

IRON (Fe) PRESENTATION

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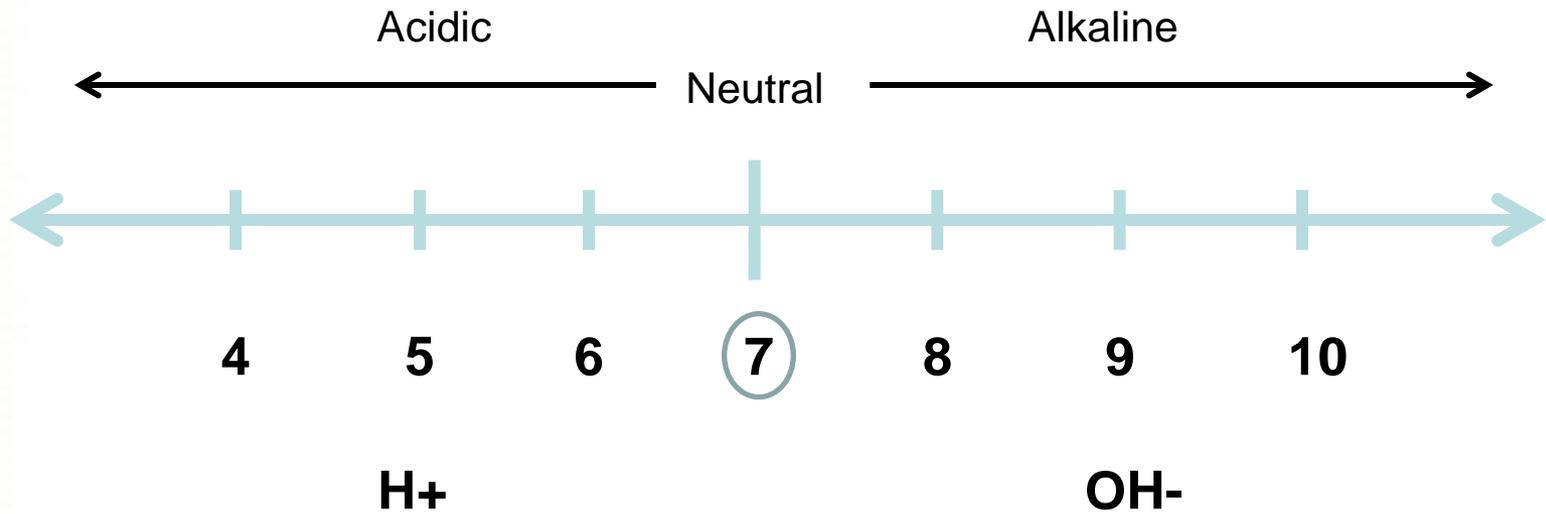


