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How high temps affect corn pollination

With a national record-breaking high in Nebraska last week and predictions for more temperatures in the 90s to 100s next week, talk in the coffeeshop is turning to how this will affect silking and pollination in nearby corn fields. As of Sunday, July 8, Nebraska Agricultural Statistics Service reported that only 7% of the state’s corn crop was in the silking stage. This was slightly ahead of the five-year average of 5% but behind last year at 12%.

As temperatures soar and with tasseling in progress, we should be concerned about pollen viability and silk receptivity. Pollination is a critical period for corn development and yield. The following summarizes information from various sources on how this stress affects corn at this critical stage.

Pollen shed occurs over a two-week period. For kernels to develop, silks must emerge and be fertilized by viable pollen. Silks grow about 1 to 1.5 inches a day and will continue to elongate until fertilized. Temperatures greater than 95°F with low relative humidity will desiccate exposed silks but not impact silk elongation rates greatly. Pollen is killed by temperatures in the mid 90s or greater, especially with low relative humidity. Fortunately, pollen shed usually occurs from early to mid-morning when temperatures are lower.

Drought stress slows silk elongation but accelerates pollen shed. This can result in pollen shed occurring before silk emergence. Any stress such as inadequate water, low soil fertility, or too thick of a planting rate can delay silking two or more weeks and reduce seed set if pollen is not available. This is potentially a major problem although I have not heard of it happening often. The fact that pollen from one plant in ten is sufficient to pollinate a field provides a degree of compensation and improves the opportunity for fertilization in stressful environments.

The bottom line is that high temperatures will not severely stress corn if soil moisture is adequate. Reports of subsoil moisture across the state indicate that levels are varying widely, with some sites reporting their lowest of the growing season and others reporting two to four inches of moisture in the top two feet.

Obviously we don’t have to tell farmers to keep up with irrigation at this time of year. It is one of the best ways to reduce the impacts of high temperatures on corn pollination and fertilization.

Rain-fed fields are more of a concern. Drought stress with high temperatures at pollination and silking can have serious effects. If the current dry-hot conditions continue, I would expect to see major differences among fields based on management practices and hybrids. Practices that conserved soil moisture this spring or last year such as no-till or reduced till will improve a crop’s performance during drought. Early-season hybrids probably will do better than other hybrids if pollination occurred before temperatures soared or moisture reserves were depleted. Full-season hybrids with good stress tolerance may do better than others with less stress tolerance.

Roger Elmore
Extension Crops Specialist
Kent Been, Extension Educator in Red Willow County: Corn is looking relatively good, although ecofallow and dryland corn is beginning to show some stress. The recent surge in heat units has spurred corn growth.

Gary Hall, Extension Educator in Phelps and Gosper counties: Extreme heat has stressed crops. Producers are irrigating corn, but most soybean producers have delayed irrigation until proper growth stage. Painted lady butterflies are numerous and many producers are fearing what the resulting thistle caterpillar might do to the soybean crop.

Karen DeBoer, Extension Educator in Cheyenne County: Wheat harvest is underway in southeastern Cheyenne County. Test cutting is occurring in other parts of the county and should continue if conditions remain favorable. We’ve had scattered hail damage that will affect yields and hot, dry conditions that will affect test weight. The wheat is in varying stages of development so we expect harvest will be prolonged. Dryland crops such as corn and proso millet are showing signs of heat and moisture stress and need rain. Most no-till dryland crops, such as sunflowers, look good.

Ralph Anderson, Extension Educator in Buffalo County: Buffalo County looks like the “Butterfly Haven” this week with sulfurs in the hay, painted ladies and red admirals in soybeans and thistles and western bean in corn.

Most of Buffalo County needs moisture. While we had some good early pasture growth, it’s over. We’ll soon need either a change in the rain pattern or a source of summer forage.

Two weeks ago, the corn appeared to be way behind last year. What a difference two weeks of hot days and warm nights have made. Now it looks to be just three to four days behind. The heat will become a concern by the weekend when we expect pollination to begin.

Duane Lieneman, Extension Educator in Webster County: We are seeing similar signs to last year’s drought. Crops and pastures are going downhill fast and I’ve never seen as many caterpillars as we’ve had this year. Several soybean fields have been infested to threshold with as many as four varieties. Thistle, yellow wollybears, and white-lined sphinx caterpillars are causing the most problems. We are seeing western bean cutworm moths in corn. There is an abundance of alfalfa and painted lady butterflies in alfalfa and soybean. Dryland crops are starting to show stress. Wheat producers are reporting below average yield, test weight and protein level with lots of shrunken berries. Alfalfa is not coming back like normal after the second cutting. Some farmers are beginning to call in about skips or bare spots in grain sorghum.

