Raynox Plus, for the Control of Sunburn on Apples

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Introduction

Raynox Plus® protects fruit from sun damage by forming a thin, clear, natural wax layer that blocks damaging UV rays from harming fruit. The clear coating of *Raynox Plus* has many benefits:

- Significantly reduces the damaging effects of solar radiation on fruit
- Does not affect fruit color development or photosynthesis
- Allows for color-picking
- No cleanup of white residue in calyx or stem ends

Materials & Methods

Experiment 1. The experiment was conducted in a mature apple block of 'Honeycrisp' apples planted to a tall spindle system, spaced 5' x 14'. The plot was located at the Rutgers Snyder Research and Extension Farm, Pittstown, NJ. The experiment was set up as randomized complete block design with 4 replications. Raynox was applied four times: July 5, August 4, August 15, and August 29. Treatments were applied with a Rears

Sunburn on untreated Honeycrisp fruit in 2015, Rutgers Snyder Farm, New Jersey.

Varying degrees of of sunburn on untreated Snowsweet in 2016, Heller Orchards, Pennsylvania. Range from mild sunburn (upper right) to severe sunburn with necrosis (lower right).

Severe sunburn on Snowsweet can have a paper-like appearance.

Tower sprayer using air induction nozzles, the sprayer was calibrated at 100 GPA. The Raynox treatment rate was 2.5 gallons per acre. Treatments were evaluated on 9 September for Incidence of sunburn as a % of fruit injured. Rows were planted north-south.

Experiment 2. The experiment was conducted in a mature apple block of 'Snow Sweet' apples planted to a V-Trellis system, spaced 3' x 14' planted North to South. The plot was located at Heller Orchards in Wapwallopen, PA The experiment was set up as randomized complete block design with 4 replications. Bloom date: May 5. Raynox Plus was applied three times: July 6, 22, and August 9. Treatments were applied with an airblast sprayer, FMC 242 customized with a Cyclone tower head from Italy. Application pressure =100 PSI. Ground speed of application =2.1 mph. Treatments were evaluated on September 12 for Incidence of sunburn as a percent of fruit injured.

Results & Discussion

Experiment 1. Raynox Plus treated trees had significantly fewer percent incidence of sunburn as compared to the untreated controls (Table 1). The West side of Raynox treated trees had significantly greater incidence of sunburn compared to the east side of Raynox Plus treated trees. The incidence of Sunburn was higher on the controls on the west side as was to be expected.

Figures 1 and 2 show the temperature and rainfall data for 2015 with treatment dates. It was a hot dry summer in 2015, very little rainfall and many days over 90F in 2015.

One of the main reasons to control sun damage to the skin of Honeycrisp fruit is to assist in the control of Bitter Rot fungus, Glomerella cingulate. Bitter rot is one of the few fruit rot organisms that can penetrate the unbroken skin of the fruit.

In 2015, Bitter Rot was evaluated on the fruit. It was not significantly different in 2015 between treatments but trended higher in the untreated control (Table 1).

Experiment 2. This was the second year of Raynox Plus experiments. In 2016, all Raynox Plus treatments had significantly less sunburn than the untreated control, Table 2.

The Raynox Plus 2.5 Gal/A treatment and the Raynox Plus 1 Gal/A applied to both sides of the tree and the Raynox Plus @1.25 Gal/A to the west side resulted in significantly less sunburn than the UTC on the west sides of the trees.

Table 1. Raynox Plus evaluation for sunburn on Honeycrisp apple, 2015, Rutgers Snyder Farm, New Jersey.

	Incidence of Sunburn (%)		Incidence of
Treatment	West	East	Bitterrot (%)
UT Control	45.6 **	9.4 *	0.5
Raynox	7.5	3.8	0

Mean separation at or within columns by F test.

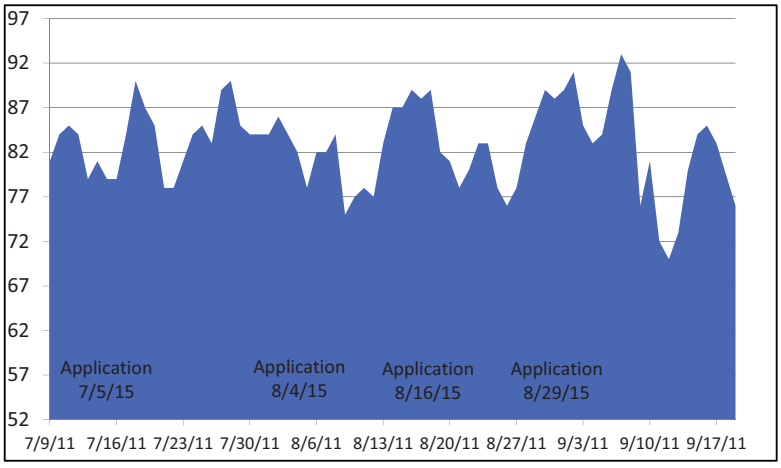

Figure 1. Temperature by Raynox application date (2015). Application dates July 5, August 4, August 15, and August 29.

