

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

### 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, blossom end rot of tomatoes and capsicums, soft nose in mangoes, and internal browning in brassicas and tip burn in lettuce.

### Safe and Effective Foliar Nutrition

Wuxal Calcium Xtra Uptake contains key nutrients and trace elements for foliar application to plants:

NUTRIENT	FORM	CONTENT (W/V)
<b>Nitrogen (N)</b>	Total	16.4%
<b>Calcium (Ca)</b>	As nitrate	17.5%
<b>Magnesium (Mg)</b>	As chloride	1.9%
<b>Trace elements: Boron (B), Molybdenum (Mo), Copper (Cu), Iron (Fe), Manganese (Mn), Zinc (Zn)</b>		

### 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.
			–	8	32	Commence with first post-blossom cover. Spray approximately 2 weeks after petal fall.
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.





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### Calcium and Magnesium Nutrition of Crops

Calcium is essential for healthy plant growth and also plays an important part in maintaining post-harvest storage quality, particularly in apples. It is required for various functions in the cell walls and membranes of plants, and as an intracellular messenger involved in coordinating the plant's responses to developmental signals and environmental conditions. Calcium is normally taken up by the roots and transported to the shoots via the xylem (the upward transport system in the plant), and different plants have different calcium requirements. Calcium deficiency in horticultural crops generally occurs when calcium supply is temporarily interrupted so that calcium is unavailable to developing tissues. Symptoms include tip burn of young, developing leaves in leafy vegetables, internal browning (brown heart) in brassica crops, and black heart in celery. In tomatoes, capsicums and watermelons, calcium deficiency is seen as blossom end rot, in apples as bitter pit, and in peanuts as empty pod. Calcium deficiency, in combination with excess nitrogen availability, has also been implicated in soft nose disease of mangoes.

Calcium, unlike some other nutrients, cannot be mobilised from older tissues to younger tissues in the actively growing parts of the plant. This forces the new, developing plant parts to absorb calcium from the xylem.

As nutrient flow in the xylem is dependent on the rate of transpiration, calcium supply to these key parts of the plant can be particularly limited during times of drought, waterlogging or in the presence of other environmental stresses such as increased soil salinity, high winds, high disease pressure, etc. For example, cracking of cherries, tomatoes and apples can be caused by hypo-osmotic shock due to a combination of calcium deficiency and rapid changes in humidity caused by rainfall.

Magnesium is a key component in chlorophyll, the green pigment required for energy absorption during photosynthesis; a process essential to plant growth. Magnesium is also an important constituent of many plant enzyme systems and aids in their function; it also helps move phosphorus around in the plant. Heavy applications of potassium can produce magnesium deficiency – this is important in pasture situations and in banana growing where excessive applications of potash are routinely made. Magnesium is easily leached from the soil. Symptoms of magnesium deficiency include older leaves turning yellow at the edges, and interveinal chlorosis (yellowing) due to a lack of chlorophyll.

Wuxal Calcium Xtra Uptake contains high levels of both calcium and magnesium to combat such deficiencies.



**Apples** – In apples, 50% of the calcium uptake occurs in the 4–6 week period after bloom, so this is an important time to ensure that calcium is available to the plant. Calcium concentration in apples at harvest is usually inversely proportional to the mean weight per apple: any management practice which increases mean fruit weight can potentially reduce the calcium concentration in the fruit and increase the likelihood of the occurrence of bitter pit. Other physiological disorders related to calcium deficiency in apples are water core, lenticel blotch pit, corking and senescent breakdown.

**Brassicas** – Hollow stem, internal browning and tip burn in cabbage, cauliflower and broccoli are often linked to calcium and boron deficiency, or excess nitrogen. Rapid growth conditions, induced by warm weather and plentiful moisture, favour the development of hollow stem, internal browning, and tip burn due to the limited mobility of calcium in the plant. Under these circumstances, levels of calcium and boron are likely to be diluted in new tissues due to rapid growth. As a result, cell wall strength and elasticity are reduced, leading to cell breakdown and stem cracking.

**Lettuce** – Tip burn in lettuce is due to calcium deficiency. It appears as either external or internal marginal leaf necrosis. External tip burn detracts from the appearance and reduces the marketability of lettuce. Internal tip burn is a significant problem for summer lettuce growers because its incidence is variable, with some plantings affected more than others and it may not be apparent at harvest. Tip burn can lead to internal bacterial breakdown or slime within the head and the crop can become unmarketable.

Under conditions of rapid growth and when plants are under stress, rapidly transpiring outer leaves take most of the water

and accumulate most of the calcium. Enclosed lettuce heart leaves have a much lower transpiration rate and draw less water and less calcium. With less calcium, the heart leaves form weaker cell walls which may collapse and die as the leaves expand close to harvest. This is seen as internal tip burn. These breakdown sites allow entry of bacteria which results in further breakdown and unmarketable product. External tip burn can occur for similar reasons but can also be caused by windburn, sand blasting or other physical damage to the delicate growing leaf tips.

