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Balchem® Plant Nutrition Research Paper

CALCIUM TRIAL ON GREEN D'ANJOU PEARS IN HOOD RIVER, OR

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Introduction

The key role calcium plays in contributing to the maintenance of optimum quality during postharvest storage and ripening in pears and apples has been extensively studied and is well known in the fruit industry. This role of calcium is seen directly in the prevention of specific disorders such as cork spot in pears and bitter pit in apples, and in relationships between calcium and more general quality properties such as fruit flesh firmness.

The recognition of the critical role of calcium has led to different strategies for prevention of disorders and optimizing quality. These strategies include the following:

1. Treating the fruit with postharvest dips and drenches in an effort to increase calcium levels in the fruit.
2. Tracking historical records of which blocks, areas or varieties typically exhibit postharvest storage problems and then not putting this fruit into storage.
3. Relying on prediction schemes, which try to predict postharvest storage capabilities based on leaf and or fruit analysis.
4. Management of crop production scheme which provides fruit at the end of the season which has mineral nutrient levels high enough and appropriately balanced at the time of harvest to provide a very low risk of disorders and provide for optimal postharvest storage.

The fourth strategy is by far the most preferred. Growers should not be producing fruit predisposed to disorders and poor storage performance.

Given the above information, it is clear that calcium is critical in fruit production. There are many different formulations of calcium available to growers with Calcium Chloride being among the least expensive and most commonly used form.

The purpose of this trial was to compare calcium movement into the **flesh** of pears following a foliar application using Albion's Metalosate Calcium (6% Ca) compared to a Liquid Calcium Chloride (12% Ca) product manufactured by Platte Chemical Company. Table 1 shows the levels of calcium in the flesh of two sets of pears before and after the spray treatments. Table 2 shows the change in calcium levels in each treatment. As the graphs clearly demonstrate, the Metalosate calcium was extremely effective at increasing the calcium levels in the flesh of the pears compared to the calcium chloride product that showed a decrease by 40 ppm in the flesh.

Materials and Methods

This trial took place in the Hood River area if Oregon. It was done on a commercial production orchard utilizing conventional production practices. The trees were D'Anjou pears grown to be stored and sold trough the winter months. The test area was a 10-acre block that was split down the middle. One side was designated as A and the other was designated B. Pears were taken from each side of the block in mid-July and placed in a bag with their respective label (a and b). The pears were then sent to Albion Advanced Nutrition in Utah to be analyzed for nutrient content prior to application of any products. The pears were washed thoroughly with soap and then rinsed in distilled water. The pears were then peeled to allow for analyzing of the peel separately from the flesh. An equatorial section of each pear was taken and then combined with the equatorial sections taken from the rest of the pears from that treatment to constitute the flesh sample. Application of the products was made and another set of samples were taken 7 days after application. These samples were then labeled as A2 and B2, and sent to Utah for analysis. The same procedure described above was used to prepare the samples for analysis. All labeling and application of product was done independently, consequently, nobody at Albion had any knowledge as to which samples had been treated with which product.

The two products were applied at different rates. The Metalosate calcium was applied at a rate of 1 ½ pints per acre (6% calcium product). The calcium chloride product was applied at a rate of 1 ½ quarts per acre (12% calcium product). These rates were based entirely upon product cost. At the rates these two products were applied the cost per acre was the same. **One very significant fact to keep in mind is that with the calcium chloride application the grower put out roughly 4 times the amount of calcium pound per pound vs. the Metalosate calcium**.

Results

Figure 1 shows the levels of calcium just prior to the applications being made. It also shows the calcium levels 7 days post application. Figure 2 represents the change in calcium levels resultant from the application of calcium. This represents a significant difference in the performance of the two products. The Metalosate Calcium increased the calcium level in the pears by 39 ppm. This was achieved while actually putting out one quarter of the amount of calcium as compared to the other treatment. The 12% aqueous calcium chloride treatment actually showed a decrease of 40 ppm in calcium levels after making the application. One possible reason for this is the fact that calcium chloride is not very bioavailable to the plant. Having made an application of calcium chloride did not provide bioavailable calcium to the tree. As the pears continued to grow and the demand for calcium increased, the demand was not able to be satisfied any other way than by the Metalosate Calcium product. Table 1 reveals another important difference between the two treatments. It represents the Calcium to Nitrogen ratios. It is well known in the fruit industry that the lower this ratio is, the better chance you have of reducing post harvest disorders thereby increasing storable life of the fruit. The Metalosate treatment had a significantly better ratio than the calcium chloride treatment.

