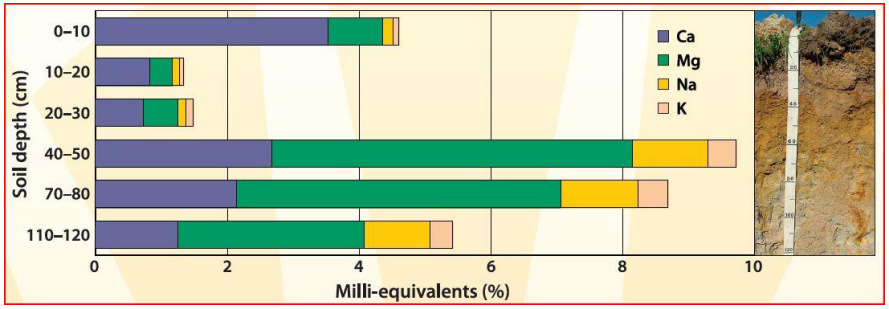
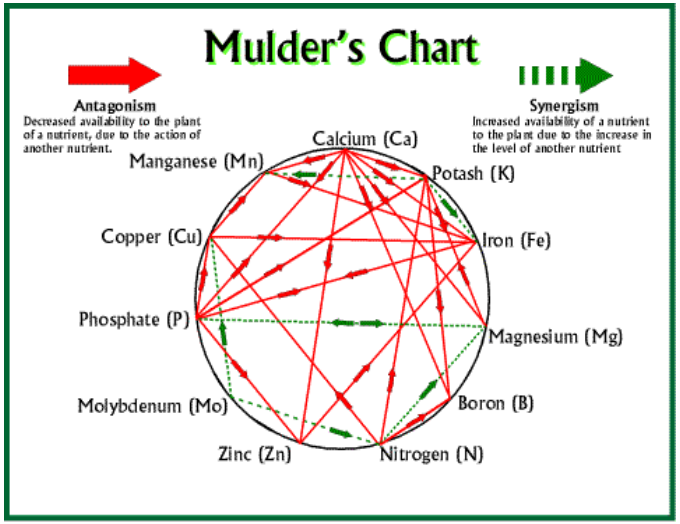
Groei saam met Ons!

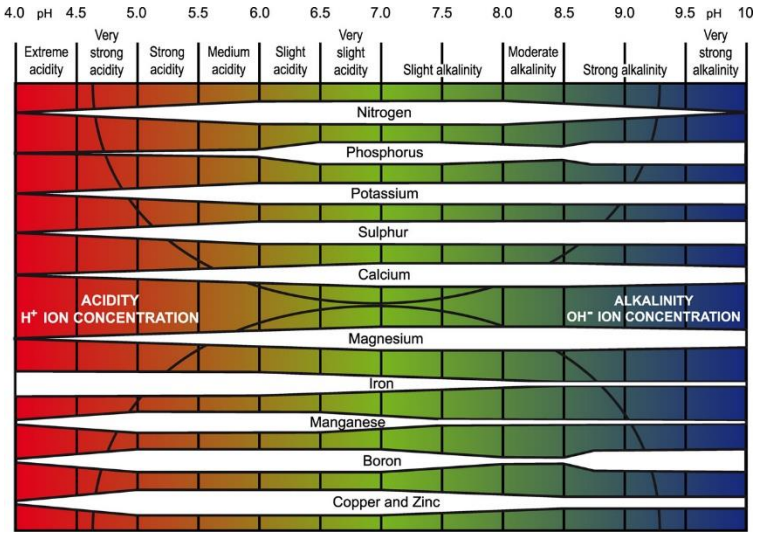
Growing with Metson!

