

# **Effect of LiberateCa™ on Fruit Quality of Apples and Pears**

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## **Experiment 1. Liberate Calcium on HONEYCRISP.**

### ***Experimental Design***

The trial was conducted in a 13 –year old Honeycrisp block with a problem of bitter pit development because of high vigor. The product was applied every two weeks starting at 25 mm by the grower at recommended rates. Apples were harvested at commercial maturity and scored for fruit weight, soluble solids, color development, firmness, nutrient content and bitter pit incidence and severity at harvest and after three months of storage.

### ***Results***

At harvest, there were no visible differences in tree health and no differences in fruit size or shape (Figure 1). Color development was not significantly different between trees that were treated with Liberate Ca and the grower standard control (Figure 2). The treated trees had slightly higher firmness and soluble solids content (Figure 3). However, horticulturally, these differences were not meaningful. Interestingly, bitter pit incidence decreased from approximately 6% in the grower standard control to approximately 2% for fruit harvested from trees treated with Liberate Ca (Figure 4). The severity of bitter pit was also reduced. Since ripening accelerates the development of bitter pit prone fruit, the differences in firmness and soluble solids content suggest that the small differences in ripeness of the fruit does not explain the decrease in bitter pit in the Honeycrisp fruit. The surface of the fruit did not have any differences in the calcium content or potassium:calcium ratio (Figure 5). However, when the fruit was analyzed through traditional lab analysis, the potassium:calcium ratio was higher in the grower standard control (Figure 6) indicating that the Liberate Ca is reducing bitter pit through improving this ratio.

## **Experiment 2. Liberate Calcium on D’Anjou Pears**

### ***Experimental Design***

The trial was conducted in a mature D’Anjou block in Tonasket, WA. The product was applied every two weeks starting in June by the grower at recommended rates. Pear were harvested at commercial maturity and stored for 3 months to assimilate chilling for ripening. After three months, the fruit was removed and ripended for 7 days. After ripening, fruit was scored for fruit weight, soluble solids, color development, firmness, nutrient content and cork spot incidence.

### ***Results***

In this pear block, cork spot was low (Figure 9). Similar to other calcium trials done elsewhere, when the calcium levels are high and there isn’t much of a problem, it is difficult to see an observed effect of calcium sprays. There were no significant differences in cork spot incidence or differences in firmness or nutrient content of the fruit. In blocks where vigor control is good and crop load is sufficient, calcium sprays are not as critical.

### Experiment 3. Fase3 coloring agent on Honeycrisp, Gala and Jonagold Apples

#### *Experimental Design*

There were two trials carried out using the Fase3 product. One trial was conducted on Gala and Jonagold apples at the WSU Sunrise Research Orchard near Rock Island, WA. The product was applied 12 days prior to harvest as per product recommendations. There were three replications for each cultivar. A second trial was conducted in a commercial Honeycrisp orchard with the product applied 11 days before harvest. The temperatures during this period were hot once again. Sprays were applied early in the morning before the temperature reached 80 °F.

#### *Results*

Overall color development was mixed. Gala showed no improvement in color with the coloring spray. Jonagold showed significant improvements in red color in the treated regions of the orchard. Honeycrisp showed a small, insignificant increase in red color development. When looking at the overall red color for each cultivar, Gala had the highest color in the untreated control whereas Jonagold was the lowest. Therefore, in situations where color development was not a problem, the product did not have an effect. However, for Jonagold, where color development was slow, Fase3 led to increased red color development.

Table 1. Red color development (1-4 scale; 1 - <25% color, 2 - 25-50% color, 3 - 50-75% color, 4 - >75% color) for fruit harvested from Gala, Honeycrisp and Jonagold apple trees in 2016 after being treated with the Fase3 coloring compound compared to an untreated control.

