CALFORMATE®

THE HIGH EFFICIENCY **CALCIUM**

agreya™ Sustainable Agriculture

MASSÓ AGRO DEPARTMENT

Why is important calcium in our crop?

Calcium (Ca) is an essential plant nutrient. It strengthens cell wall and membrane structures and participates in metabolic processes of other nutrient uptake. It is also important for the normal development of organs such as roots, sprouts and fruits thus promoting cell elongation. Besides, it plays a key role in fruit quality, increasing hardness and prolonging the conservation period.

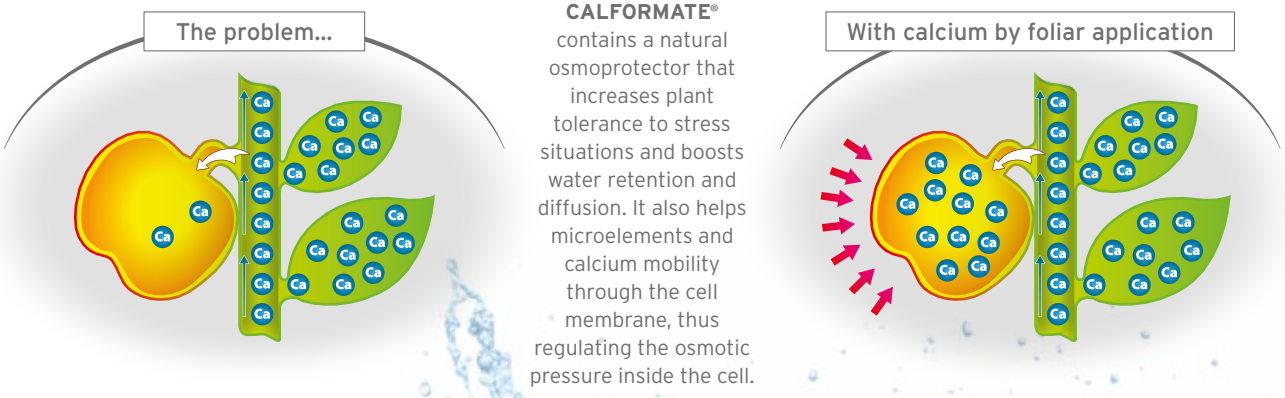
Calcium in the plant

Calcium is a secondary element with very poor mobility in the plant. It is transported passively in the plant xylem (it is dragged by water) thus, its flow absolutely depends on the plant transpiration process. In leaves and in some fruits with few stomata, the transpiration is weak and the calcium flow is small. That is why under certain circumstances of strong growth, water imbalances, etc. plants can show deficiency diseases that can be severe. Its deficiency is mainly observed in the terminal meristems.

A lack of calcium may be the origin of several physiological problems such as bitter pit in apples, tip burn in lettuce and cabbage, strawberries internal browning, blossom end rot in tomato and pepper, splitting of beetroot, stunting of celery, capsule falling in cotton, fruit cracking in several crops, etc.

Foliar application of calcium as a solution

Foliar application of calcium, with the help of a natural osmoprotector present in **CALFORMATE®**'s formulation, increases the calcium concentration in the fruits and in the green parts of the plant, improving fruit firmness and post-harvest fruit quality.



CALFORMATE® contains a natural osmoprotector that increases plant tolerance to stress situations and boosts water retention and diffusion. It also helps microelements and calcium mobility through the cell membrane, thus regulating the osmotic pressure inside the cell.

The formulation of CALFORMATE® ensures a good assimilation of calcium in the plant.

Formate:

It is a rich source of calcium.

It is easily absorbed and translocated by the plant.

High solubility in water.

Natural osmoprotector:

Osmoregulator from natural origin.

It helps the plant to transport the calcium and to tolerate stress conditions.

CALFORMATE®

Boron:

It is involved in ATP-asa activity, fundamental in ion transport processes inside plants.

