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Lisa Brown Jasa
University of Nebraska-Lincoln, ljasa@unlnotes.unl.edu

CROP WATCH

University of Nebraska Cooperative Extension
Institute of Agriculture and Natural Resources

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No. 2005-17, July 15, 2005

Controlling weeds in wheat post harvest

The 2005 winter wheat crop has been a "mixed bag." Conditions last fall resulted in mostly good stands; however, a series of problems developed from there – leaf rust last fall and wheat streak mosaic, nitrogen deficiency, drought, freeze, tan spot, striped rust and leaf rust this spring.

Controlling weeds after winter wheat harvest will be a challenge in some fields this year, especially where there were a lot of late spring and early summer rains.

The effectiveness of post-harvest weed control is influenced by production practices associated with the previous wheat crop, such as winter wheat variety selection, fertilizer practices, row spacing, planting date, and seeding rate. Other factors include: weed size, cutting off weed tops with the combine, crop rotation, temperature when spraying, rain the day of spraying, weed seed distribution, and streaks caused by sprayers, terraces, dust, straw, and chaff. The amount of residue from this winter wheat crop affects how the next crop will compete with weeds.

Weeds under stress are difficult to control. It's a general rule that you can wait a maximum of 30 days after harvest to spray wheat grown as part of a three-year rotation, but if the wheat was planted without an 11- to 14-month fallow period, it should be sprayed within 15 days of harvest. Each field should be examined separately. This year some will need to be sprayed before 30 days. The key is to prevent weeds from using soil water and producing weed seeds.

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Inside

How high temperatures, stress affect corn pollination

With temperatures consistently in the 90s and no significant break in sight, there is concern as to how the state's corn crop may be affected just as it enters the critical silking and pollination stages.

As of Sunday, July 10, the Nebraska Agricultural Statistics Service (NASS) reported that 26% of the state's corn crop was in the silking stage. This was ahead of the five-year average of 14% and last year at 16%.

As temperatures soar and with tasseling in progress, we are republishing the following article, originally published in the July 13, 2001 *CropWatch*, on 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

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Ag briefs

Delroy Hemsath, Extension Educator in Dakota, Dixon, and Thurston counties: Corn is in the tasseling stage and irrigation is underway in many fields. Dryland corn has a full soil moisture profile, but that will only carry it to the end of July if we don't receive more rain. The early rains leached the nitrogen in the sandy soils, creating some nitrogen deficiency symptoms as the corn entered the fast growing stage in July.

Soybeans are in the beginning to full bloom stage, with most fields approaching full canopy. Conditions were dry as the alfalfa second cutting was removed, but fields will begin to show water stress as the hot July winds blow. Pastures are showing the effects of no rain and are beginning to turn brown in some areas. A few soybean aphids have been found in scattered fields, but they've been in very low numbers. A few grasshoppers are showing up in the grassy areas.

Paul Hay, Extension Educator in Gage County: We have a light trap up and running and being monitored by several crop consultants. It shows a low degree of corn borer moth activity. Some areas which have received little rain since the last week of June are starting to show drought damage. Insect and disease activity are on the low side. Wheat yields ranged from 20 to 80 bu/ac with frost damage apparent in low yielding fields. The average was a bit above expectations at 42-45 bu/ac. Bunt or common smut were detected in a few instances – a reminder to treat the wheat seed prior to planting.

USDA's Nebraska Agricultural Statistics Service (as of July 10): Temperatures in the 90s and limited rainfall helped wheat harvest progress rapidly however, these same conditions caused corn and soybean ratings to move below a year ago for the first time this year.

Wheat conditions remained stable and rated 5% very poor, 12% poor, 33% fair, 39% good, and 11% excellent. Eighty percent of the crop was ripe, ahead of 74% last year and 77% for the average.

Corn condition rated 1% very poor, 2% poor, 16% fair, 52% good, and 29% excellent. Irrigated fields rated 88% percent good or excellent; dryland fields declined to 70%.

Fifty-two percent of the **soybean** crop has bloomed, ahead of last year at 41% and the average at 25%. Conditions declined and rated 1% very poor, 5% poor, 29% fair, 48% good, and 17% excellent.