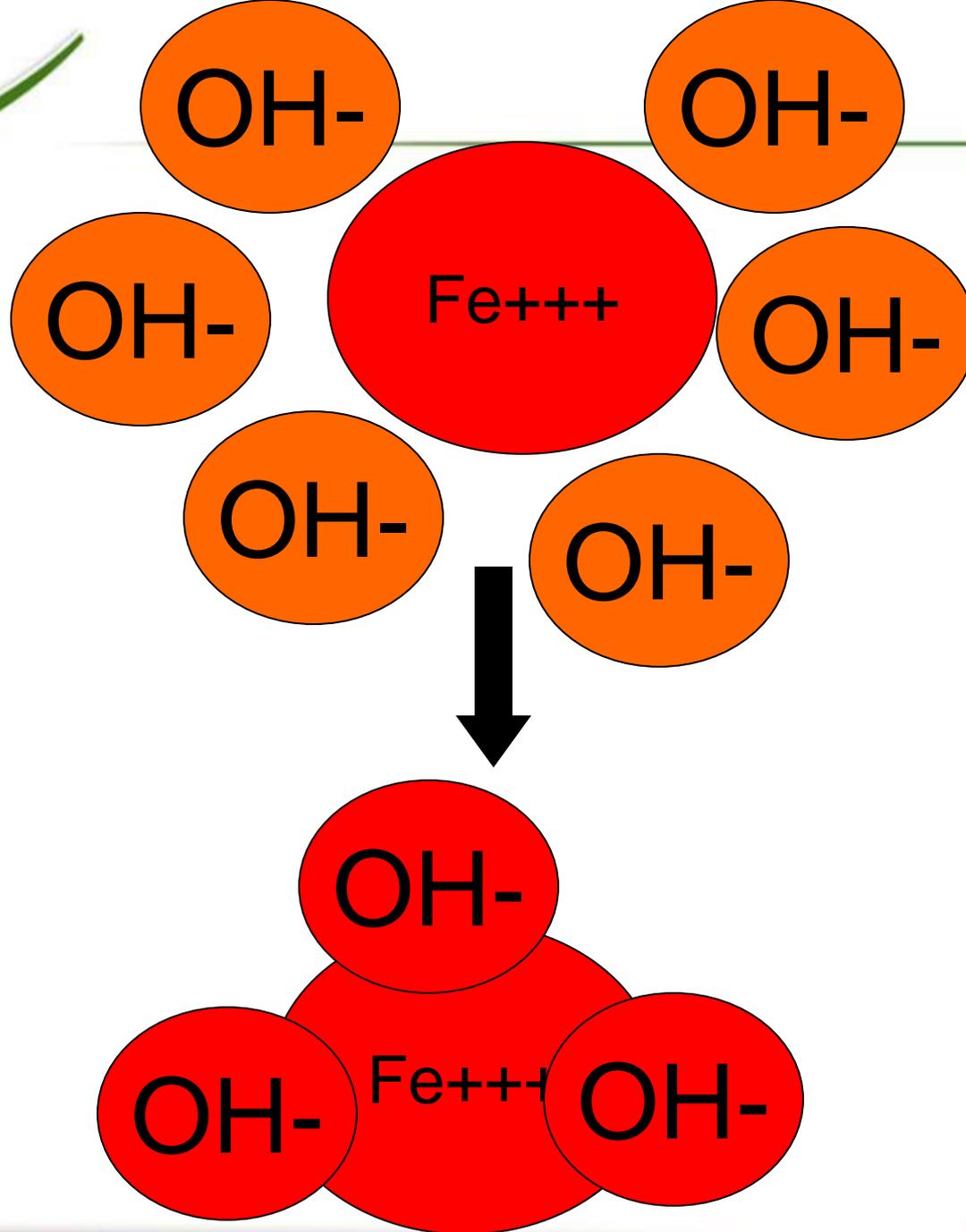
Introduction

- General Problems:
 - Availability decreased at limy soils (pH 7 – 9), increased at acidic soils.
- Iron (Fe) is one of the most deficiency observed element in the world. The main reasons are:
 - Limy soils
 - High soil and water pH
 - High HCO_3 (Bi-carbonate) concentration
 - Wrong and improper application of other different fertilizers.



pH Table





Role of Iron in Plant

- Main roles:
 - Fe is important for respiration and photosynthesis at plants.
 - It is a critical element for enzyme activities.
 - Important for chlorophyll synthesis.
- Fe is immobile at plants.



Fe Deficiencies

- Fe deficiency symptoms
 - Young leaves turn to light yellow.
 - Brown stains appear around veins.
 - Newly sprouted leaves have a color close to white.



Iron Deficiency

- Shoots without leaves; small, curved, whiten leaves; reddish pretty wide sprouts.
- Lime-induced chlorosis and yellowish leaf tissue between green veins.

