July 26: Agronomy Day at the Brownstown Agronomy Research Center

The Brownstown Agronomy Research Center will host its summer Agronomy Day on Thursday, July 26. Join University of Illinois Extension specialists and researchers as they address issues pertinent to the current growing season. The program starts at 8:30 a.m. and finishes with lunch at 11:30. The event is open at no charge to all who wish to attend.

Weather permitting, presentations will take place in the research plots, with shaded wagons taking participants to each stop. These topics will be addressed:

• What Does It Take to Produce High Soybean Yields?—Emerson Nafziger
• Optimizing Corn Planting Rates and Nitrogen Rates—Steve Ebelhar
• Corn Foliar Disease Identification and Management—Angie Peltier
• Nutrient Removal by Corn and Soybean—Fabián Fernández
• Climate Change Impacts on Crop Production and Management—Dennis Bowman

The 208-acre Brownstown Agronomy Research Center has been conducting crop research since 1936. It is dedicated primarily to corn, soybean, and wheat studies on the claypan soils of southern Illinois, with more than 30 research and demonstration projects conducted every year. Visitors are always welcome.

The research center is located south of Brownstown on IL Route 185, about 4 miles east of the IL Route 40–Route 85 junction. Visit us online at web.extension.illinois.edu/barc.—Robert Bellm

Using Drought-Damaged Corn as Livestock Feed

High temperatures and sustained drought, especially in extreme southern Illinois, have severe damaged many cornfields, with little likelihood of their producing economic grain yields. Producers wanting to salvage this drought-damaged corn for livestock feed should do so very carefully because of the potential for high nitrate levels in the forage. Levels will be highest in fields that received high nitrogen fertilizer or manure applications and in plants that are severely stunted and did not form an ear.

Nitrate concentrations are highest in the lower third of the stalk, so harvesting or grazing only the upper two-thirds of the plant will greatly reduce the potential for
nitrates containing high levels of nitrate might still be safely fed if they are diluted with grain or other feedstuffs low in nitrate. Within limits, animals can be conditioned to consume high-nitrate forages as long as they are introduced to them slowly, allowing them to acclimate to the high nitrate levels.

Drought-damaged corn that is going to be green-chopped and fed should be tested prior to harvest. Animals should be limit-fed and introduced to the forage slowly. Making hay from drought-damaged corn will not reduce nitrate levels, and any such hay should be tested before feeding.

Ensiling the forage will potentially reduce nitrate levels 30% to 60%. Since fermentation may take up to 21 days, silage should not be fed for at least three weeks after being put into the silo or bag. Care should be taken when ensiling high-nitrate forages because of the potential for production of nitrogen oxide silo gases, which are toxic. Given the variability of nitrate reduction during the ensiling process, silage made from high-nitrate forages should still be tested before it is fed.

Forage testing laboratories may report their findings in a variety of ways: as percent NO₃, parts per million NO₃, percent NO₃-N, or parts per million NO₂-N. To add to the confusion, they may report results on a dry matter basis or “as is” moisture. Test levels based on as-is moisture will always be higher when converted to a 100% dry matter basis. Recommended safe feeding levels, which may vary from state to state, are usually given as a range. (See Table 1 for feeding recommendations.) Any results based on as-is moisture must be converted to dry matter basis for the sake of consistency.

Finally, some areas of the state received scattered rainfall this week. Harvest of drought-damaged forage should be delayed at least five days after rain. Immediately after rainfall, there is a rapid uptake of nitrate by the plants. Waiting a few days will let plants metabolize the nitrate, reducing the concentration.—Robert C. Bellm

### Insects

#### Pest Observations and Management Perspectives

The hot and dry weather persists throughout much of Illinois, with the 7-to-10-day forecast showing daytime highs above 90 °F and little rain (except widely scattered showers) expected for most of the state. Jutifiable, producers’ focus has turned from most pest-related concerns to the weather, yet the hot and dry conditions will likely exacerbate infestations of twospotted spider mites throughout many soybean fields in the coming weeks.

If you are seeing discolored leaves (yellowing or bronzing) along field margins, I encourage you to tap the leaves over a sheet of white paper to dislocate mites, if they are present, from the lower leaf surface. If you observe tiny specks moving on the paper, chances are very good you have mites in that field.

Continued hot and dry conditions will very likely cause the infestation to become more widespread throughout the field. If you find discolored leaves along field margins, detect mites, and determine that the midrange forecast (7 to 10 days) will bring more hot weather and no rain, you should consider a rescue treatment.