Auto-guidance field day

A University of Nebrask–Lincoln field day will focus on the fundamentals, benefits and limitations of auto-guidance systems for agricultural vehicles.

The Auto-Guidance Field Day will be from 7:30 a.m. to 7 p.m. Thursday, Aug. 18, at the Agricultural Research and Development Center near Mead. Participants will learn the purpose and main components of auto-guidance systems for agricultural vehicles, what technical solutions are available for systems and the benefits and drawbacks of alternative auto-guidance equipment options, said Viacheslav Adamchuk, UNL precision agriculture engineer.

The day will begin with a brief introduction to the auto-guidance concept followed by an outdoor demonstration of a hands-free vehicle operation along a predefined course.

After the demonstration, representatives of major auto-guidance products will share technical details about current and upcoming systems. The main program will conclude at 4 p.m. after which participants can talk with company representatives or operate tractors in the auto-guidance mode.

More information about the field day and updates can be found online at bse.unl.edu/adamchuk/guidance.html or by contacting Adamchuk at (402) 472-8431, e-mail

Registration is free, but reservations are required by Aug. 12 as space is limited and a lunch count is needed. Make reservations by calling (402) 727-2775 or e-mailing dvarner1@unl.edu.

CROP WATCH

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Lisa Jasa, Editor; Email: ljasa1@unl.edu

Wheat weeds (Continued from page 149)

Split treatments, which have a good history of effectiveness, should be especially beneficial this year. In Kansas, there was a 20-bushel increase in corn yields the next year for treatments applied in July vs mid-August. When using a split treatment, apply the glyphosate products alone (adding surfactant, if needed, plus ammonium sulfate) as the first application in July or early August. Some glyphosate products include sufficient surfactant while many products require it to be added. Be sure to check the product label.

For all glyphosate brands, add ammonium sulfate (spray grade) at 17 lb per 100 gallons of spray solution. (The ammonium sulfate is the first item put into the spray tank after the water.) Ammonium sulfate is especially helpful when stress conditions are present. Liquid ammonium sulfate, with or without a drift retardant, also is available.

It's difficult to recognize weed stress so it's wise to always add ammonium sulfate. Improve control by increasing the rate of glyphosate. Allow at least six hours – and long with some weeds -- for the glyphosate product to become rainfast. Barnyardgrass may require as much as 24 hours without rain for maximum control. With glyphosates, use a spray volume of 5 to 10 gallons per acre and don't apply when temperatures reach or exceed 95°F.

The second part of the split treatment should be applied in September. It should contain at least 0.5 pound per acre of atrazine and possibly Gramoxone Extra (add surfactant), depending on the amount and size of volunteer winter wheat, downy brome or jointed goatgrass present. Several options are available for using nonselective herbicides with difficult-to-control weeds. With Gramoxone Extra, use a minimum of 2 pints of X-77, or equivalent surfactant, per 100 gallons of solution. Use 2 quarts of X-77 per 100 gallons of spray solution if using less than 20 gallons of carrier.

The atrazine rate varies with soil and rainfall patterns. In southwest Nebraska, use at least 2 quarts of atrazine per acre unless the following crop or soil limits the rate to a lower amount. In the Panhandle only 0.5 quart per acre is often the maximum allowed in one season.

The advantage of split treatments is that they provide excellent control of volunteer winter wheat and other winter annual grasses.

Control of volunteer wheat is especially helpful in reducing the spread of wheat streak mosaic disease. Using one quart or less of atrazine before September 10 allows winter wheat to be planted 12 months later in most areas and soils. If sufficient soil water is available the following spring, corn could be planted or if moisture is limited, the field could be fallowed and winter wheat could be planted in the fall.

Many options besides increasing herbicide rates are available for weed control after wheat harvest. Combining several options can help achieve maximum weed control. Stands of vigorous winter wheat will compete better with weeds, allowing you to concentrate on weed control in the fallow. Preparing a good firm seedbed, controlling weeds in a timely manner, fertilizing if needed, seeding properly, planting during the optimum time, selecting a competitive winter hardy winter wheat variety, and controlling weeds in the growing wheat offer the best chance of reducing weed population and vigor after harvest. In addition, it's essential that you closely watch for weed developments and spray at the proper time to achieve maximum control. Most labels state that weeds must be treated before they are 6 inches tall. If weeds are under severe drought stress, wait for rain and spray about a week later.