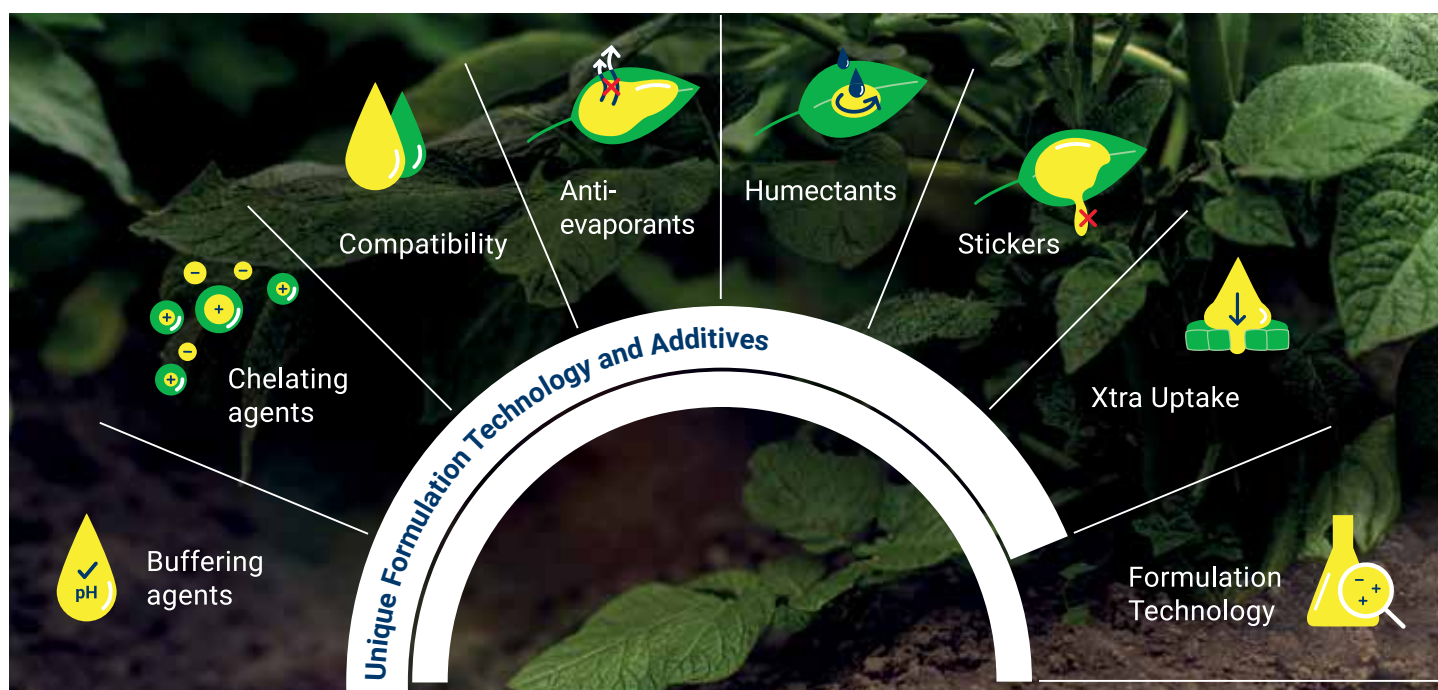
**Grapes** – Berry quality is critical, especially in table grapes. Calcium plays an important part in berry development and post-harvest quality. Grapevines remove 115–150 kg calcium per hectare per year from the soil, so calcium levels need to be maintained while the fruit is developing. Calcium sprays, especially late in the season as the berries are ripening, are important to increase the strength of the skin and improve storage and handling characteristics post-harvest.

**Mangoes** – Soft nose is a serious physiological condition of mangoes around the world, causing significant losses. Symptoms develop as the fruit matures on the tree and can also develop post-harvest, when the fruit is in storage. The condition manifests as a softening of the distal end of the fruit, sometimes accompanied by necrosis. When the fruit is cut open the flesh has a watery, soft, yellow-brown appearance, sometimes accompanied by a yeasty

smell. Soft nose has been linked to calcium deficiency and can be exacerbated by excess nitrogen fertilisation. The condition can be reduced by foliar applications of calcium and magnesium. Some mango varieties are much more susceptible than others.



**Tomatoes and Capsicums** – Calcium deficiency in tomatoes and capsicums produces blossom end rot whereby the fruits develop a sunken, dark, leathery area at the distal, or blossom end, of the fruit. These lesions may develop small to large cracks. Newly emerging leaves can appear scorched and distorted, and may cup down at the edges. It is important that the plant has an adequate supply of calcium during the flowering period and when the plant is under environmental stress.





## The Benefits of Wuxal Calcium Xtra Uptake

- High concentration of nutrients means more nutrients per litre, less storage space required, and more area treated per litre
- Higher level of calcium absorption than inorganic calcium salts
- Unique Xtra Uptake formulation, including an advanced penetrant and surfactant, and containing:
  - Chelating agents – to ensure water solubility of the nutrients in Wuxal Calcium Xtra Uptake and increase the efficiency of uptake by the plant
  - Buffering agents – improve the stability of the formulation and ensure optimum nutrient availability to the plant; ensure compatibility of Wuxal Calcium Xtra Uptake with a wide range of commonly used crop protection products
  - Anti-evaporants – slow the rate of evaporation from the leaf surface, maximising the time for nutrient uptake
  - Surfactants – give even distribution of the spray solution over the leaf surface to maximise nutrient uptake
  - Stickers – reduce nutrient loss due to wash-off by rainfall or irrigation by increasing adhesion of Wuxal Calcium Xtra Uptake to the leaf surface
  - Humectants – reactivate dried residual deposits of Wuxal Calcium Xtra Uptake, increasing time for nutrient uptake
- Superior crop safety compared with inorganic calcium salts such as calcium chloride and calcium nitrate
- Can be applied using low volume or high volume spray equipment



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