In 1988, the last year that twospotted spider mites caused widespread damage to the soybean crop (an estimated 6 million acres in Illinois received a treatment), the organophosphate insecticides chlorpyrifos and dimethoate were the primary insecticides of choice. Of the two, dimethoate provides some systemic activity. To be effective and provide longer residual activity, dimethoate must be absorbed by the leaf and translocated. Plants that are under severe drought stress are less able to absorb and translocate dimethoate as effectively. Chlorpyrifos (Lorsban 4E or generic products) is not systemic, and the residual activity may be reduced to as few as 3 to 5 days due to photodecomposition under intense heat and sunlight.

With high humidity and heavy morning dews, a fungal disease may help suppress mite densities. Cooler temperatures at night will help spread the disease. For now, keep scouting for mites and be prepared to make a rescue treatment as needed. In 1988, initial sprays that were directed only at field margins proved ineffective, and mite infestations spread quickly to field interiors. If mites are found throughout a field, border rows are bronzed, and the forecast for the next week to 10 days is hot and dry, consider treating the entire field.

Western corn rootworm and Japanese beetle adults are now commonly found throughout most of the state. The focus over the next 10 days should be scouting for evidence of excessive silk clipping, which could interfere with the pollination process. Plants under severe moisture stress may not be able to generate

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**Table 1. Guidelines for feeding forages to cattle based on NO₃-N and NO₃ concentrations (dry matter basis).**

<table>
<thead>
<tr>
<th>NO₃-N (ppm)</th>
<th>NO₃-N (%)</th>
<th>NO₃ (ppm)</th>
<th>NO₃ (%)</th>
<th>Feeding recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1,000</td>
<td>&lt;0.1</td>
<td>&lt;4,400</td>
<td>0.44</td>
<td>Not toxic.</td>
</tr>
<tr>
<td>1,000–2,000</td>
<td>0.1–0.2</td>
<td>4,400–8,800</td>
<td>0.44–0.88</td>
<td>Limit feed to 50% or less of ration dry matter.</td>
</tr>
<tr>
<td>2,000–4,000</td>
<td>0.2–0.4</td>
<td>8,800–17,600</td>
<td>0.88–1.76</td>
<td>Limit feed to 25% or less of ration dry matter. Don’t feed to pregnant cattle.</td>
</tr>
<tr>
<td>&gt;4,000</td>
<td>0.4</td>
<td>&gt;17,600</td>
<td>&gt;1.7</td>
<td>Don’t feed—potentially toxic.</td>
</tr>
</tbody>
</table>
sufficient silks to stay ahead of clipping by the beetles. In general, densities of 3 Japanese beetles per ear and 5 western corn rootworm adults per plant are sufficient to cause potential pollination problems. Don’t neglect to scout for these insects.

Is there any good news to report? So far, soybean aphids are a no-show for much of the Corn Belt; with the exception of the upper Midwest, the very hot conditions have suppressed densities. I don’t anticipate this scenario changing any time soon this growing season.

We begin our annual corn rootworm digs on July 6 to evaluate the effectiveness of various Bt products and soil insecticides. I look forward to sharing the results of these trials later this summer and during fall and winter meetings. It appears that we have very good pressure in our checks.—Mike Gray

Weeds

Weed Science Reminders

The University of Illinois weed science field research tour was held June 20 at the Crop Sciences Research and Education Center, and signs denoting the applied treatments were placed in the first replication of many weed science experiments. If you could not attend the tour but would like to see how various treatments performed, the signage will remain through most of July. A few experiments are located on the main farm north of Windsor Road in Urbana, but most are on the Animal Science tract immediately south of Windsor Road. Please feel free to stop by and peruse the plots at your convenience.

Reports continue of inconsistent control of waterhemp with foliar-applied herbicides. Several reasons could explain the lack of control, including plant size, dry soil conditions, and herbicide resistance. The U of I weed science program, through funding from the Illinois Soybean Association, is providing free herbicide-resistance screening of waterhemp. Issue 9 of the Bulletin (“Free Screening for Glyphosate Resistance”) gives details on collecting and submitting samples for screening. Samples will also be screened for resistance to PPO-inhibiting herbicides. Please remember to complete a submission form for each field sampled.