Discussion

This demonstration trial clearly demonstrates the superior performance of Metalosate Calcium. These two applications were the same in cost of product per acre. It is very clear which application will return value to the grower for cost put out. While it is difficult to figure a total return on investment it is often beneficial to analyze the results in the following way. It has been clearly demonstrated over the past several years the significant role calcium plays in improving fruit quality and in reducing post harvest

disorders like cork spot and bitter pit. In the case of pears, if a grower is able to reduce losses to calcium related disorders by increasing the calcium levels in the pear flesh while the fruit is still on the tree, they are much better off than to try and solve problems after the fruit is in C.A. storage. If the grower could increase pack-out or reduce losses due to calcium related disorders by as little as 4-6 boxes per acre at current market prices, he could offset the cost of the application as well as the packing costs. Anything above and beyond that could be considered return on investment given the fact that the grower is able to recoup the cost of production given the current market at the time. In the case of the other calcium product tested in the trial, the grower has lost the second he put the product in the spray tank. Every cent spent on the product is a loss regardless of anything the market does. A product was applied and there was absolutely no benefit realized by having done so. In fact, not only was there no benefit there was a loss, the loss of every dollar spent for the application.

Once again, the use of Metalosate brand micronutrients has proven to be by far the most economically sound products to apply. The label recommended application rate for Metalosate calcium is 1 qt. per acre. Given how well the Metalosate calcium performed at 1 ½ pints, see for yourself how well it will perform at label rates.

Figure 1. Fruit flesh concentrations of calcium in D'Anjou pears treated with foliar calcium sprays in Hood River, Oregon 2001

