

HYDROPONICS: - A CONFIRMATORY TOOL FOR NUTRITIONAL DISORDERS IN COTTON

The team...

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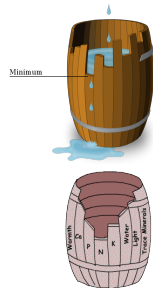


Preamble



Liebig's Law of the minimum

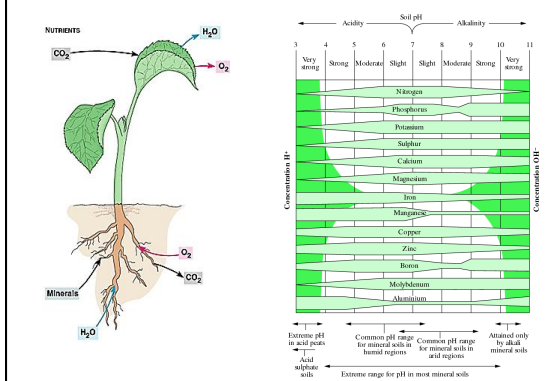
- States that growth is controlled not by the total of resources available, but by the scarcest resource (limiting factor).
- This concept was originally applied to plant or crop growth, where it was found that increasing the amount of plentiful nutrients did not increase plant growth. Only by increasing the amount of the limiting nutrient (the one most scarce in relation to "need") was the growth of a plant or crop improved.




Liebig's Barrel Analogy

Name	Chemical symbol	Relative % in plant to N	Function in plant
Primary macro-nutrients			
Nitrogen	N	100	Proteins, amino acids
Phosphorus	P	6.0	Nucleic acids, ATP
Potassium	K	25.0	Catalyst, ion transport
Secondary macro-nutrients			
Calcium	Ca	12.5	Cell wall component
Magnesium	Mg	8	Part of chlorophyll
Sulfur	S	3	Amino acids
Iron	Fe	0.2	Chlorophyll synthesis
Micro-nutrients			
Copper	Cu	0.01	Component of enzymes
Manganese	Mn	0.1	Activates enzymes
Zinc	Zn	0.03	Activates enzymes
Boron	B	0.2	Cell wall component
Molybdenum	Mo	0.0001	Involved in N fixation
Chlorine	Cl	0.3	Photosynthesis reactions

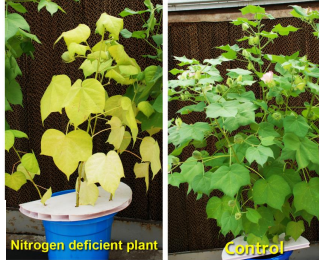
Plant Absorption and Emission






Nitrogen deficient leaf

- General chlorosis.
- Chlorosis progresses from light green to yellow.
- Entire plant becomes yellow under prolonged stress.
- Growth is immediately restricted and plants soon become spindly and drop older leaves.





Nitrogen deficient plant **Control**




Development of Nitrogen deficiency


Nitrogen Deficiency

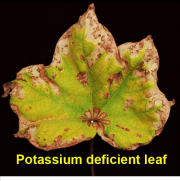
Control **N deficient** **Recovery plant**



Hydroponic




Sand Culture




Potassium deficient leaf

- Leaf margins tanned, scorched, or have necrotic spots (may be small black spots which later coalesce).
- Margins become brown and cup downward.
- Growth is restricted and die back may occur.
- Mild symptoms appear first on recently matured leaves.





Potassium deficient plant **Control**




Development of Potassium deficiency


Potassium Deficiency

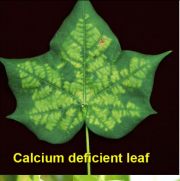
Control **N deficient** **Recovery plant**




Hydroponic




Sand Culture



Calcium deficient leaf



Calcium deficient plant **Control**





Development of Calcium deficiency


Growing points usually damaged or dead (die back).

Margins of leaves developing from the growing point are first to turn brown.


Calcium Deficiency


Control **N deficient** **Recovery plant**



Hydroponic




Sand Culture




Magnesium deficient leaf


- Marginal chlorosis or chlorotic blotches which later merge.
- Leaves show yellow chlorotic interveinal tissue on some species, reddish purple progressing to necrosis on others.
- Younger leaves affected with continued stress.
- Symptoms usually occur late in the growing season.



Magnesium deficient plant




Control




Development of Magnesium deficiency

Magnesium Deficiency



Magnesium Deficiency & Recovery

Control N deficient Recovery plant



Hydroponic

The team...



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Thank you