If downy brome is a problem and a winter wheat-fallow rotation is being used, tillage is usually recommended immediately after harvest to plant the seeds and ensure maximum weed germination during the fallow period. Do not till if only a limited amount of crop residue is present after harvest since tillage will make the soil susceptible to wind and water erosion.

Herbicides are available to control downy brome in the growing winter wheat and are best applied early. If jointed goatgrass and/or feral rye is a problem, use a rotation where wheat is not planted for at least three years under good moisture conditions and even longer under dry conditions. Herbicide tolerant winter wheat varieties are available for fields with jointed goatgrass or feral rye problems. Beyond® herbicide is then applied in the growing wheat. (Grower training is required before this herbicide can be purchased.) Check the label for additional information.

Robert Klein, Extension
Cropping Systems Specialist
West Central REC

Wheat, oat yields up

Based on July 1 conditions, Nebraska's 2005 winter wheat crop is forecast at 69.7 million bushels, down 5% from last month but up14% from last year, according to USDA's Nebraska Agricultural Statistics Service (NASS). Average yield is forecast at 41 bushels per acre, 2 bushels below last month but 4 bushels above last year. Acreage to be harvested for grain is estimated at 1.70 million acres, 50,000 acres more than last year.

Oat production is forecast at 4.38 million bushels, up 17% from last year. Acreage for harvest, at 60,000 acres, is up 9% from 2004. Average yield, at 73 bushels per acre, is equal to the record high yield set two years ago.

Eastern Nebraska dry with little rain forecast

While most of Nebraska received generous rainfall in April and May, precipitation has slowly diminished across central and eastern Nebraska during the past six weeks. During the past 30 days, east central and southeast Nebraska received 25-50% of normal rainfall and during the past 14 days, most of the eastern two-thirds of the state has had less than 25% of normal moisture.

The bright spots for precipitation have been the Panhandle and extreme north central Nebraska, where precipitation has been above normal the past 30 days. Although individual events haven't covered a broad area, the cumulative effect has been an above-normal precipitation trend across the region.

Temperatures have been in the 90s for most of the last two weeks as the corn crop approached pollination. As of July 10, the Nebraska Agricultural Statistics Service reported that 26% of the state corn crop was in the pollination stage with 60-75% expected to be at this stage by July 17. Unfortunately, no widescale precipitation events are forecast prior to that date.

Reports are beginning to filter in concerning leaf rolling across east central and southeastern Nebraska, particularly in the Seward, Mead, and Auburn areas. Expectations are that these reports will increase dramatically over the next week.

Weather models through this weekend don't offer much hope for major precipitation as the high pressure ridge over the central United States remains firmly in place. Temperatures throughout the period should easily hit the low 90s, with mid to upper 90s possible by this weekend. A weak cold front may move through the state late Sunday into Monday, offering the state its best shot of organized precipitation during the next 10 days. Temperatures will briefly cool into the upper 80s early next week, then quickly rise back into the 90s through July 23.

Widely scattered thunderstorms are possible across the western quarter of the state during the next week as monsoon moisture tries to move into the central Rockies from the desert southwest. This is a common event during July and August and can account for more than half of the normal precipitation that falls across the western third of Nebraska from late July through August.

'There is a slight chance that hurricane Emily will move through the Carribean and into the Gulf of Mexico as early as July 18. If any of her moisture is to benefit Nebraska, the hurricane will need to move onshore between Galveston and Houston. If this occurs, moisture could move into Nebraska about July 22.

Allen Dutcher
Extension State Climatologist

Corn pollination *(Continued from page149)*

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, former UNL Extension Crops Specialist

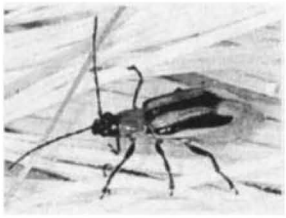
Silking and pollination are critical to the corn crop's viability and yield, but unlike pests and weeds, are something you can't control.