Be sure to register (events.SignUp4.com/RespecttheRotation2012) to attend the July 24 field research tour that will address the management of herbicide-resistant weeds. Details are available in issue 13.—Aaron Hager

Plant Diseases

Identifying Goss’s Wilt in Corn—More than Just Immunostrips

Although Goss’s wilt has not yet been detected in any corn samples submitted to the University of Illinois Plant Clinic this year, the disease may be present in the state, especially in fields that had severe Goss’s wilt in 2011 that were planted to corn again. Goss’s wilt, a bacterial disease of corn caused by the bacterium Clavibacter michiganensis subsp. nebraskensis (Cmn), was detected in several Illinois counties last season. Identification of Goss’s wilt may require a multistep approach, especially for those who are not too familiar with the disease:

1. Evaluate affected leaves to determine whether the symptoms and signs match those of Goss’s wilt. Leaf lesions will have a wavy margin, and there will be some water-soaking. Dark spots inside the lesions (often referred to as “freckles”) also should be present. The affected areas of leaves may also have a shiny appearance, the result of exudates of the bacterium on the leaf surface. Exudates sometimes resemble sticky spots of maple syrup.

2. Have a plant diagnostic lab evaluate affected leaves for bacterial streaming (ooze). A laboratory such as the U of I Plant Clinic (web.extension.illinois.edu/plantclinic) will do this test, in which affected leaf tissues are cut and placed on a drop of water on a microscope slide and checked for bacterial streaming. Its presence indicates that the affected leaves have a bacterial infection.

3. An immunostrip test may be conducted to determine if the Cmn bacterium is present in the leaves that were positive for Goss’s wilt symptoms and bacterial streaming. This test is avail-

Symptoms of Goss’s wilt on a corn leaf. Note the wavy margins of the lesion, water-soaking, and dark “freckles.”
able from Agdia (Elkhart, Indiana), but it is designed specifically to detect bacterial canker in tomato, which is caused by a similar, but different, bacterium—Clavibacter michiganensis subsp. michiganensis. The immunostrip test will also react to other species of Clavibacter, including Cmn (the Goss’s wilt bacterium). False positives are very possible when this is the only step used to identify Goss’s wilt. For accurate Goss’s wilt identification, it is extremely important that you complete steps 1 (do symptoms match?) and 2 (is bacterial streaming present?).—Carl A. Bradley

**Crop Development**

### Stress on Corn at Pollination

The good news for the 2012 Illinois corn crop is coming in small doses: it has rained in some places in recent weeks, and 46% of the crop was silking by July 1, which is far ahead of normal. Silks do seem to be abundant in many fields where there has been enough water to get plants to a height of 5 feet or more, and leaf color remains good in most of these fields.

But less positive factors continue to grow in importance, and as we continue without rain over most of the state, we expect this only to worsen. The percentage of the crop rated good-to-excellent dropped to 26% by July 1, and only about 10% of the acreage is considered to have adequate topsoil moisture. Temperatures remain high, and warm nights continue to push GDD accumulations above normal, though statewide the GDD accumulation since May 1 is only 135 above average, and most of that occurred in May, not June.

The worst news of all is that some fields, especially in southeastern Illinois, are now beyond any reasonable hope for producing any yield; plants in these fields are dead, are alive but past the pollination stage with very short plants and no kernels, or have lost most or all of their green color. Some fields have already been written off completely for insurance purposes, and some farmers are considering whether there’s enough plant material to justify cutting failed fields for silage.

A great deal has been written about salvaging drought-damaged corn as a forage crop. I won’t add much here, but questions that need to be answered include whether there is enough crop material present to justify harvest, whether there’s a market, what the nutritive value of the forage will be, and how to avoid nitrate toxicity. Robert Bellm addresses nitrate in another article in this issue. Whether a failed crop is harvested for forage or not, much of the nutrient applied to the crop will be left in the field, and so less will have to be replaced for the next crop.

The early start to pollination is a very positive development, and the fact that even in dry areas the root system has managed to find enough water to get to this point bodes well for at least the pollination process itself. One novel aspect to pollination this year is that tassels are starting to shed pollen before they clear the uppermost (flag) leaf, in some cases when they are still barely visible. In such fields, it may be easier to stage pollination by appearance of the silks, which tend to emerge starting about the same time as first pollen shed.

Tassels are struggling to emerge due to lack of water for growth, as I have discussed in previous articles. The failure to emerge might have negative consequences as pollination tries to proceed. Pollen is shed as relative humidity drops, so exposed tassel branches start to shed as soon as temperatures start to rise, usually two to three hours after sunrise. If the tassel is wrapped inside two leaves, relative humidity stays high longer, and pollen shed is delayed by as much as several hours. I was in a field on July 2 from about 10:00 a.m. to 1:00 p.m., and pollen was much more abundant at the end of that time than at the beginning. The problem is that the temperature was above 90 °F at 1:00 p.m. when pollen was being shed, and at such temperatures silks are often not as receptive as they would have been at 70 to 75 °F earlier in the day.

