
ABIES
NUTRITION BY NATURE
manica®

Abies Ca

The importance of Calcium is well documented in literature, particularly in relation to the prevention of blossom end rot, a major physiological disorder that significantly impacts the yields. Calcium also plays a crucial role in promoting cell division and elongation. The application of Abies Ca has demonstrated to mitigate this disorder.

CALCIUM OXIDE (CaO) soluble in water 34%
COPPER (Cu) sulphate soluble in water 0,25%
ZINC (Zn) sulphate soluble in water 0,25%





Abies Cu

Copper is an essential nutrient for plant growth, as it is necessary for completing the plant life cycle and cannot be replaced by other elements. It is directly involved in plant metabolism, chlorophyll formation and photosynthetic efficiency. Copper activates several enzymes, including those for vitamin A synthesis and is vital for mitochondrial respiration, iron mobilization and phytohormone signaling. It also contributes to lignin formation, seed development, stress resistance and pollen production.

COPPER (Cu) complexed by lignosulphonate (LS) soluble in water 11%

Abies Fe

Iron (Fe) is a vital micronutrient that significantly influences crop yield and quality, making its deficiency a major concern in agriculture. It is essential for overall plant metabolism, chlorophyll formation, the proper structure and function of chloroplasts. Iron activates key biochemical processes like respiration and photosynthesis and is required for nitrate and sulfate assimilation. It also acts as a cofactor for enzymes involved in the synthesis of plant hormones such as ethylene and abscisic acid.

IRON (Fe) complexed by lignosulphonate (LS) soluble in water 10%





Abies Mix

The synergistic action of iron, manganese, copper, and zinc enhances overall plant health by supporting key metabolic processes in a balanced way. This combination promotes efficient nutrient absorption, improves stress tolerance and strengthens plant development. When applied these micronutrients work in harmony to boost crop performance.

IRON (Fe) complexed by lignosulphonate (LS) soluble in water 5% / MANGANESE (Mn) complexed by lignosulfonate (LS) soluble in water 3,5% / ZINC (Zn) complexed by lignosulphonate (LS) soluble in water 1% / COPPER (Cu) complexed by lignosulphonate (LS) soluble in water 1%

Abies Mn

Manganese action enhance photosynthetic efficiency and dry matter production. It provides resistance to biotic stress by increasing plant resilience to various diseases reducing the need for fungicides. It contributes to abiotic stress tolerance—particularly under drought and heat conditions—and ultimately result in significantly higher crop yield.

MANGANESE (Mn) complexed by lignosulphonate (LS) soluble in water 11%





Abies Zn

Zinc ensures the proper functioning of numerous enzymatic systems, supports nucleic acid synthesis and auxin metabolism, and plays a key role in internode elongation and leaf development. By preventing chlorosis and premature leaf drop, it contributes to healthier, greener plants with enhanced resistance to cold and late frosts. It also improves the development of buds, flowering and fruit set, enhancing peel quality. Finally it helps reduce post-harvest storage disorders.

ZINC (Zn) complexed by lignosulphonate (LS) soluble in water 11%

ABIES

ABIES: WHAT THEY ARE.

Abies are **micro-nutrient fertilizers complexed with lignosulfonates** in a WG formulation.

Lignosulfonates are natural compounds derived from the **sulphonation of lignin**, a polymer from the **wood** industry. The raw material from which Abies are produced is therefore one of the most common natural resources on the planet: trees. The function of lignosulfonates is to **complex inorganic ions**, the trace elements, by cancelling their charges, **facilitating** their **entry into the leaf** or root.

Abies offer farmer **naturally complexed micro-nutrients** with green, biodegradable co-formulants compliant with the principles of **green chemistry**.

For all these reasons, Abies meet the production specification for uses where synthetic chelates are not permitted.



NATURALS

Due to the plant origin of the complexing agent, **Abies are recognised by the crops as a plant-similar substance**. Consequently Abies are much easily assimilated, redistributed and transformed into nutrients than synthetic chelating agents (EDTA, DTPA, ...).

The lignosulfonates contained in Abies also have an **additional nutritional function** as a source of **soluble sulphur**, essential for crop growth.



ORGANIC CARBON AND SOLUBLE SULPHUR



NO PHYTOTOXICITY

They do **not cause phytotoxicity** as the micronutrient becomes less aggressive thanks to the organic complexing agent derived from lignin.

