PEST MANAGEMENT & CROP DEVELOPMENT

BULLETIN

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INSECTS

Suddenly, Grape Colaspis

After some relatively quiet days in May, we received several reports of grape colaspis larvae feeding in cornfields during the week of May 26. The cool weather has delayed corn growth in some areas, and grape colaspis larvae have been chewing away the fine roots, ultimately resulting in wilted plants with "scorched" edges. Also, the stems of injured plants have turned purple; however, that symptom can be caused by a number of factors (including weather), so many folks simply had not taken particular note of it.

Most of the reports of grape colaspis injury have come from western and west-central Illinois. However, Mike Hellmer, field sales agronomist with Pioneer Hi-Bred International, found a field near Royal (Champaign County) infested with grape colaspis on May 29. He observed an average of about one to two larvae per plant, and some stunting was evident. Fortunately, if good growing conditions prevail soon, the plants should grow past the injury with little effect on yield.

Duane Frederking, also a field sales agronomist with Pioneer Hi-Bred International, has observed grape colaspis larvae in some cornfields in west-central and western Illinois. One field in Pike County had an average of three to five larvae per plant; root damage was severe. In a field in Sangamon County, Duane observed grape colaspis working mostly in spring-applied NH_3 knife tracks, apparently avoiding the tighter soil between the knives. Again, he found several larvae per plant, and the injury was prevalent.

Some University of Illinois Extension educators also have found grape colaspis in western and west-central counties. Mike Roegge (Quincy), Sean Evans (Macomb), and Matt Montgomery (Springfield) all have observed grape colaspis in fields in several counties. The injury in these fields has varied considerably, but all of the educators believed that most of the plants will grow out of the injury.

Kelly Cook, University of Illinois Extension IPM entomologist in the Department of Crop Sciences, examined some corn plants that had been injured by grape colaspis larvae. The plants had been submitted from near Buffalo in Sangamon County. The symptoms of the injured plants, which were about at the 4-leaf stage, were classic—some denuded roots, some purpling of the lower stem, wilted leaves, and scorched leaf edges. Again, our assessment was that the plants probably will grow out of the injury.

Grape colaspis injury to larger plants probably will not result in any yield loss, especially if warm weather returns to encourage corn growth. However, injury to smaller plants could be more problematic. As we have learned before, severe infestations of grape colaspis can result in significant stand loss. Unfortunately, there are no effective rescue treatments after the damage has been diagnosed. One only hopes that the stand is sufficient to avoid replanting. Obviously, at this late date, replanting is not an attractive option.

As additional reports of grape colaspis injury come into our offices, we will keep you apprised. In the meantime, take time to read the accompanying article ("Grape Colaspis: Some Background") about grape colaspis by Matt Montgomery, Extension crop systems educator in Springfield. Matt provides some background about the description and biology of the pests, as well as some speculation about why grape colaspis pose problems some years and not others. Interesting reading. —*Kevin Steffey*

Grape Colaspis: Some Background

The literature about grape colaspis extends well back into the 1800s. However, it's only recently that concern about this pest has become more acute throughout central Illinois. Following is some background about the insect and some possible explanations for the ups and downs of its population densities over time.

Description and life cycle. Grape colaspis, *Colaspis brunnea,* has one generation per year. The adult colaspis, which appears around mid- to late June, is about 1/8 to 1/6 inch long and resembles, according to many, a "brown northern corn rootworm beetle." Found feeding on soybean trifoliates, corn leaves, and corn silks, the adults have a series of lines on their elytra (wing covers). These lines actually are a series of small "punctures" arranged in rows. Feeding injury by the adults, which has not been documented to be economically significant, appears "jigsaw puzzle–like" in shape. Adults mate several times throughout the growing season, and females deposit elongate, white to yellow eggs in clusters of about three dozen in the soil. Larvae hatch about 1 to 2 weeks later. The young larvae have orange head capsules and white to gray bodies. Grape colaspis larvae resemble small white grubs, although they are much smaller than grubs of Japanese beetles or *Phyllophaga* species.