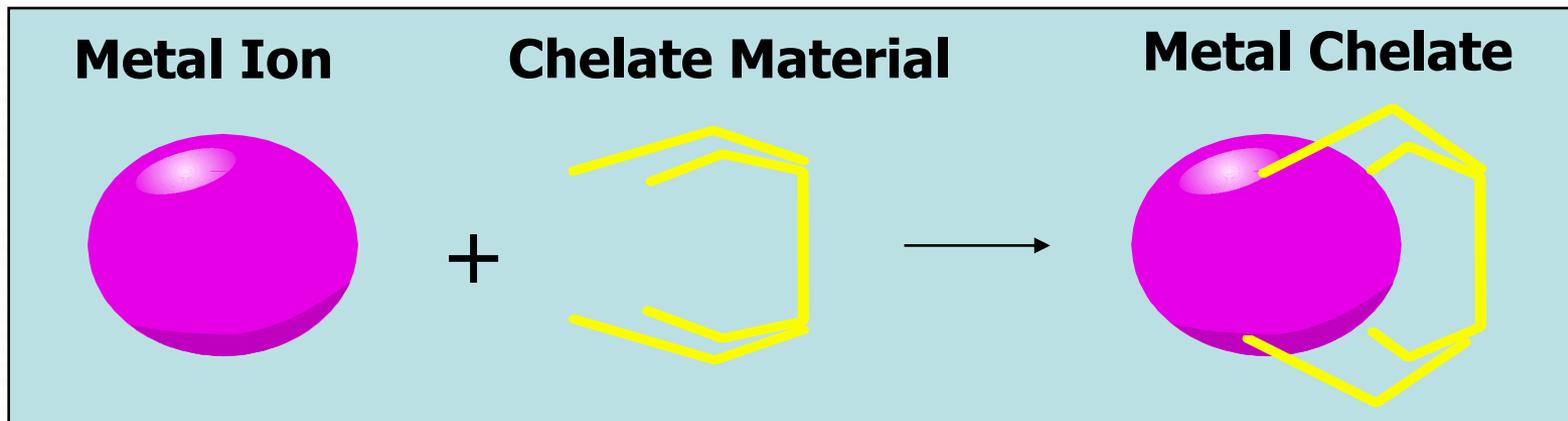


Fe Deficiency



What is Chelate?

- Iron chelate
 - Chelate protects a metal from turning into unavailable compound form (Oxidation)
 - Chelate has 3 components:
 - Fe^{+3} ,
 - Chelate material (EDTA, DTPA, EDDHA, amino-acid, humic – fulvic acid, citrate),
 - Additional ion (Na^+ or NH_4^+)



