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Behind the Proverbial Eight Ball

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"Behind the Eight Ball": A term, referring to the game of pool, meaning in an unfavorable or uncomfortable position.

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This year's corn crop in Indiana is certainly "behind the eight ball" relative to the potential for high grain yield. This year's struggles are particularly frustrating for growers who harvested record high yields last year following a growing season where the crop was "ahead of the curve" almost the entire game. In contrast to last year's almost perfect growing season, the 2005 season has misfired to date in a number of ways. As is usually the case, perfect weather from here to the finish line would help mitigate some of the damage, but certainly not all.

The corn crop condition ratings by USDA – National Agricultural Statistics Service reflect the accumulated effects of these stresses. The percent of the state's corn crop currently (7/17/05) estimated to be good to excellent is only 39% (USDA-NASS, 2005). Based on the historical relationship between July crop condition ratings and yield, the potential statewide yield could be as much as 10% less than the historical trend yield of 146 bu/ac. Contrast this potentially low yield estimate with the record yields achieved in 2004 (16% above trend) and it's no surprise why the outlook in many local coffee shops is gloomy.

Major Stresses in 2005.

Germination, Emergence, and Stand Establishment. Fields throughout eastern and southern Indiana planted in mid-April suffered the consequences of a significant cold snap and crusting rains that occurred prior to emergence of the crop. Toss in some seedling blight and bird damage for good measure and stand establishment was pathetic in a number of fields.

The number of replanted acres consequently reported by many seed companies was cited as being the highest in recent years. A further complicating factor for some fields was a shallow compacted soil layer resulting from spring tillage that eventually restricted rooting depth of the corn crop and increased its eventual vulnerability to drought stress.

Increasing Drought Stress. Though not as serious as reported in Illinois, soil moisture deficits began to develop early in some areas of Indiana and continue today to varying degrees, resulting in a dramatic "rags to riches" contrast from one field to another. Fields of corn also suffering from the root limiting effects of severe soil compaction or feeding damage from western corn rootworm (WCRW) larvae (Obermeyer et al. 2005b) are obviously even more vulnerable to the effects of drought stress.

Some of the drought-stressed fields I've walked in recent weeks are as bad as I've seen since the "Great Drought of 1988". Yet, I've seen other fields and talked with some growers who feel that 200 bu/ac is a realistic yield potential simply because they have received more rainfall at critical junctures of the season.

The effects of severe drought stress to date include a likely reduced ear size potential heading into pollination, possible delays in silk emergence during pollination, and smaller size and poorer health of the effective "photosynthetic factory". Continued drought stress early in the grain filling period can easily cause significant kernel abortion, especially in the tips of the ears. Temperatures in the lower 90's are not terribly stressful to the corn crop in and of themselves, but clearly aggravate the effects of soil moisture deficits on the health of the crop.

Warm Night Temperatures. The two main physiological processes that work in concert to "build" the "factory" and eventually produce grain are photosynthesis and respiration. The former captures solar energy and converts it to chemical energy; which is then used to convert absorbed carbon dioxide to simple sugars in the leaves.

In contrast to photosynthesis, respiration catabolizes (breaks down) some of the simple sugars produced by photosynthesis to create the chemical energy it requires to then convert the remainder of the simple sugars to more complex carbohydrates. This catabolism also produces carbon dioxide, some of which is lost through the leaf stomata.

Excessively warm nights greatly increase the rate of respiration and are sometimes thought to be detrimental to overall dry matter accumulation in the corn crop because of a possible reduction in net carbohydrate accumulation. While often talked about, there is surprisingly little published research to support the importance of this stress factor in corn.

Recent Spate of Cloudy Days. I've often thought that one of the most frequent limiting factors to high yields in the eastern Corn Belt is the typically high number of excessively cloudy or simply hazy days during mid- to late summer. The remnants of Hurricane Dennis brought welcome wet relief to some Indiana cornfields, but also blanketed the Hoosier State with nearly a week of excessively cloudy days.

Relative to the solar radiation measured on 19 July (a day with few clouds and moderate humidity) at the Purdue Agronomy Research Center near W. Lafayette, the average solar "load" received from 11 – 16 July was only about half and ranged from 35% to 61% on a daily basis (PAAWS, 2005). Such decreased levels of available solar radiation significantly reduce the rate of photosynthesis. The question is whether the reduction in photosynthesis was great enough to influence the success of pollination or the survival of newly fertilized kernel embryos in fields that were at these stages of development during the cloudy weather.

Lesser or Yet To Be Determined Stresses.

Severe Drought Stress. Corn fields in drought-stricken areas that have not received significant rainfall from recent storm systems will continue to struggle, especially if the high temperatures forecast for the next week indeed occur. Fields yet to pollinate will continue to be vulnerable to severe drought stress effects. Assuming that pollination was moderately successful in earlier planted fields, the risk of significant kernel abortion is high during first two weeks after end of pollination. Soil moisture deficits that continue to linger well into the grain filling period increase the risk of overall lower kernel dry weight and lower yield.

Silk Clipping by WCRW Beetles. Scattered reports of aggressive silk clipping in some fields can obviously interfere significantly with the success of pollination. Early planted fields by and large are finished with pollination, so are not at risk any longer. Later planted fields, including those replanted at late dates, should continue to be monitored for severity and timing of silk clipping insects (Obermeyer et al. 2005a).

Leaf Diseases. The remnants of Hurricane Dennis not only brought welcome precipitation to some areas of the state, but also foggy, misty, and otherwise high humidity weather that can be conducive for the development of a number of corn leaf diseases. For some growers, memories of last year's incidence of northern corn leaf blight are still painfully fresh. Few reports have yet been received on this yet, but the "time is ripe".

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