Cultivar	Treatment	Red Color (1-4 scale)	Significance
Jonagold	Control	3.53	***
	Fase3	3.85	P<0.001
Honeycrisp	Control	3.81	Not Significant
	Fase3	3.79	
Gala	Control	3.66	Not Significant
	<b>Fase3</b>	<b>3.70</b>	

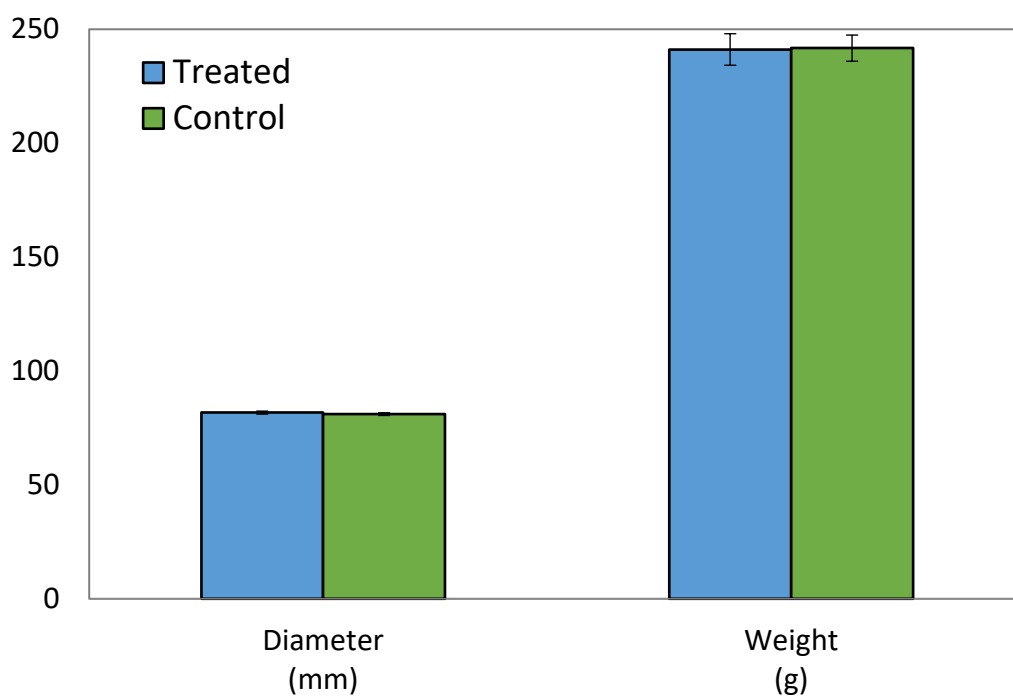


Figure 1. Diameter and weight of Honeycrisp harvested from Tonasket, WA from an untreated control compared to being treated with LiberateCa every two weeks starting at 25 mm fruit size