Chelate availability in soil

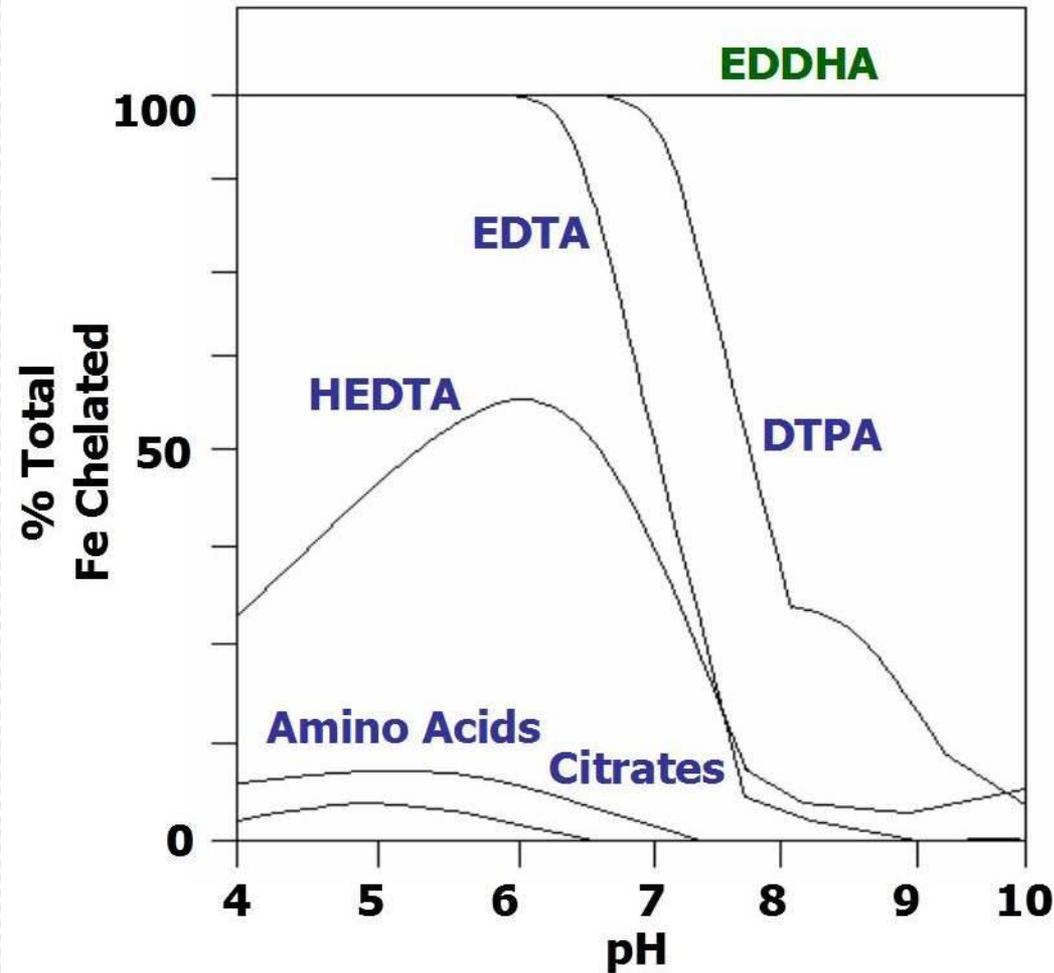
- Metal chelates – chemical stability

Stability	pH								
	1	2	3	4	5	6	8	10	
Fe-EDTA	Yellow	Cyan	Cyan	Cyan	Cyan	Cyan	Yellow	Yellow	Yellow
Cu-EDTA	Yellow	Yellow	Cyan						
Mn-EDTA	Yellow	Yellow	Yellow	Cyan	Cyan	Cyan	Cyan	Cyan	Cyan
Zn-EDTA	Yellow	Yellow	Cyan						
Mg-EDTA	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Cyan	Cyan	Cyan

- Result
 - Fe-EDTA only available pH < 6
 - Cu, Mn, Zn-EDTA is available between pH 3-11



Chelate availability in soil



- Graph shows different Fe chelates availability at different pH ranges.



Chelate availability in soil

- Iron chelates – chemical stability

Stability	pH					
	6	7	8	9	10	11
Fe-EDTA	Stable	Stable	Stable	Stable	Stable	Stable
Fe-DTPA	Stable	Stable	Stable	Stable	Stable	Stable
Fe-EDDHA	Stable	Stable	Stable	Stable	Stable	Stable

- Result
 - Fe-EDTA is suitable for foliar application and acidic soils.
 - Fe-DTPA is suitable for hydroponics (rockwool, peat) and neutral soils.
 - Fe-EDDHA is suitable for soil applications even at pH level 8,5.



Importance of ortho-ortho

Iron can make different structural bonds or bound with different type of isomeric organic complexes like chelates.

EDDHA chelate material offers two different isomers : "para" ve "ortho".

Iron has six bonds to combine. For full protection all these six bonds must be bound.