Under the current high temperatures, we can expect that pollen will be shed over fewer days than if it were cooler. We also expect that silk numbers may lag some due to shortage of water; silk emergence is generally considered to be among the growth processes most sensitive to lack of water, and if plants are struggling to take up enough water to push tassels out above the leaves, we can expect that silks may struggle as well, at least those (from the tip of the ear) that emerge late in the process.

It should come as no surprise, then, that even in fields showing silks and tassels now, the process of fertilizing kernels and keeping them going until grain fill begins may be less than fully successful in many of the drier fields. Pollination will be rapid under high temperatures, and by a week or so after we first see silks we can check to see how many kernels have been fertilized. Do this by removing husks and tugging gently on the silks; those that were fertilized successfully will detach easily, while those that have not been fertilized will remain attached.

Unfortunately, as we continue without rainfall in large areas of the state, the number of kernels fertilized may end up being considerably larger than the number that survive to fill and produce yield. That is, improvements in success of pollination and fertilization through breeding do not always translate into better yields. We remain optimistic that kernel numbers will be okay in many fields, but in each of the past two years there has been a great deal of kernel abortion, and there is every reason to expect a recurrence in 2012.

The factors that affect whether fertilized kernels abort are not entirely understood, but we know that the supply of sugars available to the developing ear is a primary determinant of success in
keeping productive kernels. Sugars are produced by photosynthesis, and as we have been saying often this year, plants that are rolling their leaves for most of the afternoon are not doing a very good job of producing the necessary sugars. Here in east-central Illinois, most fields are showing at least some stress symptoms daily. This is reducing the amount of sugars available, and it’s highly likely that the end result will be fewer kernels than normal by the time kernel filling starts several weeks from now.

As stress conditions continue, a reduction in kernel size often starts to develop at some point along the length of the cob. This indicates the start of the process of kernel loss from abortion. The abortion process isn’t very well understood, but once initiated it is probably not reversible. All of this means that in the 2012 crop, the decreased number of kernels that end up filling is likely to be a primary yield barrier in many fields where stress continues through the pollination process.

If conditions improve during grain fill, the reduced number of kernels may be able to get a little larger than they normally would. But the potential to make larger kernels will depend heavily on having a healthy canopy. In any case, we would not expect an increase in kernel size to make up much of the yield loss that will come from reductions in kernel number.

In areas where stress has been present for weeks, the first sign of rapid deterioration in yield potential is often loss of canopy color. Plants that are struggling to take up water are also not taking up much nitrogen; this, along with the fact that leaves become physiologically less flexible with age, means that loss of canopy color after pollination is often not fully reversible. The daily wilting that is visible in many fields is taking a toll, primarily by diminishing the energy (sugar) required to keep leaf tissue healthy and to repair damage, but also by causing damage itself. Water loss helps cool the leaf, and so when leaves are not getting enough water to keep stomata open, leaf temperatures rise above air temperatures; when the air temperature is 100, leaf temperatures can be 105 to 110. In addition, sunlight energy that can’t be used in photosynthesis when stomata are closed can cause direct damage to chlorophyll and the photosynthetic apparatus, leading eventually to loss of leaf color.

Many are pondering the question of how much corn yield potential has already been lost. For fields that are essentially destroyed at this point, we know the answer. In most fields—those that are pollinating now or will be pollinating in the next week under conditions of at least moderate stress—the first guess at yield potential will have to wait until we can count kernel numbers and get some idea of grain-filling conditions at stage R3 (roasting ear), during the last third of July.

Besides canopy color, light interception is an indicator of stress and photosynthetic capacity. As leaves roll in the afternoon (or morning, in some cases), light interception drops quickly. One of the best “drive-by” indicators of how a crop is doing at a given time during the day is the amount of light hitting the ground. In very stressed fields, well over half of the sunlight is getting to the ground, in which case virtually no photosynthesis is going on. Using this as an indicator, it appears that corn following corn is again struggling more than corn following soybean in 2012. This could be partly a result of incomplete recharge in some areas after last season, especially if the field was in first-year corn in 2011 and second-year corn in 2012.

I wish more optimism were possible— the start to the growing season was outstanding, and most producers “did everything right” to establish good yield potential, only to see low rainfall and high temperatures since. There’s not much to be done other than to accept that the weather is beyond our control; trying to figure what we might have done differently will not be very productive.—Emerson Nafziger

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