Bob Wright, Extension Entomologist at the South Central REC: Small thistle caterpillars are being reported in south central Nebraska soybeans, which probably indicates the start of another generation. Painted lady butterflies may lay eggs directly on soybeans, or on broad leaf weeds within the crop. See the article by Tom Hunt on assessing defoliation and treatment guidelines in last week’s Crop Watch.

Both wooly bear and alfalfa caterpillars will go through at least one more generation this summer and may feed on soybeans. Continued scouting is needed to determine the need for treatment in individual fields. Western bean cutworm moth flight has been relatively light in south central Nebraska, but fields should be scouted for egg masses, as described in the last Crop Watch, to determine the need to treat.
Rain quite welcome, but soil moisture still lacking

Substantial rainfall was observed across a broad area of western and north central Nebraska July 4-10. The heaviest rainfall was reported north of the Platte River, with precipitation generally ranging from 2 to 4 inches across the northern Panhandle through most of the Sandhills.

Rainfall did occur south of the Platte River, with the heaviest levels in a small area from Hastings though Grand Island and from Fairbury east through Nebraska City. Preliminary rainfall totals for the seven-day period ranged from 0.75 to 1.25 inches within these areas. Otherwise, most rainfall rates were between 0.25 to 0.75 inches.

Unfortunately, the driest sections of the state (southwest and south central Nebraska) failed to receive enough precipitation to reduce our concern for drought in that area. This week’s national Drought Monitor will not show a change in the current drought area in Nebraska, but some of the area north of the Platte River shown as abnormally dry will be reduced.

The recent storm activity is the result of a combination of monsoonal moisture and a slight retrogression of the massive upper air ridge that was situated over Texas and Oklahoma.

If the numerical models are correct, temperatures across Nebraska should begin to inch toward the century mark by early next week. The greatest likelihood of 100°F or greater readings should be over Nebraska. If this forecast proves true, atmospheric temperatures will probably be too warm for widespread rainfall.

It’s too early to tell whether Nebraska will see a repeat of the extreme heat recorded across southwestern Nebraska July 4-8. McCook had a high temperature of 111°F during this five-day period. If abundant rains fail to materialize through this weekend, crop stress will reappear rapidly next week.

Soil moisture monitoring sites south of the Platte River have seen a significant erosion of stored moisture during the last 30 days. Currently, all monitoring sites in this region are either at or within 2 inches of their lowest moisture levels of the year. If hot dry conditions return next week, most of the benefits of the fall and spring recharge season will have been eliminated.

Models indicate that by July 18, virtually all of the state’s corn crop should be in the silking stage. Above normal temperatures are likely during this period and sufficient moisture will be critical to limiting plant stress. If enough moisture falls prior to the return of the high temperatures, canopy moisture levels may be high enough to minimize excessive drying of silks.

Adjust alfalfa cutting for the heat

With the recent extreme temperatures, alfalfa plants are suffering. Growth rates decrease and moisture stress is common, even in moist soil. Growers attempting to produce high-quality hay also will have a problem if temperatures don’t cool down enough at night. High nighttime temperatures cause high metabolic rates in alfalfa, burning off valuable nutrients that the plants had accumulated during the day. This often produces alfalfa hay with fine stems that contain high protein, as well as high fiber and low relative feed value. It is nearly impossible to make dairy hay under these conditions.

Another problem is the rate at which alfalfa plants mature. When it’s hot, alfalfa may begin to bloom in less than four weeks. Since many growers use blooming as a signal to harvest, this early blooming can be misleading. During hot weather alfalfa plants need more time not less time to rebuild nutrient reserves in their roots because they burn off nutrients instead of moving them to the roots when it is hot. Often five to six weeks of regrowth is needed.

Growers also may need to adjust the time of day when hay is cut. As long as hay stays above 50% moisture, plant cells will continue to respire, burning away valuable nutrients. Cutting hay late in the day forces plant cells to respire all night long, losing yield and quality. Instead, it may be wiser to cut in the morning on good drying days if plant cells can be stabilized before nightfall.

