

METALOSATE[®] FIELD TRIALS ON GOLDEN DELICIOUS APPLES IN WASHINGTON

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Introduction

This project was established to take a look at four different calcium products and learn how well each performed in the field. The criteria that were to determine the level of performance for each product were as follows: first, leaf calcium levels would be analyzed; second, fruit flesh would be analyzed for calcium content; third, pressure testing of fruit after CA storage, fourth, measuring the percent bitterpit in the warehouse culls, fifth, determination of the total percentage of culls, and sixth, a count of the total pack out per bin. This project took over a year to complete as the calcium applications began after petal fall with the first cover spray. The apples were then picked in the fall and kept in CA storage until the time it was packed. This fruit was packed on August 18, 2003. This fruit was sprayed in the spring of 2002. It is well known in the industry that fruit flesh calcium levels are inversely related to bitterpit losses. Much of the work done to date on calcium related disorders looks at the levels of calcium in the fruit at the time of harvest and concludes that fruit with higher calcium levels will exhibit fewer tendencies for calcium related disorders (bitterpit) during the storage period. In this trial we took a look at this and found it to be the case. Also, in this process we were able to draw conclusion as to which calcium product was the most efficient at increasing fruit quality during several months of CA storage.

Materials and Methods

The location for this project was in Okanogan, Washington. The block treated was a golden delicious apple block that in the past has been very prone to produce fruit with bitterpit problems. The block was divided into 4 sections with each section receiving different calcium treatments with all other inputs being the same throughout. Table 1 is a summary of the treatments applied, the frequency of application and the percent calcium contained in each product.

Table 1
Summary of Treatments Applied

Treatment	Application Rate	Application Frequency	Mineral Analysis
Metalosate®	64.0 fl oz/acre (4.7 L/ha)	4 times, 14 day interval	6.0% Ca
Nutri-Cal®	64.0 oz/acre (4.7 L/ha)	4 times, 14 day interval	8.0% Ca
Mira-Cal®	6.0 lb/acre (6.7 kg/ha)	4 times, 14 day interval	30.0% Ca
Calcium Chloride	4.0 lb/acre (4.5 kg/ha)	4 times, 14 day interval	35.5% Ca

All treatments were made on the same day. The applications began with the first cover spray and continued from there every 14 days for 4 applications total. The leaves were collected from a fruiting spur located at a 45 degree angle from the spray rig and into the tree canopy 3 feet (1 meter). Samples were collected on September 20, 2002 and sent to Cascade Analytical for analysis. Apples were also collected on the same day from the same location as the leaves. They also were sent to Cascade Analytical for analysis of the fruit flesh. The orchard was then harvested and placed in CA storage. They were taken out of CA and packed on August 18, 2003. This would indicate that they were in CA storage for just less than 11 months. When the apples were taken out of CA storage, tests were done using a handheld penetrometer on good fruit. Fruit tested had no sunburn, bitterpit or rot. Next 100 culls were taken at random from each treatment and observations made to determine how many of them had bitterpit. The fruit was then packed and the total number percent culls from each treatment were determined. Also, the warehouse packs per bin in each treatment was calculated.

Results

Table 2 represents a summary of the information discovered in this field trial. A look at the leaf sample calcium levels would indicate that the Nutri-Cal® treatment contained the highest calcium levels. This was closely followed by the Mira-Cal® treatments with the Metalosate® treatment next leaving the Calcium Chloride treatment to the last. Next are the results from the flesh test. Here the order is as follows: Metalosate highest followed by the Nutri-Cal treatments, followed by the Mira-Cal treatments with the calcium chloride being last. The next measure was the average pressure tests taken from 100 apples in each treatment. The Mira-Cal treatment had the highest pressures, followed by the calcium chloride treatment, third was the Metalosate treatment and lastly was the Nutri-Cal treated fruit. The next item is the results from the percent bitterpit found in the culls.

Table 2
Summary of Experimental Results

Treatment	Leaf Calcium	Flesh Calcium	Average Pressure*	% Bitterpit In Culls**	% Total Culls	Total Warehouse Packs/Bin
Metalosate®	2.14%	201 ppm	16.33 lbs (7.407 kg)	14	31	15.7
Nutri-Cal®	2.37%	190 ppm	15.93 lbs (7.226 kg)	20	34	15.0
Mira-Cal®	2.15%	148 ppm	17.08 lbs (7.747 kg)	25	34	15.0
Calcium Chloride	1.70%	138 ppm	16.46 lbs (7.466 kg)	26	36	14.8

* No sunburn, bitterpit, or rotted fruit tested

** 100 culls from each treatment tested

The Metalosate treated fruit has the lowest percentage of culls due to bitterpit at 14%. The next best treatment was the Nutri-Cal treated fruit at 20%. This was followed by the Mira-Cal treatments at 25% with the calcium chloride treated fruit showing the highest percentage of culls due to bitterpit at 26%. The 5th column of information in table 2 represents the total number of culls from each treatment. The Metalosate treatments showed the lowest percentage of total culls with 31%. That was followed by the Nutri-Cal and Mira-Cal treatments where each had 34%. This was followed by the calcium chloride treatments showing a total cull percentage of 36%. The last column of information on the table represents the total warehouse packs per bin of fruit. This information is taken directly from the warehouse packing records. Here the Metalosate treated fruit has the highest pack out per bin at 15.7. This was followed by the Nutri-Cal and Mira-Cal treated fruit giving a total pack out of 15 per bin each. This was followed by the calcium chloride treatments with a total pack out of 14.8 packs per bin.

Conclusion

This field trial was quite extensive and provided a great deal of valuable information. It indicates that in terms of increasing apple flesh levels of calcium, reducing percentage of culls due to bitterpit, reducing total cull percentage, and increasing total fruit pack out per bin, applications of Metalosate calcium is the best product. All four of these indicators are directly related to fruit quality. The relationship between fruit quality and profitability for the grower is a direct relationship. The higher the quality of the harvested fruit is, the better it will hold up under CA conditions which equates to a better pack out for the grower which means higher profitability.

These results were achieved with the Metalosate calcium applications starting well after the recommend timing. If the applications had begun at bloom the

results would have been even improved over what was measured in this trial. When looking at the total pounds of calcium applied on a per acre basis, the Metalosate treatments were the lowest, yet we were able to achieve the greatest positive impact on the fruit. This is due to the unique properties found in the Metalosate products. This is another example showing that you cannot afford not to use the Metalosate line of products. With the ever increasing pressure placed on growers to produce not only high quantity but also high quality fruit, the Metalosate products will meet both of these demands.

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