Boron is a Synergist element for the Ca movement and absorption.

Formulations:

There are two **CALFORMATE®** formulations:

CALFORMATE® for foliar applications.

CALFORMATE® R to apply preferably in fertirrigation.

CALFORMATE®

High efficiency calcium deficiency corrector for foliar application in several crops.
Specifically designed formulation for optimal foliar absorption.

Composition:

Total Nitrogen (N)	1.2% w/w
Organic Nitrogen	1.2% w/w
Calcium (Ca) water soluble	24% w/w
Boron (B) water soluble	0.9% w/w

Rates and application timing:

The general application rate is 0.2 - 0.25% (200 - 250 g/100 L) in foliar spray.

	Crops	Application time
	Apple*	To prevent bitter pit. Apply 3-4 treatments during the period of cell division and 3-4 applications during cell expansion until harvest.
	Cherry, peach, flat peach and nectarine	To prevent cracking, to enhance the strength of the fruit and postharvest shelf life. Apply from fruit set until harvest, every 10-15 days (3-4 treatments).
	Citrus	To increase calcium uptake to reduce albedo breakdown and splitting apply from flowering and fruit set through spring/summer (2-3 treatments). To improve fruit firmness and to extend the postharvest shelf life apply at initial colour break. A second application may be recommended after 30 days and ideally mixed with OSMOSHIELD at 100-200 g/100 L.
	Vine and table grapes	To prevent cracking and to enhance fruit crunch apply from fruit set (2-3 treatments). To extend the postharvest shelf life apply at bunch closure and at the beginning of ripening.
	Tomato and pepper	To prevent blossom end rot and to promote fruit firmness and quality apply from the formation of fruit clusters until harvest, every 10-15 days.
	Lettuce and cabbage	To prevent tip burn (foliar necrosis) and to enhance shelf life apply from 3-4 developed leaves (3-4 treatments).
	Cucurbits	To prevent physiological disorders, like apical necrosis or deformed fruits, to increase firmness and to improve postharvest shelf life apply from the formation of the first fruits until harvest, every 10-15 days
	Other fruits, banana, kiwi, other tropical fruits	In general, to enhance firmness, quality and preservation.
	Strawberries and other berries	To enhance firmness, appearance and to improve postharvest shelf life. Apply from fruit set until harvest, every 10-15 days.

* Photo courtesy of IRTA

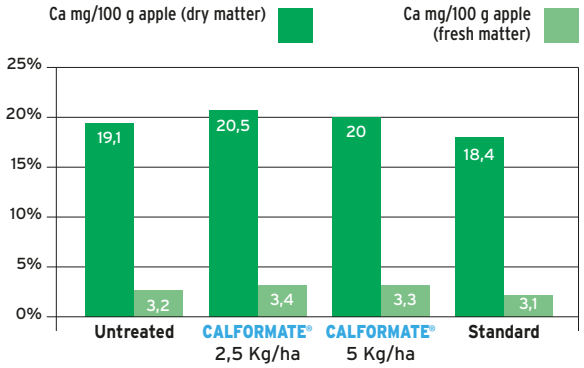
Summary of different efficacy trials

Bitter pit reduction in apples

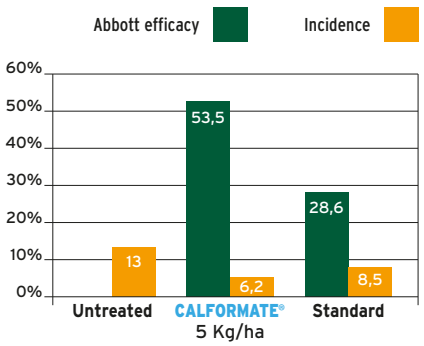
Variety	Golden Smothee
Location	Lleida (Spain)
Plantation frame	4 x 1,4 m
Replications	4
Elemental plot size	4 trees
Trial design	Randomized complete block

