

METALOSATE[®] CALCIUM, MOVING AT THE SPEED OF NITROGEN!

Normally calcium moves very slowly through the plant's xylem causing a possible deficiency situation but Metalosate Calcium moves at the speed of nitrogen through the phloem. Albion Plant Nutrition's Metalosate Calcium is molecularly bonded to special amino acid molecules that are building blocks of proteins. A patented bonding process between calcium and amino acid lets Metalosate Calcium move 20 times faster through the plant. Calcium deficiency problems can effectively and economically be solved by using Albion Plant Nutrition's Metalosate Calcium Foliar Fertilizer to improve growth, fruit quality and shelf life. Read on to learn more.

Function of Calcium in Plants

Calcium (Ca²⁺) is an extremely important mineral in so many plant processes:

- maintains the strength of stems and stalks
- regulates the absorption of nutrients across plasma cell membranes
- functions in plant cell elongation and division
- functions in plant structure and permeability of cell membranes,
- nitrogen metabolism
- carbohydrate translocation¹

Calcium is a secondary nutrient even though the concentration of calcium in the plant is as great as nitrogen or potassium. Calcium is nontoxic, even in high concentrations, and serves as a detoxifying agent¹.

Calcium is a critical component of the cell wall and acts as the cement that binds the cell walls together. Of great importance to fruit and vegetable buyer/sellers, calcium is one of the most significant factors of firmness with a direct correspondence to the storage and shelf life of fruit. Seed viability is also directly related to calcium concentration.

Calcium Deficiency Symptoms

When plants are deficient in calcium, the results are most pronounced in young tissue where cell division is occurring:

Meristematic zones of roots, stems and leaves. If deficient in calcium, plants produce twisted and deformed tissues and the meristematic zones die early.^{1,5}

Calcium deficiencies can be observed as death of growing points such as buds, blossoms and root tips.

Other examples are:

- deformed watermelons
- bitter pit in apples
- blossom end rot in tomatoes and chilies
- leaf tip burn in lettuce
- internal brown spot in potatoes
- softer, non-marketable fruit in general
- shorter fruit shelf life

There are several causes of calcium deficiency to show up in fruit and vegetables even though soil and weather conditions seem perfect. With the application of nitrogen fertilizers, nitrogen is translocated in the plant approximately 20 times faster than calcium. Calcium is the slowest moving nutritional mineral in the plant. Unnatural amounts of nitrogen are frequently applied in an attempt to maintain yields. This large nitrogen boost causes the plant to grow faster than the calcium can move within the plant, thus inducing calcium deficiencies in the growing points and fruit. A second reason for calcium deficiency is the passive movement of calcium through the xylem (water conducting tissue) by transpiration. Leaves have a much higher rate of transpiration than fruit, causing a lower calcium concentration in the leaves. This makes leaf calcium concentrations and appearance poor indication of calcium deficiency in the fruit¹. One can have adequate or even high concentrations of calcium in leaf tissue analyses and still have calcium deficiencies in the fruit. For example, "in calcium deficient fruit of watermelon and cucumber, it has been shown that the blossom end of the fruit wall becomes thinner and water-soaked, brown, necrotic spots develop."¹ Cooler weather further exacerbates the problem of calcium moving to fruit as seen in late fall melons in the U.S. or winter grown melons in Central America. Extreme heat

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negatively affects calcium movement in apples, pears, cherries, lettuce and other fruit and vegetable crops.

How to get sufficient calcium into the fruit

Albion Plant Nutrition's exclusive Metalosate Calcium foliar fertilizer is the only product on the market to effectively and economically ensure sufficient calcium concentrations in fruit and other growing points without phytotoxicity. There are a number of calcium products on the market that do very little to get calcium into the fruit. Application of gypsum or calcium nitrate to the soil will only have a marginal affect on calcium deficiency due to the problem of the slow speed at which calcium moves into and within the plant. Only Albion's Metalosate Calcium foliar fertilizer has been proven to effectively penetrate the surface of the leaf and/or skin of the fruit. The Metalosate Calcium is further translocated to areas in the plant of greatest need. Other products on the market such as calcium chloride have devastating phytotoxic effects and studies have shown EDTA calcium chelates penetrate the leaf but hold the calcium so tightly it cannot be translocated to the points of greatest demand^{7,8}.

