AGMasters Conference Lineup of Speakers Coming Together for December 5 and 6

If you haven’t done so already, please be sure to put December 5 and 6 on your calendar to take part in the third annual AGMasters Conference. The conference will be held at the I Conference and Hotel Center, across the street from Assembly Hall. Parking is accessible and free. The conference will begin with a general session the morning of December 5, followed by 12 advanced sessions over the next day-and-a-half. Participants will be able to select six topics of most interest to them. As with last year, enrollment for each topic will be capped at 160, so getting registered early will ensure you can attend the sessions you want. Each advanced session takes place in a classroom-style setting with no more than 40 students. Instructors are encouraged to engage the participants with questions that stimulate interaction.

The general session will focus on an issue emerging across the Corn Belt—resistance to herbicides, to fungicides, and most recently to Bt rootworm corn. Our keynote speaker is Leonard Gianessi, director of the Crop Protection Research Institute, Washington, DC. In addition, Dr. Aaron Gassmann, Iowa State University, will speak in the general session and describe his research on the field-evolved resistance to Bt rootworm corn that he has observed in Iowa. The advanced sessions will cover a variety of emerging and important topics, including Goss's wilt, mystery application products, potential invasion of stink bug species into corn and soybeans, plant responses to environmental extremes, protecting your business with record-retention procedures, unexpected consequences of glyphosate applications, and improving the effectiveness of adjuvants. Many of the advanced sessions will be taught by out-of-state speakers who are recognized experts in their fields of study. For example, Dr. Galen Dively, University of Maryland, will provide the latest management information on brown marmorated stink bugs. This insect species is likely to cause significant challenges to profitable corn and soybean production in the coming years.

In following issues of the Bulletin, we will provide more details about the AGMasters Conference and registration procedures. For now, please hold the dates and stay tuned.—Mike Gray

Insects

More Reports of Severe Rootworm Damage to Bt Corn Received: Questions and Answers

During the past few weeks, I’ve received more reports of severe corn rootworm injury to Bt corn following my article on this topic (bulletin.ipm.illinois.edu/article.php?id=1555). Most reports are from northwestern and north-central Illinois. The
affected fields share some common features—corn has been grown without rotation, and the Bt hybrids used have expressed the Cry3Bb1 protein for many successive years.

On September 13, in response to a request to confirm severe corn rootworm damage to Bt corn, I traveled to LaSalle County, in north-central Illinois. I met the producer whose field had damage suspected to be caused by corn rootworms and several seed industry representatives. I observed significant lodging in many areas of the field and began to remove random root systems for a closer look.

Many of the roots had several nodes of roots completely pruned as a result of corn rootworm feeding. After plants were dug, a few taps on the shovel quickly dislodged loose soil from the roots, revealing the extent of the injury. Once we were out of the field with roots in hand, we checked them for the expression of the Cry3Bb1 protein and found them all to be positive for this trait.

The extent of injury is difficult for me to assess adequately. Producers who are unhappy with the level of root protection afforded by these hybrids should contact their industry representatives. As more information is generated, we will collectively be able to more accurately assess the situation. At this point, I don’t believe that these fields represent a “needle in the haystack,” nor do I believe that control failures of Bt rootworm hybrids that express the Cry3Bb1 protein occur in most fields. I do hope that the extent of these control failures will increasingly be shared with the broader agricultural and regulatory community as we move forward this fall. With that approach, producers will be able to make more informed choices regarding Bt corn rootworm products for the 2012 growing season.

Do these reports of severe corn rootworm pruning to Bt corn (Cry3Bb1) mean that resistance has been confirmed in these fields?

No. Confirmation of resistance requires collection of adults from affected fields and conducting further detailed laboratory investigations. We should be careful not to make the leap of assuming that fields with severe rootworm injury are supporting a resistant western corn rootworm population.

Prior to this season, has significant root pruning been observed on Bt corn (Cry3Bb1)?