SCIENTIFIC BACKGROUND ON NUTRITION

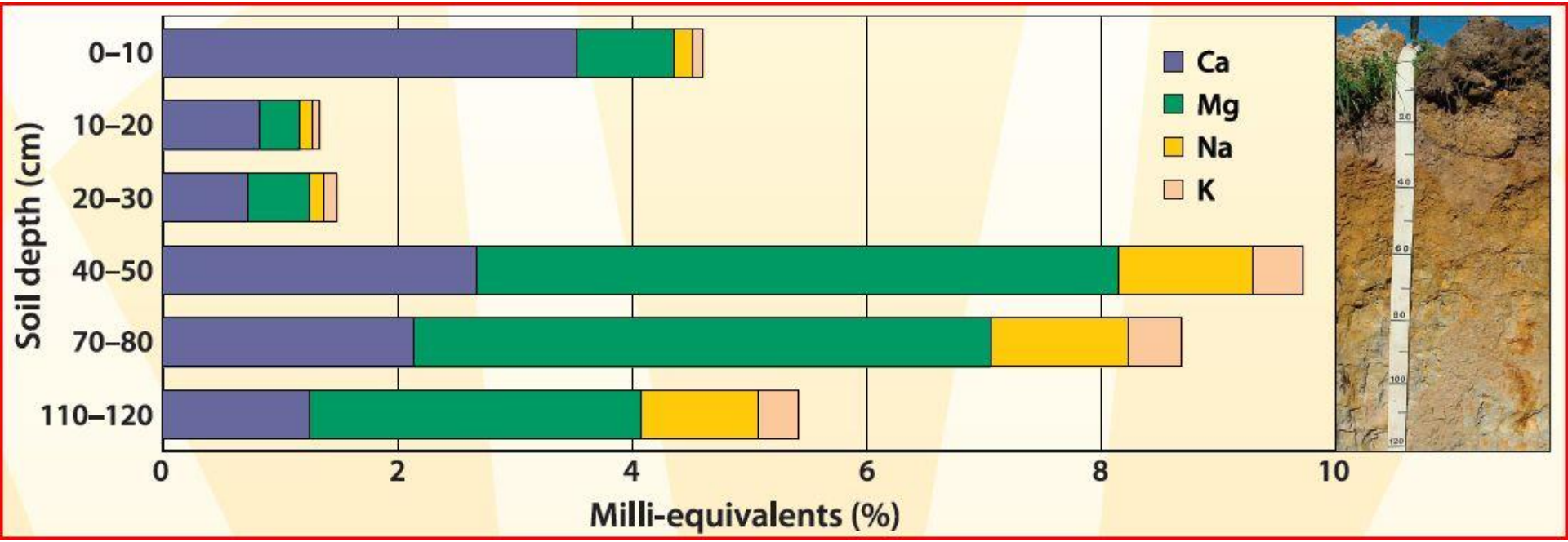
FOLIAR NUTRITION





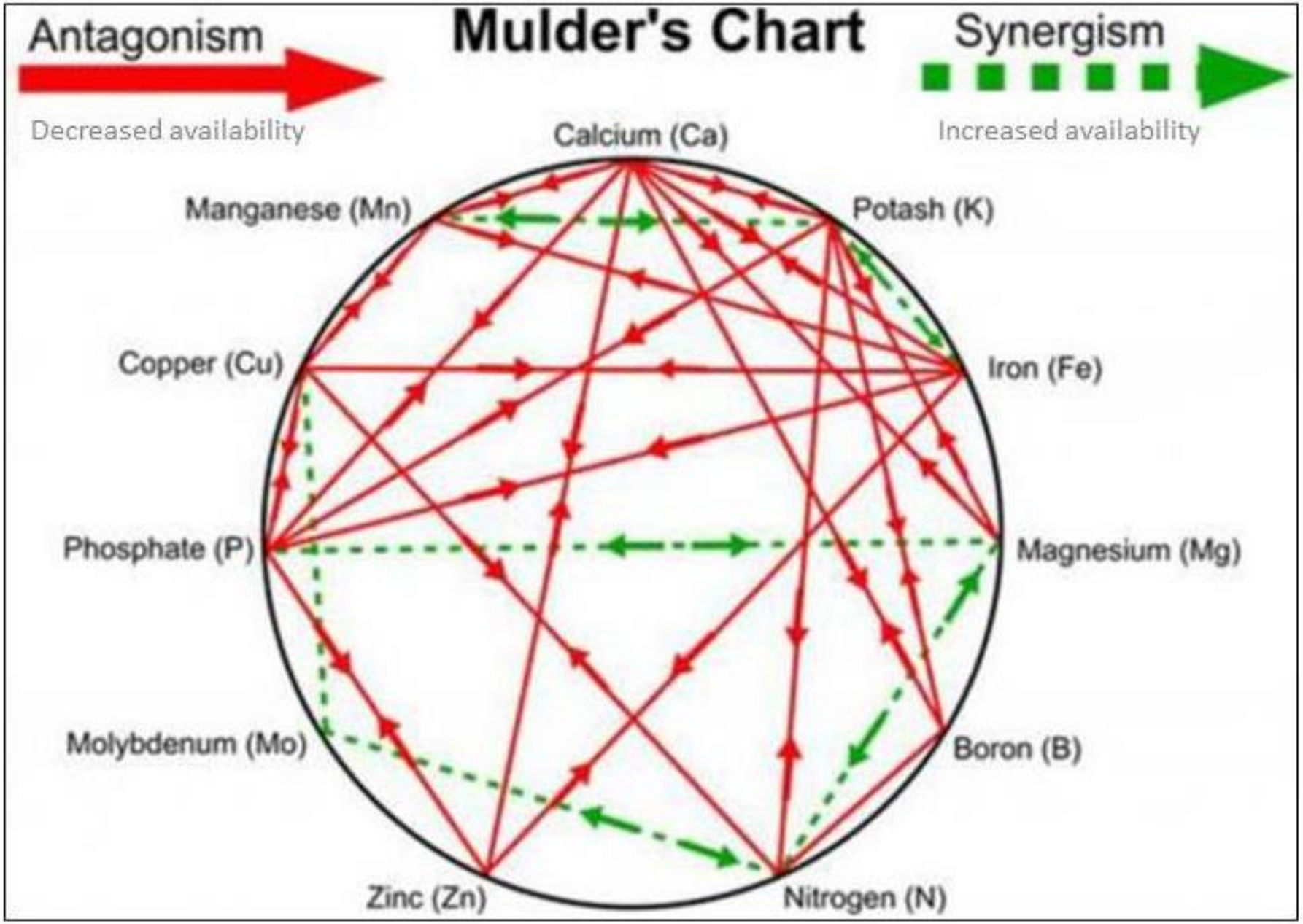