In the fall, grape colaspis larvae move downward and outward in the soil profile and begin to feed on the roots of available plants. In September, as soil temperatures begin to decline, the larvae migrate 8 to 10 inches deep in the soil, where they overwinter. When the soil warms up in the spring, larvae return to more shallow regions of the soil profile. They begin to strip away fine roots and gouge "channels" in the roots of available plants (typically corn, but also soybean), sometimes causing significant stand reduction in fields of commercial corn hybrids. Grape colaspis damage to corn inbreds can be disastrous in seed-production fields. In early to mid-June, the larvae excavate earthen cells in which they pupate and transform into adults.

Some grape colaspis history. Grape colaspis was troublesome off and on throughout the 20th century and was especially noted on corn following red clover up to about the mid- to late 1950s. The pest appeared occasionally after the 1950s, making a late-1980s appearance in drought-stressed soybean fields. (Although we remember that spider mites caused damage to soybeans in 1988, grape colaspis larvae caused significant damage to soybeans earlier in that same year.) In the mid-1990s, grape colaspis larvae seemed to reappear with what some might call a vengeance. Although some people believe that grape colaspis larvae afflicted corn without being diagnosed for several years, problems with grape colaspis were verified in 1998 and thereafter. Widespread injury occurred in 1999 and 2000, and concern about this pest has escalated accordingly. In 2001 and 2002, grape colaspis problems abated somewhat.

Effect of soil moisture on grape colaspis larvae. So why the difference in densities of grape colaspis between the late 1990s and 2001? Nobody really knows for certain, but we can speculate. Dale Richard Lindsay published a thesis entitled *The Biology and Morphology of* Colaspis flavida in the 1940s *(Colaspis flavida* being the former scientific name for grape colaspis). Lindsay noted some interesting points about various portions of the grape colaspis's life cycle. He noted that eggs, pupae, and larvae were very susceptible to "desiccated conditions." In other words, dry conditions had a significant detrimental impact on grape colaspis survival during each immature growth stage. The larval stage, especially during the first week of the larval stage, was deemed most at risk when exposed to dry conditions. I mapped various rainfall patterns for Sangamon and Menard counties for different periods of the growing seasons in 1998, 1999, and 2000 and noticed some interesting patterns. When rainfall patterns during July to September were near average, grape colaspis problems were notable the following year. For instance, rainfall in Menard County in 1998 and 1999 appeared to be fairly close to a 10-year average. Subsequent grape colaspis problems in 1999 and 2000 were fairly widespread and significant. Conversely, rainfall during July through September in 2000 was significantly less than the 10-year average. Subsequent grape colaspis problems in 2001 were relatively uncommon. It is possible that dry soil conditions between July and September in 2000 may have resulted in significant mortality of young grape colaspis larvae. Adequate soil moisture between July and September in 1998 and 1999 may have encouraged survival of grape colaspis larvae. It is interesting to note that rainfall from July through September in 2002 was very similar to the rainfall that occurred during July through September in 1998 and 1999. We do not know, however, if there are cumulative effects on grape colaspis mortality from consecutive "dry" years.

Anticipation and management of grape colaspis. For now, our best recommendations for management of grape colaspis are to adopt practices that result in the most rapid, uniform emergence of seedlings in fields with a history of grape colaspis problems, as well as practices that result in fast-growing, vigorous root systems. Any valid option that can give the seedling a head start, allowing it to outpace colaspis damage, is to the producer's advantage. If we become better at predicting this troublesome pest, prophylactic use of effective soil insecticides or insecticidal seed treatments would be warranted.—*Matt Montgomery*

Soybean Aphids on Seedling Soybeans

Jeff Wessel, farm manager of the J. F. Richards Demonstration and Research Farm at Joliet Junior College, reported the first soybean aphids of the season in Illinois on May 29. He found as many as 40 aphids on one V2–V3 stage soybean plant. He found various numbers of aphids and ants on other plants in the planting-date study that was planted on April 9. Jeff indicated that a natural area on the Joliet Junior College campus has a significant number of buckthorn plants, the overwintering host for soybean aphids. Obviously, soybean aphids have left their overwintering hosts in the area to colonize these early-planted soybeans. In the three years during which soybean aphids have been found in the spring in Illinois, Jeff's report is the earliest report of soybean aphids on seedling soybeans.

