



Grain Crops Update

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Poor Early Corn Growth and Nutrient Deficiencies

Many corn fields suffer from poor early plant health, particularly during cool, wet springs, like we have experienced this year. These growth problems can be caused by a multitude of factors, but can normally be attributed to nutritional limitations and/or poor root development. Poor early corn growth is often blamed on inadequate or poor nitrogen availability, but in my experience, this is rarely the case. Nitrogen is very mobile in the soil, and corn requires relatively little nitrogen until rapid growth begins, so nitrogen fertilizer placement and amount rarely limit early season corn growth. However, other nutrients, including phosphorus, potassium, magnesium, zinc and soil pH commonly limit early season corn growth in Mississippi. Phosphorus and Zinc deficiency are particularly likely in young corn. Poor root development will also severely limit nutrient uptake and stunt vegetative development, but is often overlooked in terms of crop diagnosis and management.

Young corn plants appearing stunted with purple lower leaves are likely suffering from phosphorus deficiency. This is a relatively common occurrence in our region. Phosphorus deficiency often occurs when corn is grown in rotation with cotton or soybeans, because corn uses nearly twice the amount of phosphorus required for cotton and soybeans. Thus, if corn nutritional needs are not the prime component of the crop rotation nutrient program, then problems may occur. Phosphorus deficiency is also especially prevalent when corn is grown following a rice crop, because the absence of a flood reverts soluble ferrous phosphates to unavailable ferric phosphates. Phosphorus deficiency symptoms are most prominent on lower leaf tips and margins.

Figure 1. Purple leaf tips and margins on lower leaves are symptomatic of phosphorus deficiency.



Corn hybrids often differ considerably in the degree of purple symptomology they express – so don't be alarmed if one hybrid exhibits more vivid symptomology than others, particularly if no stunting is apparent. Hybrids differ in the presence of genes that trigger production of anthocyanins, which are the pigments responsible for the purple coloration.

Purple symptoms are frequently produced in young corn (4-12 inches) when bright sunny conditions occur, following prolonged cool, wet, spring conditions. The purple symptoms result when abundant energy production and vegetative growth rate exceeds the ability of the roots to supply nutrients. If the symptoms are primarily due to abundant anthocyanin pigment production (rather than nutrient limitations), symptoms will disappear as root development catches up with the rest of the plant and little yield loss will be likely. However, if phosphorus availability is limited, and/or cultural factors restrict uptake for a prolonged time, then yield loss will occur.

Many cultural or environmental factors can limit root growth, making phosphorus deficiency worse:

- Overly wet or dry soil
- Cool temperatures prevalent after planting
- Seed furrow walls compacted during planting
- Low soil pH
- Shallow seed placement and/or soil erosion on raised beds
- Root pruning from side-dress knives
- Insect damage
- Herbicide injury

Phosphorus deficiency symptoms normally slowly disappear when favorable growing conditions promote more root growth. Treatment options to remedy phosphorus deficiency produce gradual results, particularly compared to nitrogen application, because phosphorus is immobile in the soil solution. Thus, plant roots must grow into the zone where fertilizer was applied before phosphorus uptake and plant response will occur. Surface application of phosphorus fertilizer will limit availability to the top couple inches of soil. Thus, broadcast phosphorus application would be best suited to irrigated and/or minimum tillage fields with substantial crop residue on the soil surface, where these factors would promote soil moisture, root activity and nutrient uptake in the upper few inches of soil. Phosphorus injected as a side-dress treatment will generally increase availability to roots later in the season, particularly in dryland fields. However, be careful not to prune roots when sidedressing. Corn root diameter is generally similar to plant height, so don't sidedress much closer to the row than the plant height.

Figure 2. Interveinal chlorosis and bleached upper leaves of young corn may be associated with Zinc deficiency. Zinc deficiency is often apparent when cold, wet soils limit early season corn root growth.



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