Yes. We have observed significant pruning on Bt corn (Cry3Bb1) in our corn rootworm efficacy trials soon after these Bt hybrids were commercialized. In our experiments, we use a trap crop (late-planted corn interplanted with pumpkins) to increase the density of larvae so that we adequately challenge soil insecticides, insecticidal seed treatments, and Bt corn rootworm hybrids. In 2005 we reported on the variability in root protection of Bt corn rootworm hybrids that expressed the Cry3Bb1 protein in our On Target report (ipm.illinois.edu/ontarget/2005report.pdf). So the recent reports of significant damage in producers’ fields should be taken seriously, but be aware that severe pruning to Bt corn has been observed previously by us, by other investigators, and by producers.

Remember, corn rootworm Bt products offer only a low to moderate dose of Cry proteins. Nonetheless, these proteins are designed to protect root systems against damaging levels of root injury, and producers have just cause for concern when excessive pruning results in lodging and significant yield loss.

Has root pruning been observed on corn rootworm Bt hybrids that express other Cry proteins?

Yes. In our 2011 corn rootworm product efficacy trials (bulletin.ipm.illinois.edu/article.php?id=1560), two Bt hybrids that express the modified Cry3A protein had approximately ½ of a node of roots pruned in an experiment at the DeKalb Research and Education Center near Shabbona, Illinois. The checks in this study had root pruning that averaged

Severely lodged rootworm Bt (Cry3Bb1) corn plants in La Salle County, Illinois, September 13.

Severe root pruning to rootworm Bt (Cry3Bb1) corn in LaSalle County, Illinois, September 13.

Checking rootworm Bt corn plants in LaSalle County, Illinois, for expression of the Cry3Bb1 protein, September 13.
about 1½ nodes of roots destroyed. In 2008, a Bt hybrid expressing the Cry34Ab1/Cry35Ab1 corn rootworm proteins had nearly 1 node of roots pruned, again at the DeKalb research site (bulletin.ipm.illinois.edu/article.php?id=1038). The level of injury in the checks was intense, with nearly 3 nodes of roots destroyed.

Bottom line: the collective experience with corn rootworm injury and Bt hybrids has not been as clean or smooth as with the Bt lineup of products targeted at the lepidopteran complex (e.g., European corn borer) in the north-central region of the United States. As I learn more about the most recent reports of corn rootworm injury to Bt hybrids this season, I will be sure to share the information with readers of the Bulletin.

If I’ve had root protection problems with a certain type of Bt hybrid this season, how should I proceed for 2012?

If you experienced significant lodging and root pruning with a certain type of Bt hybrid in 2011, then I urge you to look at the recommendations I outlined in issue 20 (bulletin.ipm.illinois.edu/article.php?id=1555). I look forward to discussing this issue at fall and winter University of Illinois Extension meetings.—Mike Gray

The University of Illinois Plant Clinic Is Moving Soon!

After some 35 years on St. Mary’s Road in Urbana (near the U of I South Farms), the University of Illinois Plant Clinic is relocating to new labs at S-417 Turner Hall on the U of I campus (see www.fs.uiuc.edu/ada/0197.html for a map).

In past years the clinic has closed on September 15 and not accepted samples again until spring. Now, however, we will accept plant samples year-round. Regular business hours will continue from May 1 to September 30. If you wish to submit a sample during the other months, please call ahead to ensure the availability of our diagnosticians or specialists.

For anyone who would like to deliver samples in person, parking will be available at metered spaces in lot F28 (see the map). Take the elevator in the southeast corner of Turner Hall to the 4th floor and turn left—we’ll be glad to see you. There will also be a drop box in the hall outside the clinic office.

Our address after September 30:

University of Illinois Plant Clinic
S-417 Turner Hall
1102 S. Goodwin
Urbana, IL 61801

Our phone number remains the same: 217-333-0519.

For more information about the Plant Clinic, visit the sites listed below, or contact one of us (Stephanie at satterle@illinois.edu; Suzanne at sbissonnette@illinois.edu).