The **dispersivity** is **TOTAL**. Indeed, the high quality of the lignosulfonates used to produce Abies, allowes to minimize the fraction of insoluble product.



TOTAL DISPERSIVITY

DOSE RATES

FOLIAR (kg/ha)

CROPS	ABIES Ca	ABIES Cu	ABIES Fe	ABIES Mix	ABIES Mn	ABIES Zn
GRAPES	2-4	0,5-1	1-2	1-2	2-3	2-3
POME FRUITS, STONE FRUITS, KIWI, CITRUS, NUTS	2-4	0,5-1	1-2	1-2	2-3	2-3
SMALL FRUITS	300-500 g/hl	0,5-1	1-2	0,5-2	2-3	2-3
CEREALS, BEET	2-4	0,5-1	2-3	1-2	2-3	2-3
VEGETABLES	2-4	0,5-1	1-2	0,5-2	2-3	2-3
OLIVE	3-5	0,5-1	1-2	0,5-2	2-3	2-3

DRIP-IRRIGATION (kg/ha)

CROPS	ABIES Ca	ABIES Cu*	ABIES Fe	ABIES Mix	ABIES Mn	ABIES Zn
GRAPES	5 – 10	5 – 10	5 – 10	5 – 10	5 – 10	5 – 10
POME FRUITS, STONE FRUITS, KIWI, CITRUS, NUTS	5 – 10	5 – 10	5 – 10	5 – 10	5 – 10	5 – 10
SMALL FRUITS	0,5-1 kg/1000mq	5 – 10	5 – 10	5 – 10	5 – 10	5 – 10
CEREALS, BEET	5 – 10	5 – 10	5 – 10	5 – 10	5 – 10	5 – 10
VEGETABLES	5 – 10	5 – 10	5 – 10	5 – 10	5 – 10	5 – 10
OLIVE	5 – 10	5 – 10	5 – 10	5 – 10	5 – 10	5 – 10

*It is suggested to not exceed the concentration of 0.2% for soilless crops and 0.5% in soil crops fertigation.

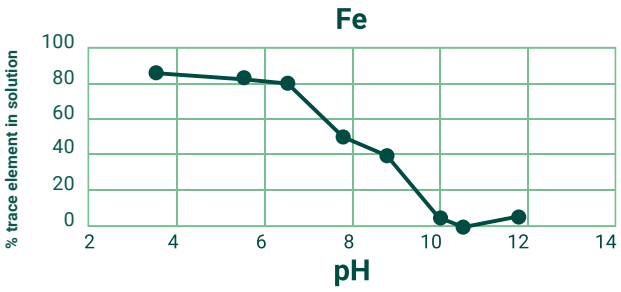
TECHNICAL SPECIFICATIONS

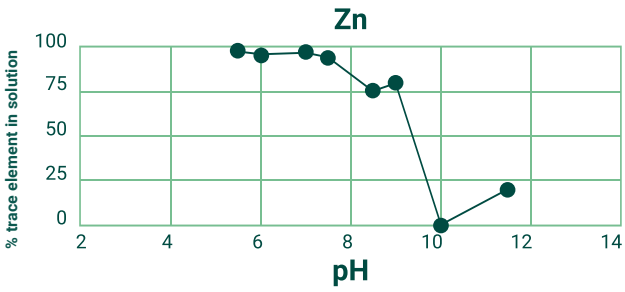
Registration	Formulation	Colour
CE Fertilizer	Water dispersible Granules	Brown

HIGH QUALITY MICRO-NUTRIENTS

ADVANTAGES OF ABIES

- Authorised in **organic farming**
- Provide higher levels of complexed micronutrients than synthetic chelates
- **Do not cause phytotoxicity**
- **Rapid efficacy** against proven deficiencies
- **Wide pH range** which ensures stability of the complexed fraction
- Due to the sub-acid reaction in water, the use of Abies does not require the addition of acidifiers in the sprayed solution
- No stains on fruits and excellent selectivity
- **Foliar and drip application**

