

INTEGRAL SOLUTIONS IN CROP NUTRITION




TRADECORP
NUTRI-PERFORMANCE

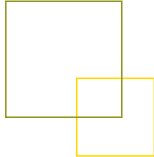





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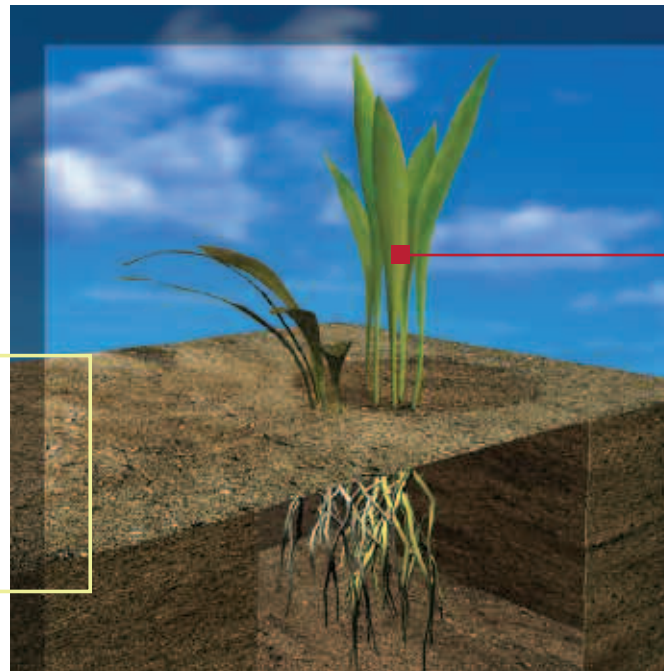


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- * CO₂
- * H₂O
- * Macronutrients

Requirements of plants



- * Secondary elements
- * **MICRONUTRIENTS**

THE IMPORTANCE OF MICRONUTRIENTS

Micronutrients are absolutely necessary and essential for the development of crops and their denomination is due to the fact that plants require them in very small quantities.

The following elements are considered to be **essential micronutrients**: iron, manganese, boron, zinc, molybdenum and copper.

Calcium, magnesium and sulphur are considered to be **secondary elements** and nitrogen, phosphorous and potassium are denominated **macronutrients**.

TRADITIONAL SOURCES:

- * Salts (sulphates, nitrates)
- * Oxides

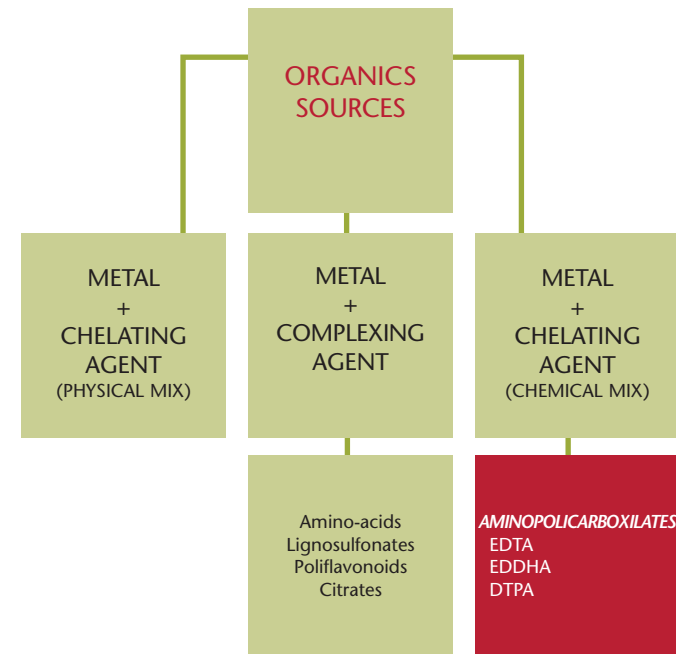
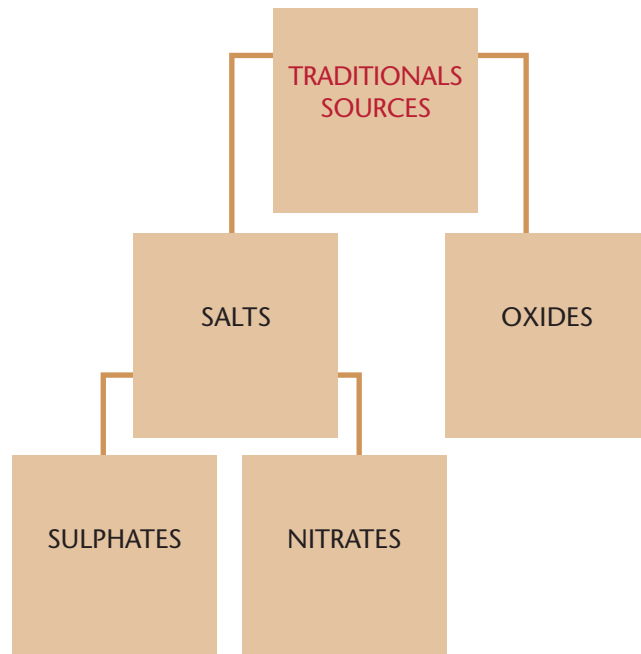
React with:

- The clay-humus complex of the soil
- Soluble phosphates (present in the soil or applied with N, P, K fertilisers)

Sources of micronutrients

ORGANIC SOURCES:

- * Complex micronutrients
- * Chelated micronutrients = CHELATES



- * Retention in the clay-humus complex
- * Interaction with other ions
- * Presence of carbonates
- * Soils with high pH
- * High content of organic matter

Factors which cause the immobilisation of micronutrients

It is therefore necessary to protect the micronutrient...