- Our website: web.extension.illinois.edu/plantclinic
- Our Facebook page: www.facebook.com/UofIPlantClinic
- Our blog: universityofillinoisplantclinic.blogspot.com
- Our podcasts: web.extension.illinois.edu/podcasts/plantandpest

—Stephanie Porter and Suzanne Bissonnette

Crop Development

Corn Following Corn—Strike 2?

In 2010, following a very wet start to the season and damage to root systems from which plants never fully recovered, corn following corn yielded much less than corn following soybean in many areas of Illinois (see my article from October 2010 at bulletin.ipm.illinois.edu/article.php?id=1426). This came after a number of years in which corn following corn produced good yields, in many cases equal to those of corn following soybean.

While the spring planting season and crop conditions were quite different this year than in 2010, we are again hearing that corn following corn is producing lower yields than corn following soybean in many areas of Illinois. This is not likely the case everywhere, but it seems most noticeable in areas where it’s been very dry since July. I’ve heard of cases where corn following soybean is yielding about 230 bushels per acre, while corn following corn in the same area, planted with similar practices, is yielding in the range of 160 to 170. We don’t expect corn following corn to average 60 or 70 bushels less than corn following soybean over whole areas, but this does illustrate what will again be a significant issue in some fields this year.

Last year it was easy to make the case that, with the wet fall and lack of fall tillage in 2009, large amounts of surface residue and cool, wet conditions at planting, followed by heavy rain and root injury, all added up to yield losses for corn following corn. In 2011, we don’t have as clear a picture for why we are seeing this problem. For one thing, the fall of 2010 was very dry and harvest was early; this, together with the pent-up desire to do tillage to relieve effects of wet conditions for the previous two years, led to a huge amount of fall tillage last year. Surface residue was well buried in most fields following corn in 2010, and we can’t blame residue for this problem in 2011.

So what did happen in 2011 that resulted in a second year of substantial yield loss in corn following corn? It’s never possible to paint a complete picture, but I’ll offer the following:

1. The spring of 2011 started out well, with some corn planted in early April. Almost all of this was corn follow-
As a result of these problems, many who attempted to apply extra nitrogen into such cool, wet conditions. Some problems we associate with planting uneven stands, poor color, and other things to try to bring the crop to normal color and growth in corn following corn.

Once the calendar turned to May and it dried up enough for fieldwork, planting got underway in a big rush, with about 60% of the crop planted over the first two weeks of May. Many—probably most—fields planted during this period were wetter than would have been ideal. And because fields that were corn the year before almost always dry out more slowly than those that were in soybean, those who started planting corn following corn in early May planted into even wetter and cooler soils than those planting after soybean. This not only caused more compaction, “undoing” much of the benefit of tillage last fall, but it also brought issues of residue interference, seed placement, and effects of heavy equipment in many corn-on-corn fields.

As a result of these problems, many reported that corn following corn looked bad from the start, with uneven stands, poor color, and other problems we associate with planting into such cool, wet conditions. Some who attempted to apply extra nitrogen, foliar nitrogen, micronutrients, or other things to try to bring the crop around generally found that their efforts didn’t do a lot of good. Starter fertilizer helped make some stands look more uniform, but it did not completely solve the problem.

The heavy rainfall in May and June in some areas was a repeat of what we saw in 2010. But with the crop not nearly as far along in 2011 and with June temperatures not as high as in 2010, immediate effects of this heavy rain on the corn crop were not as severe in 2011 as in 2010. This did, though, delay even more the return of the crop to normal color and growth in corn following corn.

When the rains stopped in many areas in late June and soils dried in July and August, the effects were much more severe in most corn-on-corn fields than in fields where corn followed soybean. Due to drier soils, root systems generally developed better and remained healthier in 2011 than in 2010. But with the effects of compaction, slower growth due to less (and a less green) canopy, residue, possible tillage effects, and other factors in corn following corn, it seems that the ability of the roots to extract water was compromised compared with corn following soybean. Both crops seemed to pollinate okay, but corn following corn showed more leaf stress in July and August, and reduced light interception was evident in many fields where corn followed corn. This increased kernel abortion and decreased the ability of the crop to fill the kernels it had.

