Knowledge grows

YaraVita™ REXOLIN®

Chelated Micronutrients

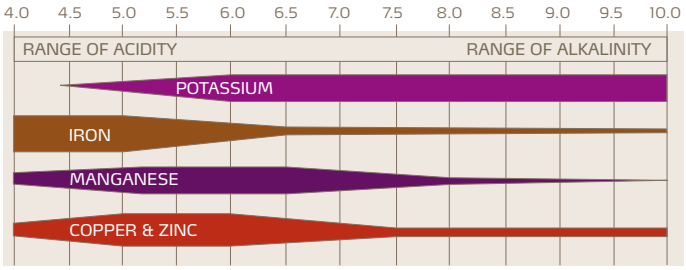
Crop Nutrition - Open field, Hydroponic and Greenhouse

YaraVita™ REXOLIN®

Why Chelates ?

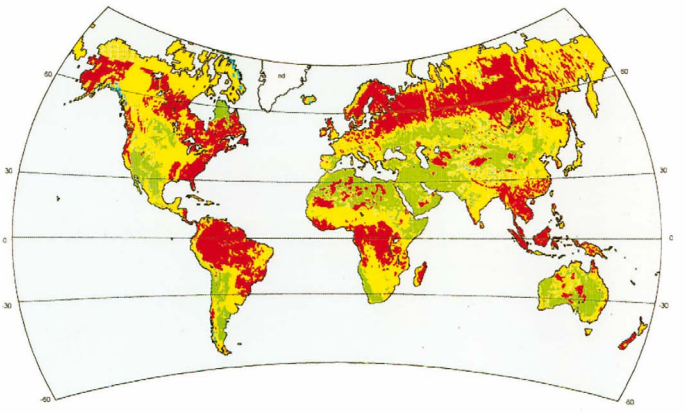
There is reduced availability of Zn, Mn and Cu in soils and hydroponics when pH > 6, in highly organic soil (independent of pH), and in the case of Fe, when pH > 5 (see figure below). Hydroponics require a pH of 5 – 6.2 and in practice it is occasionally higher.

The influence of soil pH on nutrient availability



Globally, in many areas, availability of Mn, Zn, Cu and Fe is reduced due to soil pH (see figure below)

Global distribution of soil pH-H_2O (depth 0-30cm)

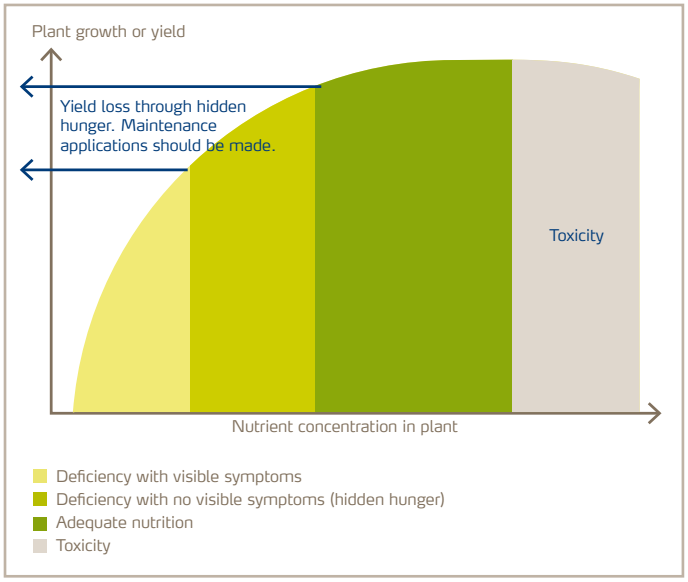


Oceans
Glaciers
pH < = 5.5
5.5<pH<=7.3
7.3<pH<=8.5
8.5<pH
4<pH<=8.5
nd - Not determined

Source: AkzoNobel

Hidden hunger

A crop and yield can often suffer from a mild nutrient deficiency without exhibiting any visual symptoms. This type of subclinical deficiency is sometimes called the 'hidden hunger'.



