WUXAL® Xtra Uptake

Calcium

A proven suspension concentrate formulation containing nitrogen, calcium, magnesium and trace elements, specifically designed for foliar application to crops for the prevention of calcium deficiency.

The Product

Wuxal® Calcium Xtra Uptake is recommended for the control of physiological conditions caused by calcium deficiency in a range of crops, such as bitter pit in apples.

The new Xtra Uptake technology offers an advanced penetrant and surfactant, enhancing rapid foliar nutrient absorption which increases efficiency, especially on plants with hard-to-wet foliage and under suboptimal weather conditions.

Bitter Pit in Apples

Bitter pit in apples is characterised by shallow pits, usually seen around the calyx end of the apple. Beneath the skin of these pitted areas is a small area of brown, dead tissue. This disorder is linked to a deficiency of calcium in the fruit.

Background

In plants, 60% of the calcium is associated with the cell wall, 7% with membranes and 33% with the soluble fraction inside the cell. Hence calcium plays a key role in membrane stability and cell integrity. Low levels of calcium mean leaky membranes and materials can be lost from inside the cell.

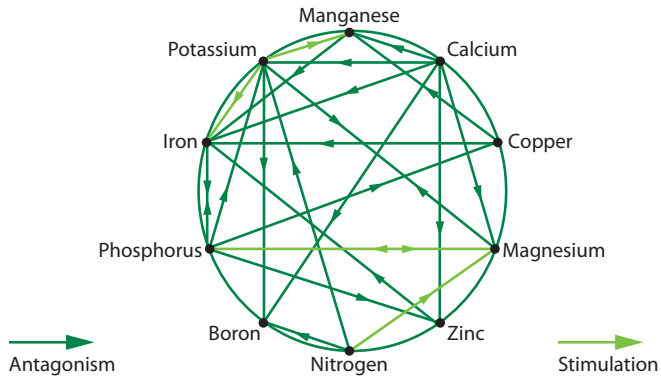
Factors

- In vigorously growing trees, calcium flows to the leaves rather than fruits, resulting in up to 87% of fruit showing signs of bitter pit.
- Fruit on young trees and/or heavily pruned trees are more susceptible to bitter pit than fruit on old trees. In addition, fruit near the ends of leaders and laterals are also highly susceptible to bitter pit.
- Rootstock can influence calcium uptake.
- Periods of hot dry weather can cause rapid water loss from the leaves. Excessive heatwave conditions can see moisture withdrawn from fruit to make up for the loss from leaves, resulting in calcium deficiency in the fruit.
- Late season irrigation/rainfall after a dry period can cause a late increase in fruit size, leading to an increase in bitter pit susceptibility.
- Transpiration rate and size of fruit
  - Surface area in 5 cm diameter fruit vs 8 cm fruit is 1:2.3
  - Transpiration rate is 2.3 times greater in larger fruit vs smaller fruit
  - Larger fruit receive 2.3 times as much calcium as smaller fruit
  - However, the volume is 3.4 times greater in larger fruit and therefore larger apples are only getting two thirds the amount of calcium per volume of tissue from the transpiration stream
  - As a result, larger fruit are more likely to be calcium deficient than smaller fruit
  - Trees with a light crop load can lead to large sized fruit.
- Calcium is relatively immobile in plants and therefore calcium in leaves is unavailable for transfer to fruit. This could result in adequate calcium levels in the leaves but a deficiency in the fruit

  - Ratio of increase of nutrients over time

Nutrient	Leaves	Fruit
Potassium	1 to 1	3 to 9
Calcium	1 to 1	9 to 174

- Application and uptake of other nutrients, such as magnesium, nitrogen (as ammonium) and potassium, can impact antagonistically on calcium uptake or vice versa
  - Mulder's uptake chart:



  - Absorption of nutrients from a foliar application

Nutrient	Time for 50% absorption
Nitrogen (Urea)	1.5 to 2 hours
Magnesium	2 to 5 hours
Potassium	10 to 24 hours
Calcium	1 to 2 days
Manganese	1 to 2 days
Zinc	1 to 2 days
Phosphorus	5 to 10 days
Iron	10 to 20 days
Molybdenum	10 to 20 days

- Adequate levels of boron are also important due to the antagonistic behaviour of calcium uptake.

Innovation. Quality. Solutions.

WUXAL® Xtra Uptake

Calcium

Control

Apply calcium sprays throughout the growing season to ensure adequate calcium levels in fruit.

Leaf tissue analysis for calcium is of little to no value; analysis of the calcium content of the flesh of the fruit is more important with a target of 2.5 mg calcium per 100 g of apple.

NZ Apple and Pear Marketing board rule of thumb:

- >2.5 mg Ca/100 g = <5% bitter pit incidence
- 2.0-2.5 mg Ca/100 g = <10% bitter pit incidence
- 1.5-2.0 mg Ca/100 g = 10-15% bitter pit incidence

Which Calcium Spray do I Use?

