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Rain, Hail, Wind: What Next?

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Frequent and heavy rainfall in recent days has caused record and near-record flooding of rivers, creeks, and streams throughout much of Indiana. Large ponded areas exist in fields distant from floodwaters. The rains have often been accompanied by damaging winds and hail that have caused additional damage to the state's corn, soybean, and wheat crops. The consequences to grain yield and quality from the damage caused by the flooding/ponding and wind are difficult to pinpoint with much accuracy because little research exists that addresses these chance-occurring yield-limiting factors. Risks and expectations, however, can be outlined.

- Rules of thumb suggest that corn and soybean crops inundated by standing water may only survive a few days with the 90-degree temperatures that have been prevalent during this epic rainfall episode. Oxygen deprivation quickly results in significant deterioration and death of above- and below-ground plant tissue.
- Further physical crop damage (soil erosion, washing away of plants, lodging of plants, and plant tissue damage) occurs from the force of the flowing water on land adjacent to flooded creeks and rivers as well as from any debris caught up in the floodwaters.
- Severe lodging of wheat yet unharvested will result in yield loss due to mechanical harvesting difficulties and/or reduction in grain quality due to weathering and sprouting of grain (Lipps et al. 2003). The quality of wheat straw harvested from these ponded areas will also be lower.
- Deposits of sediment and crop residues often remain on crop plants once the water recedes that either outright smother any surviving plants or greatly reduce their ability to capture sunlight and photosynthesize carbohydrates.
- Mud and crud that cakes the leaves and stalks encourage subsequent development of fungal and bacterial diseases in damaged plant tissue. When Deer Creek (Carroll County) flooded severely in August of 1998, adjacent fields of corn that were in the initial stages of pollination subsequently developed severe bacterial ear rots following inundation by flood waters at or above the ear level of the plants (Nielsen & Ruhl, 1998).
- Crops that survive less severe bouts of ponding and saturated soils will nonetheless suffer significant damage to their root systems. The immediate effects will be stunting of plant development. In the longer term, root systems compromised by ponding and saturated soils now will be less able to sustain the crops IF drought conditions would develop later in the growing season.

- For corn, damage to its root system now will predispose the crop to the development of root and stalk rots later by virtue of the photosynthetic stress imposed by the limited root system during the important grain filling period following pollination. Monitor affected fields later in August for the possible development of stalk rots and modify harvest-timing strategies accordingly.
- Loss of soil nitrate nitrogen in saturated soils due to denitrification or leaching processes is undoubtedly occurring at significant rates. Estimates of nitrate-N loss due to waterlogged soil conditions are at least five percent per day given the current warm soil temperatures (Hoeft, 2002). Many cornfields in the affected area are still in their rapid growth phase prior to pollination when nitrogen uptake rates are at their peak. Consequently, some of these fields currently enduring soggy soil conditions may ultimately develop nitrogen deficiency symptoms without additional fertilizer applications. Where estimated nitrogen loss is significant (60 lbs or greater) in fields not yet tasseling and yield potential is still reasonable, corn may respond to an additional 50 – 80 lbs of applied fertilizer N up to or shortly after tasseling (Hoeft, 2001).
- Assessing the effects of hail damage to corn can be challenging. Important factors include the amount of defoliation and stalk bruising caused by the hail stones relative to the growth stage of the crop. While hail damage can result in severe yield losses in corn, most of the time the human eye perceives greater damage than truly exists. Browse the two references listed below (Nielsen, 2001; Vorst, 1993) on hail damage assessment for more information.
- Wind damage to corn has occurred either as stalk breakage (aka "green snap") or root lodging (plants uprooted and laying nearly flat to the ground). The yield effect of "green snap" damage depends on the percentage of field affected and whether the stalk breakage occurs above or below the ear, but is usually serious regardless. Obviously, stalk breakage below the ear results in zero yield for that plant. Stalk breakage above the ear results in significant yield loss due to the loss of upper canopy photosynthesis capacity for that plant. Root lodged corn will recover or straighten up to varying degrees depending on the growth stage of the crop. Generally, younger corn has a greater ability to straighten up with minimal "goose-necking" than older corn. Yield effects of root lodging depend on whether soil moisture remains adequate for root regeneration, the severity of root damage due to the uprooting nature of root lodging, and the degree of "goose-necking" that develops and its effect on the harvestability of the crop.

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