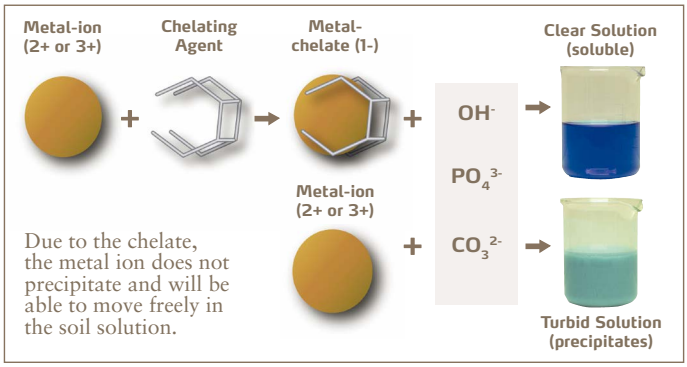
Each micronutrient plays a key role in crop production

- **Iron:** for photosynthetic activity - generating high quality fruit and vegetable production.
- **Zinc:** to regulate growth hormones - key for fruit development and boosting protein formation.
- **Manganese:** for productive plant growth and formation of proteins.
- **Copper:** key for fruit and grain formation and as a catalyst in photosynthesis and respiration.

What is a Chelate ?

Quality

A chelate guarantees availability of Fe, Zn, Mn and Cu in pH conditions > 5 – 6, as due to the chelate, the complex becomes negatively charged.



For all fertigation systems

To guarantee micro-nutrient availability REXOLIN® products are key for use in fertigation (both soil and soilless), soil application, seed treatment and foliar application.

- In particular, Iron products, as availability reduces if soil/water pH > 5.
  - Fertigation is the preferred method of application, as Fe is immobile in the crop.
- Other nutrients are key when soil/water pH > 6 (fertigation and soil application)
- In highly organic soils (even at low pH)
- In highly calcareous soils

Benefits of using REXOLIN®

Safe and easy to use:
- Extremely low in heavy metals and very pure.
- Crystalline or micro granular product.
  - No dust.
  - Easy to dissolve.
  - Free flowing.
  - Does not cake.

Quick and easy application:
- Intermixable with soluble fertilizers.
- Intermixable with most herbicides and pesticides.

Efficient use and nutrient uptake over time, guaranteeing a healthy, productive crop and maximum yield.
- REXOLIN® avoids precipitation and fixation of micro nutrients, therefore avoiding unnecessarily high nutrient applications.
- Long-term stable supply of nutrients.
- High grade metals (highest quality raw materials).
- Formulated to be easily taken up by the roots.
- Suitable for application in a very wide range of growing conditions.

Due to 100% chelation and pure product, no precipitation of fertigation system.
- The high quality of REXOLIN® minimizes interaction with other nutrients, and so nutrients remain available to the crop (both in water and soil).
- Very pure, no fillers.
- No corrosion of fertigation system.

Consistent high quality, guaranteed by:
- ISO 9002 and 14001
- Every batch sampled, and retained for 2 - 3 years

Product range, pH stability & application

Fe Chelates

Product name	Chelate	%w/w	Fe % as O-O	Physical Form	Common Application	Remark	pH stability of chelates
REXOLIN® E13	Fe-EDTA	13.3% Fe		Crystals	S/H/F		
REXOLIN® D3	Fe-DTPA	3.1% Fe		Liquid (1.3 g/l)	S/H		
REXOLIN® D7	Fe-DTPA	6.9% Fe		Micro-granular	S/H		
REXOLIN® D6	Fe-DTPA	6.1% Fe		Liquid (1.3 g/l)	H/S/F	Sodium free	
REXOLIN® D12	Fe-DTPA	11.6% Fe		Crystals	H/S/F	Low in sodium	
REXOLIN® Q15	Fe-EDDHA	7.0% Fe	1.5%	Micro-granular	S		
REXOLIN® Q40	Fe-EDDHA	6.0% Fe	4.0%	Micro-granular	S/H		
REXOLIN® Q48	Fe-EDDHA	6.0% Fe	4.8%	Micro-granular	S/H		
REXOLIN® X60	Fe-HBED	6.0% Fe	6.0%	Micro-granular	S/H	Sodium free	

