**Yara Africa Fertilizer (Pty) Ltd**
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Operations in more than **50** countries

Sales to more than **150** countries

Yara's market presence includes a global network of sales offices in more than 50 countries and sale to more than 150. The company has a strong production and marketing base in Europe and has greatly extended its presence in North and South America, not least taking a strong position in Brazil, as well as in Australia, while expanding in Africa and Asia.

## Market Knowledge

Yara delivers a wide range of solutions for the world's farmers and industrial users, leveraging its experience and knowledge to tailor solutions to local needs. With regard to Agricultural Solutions, Yara offers the market's most complete portfolio of mineral fertilizers and solutions for sustainable agriculture – covering all necessary nutrients for most crops.

## Creating Impact

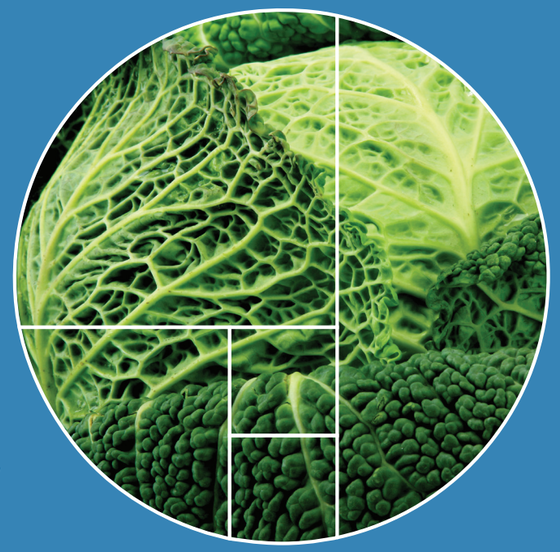
Yara commits to a sustainable future. Creating impact is our blueprint to create business value in the way we respond to human challenges. Yara creates value by delivering profitable, sustainable growth benefitting customers and shareholders – as well as society at large. By creating value Yara is positioned to create impact, to make a difference. Successful alignment of the company's current and future core business with global challenges will strengthen the company's position and develop a sustainable competitive edge. Yara creates impact by engaging in three focal areas where it is able to make a profound contribution: food security, resource management, and environmental issues. The three areas are intrinsically linked, and Yara is uniquely positioned to develop viable business solutions that address related global challenges.

Knowledge grows

# Quality Brassica

# LASTING FRESHNESS

## Inner health, outer beauty



### Introduction

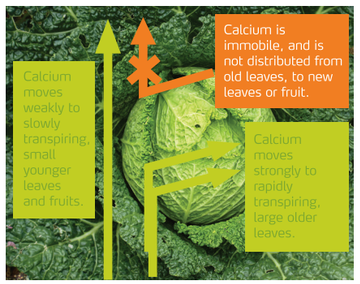
Calcium moves readily to rapidly transpiring leaves, and more slowly to low transpiring inner leaves. It is not redistributed once 'fixed' in the leaves therefore it is essential to supply calcium during the early stages of cell division.

Maintaining adequate levels of calcium in the soil solution by using YaraLiva will assist in the distribution of calcium throughout the plant in 2 ways: transpiration stream uptake, and positive root pressure uptake that occurs at night.

### The YaraLiva™ Range

Our YaraLiva range is consisting of three products: Calcinit and Calfło for fertigation and Nitrabor for dry applied. These products are ideal to meet the needs of your brassica crop, enhancing quality and marketable yield.

This unique combination of fully soluble calcium and nitrate nitrogen ensures rapid uptake and unhindered distribution within the brassica plant.




This range of products supplies nitrate nitrogen, the ideal choice for side dressing of high value crops. Nitrate nitrogen complements the uptake of calcium and other positively charged elements, as oppesed to ammonium, which is antagonistic.

### The YaraVita™ Foliar Nutrition

Despite soil applications of fertilizers, brassicas are often unable to take up sufficient nutrients from the soil. Foliar applications are able to overcome this problem, but their success depends upon timely application of nutrients at worthwhile rates based upon an understanding of their role and requierments at key stages during the season.

