6-7-2008

Assessing Hail Injury in Corn

Roger W. Elmore
Iowa State University, relmore@iastate.edu

Lori Abendroth
Iowa State University, labend@iastate.edu

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Abstract
Storms on June 4 and 5 not only brought more 'unwelcomed' rain but also damaging winds and destructive hail. Variation currently exists in corn development across Iowa, ranging from emerged to the sixth leaf stage. Vegetative stages are determined and most often referred to based on the leaf-collar method developed by Iowa State agronomists.

Keywords
Agronomy

Disciplines
Agricultural Science | Agriculture | Agronomy and Crop Sciences

ICM News

Assessing Hail Injury in Corn

June 7, 2008

By Roger Elmore and Lori Abendroth, Department of Agronomy

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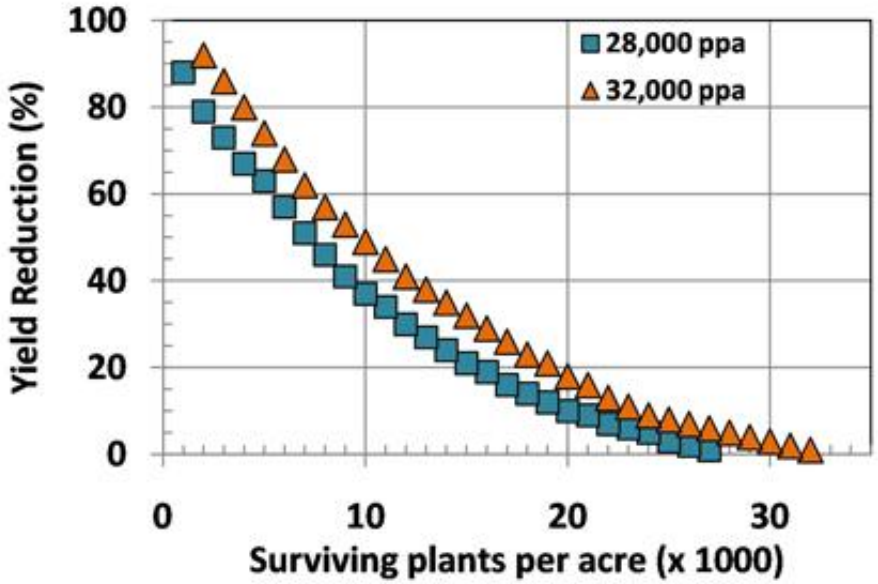
Hail damage on corn at the sixth leaf stage (V6). If the growing point is intact, plants can recover. Picture taken 7 days after the storm in Montgomery County, Iowa. (Photo by Kyle Jensen)

In contrast to soybean, corn has an advantage early season when hail damages the aboveground plant, because its growing point remains below ground until approximately the sixth-leaf stage. The sixth-leaf stage of the ISU leaf-collar system correlates to the



seventh-leaf stage used by .
Several fields that received hail damage are beyond this point, with the growing point at soil level or above.

Two different methods exist for assessing damaged fields based on the developmental stage of the crop when it incurred the damage:

- In fields where the corn was at the fifth leaf or smaller, regrowth is expected and yield impacted negligibly. This is true regardless of the amount of defoliation.
- In fields where corn was near or beyond the sixth leaf stage, evaluate injured plants to determine whether the growing point is viable. Make assessments of plant survival

three to five days after the storm so that surviving plants have a chance to recover. If weather is not conducive for plant growth for a prolonged period after the storm, assessing the remaining stand may require waiting up to a week. It may take that long before it is clear which plants will survive and which will not.

Assessing a damaged field requires that the growing point is located and evaluated. Use a sharp knife and cut lengthwise down the stem in order to cross-section the stem. Assess the viability of the growing point; it should have a white to cream color. Plants with a healthy growing point should survive, especially if the growing point lies below the soil surface.

Be cautious about two issues unique to 2008:

Soil crusting, soil temperature variations and planting depth variability resulted in uneven emergence and variable early season growth across many fields. If this is the case in a damaged field, then perhaps not all plants are at the same stage of development.

Plant heights this year appear short relative to what we expect for a certain developmental stage. This is due to condensed internode lengths likely caused by the cool spring conditions we have experienced.

Many agronomists are finding that although plants have heights similar to two- or three-leaf plants, they are actually at four- or five-leaf. Therefore, height may be deceiving and not an accurate representation of plant viability.

Nodal roots form approximately one inch below the soil surface when planting depths are greater than 1.5 inches and soil conditions are normal. The coleoptile, nodal roots and growing point all emerge from the same node. The location of the nodal roots, and root structure in general, may vary from normal this year because of abnormal planting conditions. Situations experienced in 2008 are:

1) Wet planting conditions prompted some producers to plant shallower which may have placed the nodal roots and growing point higher.

2) If conditions were wet at planting (many producers were trying to plant between rain events), seed furrows may have reopened once soils dried.

3) Moderate to severe rain events have compacted soils and/or caused soil erosion, thereby creating shallow nodal root systems even if planted at a normal seeding depth.

Each of these three scenarios will cause the plants to form nodal roots closer to the surface than normal. If this happened, the growing point on very young plants may lie close to the soil surface and have experienced hail damage.

Grain yield of young plants (less than sixth-leaf) injured by hail is negligible if their growing points remain healthy. Certainly, leaf defoliation or the loss of entire leaves will

slow growth rates, but this leaf loss will not significantly impact yield. Plants with unhealthy growing points will die, and therefore reduce the plant population of that field. Grain yield losses will result.