	Treatments	Nº of treatments	Application rate/ per treatment
Untreated	-	-	-
CALFORMATE®	4 treatments every 7-10 days. First application at pink bud stage/hollow ball (BBCH 57-59). 4 treatments more every 11-12 days, beginning in mid-July.	8	2,5 Kg/ha (250g/100 L)
			5 Kg/ha (500 g/100 L)
Standard calcium chloride (16.9% w/v CaO)			6 L/ha (600 cc/100 L)

CALCIUM CONTENT IN APPLES AT HARVEST TIME



BITTER PIT INCIDENCE AND ABBOTT EFFICACY OF **CALFORMATE®** IN APPLES STORED 4 MONTHS IN A REFRIGERATED CHAMBER



Enhance of quality parameters in apricots at harvest time

Variety	Farbaly
Location	Lleida (Spain)
Trial design	Comparation with a standard product

Parameters	CALFORMATE®	Standard (Ca)
Brix	13,2	15
Fruit average weight (g)	68	60
Firmness (Kg/cm²)	1,85	0,99
Fruits diameter (mm)	49,8	47

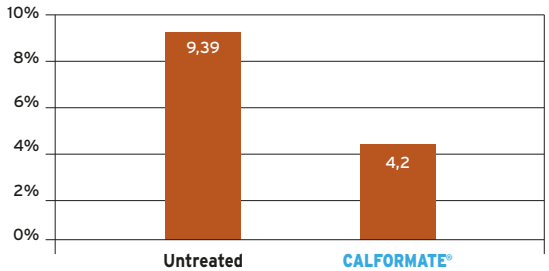
	Treatments	Nº of treatments	Application rate/per treatment
CALFORMATE®	2 treatments, one at the beginning of summer and another, one week before harvest.	2	250 g/100 L
Standard (30% CaO)			1 L/100 L

Cracking reduction in citrus fruits

Variety	Nova
Location	Sevilla (Spain)
Plantation frame	6 x 3 m
Plot size	3 trees
Trial design	Untreated / treated

	Treatments	Nº of treatments	Application rate/ per treatment
Untreated	-	-	-
CALFORMATE®	4 applications: One after full flowering, one after fruit thinning and the last 2 during fruit ripening.	4	5 Kg/ha

% OF FRUITS WITH CRACKING



Summary of different efficacy trials

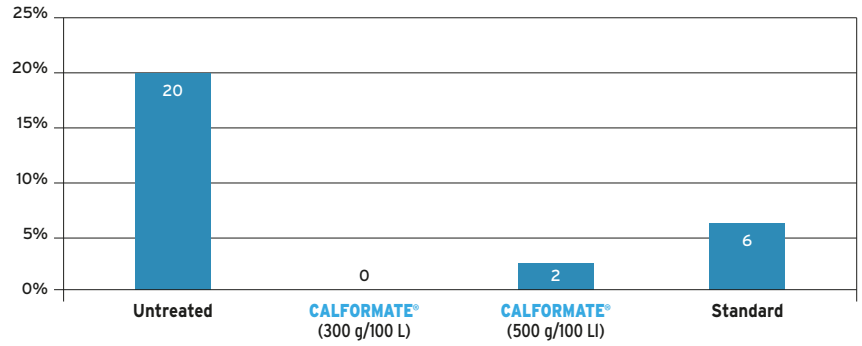
Reduction of blossom end rot incidence in processing tomato

Variety	Bosca
Location	Huelva (Spain)
Planting rate	10.000 plants/ha
Replications	4
Elemental plot size	24 m²
Trial design	Randomized complete block

	Treatments	Nº of treatments	Application rate/ per treatment
Untreated	-	-	-
CALFORMATE®	1- First fruit cluster (first fruit has reached its typical size) 2- 7 DAT1 3- 10 DAT2 4- 10 DAT3 5- 10 DAT4 DAT= Days after treatment	5	300 g/100 L
CALFORMATE®			500 g/100 L
Standard (30% CaO+1% B)			300 g/100 L

