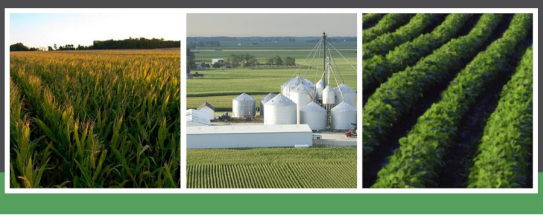

Agronomic Spotlight

High Temperature Effects on Corn Pollination

- Long stretches of high temperatures may affect corn pollination.
- Hot weather can reduce viability, production, and the release of pollen grains.
- Silk viability can be reduced under extreme high temperatures before pollen shed.
- Timing of pollen shed, silking, and hot temperatures play a role in how heat affects the pollination process.

Drought Stress Versus Heat Stress

By itself, hot weather is not believed to severely stress corn pollination when there is adequate soil moisture.[1] It is difficult to separate the effects of drought and heat stress. High-temperature damage to corn often synchronizes with drought stress.

Section Effects of High Temperatures on Silking

Consistent and timely silking is needed to allow for a viable silk and pollen grain to unite. Silk that becomes less receptive to pollen and senesces prior to pollen shed can lead to reduced kernel set in ears. Exposed corn silks can be killed prematurely when humidity is low and temperatures exceed 95° F.[1] Silks generally emerge at a rate of 1 to 1.5 inches per day and continue until fertilized. Hot weather does not greatly slow the rate of silk elongation.[1]

Figure 1. Silk desiccation may happen prematurely when temperatures exceed 95 °F.

Effects of Heat on Pollen

Pollen shed from anthers is called dehiscence and occurs when there is a rise in temperature and a drop in humidity.[2] Typically, pollen shed begins in the early to mid-morning when temperatures are not as extreme with a second 'flush' of pollen shed sometimes occurring in the late afternoon with cooler temperatures. Humidity and temperature conditions can affect dehiscence, and a decrease in pollen shed has been reported when temperatures are greater than 86 °F.[3]

An individual tassel can shed pollen for a week with the majority of dehiscence occurring on the second or third day.[3] Hot temperatures along with dry weather can accelerate pollen shed. Each tassel provides millions of pollen grains producing adequate pollen in most conditions.[3,4] Continuous hot weather occurring a few days before and during pollination can reduce pollen production as photosynthesis may not be efficient and sugar synthesis can be reduced.[2]

Figure 2. High temperatures before and during tasseling can reduce viability before pollen grains are shed by anthers.

New pollen continues to mature from anthers until all anthers have shed pollen from the tassel. Pollen grains have a thin outer membrane and remain viable for 18 to 24 hours in favorable conditions.[4] Viability may be reduced to less than a couple hours during extreme heat.[2] Temperatures of 100 °F or greater cause extreme heat stress that can sometimes desiccate pollen before it can successfully fertilize an ovule or kernel.[3] High temperatures can also reduce viability before pollen grains are shed by anthers.[2]

Summary

Kernel set can be irregular on ears when silk elongation and pollen shed are not synchronized. This is more common when heat stress is accompanied by moisture stress. Pollination can be successful during stretches of high temperatures if adequate moisture is supplied to the plant. Additional conditions that facilitate successful pollination include cooler nighttime temperatures, healthy soil structure, and corn products with close timing between mid-pollen shed and mid-silking date.

Sources

[1]How high temperatures and stress affect corn pollination. Iowa State University. http://www.agronext.iastate.edu.

[2]Hoegemeyer, T. 2011. How extended high heat disrupts corn pollination. University of Nebraska—Lincoln. https://cropwatch.unl.edu.

[3]Nielsen, R.L. 2010. Tassel emergence and pollen shed. Corny News Network. Purdue University Extension.

[4]Thomison, P. Corn pollination—an overview. The Ohio State University. AGF-128-95. Web sources verified 5/26/2016. 150720105714