Information in Figures 1 and 2 is from the United States Department of Agriculture (USDA) and the Federal Crop Insurance Corporation (FCIC) and identifies expected yield reductions based on surviving population (Figure 1) or percent of leaf area destroyed (Figure 2).

Figure 1 displays the estimated yield loss associated with two different starting populations (what existed before the damage occurred). Data represented by the squares, show yield reductions with an initial population of 28,000 plants per acre. Data represented by triangles show yield reductions with an initial population of 32,000 plants per acre. It is clear that small reductions in plant survival do not impact yields severely.

For example, in both original populations a reduction of 10,000 plants per acre reduced yield by less than 20 percent Therefore, it is not a 1:1 relationship, neighboring plants are able to compensate (to a degree) for non-surviving neighbors.

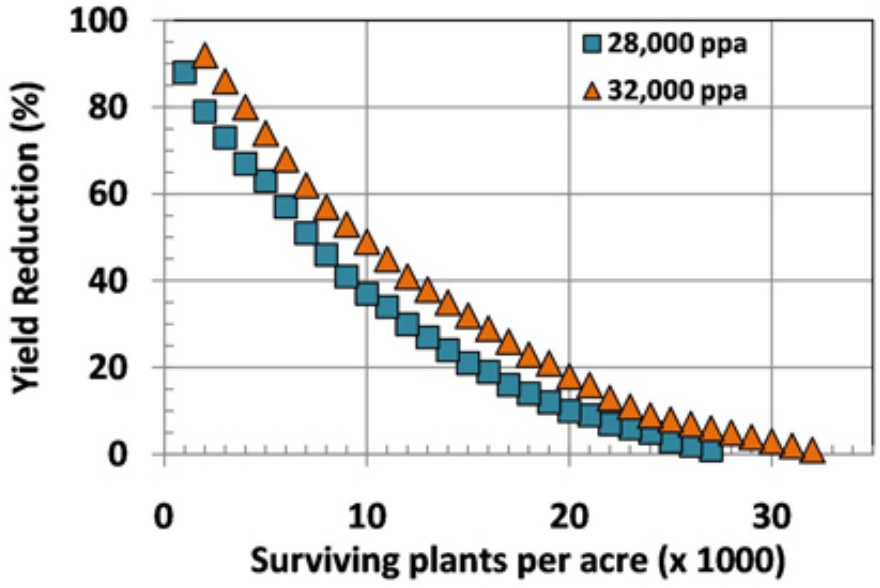


Figure 1. Plant survival and the impact of stand reductions on grain yield for original stands of 28,000 and 32,000 plants per acre (ppa). Adapted from USDA and FCIC, 2005.

Leaf defoliation from hail will not affect plants if they are less than the sixth leaf stage. Plants with six leaves or greater will experience yield losses depending on the extent of the defoliation. For example, 75 percent leaf defoliation of sixth- and seventh-leaf plants will result in 5 and 6 percent yield losses, respectively (Figure 2). Leaf losses less than 40 percent do not affect corn yields if they occur at these early-growth stages.

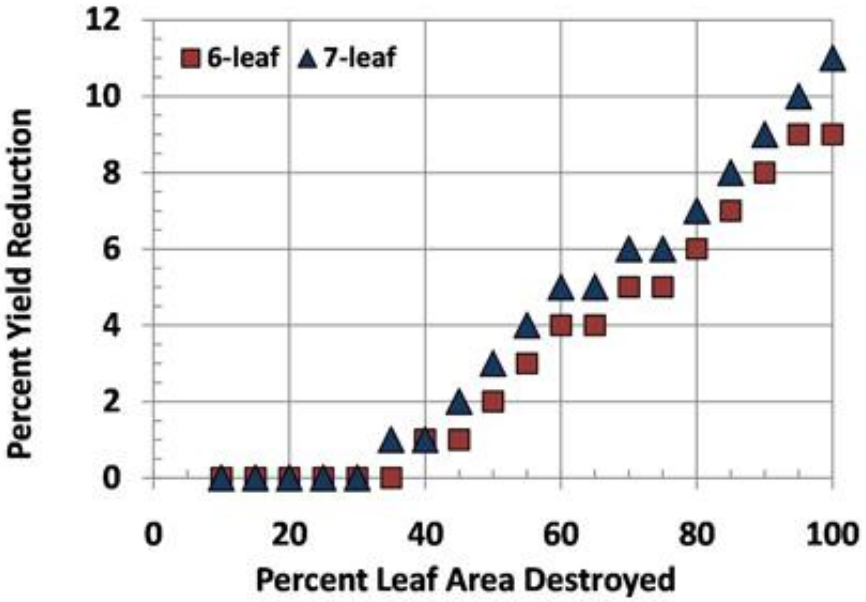


Figure 2. Percent leaf area destroyed and the impact on grain yield for plants at the sixth- or seventh- leaf stage. Adapted from USDA and FCIC, 2005.

Fields with corn less than the sixth-leaf stage and fields with sixth- or seventh-leaf corn that has less than 40 percent leaf area destroyed are expected to recover with little yield loss. Evaluate fields that are outside of either of these two parameters and assess expected yield reductions.

Remember that the key to responding to hail is to assess plant viability thoroughly once the plants have had a good chance to recover. Contact your crop insurance company before destroying the crop or replanting.

More photos are available in the Image Gallery on the ISU Extension Corn Production web site.

Roger Elmore is professor of agronomy with research and extension responsibilities in corn production. Lori Abendroth is an agronomy specialist with research and extension responsibilities in corn production.

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