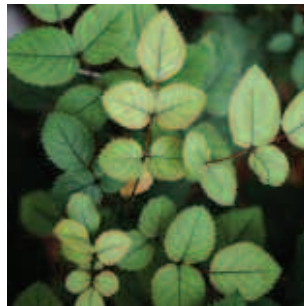
DEFICIENCIES



Manganese deficiency on potato



Zinc deficiency on citrus



Iron deficiency on rose



Calcium deficiency on tomato

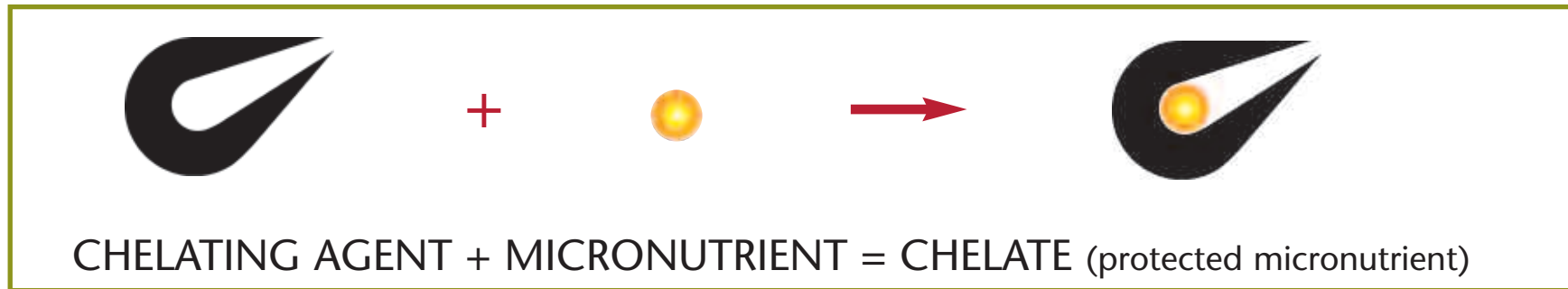


Magnesium deficiency on vine



Copper deficiency on wheat

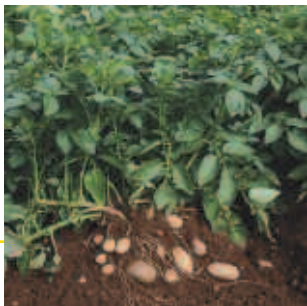
How can we prevent the immobilisation of the micronutrient ?



A chelate is a cyclical structure which is the result of the union of coordinated covalent bonds between an organic molecule (**chelating agent**) and a metallic atom (**micronutrient or secondary element**)*

* Besides, calcium (Ca) and magnesium (Mg), secondary elements, can be synthetised as chelates

HEALTHY CROPS



Potato



Citrus



Rose



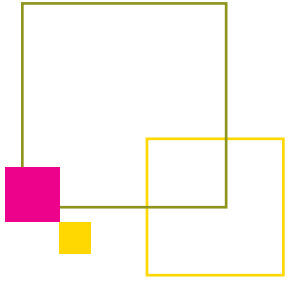
Tomato



Vine



Wheat



- * Greater stability in the soil as the metal is protected by the chelating agent and this prevents interaction with other elements in the soil (carbonates, organic matter, clay-humus complex, etc)
- * Greater stability in the spraying volumes and with the irrigation waters (pH, other ions, etc)
- * Minimum risk of phytotoxicity as the mixture is not aggressive to plant tissues and because it is not caustic

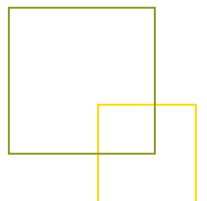
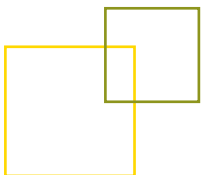


Advantages of chelates vs. traditional sources of micronutrients

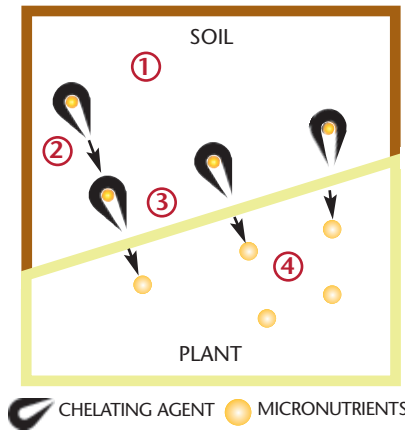
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- * Greater efficiency:
 - Easily assimilated by the plant as a result of its organic structure
 - Greater stability in the soil
 - Greater efficiency with lower dose rates
- * Compatible with the majority of agrochemicals and foliar fertilizers



ABSORPTION OF
MICRONUTRIENTS
IN THE ROOTS
WITH
THE APPLICATION OF
CHELATES



- 1 The chelating agent (organic molecule) protects the micronutrient from factors that might cause it to become immobile and block the soil, e.g. the presence of carbonates, exposure to high pH, formation of insoluble hydroxides, etc...
- 2 Besides increasing the solubility and mobility of the nutrients in the soil, the chelating agent ensures the nutrients are transferred to the rhizosphere

