



EpiShield™

Natural Cuticle Protection

A Revolutionary Solution that goes Skin Deep

EpiShield™ a preharvest formulation of a proprietary mixture of plant extracts and vegetable esters helps reduce the incidence of **Lenticel Breakdown Disorder** deep within the apple skin.

This natural solution penetrates the apple cuticle and helps seal micro-cracks and pores that develop during normal fruit growth, acting as a protective coating to shield against stressful environmental conditions and postharvest processes.

Lenticel Breakdown in Apples

For the past several years, Lenticel Breakdown (LB) and other related lenticel markings and disorders have been increasingly troublesome as a source of post storage loss for several apples varieties in Washington State as well as other fruit growing regions throughout the world. In a 2006 survey of fruit packers in Washington State conducted by the Washington Tree Fruit Research Commission, over half of those interviewed reported lenticel-related problems¹. Although certain postharvest practices have been associated with increased incidence and severity, LB appears to have its origin in the orchard during the growing season.

The role of several preharvest factors (climate, fruit nutrition, stress, etc.) is still under investigation; however, it is generally accepted that late harvest of over-mature fruit, together with prolonged storage, often result in increased LB after packing.

Early symptoms may appear as small, barely visible pits, which may later enlarge becoming brown circular pits centered on a lenticel (Figure 1A and 1B,). Prolonged storage often leads to larger, deeper pits that become less defined (Figure 1C and 1D.)

Figure 1

Lenticel Breakdown (LB) in 'Gala' apples exhibiting early (A) and more advanced (B, C, D) symptoms. (Images courtesy of Dr. Eric Curry, USDA, ARS, Tree Fruit Research Laboratory.)



Figure 1A



Figure 1B



Figure 1C



Figure 1D

¹ Lenticel Disorders Industry Survey
<http://postharvest.tfrec.wsu.edu/PC2006A.pdf>

A Natural Treatment to Reduce LB

Based on the hypothesis that preharvest desiccation stress of fruit epidermal tissues during periods of rapid fruit enlargement could be among the factors responsible for development of LB after storage², Pace International, in cooperation with scientists from the USDA, ARS, Tree Fruit Research Laboratory in Wenatchee have been evaluating a preharvest formulation of a proprietary mixture of plant extracts and vegetable esters. EpiShield™ was the result of the collaboration - a formula developed to help reduce the incidence of LB.

This solution works by penetrating the apple cuticle and sealing the micro-cracks and pores that develop during normal fruit growth, thereby acting in a protective role against stressful environmental conditions (Figure 2).

Figure 2

Scanning electron micrographs (1mm x 1mm) of 'Gala Gala' apple surface during cold storage showing natural microcracking on untreated fruit surface (Figure 2A) and treated fruit surface (Figure 2B) with microcracking largely filled in with EpiShield™ applied preharvest.

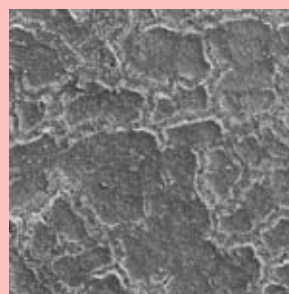


Figure 2A

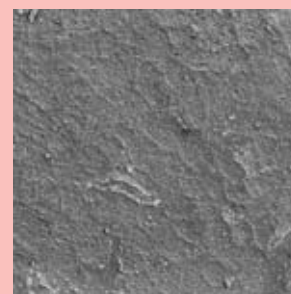


Figure 2B

(Images courtesy of Dr. Eric Curry, USDA, ARS, Tree Fruit Research Laboratory.)

² Curry, E.A, Torres C.A., Neubauer, L. 2007. Preharvest lipophilic coatings reduce lenticel breakdown disorder in 'Gala' apples.