How Metalosate® Calcium Works

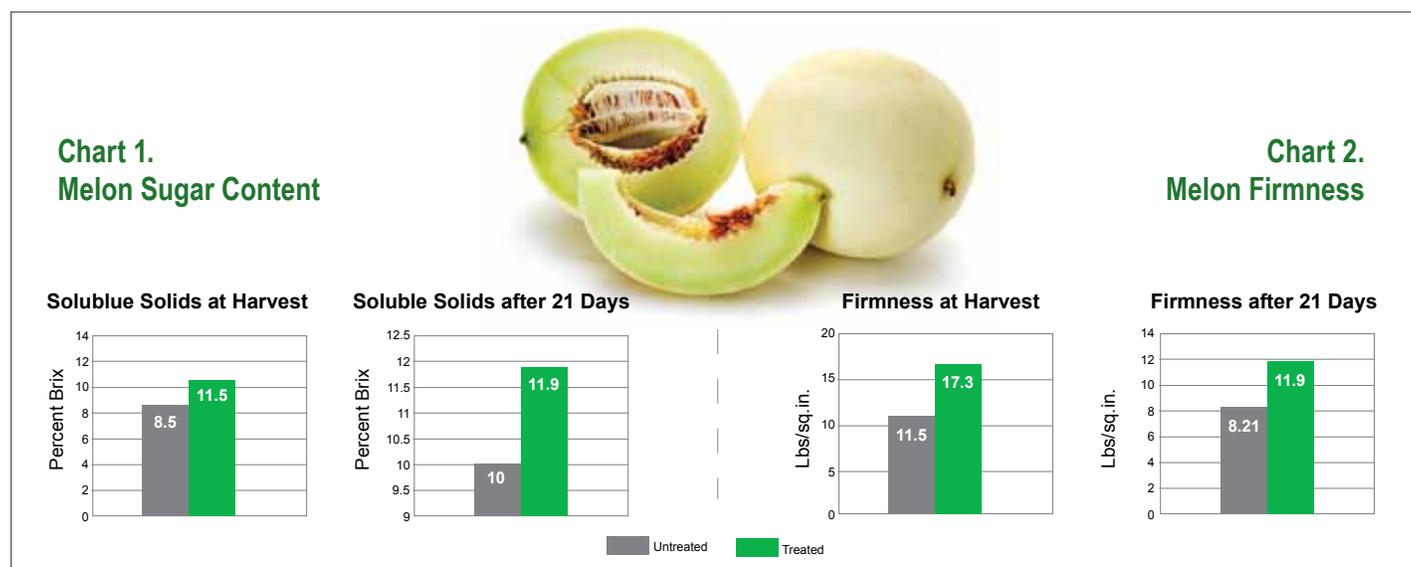
As stated earlier, normal calcium minerals move in the xylem and the passive movement in the water is caused by transpiration. We also stated that nitrogen could translocate about 20 times faster than calcium. Nitrogen moves so fast because its compounds, such as amino acids and proteins can move along with carbohydrates in the phloem to areas of greatest demand like the fruit and tips.

To get calcium to move fast and translocate to the fruit and plant growing points you need the special formulation of the patented Metalosate Calcium. The Metalosate formula bonds through a patented chelation process the calcium mineral to an amino acid creating the Metalosate Calcium Molecule. This molecule, with calcium at its core, is seen by the plant as an amino acid and can now move at the speed of nitrogen through the plant's phloem instead of the slower xylem route. This is a major break-through in plant mineral nutrition science! Not only is the Metalosate Calcium molecule mobile but it will also move to the areas of greatest need of photosynthates such as the meristematic tissues and fruit². Within two hours fifty percent of the Metalosate Calcium will be translocated within the plant.

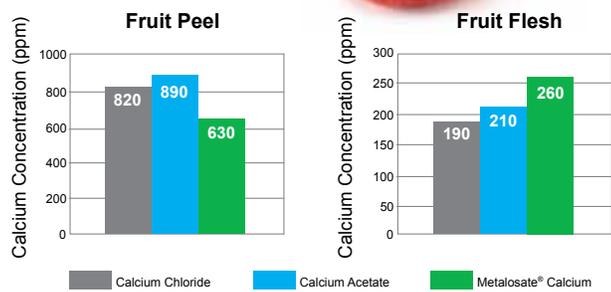
Studies across the world have proven that Metalosate Calcium is the most effective way to increase calcium concentrations inside of fruit and meristematic tissues without any phytotoxic side effects.

Growers Reported Best Melon Pack Out Ever

Dr. Gene Lester, one of the world's leading post harvest physiologists on melons, who now works at the USDA-Agricultural Research Service in Washington, D.C., conducted an experiment dipping honeydew melons post harvest in a solution of Albion's calcium amino acid chelate. The melons were dipped for 20 minutes and air dried. Tests showed a remarkable change in the shelf life of the dipped melons. The treated melons' shelf life was extended 2.4 times longer, an equivalent of 24 days^{3,4}.