Chelates: Unique mode of action

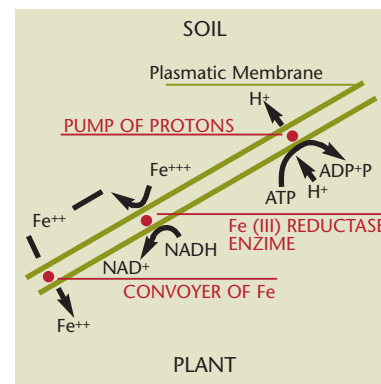


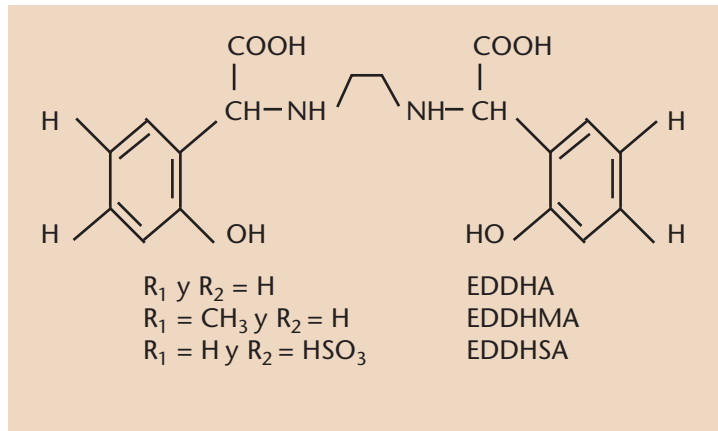
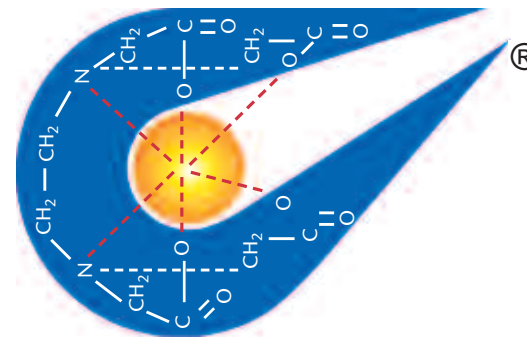
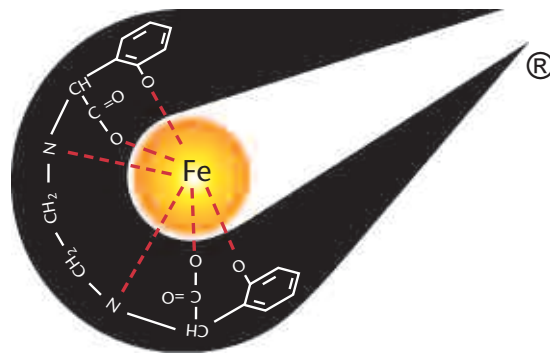
DIAGRAM 1

- 3 The chelating agent releases metal and is absorbed in the rhizosphere. Diagram 1 shows this phenomenon for the case of iron (Fe) in dicotyledonous and non gramineous monocotyledonous
- 4 The use of chelates ensures the maximum absorption and assimilation of micronutrients by the plant, increasing the performance and quality of the harvest

Aminopolycarboxilates

- EDTA
- EDDHA
- DTPA

Types of chelating agents



Chemical structure of EDTA chelating agent

The organic molecule (EDTA chelating agent), shown in blue, is linked to different micronutrients (Cu, Fe, Mn and Zn) or secondary elements (Ca and Mg) by means of covalent bonds.

Chemical structure of chelating agents specifically of Fe

The organic molecule (EDDHA chelating agent), shown in black, is linked to the iron (Fe) by six co-ordinated covalent bonds.

- * pH
- * Stability constant
- * Type of application

Parameters for choosing the chelating agent



Parameters for choosing the chelating agent

pH

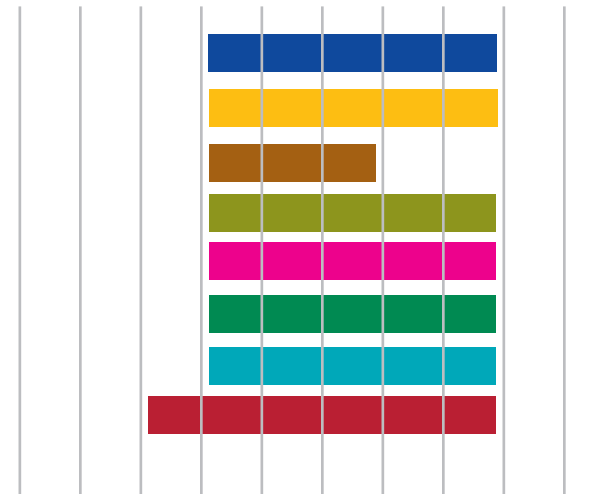
Chelates are stable in a wide range of pH

Stability range of the chelated fraction



pH 1 2 3 4 5 6 7 8 9 10 11

- Trade Corp® Ca
- Trade Corp® Cu
- Trade Corp® Fe
- Trade Corp® Mg
- Trade Corp® Mn
- Trade Corp® Zn
- Tradecitrus®
- Trade Corp® AZ



Ultraferro®



®

Parameters for choosing the chelating agent

Stability constant

- * One of the most important factors in choosing the chelate is the constant that measures the strength of the link between the chelating agent and the metal
- * The stability constant expressed as $\log K_a$, indicates that the greater the constant, the greater the stability