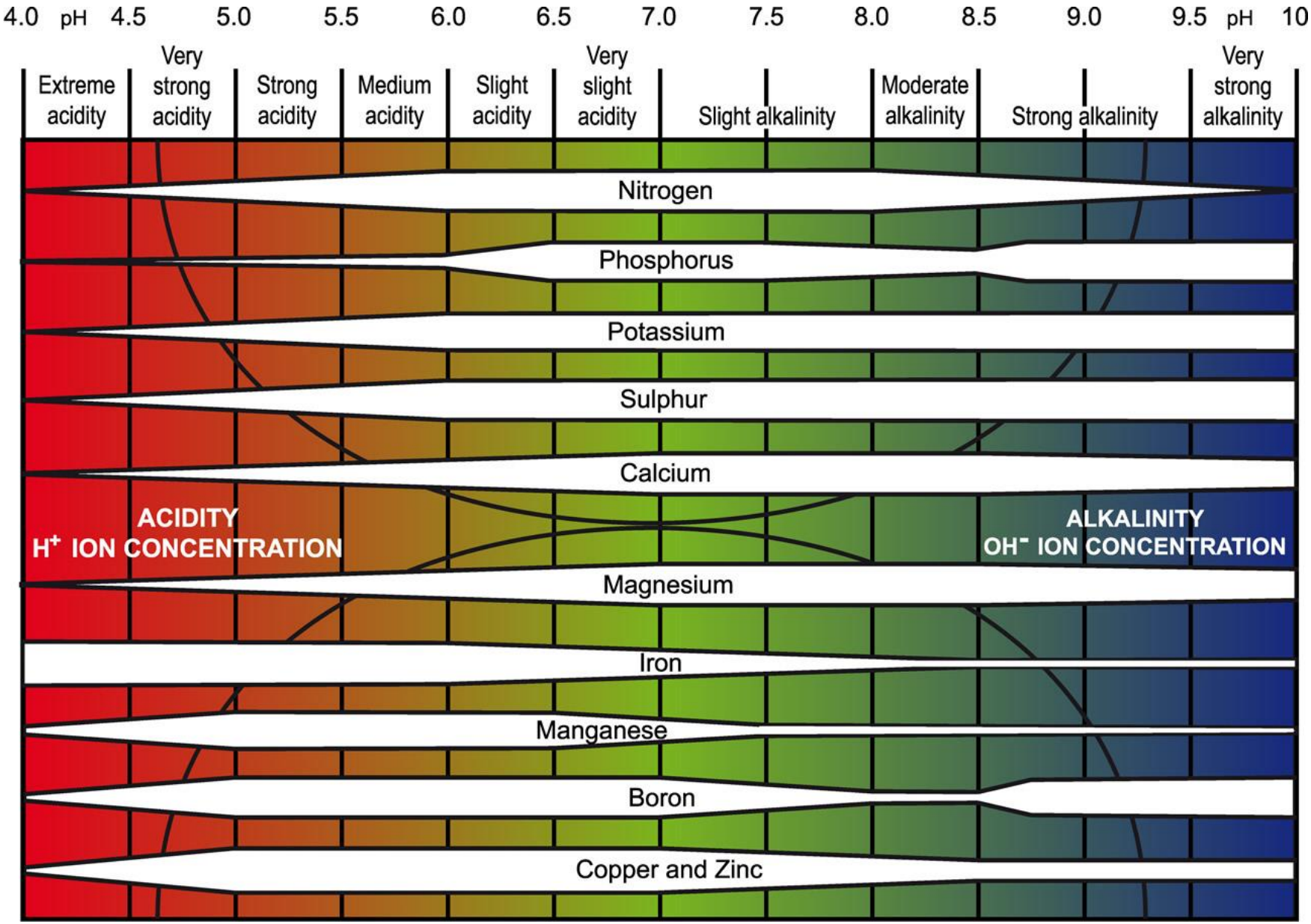
Sandy duplex soil, with clay at 40 cm. Note the high CEC of the clay below 40 cm, and the impact of organic matter on the sand's CEC.



