July 23, 2013

CORN – A TRUE NATIVE AMERICAN

Dr Tom Hoegemeyer, University of Nebraska Professor of Practice shares this information on corn pollination concerns. One interesting point is that early in the development of the ear and the tassel, both are perfect flowers, having both male and female present in the flower. Corn has found some developmental advantage in aborting the male flower in the ear and the female in the tassel. Corn was originally a tropical grass from the high elevation areas of central Mexico about 7,400 feet above sea level, 2,000 feet higher than Denver. Today, corn still prefers conditions typical of that area — warm daytime temperatures and cool nights. Areas that consistently produce high corn yields share some significant characteristics. These areas — central Chile, the west slope of Colorado, etc. — are usually very bright, clear, high light intensity areas with cool nights.

Corn maximizes its growth rate at 86°F. Days with temperatures hotter than that cause stress. In the high yield areas, cool night temperatures — at or below 50°F — reduce respiration rates and preserve plant sugars, which can be used for growth or reproduction, or stored for yield. These are optimum conditions for corn, and interestingly, are fairly typical for areas around central Mexico where corn is native. This year, in the prairie states and in the Cornbelt, conditions have been dramatically less than optimal.

In years when we get high day and nighttime temperatures coinciding with the peak pollination period, we can expect problems. Continual heat exposure before and during pollination worsens the response. Daytime temperatures have consistently stayed in the upper 90s to low 100s. The high humidity, which helps reduce crop water demand, also increases the thermal mass of the air—and provides extra stored heat and insulation at night.

Corn is a "C4 Photosynthesis" plant, making it extremely efficient at capturing light and fixing CO2 into sugars. One drawback of this system is that with high daytime temperatures, the efficiency of photosynthesis decreases, so the plant makes less sugar to use or store. High nighttime temperatures increase the respiration rate of the plant, causing it to use up or waste sugars for growth and development. This results in the plant making less sugar but using up more than it would during cooler temperatures.

Heat, especially combined with lack of water, has devastating effects on silking. If plants are slow to silk, the bulk of the pollen may already be shed and gone. Modern hybrids have vastly improved "ASI" or anthesis-silk interval (the time between mid-pollen shed and mid silk). Regardless, in some dryland fields we see seed set problems because of "nick" problems between pollen and silking. For each kernel of grain to be produced, one silk needs to be fertilized by one pollen grain.

Some stressed areas within irrigated fields can see stress-induced slow silking and resulting seed set issues. Historically, this has been the most important problem leading to yield reduction, particularly in stressful years. Once silks begin to desiccate, they lose their capacity for pollen tube growth and fertilization. Even with adequate moisture and timely silking, heat alone can desiccate silks so that they become non-receptive to pollen. While this is a bigger problem when humidity is low, it is apparent that it is happening this year, especially on hybrids that silk quite early relative to pollen shed. Even with dew points in the 70s, when temperatures reach the high 90s to the100s, the heat can still desiccate silks and reduce silk fertility.

Heat also affects pollen production and viability. First, heat over 95°F depresses pollen production. Continuous heat, over several days before and during pollen-shed, results in only a fraction of normal pollen being formed, probably because of the reduced sugar available. In addition, heat reduces the period of pollen viability to a couple hours (or even less). While there is normally a surplus of pollen (2.4 million grains per tassel, enough to pollinate 300 bu/A corn) heat can reduce the fertility and amount available for fertilization of silks.

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