Chelating agent	log K_a					
	Fe ³⁺	Fe ²⁺	Zn ²⁺	Cu ²⁺	Mn ²⁺	Ca ²⁺
EDTA	25	14.27	14.87	18.70	13.81	11.00
EDDHA	33.90	14.30	16.80	23.94	-	7.20
Citrate	11.20	4.80	4.86	5.90	3.70	4.68



$$K_a = \frac{(\text{chelated metal})}{(\text{metal}) (\text{chelate})}$$

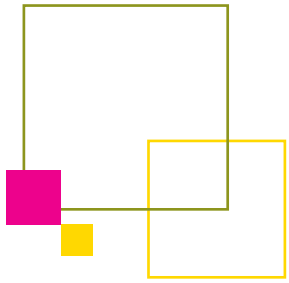
Parameters for choosing the chelating agent

Type of application:

- Foliar
- Soil (Fertigation, Injection)
- Hydroponics

Depending on the conditions of the soil and the type of application, certain chelating agents will have a greater efficiency



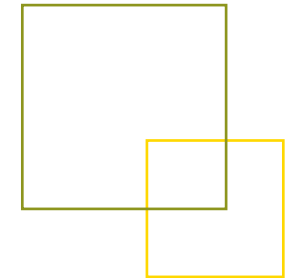


Principal parameters of the quality of chelates

- * Solubility
- * Stability
- * % of chelated metal (chelation grade)
- * Type of chelating agent
- * **TECHNOLOGY IN THE MANUFACTURING PROCESS**



Aerial view of Tradecorp's production plant in Ávila (Spain)





View of the reactor where the EDDHA chelating agent is synthesised. Tradecorp's production plant in Ávila (Spain)

Differences between different commercial products

- * Tradecorp ensures the highest quality and guarantees in the manufacturing process:
 - Maximum level of chelation
 - Richness guaranteed in micronutrients
 - Guarantee in the quality of the chelating agent

TRADECORP: MAXIMUM CHELATION GRADE

CONTROLLED REACTION



 CHELATE AGENT

 MICRONUTRIENTS

OTHERS: LOW CHELATION GRADE

REACTION INSUFFICIENTLY CONTROLLED





Advantages of Tradecorp's chelates

- * Chemical
- * Physical
- * Agronomical



Chemical *advantages of Tradecorp's chelates*

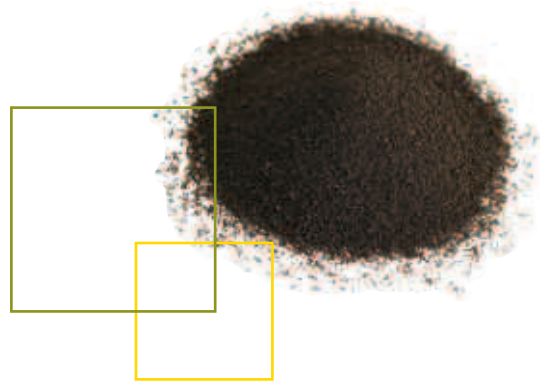
- * Tradecorp is one of the few companies in the world that synthesises and manufactures the EDDHA chelating agent
- * Tradecorp offers its own synthesis, chelation and manufacturing technology

- * Tradecorp presents its range of chelates in soluble micro-granules (WG) due to the drying technology used in its production plants
- * Tradecorp's chelates have the highest chelation grade





Soluble
micro-granules
(WG) presentation



- * The fact that they are provided in soluble micro-granules (WG) means that Tradecorp's chelates have the following advantages:

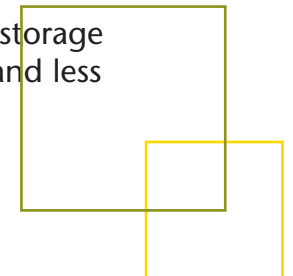
Physical advantages of Tradecorp's chelates

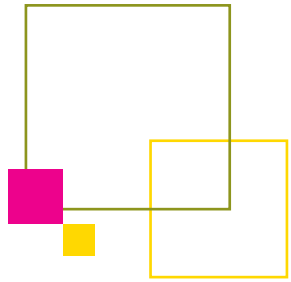
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Sequence of the solubility: Maximum and instantaneous

- Rapid and total dissolution in all types of water without forming lumps or sediments
- Maximum ease of handling compared with other formulations presented as powder
- Avoids problems of blocking and cleaning as they do not contain anti-conglomerating agents
- Greater ease of handling and storage compared with other liquids and less concentrated formulations





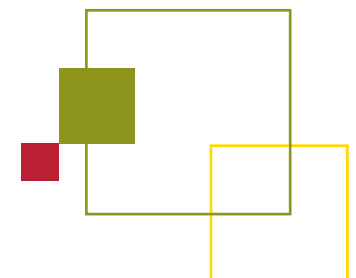
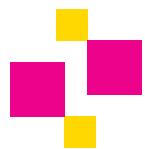
- * High stability in a wide range of pH, reaching the maximum efficiency in all conditions, even in the most difficult cases (e.g. iron deficiency in alkaline and calcareous soils)
- * Cost savings in a second application given that they are compatible with most agrochemicals and foliar fertilizers
- * Maximum efficiency with lower dose rates due to the chelated micronutrients being totally available to plants

Agronomical advantages of Tradecorp's chelates

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- * High level of security as they are not aggressive or caustic and they do not damage either the plant tissues or the roots
- * Greater flexibility in the application: foliar, drip irrigation, injection, hydroponics. With foliar application it is possible to use lower spraying water volumes and in drip irrigation the blocking of drippers and nozzles is prevented
- * Optimum solution for hydroponics and fertigation



Product catalogue

- * Ultraferro®
- * Tradecorp® Range:
 - Tradecorp Ca
 - Tradecorp Cu
 - Tradecorp Fe
 - Tradecorp Mg
 - Tradecorp Mn
 - Tradecorp Zn
 - Tradecitrus
- * Tradecorp® AZ Range

■ Ultraferro



The exclusive technology of our production plants allows us to synthesize and manufacture the EDDHA chelating agent.