INFLUENCE OF SOIL TYPE ON MICRO-ELEMENT

Soil Type	Anticipated Nutrient Deficiency
Poorly leached lime soil	Mg, Fe, Mn, B
Limy and sandy soil	Mg, Fe, Zn, Mn, Cu
Organic soils over manured with a lime layer on variable water tables	Mn, Cu
Compacted clay soil or heavily fertigated with P	Fe, Mn, Zn, B
Heavily limed organic soil and acidic peat	Mn, Cu, B
Poorly leached clay and acid sand	Ca, Mg, Fe, Mn, Zn, Cu, B
Sandy soils	Fe, Mn, Zn, B
Heavily leached soil	Mg, S, Cu, B
Acidic, leached sandy soils	Ca, Mg, S, Fe, Cu, B
Granite	B, Mo
Acidic, clay soils	Ca, Mg, Mo
Peat	Ca, Mg , Cu, B
Iron rock soils	Mg, Zn, Cu, B, Mo, S


Antagonism
Mulder's Chart
Synergism
Decreased availability
Increased availability
Calcium (Ca)
Manganese (Mn)
Potash (K)
Copper (Cu)
Iron (Fe)
Phosphate (P)
Magnesium (Mg)
Molybdenum (Mo)
Boron (B)
Zinc (Zn)
Nitrogen (N)


4.0 pH 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0 9.5 pH 10
Extreme acidity
Very strong acidity
Strong acidity
Medium acidity
Slight acidity
Very slight acidity
Slight alkalinity
Moderate alkalinity
Strong alkalinity
Very strong alkalinity
Nitrogen
Phosphorus
Potassium
Sulphur
Calcium
ACIDITY
H+ ION CONCENTRATION
ALKALINITY
OH- ION CONCENTRATION
Magnesium
Iron
Manganese
Boron
Copper and Zinc

EFFECT OF INCREASING

- Nitrogen (N): Aidss Ca, Zn, B, P and Fe until an excess causes a dilution of these elements through excessive vegetative growth
- Phosphate (N_2O_3): Reduced Zn and Ca uptake generally and interferes with B in acid coils
- Potassium (K): Inhibits uptake of Ca, Mg, Zn, Mn, Fe and Cu. Increases B toxicity or leads to low B.
- Magnesium (Mg): Interferes with uptake of K, Ca, B, P, Zn, Mn, Fe and Cu.
- Calcium (Ca): Interferes with uptake and reduces availability of K, Mg, B, P, Zn, Mn, Fe and Cu
- Zinc (Zn), Manganese (Mn), Copper (Cu) and Iron (Fe). 1. Preponderance of 1 metal interferes with the uptake of others. 2. High levels of any or all metals interferes with P, K, Ca and Mg uptake.