pH stability of chelates: 1 2 3 4 5 6 7 8 9 10 11 12

Chelates of other nutrients

Product name	Chelate	%w/w	Physical Form	Common Application	pH stability of chelates
REXOLIN® Cu15	Cu- EDTA	14.8% Cu	Micro-granular	S/H/F	
REXOLIN® Mn13	Mn-EDTA	12.8% Mn	Micro-granular	S/H/F	
REXOLIN® Zn15	Zn-EDTA	14.8% Zn	Micro-granular	S/H/F	
REXOLIN® Ca10	Ca-EDTA	9.7% Ca	Micro-granular	F	
REXOLIN® Mg6	Mg-EDTA	6.2% Mg	Micro-granular	F	

pH stability of chelates: 1 2 3 4 5 6 7 8 9 10 11 12

H: Hydroponics **S:** Soil **F:** Foliar

For any information on liquid products, please contact your local Yara contact.

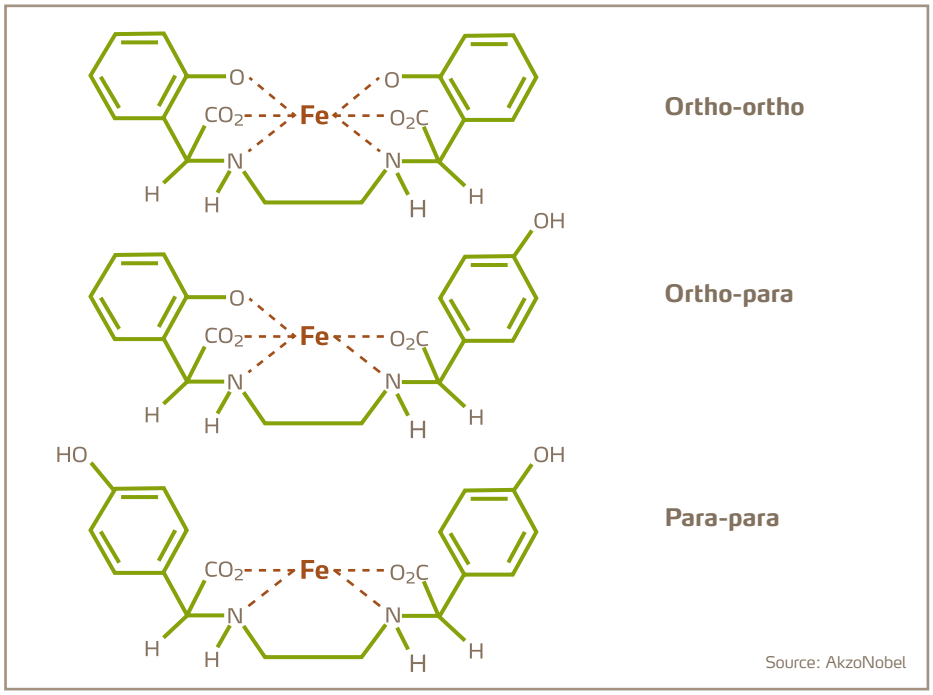
REXOLIN® Iron products

Different iron chelates are stable within different pH ranges. Therefore, based on soil or water pH the right REXOLIN® product should be chosen according to pH stability (see table for pH stability of products).

In the REXOLIN® Q (EDDHA) and X (HBED) range, take into account ortho-ortho (o-o) isomer.