Ultraferro® is recognised to be the most efficient and stable iron chelate for correcting and preventing iron chlorosis.

■ Tradecorp® Range



The **Tradecorp® Range** of EDTA chelates enables the prevention and correction of the most common micronutrients deficiencies in crops.

■ Tradecorp® AZ Range



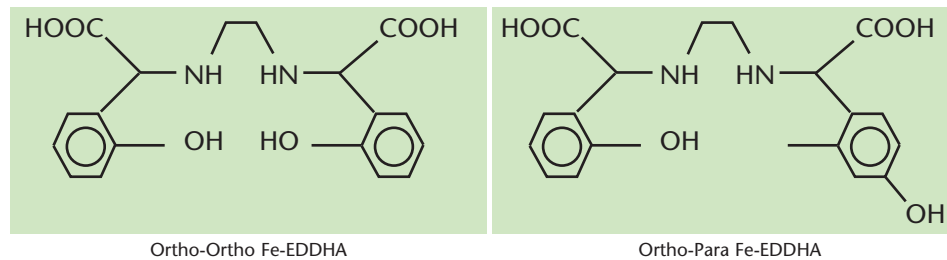
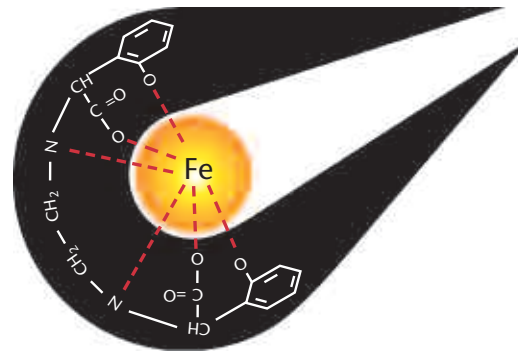
The flexibility of our production plants means we have the ability to develop a series of chemical mixes that can be especially adapted to regional agricultural needs and conditions.

Ultraferro®



- * **Denomination:** Fe-EDDHA chelate with 4,2% w/w content in EDDHA ortho-ortho isomer
- * **Composition:** 6% w/w iron (Fe) chelated by EDDHA and soluble in water
- * **pH stability range:** 3 - 11
- * **Presentation:** Soluble micro-granules (WG)
- * **Application:** Soil (Fertigation, Injection) / Hydroponics
- * **Crops:** Fruit crops / Vegetables / Flowers / Ornamentals / Herbaceous crops

Ultraferro®



THE IMPORTANCE OF THE ORTHO-ORTHO AND ORTHO-PARA ISOMERS

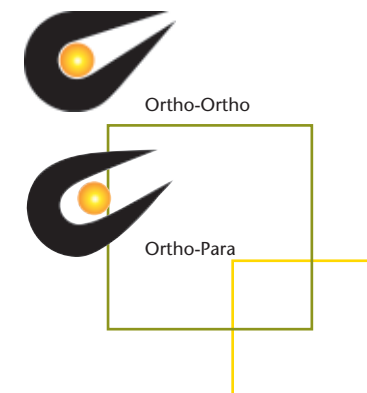
Depending on the position of the hydroxyl group (OH) within the phenolic ring, the EDDHA chelating agent may have three isomers: ortho-ortho, ortho-para and

para-para. The first two are recognised as chelating agents in the new standards (European Regulation 2003/2003).

The **ortho-ortho isomer** efficiently protects the iron from the presence of carbonates, other metals and edaphic elements present in calcareous and alkaline soils. This isomer is responsible for the **stability** of the soil and the **persistence** of the treatment throughout the crop cycle.

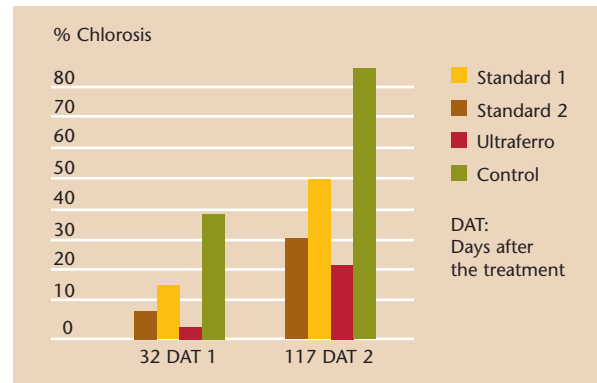
The **ortho-para isomer** releases the iron more quickly due to the fact that its hydroxyl groups are further apart than in the ortho-ortho isomer. This isomer is responsible for the **speed of action and the shock effect**. The agronomic benefits of the ortho-para isomer, as far as the quick action and sufficient stability in calcareous soil are concerned, have been proven by different trials carried out by prestigious universities such as the Autónoma University of Madrid (Spain).