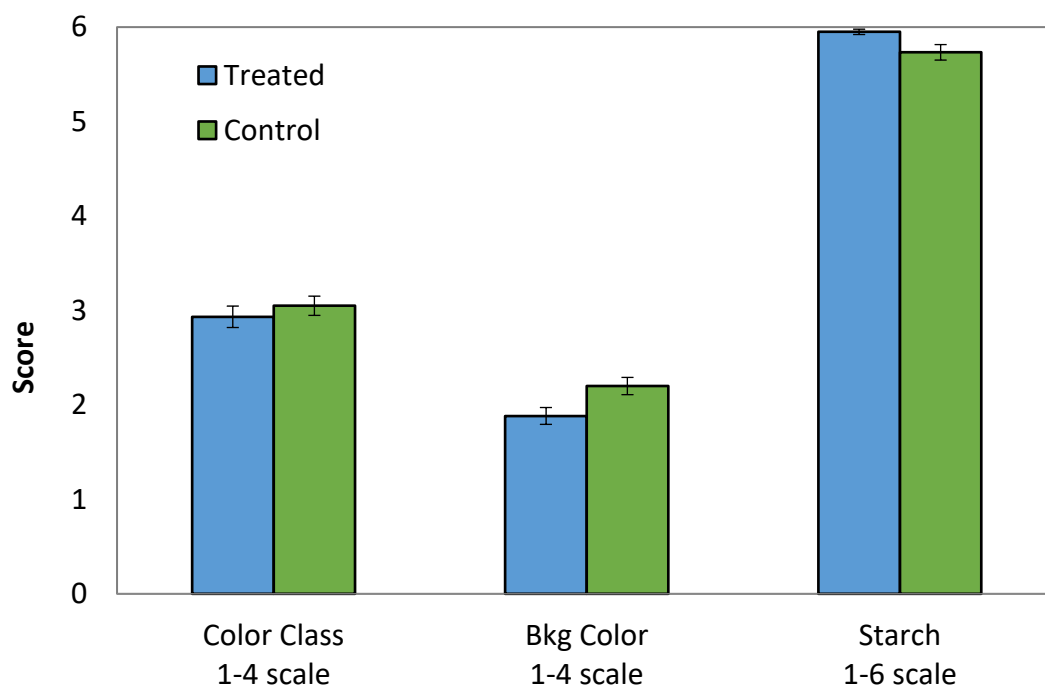


Figure 2 Foreground color, background color, and starch class of Honeycrisp harvested from Tonasket, WA from an untreated control compared to being treated with LiberateCa every two weeks starting at 25 mm fruit size

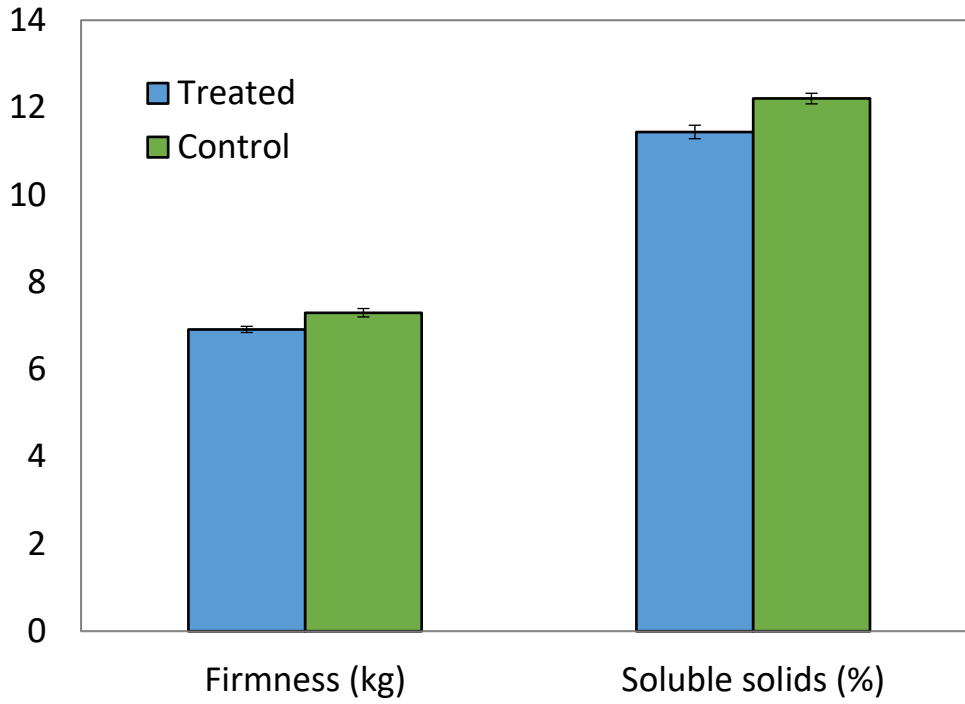


Figure 3 Firmness and soluble solids content of Honeycrisp apples harvested from Tonasket, WA from an untreated control compared to being treated with LiberateCa every two weeks starting at 25 mm fruit size