In the driest areas, corn following corn lost canopy color and died prematurely, often before corn following soybean. This stopped the filling of kernels, and in many cases led to more stalk quality problems.

It is discouraging that, after corn-on-corn has done so well in recent years, we now have a second year of lower yields in many corn-on-corn fields. Many will find that their profitability will be higher with corn following soybean than corn following corn this year, even accounting for what have often been lower returns from soybeans than from corn in recent years.

Of course, we can’t simply decide to plant more corn acres following soybean in 2012 than we did in 2011; we planted only about 9 million acres of soybeans in Illinois both years, and acres of corn following soybean the next year can’t exceed that number. So as long as corn acreage stays near the 12 million acres of recent years, some 20% to 25% of Illinois corn will have to be corn following corn.

A special request. Given the severity of this yield problem and the fact that it has now happened for a second year, I think we should work to get a better handle on it and try to come up with possible research to address it. I ask that anyone who is seeing the problem this year send me an email with the following information:

- a brief description of the yield differences you’re seeing
- where the differences are the worst
- whether any corn-on-corn fields seem to have escaped this problem to yield nearly as well as corn following soybean, and, if so, what was different in those fields that might explain this result

Thank you for your assistance.—Emerson Nafziger

Fall Nitrogen Application: What, When, Where, and How

It is once again harvest season! Although combines recently started to roll, it will not be long before most Illinois fields will be cleared of crops, and farmers will start operations to prepare for the next growing season.

Nitrogen application is one of the many decisions to be made at this time of year, and it is an important one. Proper nitrogen management is critical to sustainable corn production, and what is done in this regard can impact farmers’ profitability and the environment in which we all live. For these reasons it would be wise to review important guidelines developed through years of research and experience.

I acknowledge that a given recommended practice may not work very well every year—mostly because of environmental conditions beyond our control—but these guidelines, if followed, will ensure the best chance for protecting your nitrogen investment and at the same time enhancing environmental protection.
What to Apply

While many inorganic nitrogen sources are available in the marketplace, for fall application the only recommended sources are anhydrous ammonia (NH₃) and ammonium sulfate [(NH₄)₂SO₄]. Ammonia transforms quickly to ammonium (NH₄⁺), and nitrogen in ammonium sulfate is already in the ammonium form. Ammonium is adsorbed onto the exchange sites in soil particles and organic matter, and thus it is protected from leaching. By contrast, nitrogen sources containing nitrate (NO₃⁻) should not be used in the fall because nitrate does not become adsorbed onto exchange sites in the soil and can be easily leached or denitrified long before corn plants are ready to use it. Common fertilizers that contain nitrate include ammonium nitrate (NH₄NO₃) and urea ammonium nitrate (UAN).

Another common nitrogen source is urea (CO(NH₂)₂). Urea converts to NH₃ and then to NH₄⁺ within a few days of application. However, research results indicate that this fertilizer should not be used in the fall because it has a greater risk of loss compared with anhydrous ammonia before rapid nutrient uptake by the crop the following spring. The same can be said of polymer-coated ureas. While the coating protects urea for a while, often urea starts to diffuse out of the granule too early, and the loss potential is higher than for anhydrous ammonia.

One of the benefits of anhydrous ammonia is that it kills nitrifying bacteria (which are responsible for the transformation of ammonium to nitrate) at the point of application. In addition, as ammonia reacts with water to form ammonium, the reaction creates an alkaline (high pH) environment in the ammonia retention zone. This high pH also inhibits activity of nitrifying bacteria for a while, but the effects are temporary.