Ultraferro has the **optimum balance** between each one of its ortho-ortho and ortho-para isomers. Thus, using Ultraferro guarantees the maximum stability and persistence in the soil and a fast speed of action.



TRIAL ON PEACH TREES
(Trialcamp - Valencia, España)

The following test, carried out on the Maycrest variety, shows the excellent results of **Ultraferro** in the short term (32 days after the first application) and its persistence, 117 days after the second application, in comparison with the control and another two commercial products.

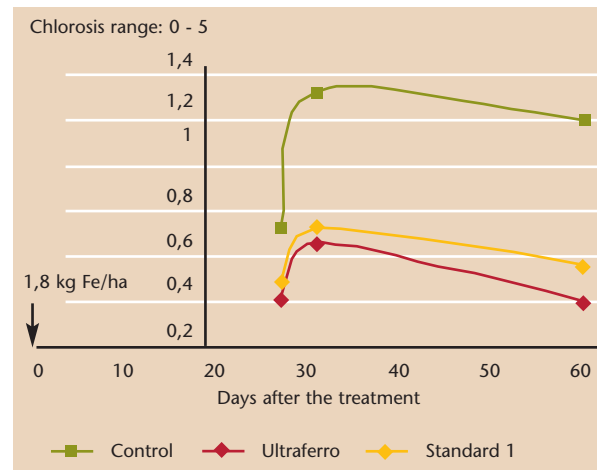


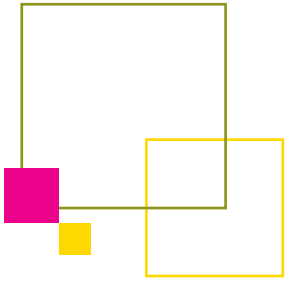
Efficiency proven in the field

* The following tests, carried out on peaches and vines, confirm the efficiency of **Ultraferro**, compared to other commercial chelates.

TRIAL ON VINE (CIVC – Champagne, France)

The second test carried out in the Champagne region (France) by the Inter-Professional Champagne Committee (C.I.V.C.) shows the excellent results of **Ultraferro** in the short term (30 days after application) and the medium term (60 days).

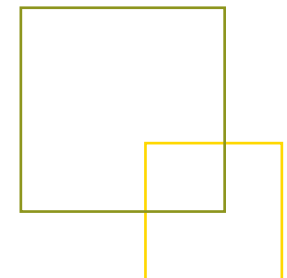




Tradecorp[®] Ca



- * **Denomination:** EDTA calcium chelate
- * **Composition:** 14% w/w calcium oxide (CaO) chelated by EDTA and soluble in water
- * **pH stability range:** 4 - 9
- * **Presentation:** Soluble micro-granules (WG)
- * **Application:** Soil (Fertigation) / Hydroponics / Foliar
- * **Crops:** Fruit crops / Vegetables / Forage / Ornamentals / Herbaceous crops



Tradecorp[®] Cu



- * **Denomination:** EDTA copper chelate
- * **Composition:** 14.5% w/w copper (Cu) chelated by EDTA and soluble in water
- * **pH stability range:** 4 - 9
- * **Presentation:** Soluble micro-granules (WG)
- * **Application:** Soil (Fertigation) / Hydroponics / Foliar
- * **Crops:** Fruit crops / Vegetables / Forage / Ornamentals / Herbaceous crops

Tradecorp® Fe



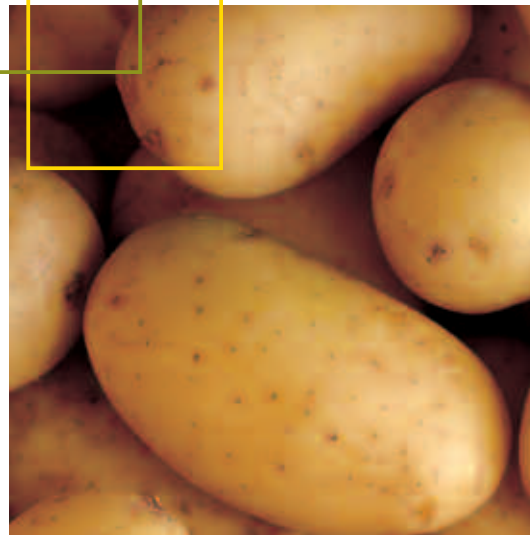
- * **Denomination:** EDTA iron chelate
- * **Composition:** 13.2% w/w iron (Fe) chelated by EDTA and soluble in water
- * **pH stability range:** 4 - 7
- * **Presentation:** Powder (WP)
- * **Application:** Soil (Fertigation) / Hydroponics / Foliar
- * **Crops:** Fruit crops / Vegetables / Forage / Ornamentals / Herbaceous crops

Tradecorp[®] Mg



- * **Denomination:** EDTA magnesium chelate
- * **Composition:** 10% w/w magnesium oxide (MgO) chelated by EDTA and soluble in water
- * **pH stability range:** 4 - 9
- * **Presentation:** Soluble micro-granules (WG)
- * **Application:** Soil (Fertigation) / Hydroponics / Foliar
- * **Crops:** Fruit crops / Vegetables / Forage / Ornamentals / Herbaceous crops

