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Yellow, Stunted Corn... More Than One Possible Cause

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Areas of light green to yellow, often stunted, corn plants are visible in many corn fields throughout the state at this point in mid-June. There is no single cause for such crappy™ looking corn (Nielsen, 2012) and multiple causes may occur in the same field, which makes for challenging diagnoses and frustrating discussions with the grower. I offer a few observations from my recent travels around the state about some of the common causes of ugly stands of corn this year.

Frequent and, often, excessive rainfall is one of the more common underlying themes this year, especially in the northern third or half of Indiana. As of 13 June, the accumulated precipitation for the past 30 days has been 25 to 50% above average in those areas of the state (Midwestern Regional Climate Center, 2015). More importantly, rainfall amounts during the past 7 days have ranged, statewide, from 75% to 300% above average northwest of a line extending roughly from Vincennes (southwest IN) to Richmond (eastcentral IN). Localized rainfall amounts have been even greater in some areas. Such excessive rainfall results in ponding or flooding of fields and lengthy periods of saturated soils after the water recedes or drains away. Root damage occurs rapidly in oxygen-depleted soils, especially with warm temperatures, resulting in plant death or stunting.

The consequences of excessive rainfall are accentuated in soils that are naturally poorly drained, especially if the fields are not well drained by artificial drainage tile or surface drains. Field to field variability for the adequacy of the artificial drainage often results in "black and white" differences in adjacent fields of corn that receive the same amount of excessive rainfall over a period of days or weeks. Even in fields with generally adequate artificial drainage, there will be small areas that are not well-drained and root health of young corn plants will suffer due to lengthy periods of saturated soil conditions. Some of the signs of such poorly drained areas include algae growth on the soil surface and damp-loving nutsedge plants.

The existence of compacted soil layers accentuates the consequences of excessive rainfall on poorly drained fields. Beginning way back last fall during harvest, opportunities for creating soil compaction have been abundant throughout the state from all sorts of field activities... harvest machinery (combines, grain carts), tillage equipment (fall and spring), fertilizer spreaders (fall and spring), manure spreaders (fall and spring), planters (sidewall compaction). Soil compaction further decreases natural soil drainage and lengthens the time period in which soils remain saturated (anerobic) and detrimental to root health.

Even in the absence of excessive rainfall, soil compaction has negative effects on the initial stand establishment of a corn crop. Planter sidewall compaction restricts the seedlings' root development to the furrow itself for long periods of time. Soil compaction caused by tillage tools further limit the natural downward development of the crop's root system. Together, the net result is a shallow-rooted crop that is especially vulnerable to the effects of inadequate rainfall, as has been the case in some areas of southern Indiana since planting.

Some areas within fields are lighter green than other areas simply due to differences in soil color. In years when temperatures after planting are relatively cool, lighter colored soils (lower soil organic matter) warm slightly slower than darker colored soils. Slightly cooler soil temperatures translate into slightly fewer Growing Degree Days (GDDs). Slightly fewer GDDs per day over enough days easily translate to a leaf stage or two less development than in the darker, warmer soils (Nielsen, 2014). In reality, the lighter green areas are simply areas where plant development is behind that of other areas. When you are walking a field near the time it is transitioning to the rapid growth phase (sometime after leaf stage V6), minor differences in leaf stage development throughout a field can be visually dramatic. The more developed areas of the field will be taller and darker green than areas of the field that are 1 or 2 leaf stages behind. Yet, plant health may in fact be identical in both areas even though your eyes tell you something is "wrong" with the areas of lighter green plants.

Cool and wet stand establishment periods for corn can be conducive for the development of and damage by parasitic corn nematodes (Faghihi & Ferris, 2015). Certainly, the 2015 growing season has been characterized as cool and wet during stand establishment in many areas of the state. We tend to think about corn nematodes being primarily restricted to sandier soils, but that is not always the case. There is no question that some of the fields in 2015 exhibiting yellow and stunted corn plants may be due to damage caused by parasitic corn nematodes. If you suspect corn nematodes are the culprit, send soil samples in to the Nematology Lab at Purdue (Faghihi & Ferris, 2015).

Cool and wet stand establishment periods for corn can also be conducive for the eventual development of seedling blights (Sweets,

2015). Most of the disease-causing fungi are controlled effectively by the fungicidal seed treatments commonly used by the seed industry. The problem is that the seed treatments do not last forever. Slowly developing corn seedlings, in response to a cool stand establishment period, may fail to transition sucessfully to reliance on their nodal root systems before the seed treatments deteriorate and disease develops on the mesocotyl or seed. Symptoms often develop three or more weeks after planting when seedling development has been slow.

More and more growers apply the bulk of a corn crop's nitrogen fertilizer after emergence of the crop, which certainly minimizes the risk of losing soil fertilizer N before crop uptake occurs. However, some fail to combine the benefits of a sidedress N application program with a robust starter fertilizer program during planting. The combination of soil N loss and stunted corn root development that occur in an excessively wet early season almost always results in a crop prior to sidedressing that is yellow and stunted. The severity of the problem is even greater where a) sidedressing is delayed because of frequent rains and/or b) corn follows corn where there is additional immobilization of soil N by the decomposing corn residues from the previous year.

Related reading

Faghihi, Jamal and Virginia Ferris. 2015. Nematode Update: Corn Parasitic Nematode. Pest & Crop Newsletter, Purdue Extension. http://extension.entm.purdue.edu/pestcrop/2015/Issue8/ [URL accessed June 2015].

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