% OF FRUITS WITH BLOSSOM END ROT

Results 7 days after last treatment

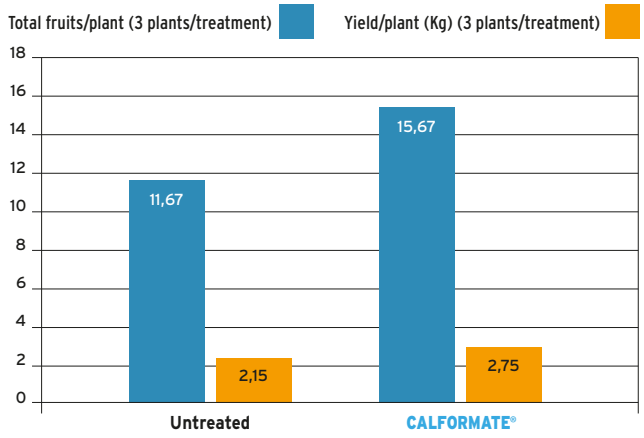


Increase the firmness and the yield in open field pepper

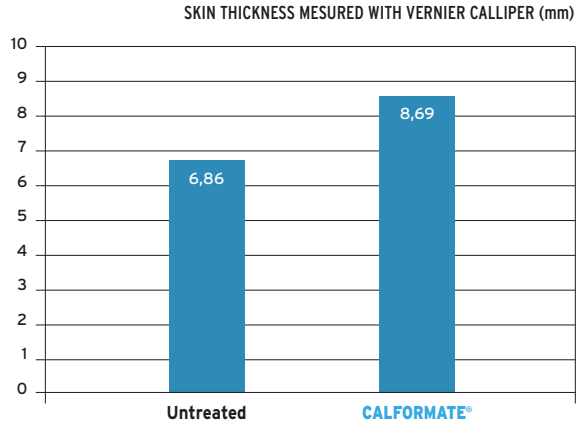
Variety	Claudio
Location	Badajoz (Spain)
Planting rate	35.000 plants/ha
Replications	1
Plot size	1 ha
Trial design	Untreated / treated

	Treatments	Nº of treatments	Application rate/ per treatment
Untreated	-	-	-
CALFORMATE®	1- 15 days after blossom, beginning of fruit set 2- 15 DAT1 3- 15 DAT2 DAT= Days after treatment	3	3 Kg/ha

TOTAL NUMBER OF FRUITS AND ITS TOTAL WEIGHT



SKIN THICKNESS



Summary of different efficacy trials

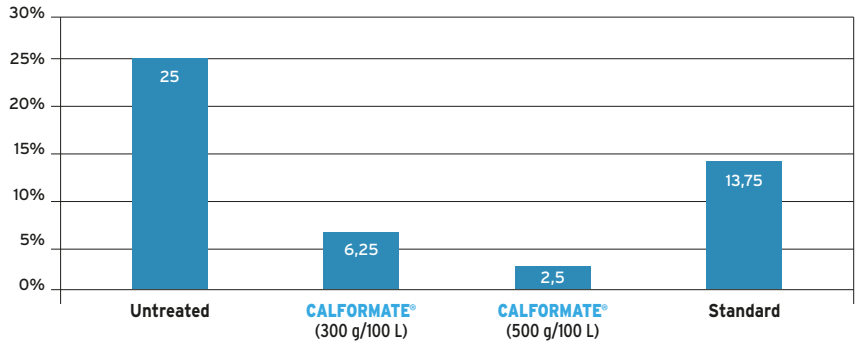
Reduction of tip burn incidence in lettuce

Variety	Isasa
Location	Huelva (Spain)
Planting rate	1.800 plants/ha
Replications	4
Elemental plot size	4,2 m²
Trial design	Randomized complete block