**Chart 3.
Apple Calcium Content**



Many growers heard or read of this experiment but could not dip their melons because they field-packed them. Albion research came up with an in-field alternative for growers:

- applying 1 quart (946 ml) Metalosate Calcium at first commercial flowering
- two weeks later apply 1 quart (946 ml) again
- 10 to 14 days before harvest apply 1 quart (946 ml) one last time

Growers reported their best quality ever with increases in pack outs of 30% due to the firmness of melons. A replicated field study in Texas showed that not only were there increases in firmness but also increases in sugar, proving again that the Metalosate molecule penetrates the skin and works in the plant. See chart 1.

In addition to the increased pack out rate melons treated with Metalosate Calcium generally had firmer flesh after 21 days than the non-treated. This also resulted in greater shipping capabilities and shelf life. See chart 2.

Apple Bitter Pit Reduced to Less Than 1%

In South Africa the use of Metalosate Calcium has reduced bitter pit in apples to less than 1%. Studies have shown the ability of Metalosate Calcium to penetrate through the peel. Most calcium foliar, including EDTAs just stick to the peel of the fruit. A true test of calcium concentration is to peel the fruit and measure the calcium concentration of the flesh.

During a regular growing season, an orchard of Fuji apples in Washington State was divided into three blocks. The first was treated with eight pounds of calcium chloride per

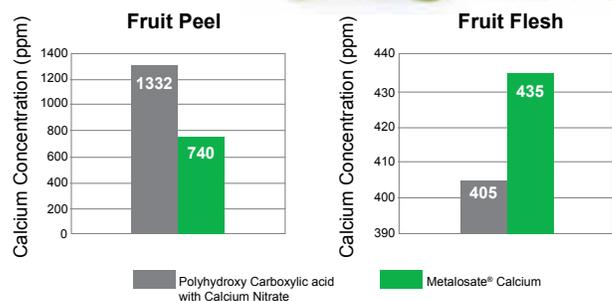
acre, the second with two quarts per acre of a liquid calcium acetate material, and the third with one quart per acre of Metalosate Calcium. Each block received three applications at these rates⁶.

Chart 3 shows the peel concentrations are higher for calcium chloride and calcium acetate than Metalosate Calcium but in the flesh of the apples the Metalosate Calcium is the highest. Considering the volume of the peel versus the volume of the flesh, significantly more of the Metalosate Calcium penetrated the flesh than calcium chloride or calcium acetate.

Reduced Shatter and Increased Shelf Life in Table Grapes

In Southern California a Thompson seedless grape vineyard was split. To one half of the vineyard two quarts of polyhydroxycarboxylic acid with calcium nitrate was applied and to the other half, 1 pint Metalosate Calcium. This application was repeated 3 times during the growing season. In spite of using one fourth the amount of Metalosate Calcium as the other product, Metalosate Calcium had 30 ppm more calcium in the fruit than the calcium nitrate. See chart 4.

**Chart 4.
Grape Calcium Content**



The calcium from the other product just stayed on the skin of the grapes. Metalosate Calcium reduced shatter and increased shelf life in table grapes. Growers have also noticed a decrease in botrytis bunch rot because of a strong skin on the berries. Metalosate Calcium can be added with gibberellic acid sprays, insecticides and fungicides and has been shown to have a synergistic effect with many of these products.

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In Conclusion

The outstanding results from the application of Metalosate Calcium on various crops are extensive. To date, results similar to those summarized above have been found in over 300 agricultural and ornamental crops. Join the multitude of satisfied loyal customers that made the switch to Albion Plant Nutrition's full Metalosate range of foliar fertilizers products.

Contact us today to find a dealer near you. When you talk to the Albion representative ask him about how our exclusive T.E.A.M.® Report for mineral plant analysis can make mineral application simple and on time for your plants growing cycle.

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Metalosate®

Liquid Foliar Products

- » Boron
- » Calcium
- » Copper
- » Iron
- » Magnesium
- » Manganese
- » Potassium
- » Zinc
- » Crop-Up®
- » NPK
- » Multimineral™
- » MZ™
- » Tropical™
- » Zinc Plus™

Organic Foliar Products

- » Calcium
- » Calcium Boron
- » Copper
- » Iron
- » Magnesium
- » Manganese
- » Zinc
- » Crop-Up®
- » Multimineral™



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