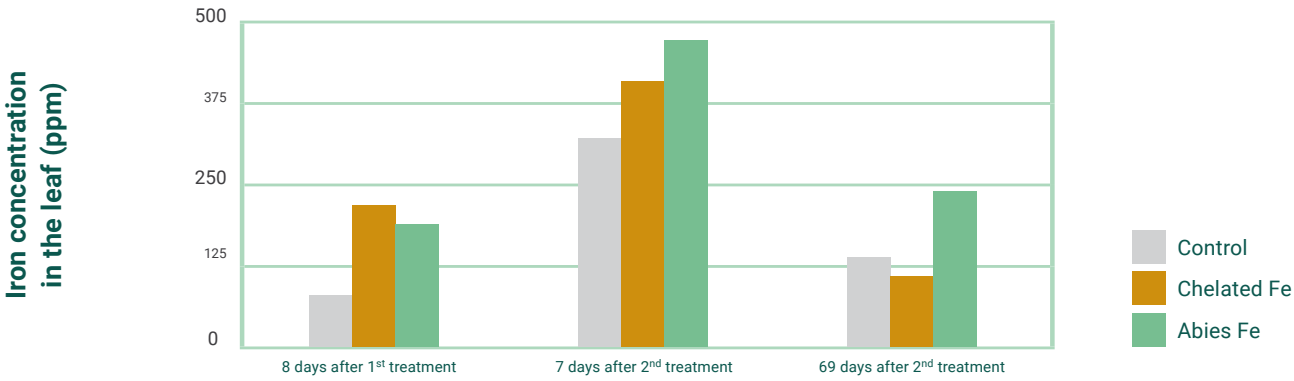




In both graph you can see the stability and efficacy of the chelated products also at higher pH of the solution. Abies range are working very good with a wide range of pH.

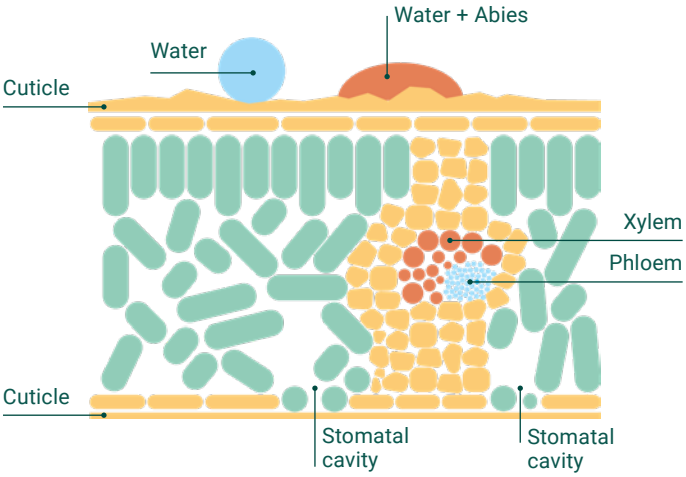
DURATION

Synthetic chelating agents such as EDTA, DTPA have a short effect that lasts few days after the application. The products complexed with high-quality lignosulfonates from Abies guarantee a supply of micronutrients that lasts for days after the application, gradually releasing the complexed micronutrients.
In the graph below, you can see that Abies Fe guarantees a higher foliar Fe content than a conventional chelated product, 69 days after the second application.

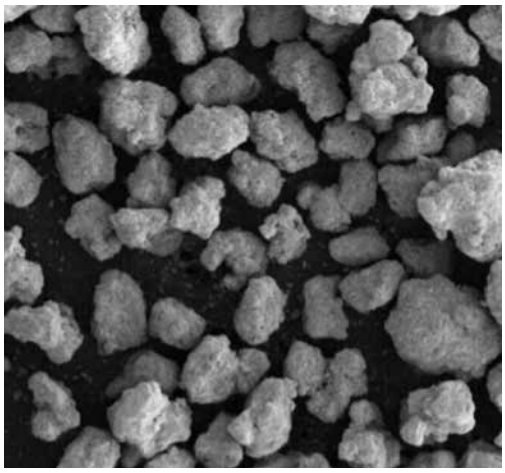


FORMULATION

Manica WG formulation used in Abies guarantees **excellent adhesiveness and homogeneity of distribution** without the need to add adjuvants.
The soluble component of Abies is **highly hydroscopic** and **therefore can spread from the surface into the leaf tissue**, even in low humidity conditions.This is an advantage compared to other micro-nutrient products that dry out quickly and therefore are inactivated shortly after treatment.

