Reading Nutrition Deficiencies on Plant Leaves

Plant nutrition impact a lot on crop margins as it is key in plant growth and photosynthesis :

- Crop production duration
- Production quantity loss (fewer fruits or flowers)
- Quality loss
- Production cost

A well balance and sufficient nutrition will also make plant healthier and less susceptible to diseases and pests damage.

The key is to provide what is needed without any waste or even worse large excess quantity that could lead to salts burns.

This article is intended to help diagnose nutrition deficiency when such a situation happens. It is always interesting when such crop issues happen to get a visual understanding before sending a sample for analysis.

1- Micro and Macro elements

Just as a reminder, below is the list of the elements involved in plant growth :

List of major micro elements

- Fe (Iron)
- Cu (Copper)
- Zn (Zinc)
- Bo (Boron)
- Mn (Manganese)
- Mo (Molybdenum)
- Cl (Chlorine)
- Ni (Nickel)

List of major macro nutrients

Mineral elements

- N (Nitrogen)
- P (Phosphorus)
- K (Potassium)
- Ca (Calcium)
- Mg (Magnesium)
- S (Sulfur)

Non Mineral elements

- C (Carbon)
- H (Hydrogen)
- O (Oxygen)

2- Element deficiency detection

The visible symptoms on the plant are subtle and we will describe them in details and try to elaborate a representative image to help accurate diagnose. The diagram tries to render the description but reading detailed description is necessary.

1- Deficiencies visible on Older growths (lower part of the plant)

N => Leaves getting light green, Older leaves getting yellow and even dying
P => Leaves getting dark green to purple, leaves and plant are small
K => Older leaves getting yellow and burnt on the edge
Mg => Older leaves getting yellow discolouration between veins, purple edges
Zn => Inter-veines Chlorosis to bronzing

Please note that yellowing of the bottom leave may also be linked to lack of light.

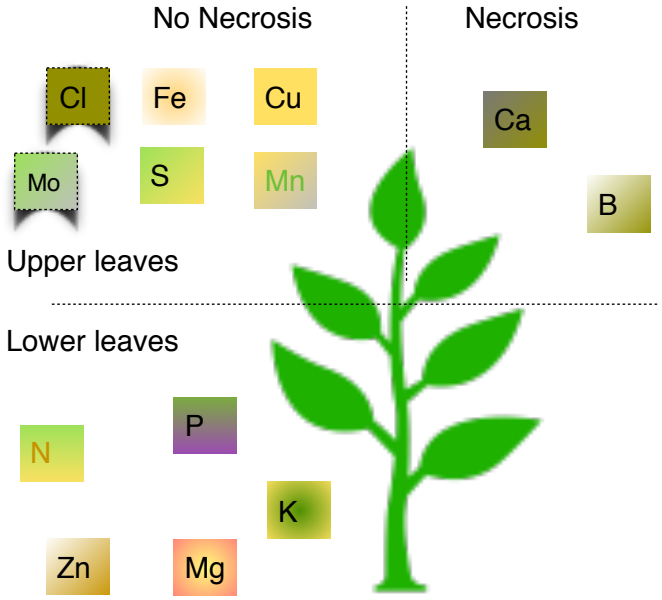
2- **Deficiencies visible on Younger growths** (Top of the plant)

a- New growth Necrosis

Ca => Delay in emergence and bud necrosis
B => Leaves turn yellow, White to light brown bud with tissue necrosis

b- No Necrosis of new growth

S => Starting from younger leaves, Whole leaves (veins included) turn light green to yellow
Fe=> Leaves turn yellow then white, Chlorosis of leaves tips
Mn => Leaves turning grey to red with green veins
Cu => Younger leaves turning pale yellow and sometimes wilting
Mo => Start wilting then Chlorosis happens (lack of chlorophyl)
Cl => Young leaves wilt and then die



3- Reasons for nutrient loss

There can be multiple reasons for a missing nutrient if you provide it in your feeding formula:

Consumed by plants => insufficient feeding
Consumed by micro organisms
Leached by watering => overwatering
Evaporated = Converted to gaseous form

It is very important to track the actual reason in order to find a solution to balance back your plant nutrition.