If you're a little hazy on the details or need a refresher, don't blush. Bob Nielsen of Purdue University has developed several online articles which illustrate the process. *Sex in the Cornfield: Silk Emergence* and *Sex in the Cornfield: Tassel Emergence and Pollen Shed* are available online at his Chat 'n Chew Café at *www.agry.purdue.edu/ext/corn/cafe/*

You also may be interested in a July 9 article by Nielsen, available on the same site: *Suggestive Behavior in the Corn Field: A Fast and Accurate Pregnancy Test for Corn.*

Use corn rootworm scouting numbers as basis for production decisions in 2006

Western corn rootworm beetles began emerging in late June in southeastern and south central Nebraska. Beetle emergence will be somewhat later in northeastern and western Nebraska. 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 they become 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.



Corn rootworm beetle

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 count of at least 10 beetles per ear is required to seriously affect pollination. Severe silk feeding at 25-50% pollen shed may indicate a need to apply insecticide, especially in seed production fields. Visit the UNL Department of Entomology Web site at entomology.unl.edu for a list of insecticides labeled for adult rootworm control.

Traditionally we have talked about the value of rootworm beetle scouting to determine the need for insecticides the next year if a field is to be planted back to corn. With the registration of YieldGard Rootworm corn, beetle scouting also can be used to determine where it would be most profitable to use this technology. Unlike European corn borers, we can predict where the greatest likelihood for rootworm injury will be, and beetle scouting information from this summer can be used to target placement of transgenic corn hybrids next year for rootworm control.

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

Plants per acre	Average number of rootworm beetles			
	Continuous corn[1]		First year corn[2,3]	
	Per plant	Per ear zone	Per plant	Per ear zone
14,000	1.28	0.64	0.96	0.48
16,000	1.12	0.60	0.84	0.42
18,000	1.00	0.50	0.75	0.37
20,000	0.90	0.45	0.68	0.34
22,000	0.81	0.40	0.61	0.30
24,000	0.75	0.37	0.56	0.28
26,000	0.69	0.34	0.52	0.26
28,000	0.64	0.32	0.48	0.24
30,000	0.60	0.30	0.45	0.23
32,000	0.56	0.28	0.42	0.21

[1] Based on a 50:50 ratio of females to males.
[2] Based on a 70:30 ratio of females to males.
[3] Use 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).

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 rootworm control is needed next year. With adult beetle control programs decisions as to whether to treat and if so, when to spray, should be based on information from field scouting. Start 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).

In continuous corn if beetle counts exceed 0.75 beetle per plant, damaging populations of corn

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If corn rootworm beetle numbers exceed the threshold, consider rotating out of corn next year, planting a transgenic corn active against rootworms or plan for an insecticide at planting or cultivation to prevent economic damage.

Adult rootworms *(Continued from page 153)*

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 on page 153 or NebGuide G86-774, *Western Corn Rootworm Soil Insecticide Treatment Decisions Based on Beetle Numbers,* available online at *ianrpubs.unl.edu/insects/g774.htm*). If the ear zone method is used for scouting, 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 the threshold, consider rotating out of corn, planting a transgenic corn active against rootworms or plan to use an insecticide at planting or cultivation to prevent economic damage. Fields remaining below the threshold level throughout the beetle egg-laying period are not expected to have economic populations of rootworms 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 *Corn Rootworm Management* (EC1563), available online at *ianrpubs.unl.edu/fieldcrops/ec1563.htm*

Bob Wright
Extension Entomologist

The **CropWatch Weather Web**, online at *cropwatch.unl.edu/weather.htm*, offers daily updates of precipitation, evapotranspiration, and growing degree day accumulations for a number of Nebraska locations and crops.

Ecological intensification

A public seminar and field day on Ecological Intensification of Corn and Soybean Cropping Systems will be held August 26, 1 to 5 p.m., at the University of Nebraska–Lincoln East Campus, Lincoln.

The program will update participants on UNL research on corn and soybean yield potential and optimal management practices for high-yielding systems. The program includes brief presentations and field visits at the UNL high-yield research site on East Campus.

Participants are asked to assemble at 1 p.m. in room 327 Keim Hall (Department of Agronomy and Horticulture seminar room). For more information contact Achim Dobermann by email at adobermann2@unl.edu or by phone at 402-472-1501.