To lengthen the period of bacterial inhibition, it is always a good idea to include a nitrification inhibitor with the application of anhydrous ammonia. Many years of research have indicated that nitrification inhibitors, such as dicyandiamide (DCD) and N-serve, can protect fall nitrogen against loss and increase the amount of nitrogen present in the ammonium form the following spring.

As with most practices, the use of a nitrification inhibitor might not pay every year. For example, if the following spring is dry and cool, the inhibitor might not be as beneficial in enhancing ammonium recovery. However, as I mentioned earlier, this practice will overall ensure the greatest chance to both protect your nitrogen investment and enhance environmental protection.

From the standpoint of production profit, in times when nitrogen prices were low, it was cheaper to buy additional nitrogen rather than the nitrification inhibitor. As nitrogen prices increase and the cost of nitrification inhibitors remains relatively constant, using an inhibitor is becoming more profitable. Still, while an inhibitor represents an added cost, it is important to realize that a reduction in nitrogen efficiency due to losses plus the environmental degradation linked to nitrogen loss also represent added costs. Farmers must carefully consider all these factors when deciding to apply nitrogen in the fall.

Ammonium sulfate is an excellent nitrogen source for no-till fields where broadcast applications are preferred. It is always best to apply it before soils freeze so the fertilizer can be dissolved and incorporated into the soil by rain. In fields with minimal slope (less than 5%) and where the potential for runoff is very low, it is feasible to apply ammonium sulfate on frozen ground because there is no concern of volatilization loss. An important point to remember is that ammonium sulfate is more acidifying than other nitrogen sources, so make sure to keep an eye on soil pH. As a general rule, 5 pounds of lime is needed to neutralize 1 pound of nitrogen from ammonium sulfate compared with 2 pounds of lime needed per pound of nitrogen from anhydrous ammonia.

Last but not least, organic fertilizers derived from animals (manure, poultry litter, etc.) are good for use in the fall. These products supply nitrogen as well as phosphorus, potassium, and other crop nutrients. Often these organic fertilizers represent a less expensive source of nutrients compared with inorganic fertilizers.

When to Apply

This fall, just as in the fall of 2010 to a certain extent, harvest is happening earlier than is typical. In years like this, it is critical to keep in mind that soil temperature can significantly impact the efficiency of fall nitrogen applications and the effectiveness of nitrification inhibitors. Nitrifying bacteria are active until soils freeze (32 °F), but their activity is greatly reduced once soil temperatures go below 50 °F. For this reason, it is recommended that the start of fall nitrogen applications be directed by soil temperature and not by date, when harvest is complete, or any other consideration.

The temperature guideline applies equally for anhydrous ammonia, ammonium sulfate, and manure/organic fertilizers that can be used in the fall. As I mentioned earlier, the efficiency of nitrification inhibitors also decreases with warm temperatures. Higher temperatures result in faster breakdown of the molecule responsible for inhibition of nitrifying bacteria. The cooler the temperature, the greater the efficiency of the inhibitor, and the greater the chance that ammonium does not convert to nitrate.

While I realize that every year anxiety levels rise when soil temperatures are not getting down to 50 °F and falling steadily, I would remind readers that in most years, the 50 °F temperature allows for nitrogen applications before soils become too wet or frozen. There is no need to increase the risk of nitrogen loss by starting applications too early. Also, applying once temperatures are 50 °F does not automatically ensure no nitrogen loss, though it does provide a better chance to protect your investment.
Air temperatures in Illinois can vary substantially during the early fall. Even if temperatures are getting to 50 °F, historically the chance that they will continue to decline without a significant bounceback to warmer levels are very rare before the second week of October in northern Illinois and the third week in central Illinois. On average, soil temperatures reach 50 °F and continue to go down the first week of November in central and northern Illinois. Daily maximum 4-inch bare-soil temperatures for Illinois this week have been bouncing between the 60s and the 70s.

Up-to-date soil temperatures can be accessed at www.isws.illinois.edu/warm/soiltemp/displaymap2.asp?day=0&data=bstmax. However, these values should be used as a reference. Since soil temperatures can be influenced by a number of factors (such as residue cover, soil color, and drainage), it is always best to monitor temperatures in individual fields prior to nitrogen application.