Bruce Anderson
Extension Forage Specialist

Crop production field day July 20

Field demonstrations and presentations on farmer-identified topics will be the focus of this year’s UNL Crop Production Field Day. The free program will be 9 a.m. to 1:30 p.m. July 20 at the NU Agricultural Research and Development Center near Mead.

“Quick-hitter” topics will include:

- Anhydrous ammonia properties and timing;
- No-till weed management and glyphosate brand comparisons;
- Impact of plant spacing uniformity on corn yield;
- Management strategies for cutworms, wireworms, and white grubs;
- Early season diseases in corn and soybeans; and
- Update on early planted soybean and corn project.

The field day provides an opportunity for producers to view various crop production systems and ask questions regarding their use and management. CEU credits are not available.

For more information, contact the ARDC at (402) 624-8030.
Low test weights, price discounts typical of early harvested winter wheat

In southwest Nebraska the wheat harvested to date is showing below normal test weights. In southeast Nebraska where seasonal rains were timely, test weights were somewhat better.

Southwest Nebraska

Most test weights have been in the 52 to 58 pounds per bushel range. Only a few have been 60 or above, the weight needed to meet the minimum grade standard for U.S. No. 1. The grade requirements for winter wheat test weight are as follows:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Test weight (lbs/bushel)</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S. No. 1</td>
<td>60</td>
</tr>
<tr>
<td>U.S. No. 2</td>
<td>58</td>
</tr>
<tr>
<td>U.S. No. 3</td>
<td>56</td>
</tr>
<tr>
<td>U.S. No. 4</td>
<td>54</td>
</tr>
<tr>
<td>U.S. No. 5</td>
<td>51</td>
</tr>
<tr>
<td>U.S. Sample Grade is less than 51</td>
<td></td>
</tr>
</tbody>
</table>

This year’s lower test weights are a result of unfavorable conditions during grain fill. High temperatures (above 85°F), especially when accompanied by winds, shortage of soil moisture and foliar disease such as stripe rust causes shriveled kernels which lowered test weights.

In addition to the low test weights being graded lower and discounted at the elevator (see box), they will likely affect seed quality. Large, dense kernels are considered better quality for seeding. Large seed tends to tiller more than small seed. Seed quality is also affected by the protein content of the seed. The amount of protein in the seed is very important to early seedling vigor. This is not protein percentage and a large seed may indeed have a lower percentage than a small shriveled seed, but it will have more total protein in each seed.

Test weight is a bulk density or a weight per volume measurement and since small seed can pack well, it may have a high test weight. Therefore, test weight is not the best measure of seed quality. A better measure of seed quality is thousand kernel weight or seeds per pound. For many varieties 15,200 seeds per pound is used as a minimum for good quality seed. If test weight is used as a measure for seed quality, use seed with test weights above 57 pounds per bushel.

Seed cleaning will usually add one to two pounds per bushel by removing straw, chaff, weed seeds, small kernels, etc. to the test weight. It is always advisable to plant the largest seed available for a particular variety.

Bob Klein, Extension Cropping Systems Specialist, West Central REC

Discounts add up quickly

<table>
<thead>
<tr>
<th>Test weight (lbs/bushel)</th>
<th>Discount (Price/bushel)</th>
</tr>
</thead>
<tbody>
<tr>
<td>59-59.9</td>
<td>1 cent</td>
</tr>
<tr>
<td>58-58.9</td>
<td>2 cents</td>
</tr>
<tr>
<td>57-57.9</td>
<td>4 cents</td>
</tr>
<tr>
<td>56-56.9</td>
<td>7 cents</td>
</tr>
<tr>
<td>55-55.9</td>
<td>11 cents</td>
</tr>
<tr>
<td>54-54.9</td>
<td>17 cents</td>
</tr>
<tr>
<td>53-53.9</td>
<td>23 cents</td>
</tr>
<tr>
<td>52-52.9</td>
<td>29 cents</td>
</tr>
<tr>
<td>51-51.9</td>
<td>36 cents</td>
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<td>50-50.9</td>
<td>43 cents</td>
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<td>50 cents</td>
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<tr>
<td>48-48.9</td>
<td>57 cents</td>
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<tr>
<td>47-47.9</td>
<td>64 cents</td>
</tr>
<tr>
<td>46-46.9</td>
<td>71 cents</td>
</tr>
<tr>
<td>45-45.9</td>
<td>78 cents</td>
</tr>
</tbody>
</table>

Southeast Nebraska

Wheat harvest in Saline County was excellent. It was typical to hear about yields of 38 to 60 bu/acre with test weights 60 to 62 lbs per bushel with an average of 61. By July 10, the harvest was 85% complete. Residual weed control was important in many fields this year due to the early spring weather.

