Hunger signs in plants

Signos de hambre en plantas

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ABSTRACT

Soil, water and tissue analysis are all used to diagnose plant nutrition. This is often helpful and can confirm nutrient toxicities or deficiencies, but often the easiest and most direct technique is to look at the plant symptoms. All higher plants take on certain patterns on their leaves when there is a lack or overabundance of a certain nutrient

Keywords: nutrients; deficiencies; toxicities; symptoms

RESUMEN

El suelo, el agua y el análisis de tejidos se usan para diagnosticar la nutrición de las plantas. Esto a menudo es útil y puede confirmar toxicidades o deficiencias de nutrientes, pero a menudo la técnica más sencilla y directa es mirar a los síntomas de la planta. Todas las plantas superiores toman en ciertos patrones en sus hojas cuando hay una falta o exceso de un determinado nutriente

Palabras clave: nutrientes; deficiencias; toxicidades; síntomas

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INTRODUCTION

Since Greek and Roman times, the appearance of a plant has been used to help identify plant health. The plant speaks through distress signals. The message may be that there is simply too little or too much water. Or the sign may tell us of a disease caused by a microorganism, such as a bacteria, virus or fungus. The plant may show symptoms of attack by nematodes, insects or rodents or from injuries from frost or lightning. According to the plant species these signals may differ slightly, but frequently they can be generalized.

It is also possible to generalize about the signals linked to the nutritional status of a plant. Learning these symptoms can alert us to appropriate steps to correct the toxicity, deficiency or imbalance of nutrients.

There are 17 elements essential for plant growth. Hydrogen, oxygen, and carbon come either from the air or water. The others come from the soil. Depending on the quantity needed by the plant, these are called either primary or trace (micronutrients) nutrients. The micronutrient nickel is required in such small amounts (50 -100 parts per billion) by plants that it was identified only last year as being an essential nutrient. Other micronutrients are: iron, manganese, boron, chlorine, zinc, copper and molybdenum. Some other nutrients have been identified as being essential for only certain plants, such as silicon for sugar cane (Barker and Pilbeam 2015; Zeki and Obreza, 2015).

The primary nutrients are measured on a percent (parts per 100) dry weight tissue basis. These are: nitrogen, phosphorus, potassium, calcium, magnesium and sulfur. The trace elements are measured on a part per million dry weight basis. For example, a typical analysis of a dried leaf from a healthy cherimoya might show 2% nitrogen, 1% potassium, 100 ppm (parts per million) iron and 50 ppm boron (George *et al*, 1989).

Although plants require more primary than trace nutrients, all the essential elements need to be present for a healthy plant. An excess, deficiency or even an imbalance of these elements will lead to individual symptoms which are characteristic to most plants.

Furthermore, these symptoms take on characteristic positions. The micronutrients typically show up on young, expanding tissue (calcium is a macronutrient that also shows up on young tissue), while macronutrients and toxicities generally show up on older tissue.
Figure. 1. (Zeki, 2015).

Because of our climate and soils, some nutritional issues are more common in some areas than others. Acid soils in high rainfall areas will typically show calcium, magnesium, and boron deficiencies than those in high pH soils with low rainfall. Iron, manganese, copper and zinc are more common in higher pH soils than in low. Nitrogen, phosphorus and potassium can appear on plants in many different environments (Marschner, 2012).

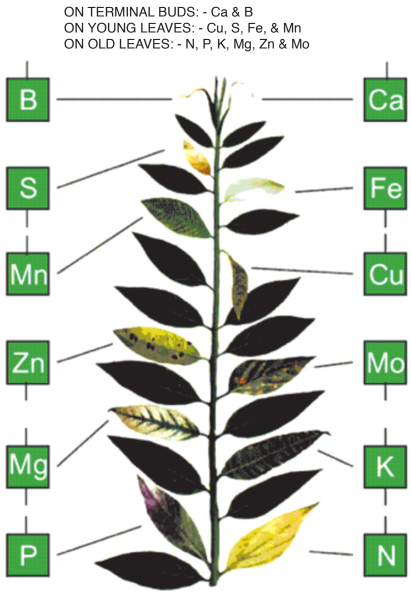

Figure 1 Positions on a plant where deficiencies occur. Source: Author

Excess or toxicity (often related to irrigation practices)

• Boron - chlorosis (yellowing), leading to tissue death (necrosis) along the margins of older leaves Figure. 2.