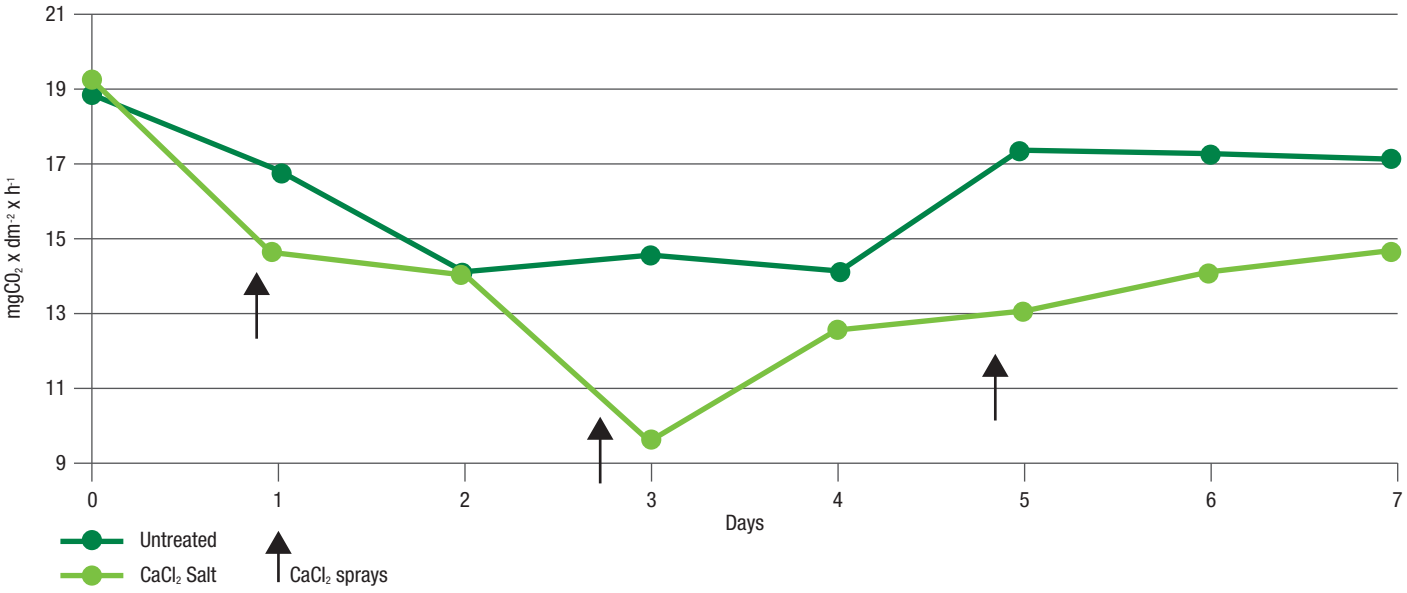
There are numerous calcium sprays on the market, from binary salts such as calcium chloride and calcium nitrate to formulated products such as Wuxal Calcium Xtra Uptake and Stopit*.

The main advantage of formulated products is their ability to improve the uptake of calcium via stickers and spreaders when compared with simple binary salts.

WUXUL CALCIUM XTRA UPTAKE	CALCIUM CHLORIDE	CALCIUM NITRATE
Up to 2% applied solution possible	0.3- max. 0.5% applied solution recommended	0.3- max. 0.5% applied solution recommended
Ca uptake highly effective	Slower Ca absorption	Slower Ca absorption
Non corrosive	Alkaline pH of spray mixture	May promote metal corrosion
Reduces premature leaf- fall	Does not reduce premature leaf-fall	Does not reduce premature leaf-fall
Reported improvement of fungicide efficacy	No improvement of fungicide efficacy	No improvement of fungicide efficacy
Low risk of leaf scorch		Low risk of leaf scorch
Improves Mg supply		May induce Mg-deficiency
	Risk of pesticide hydrolysis	
	Not used for early sprays	
	High risk of leaching from leaf	
	May depress photosynthesis (see graph below)	

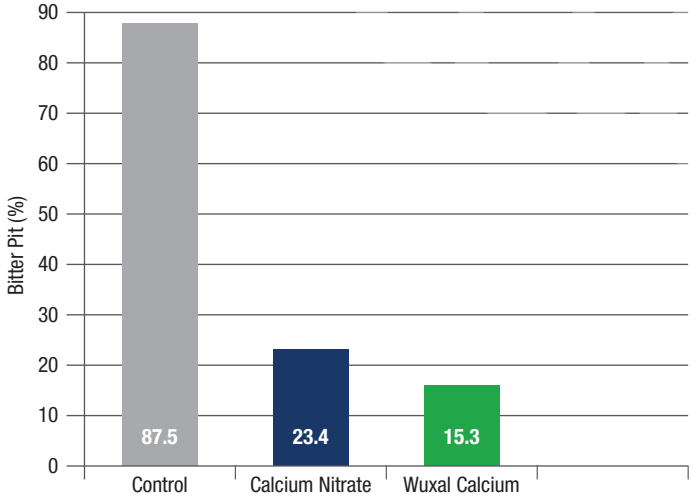
Effect of Technical Calcium Chloride on Photosynthetic Rate