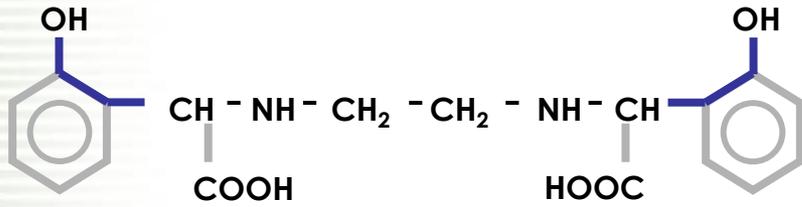
At "para" isomer, iron is only bind with five bonds and this increases the interactions with external effects.

At "ortho" isomer, all bonds are bound, thus iron can be protected from external effects.

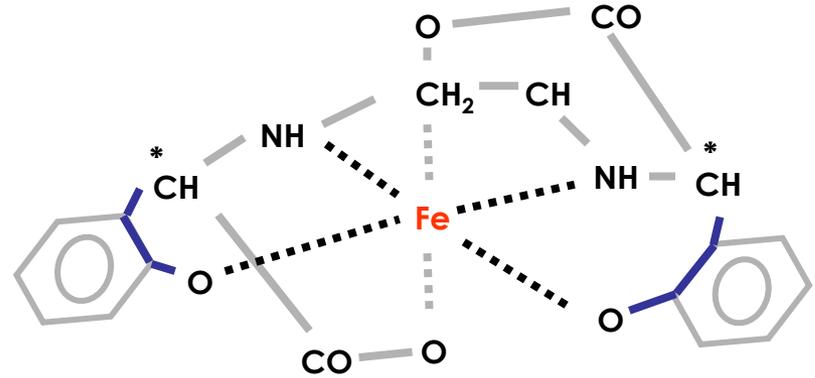
Because of this, it is possible to say most protection and quality can be provided from "ortho" isomer.