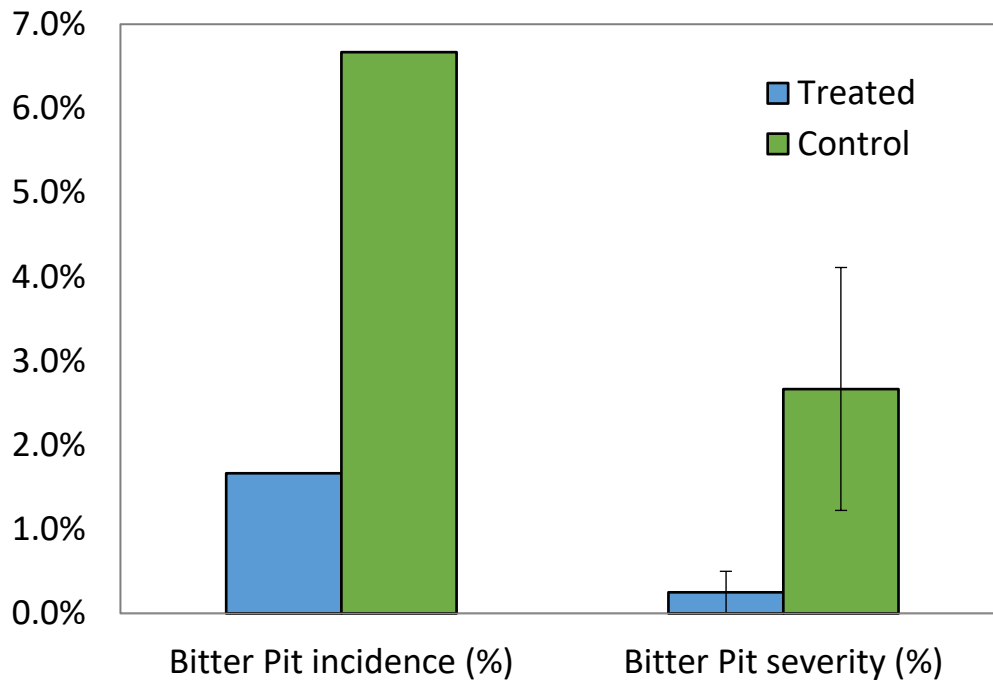


Figure 4. Bitter pit incidence (%) and severity (% coverage) of Honeycrisp apples harvested from Tonasket, WA from an untreated control compared to being treated with LiberateCa every two weeks starting at 25 mm fruit size

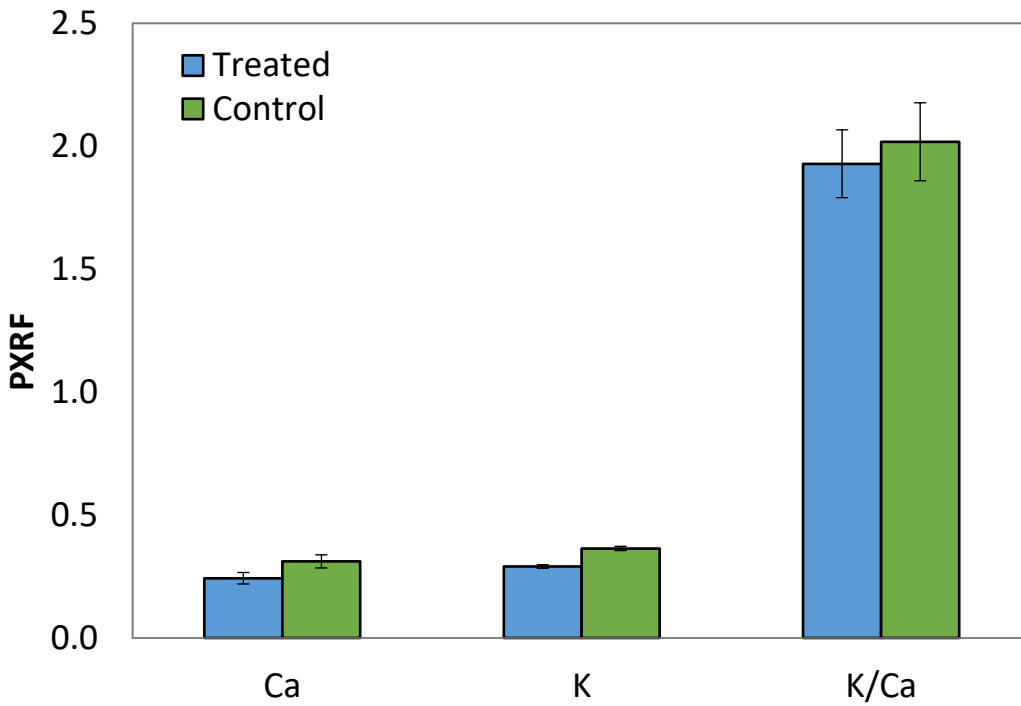


Figure 5. Calcium, potassium and potassium:calcium ratio measured on the apple surface using a portable x-ray fluorometer of Honeycrisp apples harvested from Tonasket, WA from an untreated control compared to being treated with LiberateCa every two weeks

