



Calcium in Fruit Production

Calcium is the primary building block in cell formation. It is also the main line of defense against infection of disease.

The plant requires an adequate supply of calcium for all new growth of plant tissue. If calcium is short in supply new growth will be misshapen.



Tip burn and misshapen leaf due to calcium deficiency

Supplying calcium to the strawberry or any fruit that grows as rapidly as the strawberry is often difficult because of the rapid demand for calcium during peak production.

Calcium is taken up by the plant primarily by “mass flow”, (the movement of a nutrient to the root surface in soil water), therefore in dry weather or dry field conditions calcium can be short in supply even when calcium soil levels are adequate.

Optimum soil levels for calcium in soils are between 65 and 75% saturation and even at these levels the crop will require supplemental calcium during peak production.

In my complete fertility program for strawberry, I will recommend the use of gypsum at renovation and/or in the spring to supply soluble calcium to the developing crop.

In this article I will discuss the use of foliar calcium and the results on various crops that I have had over the past years.

I first began using Calcium foliars on fruit to increase the shelf life of the fruit and improve fruit firmness. The results on different varieties that normally would pick soft when ripe proved to be very effective.

With continued use of this material on strawberries, Tomatoes, and other crops to improve shelf life and reduce rotting I noticed that the incidence of botrytis on these crops was also greatly reduced.

I now recommend Calcium Chloride as a routine application on small fruit as a preventative treatment to reduce botrytis. I do not suggest that you ignore your regular fungicide program but in crops

that we have supplemented a regular fungicide program with Calcium it has been both effective and cost efficient.

This material will not get rid of disease but it helps the plant fight primary infection when it is used as a preventative.

As I mentioned in the beginning Calcium is the plants first line of defense against disease. The calcium in the plant that holds cells together in tissue is in the form of a Ca Pectate or pectins. A fungal spore penetrates the plant tissue and secretes enzymes called pectinase that dissolve these pectins. The higher the level of Calcium in tissue, and the higher the concentration of pectins, the greater the plants ability to reduce fungal infection naturally.

This is a simple explanation of why Calcium fortifies plant tissue but it doesn't explain exactly why the foliar calcium chloride treatment was so successful on strawberries in the prevention of Botrytis.

Recently I have found research information from other crops around the world where the researcher has used Calcium materials in fighting different diseases and the findings would explain why this has been effective.

The researchers in all cases agreed with their findings and the reason that the calcium works is that it actually interferes with the production of the enzyme that these organisms produce that dissolves the pectins. Therefore not only does the calcium increase the pectin content of the plant but it also interferes with the production of the disease primary method of infection.

In all cases the organisms that were found to be reduced by calcium were the organisms that produce "Oxalic Acid" as the enzyme that dissolves the calcium from the tissue.

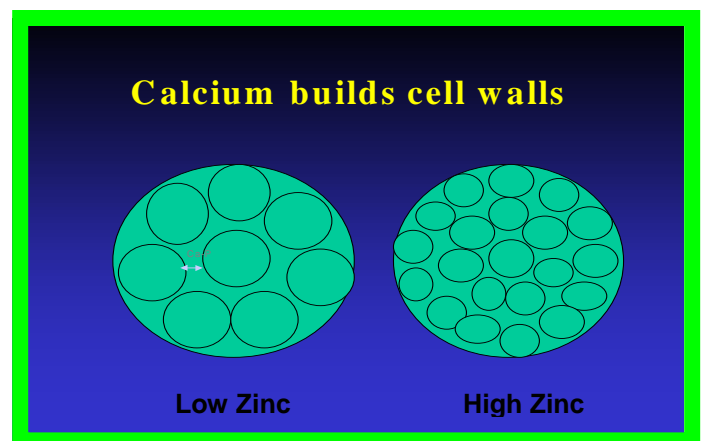
In the research literature it is stated that the disease is reduced by calcium forming insoluble calcium pectate and by sequestering fungal oxalic acid and inhibiting the activity of cell wall degrading enzymes.

In any case now I have a better understanding of why it works as well as it has.

As I mentioned calcium is the building block of all cell walls and increasing calcium in plants increases the quality of the plant. However in order to get the levels of calcium into tissue of fruits the fruit first of all has to have cells to use the calcium.

A common mistake in fruit production is that we do not add the needed nutrients at the right stages to increase cell numbers.

In small plants IAA concentration controls that amount of cell differentiation. With high levels of IAA in developing fruit the fruit will create more cells that will have the capacity to absorb more calcium.



The plant on the left has low zinc levels and at the time of fruit initiation it produces fewer cells. The plant on the right has higher levels of zinc and produces more cells during the cell differentiation stage. Each one of these cells, cell wall, is made up of calcium and each of these cells is held together by Ca-pectate.

The production of IAA in plants is stimulated by Zinc. Early zinc application before flowering will increase the amount of cell differentiation and hence increase the plants capability to absorb calcium. In fact zinc will create the calcium sink in the plant or fruiting body.

Low levels of zinc in plant tissue will reduce the cell differentiation and also reduce the fruits ability to use calcium. Therefore if early zinc levels are not adequate all the foliar application of calcium will not increase calcium levels in the fruit.

Recommendation for use of Calcium Chloride in Strawberries

As I mentioned in the nitrogen management of strawberries newsletter we need to have a regular application of Calcium to fortify the plant.

The nitrogen recommendations that I mentioned are very aggressive and if additional calcium foliars are not used disease pressure and fruit quality will be a problem.

Calcium foliar application if you stay at the levels that I suggest will not be phytotoxic to the plant. It also will not harm beneficial insects.

In order for the calcium to get into the plant and provide the protection it must go on early. Begin applying Calcium as soon as blossoms open.

If you were frost protecting a number of times application of fungicides often, is not recommended and it would also be expensive. I recommend that after each frost protecting that you apply an application of Ca Chloride just before shutting down the irrigation system.

In season when applying the Nitrogen as I suggested in the previous newsletter keep the Calcium program every other day.

Again as discussed in Nitrogen management if you apply N, it should be followed by an application of Calcium within two days.

An example would be if Nitrogen were applied on Monday than Calcium should go on Tuesday or no later than Wednesday.

In season when the crop load is very heavy and you stop foliar applying N keep up the Calcium application to increase fruit firmness and reduce the rotting.

In seasons where the fruit load is heavy an application of Calcium chloride will hold the fruit a few extra days.

As long as you stay within the recommended levels of application you can apply Ca as often as you like without causing damage to the plant. Calcium application supports the natural plant growth process and extended use

of calcium will not create diseases that are immune to this treatment.

through the irrigation system at 4 pounds per acre.

Calcium Recommendations

The following recommendations are for the use of Calcium Chloride. Other calcium materials that you purchase will have suggested label rates that you should follow.

Never mix Calcium Chloride with any other material. This material is very hot and will cause leaf damage if used with other materials or at high rates.

Other sources of Calcium may be mixed with other spray materials, follow label recommendations.

Application through the Irrigation system

Apply Calcium Chloride at 4 pounds per acre at the end of irrigation. Material must stay on the leaf or fruit to be effective.

Application by Sprayer

The volume of water is not a concern just use enough water to give coverage. The rate is 1 gram of Calcium Chloride per gallon of water. I have had some growers suggest that they have gone as high as 2 grams per gal without damage but this is pushing the limits.

Again Calcium Chloride is hot stuff and when you mix this 1 gram per gallon does not look like much, but don't go higher. The 1 gram per gallon of water if you calculate this rate is 3 times stronger than what we are putting it on