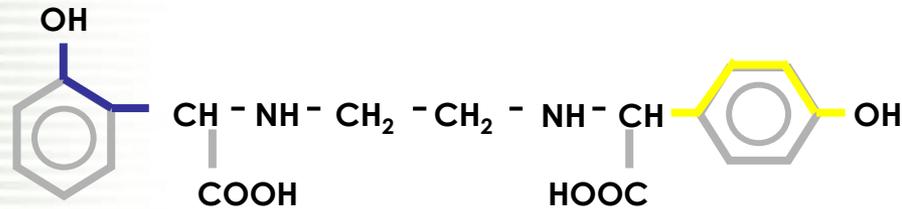
Importance of ortho-ortho



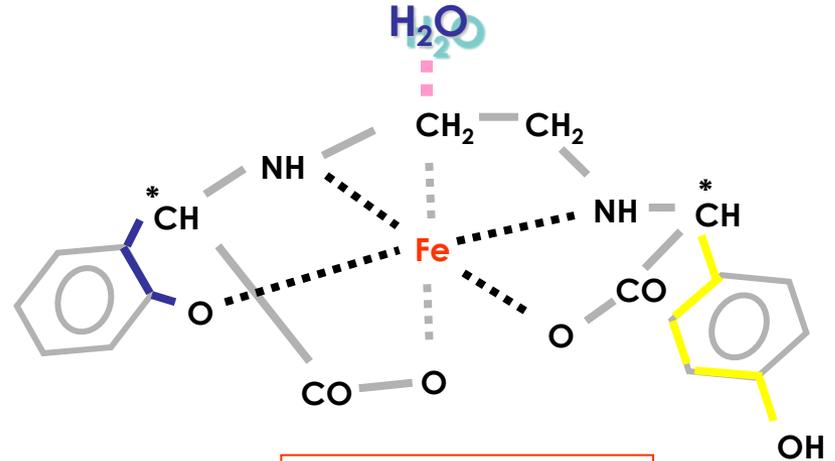
ORTO- ORTO



Fe (III) – orto-orto EDDHA



ORTO- PARA



Fe (III) – orto-para EDDHA



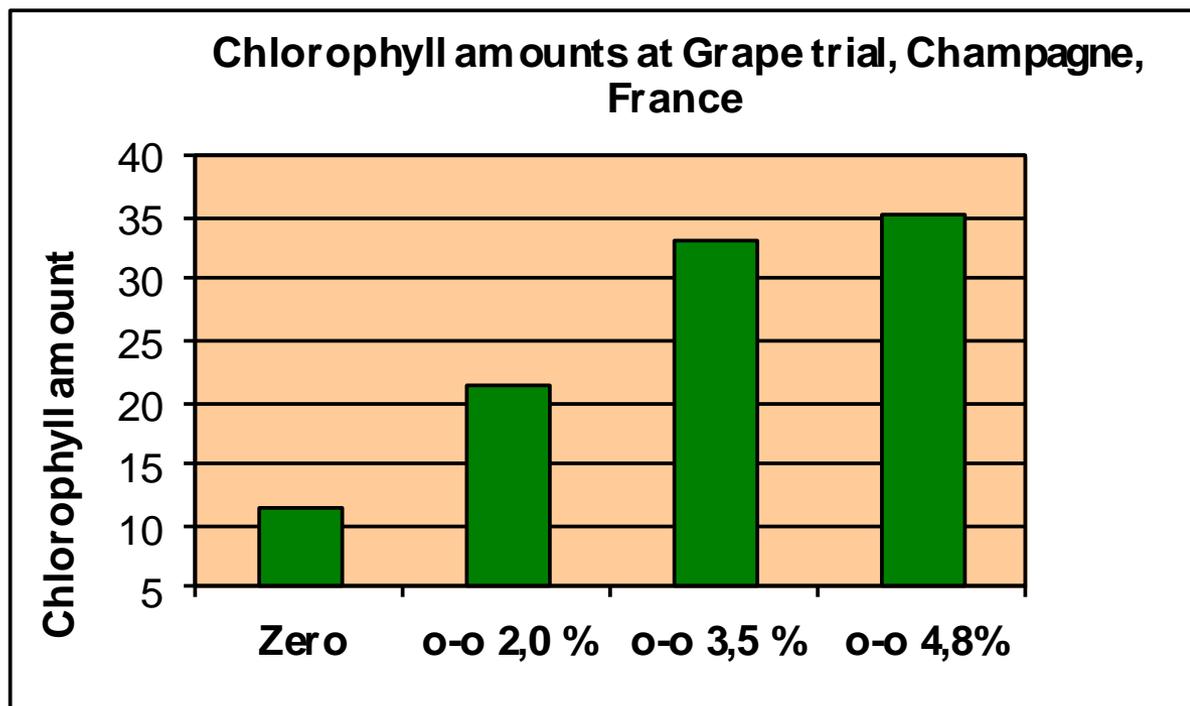


Trials



Trial Results

- 4,8% Fe³⁺ -o,o-Fe-EDDHA provided the highest chlorophyll content.