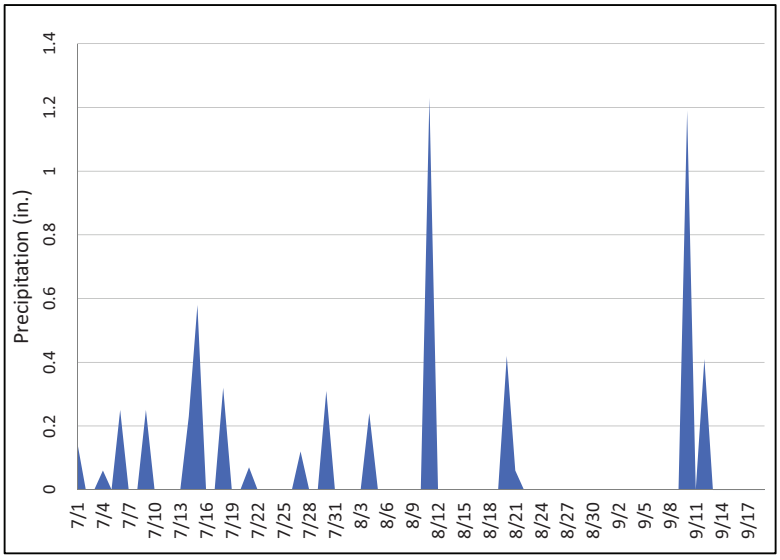

Figure 2: 2015 Rainfall and Raynox application dates date at Rutgers Snyder Farm. Application dates July 5, August 4, August 15, and August 29.

There was an insignificant amount of sunburn on the east side of any treatment (1.4% on east side and 19.2% on the west side of the tree).

There was significant treatment and row direction (east vs. west) effect (data not shown). In this orchard orientation of tree rows planted North to South, there is very little sunburn on the east side of all rows, including the UTC. This was also true in the 2015 NJ experiment.

A forth application was called for in September 2016, due to high forecasted temperatures. However, the grower was in the middle of Gala, Honeycrisp and McIntosh harvest and was not able to apply the forth application. I believe we would have had a reduced sunburn if this application could have been applied. There was no bitter rot observed in 2016 due to the dry summer

Conclusion

Raynox Plus was highly effective at preventing sunburn on Honeycrisp fruit in 2015 at the Rutgers Snyder Farm and in 2016 at the Heller Orchard in Pennsylvania.

Both years of evaluation resulted in positive results where Raynox Plus significantly reduced sunburn in both trials.

We consider 2016 a high sunburn incidence year. That being said, three applications of Raynox Plus significantly reduced sunburn on a highly prone cultivar, SnowSweet.

Two years of trials suggest that just the west side of the row in a north south orchard orientation needs to be treated. The lower rate of 1 gallon/acre appeared to provide adequate control in 2016.

Observations over the past 5 years in the Northeast indicated that fruit are subject to sunburn following temperatures of 90F or higher, particularly if temperatures are high for multiple days.

Our sense is that the first two applications should be applied fairly close together, the first approximately 7 weeks after first bloom, the second within a few weeks of the first application. This approach 'layers' the product on the fruit. Keep an eye on forecasted high temperatures. In the humid Northeast, time the 3 and 4 applications when the forecast calls for an extended period of time with temperatures over 90F. Excessive rainfall should shorten the application interval.

What is needed is a better way to time Raynox Plus applications with a forecasting model like Washington State is working on. See WSU Interactive Sunburn

Table 2. Raynox Plus evaluation for sunburn on Snowsweet apple, 2016, Hellers Orchard, Wapwallopen, PA.

Raynox treatment	Sunburn (%)
UTC	20.8 a
Raynox 2.5 Gal/A-East & West	9.6 ab
Raynox 1.25 Gal/A West Only	6.2 b
Raynox 1 Gal/A East & West	4.6 b

Model – details at: http://hort.tfrec.wsu.edu/pages/Sunburn. Our weather conditions are significantly different in the Northeast as compared to the Northwest model. Our different parameters would need to be incorporated in to a humid Northeast or Midwest model.

One of the key factors in the potential for Sunburn in the Northeast is the training system used, combined with tree vigor. On weaker trees with poor leaf cover, sunburn incidence is higher. Narrow-canopy, tall-spindle systems can be sunburn prone if there is not adequate tree vigor and foliage cover.

There is also tremendous variability in cultivar sensitivity to sunburn as well.