Tradecorp[®] Mn



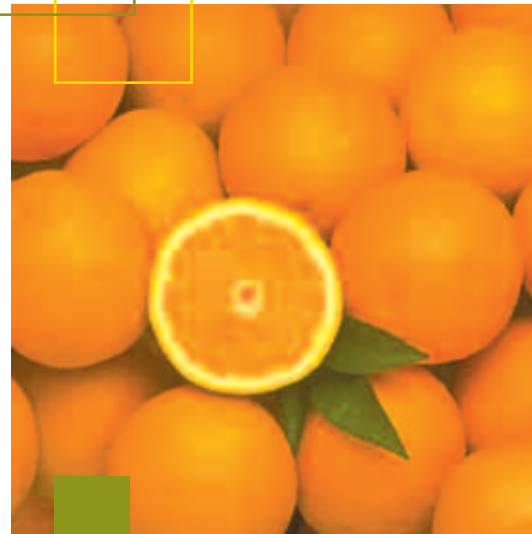
- * **Denomination:** EDTA manganese chelate
- * **Composition:** 13% w/w manganese (Mn) chelated by EDTA and soluble in water
- * **pH stability range:** 4 - 9
- * **Presentation:** Soluble micro-granules (WG)
- * **Application:** Soil (Fertigation) / Hydroponics / Foliar
- * **Crops:** Fruit crops / Vegetables / Forage / Ornamentals / Herbaceous crops

Tradecorp[®] Zn



- * **Denomination:** EDTA zinc chelate
- * **Composition:** 14% w/w zinc (Zn) chelated by EDTA and soluble in water
- * **pH stability range:** 4 - 9
- * **Presentation:** Soluble micro-granules (WG)
- * **Application:** Soil (Fertigation) / Hydroponics / Foliar
- * **Crops:** Fruit crops / Vegetables / Forage / Ornamentals / Herbaceous crops

Tradecitrus®



- * **Denomination:** EDTA manganese and zinc chelate
- * **Composition:** 6% w/w manganese (Mn) and 8% w/w zinc (Zn) chelated by EDTA and soluble in water
- * **pH stability range:** 4 - 9
- * **Presentation:** Soluble micro-granules (WG)
- * **Application:** Soil (Fertigation) / Hydroponics / Foliar
- * **Crops:** Fruit crops / Vegetables / Forage / Ornamentals / Herbaceous crops

Tradecorp® AZ

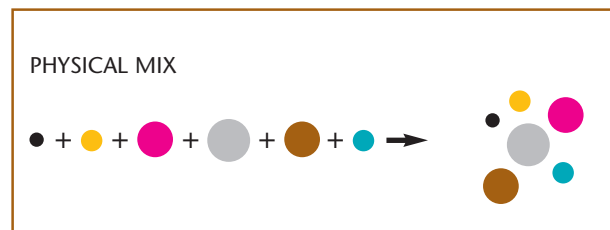


- * **Denomination:** Chemical mix of chelated micronutrients (EDTA) to prevent and correct multiple deficiencies
- * **Composition:** 7.5% w/w iron (Fe), 3.5% w/w manganese (Mn), 0.28% w/w copper (Cu) and 0.7% w/w zinc (Zn) chelated by EDTA and soluble in water. Furthermore, it contains 0.65% w/w boron (B) and 0.3% w/w molybdenum (Mo) in the form of salt
- * **pH stability range:** 3 - 9
- * **Presentation:** Soluble micro-granules (WG)
- * **Application:** Soil (Fertigation) / Hydroponics / Foliar
- * **Crops:** Fruit crops / Vegetables / Forage / Ornamentals / Herbaceous crops

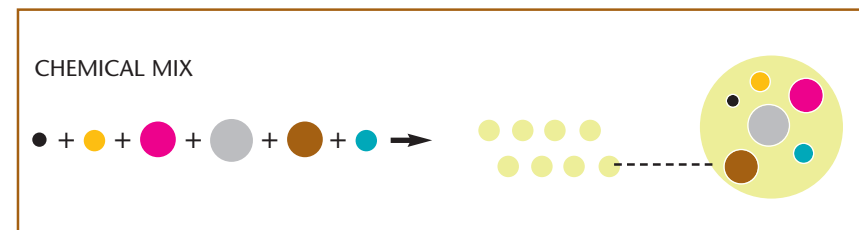
Tradecorp[®] AZ Range

- * A series of balanced formulations are included in the Tradecorp AZ Range and these are used to replace the extractions of micronutrients and the requirements of the crops

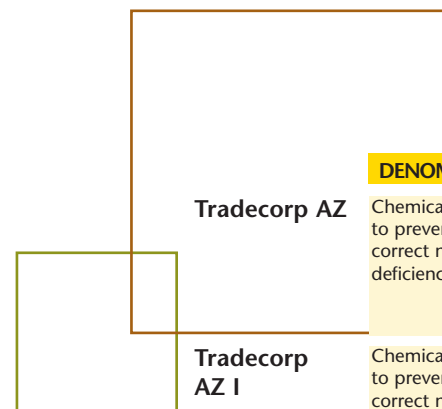
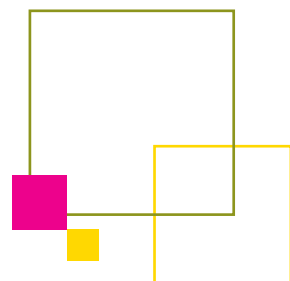
OTHERS



TRADECORP

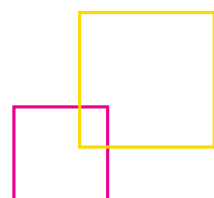


- * The products in this range are provided in soluble micro-granules (WG) and are the result of a chemical mix which ensures the homogeneity of the product with regard to the composition of microelements, density and colour