No-till bus tour, field day

No-till on the Plains is offering two no-till events in Nebraska in coming weeks. A Whirlwind No-till Expo will be held at 9:30 a.m. on July 28 at the Duane Lange Farm 10 miles south of Ord. The farm has been using no-till for 25 years. Cost is $10 if registering by July 25 and $20 for walk-ins.

On the South Dakota No-Till Bus Tour August 1-3 participants can talk with other producers and see production practices and management challenges solved by long-term no-till users.

Tour stops will cover a spectrum of soils and climates and will include the University of Nebraska-Lincoln Rogers Memorial Farm near Lincoln with Paul Jasa, UNL Extension Engineer; Dakota Lakes Research Farm at Pierre, S.D. with producer Dwayne Beck and Ward Labs at Kearney with owner Ray Ward, as well as other farm stops.

For more information visit the Web site at *www.notill.org* or call 888-330-5142. Tour cost is $295 and covers transportation and lodging.

Getting the most from the available water

Timing sunflower irrigations

Sunflowers are generally considered a dryland crop but as irrigation water supplies decline, they are being considered for inclusion in normal crop rotations. Sunflowers are well adapted to dryland conditions because they can extract water stored deep in the soil profile. It is not uncommon for sunflowers to remove water from as deep as 6 feet or more, if soil conditions are good for root growth.

Sunflowers, under fully irrigated conditions, will use approximately 22 inches of water during the growing season. Throughout the growing season there are times when water needs are more critical and a decision must be made as to whether to irrigate or allow the crop to undergo stress. Like most crops, having adequate soil water during plant establishment is critical. If soil water is deficient and good germination and plant establishment is not likely, irrigation should be used at this time.

During bud and full flower, water use is near peak levels so the greatest amount of irrigation is normally needed at these times. In some situations you might hear that irrigating just at these growth stages can produce yields nearly equal to full irrigation. Keep in mind that these irrigations will fill the soil profile and can more easily be accomplished with furrow irrigation.

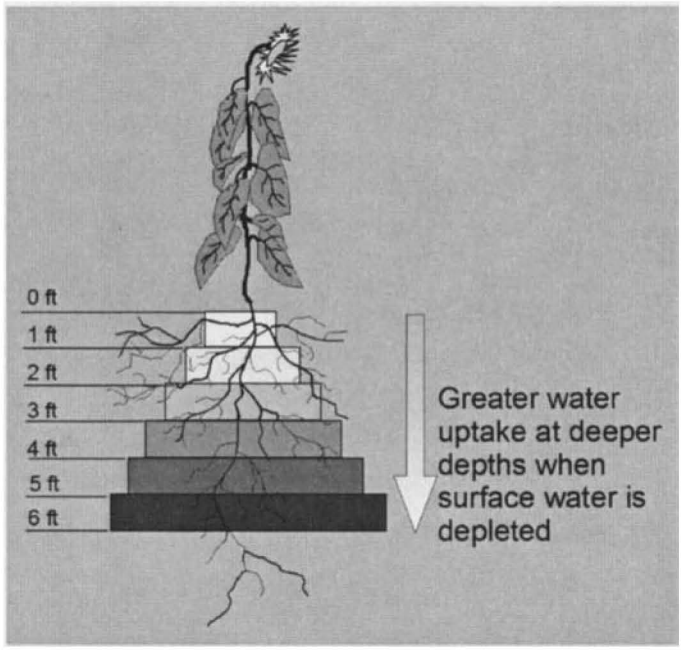

Figure 1. Sunflower uses about 22 inches of water during the growing season and will take more water at deeper depths if the surface water is depleted.

The key is to base irrigation timing on current soil water content, the amount of water available for irrigation and the potential for rainfall to supplement irrigation.

When using a center pivot, the challenges are different. Water application is dictated by system capacity. During peak water use periods, system capacity may not be adequate to keep up with crop demand. In this case, irrigation must begin prior to these critical periods to ensure adequate water is available later. If system capacity is greater and more water can be applied with each turn of the pivot, use caution as runoff can result.

If water stress occurs early or late in the growing season, yield reduction will be relatively small because the need for water is small; however, mid season water stress will result in greater yield reduction because water demand is high. Regardless of when crop water stress occurs, some yield reduction can be expected. Because of the difference in crop water demand through the season, yield reduction will generally be higher when crop demand is higher.