Where to Apply

Because temperatures do not stay below 50 °F long enough during the winter in all of Illinois, fall nitrogen application should not be done south of a line roughly parallel to Route 16. In areas near this boundary, evaluate soil characteristics to determine whether fall application is appropriate. Soils with high potential for nitrate leaching in the fall or early spring (sandy soils or those with excessive drainage) should not receive fall nitrogen applications. Also, regardless of location in the state, do not apply nitrogen in the fall to soils with high potential for nitrate leaching or soils that are very poorly drained.

Given the length of time between application and utilization by the crop, application of manure and other organic nitrogen sources should be done as far as possible from environmentally sensitive areas, such as on steep slopes and near bodies of water. If the application cannot be accomplished in late fall, do not apply on frozen soils in the winter; it is better to wait until spring.

How to Apply, and How Much

When applying anhydrous ammonia, make sure soil conditions are fit for the application. Soils that are too dry or too wet can result in ammonia loss to the atmosphere because the application knife tracks may not seal properly. When soils are dry, increasing depth of application or reducing application rates typically can help minimize volatilization loss. When soil is wet, little can be done to minimize loss through volatilization. If you use manure, poultry litter, or other animal-derived fertilizers, incorporate them into the soil to avoid volatilization.

To determine the economically optimal nitrogen rate at various corn and nitrogen prices, use the corn nitrogen rate calculator at extension.agron.iastate.edu/soilfertility/nrate.aspx. While the calculator is designed to help you make the most profitable decision for nitrogen management, it does not account for carryover nitrogen that might not have been used by a crop if conditions were dry. Also, if you applied manure or the soil has high potential for nitrogen mineralization (as in the case of a field coming off of alfalfa), you will need to adjust the values derived from the calculator to reflect what will be available next year.

Once you determine how much nitrogen you will need, remember that you don’t have to apply the entire amount in the fall. If you don’t like taking big risks, but a fall application makes sense, it may be better to apply some nitrogen in the fall and the rest in spring. A portion of the total nitrogen requirement applied in the fall can provide all of what the corn crop will need to get started in spring. Applying the remainder closer to when plant will need the most nitrogen can increase use efficiency because there is less chance for leaching or denitrification. Also, research has shown better efficiency of nitrification inhibitors when lower nitrogen rates are used in the fall. Splitting the total application thus might produce benefits on several fronts.

Finally, be aware that anhydrous ammonia is under a lot of pressure inside the nurse tank, and when released it reacts quickly with water. If ammonia comes in contact with your skin, eyes, or mucous membranes, it will cause dehydration and burns, so please use extreme caution when handling it. Remember that “it is better to lose a minute in life than life in a minute.”

Weigh Your Options

While nitrogen does not have to be applied in the fall, this timing has both economic and logistic advantages. Soil conditions are typically more conducive to application, there is more time available than during the busy planting season, equipment and labor are better distributed, and often there are price incentives to buy anhydrous ammonia. The spring typically is wet, and soil compaction is of greater concern, especially for manure application. Waiting until spring to apply fertilizer also can delay planting, damage crops, and delay application of fertilizer to meet the crop’s early nutrient uptake needs.

Unfortunately, though, because spring weather conditions greatly influence nitrogen efficiency, it is impossible to know in any given fall how safe or how risky it is to apply nitrogen. If the following spring is dry, there is little risk of loss from fall application (assuming nitrogen was applied correctly). On the other hand, if the spring is wet, the chance of loss increases. If after considering your options you decide fall nitrogen application is right for you, following the guidelines outlined here will certainly help protect your nitrogen investment and at the same time enhance environmental protection.—Fabián G. Fernández

Nutrient Applications for Wheat

Relatively early harvest in most of Illinois this year should allow enough time to get wheat planted and well established before it gets cold. If a wheat crop is in your plans this fall,
Nitrogen (N) is important for vegetative growth, but the amount taken up by roots and vegetative tissues does not exceed 30 to 40 lb N per acre before it gets too cold. Nearly all modern varieties of wheat have been selected for improved standability. While concern about lodging under high N rates has decreased considerably, to minimize any lodging risks it is best not to apply too much nitrogen in the fall. Also, because N applications will promote excessive vegetative growth, the crop may come across disease problems later.