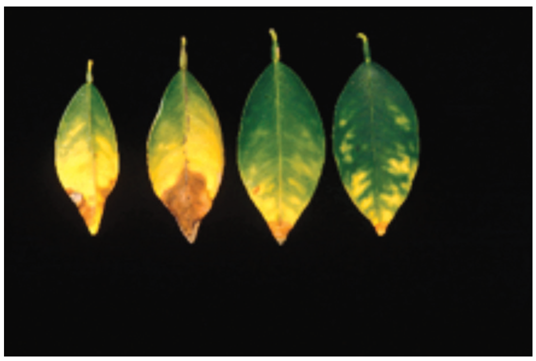

Figure 2. Boron toxicity citrus (tip burn, older leaves). Source: Author

• Sodium, Chloride - necrosis of the leaf tips and margins on older leaves. They often occur in combination Figures 3 and 4.

Figure 3. Sodium toxicity avocados (marginal leaf burn, older leaves).
Source: Author

Figure 4 Chloride toxicity avocado (tip burn, older leaves)
Source: Author

DEFICIENCY

• Phosphorus - frequently the only symptom is smaller plants, but occasionally the leaves are darker than normal or may have a reddish cast, a common symptom in sweet corn. Phosphorus deficiency in California trees is rare Figure 5.

Figure 5 Phosphorus deficiency in pear (small leaves, shortened internodes, older leaves).
Source: Author

• Potassium - scorching or firing along leaf margins that usually first appears in older leaves. Plants grow slowly and have a poorly developed root system. Stalks are often weak and fall over Figure 6.

Figure 6. Potassium deficiency in citrus (leaf curling, but often marginal leaf burn on older leaves).
Source: Author

• Nitrogen - plants are light green or yellow. Older leaves are often affected first, but in trees the chlorosis may appear on any part of the plant Figure 7.

Figure 7. Nitrogen deficiency in avocado (general yellowing of older leaves).
Source: Author

• Zinc - depending on the plant there may be interveinal (between the leaf veins) chlorosis on younger leaves, but frequently the leaves are small and appear in a rosette Figure 8.

Figure 8. Zinc deficiency in citrus (smaller leaves on young tissue, older unaffected leaves in background)
Source: Author

- Iron - very sharply defined interveinal chlorosis of younger leaves, with little size reduction. Can often be associated with wet soil conditions Figure 9.

Figure 9. Iron deficiency on citrus (fine interveinal yellowing, young leaves).
Source:Author

- Manganese - mild interveinal chlorosis of younger leaves, with no size reduction Figure 10.

Figure 10. Manganese deficiency on citrus (blotchy yellow interveinal areas).
Source: Author

In Acid Soils especially, Deficiencies in*:*

- Boron – leaves can have general yellowing often with holes Figure 11.

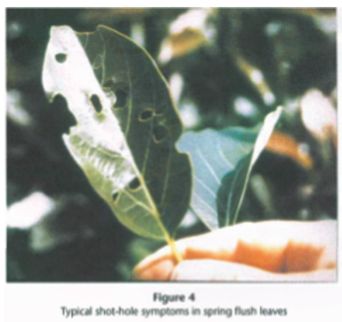

Figure 11. Boron deficiency in avocado (young leaves with holes), photo Tony Wiley.
Source: Author

- Calcium – leaf margins light colored, entire leaf blade made be thickened Figure 12.

Figure 12. Calcium deficiency in citrus fruit with stylar end rot, leaves often appear dark green.
Source: Author

- Magnesium – a pointed shape appears in the center of the leaf Figure 13.

Figure 13. Magnesium deficiency in citrus (pointed shape on older leaves).
Source: Author

These and other problems can be corrected with appropriate fertilizers, amendments and manures and also by soil and water management. In well-managed plants you may never see these signs, but learning the signals can help direct your activities if you do.

All plant species show similar responses to low or high levels of nutrients (Marschner, 2012). Some show the symptoms more clearly than other plants. Sweet corn is a wonderful indicator plant which develops very prominent symptoms according to the deficiency. Planting a row of sweet corn (not field) is a tasty way to determine if your soil has a generic nutritional problem.

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