala and Fuji apples showed that presized fruit is much more susceptible to develop LB than fruit that is packed directly. Gala apples packed two days after presizing had less LB than fruit presized then stored 8, 22 or 36 days prior to packing. Fuji apples had the same amount of LB after packing regardless of time delay between presize and packing
7. **Dump tank**—chemical additives in the dump tank (scale removers, acidifiers) caused LB damage, which increased significantly when concentrations were higher than stated on the label. Delay in packing of 5 to 7 days after dump tank 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. **Liquid bleach (sodium hypochlorite)**—in dump tank solution to provide chlorine did not increase LB over a wide range of concentrations, conductivities or temperatures.
10. **Soaps or detergents**—in a test using a single alkaline cleaner, a neutral pH cleaner and an acidic cleaner applied as line sprays followed by a warm water rinse, 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. Applying the cleaners at higher concentrations than label rate caused more severe LB damage.

11. **Wax type**—the type of wax (carnauba or shellac) did not affect the incidence or severity of LB damage.
12. **Hyperclean**—fruit treated with the Hyperclean system did not develop more LB when packed on a commit to pack line.
13. **Fungicides**—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 to LB. Maturity at harvest and/or preharvest orchard sprays appears to be implicated in the incidence of LB after packing.

All fruit should be treated with a minimum of packingline soaps or detergent chemicals used at the lowest concentration possible. Susceptible fruit should be packed early in the season (4 months or less in storage) and marketed. This fruit can be treated with SmartFresh™ and stored in air or CA. The effect of early-season presizing on susceptible fruit has not been studied; however, to minimize potential LB damage, fruit should be packed as soon as possible following presizing. Fruit that must be stored longer than 4 months should be packed only on a commit to pack line.

For further information and updates: <http://postharvest.tfrec.wsu.edu/>

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