The key is to base irrigation timing on current soil water content, amount of water available for irrigation and the potential for rainfall to supplement irrigation. This year conditions are slightly different than in the past. Adequate spring and early summer rains have provided good soil water deep in the soil profile. Not irrigating early and saving water makes good sense this year. In years when soil water is not replenished early, limited water supplies likely may need to be used early to avoid significant yield reduction.

Finally, if rainfall occurs during the growing season, make sure you have a rain gauge near your field to know how much moisture you received. You also may need to estimate how much infiltrated the soil, especially if the rain came fast and runoff was evident. A soil probe is always handy to help you determine just how deep the rain penetrated into the soil.

C. Dean Yonts
Extension Irrigation Specialist

Corn enters final yield-determining stages

In the April 8 and July 1 issues of *CropWatch* we discussed the importance of accurately staging the growth of early (VE to V6) and mid-season (V7 to VT) corn. Now I will address the final stages of corn development as the plant progresses through the reproductive stages (R1 to R6).

Often we will get to the end of the season and look at ears that have aborted kernels, abnormal fill patterns, or other anomalies and wonder what happened. Yet, it is possible to know why the ears appear this way if we understand when certain stresses cause these traits.

Up to this point we have used the leaf collar method to determine developmental stages of corn based on identifying the uppermost leaf. The final vegetative stage is reached when the entire tassel is visible. This is denoted as VT. Earlier this week several corn fields that were planted in late April were at VT or R1 (see *Figure 1*). R1 is the first reproductive stage and will occur about two to three days after VT.

The plant's pollination and fertilization processes take place during **R1** (*silking*). R1 occurs when silks have emerged from the tip of the ear shoot on at least 50% of the plants. Emerged silks are viable and receptive to pollen up to 10 days. Each silk is connected to a potential kernel on the cob. During pollination the female portion of the plant (ear) receives pollen from the tassel, resulting in fertilization of the ovule (kernel). Typically, silks attached to potential kernels at the base of the cob will emerge first with tip silks emerging last. The kernel is white on the outside and the inner components are clear. Poor pollination can result in *non-fertilization of kernels*. Since silks emerge in different increments based on which potential kernels they are attached to, it is possible to have variability in the fill pattern.

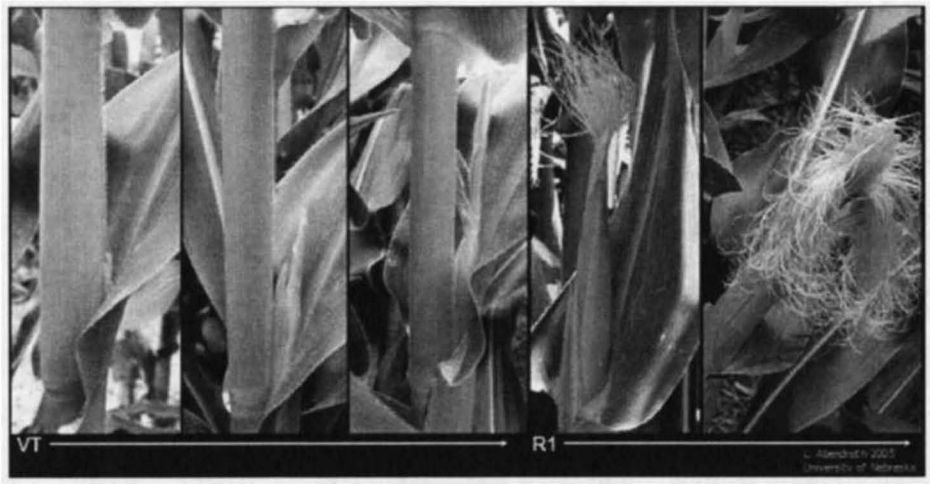

Figure 1. Corn planted in late April in central and eastern Nebraska is entering the VT or R1 growth stage this week. VT indicates the final vegetative stage and R1 shows the beginning of the reproductive stage.