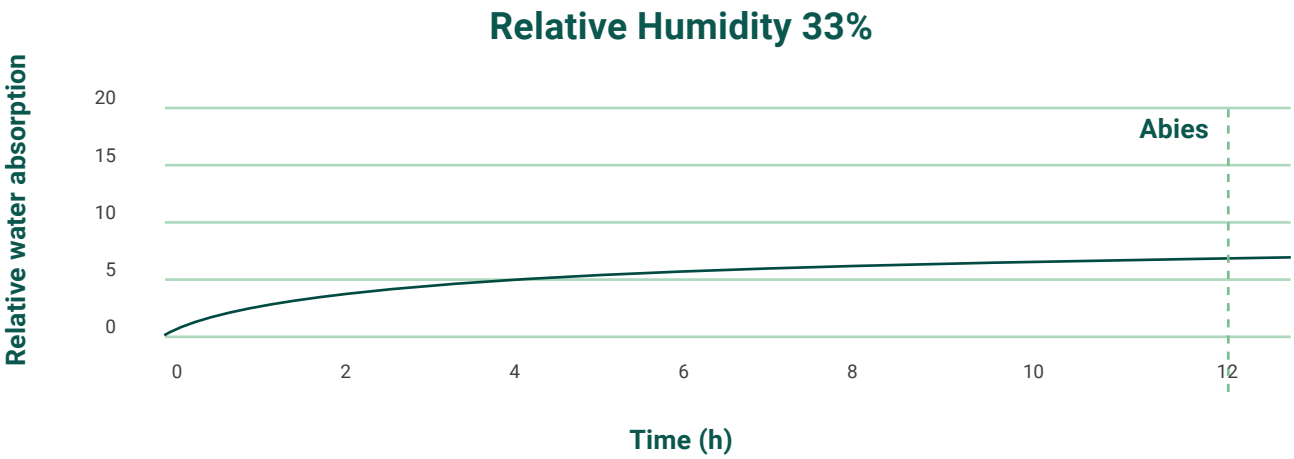


Leaf cross-section



Microscope photography scanning (SEM) of the microgranules

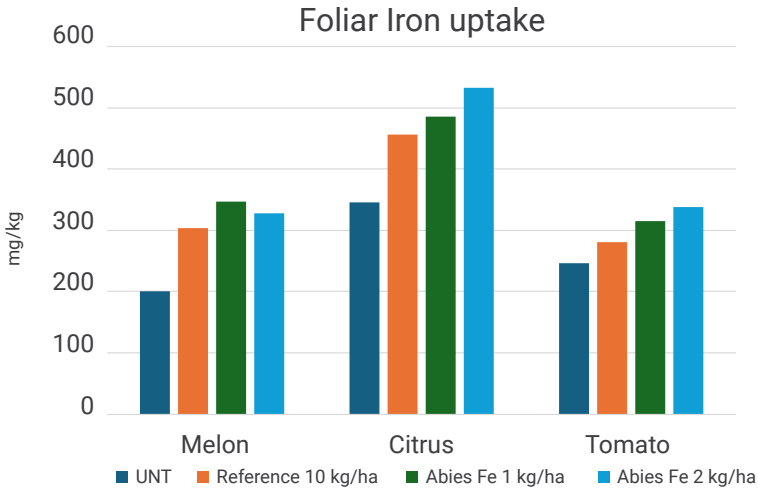
Compared to synthetic chelates, Abies mantain a **constant release of complexed micronutrients** and therefore has a long-term effect. The graph below represents the progressive hydration of Abies in conditions of low air moisture (33%). At 12 hours the product has not exhausted its water retention capacity yet and therefore is still active on the vegetation surface.



TRIALS

LEAF UPTAKE

The graphs below illustrate the foliar Iron content measured at the end of the trial period across three different crops. Abies Fe was evaluated alongside an untreated control (UTC) and a commercial standard product (7% Fe EDDHA). Each trial involved two applications, managed at 15-day intervals. The assessments were carried out 50 days after the last treatment.