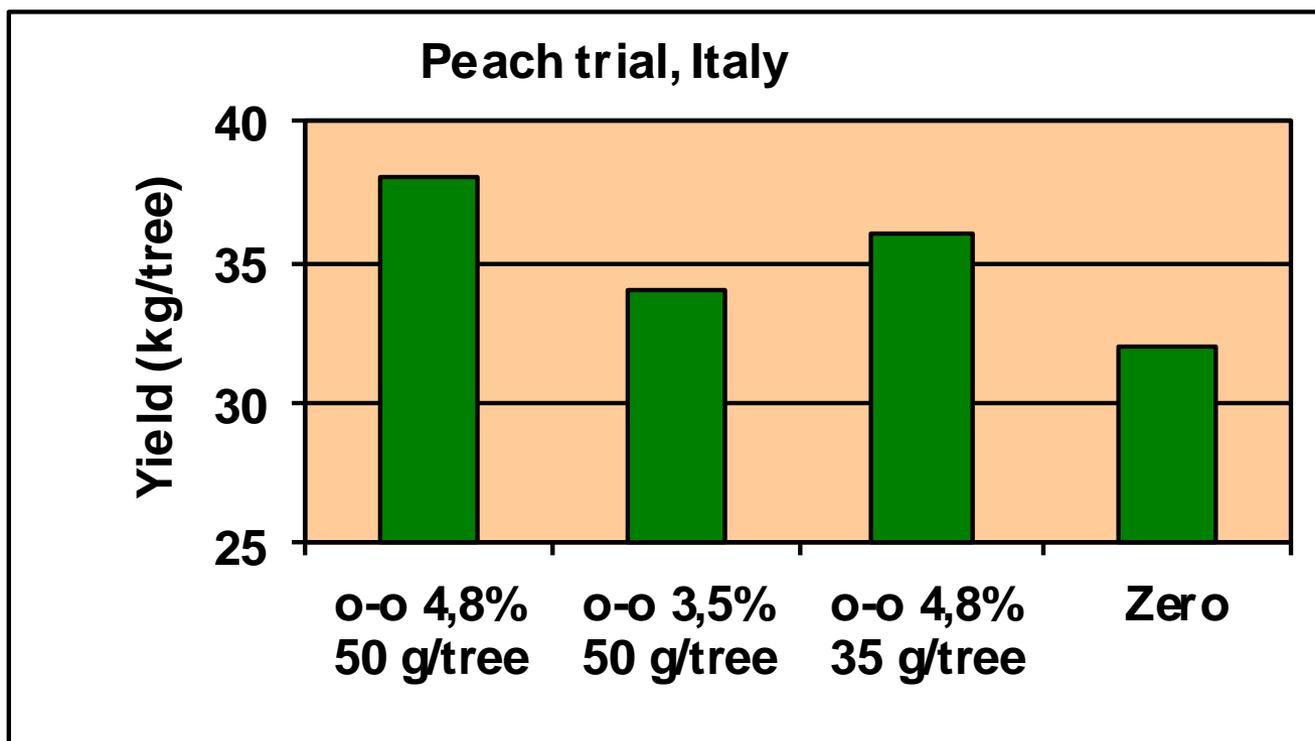


Source: CIBA - VII seminario internacional en tecnologias aplicadas en cultivos hortcolas, Mexico, 2002



