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Blue Skies... Not Smiling on Me

R.L. (Bob) Nielsen
Agronomy Dept., Purdue Univ.
West Lafayette, IN 47907-2054
Email address: rnielsen at purdue.edu

The lyrics of that well-known Irving Berlin song have been a favorite selection on the well-worn jukebox down at the Chat ‘n Chew Café in recent weeks as farmers yearn for a return to sunshine and warmth to rejuvenate the appearance of their water-logged corn fields. The seemingly incessant occurrence of depressingly cloudy days seems to add insult to injury as crops already stunted by saturated soils and nitrogen deficiency struggle to recover.

How much damage can these cloudy days cause to a corn crop? The primary effect of cloudy days is obviously the reduction in solar radiation levels and the subsequent reduction of photosynthetic rates by the plants. For crops that are struggling to recover from severe stress or damage, a reduction in available photosynthate slows the recovery process and possibly "tips the scales" in favor of unrecoverable yield loss due to stunted growth or plant death.

For otherwise healthy crops, restricted photosynthate supply caused by cloudy weather prior to pollination results in smaller plants, but likely does not affect ovule development (ear size determination) very much. However, the "snowball" effect of smaller plants later during pollination and grain fill is that kernel abortion may increase and kernel weight may decrease if the smaller plants cannot produce adequate amounts of photosynthate.

Restricted photosynthate supply caused by cloudy weather during pollination may interfere with the synchrony of silk emergence and pollen shed, resulting in noticeable numbers of non-fertilized ovules or "blanks" on the cob. One potential sign of asynchronous silk / pollen availability is the presence of longer than expected emerged silks (Nielsen, 2015). Abortion of newly fertilized ovules may also occur when pollination occurs in a string of intensely cloudy days, leaving behind "blanks" that can misinterpreted as due to pollination failure.

Restricted photosynthate supply caused by cloudy weather during the grain fill period can cause abortion of young kernels at the blister (R2) and milk (R3) stages of development or reduction in kernel weight through the remainder of the grain fill period.

Estimates of potential yield loss due to cloudy weather come from studies where plants were shaded artificially at different times and durations. Many of the trials evaluated the effects of treatments of continuous 50% shading for 2 to 4 weeks or longer, which is quite unrealistic from a real world perspective.

Suffice it to say that yield losses can occur, perhaps even significantly, due to a combination of reduced kernel numbers per ear and reduced weight per kernel, both as a consequence of reduced photosynthate availability during pollination and/or grain filling. This is true regardless of the cause of reduced photosynthate availability (cloudiness, drought stress, foliar diseases, nutrient deficiencies).

The magnitude of the shade-induced reductions in yield components obviously depends on the severity of the shading (cloudiness) and the duration, especially relative to number of consecutive days of intensely cloudy weather. While we may think there have been many intensely cloudy days this season, the number of days with solar radiation less than 50% of maximum has been relatively low. For example, at the Davis-Purdue Ag Center in eastern Indiana, there have only been 18 to 20 days with 50% or less of maximum solar radiation from May 1 through July 12 (iClimate.org), with never more than 3 consecutive days of such cloud cover.

Interesting Note: Several studies document a positive relationship between high plant population tolerance of hybrids with higher tolerance to shading. This makes sense from the perspective that one of the consequences of higher plant populations is increased shading of individual plants' leaves.

“*Blue Skies smiling at me, Nothing but Blue Skies do I see* …” (Irving Berlin, 1927).

Related reading

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