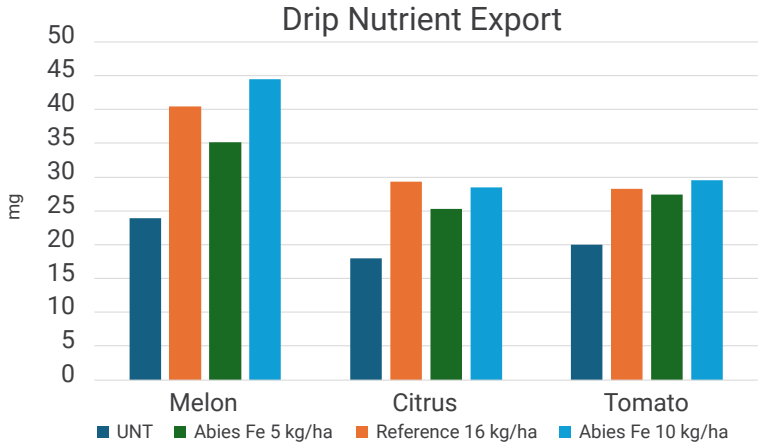
PRODUCT	TYPE OF APPLICATION	DOSE RATE	TIMING OF APPLICATION
Untreated			
Reference	Foliar	10 kg/ha	AB
Abies Fe	Foliar	1 kg/ha	AB
Abies Fe	Foliar	2 kg/ha	AB

A:15 DAT - B:10 DAA

In the **foliar** application trial, Abies Fe in both dose rates outperformed the untreated control and the reference standard across all three crops.

NUTRIENT EXPORT

This evaluation quantifies total Iron uptake by multiplying the Iron concentration in plant tissue by the total dry matter. Abies Fe was evaluated alongside an untreated control (UTC) and a commercial standard product (6% Fe HBED). The data indicate that plants treated with Abies Fe achieved higher Iron accumulation without compromising biomass production, suggesting enhanced nutrient use efficiency. These findings support the conclusion that Manica WG formulation facilitates more effective Iron uptake compared to the reference product.



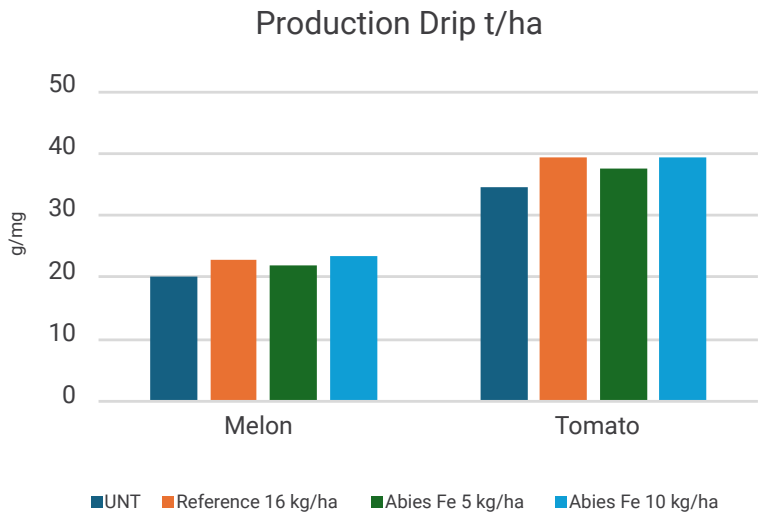
PRODUCT	TYPE OF APPLICATION	DOSE RATE	TIMING OF APPLICATION
Untreated			
Reference	Drip	16 kg/ha	AB
Abies Fe	Drip	5 kg/ha	AB
Abies Fe	Drip	10 kg/ha	AB

A:15 DAT - B:10 DAA

In the drip irrigation trial, across all three crops, the highest Iron uptake was observed with Abies Fe applied at 10 kg/ha. Abies Fe consistently delivered greater Iron accumulation compared to the reference standard, resulting in the best overall performance.