4- Excess or unbalanced nutrients

Assuming that you track the pH and conductivity of your media (the overall quantity of nutrients is correct) issues can happen if the formula is not balanced according to the plant needs.

Sometimes what happens is unused elements are stocked in the soil reaching a toxicity level. The plant is unable to feed properly. That is why it is so important to balance the elements in the fertilizer formula and prepare specific formulas according to the stage of the plant.

For the major 3 elements (N, P, K), they are necessary for any plant stage with an increased need of Phosphorus during the early stages of the plant to build the root system, then Nitrogen is most important for the growth of the plant and lastly, Potassium is very key element to produce the fruit or flower of the plant.

Each plant is different and the best way to set up a feeding formula for a new crop is to start from the one you are using for the most similar kind of plant in your facility and adapt over time.

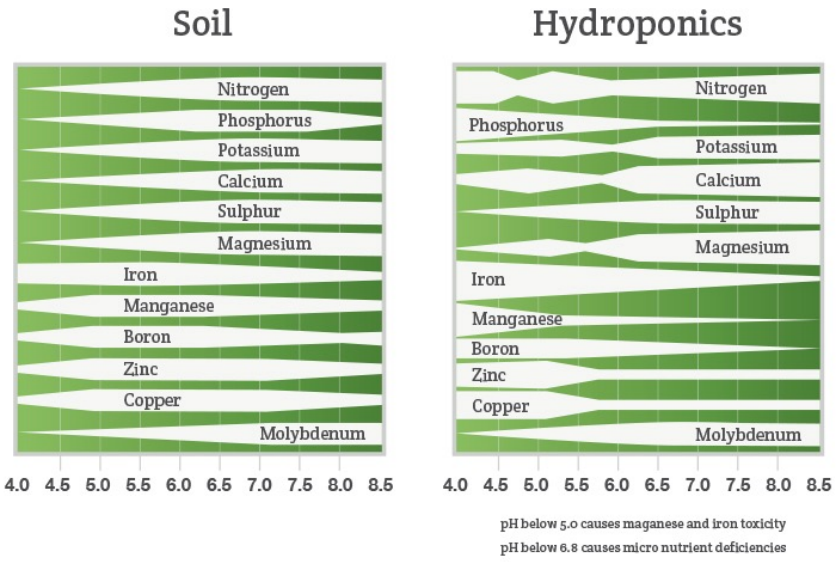
Then you have to track what is used by the plant or stored in the soil through constant analysis tracking. Plant tissue and soil analysis are well known from growers to achieve this but I would advise you to listen to CropTalk about Sap Analysis :

Sap analysis : It is a brand new promising tech, enjoy the content of this podcast !
Changing the Way you Manage Your Plant Nutrition Through SAP Analysis w/ Scott Wall

https://podcasts.apple.com/us/podcast/44-changing-way-you-manage-your-plant-nutrition-through/id1443576689?i=1000462237048

5- pH and element absorption

This is a well known chart but good to keep in mind. For most of the plants, your media or soil pH has to be between 5.5 and 6.5 (best range is 5.8 to 6.2) to allow access to nutrients. Hydroponics is a little bit as we see on the diagram below:



Source : https://hydrobuilder.com/learn/nutrients-and-ph/

Conclusion

Plant nutrition is very complex but it is a key factor for the success of any farming operation.
It require to establish for each crop and each stage :

- The balance of necessary nutrients to build the formula
- The amount of this formula that the plant need.

As a first approach, the stages can be limited to :

- Nursery or rooting
- Plant growth
- Production (producing flowers or fruits)

According to the season (summer or winter), plant growth speed, evaporation quantity and watering need will change necessitating to adapt the Ec of your watering solution.

Comment or questions?

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