Randy Pryor, Extension Educator in Saline County

The wheat crop was thin because of winterkill, but yields were average or a little above. Most producers reported yields of 40-45 bushels per acre. Test weights were 59-61 pounds per bushel.

Producers harvesting wheat are having a few problems with weedy fields due to thin stands and now more chinch bugs than normal moving into adjacent milo and corn fields.

Paul Hay, Extension Educator in Gage County
Plan control for next year or initiate adult control

Scout for corn rootworm beetles

Western corn rootworm beetles began emerging in early July in southeastern and south central Nebraska. Beetle emergence will be somewhat later in northeastern and western Nebraska. Although rootworm populations may be down somewhat compared with last year due to winter weather, areas with economic populations of rootworm last year will likely have economic levels this year.

Beetles emerging before silk emergence may feed on corn leaves. They feed by scraping the surface tissue, leaving a white parchment-like appearance. Once silks emerge this is the favored food. The earliest silking fields in an area often are most heavily damaged because beetles will move around in search of green silks. There are no thresholds for silk-clipping damage based on beetle numbers because damage levels are not correlated well with beetle densities. Usually an average of at least 10 beetles per ear are required to seriously affect pollination. Severe silk feeding at 25-50% pollen shed may indicate the need to apply an insecticide, especially in seed production fields. Visit the NU Department of Entomology web site at http://entomology.unl.edu/instabls/crwadult.htm for a list of insecticides labeled for adult rootworm control.

During late July and August these beetles will lay eggs in corn fields. These eggs overwinter in the soil, hatch into rootworms in the spring, and feed on corn roots if continuous corn is grown. However, not all continuous corn fields have economic infestations of corn rootworms. Weekly scouting of adult rootworm beetles in July and August will provide the information needed to decide whether a rootworm insecticide is needed next year. People using adult beetle control programs should base the decision to treat and spray timing on information from field scouting.

Begin scouting for corn rootworm beetles soon after beetle emergence begins and continue scouting weekly until threshold levels are exceeded or beetle activity stops. Examine 50 plants per field, taking samples from each quarter of the field. Sampled plants should be several paces apart, so that examining one plant doesn’t drive beetles off of the next plant to be sampled. The most reliable method is to examine the whole plant for beetles. Beetles may hide behind leaf sheaths or in the silks, so care is required to observe all beetles present. An alternative method is to check for beetles only in the ear zone (the area including the upper surface of the leaf below the primary ear and the under surface of the leaf above the primary ear).

Average number of western corn rootworm beetles present in cornfields that may produce an economically damaging rootworm population in corn the following year.

<table>
<thead>
<tr>
<th>Plants per acre</th>
<th>Average number of rootworm beetles</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Continuous corn¹</td>
</tr>
<tr>
<td>Per plant</td>
<td>Per ear zone</td>
</tr>
<tr>
<td>14,000</td>
<td>1.28</td>
</tr>
<tr>
<td>16,000</td>
<td>1.12</td>
</tr>
<tr>
<td>18,000</td>
<td>1.00</td>
</tr>
<tr>
<td>20,000</td>
<td>0.90</td>
</tr>
<tr>
<td>22,000</td>
<td>0.81</td>
</tr>
<tr>
<td>24,000</td>
<td>0.75</td>
</tr>
<tr>
<td>26,000</td>
<td>0.69</td>
</tr>
<tr>
<td>28,000</td>
<td>0.64</td>
</tr>
<tr>
<td>30,000</td>
<td>0.60</td>
</tr>
<tr>
<td>32,000</td>
<td>0.56</td>
</tr>
</tbody>
</table>

¹Based on a 50:50 ratio of females to males.
²Based on a 70:30 ratio of females to males.
³Use this threshold for continuous corn fields that did not have larval populations earlier in the season (adult beetles are immigrants, similar to first year corn).

In continuous corn if beetle counts exceed 0.75 beetle per plant, damaging populations of corn rootworms are possible in that field next year. In first year corn, there is a higher proportion of female beetles, so the threshold is lowered to 0.56 beetle per plant. These thresholds are based on a 24,000 plant population per acre. The number of beetles per plant to equal a threshold level should be adjusted for different plant populations (see table or NebGuide G86-774, Western Corn Rootworm Soil Insecticide Treatment Decisions Based on Beetle Numbers). People scouting using the ear zone method should divide the above thresholds in half, since on average only 50% of the beetles on a plant are counted using this method.