AGRONOMIC EFFICIENCY OF SUPPLIED NUTRIENT (AE)

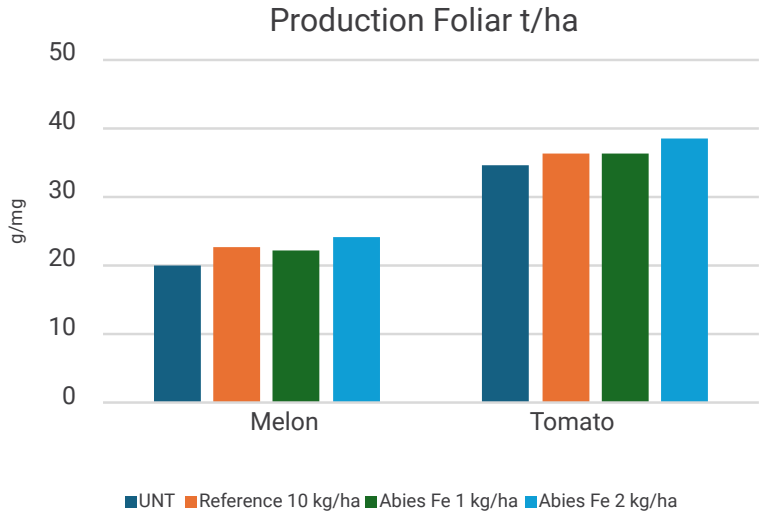
Yield increase per unit of commercial product applied in the field refers to the crop productivity gain (e.g., biomass or yield) achieved per kilogram of fertilizer used, accounting for potential losses such as leaching, run-off, volatilization, and soil fixation. This parameter reflects the agronomic efficiency of the product under real field conditions.



PRODUCT	TYPE OF APPLICATION	DOSE RATE	TIMING OF APPLICATION
Untreated			
Reference	Drip	16 kg/ha	AB
Abies Fe	Drip	5 kg/ha	AB
Abies Fe	Drip	10 kg/ha	AB

A:15 DAT - B:10 DAA

In the drip irrigation trial, **Abies Fe** demonstrated comparable effectiveness to the reference product at a lower dose rate. In particular on the Citrus trial the Abies Fe at 5 kg/ha outperformed. These results confirm the efficacy of the formulation when applied via drip irrigation.



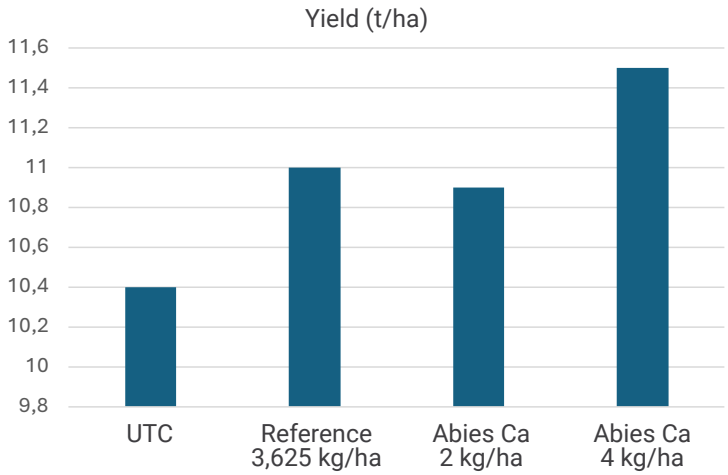
PRODUCT	TYPE OF APPLICATION	DOSE RATE	TIMING OF APPLICATION
Untreated			
Reference	Foliar	10 kg/ha	AB
Abies Fe	Foliar	1 kg/ha	AB
Abies Fe	Foliar	2 kg/ha	AB

A:15 DAT - B:10 DAA

In the foliar treatment, it is evident that even at application rates of just 1 and 2 kg/ha, a yield increase was achieved. These results indicate that a lower quantity of Abies Fe is sufficient to enhance crop productivity, highlighting the high efficiency of the formulation.