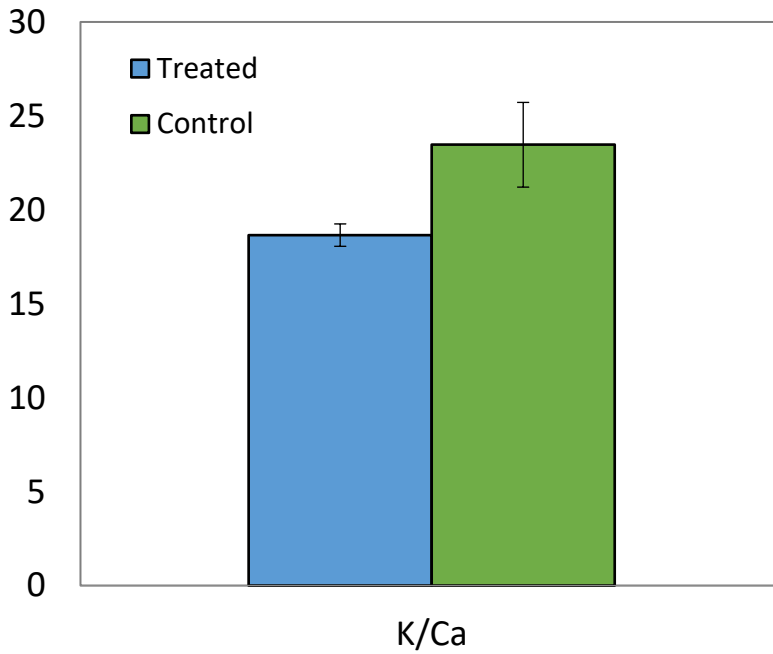


Figure 6. Potassium:calcium ratio through traditional lab analysis of Honeycrisp cortex harvested from Tonasket, WA from an untreated control compared to being treated with LiberateCa every two weeks

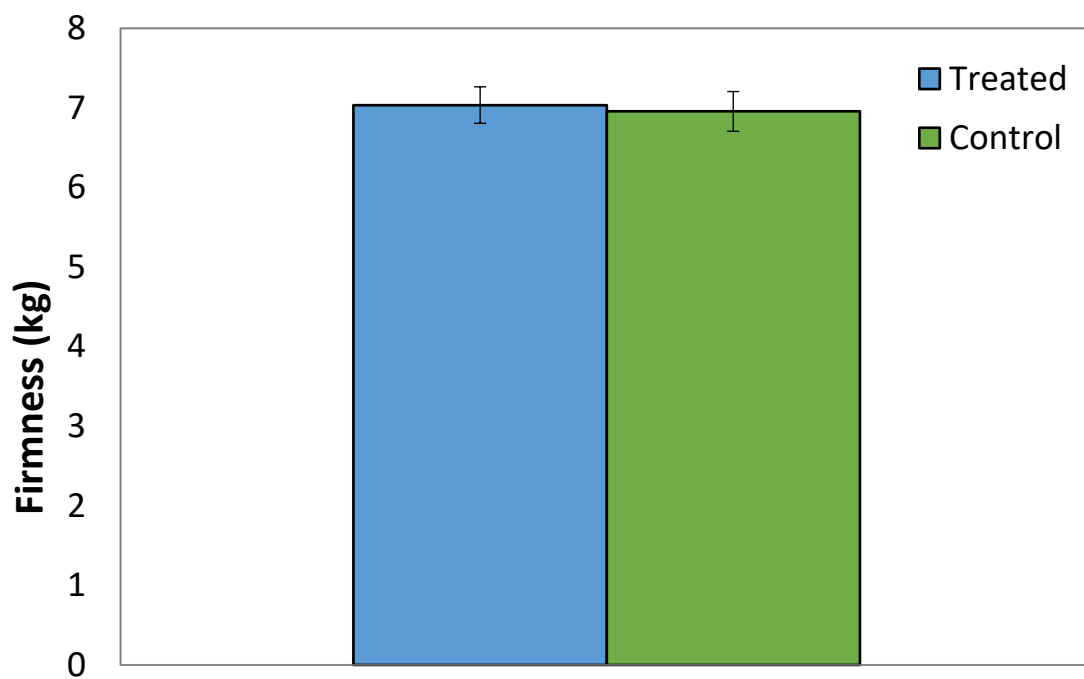


Figure 7. Fruit firmness (kg) of D'Anjou pears harvested from Tonasket, WA comparing an untreated control and trees treated with LiberateCa and stored for 3 months