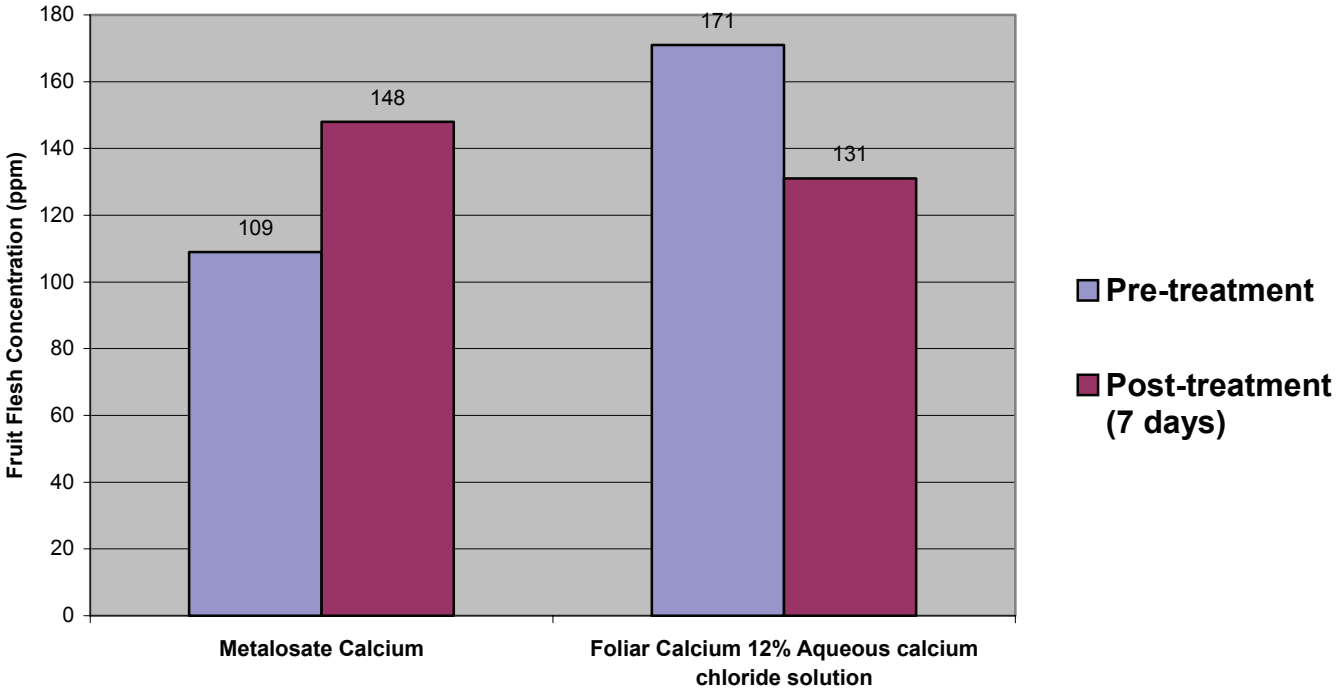

Figure 2. Change in pear fruit flesh concentration in D'Anjou pears treated with foliar calcium sprays in Hood River, Oregon 2001

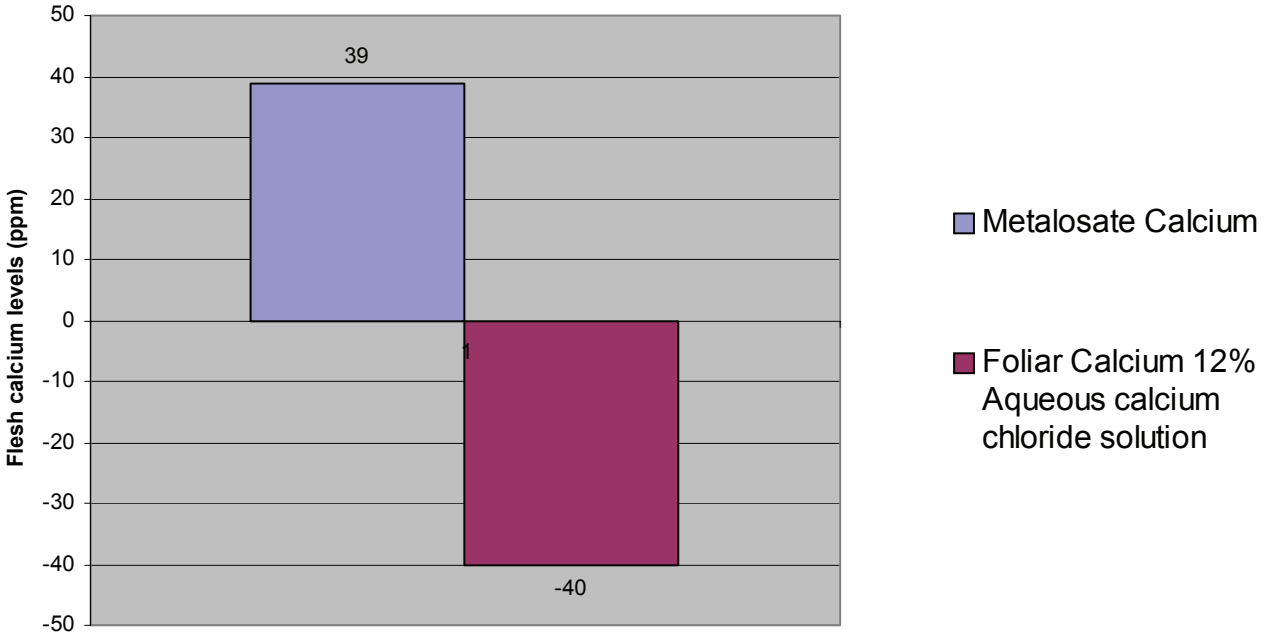

Table 1. Calcium to Nitrogen ratios for the two treatments

Treatment	Flesh Ca (ppm)	Flesh N (ppm)	Ca: N ratio
Metalosate Calcium	148	361	1:2.44
Aqueous Calcium chloride	131	520	1:3.97