The plant uses the most water per day (0.35 inches) during R1. The silks have the highest water content among all parts of the corn plant. Therefore, if possible, plants should especially not be under water stress during R1. For more information on how corn uses water during this growth period, see the UNL Extension NebGuide, *Irrigating Corn* (G1354), available online at *ianrpubs.unl.edu/fieldcrops/g1354.htm.* (Also see the story on Page 149 for more information on how heat and a lack of water affect pollination.)

R2 or the *blister* stage occurs about 10-14 days after silking. If we estimate silk emergence as July 19 based on the plants in *Figure 1*, R2 would begin between July 29 and August 2. The kernel is visible and resembles a blister on the cob at this stage. The kernel is filled now with clear fluid. If you dissect the kernel you will be able to see an embryo -- this is the portion that sprouts next year if the seed is planted. The kernels are approximately at 85% moisture content and this will decrease as they near maturity. If severe stress occurs now or during R3, *kernels may be aborted* from the tip-down to lessen the load on the plant.

R3 or the *milk* stage will occur approximately 18-22 days after silking (August 6-10). The kernel is now yellow on the outside with the inside containing milky white fluid. Starch is rapidly accumulating in the kernel. By R3 cell division in the endosperm is complete and kernel growth that occurs now is due to cell expansion and starch fill in the individual kernels. At this point it is possible to estimate yield with the Yield Component Method described in the publication cited below, *Estimating Corn Grain Yield Prior to Harvest.* These estimates will be about 30 bushels plus/minus actual yield.

R4 or the *dough* stage will occur approximately 24-28 days after silking (August 12-16). The interior of the kernel has now thickened to a dough or paste-like substance. The kernels have now accumulated about half of their mature dry weight. Stresses will not likely cause kernel abortion by this stage. Prior to R5 the kernels at the tip of the ear will begin to dent (beginning dent).

R5 or the *dent* stage will occur approximately 35-42 days after silking (August 23–30). Kernels are

(Continued on page 154)

Corn stages

(Continued from page 156)

dented in at the top and are drying down. Kernels have 55% moisture content at the beginning of R5. You will be able to see a line separating yellow from white on the kernel; this will progress downward as the kernel matures and the starch hardens. Stress is only able to reduce *kernel weight* at this time by hindering dry matter accumulation.

R6 or *physiological maturity* occurs approximately 55-65 days after silking (Sept. 12-22). All kernels have reached their maximum dry matter accumulation now since the starch layer has moved completely to the cob. A black or brown layer will be visible at the base of each kernel. Tip kernels will first reach this black layer stage and basal kernels will be last to. Kernel moisture is now between 30-35% with much variability due to hybrid and environment. Moisture moves out of the kernel easily if the plant is still green, which is why many now prefer stay-green hybrids. Stress that occurs now will have little effect on yield except if plant lodging or insect feeding on the ear occurs.

References

Hanway, J.J. and S.W. Ritchie. 1984. *How a Corn Plant Develops: Special Report No. 48,* Iowa State University.

Nielsen, R.L. 2004. *Estimating Corn Grain Yield Prior to Harvest, Purdue University (online at www.kingcorn.org/news/articles.04/YieldEst-0718.html)*

Lori Abendroth , Research and Extension Associate, Agronomy

For more stories see

CropWatch on the Web at

cropwatch.unl.edu

Improving Crop Water Productivity Conference to be Aug. 10-11

Water is one of Nebraska's most valuable and sought after natural resources as well as one of its most contested. Learn how to get more benefit from the water you have as well as what lies ahead for the state's water users at the first annual Great Plains Conference on Improving Crop Water Productivity. It will be Aug. 10-11 in North Platte.

Presented by the University of Nebraska-Lincoln West Central Research and Extension Center (WCREC), this conference offers a unique opportunity for producers to learn how to get more from the water they have, see the results of various practices in the field, and hear from key players and policy makers on water issues affecting Nebraska agriculture today and in the future.

Participants are invited to attend one or both days. On day one, speakers will describe the state's water history and current water status and present tested strategies that producers can implement. On day two, participants will hear from groups affecting water use and water policies and take field tours to view the results of recommended practices.

Presentations will be at the North Platte Community College South Campus at 601 West State Farm Road. Field tours will be at the UNL WCREC.

Speakers will include specialists from the University of Nebraska-Lincoln and state agencies as well as natural resource groups.

