

CALCIUM + BORON CHELATE

Calcium + Boron – Role in plant physiology.

Calcium for cell wall integrity:

Calcium as calcium pectate is found in cell walls, and if lacking may be replaced by other cations, including magnesium, creating a condition called “leaky cells”, which weakens the integrity of the cell. The cross linkage of pectin by calcium strengthens the cells walls, whereas a calcium deficiency makes the cell wall more pliable and therefore easily ruptured.

Calcium also binds the phospholipids in the cell membrane controlling membrane permeability. Low calcium leads to a loss of metabolic and ionic nutrients.

Calcium an important cell regulator:

Calcium is being recognized as a critical cell regulator, with many roles within cells including cytoplasmic streaming and cell division and is therefore required at the growing points and buds.

Calcium relationship to plant growth regulators:

The relationship with the cytokinin growth regulators, may be antagonistic, with calcium suppressing the senescence and leaf abscission role of the cytokinins. Calcium may also reduce ethylene production and therefore reduce premature ripening and softening of fruit.

Calcium key function in plant heat stress resistance:

Cytosolic calcium plays a role in thermal modification within plants. At high temperatures plants are unable to maintain the pH of the cellular cytosol due to damage to the ATP driven proton-pumping mechanism which maintains an alkaline environment in the cytosol. By producing a calcium activated regulatory protein, calmodulin, plants are able to correct this imbalance.

Symptom's of calcium deficiency:

- Weakened cell walls
- Increased frost sensitivity
- Reduced heat tolerance
- Poor root development
- Leaf curling
- Blossom end rot
- Bitter pit
- Fruit cracking
- Poor storage
- Water soaking

The application of calcium fertilisers:

Symptoms of calcium deficiency may occur in plants despite “adequate” levels of calcium expressed in soil tests. Calcium is poorly translocated throughout the plant, necessitating a continuous uptake from the roots and if root absorption is compromised due to soil temperatures falling below 20°C, or high temperatures impacting transpiration, calcium deficiencies may occur at the growing points, flowers or within fruits.

Foliar Fertiliser uptake is highly efficient:

Calcium absorption and transport occur through two distinct processes. Following root absorption calcium is transported via the xylem and following foliar absorption via the phloem. Calcium is a particularly immobile element within the plant. It is carried through the xylem tissue to the older leaves where most transpiration is taking place, and not to the younger leaves and growing points, where a deficiency may develop. Foliar applications are most effective in correcting such deficiencies.

Foliar fertilisers compliment a soil fertilising program. Using traceable isotopes, foliar efficiency is shown to be about 10 times more efficient than root applications for a defined amount of nutrient.

Field trial Orange NSW 10 year old apple trees:

Soil conditions and plant growth cycles affect mineral availability.

Certain soil conditions may render nutrients unavailable to the plant root and the nutrient demand at stages in a plant’s life cycle may be greater than its physiological capacity to supply itself through the leaves.

In order to assist leaf and fruit absorption, FMN nutrients are chelated into long chain molecules that are naturally carried through the cell wall by protein based carriers, which release or translocate the element within the plant.

Mineral Element	19 th January 2004 Before treatment Calcium+boron chelate 5/ha	20 th February 2004 After treatment	% change
Calcium	0.87% leaf tissue	1.19%	87% increase
Boron	27.33ppm leaf tissue	35.29ppm	29% increase

The above field trial was conducted using foliar applied FMN Calcium+boron Chelate on apple trees. (Calcium is required to prevent pitting and softening of apples.) The Calcium and Boron increase was significant and exceeded the target requirements.

Suggested Frost and Heat Resistance Programme.

	<i>Ectol</i>	<i>Calcium + boron</i>
Litres per ha	5	5

The frost resistance programme should commence at budburst and continue every 10 days during the period of risk. The same programme can be implemented as periods of heat stress are predicted.

Boron – An essential micronutrient with a synergistic relationship with calcium.

Boron is known to be critical to:

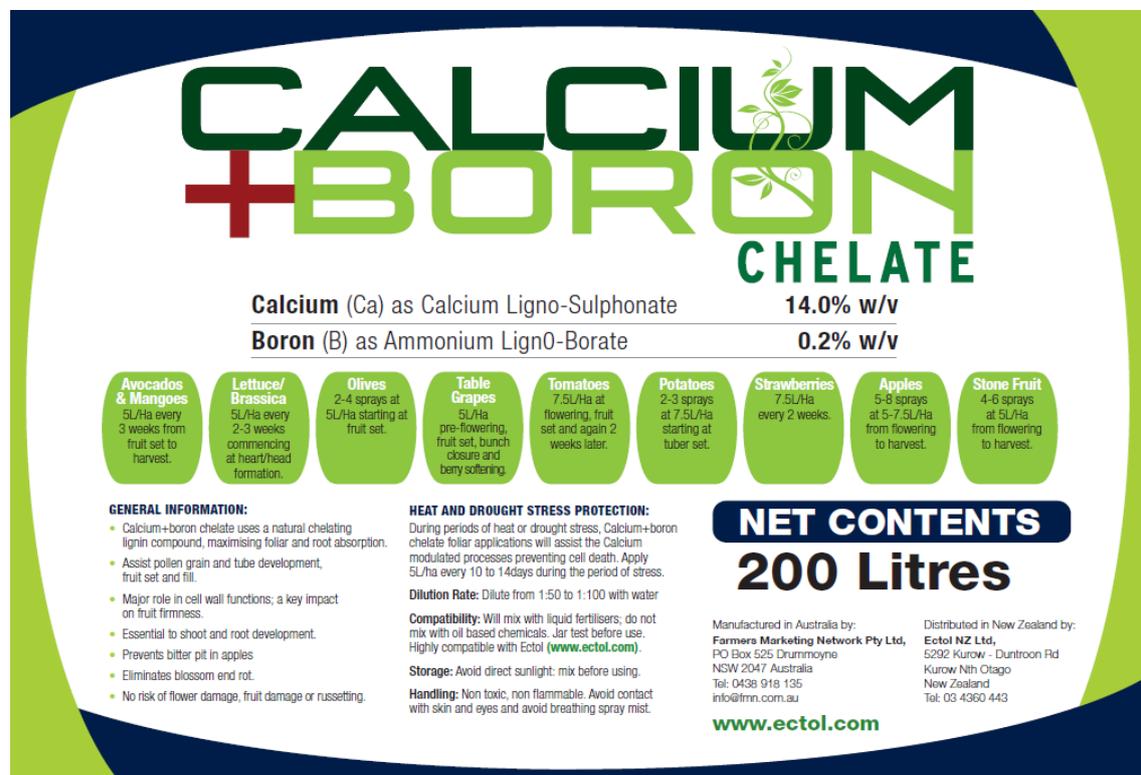
- Cell wall structure
- The maintenance of the plasma membrane in cells
- Operations of several metabolic pathways include nitrate metabolism.
- Calcium's genetic signaling within the cell.

Boron is taken up by the plant through the roots and the leaves and is transported by the xylem and the phloem pathways within the plant.

Boron deficiency impacts:

- Root elongation
- Plant growth regulators including IAA.
- Sugar translocation
- Carbohydrate metabolism
- Nucleic acid metabolism
- Pollen tube growth
- Reduced accumulation of phenolics and polyamines
- Cross linking of cell walls
- Nitrate assimilation

FMN Calcium and boron chelate is available in 20L, 200L and 1000L shuttles



CALCIUM + BORON CHELATE

Calcium (Ca) as Calcium Ligno-Sulphonate **14.0% w/v**
 Boron (B) as Ammonium Ligno-Borate **0.2% w/v**

Avocados & Mangoes 5L/ha every 3 weeks from fruit set to harvest.	Lettuce/Brassica 5L/ha every 2-3 weeks commencing at heart/head formation.	Olives 2-4 sprays at 5L/ha starting at fruit set.	Table Grapes 5L/ha pre-flowering, fruit set, bunch closure and berry softening.	Tomatoes 7.5L/ha at flowering, fruit set and again 2 weeks later.	Potatoes 2-3 sprays at 7.5L/ha starting at tuber set.	Strawberries 7.5L/ha every 2 weeks.	Apples 5-9 sprays at 5-7.5L/ha from flowering to harvest.	Stone Fruit 4-6 sprays at 5L/ha from flowering to harvest.
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GENERAL INFORMATION:

- Calcium+boron chelate uses a natural chelating lignin compound, maximising foliar and root absorption.
- Assist pollen grain and tube development, fruit set and fill.
- Major role in cell wall functions; a key impact on fruit firmness.
- Essential to shoot and root development.
- Prevents bitter pit in apples
- Eliminates blossom end rot.
- No risk of flower damage, fruit damage or russetting.

HEAT AND DROUGHT STRESS PROTECTION:

During periods of heat or drought stress, Calcium+boron chelate foliar applications will assist the Calcium modulated processes preventing cell death. Apply 5L/ha every 10 to 14days during the period of stress.

Dilution Rate: Dilute from 1:50 to 1:100 with water

Compatibility: Will mix with liquid fertilisers; do not mix with oil based chemicals. Jar test before use. Highly compatible with Ectol (www.ectol.com).

Storage: Avoid direct sunlight; mix before using.

Handling: Non toxic, non flammable. Avoid contact with skin and eyes and avoid breathing spray mist.

NET CONTENTS 200 Litres

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