Source: Swietlik, D, *et al.*, 1984



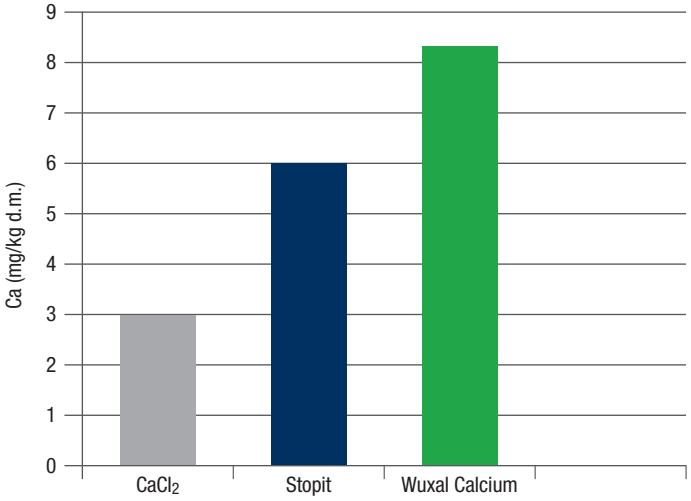
Effect of Wuxal Calcium† on bitter pit incidence

var. Granny Smith Spur



Wuxal 6 x 0.2 l/hl
$Ca(NO_3)_2$ 6 x 0.5 kg/hl
INTA Argentina, 1999
Dr. E. Sanchez

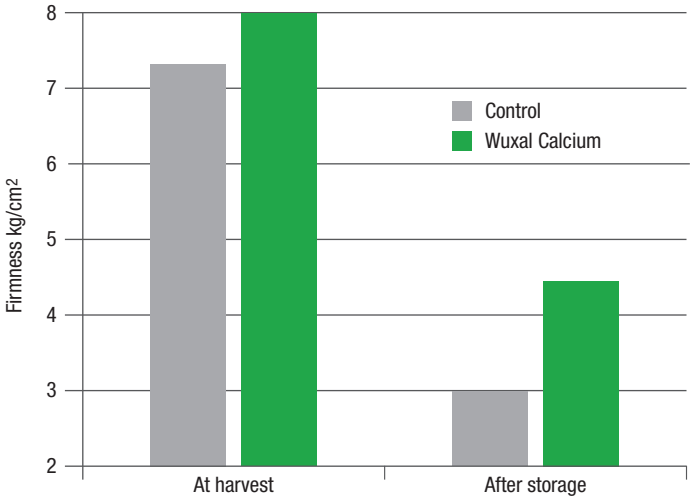
Effect of Wuxal Calcium† on fruit calcium per kg of calcium applied



Results obtained by the University of Warsaw, Fruit Science Dept., demonstrate the higher efficiency of the calcium contained in the Wuxal formulation in comparison to $CaCl_2$ and Stopit (Trial 1996)

Effect of Wuxal Calcium† on fruit firmness

Site: University of Warsaw
Var.: Champion
Treatment: 4 x 0.4%



Conclusions: Significantly improved fruit firmness at harvest as well as after 3 months of cool storage.

Effect of early or late sprays of Wuxal Calcium† on leaf nitrogen content

Crop: var. Cox
Site: Fruit Research Station Bad-Neuenahr-Ahrweiler, Germany, 1997.
Treatments: Untreated control; Wuxal Calcium, 5 L/ha,
Early: 5 times between petal fall until June.
Late: 5 times between July until harvest.
Assessed: 8th August

Treatment	Leaf Nitrogen Content (% d.m.)
Untreated	**3.29** *(Reference value: 2.4 - 3.0)*
Wuxal Calcium late	**3.19**
Wuxal Calcium early	**2.88**

Result: Early or late Wuxal Calcium sprays do not increase leaf-N levels, which would have possible negative impacts on plant vigour.