	Treatments	Nº of treatments	Application rate/ per treatment
Untreated	-	-	-
CALFORMATE®	1- 9 or more true leaves unfolded 2- 7 DAT1 3- 10 DAT2 4- 10 DAT3 5- 10 DAT4 (DAT= Days after treatment)	5	300 g/100 L
CALFORMATE®			500 g/100 L
Standard (30% CaO+1% B)			300 g/100 L

% OF AFFECTED PLANTS

Results 15 days after last treatment



Increase of yield and shelf life in table grapes

Variety	Benitaka
Location	Petrolina (Brazil)
Planting rate	1.905 plants/ha
Replications	1
Plot size	0,34 ha
Pruning date	19th December
Crop cycle	107 days

Trial done by: Defensive-Agrovant (Brazil).

	Treatments		Nº of treatments	Applic. rate/ per treatment	Total CaO applied (Kg/ha)
CALFORMATE®	Soil	Foliar	4 soil + 8 foliar	0,590 Kg/ha (both, soil and foliar applications)	2,11 Kg
	First 21 DAP (days after pruning), and 3 treatments more every 7 days (4 total treatments)	First 56 DAP (days after pruning), and 7 treatments more every 7 days (8 total treatments)			
Standard application	Soil	Foliar	14 soil + 12 foliar	Soil application: 2,4 l/ha Foliar application: 1,8 l/ha	6,32 Kg
	First 7 DAP (days after pruning), and 13 treatments more every 7 days (14 total treatments) (14% CaO)	First 30 DAP (days after pruning), and 11 treatments more every 7 days (12 total treatments) (8% CaO)			

Treatments	Yield (Kg/ha)	Increase (%)
1 CALFORMATE®	11.433	+ 11 %
2 Standard application	10.300	

The **CALFORMATE®** application, has increased the yield 11%.

Harvest quality parameters

	Standard application	CALFORMATE®	Difference (%)
Brix (ºB)	13	14,1	+ 8,5
Acidity (g tartaric acid)	1,005	0,82	- 18
Lipid peroxidation (nmol g-1 fresh matter)	15,16	8,6	- 43
Firmness (N)	11,72	12,7	+ 8,4

Less acidity and less lipid peroxidation, it produces better cell wall structure, extending the fruit shelf life. Moreover, the fruit firmness and the soluble solids are greater in the case of vines treated with **CALFORMATE®**.

Summary of different efficacy trials

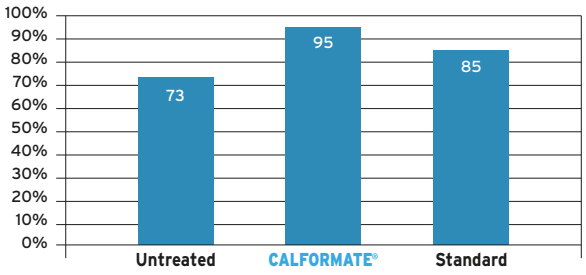
Enhance shelf life in raspberries

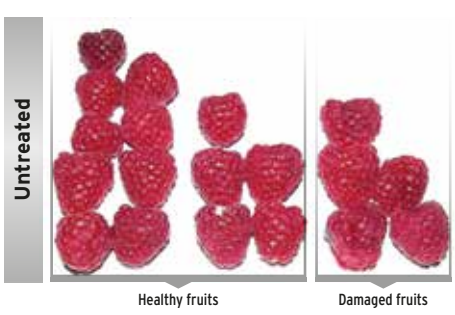
Variety	Maravilla
Location	Huelva (Spain)
Planting rate	30.000 plants/ha
Replications	2
Plot size	20 m²

