BASF FRESHSEAL® POST-HARVEST COATING REDUCES SHRIVEL AND DECAY OF TOMATO (SOLANUM Lycopersicum)

HUATING DOU1*, PAUL JOHNSON1, MARK P. KOHOUT1, STEVEN A. SARGENT2 AND MARK A. RITENOUR3
1 BASF Corporation
Agricultural Research Station
10181 Avenue 416
Dinuba, CA 93618
2 University of Florida/IFAS
Horticultural Sciences Department
Gainesville, FL 32611
3 University of Florida/IFAS
Indian River Research and Education Center
Fort Pierce, FL 34945

Abstract. During the past two seasons, the effect of BASF FreshSeal post-harvest coating was the subject of investigations conducted under the observation of packinghouse management for eight commercial trials. Specifically, the incidence of shrivel and decay along with the overall color development of mature green fruit were evaluated; all are post-harvest concerns that greatly affect commercial shipping operations. During five trials conducted in Virginia in August-September, 2005, FreshSeal treatment reduced total post-harvest losses (i.e., the aggregate of shrivel and decay) by 60% on average compared to mineral oil wax treatment after 12-15 days including gassing at 68 °F and storage at 55 °F and 85% relative humidity. During three trials conducted in South Florida in January, 2006, FreshSeal treatment reduced total post-harvest loss by 46% on average compared to mineral oil wax treatment after 17-22 days including gassing at 68 °F and storage at 55 °F and 85% RH. The data demonstrates that treatment with FreshSeal CHC resulted in approximately 6 additional, saleable tomatoes per carton. Moreover, the add-on value within FreshSeal treated cartons continues to increase directly with price per carton throughout the entire marketing chain including second handlers, wholesalers, re-wholesalers, and retailers. In addition, FreshSeal treatment accelerated fruit maturity by one color stage compared to mineral oil wax treatment; this feature benefits shippers as well as second handlers during the post-harvest marketing period.

In commercial operations, round tomatoes are typically harvested green, packed after washing and coating application, then gassed for longer than 3 d at approximately 70 °F (Cantwell and Kasmire, 2002; Sargent, 1998). This practice requests a coating application that both composites the immature fruit surface wax and protects against fruit shrivel and decay caused by physiological and pathogenic disorders. The mineral oil-based coating traditionally applied to tomatoes retards fruit moisture loss but is difficult to dry completely following its application. Furthermore, such fruit appears greasy in addition to its developing fungi decay. Recently, a post-harvest coating from BASF was formulated for use on tomatoes and peppers (www.basf.com/freshseal). In comparison to mineral oil-based wax, the FreshSeal coating dries rapidly, is water-soluble, and offers added benefits such as significantly reduced shrivel and decay. The objective of this paper is to present recent data on the effects of FreshSeal CHC post-harvest coating throughout two seasons on commercially harvested and packed round tomatoes in Florida and Virginia.

Materials and Methods

Five trials were conducted at a commercial packinghouse in Virginia, and three trials were conducted at a commercial packinghouse in South Florida. Green tomatoes were harvested and transported to the packinghouse on 8/3, 8/4, 8/16, 8/22, 8/23/2005, and or on 1/3, 1/4/2006, respectively. After commercial washing with chlorinated water, tomatoes were packed on the line and treated with FreshSeal CHC (0.5% ai). After approximately 1 h of running, FreshSeal treated sample cartons were randomly selected from the line. Upon switching to wax and after approximately two hours of running, wax treated sample cartons were randomly selected. All sample cartons were gassed at approximately 68-70 °F and then stored at 50-55 °F, both at 76-80% relative humidity (RH).

Individual fruits were inspected for shrivel and decay on days 13, 14, and 15 and days 17 and 22 in Virginia and in Florida, respectively. Shrivels and decay were both classified according to packinghouse management. The aggregate of shrivel and decay was the total post-harvest loss.

All trials were completely randomized block design. All data was analyzed by ANOVA using statistical software Plotit (Scientific Programming Enterprises, Haslett, Mich.). Means were separated by Duncan’s new multiple range test at p ≤ 0.05.

Results and Discussion

Trials 1, 2, 3, and 4 conducted in Virginia and trials 6 and 8 in Florida demonstrated that Freshseal applied at 0.5% ai significantly reduced shrivel, decay, and post-harvest loss. A similar trend (i.e., although not statistically significant) was seen in trials 5 (Va.), & 7 (Fla.). The exact percentage of reduction is listed as follows:

Trial 1: Total loss was 9% in wax treatment and 4% in FreshSeal treatment (Fig. 1);

Trial 2 and 3 (As no rotten fruit were present in the FreshSeal treated cartons during Trial 3, decay was 100% reduced in comparison to the wax treatment): Total loss was 10% in wax treatment and 2% in FreshSeal treatment (Figs. 2 and 3);

Trial 4: Total loss was 10% in wax treatment and 4% in FreshSeal treatment (Fig. 4);

Trial 5: Total loss was 5% in wax treatment while 3% in FreshSeal treatment (data not shown).
In Florida trials 6, 7, & 8, total post-harvest loss is represented by the % decay due to the absence of shrivel and is listed as follows:

**Trial 6**: Total loss was 39% in wax treatment and 26% in FreshSeal treatment (Fig. 5);

**Trial 7**: Total loss was 54% in wax treatment and 40% in FreshSeal treatment;

**Trial 8**: Total loss was 8% in wax treatment while 3% in FreshSeal treatment (Fig. 6).

The individual decay fungi were not isolated, but the major decay pathogen for tomatoes is *Botrytis* in trials. In general, however, FreshSeal advances fruit color development more rapidly than mineral oil-based waxes. The picture taken at day 4 after 72 h of ethylene treatment clearly showed the benefits of FreshSeal application in fruit color development in comparison to waxed control (Fig. 7, Trial 8). 34% of more fruit developed acceptable color at day 7 in FreshSeal treated than waxed fruits according to packers color standards. Weight loss and shine were not evaluated. The trials conducted in Virginia and Florida were based on the above mentioned industry needs and packer/shipper concerns and demonstrated excellent results for FreshSeal treatment on tomatoes. Further research is needed to identify the specific mechanisms by which FreshSeal cures and coats fruit. It is suggested that FreshSeal may have an anti-fungal effect by a) increasing fruit enzyme activity and b) reducing the senescence.

By significantly reducing post-harvest loss as well as enhancing fruit color development, FreshSeal CHC benefits shippers through reduced bill backs and/or allowances from second handlers. Furthermore, FreshSeal generates higher...
net revenues for produce buyers and sellers and can help to deliver a more premium quality product to retail and food service market outlets.

Literature Cited


Fig 7. Effect of FreshSeal application in increasing fruit color development (Right) in comparison to waxed fruits (left) at day 4 (fruit were stored at 50°F, and 76-80% RH) After 72 h with ethylene treatment (tomatoes were gassed to 150 ppm ethylene using their original corrugated boxes at 70°F, 95% RH) (Trial 8).