Wuxal Calcium Xtra Uptake

- Highly concentrated foliar fertiliser with a significantly higher calcium uptake efficiency than binary salt sprays. This improves application efficacy and so less applications are required compared to binary salt sprays, reducing freight and handling costs.
- Contains stickers, surfactants, humectants and anti-evaporants which improve the application efficacy and plant uptake, reducing wastage and improving plant performance.
- Has superior crop safety compared to binary salt sprays, which may cause phytotoxicity.
- Has a pH of approximately 6.5. Its buffering capability can make mixing easier and cheaper. Expensive buffering solutions may not be needed with Wuxal Calcium Xtra Uptake and it is compatible with most commonly used fungicides and insecticides (except lime sulphur and Bordeaux mixtures).
- Can be applied with high or low volume equipment.

†These trials used the original formulation of Wuxal Calcium

Innovation. Quality. Solutions.

ACTIVE CONSTITUENTS			
w/v			g/L
16.0% 2.1% 0.3% 13.6%	N	Total Nitrogen as amide as ammonium as nitrate	160 21 3 136
17.2%	Ca	Calcium (present as calcium nitrate)	172
1.8%	Mg	Magnesium (present as chloride)	18
TRACE ELEMENTS			
w/v			mg/L
0.0800%	B	Boron water-soluble	800
0.0016%	Mo	Molybdenum water-soluble	16
As EDTA complex:			
0.0640%	Cu	Copper water-soluble	640
0.0800%	Fe	Iron water-soluble	800
0.1600%	Mn	Manganese water-soluble	1600
0.0320%	Zn	Zinc water-soluble	320
0.05		Maximum level of biuret	500
This product contains:			**% w/w**
Water			21.5
Total solids			78.5

When storing the product, temperatures below +5°C (41°F) and above +40°C (104°F) as well as frequent temperature fluctuations should be avoided.

Directions for Use Table

The following is an extract of the product label and does not constitute the complete directions for use.
The product label should be read thoroughly before opening the packaging.

CROP	SITUATION	STATE	RATE			CRITICAL COMMENTS
			L/HA	L/HA/ SPRAY	L/HA /SEASON	
All crops	Regular fertiliser	All states	6	-	-	Apply regularly in a tankmix with all normal crop sprays.
Apples (All varieties)	Bitter pit control	Qld, NSW, SA, WA only	-	6	24-42	First post-blossom cover spray, then every second cover spray.
		Tas only	-	6	26-36	First post-blossom cover spray and each subsequent spray.
			-	8 or 12	26-36	Last 2 pre-harvest sprays where potential for bitter pit is high.
Jonathan	Bitter pit control	Vic only	-	8	32	Commence with first post-blossom cover. Spray approximately 2 weeks after petal fall.
Red Delicious Golden Delicious	Bitter pit control	Vic only	-	8	40	Commence with first post-blossom cover. Spray approximately 2 weeks after petal fall.
Granny Smith	Bitter pit control	Vic only	-	8	48	Commence with first post-blossom cover. Spray approximately 2 weeks after petal fall.
Brassicas	Internal browning control	NSW, Vic, Tas, SA, WA only	6	-	-	Apply monthly or with normal crop sprays.
Lettuce	Tip burn control	All States	3	-	-	Apply prior to head formation.
Mangoes	Soft nose control	All States	6	-	-	Apply monthly or with normal crop sprays.
Poppies		Tas only	3-5	-	-	Apply 1-2 times prior to flowering.
Tomatoes	Blossom end rot control	All States	3	-	-	Tankmix with every normal crop spray.
Viticulture		All States	5	-	-	Apply regularly in a tankmix with all normal crop sprays, beginning after blossom.
			5	-	-	Apply from the beginning of berry softening onwards, thoroughly spraying fruit bunches. Repeat at 14-day intervals.

The information provided herein may include extracts from the product label and does not constitute the complete directions for use.
READ THE PRODUCT LABEL THOROUGHLY BEFORE OPENING OR USING WUXAL CALCIUM XTRA UPTAKE

AgNova Technologies Pty Ltd
ABN 70 097 705 158
PO Box 2069 Box Hill North
Victoria 3129 Australia
Ph 03 9899 8100

Data referred to herein were generated using products and rates that were registered at the time. Always read and follow product labels. AgNova Technologies Pty Ltd shall not be liable for any consequential or other loss or damage relating to the supply or subsequent handling or use of this product, unless such liability by law cannot be lawfully excluded or limited. All warranties, conditions or rights implied by statute or other law which may be lawfully excluded are so excluded. Where the liability of AgNova Technologies Pty Ltd for breach of any such statutory warranties and conditions cannot be lawfully excluded but may be limited to it re-supplying the product or an equivalent product or the cost of a product or an equivalent product, then the liability of AgNova Technologies Pty Ltd for any breach of such statutory warranty or condition is so limited.
© Copyright AgNova Technologies Pty Ltd 2019 WUXCALBP200807
® Wuxal is a registered trademark of AGLUKON Spezialdünger GmbH & Co. KG
* Stopit is a registered trademark of Yara Australia Pty Ltd