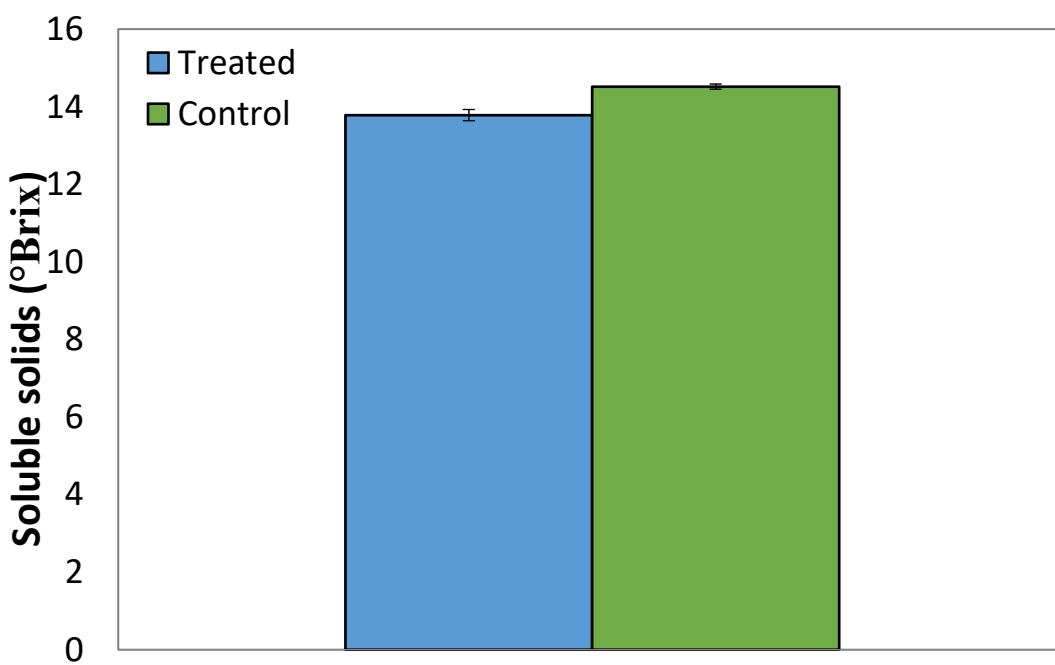


Figure 8 Soluble solids content of D'Anjou pears harvested from Tonasket, WA comparing an untreated control and trees treated with Liberate Ca and stored for 3 months

