

# ORGANIC and CONVENTIONAL BITTER PIT CONTROL MATERIALS COMPARISON

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Bitter Pit is a very common disorder of apples worldwide. The malady appears as watersoaked or bruise-like spots mostly around the blossom end and in severe cases on the sides and shoulders of the fruit. It is generally regarded as a calcium deficiency since applications to the fruit on the tree and or postharvest dips of various formulations of calcium will significantly reduce the incidence of the problem.

Treatment for the prevention of bitter pit has commonly been the spray application of water-soluble calcium to the tree and developing fruit. Usually three applications are made in mid-June, mid-July and mid-August, depending on the variety. Post-harvest dips into a dilute calcium solution have also been used to reduce bitter pit development in cold storage.

Calcium nitrate and calcium chloride are the two most commonly used formulations of calcium for the control of bitter pit. Organic apple producers have suffered extensive losses from bitter pit in the past since calcium nitrate is a prohibited material and only “natural” sources of calcium chloride are allowable for use by organic apple producers under California Certified Organic Farmers (CCOF) guidelines. Organic growers then are at a competitive disadvantage in dealing with bitter pit unless an alternative source of allowable calcium is used.

## MATERIALS and METHODS

This trial compares five different materials (3 conventional and 2 organic) and an untreated control on Golden Delicious and Granny Smith apples in Sonoma County California. The materials are Calcium Nitrate, *Viking* brand, which contains 19%  $\text{Ca}(\text{NO}_3)_2$ ; Calcium Acetate, 10%, *Foli-Cal* brand and several formulations of Calcium Chloride. The Calcium Chloride brands were: *Stopit*  $\text{CaCl}_2$ , 12%; *Calcium 25*  $\text{CaCl}_2$ , 25%; and *Stoma Feast*  $\text{CaCl}_2$  1%, and *This Calcium*  $\text{CaCl}_2$  6% the latter two were used in a tank mix combination. The *Calcium 25*, *Stoma Feast*, and *This Calcium* are allowable under CCOF standards. The other materials are not.

Two orchards were selected because of their historical propensity for having severe bitter pit problems. Eight single tree replications were used for each treatment. Application rates were based on the manufacturer's recommendation and label. Three spray applications were made with a hand-gun sprayer at 250 psi. and 250 gallons per acre starting when the fruit was approximately one inch in diameter and ending when it was approximately two inches in diameter. The first application of “Stopit” was applied 12 days late due to a delay in receiving the material. The Golden Delicious were harvested at market maturity on September 1 and placed in conventional cold storage for 3 1/2 months. The Granny Smith apples were harvested on October 4 and placed in the same cold storage unit for 2 1/2 months.

Statistical analysis of data from this trial was conducted using an analysis of variance and the Duncan's Multiple Range Test. In the tables, numerical values followed by the same letter do not differ significantly (P = 0.05).

## RESULTS

The incidence of bitter pit was much more severe in the Granny Smith variety than in the Golden Delicious variety in 1994. Annual variability is quite common with bitter pit in these two orchards according to the owners and the packer who has packed the fruit from both orchards for the last 15 years.

### Golden Delicious Orchard

All of the treatment materials controlled bitter pit better than the untreated control which had 89.25% of the fruit without bitter pit. Calcium Nitrate treated trees had 100.00% of the fruit without bitter pit which was the only treatment significantly better than the Calcium Acetate treatment at 97.30% fruit without bitter pit. (see table I)

### Granny Smith Orchard

Again, all of the treatment materials were successful at preventing bitter pit and there was no significant difference between any of the five materials. The untreated control had 54.05% fruit without bitter pit while the treatment materials ranged from 87.00% to 73.40% fruit without bitter pit. (see table II)

These data indicate that all of the materials tested prevented bitter pit damage compared to the untreated control fruit. The status as to its classification of being an allowable or prohibited material for "organic" orchards didn't make any difference. Organic growers now have alternative calcium materials that can be used to prevent bitter pit, a treatment that conventional growers have been using for years.

**Table I. Comparison of Several Calcium Materials for the Control of Bitter Pit in Golden Delicious Apples; Sonoma County, CA 1994**

<i>Materials</i>	<i>Rate</i>	<i>Application Dates</i>	<i>%Fruit without Bitter Pit</i>
Calcium nitrate (Ca(NO <sub>3</sub> ) <sub>2</sub> , 19%)	5# / 100gal	5/18, 6/15, 7/21	100.00% <sub>a</sub>
Calcium 25 (CaCl <sub>2</sub> , 25%)	1# / 100gal	5/18, 6/15, 7/21	99.55% <sub>ab</sub>
STOPIT (CaCl <sub>2</sub> , 12%)	36oz / 100gal	6/1, 6/15, 7/21	99.25% <sub>ab</sub>
Stoma Feast (CaCl <sub>2</sub> , 1%) & "THIS" (CaCl <sub>2</sub> , 6%)	50oz & 25oz / 100gal	5/18, 6/15, 7/21	98.45% <sub>ab</sub>
Foli-Cal (Ca acetate, 10%)	64oz / 100gal	5/18, 6/15, 7/21	97.30% <sub>b</sub>
Control	0	not sprayed	89.25% <sub>c</sub>

**Table II. Comparison of Several Calcium Materials for the Control of Bitter Pit in Granny Smith Apples; Sonoma County, CA 1994**

<i>Materials</i>	<i>Rate</i>	<i>Application Dates</i>	<i>% Fruit without Bitter Pit</i>
Calcium nitrate (Ca(NO <sub>3</sub> ) <sub>2</sub> , 19%)	5# / 100gal	5/18, 6/15, 7/26	87.00 % <sub>a</sub>
STOPIT (CaCl <sub>2</sub> , 12%)	36oz / 100gal	6/1, 6/15, 7/26	83.30 % <sub>a</sub>
Stoma Feast (CaCl <sub>2</sub> , 1%) & "THIS" (CaCl <sub>2</sub> , 6%)	50oz & 25oz / 100gal	5/18, 6/15, 7/26	82.85 % <sub>a</sub>
Calcium 25 (CaCl <sub>2</sub> , 25%)	1# / 100gal	5/18, 6/15, 7/26	74.80 % <sub>a</sub>
Foli-Cal (Ca acetate, 10%)	64oz / 100gal	5/18, 6/15, 7/26	73.40 % <sub>a</sub>
Control	0	not sprayed	54.05 % <sub>b</sub>

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