David Voegtlin, research entomologist with the Illinois Natural History Survey, reported finding the first winged soybean aphid adults in Illinois this season on April 23. Dave and his coworkers had been watching soybean aphids on *Rhamnus cathartica*, a buckthorn species, and had found hundreds of aphids on some of the small plants. However, there were no soybeans in the vicinity, so the aphids' movement to their secondary host had not commenced at the time.

You might recall that the scientific literature suggests that populations of soybean aphids develop more readily when temperatures are cool. Thus far this spring, our temperatures certainly have been cool, so soybean aphids may be off to a fast start. It's also important to remember that yield losses usually are more significant when soybean aphids colonize seedling soybeans than when they colonize older plants.

This early sighting of soybean aphids serves as a heads-up for everyone scouting soybeans right now. During the past few years, David Voegtlin and his co-workers have established and operated a set of suction traps (currently at nine locations) designed to sample the air for flying aphids. Dave and his team have had limited success capturing winged soybean aphids during the spring movement from buckthorn to soybeans. He has speculated that the number of aphids flying in the spring is relatively small compared with the larger flights that occur later in the summer. Nonetheless, you should check out information about the Soybean Aphid Suction Trap Network at http://www.ipm.uiuc.edu/fieldcrops/insects/soybean_aphids/suction_trap_network/index.html. At the time I wrote this article, no data for 2003 had been posted. However, Dave and his coworkers are looking through the samples collected thus far this spring and will report their findings soon.

Again, just keep your eyes open for soybean aphid colonies on seedling soybeans. Because soybean aphids were not very prevalent in 2002, neither were some of their predators, most notably the multicolored Asian lady beetle. Consequently, if soybean aphids become established this spring and few predators are around, their densities could increase rapidly. We'll keep you posted as we learn more from around Illinois and from neighboring states.—*Kevin Steffey*

Asana XL Labeled for Control of Soybean Aphid

E. I. du Pont de Nemours and Company, Crop Protection, issued a FIFRA (Federal Insecticide, Fungicide, and Rodenticide Act) Section 2 (ee) recommendation for application of Asana XL for control of the soybean aphid in soybeans. The label is effective in the states of Colorado, Illinois, Indiana, Iowa, Kansas, Kentucky, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, Pennsylvania, South Dakota, and Wisconsin. The rate of application of Asana XL for control of soybean aphids is 5.8 to 9.6 oz of product per acre (0.03 to 0.05 lb a.i. per acre). Following are some restrictions:

- Do not feed or graze livestock on treated fields.
- Do not apply more than 0.2 lb a.i. per acre per season.
- Do not apply within 21 days of harvest.

Use of Asana XL is restricted for certified applicators.—*Kevin Steffey*

Reports of European Corn Borers Begin

Reports of European corn borer moths are starting to filter in from areas around the state. In the "Hines Report" (http://www.ipm.uiuc.edu/pubs/hines_report/), Ron Hines has been reporting catches of moths since the week of May 6 in southern Illinois. Mike Roegge, unit educator in crop systems, reported the first catches in Adams/Brown counties beginning May 27. Duane Frederking, field sales agronomist, Pioneer, reports European corn borer moths are noticeable everywhere in varying numbers. With all this moth activity, a little refresher on first-generation corn borers may be in order.

European corn borers overwinter as fifth-instar larvae. The larvae pupate and emerge as moths in the spring when temperatures reach 50˚F. We can use the accumulation of degree-days (base 50˚F) to predict different life stages or larval development (Table 1).

Degree-day accumulation begins at the first significant moth flight. Eggs hatch in about a week, and larvae move to the whorl of the plant. As moths emerge, they seek shelter in dense areas of vegetation (action sites) that provide shelter and moisture, and they mate. Females lay eggs on the

Table 1. Accumulated degree-days (base 50°F) from significant moth flight in the spring to first occurrence of like stage or activity of first-generation European corn borers (from *European Corn Borer: Ecology and Management*, NCR Publication No. 327, Iowa State University, Ames).