If the soil has large potential to supply N, fall applications before planting may not be necessary. Also, this year’s cornfields should have some leftover N in the soil, as the crop probably did not use it all during dry conditions in July and August. Normally, in any given year an application of 20 to 30 lb N per acre in the fall is all that is needed to get wheat established. This amount can be supplied in the form of di-ammonium phosphate (DAP), which should also supply what is needed for phosphorus fertility (see the later discussion).

The total N required for a wheat crop depends on the capacity of the soil to supply it. Dark soils high in organic matter require less N than light-colored soils with low organic matter. For soils with organic matter higher than 4%, 70 to 90 lb N per acre is typically sufficient; soils with organic matter between 2% and 4% often maximize yields with a rate of 100 to 120 lb N per acre; soils with organic matter of less than 2% require 150 lb N per acre.

While the full amount of N can be applied with anhydrous ammonia and a nitrification inhibitor in the fall, the preferred method is to apply most of what is needed by top-dressing in the spring, right before the crop greens up and starts to take N. Application at this later time minimizes the potential for loss and provides needed N that might not be available from the soil due to slow mineralization of soil N by bacteria during cool springs. The top-dressing can be accomplished with dry or liquid N solutions as long as they don’t contain free ammonia. If you use urea, it is important to apply it when leaves are free of dew or moisture and the soil surface is not excessively dry.

While most wheat is planted after soybean, if it is planted after corn, one potential concern is that N can be temporarily tied up while microorganisms break down corn stover. Fortunately, most of this tie-up takes place in the spring once soils warm up, which is often after wheat has taken up most of its N. For these reasons, N beyond the recommended amount is not needed for wheat grown after corn.

On soils with higher organic matter, spring application timing has little impact on yield. On the other hand, N rates can be decreased by 10% in soils low in organic matter in southern Illinois when one of the following applies:

- Spring application is delayed due to late tillering (Feekes growth stage 5.0–6.0).
- Spring applications are split, with one at early greenup and one at late tillering or early jointing.
- Nitrification inhibitor or a slow- or controlled-release N source is used.

Research has also shown that a spring-split N application, with one-third early and two-thirds at late tillering to jointing, can increase yields by about 10% compared to a single spring application at greenup, especially when conditions favor N loss. Delaying all of the application to late tillering or early jointing usually produces the same yield as splitting applications in the spring.

Phosphorus (P) is very important to stimulating early growth, helping with tillering (which eventually determines the number of seedheads), and improving winter survival. The amount of P to be applied depends on soil test levels as well as the P-supplying power of the soil. It is recommended that test levels for high, medium, and low P-supplying soils be at 40, 45, and 50 lb per acre, respectively.

If P is below the desired level, it is recommended that you apply enough to both build up the soil and supply what the crop will remove. If test levels are adequate, it is recommended that you apply enough at planting time to replace 1.5 times the amount to be removed by the crop. This large amount is needed to meet the high P requirements of wheat. In many fields, a typical rate of 150 lb of DAP (18-46-0) per acre supplies not only P but also sufficient N for establishment of the crop (discussed earlier). It might be tempting to reduce or eliminate P application in soils that test at or just above the critical level. If your finances do not allow for a full application, it is strongly suggested that you apply 80 to 100 lb of DAP per acre to ensure a good supply of readily available P to facilitate adequate establishment of the crop.