TRIALS AND APPLICATION

EpiShield™ - Trial Results

In 2005, 'Imperial Gala' apples treated with EpiShield™ before harvest had fewer LB symptoms after regular storage and simulated packing than untreated controls (Figure 3). Fruit treated with a single application of EpiShield™ had 20% fewer symptoms of Lenticel Breakdown than the untreated control.

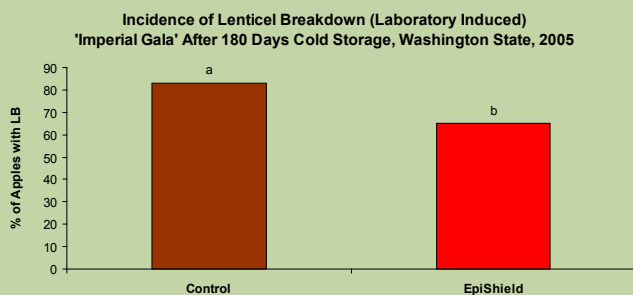


Figure 3

In 2006, Lenticel Breakdown did not appear to be a serious problem for apples in Washington State as in the past. In this season, a single application preharvest of EpiShield™ reduced LB by almost 30%, but because of sample variability this difference was not statistically significant.

However, a program of 3 applications starting 3 weeks before harvest significantly reduced the appearance of this disorder by approximately 50% on 'Gale Gala' (Figure 4).

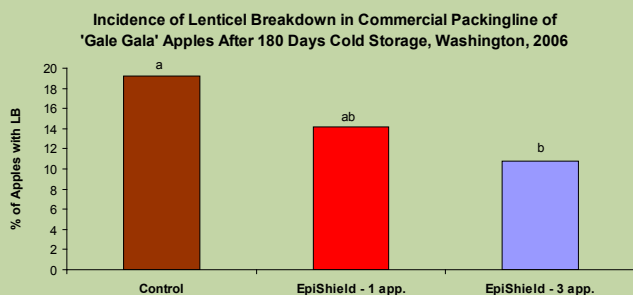


Figure 4

2007 trials in the southern hemisphere under commercial packing line conditions, have confirmed that a single preharvest application of EpiShield™ is able to reduce the incidence of LB by 50% on 'Imperial Gala' (Figure 5).

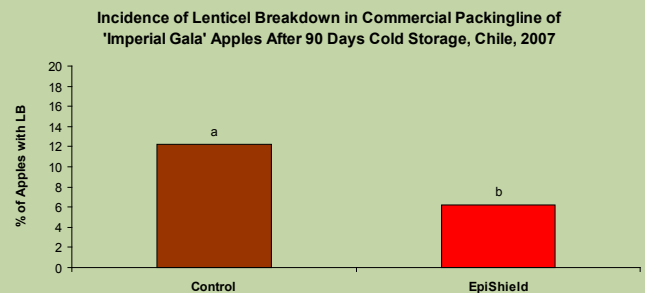


Figure 5

EpiShield™ Application

After several years of study and two seasons of semi-commercial evaluations, EpiShield™ is now commercially available to apple growers.

Application Recommendation:

- Apply EpiShield™ at 2.5% dilution to LB susceptible apple orchards 1 week before harvest.
- A spray volume of 200 gallons per acre is recommended for adequate coverage of the fruit for EpiShield™ to protect against dissection.

EpiShield™ Product Availability

Pace International continues to conduct additional efficacy trials to better understand the physiological processes behind LB disorder and find ways to improve EpiShield™ efficacy in apple orchards.



Call your Field Advisor today to learn more about how EpiShield™ can reduce the outbreak of Lenticel Breakdown Disorder in your apples.

**ADDITIONAL
BENEFITS
FOUND!**

Recent trial results found EpiShield™ to provide excellent dehydration control!



**Innovative solutions
that enhance, protect,
and preserve fruit and
vegetable quality.**

 **Pace International**^{LLC}

For more information contact your Pace Representative or Pace International, LLC
1201 3rd Avenue, Suite 5450, Seattle, WA 98101
Customer Service: 1.800.936.6750
www.paceint.com