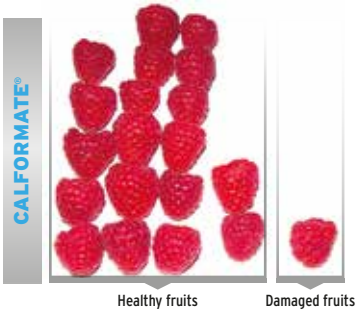
	Treatments	Nº of treatments	Application rate/ per treatment
Untreated	-	-	-
CALFORMATE®	3 applications: first at fruit ripening, second 6 DAT1, and third 6 DAT2 (2 days before harvest) DAT= Days after treatment	3	300 g/100 L
Standard (30% CaO+1% B)			

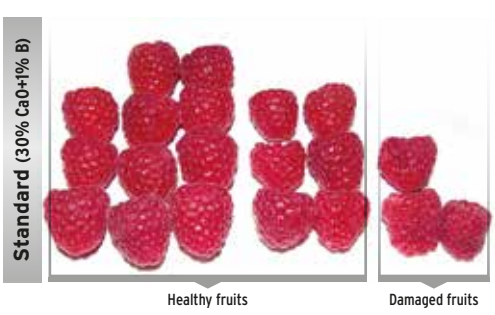
% OF HEALTHY FRUITS

After harvest, fruits were kept 4 days in cold storage and 4 days at room temperature, obtaining the below results (20 fruits per treatment):





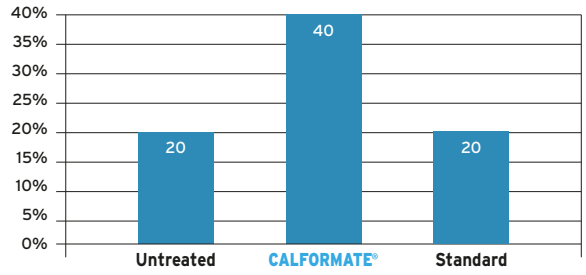
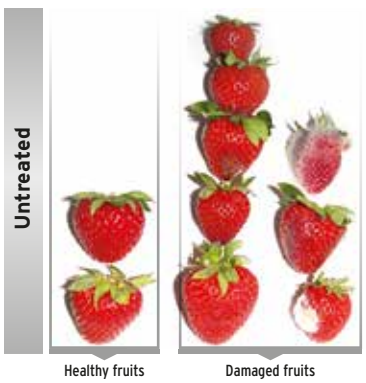
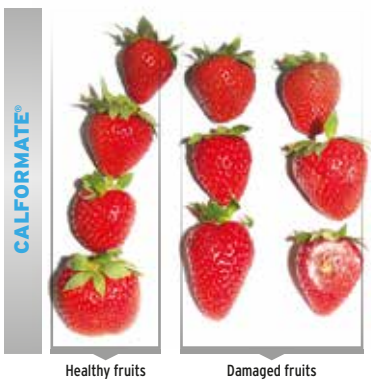
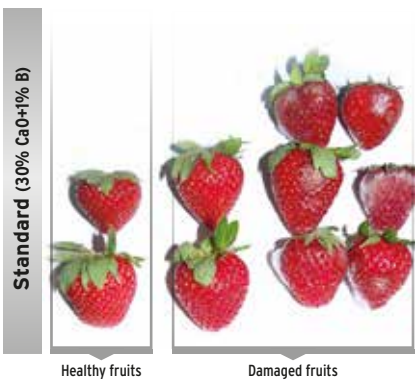




Enhance shelf life in strawberries

Variety	Virtud
Location	Huelva (Spain)
Planting rate	70.000 plants/ha
Replications	2
Plot size	20 m²

	Treatments	Nº of treatments	Application rate/ per treatment
Untreated	-	-	-
CALFORMATE®	3 applications: first at the end of flowering, second 6 DAT1, and third 6 DAT2 (2 days before harvest) DAT= Days after treatment	3	300 g/hl
Standard (30% CaO+1% B)			

% OF HEALTHY FRUITS

After harvest, fruits were kept 4 days in cold storage and 3 days at room temperature, obtaining the below results (10 fruits per treatment):