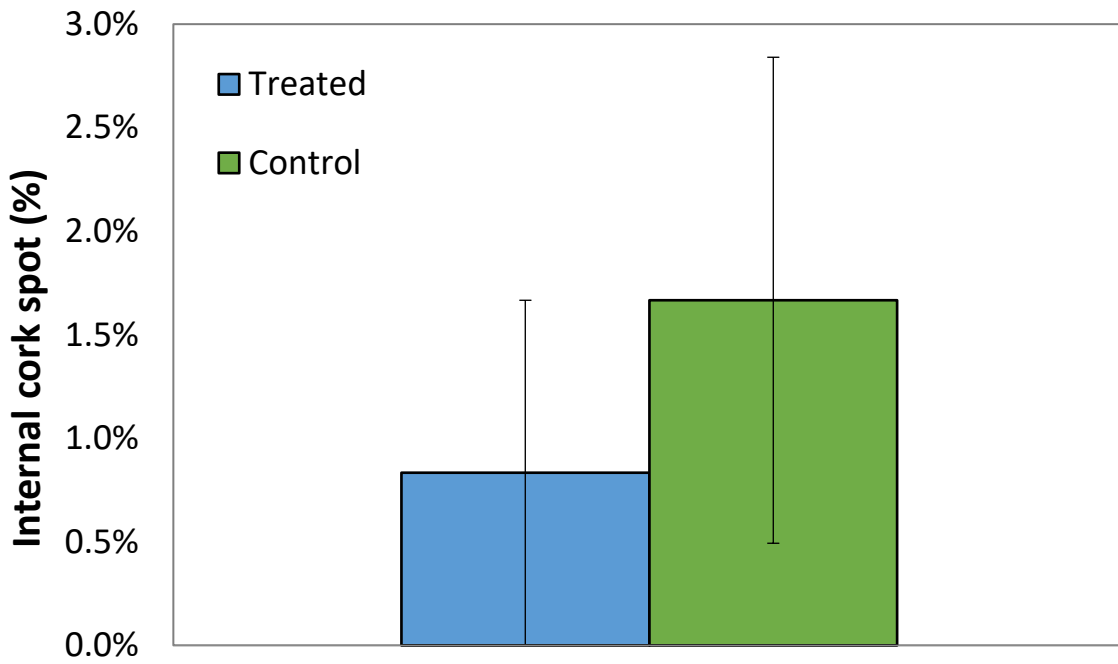


Figure 9. Internal cork spot of D'Anjou pears harvested from Tonasket, WA comparing an untreated control and trees treated with Liberate Ca and stored for 3 months

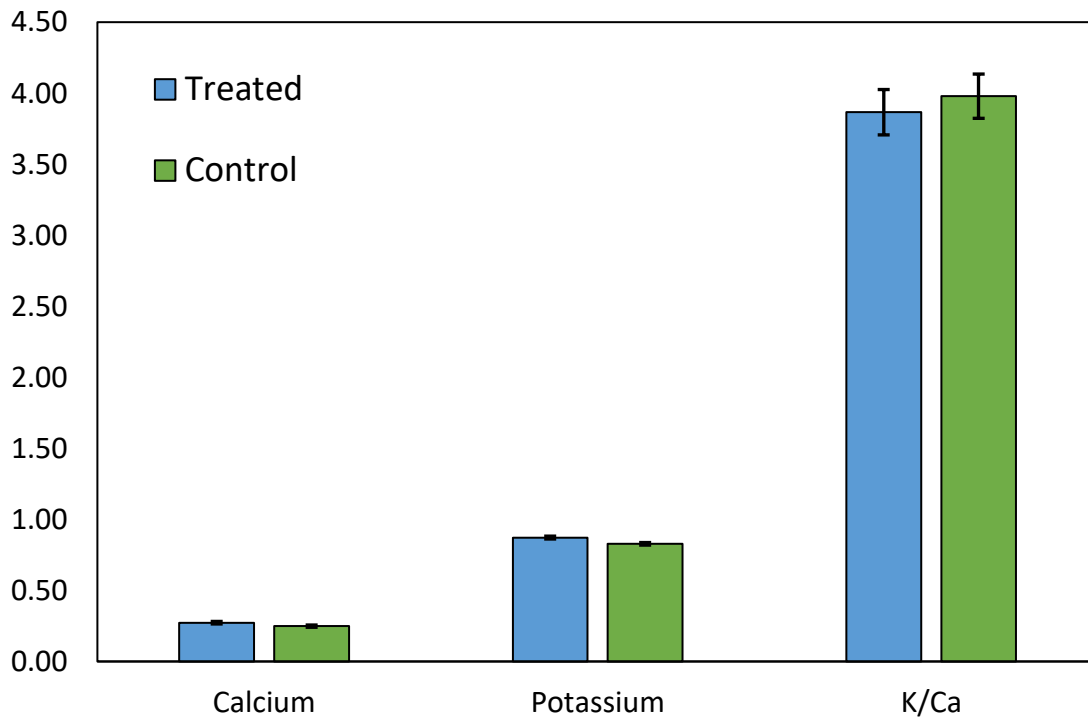


Figure 10. Calcium, potassium and potassium: calcium ratio of D'Anjou pears harvested from Tonasket, WA comparing an untreated control and trees treated with Liberate Ca and stored for 3 months