Potassium (K) is also an important nutrient, but wheat normally does not respond to applications of K unless soil test levels are extremely low (<100 lb per acre). Since soybean and corn are grown in the rotation with wheat and are more responsive to K than is wheat, it is recommended that you manage K to maximize yield of corn and soybean. Doing so will automatically take care of the needs of wheat.—Fabián G. Fernández

Fall Seeding Issues

With corn and soybean harvest getting underway in much of the southern part of the state, it shouldn’t be too difficult to get wheat seeded close to the best time in that part of Illinois. The optimal time to plant wheat ranges from just past mid-September in the northern edge of Illinois to just before mid-October at the southern tip. In the major growing area of southwestern Illinois, wheat should be planted the second week of October.
Planting a few days before or after that time is not of concern, but planting 10 days to two (or more) weeks early is not best practice.

Harvest has started very slowly in northern Illinois, however, so getting wheat planted on time there will be a challenge unless it can follow something other than corn for grain or soybean. Planting a week or two late usually doesn’t produce a big penalty, but it can lower yields in years when cold weather comes early.

In fall 2010 the wheat crop was planted on time but got off to a slow start due to very dry soils at planting. This may occur again this year, as some areas continue to be very dry. While wheat seed does not need to take up a lot of water to germinate, it does need some. There may be enough water present in soils following harvest, but you need to be careful to get the seed placed so it can take up what water is there. No-till can help, but not if the soil is powder-dry at the depth of seed placement. It’s a little risky, but if there is more soil moisture several inches deep than at the surface, some tillage might help bring up enough to allow the seed to germinate. No matter what, make sure the seed is placed uniformly deep and that the planting process produces good seed–soil contact. That can be more difficult in cornstalks than in soybean residue, but either can work as a preceding crop.

Wheat seeding rate trials in recent years have shown that rates should be between 30 and 40 seeds per square foot. The higher number may be appropriate for later planting or in cases, such as planting into very dry soils, where emergence might be late. The point is that late emergence usually lowers the number of tillers per plant, so more plants can help bring shoot numbers up.

One question that has come up recently is about the possibility of planting wheat in 15-inch rows, using a split-row planter. It seems that some see this as a way to convince farmers who no longer have a drill to plant wheat, and some have promoted it as producing higher yields, or maybe equal yields with lower seeding rates. At Ohio State University they have even conducted wheat variety trials at both spacings; there, they grow much of their wheat farther north and sometimes plant soybeans as a relay crop between wheat rows during wheat growth.

I consider 15-inch wheat rows to be roughly equivalent to 40-inch corn rows. That means that we can often get good yields, but under the best conditions we will not maximize yields in the wider rows. I would exhaust every possibility for getting a wheat drill to use before I would consider modifying a set of vacuum plates to use to plant wheat.

There has been some recent publicity about an effort to establish pennycress (Thlaspi arvense) in the fall to be used to produce oil for biodiesel. Pennycress, a member of the mustard family, is essentially a winter annual weed at this point. Some breeding work is underway. Pennycress is probably best seeded in late August or early September, and as a winter annual it produces a plant that stays small into the winter, then bolts in the spring. We have had it in the field the past two years and have not been overwhelmed by the yields, which have usually been less than 1,000 lb per acre. There’s not a well-established market for this crop, at least nearby.

Canola is another crop that is seeded in the fall in regions like Illinois where the winter is not too severe. The crop is used mostly for edible oil and has had a small resurgence of interest in recent years. It is also a member of the mustard family, but unlike pennycress it is well developed as a crop. Issues in past trials have included diseases and inadequate winterhardiness. You can expect to harvest canola at or a little after the time that winter wheat is harvested. It can also be difficult to find a market nearby for this crop.—Emerson Nafziger

Contributing Authors

Suzanne Bissonnette, sbissonn@illinois.edu, 217-333-4901
Fabián Fernández, fernande@illinois.edu, 217-333-4426
Mike Gray, megray@illinois.edu, 217-333-6652
Emerson Nafziger, ednaf@illinois.edu, 217-333-4424
Stephanie Porter, satterle@illinois.edu, 217-244-3254