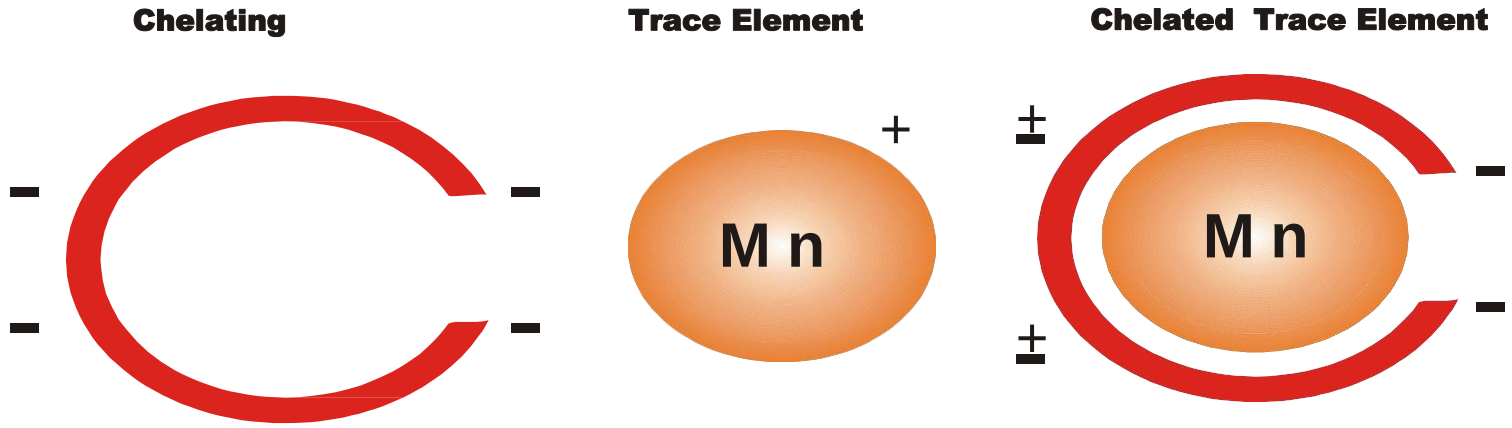
EFFECT OF DECREASING

- **Nitrogen (N): Can reduce Ca, Zn, B, P and Fe uptake Phosphate (N_2O_3): Less interference with Zn and Ca**
- **Potassium (K): Diminished levels have reversed effect on uptake and no effect on B.**
- **Magnesium (Mg): Less Mg in soil reduces interferes with other alkaline (K and Ca), B, P and metals**
- **Calcium (Ca): Less Ca deduces interferences with alkali (K and Ca), B, P and metals**
- **Zinc (Zn), Manganese (Mn), Copper (Cu) and Iron (Fe). 1. Lower levels of competing metals are not able to interfere with each other. 2. Lower levels of metals e.g. Zn does not interfere with P or alkali metals (K, Mg, Ca)**

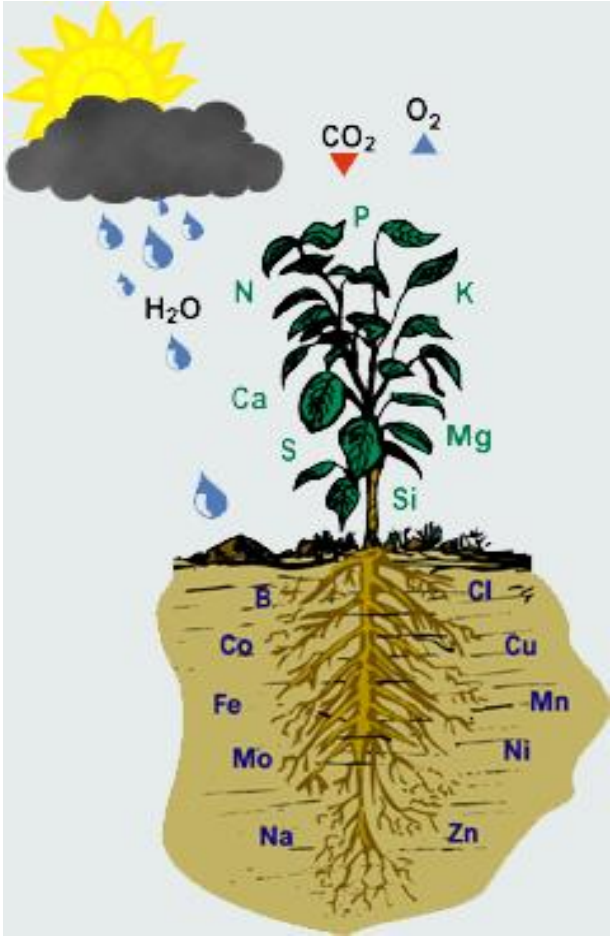
INTERACTION BETWEEN NUTIENTIONAL ELEMENTS