In fields with insect levels over...
Rootworm
(Continued from page 155)

the threshold, consider rotating out of corn or plan to use an insecticide at planting or cultivation to prevent economic damage. Fields remaining below the threshold level do not need to be treated with a rootworm insecticide next year.

Individuals using adult beetle control programs should begin treatments when the beetle threshold is exceeded and 10% of the female beetles are gravid (abdomen visibly distended with eggs). This is an important point since the first beetles to emerge are mostly male, and females require at least 10-14 days of feeding before they can lay eggs. Treatments applied too early may be ineffective if large numbers of females emerge after the residual effectiveness of the treatment has dissipated. Continue to monitor fields weekly after treatment for rootworm beetles. If beetle numbers exceed 0.5 beetles per plant, retreatment is warranted. Late maturing fields are particularly susceptible to corn rootworms moving into them from nearby earlier maturing fields.

A complete discussion of adult corn rootworm management can be found in NU Miscellaneous Publication 63, *Adult Corn Rootworm Management*, by UNL Entomologist Lance Meinke.

Be aware that reduced adult rootworm control with foliar insecticides due to insecticide resistance has been documented in parts of south central Nebraska (see NebFact 99-367, *Adult Western Corn Rootworm Insecticide Resistant in Nebraska*). If you experience poor control with repeated applications of foliar insecticides, and high numbers of beetles are still present, it may be better to consider rotating that field out of corn next year rather than continuing to treat for beetles.

Bob Wright, Extension Entomologist, South Central REC

Nelson coordinates NU variety testing

*This is the fifth in a series of stories on the research pursuits of our contributing authors. Most NU Extension specialists also have major appointments in the NU Institute of Agriculture and Natural Resources’ Research Division.*

Lenis Nelson has coordinated NU’s crop variety testing program since 1988. Prior to that, he was the proso millet breeder at the Panhandle Research and Extension Center for nearly 18 years. During that time, he was involved with the variety tests of winter wheat, corn, and grain sorghum as well many other crops.

Nelson is an Extension crop variety and seed production specialist and a professor in the NU Department of Agronomy. He received his B.S. in agricultural education from South Dakota State University, and his M.S. and Ph.D. degrees in agronomy from North Dakota State University.

Variety tests are conducted across the state with agronomists at the district Research and Extension Centers. Corn is tested at 30 locations with some irrigated, some dryland, and some no-till sites. Fewer than 10 of these are on University land, the rest are on farmers fields. Extension educators help identify local cooperators and fields that would be representative of most of the county.

Soybean variety tests are conducted primarily in eastern Nebraska. As the soybean acres increased in western Nebraska, locations were added in Custer, Perkins, and Brown counties. These tests have made a huge shift from conventional to Roundup Ready.

Winter wheat tests are mostly in western Nebraska. There are two tests in southeast Nebraska, two in south central Nebraska, five in west central Nebraska and 10 in the Panhandle and eastern Wyoming. Only two are irrigated; the others are planted into the predominant tillage system of a given area.

“The Extension goal of the variety testing program is to provide accurate and unbiased data which compares the yield and performance of seed from all sources, Nelson said. “We gather this data from a sample of soil and climatic conditions. Our research goals are to relate the plant and environmental characteristics to allow us to more quickly and accurately place the proper varieties where they are best adapted.”

“Research on alternate crops has been a considerable challenge,” he said. “In times of low prices, there is an interest in new and totally different crops which can return greater profit. A number of factors work against this process:

1) The new crop has a hard time competing with traditional corn, wheat and soybean.

2) There is a learning curve for successful cultivation of any crop.

3) Producers will need to find markets for the new crop and competition is likely to be high.

4) There is a limited market for each new product.

5) A new crop usually requires a high level of labor and management.”

“Recently more of the alternate crop emphasis has been on specialty products from crops already well known in the area. This may include food grade soybean and corn. These require planting special seed, taking special care of the crop through the growing season, and harvesting and storing with greater emphasis on maintaining quality.”

Dr. Nelson can be reached at 342 Keim Hall, Department of Agronomy and Horticulture, University of Nebraska-Lincoln, P. O. Box 830953, Lincoln, NE 68583-0953; phone: (402) 472-1489; or email lnelson1@unl.edu.