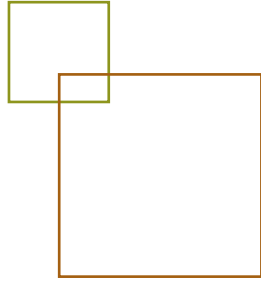


Tradecorp[®] AZ Range

- * Tradecorp has developed a wide variety of specific chemical mixes adapted to local agronomical needs and conditions
- * Tradecorp offers the possibility of developing customised formulations for any necessity



	DENOMINATION	COMPOSITION	APPEARANCE	PACKAGING	CROPS	
	Tradecorp AZ	Chemical EDTA mix to prevent and correct numerous deficiencies	7.5% w/w iron (Fe); 3.5% w/w manganese (Mn); 0.28% w/w copper (Cu); 0.7% w/w zinc (Zn), chelated by EDTA and soluble in water. And 0.65% w/w boron (B) and 0.3% w/w molybdenum (Mo) as salt form pH stability range: 3 - 9	Microgranule (WG)	1 / 5 / 20 Kg	Fruit crops / Vegetables / Ornamentals / Herbaceous crops / Forage
	Tradecorp AZ I	Chemical EDTA mix to prevent and correct numerous deficiencies	7.5% w/w iron (Fe); 3.5% w/w manganese (Mn); 0.28% w/w copper (Cu); 0.7% w/w zinc (Zn), chelated by EDTA and soluble in water. And 0.3% w/w molybdenum (Mo) as salt form pH stability range: 3 - 9	Microgranule (WG)	1 / 5 / 20 Kg	Fruit crops / Vegetables / Ornamentals / Herbaceous crops / Forage
	Tradecorp AZ II	Chemical EDTA mix to prevent and correct numerous deficiencies	5% w/w iron (Fe); 3.5% w/w manganese (Mn); 1% w/w copper (Cu); 2.48% w/w zinc (Zn), chelated by EDTA and soluble in water. And 0.65% w/w boron (B) and 0.3% w/w molybdenum (Mo) as salt form pH stability range: 3 - 9	Microgranule (WG)	1 / 5 / 20 Kg	Fruit crops / Vegetables / Ornamentals / Herbaceous crops / Forage
	Tradecorp AZ Bentley	Chemical EDDHA and EDTA mix to prevent and correct numerous deficiencies	0.40% w/w iron (Fe) chelated by EDDHA. 5.50% w/w iron (Fe); 3% w/w manganese (Mn); 0.70% w/w zinc (Zn); 0.47% w/w copper (Cu) and 0.015 w/w cobalt (Co), chelated by EDTA. And 1.40% w/w boron (B) and 0.20% w/w molybdenum (Mo) as salt form pH stability range: 4 - 10	Microgranule (WG)	1 / 5 / 20 Kg	Fruit crops / Vegetables / Ornamentals / Herbaceous crops / Forage
	Tradecorp AZ XIV	Chemical EDTA mix to prevent and correct numerous deficiencies	4% w/w iron (Fe); 3% w/w manganese (Mn); 3% w/w zinc (Zn); 3% w/w copper (Cu), chelated by EDTA. And 0.65% w/w Boron (B) as salt form pH stability range: 3 - 9	Microgranule (WG)	1 / 5 / 20 Kg	Fruit crops / Vegetables / Ornamentals / Herbaceous crops / Forage
	Tradecorp AZ Bentley Plus	Chemical EDDHA and EDTA mix to prevent and correct numerous deficiencies	0.50% w/w iron (Fe) chelated by EDDHA. 5.50% w/w iron (Fe); 1% w/w manganese (Mn); 1.4% w/w zinc (Zn); 1% w/w copper (Cu) and 0.015 w/w cobalt (Co), chelated by EDTA. 1.40% w/w boron (B) and 0.20% w/w molybdenum (Mo) as salt form pH stability range: 4 - 10	Microgranule (WG)	1 / 5 / 20 Kg	Fruit crops / Vegetables / Ornamentals / Herbaceous crops / Forage
	Tradecorp AZ Plus	Chemical EDTA mix with amino acids to prevent and correct numerous deficiencies	6% w/w iron (Fe); 2.50% w/w manganese, 1.20% w/w zinc (Zn); 0.60% w/w copper (Cu) and 0.02% cobalt (Co), chelated by EDTA. 0.50% w/w boron (B) and 0.40% w/w molybdenum as salt form. And, 2% w/w synthetic amino acids pH stability range: 3 - 9	Microgranule (WG)	1 / 5 / 20 Kg	Fruit crops / Vegetables / Ornamentals / Herbaceous crops / Forage
	Tradecorp AZ Jaguar	Chemical EDDDDHA and EDTA mix to prevent and correct numerous deficiencies	9% w/w iron (Fe); 3% w/w Fe-EDDHA (2% w/w ortho-ortho Fe-EDDHA isomer) and 6% w/w Fe-EDTA pH stability range: 4 - 11	Microgranule (WG)	1 / 5 / 20 Kg	Fruit crops / Vegetables / Ornamentals / Herbaceous crops / Forage



Alcalá, 498 - 2nd Fl.
28027 Madrid (Spain)
Tel.: + 34 91 327 32 00
Fax: + 34 91 304 71 72
e-mail: global@tradecorp.sapec.pt



Agspec Asia PTE LTD
148A Mackenzie Road
Singapore 228724
Tel.: + 65 63346173