- **(o-o) strongest isomer to fixate Iron.**
  - Only isomer which works in calcareous soil conditions.
  - (o-o) should be indicated on label.
- **Ortho – para to loose the fixated Iron within one day, in soil.**
  - Thus this Fe is not available to the crop anymore.

Different isomers of the Fe EDDHA and HBED chelates



REXOLIN® Combi products

- Microgranular products - Easy and safe to use.
- Minimize nutrient interaction problems.
- Balanced composition – to avoid mistakes and crop damage due to imbalanced nutrition.
- To avoid competition in fixation of the chelate.

Product Name	Suitable application areas	Specifications %		Remarks
REXOLIN® ABC	Designed for application in arable crops.	Fe: 4.0 as Fe-EDTA Mn: 4.0 as Mn-EDTA Zn: 1.5 as Zn-EDTA	Cu: 1.5 as Cu-EDTA B: 0.5 Mo: 0.1	12% K_2O 7.5% SO_4 & 3.0% MgO Na < 2%
REXOLIN® APN	Designed for soilless cultures, according to Dutch fertilization standards.	Fe: 6.0 as Fe-DTPA Mn: 2.4 Mn-EDTA Zn: 1.3 as Zn-EDTA	Cu: 0.25 as Cu-EDTA B: 0.85 Mo: 0.25	
REXOLIN® BSP	Designed for soilless cultures.	Fe: 7.5 as Fe-EDTA Mn: 3.7 Mn-EDTA Zn: 0.6 as Zn-EDTA	Cu: 0.3 as Cu-EDTA B: 0.4 Mo: 0.2	2 component Combi
REXOLIN® CXK	Combi specially designed for Zinc deficient areas.	Fe: 3.4 as Fe-EDTA Mn: 3.2 Mn-EDTA Zn: 4.2 as Zn-EDTA	Cu: 0.5 as Cu-EDTA B: 0.85 Mo: 0.05	13.3% K_2O 5.4% SO_4 & 2.0% MgO Na < 2%
REXOLIN® ATZ	Combi suitable for application to potting soil and soil application.	Fe: 3.35 as Fe-EDTA Mn: 1.7 Mn-EDTA Zn: 0.6 as Zn-EDTA	Cu: 1.7 as Cu-EDTA B: 0.87 Mo: 0.02	3.6% K_2O 5.3% P_2O_5
REXOLIN® LPN	Liquid version of the APN-combi.	Fe: 3.13 as Fe-DTPA Mn: 1.3 Mn-EDTA Zn: 0.73 as Zn-EDTA	Cu: 0.14 as Cu-EDTA B: 0.57 Mo: 0.14	Density: 1.25 g/ml 4% N as NH_4 Na < 0.1%
REXOLIN® LSP	Liquid version of the BSP-combi	Fe: 3.75 as Fe-EDTA Mn: 1.85 Mn-EDTA Zn: 0.3 as Zn-EDTA	Cu: 0.15 as Cu-EDTA B: 0.35 Mo: 0.1	Density: 1.25 g/ml 2.8% N as NH_4 Na < 0.1%

For further information contact:
Yara International ASA
Postboks 343, Skøyen
0213 Oslo
Norway
www.yara.com

Yara Vlaardingen B.V.
P.O. Box 58
3130 AB Vlaardingen
The Netherlands

About Yara

Yara´s knowledge, products and solutions grow farmers', distributors' and industrial customers' businesses profitably and responsibly, while protecting the earth's resources, food and environment.

Our fertilizers, crop nutrition programs and technologies increase yields, improve product quality and reduce the environmental impact of agricultural practices. Our industrial and environmental solutions improve air quality by reducing emissions from industry and transportation, and serve as key ingredients in the production of a wide range of goods. We foster a culture that promotes the safety of our employees, contractors and societies.

Founded in 1905 to solve emerging famine in Europe, today, Yara has a worldwide presence, with close to 13,000 employees and sales to about 160 countries. **www.yara.com**