A high level of….	Decreases the availability of…
Ca	B, Fe, Mg
K	Mg
P	Zn
N	Cu
Cu	Vineyard soil: Fe

Elements	Intervals	Sulphate / Nitrate	Carbohydrate Chelate
Ca	Minimum 30 days	± 18 days	± 8 hrs
Mg	Minimum 30 days	± 7 days	± 2 hrs
Zn	Minimum 30 days	± 4 days	± 2 hrs
Fe	Minimum 30 days	± 4 days	± 3 hrs
Cu	Minimum 30 days	± 4 days	± 3 hrs
Mn	Minimum 30 days	± 4 days	± 3 hrs



WHY CAN MICRO-NUTRIENTS BE IN SHORT SUPPLY



Micronutrient	Factors that reduce availability	Susceptible plants
Zinc (Zn)	• Heavy P applications • High pH soils • Low Zn soils • Light & Sandy soil • Low soil organic matter • Cool soil temperatures • High Fe or Mn levels • Restricted root zones • Heavy manuring • Liberal N applications (Zn is only slightly mobile in plants)	• Potatoes • Beans • Onions • Cotton • Tree fruit • Sugar beets • Rice • Corn • Citrus • Sorghum

Micronutrient	Factors that reduce availability	Susceptible plants
Iron (Fe)	• Low soil Fe • High soil pH • Free Ca CQ3 • Excessive bicarbonates • High amounts of heavy metals • Poor aeration (excess CO2) • Extremes in temperature & moisture • Heavy manuring (alkaline soils) • High soil P, Mn, Cu, Zn • Low K (Fe is only slightly mobile in plants) • Poorly drained soils	• Potatoes • Barely • Sugar beets • Ornamentals • Sorghum • Tomatoes • Beans • Grass • Citrus • Grapes • Berries • Cole Crops

Micronutrient	Factors that reduce availability	Susceptible plants
Manganese(Mn)	• Low soil Mn • High soil Fe, Zn and Cu • Dry weather (drought) • Low light intensity and soil temperatures • Heavy manuring • Poorly drained soils • High soil pH • Light and sandy soil (Mn is sufficiently mobile in plants to transfer from older to younger leaves)	• Potatoes • Peas • Sugar beets • Grapes • Sorghum • Tree fruits • Small grains • Beans • Citrus • Betties • Vegetables
Copper(Cu)	• Low soil Cu • High soil N, P, Zn, Mn • Low organic matter • High soil pH • Light and sandy soils and peat coils • Low Zn (Fe is somewhat immobile in plants)	• Small grains • Citrus • Sugar beets • Cole crops • Alfalfa/Lucerne

Micronutrient	Factors that reduce availability	Susceptible plants
Boron (B)	• Low soil B • Excessive leaching • Dry weather (dought) • High soil pH • High Ca (Increases B requirements) • Wet soils (irrigation or rain) • High Light intensity • Low organic matter • Light and sandy soils (Boron is relatively immobile in plants)	• Potatoes • Alfalfa seeds • Sugar beets • Tree fruits • Alfalfa/Lucerne • Cole crops
Molybdenum(Mo)	• Low soil Mo • Acid soils • Heavy soil applications of sulfates	• Broccoli • Cauliflower • Peans • Beans • Other legumes • Citrus