Trial Results

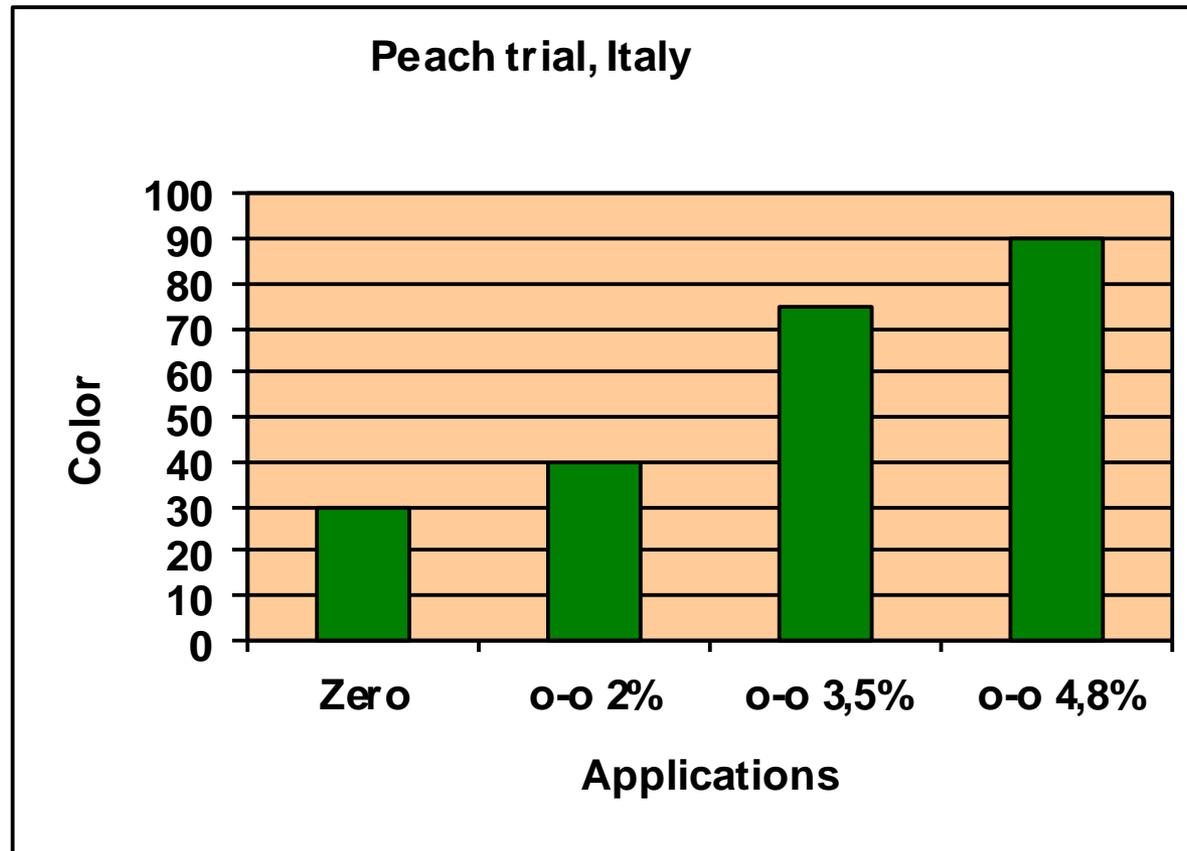
- 4,8% Fe³⁺ -o,o-Fe-EDDHA is provided the highest yield, even at low dosage more yield is observed than standard 3,5%.



Source: CIBA - VII seminario internacional en tecnologias aplicadas en cultivos hortcolas, Mexico, 2002

Trial Results

- 4,8% Fe³⁺ -o,o-Fe-EDDHA is provided the highest color index.



Source: CIBA - VII seminario internacional en tecnologias aplicadas en cultivos hortcolas, Mexico, 2002

Iron Chelate Differences

This trial took place in Eđirdir Research Institute, the purpose of this trial is to show differences between chelate types

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Trial is taken place in Eđirdir Arařtırma Institute.

- This presentation prepared from photos taken by research institute.
- All measurements have done for total active iron content of leaf.
- Peach is chosen for this trial because its iron sensitivity.
- The trial area is very limy and the pH is above 8.
- 7.2 g/tree chelated Fe fertilizers are applied.
- As a fertilizer 300 g iron sulphate is applied.





17/07/2008









D7 – Iron Sulphate



D7 – Iron Sulphate



D 19 - Fe EDTA



D 19 - Fe EDTA



D 10 - Control



D 10 - Control



D 12 - Fe DTPA



D 12 - Fe DTPA



17/07/2008

D12

D 13 - Fe EDDHA



D 13 - Fe EDDHA





D 4 - Fe EDDHA – Doctoferro48



D7 –
Iron Sulphate



D 19 –
Fe EDTA



D 10 –
Control



D 12 –
Fe DTPA



D 13 –
EDDHA



D 4 –
Doctoferro48



Eğirdir Horticulture Research Institute
Iron Trial on Peach
Total active iron amounts (Last Amounts)

RESULTS

• Product		1. RPT	2. RPT	3. RPT	Average
• Control	13,05	10,59	16,32	13,32	
• FeSO4	19,06	10,91	17,13	15,7	
• DTPA	9,72	14,21	9,65	11,19	
• EDTA	18,44	21,08	20,77	20,1	
• EDDHA	20,8	19,58	21,12	20,5	
• Doctoferro48	24,73	26,35	26,01	25,7	

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