Stress, Anthesis—Silk Interval and Corn Yield Potential

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Abstract
Forecast daily high temperatures every day this week hover just below 100 degrees. Across Iowa corn ranges from the 10th leaf stage (V10) to tasseling and silking (VT and R1). As of July 1st, the USDA reports that 16 percent of Iowa's corn was silking; that's nearly 2 weeks ahead of normal. Unfortunately, dry surface and subsoil moisture conditions prevail (see June 26, 2012, Drought Monitor). In the USDA report linked above, 73 percent of Iowa's subsoil moisture was reported as either short or very short compared to 2 percent last year. Crop water use ranged between 0.2 and 0.4 inches per day in central Iowa the last few days (see Soil Moisture Conditions and Crop Water Use, ICM News, for more information on this). With the majority of Iowa's corn pollinating in the next week to 10 days, this combination of events does not lead to optimism among Iowa's corn agronomists.

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Stress, Anthesis - Silk Interval and Corn Yield Potential

By Roger W. Elmore, Department of Agronomy

Forecast daily high temperatures every day this week hover just below 100 degrees. Across Iowa corn ranges from the 10th leaf stage (V10) to tasseling and silking (VT and R1). As of July 1st, the USDA reports that 16 percent of Iowa’s corn was silking; that’s nearly 2 weeks ahead of normal. Unfortunately, dry surface and subsoil moisture conditions prevail (see June 26, 2012, Drought Monitor). In the USDA report linked above, 73 percent of Iowa’s subsoil moisture was reported as either short or very short compared to 2 percent last year. Crop water use ranged between 0.2 and 0.4 inches per day in central Iowa the last few days (see Soil Moisture Conditions and Crop Water Use, ICM News, for more information on this). With the majority of Iowa’s corn pollinating in the next week to 10 days, this combination of events does not lead to optimism among Iowa’s corn agronomists.

The impact of stress on corn depends on the timing of two critical events: pollen shed and silking. In May, I discussed the multiple 2012 planting dates in a Crop Minute, as well as some of the pluses and minuses associated with them. The USDA forecast of above trend-line yields released after planting earlier this year reflected optimism often associated with early planting and higher yields. On average, we often say that earlier planting results in greater yields and later planting results in lower yields (see the April 27th ICM News). Of course, as with any average, these generalities are not always true. Sometimes later planting dates result in the best yields.

Pollen shed and silking

Due to the wide planting window experienced this year, expect a wide window for both pollen shed and silking. No doubt earlier silking in normal years is in part associated with earlier planting, and, in addition, early silking is loosely correlated with higher yields. However, many exceptions to this occur. For example, although we had relatively early silking dates from 2005 to 2007 and again in 2010, silking nearly a week later in 2009 resulted in the highest corn yield in Iowa's history. Our second best yield occurred in 2004, which silked about the same time as those of from 2005 to 2007, and 2010. Early silking this year, if associated with the anticipated stress, will not be associated with maximum yields.

Stress during the pollination and silking period often reduces yield potential. Water stress is the worst stress factor although high temperatures, defoliation – from hail, insects, etc. - and extremely high plant populations, among others, reduce yield during this critical time especially when coupled with drought stress. During flowering, plants use more water (0.35 to 0.40 inches per day) than at any other time. This is in part because silks have the highest water content among all parts of the corn plant.
Anthesis – silk interval: An indicator of stress

One of the best indicators of how plants respond to stress during flowering is the Anthesis – Silk Interval, ASI. This measures the time in days between pollen shed and silk emergence. We also are concerned about ‘nick,’ referring to the overlap of these two critical developmental stages. The ASI for older hybrids in good condition might have been 2 to 3 days with a range up to a week or more. Corn breeders over the last 5 to 6 decades worked toward developing hybrids that shed pollen and silk at nearly the same time. They have succeeded. With some modern hybrids, silks actually emerge before pollen shed even begins.

These reductions in ASI over the decades helped stabilize modern corn yields in stressed environments. In situations where water is limited, silk emergence and elongation slows. Pollen shed remains constant or accelerates. In older hybrids, water stress often resulted in a loss of nick; thus when silks emerged, there was no pollen source. Barren plants or ears with fewer kernels per ear resulted. By condensing the window of time between tassel and silk emergence, we are more assured of having good pollination with modern hybrids. This is true even if the silks are delayed a couple days or more due to water stress.

Pollen shed occurs over a 5 to 8 day period and silks are viable and receptive to pollen up to 7 to 10 days. Smaller ASI values means a greater chance of successful seed set, increased kernel numbers and increased yield.

The wide planting window this year offers challenges as well as opportunities. Taking note of ASI in your fields will indicate how the crop is faring at flowering. Did pollen shed and silking coincide in near-perfect synchrony, or did stress delay silking and not pollen shed.

In the long-run, the impact of stress conditions during this time will determine yield. On the positive side:

- No major storms are expected this week, so thunderstorms and the associated strong winds that lodge and break plants prior to tasseling, i.e. greensnap, won’t be a problem.
- The wide range of 2012 planting dates means that a portion of the crop will not tassel and silk this week and thus may avoid the threats of an abundance of stress for corn… and everyone associated with it.

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