### YaraVita™ foliar sprays timing chart

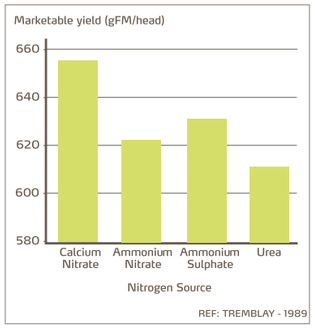
| Foliar YaraVita™ | 4 - 9 leaf stage | Start of stem extension |
|---|---|---|
| | YaraVita™ Molytrac Dual | YaraVita™ Bortrac 150 |
| | YaraVita™ Bortrac 150 | YaraVita™ Seniphos |
| | YaraVita™ Mancozin | YaraVita™ Stopit |
| | YaraVita™ Magtrac | |
| | YaraVita™ Mantrac Dual | |
| | YaraVita™ Zintrac 700 | |
| | Chelate 1089 | |

### Yield

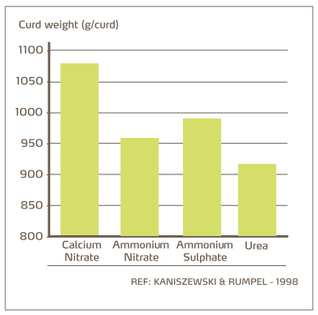
YaraLiva has been shown in trials to promote the marketable yield of cauliflower and broccoli. YaraLiva supplies the more effective nitrate form of nitrogen that can enhance te uptake of other important nutrients such as calcium, potassium and magnesium. It also maintains soil pH, which is vital to the availablility and uptake of all nutrients.

Compare this with ammonium sulphate or urea, that can significantly reduce soil pH over a period of time, and can lead to certain nutrients becoming unavailable. Calcium is important for maintaining a high percentage of marketable yields. Losses due to internal rotting or internal tipburn can be reduced, by the use of YaraLiva as part of a full nutrient program.

### The Effect of Nitrogen on the Marketable Yield of Broccoli




### The Effect of Nitrogen on the Marketable Yield of Broccoli




### Calcium and Quality

Calcium improves disease tolerance and disorders. It plays an important role in producing quality brassica crops. A lack of calcium leads to internal tipburn of heading brassica crops and an increase in bacterial rot.

Bacterial rot

Tipburn (calcium deficiency)

### Tipburn in lettuce:

- Is a calcium related disorder that involves a collapse and necrosis of the apex and margins of actively growing leaves (Collier and Tibbitts, 1982; Termohlen et al. 1966)
- Localized calcium deficiency: The disorder is believed to be due to insufficient calcium transport to enlarging leaves, rather than insufficient calcium uptake by the roots (Bangerth, 1979).
- Calcium moves mainly by transpiration stream in the xylem (Bell and Biddulph, 1963; Clarksen, 1984).
- Leaves of lettuce plants that are totally or partly enclosed as a result of heading are particularly susceptible to the disorder (Collier and Tibbits, 1982).
- These leaves do not freely transpire and contain abnormally low levels of calcium (Collier and Huntington, 1983).

Tipburn - Lettuce

| | Number of plants with tipburn (%) |
|---|---|
| Optimal B & Ca Supply | 0 |
| Low Ca | 58 |
| Low B | 31 |
| Low Ca/Low B | 77 |

REF: KUO ET AL - 1981

Calcium forms strong cell walls and is vital to cell membrane integrity, in order to avoid these quality problems.

### Typical Rates and Recommendations

To help improve quality and reduce internal defects: YaraLiva Nitrabor should be side dressed at 250 - 300 kg/ha, within 4 - 6 weeks of planting, during early cell division. Later top dressing can also be beneficial to maintain leaf quality. A banded application along the rows can give improved results compared to broadcasting, but direct contact between the fertilizer and the stem of the seedling should be avoided as it can result in scorching at early stage.