Register now

For more information about the conference or to register, call the WCREC at (308) 696-6727 or email llehmann1@unl.edu Advance registrations made by Aug. 1 are discounted. Following are the early (by August 1) and late registration rates for the various options:

Both days: $40/$50

First day, afternoon only, no barbeque: $20/$25

Second day only: $20/$25

Conference schedule

(For a full schedule with speakers, see *Events* on the *Web CropWatch* at *cropwatch.unl.edu*)

Wednesday

10:30 a.m.-12:00 p.m. Registration
12:05 p.m. Welcome
12:15 p.m. Nebraska and Water
12:45 p.m. Nebraska Water Resources – History and Status of Groundwater and Surface Water
2:00 p.m. Response of Crops to Water
3:30 p.m. Strategies to Improve Water Use Efficiency – Taking the E out of ET
4:00 p.m. Center Pivots – Fine Tuning to Conserve Water
4:30 p.m. Furrow Irrigation Management to Conserve Water
5:00 p.m. Limited Irrigation – Improving Productivity

Thursday -- *Comments on Nebraska water issues from dignitaries*

8:00 a.m. What are the various agencies doing to deal with the Nebraska water situation? Representatives of 15 groups will address the topic.
10:00 a.m. Morning Field Tours at West Central Research & Extension Center including drip irrigation, lateral move, skip-row corn, weather stations, and irrigated grass
12:00 p.m. Lunch
1:00 p.m. Continuation of 8 a.m. program
2:30 p.m. University Response to the Water Situation in Nebraska

Small irrigation pipe leaks add up to big losses

As you walk a pipeline and see a few leaks from gates or gaskets, remember that a few gallons here and a few gallons there can add up to big losses in money and labor.

Estimating the amount of loss is not simple, but odds are there is an ultrasonic flow meter nearby that can make the measurement with ease.

Most gated pipe systems have leaks. People sometimes dismiss small leaks, assuming it doesn't amount to much water and after all, the leak is watering a row, right? Wrong on both counts! Logic tells you that one or two gallons per minute isn't going far down a furrow. If you could irrigate with that flow rate, you wouldn't need sets. Regarding the amount of water loss, losing 150 gpm is common on one-half mile of pipe. A single leak of 1.5 gpm on each 30-foot length of pipe plus 3 gpm loss on six gaskets adds up to 150 gpm.

Fixing leaky gates and gaskets in a furrow irrigation system can lead to significant savings of water and irrigation time leading to a reduction in production costs.

Table 1 shows the impact of a system with 1000 gpm well that is losing 150 gpm to leaks that could be corrected to 50 gpm loss. This example assumes full pipe with no shut-offs and every-other-row irrigation. The big savings in this example is realized by reducing the number of sets for this field. Over the course of the season, it could easily amount to three fewer days of irrigation expense and labor.

Fixing leaky gates and gaskets is one of the topics addressed as part of the University of Nebraska program, Ten Easy Ways to Boost Profit $20/acre. Look for more workshops in this series this winter.

If you want to learn how much water your system is losing, contact your local NRCS or NRD and see if they have an ultrasonic flow meter. The meters work on full pipe and can be attached along obstruction-free lengths of pipe. It might be the easiest thing you can do to add profit to your system.

Andrew Christiansen, Extension Educator in Hamilton County

Table 1. Impact of repairing irrigation pipe leaks to decrease losses from 150 gpm to 50 gpm.[1]

GPM leaks	Well output	GPM furrow	Total rows	Rows in set[2]	Sets in field
150	1000	16.0	1056	106	10
50	1000	16.2	1056	117	9

[1] For the purpose of demonstrating potential savings, several assumptions were made: 1) the leaks are evenly dispersed along the length of the pipe, 2) the pipe is full, and 3) an entire set is opened at one time and closed at one time, although many people do not irrigate this way. Finally, we realize that number of rows in a set changes depending on which set you are talking about. It shouldn't change the outcome. The example assumes quarter-mile long rows and irrigating every other row. It is an 80-acre field with 2640 feet of pipe extending in one direction from the well. This is not an uncommon amount of leakage. We are assuming repairs fix all but 50 gpm of the leaks.

[2] Every-other row irrigation -- half of these rows carry water.