eKonomics

The Primary Macronutrient Deficiencies

PotashCorp

The Primary **Macronutrient Deficiencies**

Assessing a soil for nutrient status in a laboratory setting can be a good way to determine whether it has adequate fertility to support optimum crop growth, but visual assessment of the crop can also tell a lot about what is going on in the soil. Visual cues produced as a result of inadequate nutrient supply can help determine just what is causing the problem. Following up visual assessment with soil or tissue analysis can help confirm the underlying cause of the issue and suggest a corrective course of action.

This discussion will cover only the primary macronutrients, but the general rule is: A nutrient deficiency that affects the lower leaves (older growth) is usually nitrogen, phosphorus, potassium or magnesium. Symptoms that affect the upper leaves are usually the result of inadequate sulfur (although it can affect lower leaves as well) or a micronutrient deficiency. Below are some useful guides to remember for next year when evaluating crops for nutrient deficiencies.

Nitrogen Deficiency

In *grasses* (corn, rice, wheat, etc.), nitrogen deficiency typically exhibits as a chlorosis (yellowing) of the lower leaves. Those leaves are affected because nitrogen is mobile within the plant, so as the soil nitrogen supply is exhausted, the lower leaves are cannibalized for the sake of the upper, more photosynthetically active leaves. The chlorosis has a distinct pattern. It begins at the tip of the leaf and proceeds to the base along the midrib, creating a V-pattern that points toward the base of the leaf. Plants will be stunted and obvious nitrogen stress will result in decreased yield.

In *broadleaves* (soybeans, cotton, etc.), nitrogen deficiency typically exhibits as a chlorosis of the lower leaves, and it can also result in smaller overall size of younger leaves. Plants will be stunted and yield will be decreased.

Nitrogen deficiency occurs as a result of low nitrogen supply due to inadequate fertilization rate or excessive loss of nitrogen from the rooting zone. If the deficiency pattern in the field is systematic (meaning it follows a set pattern), assess the application equipment to ensure that each nozzle is supplying at the same rate.

Phosphorus Deficiency

In *grasses*, phosphorus deficiency typically exhibits as a reddish-purple color of the lower leaves of younger plants. The symptoms are usually observed on the leaf tip and

Figure 1. Nitrogen deficient corn. The two rows of corn are exhibiting lower-leaf firing as the result of inadequate nitrogen supply. The picture insert is a classic example of a nitrogen stressed corn leaf. Notice how the deficiency symptom progresses along the leaf's midrib.

Source: IPNI

Figure 2. Typical phosphorus deficiency symptoms of corn. Notice the red pigment in the leaves.

edge, but can progress and affect the entire leaf surface. Like nitrogen, the symptoms start at the leaf tip and progress toward the base. As the crop ages, visual symptom will likely disappear and the only evidence of phosphorus deficiency will be stunted plants and, consequently, lower yield.

In *broadleaves*, phosphorus deficiency can be very difficult to detect with visual assessment. Typically the leaves will exhibit a dark green, and they may even show some reddish-purple color in extreme cases. Plants will be stunted and consequently, yield can be decreased.

Phosphorus deficiency occurs as the result of low phosphorus supply due to inadequate fertilization rate, but it can also be the result of cool soil conditions early in the growing season.

Potassium Deficiency

In *grasses*, potassium deficiency typically exhibits as a chlorosis of the lower leaves. This is often confused with nitrogen deficiency, but there is an easy way to tell the difference. Potassium deficiency begins at the tip of the leaf and proceeds to the base along the leaf edge, creating a V-pattern that points toward the tip. This distinct difference should allow you to easily differentiate between potassium and nitrogen deficiency.

In *broadleaves*, potassium deficiency typically exhibits as a chlorosis of the lower leaves, but it can also affect newer growth (especially during periods of rapid vegetative growth). The chlorosis begins at the tip of the leaf and progresses toward the base along the leaf edge.

Potassium deficiency occurs as a result of low potassium supply due to inadequate fertilization rate, but it can also occur in response to the soil environment. Poor potassium uptake will occur during drought periods due to low diffusion (movement of potassium from the soil to the root). Potassium deficiency can also be caused by areas of extreme compaction, which results in poor root development.

Figure 3. Corn leaf exhibiting potassium deficiency. Notice that the symptoms are progressing along the leaf edge/margin.

Figure 4. Soybean leaf exhibiting potassium deficiency. Notice how the symptoms are present primarily on the leaf edge/margin.

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