YIELD INCREASE

TOMATO

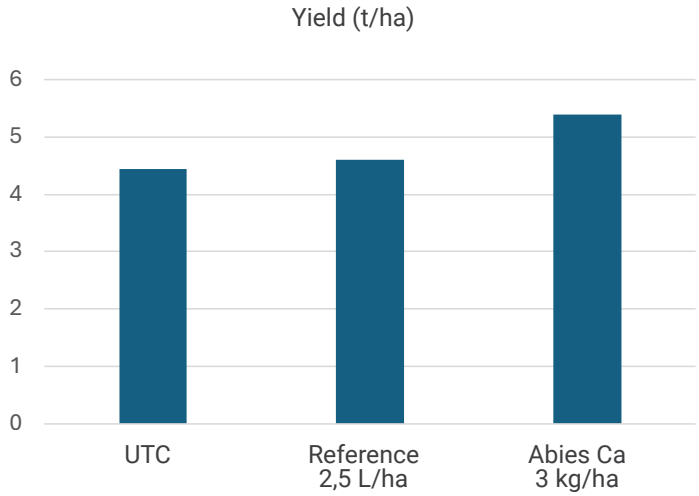


PRODUCT	TYPE OF APPLICATION	DOSE RATE	TIMING OF APPLICATION
Untreated			
Reference	FOLIAR	3,625 kg/ha	ABCDEF
Abies Ca	FOLIAR	2 kg/ha	ABCDEF
Abies Ca	FOLIAR	4 kg/ha	ABCDEF

A:BBCH:71 - BCDEF: Every 7 Days

The increase in the total number of fruits observed with the application of Abies Ca at 4 kg/ha translated into a higher overall yield compared to both the untreated control and the reference treatment. This result highlights the agronomic efficiency of Abies Ca, not only in mitigating physiological disorders such as blossom end rot, but also in enhancing fruit set and productivity. The improved Calcium availability likely supported better cell division and structural development, contributing to the increase in marketable yield.

CITRUS



PRODUCT	TYPE OF APPLICATION	DOSE RATE	TIMING OF APPLICATION
Untreated			
Reference	FOLIAR	3,625 kg/ha	ABCD
Abies Ca	FOLIAR	3 kg/ha	ABCD

A: BBCH 81 - BCD: Every 15 days

As shown in the graph, the application of Abies Ca at 3 kg/ha resulted in an increased number of fruits per plant compared to both the untreated control and the reference treatment. This improvement in fruit set directly contributed to the yield increase illustrated in the graph below. These results underline the effectiveness of Abies Ca in enhancing fruit production, even at a relatively low application rate.

ABIOTIC STRESS MANAGEMENT

LETTUCE

In lettuce cultivation, we performed 2 applications of Abies Cu at 0.5 g/L with an interval of 7-10 days between application. In this trial Abies Cu supported plant vigor, leading to improved leaf opening and overall health. By strengthening the plant's physiological balance, it promoted uniform growth and contributed to cleaner, healthier foliage, better suited to face environmental and biotic stresses.



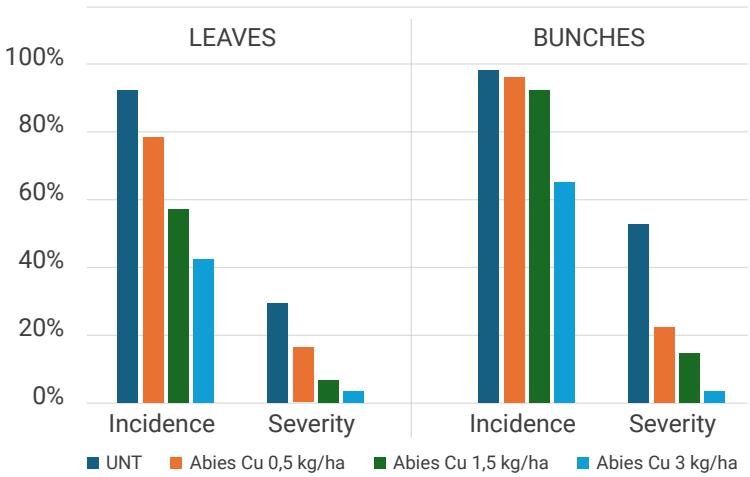
Untreated



Abies Cu 0,5 g/L

GRAPES

Thanks to Abies Cu, the attack of *Plasmopara viticola* had a significantly lower impact. The product enhanced the plant's natural defenses and overall vigor, making tissues more resilient and less susceptible to infection. By reinforcing the plant structure and supporting physiological balance, Abies Cu helped limit the spread and severity of the disease, contributing to better crop health and quality.



PRODUCT	TYPE OF APPLICATION	DOSE RATE	TIMING OF APPLICATION
Untreated			
Abies Cu	Foliar	0,5 Kg/ha	ABCDE
Abies Cu	Foliar	1,5 Kg/ha	ABCDE
Abies Cu	Foliar	3 Kg/ha	ABCDE

A: BUNCH CLOSURE – EVERY 15 DAYS

ITALIAN TOUCH

FERRICOM

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