Accumulated degree-days	*First occurrence of stage or event*	*Days to first occurrence*[a]	*General activity*
0	First spring moth catch		
212	Egg hatch (first instar)	16.3	Pinhole feeding
318	Second instar	6.6	Shot-hole feeding
435	Third instar	6.5	Mid-rib and stalk boring
567	Fourth instar	6.6	Stalk boring
792	Fifth instar	10.2	Stalk boring
1,002	Pupa	7.6	Changing to adult

[a]Average number of days of development to reach the first occurrence of the stage or event since initiation of the previous stage listed. For example, it takes about 16 days from the first moth capture to egg hatch; first instars require about 6.6 days to develop second instars, etc. The number of days varies if temperatures are cooler or warmer than average.

undersides of leaves of corn or other hosts. Some fields are more attractive to egg-laying moths than others. Early-planted fields are at a higher risk than fields planted later in the season. Corn that is smaller than 15 to 18 inches tall is not as susceptible to corn borer injury; corn this size contains DIMBOA, a plant compound that prevents corn borer larvae from establishing. The concentration of DIMBOA decreases as plants mature. Larval survival is better on plants that are in the mid- to late-whorl stages.

As plants approach 15 to 18 inches in height, scouting for larvae and whorl feeding should take place. Larvae are small, cream-colored insects with black heads and have two distinct spots on the top of each abdominal segment. Young larvae can be found feeding in the whorl, chewing holes through the leaves, leaving what is called a “buckshot” effect. As larvae reach the third and fourth instars, they begin to tunnel in the midribs and leaf sheaths.

When scouting, be sure to walk at least 100 feet into the field. In five random locations throughout the field, examine 20 consecutive plants (a total of 100 plants in the field). Check for fresh whorl-feeding and record the percentage of infested plants in the field. Remove two plants for every 20 plants examined and check for the presence of live corn borers by unrolling each whorl and examining the leaves. Note the stage of the larvae found. In larger fields, it is more practical to examine 25 plants in each of five random locations for every 80 acres. After the field has been scouted, use the management worksheet for first-generation European corn borer (below) to make the appropriate control decision. If a rescue treatment is warranted, granular formulations are more effective than sprays when applied by air, and sprays are most effective when directed by ground equipment over the row rather than broadcast (Table 2).

Management Worksheet for First-Generation European Corn Borer

☐	Larvae found	×	☐	expected survival[1,2]	=	☐	surviving larvae
☐	Surviving larvae	÷	☐	plants examined	=	☐	larvae/plant
☐	Larvae/plant	×	☐	yield loss/larva[3]	=	☐	yield loss
☐	Yield loss	×	☐	expected yield (bu/A)	=	☐	loss (bu/A)
☐	Loss (bu/A)	×	$	price/bu	=	$	loss/A
$	Loss/A	×	☐	control[4]	=	$	preventable loss/A
$	Preventable loss/A	–	$	cost of control/A	=	$	gain (+) or loss (–) per acre if control applied

NOTES:

[1]Record all percentages as decimals (for example, 20% = 0.2).

[2]If larvae are newly hatched (first instar), it is likely that only about 20% will survive to maturity, depending on environmental stresses. If larvae are second instar (about 3/16 of an inch) or larger the survival rate may increase to 50%. Adjust this number accordingly.

[3]Use 0.06 for V10 corn or 0.05 for V16 (green-tassel) corn. When borer numbers reach or exceed three per plant, the loss caused by each additional borer will decrease. Therefore, use 0.035 loss per borer for each additional borer above three per plant.

[4]80% control with granules (aerial or ground application) and with sprays directed over the whorls (ground application); the more effective insecticides provide comparable control when applied as broadcast sprays (aerial application).

Table 2. Suggested insecticides for first-generation European corn borer control in field corn.

Insecticide	*Amount of product per acre*	*Placement*
Ambush*	6.4 to 12.8 oz	Broadcast
Bacillus thuringiensis	See product label	See product label
Capture 2EC*	2.1 to 6.4 oz	Broadcast
Lorsban 4E*	1.5 to 2 pt	Over whorls
Lorsban 15G	3.5 to 8 oz/1000 ft row	Over whorls
Lorsban 15G	5 to 6.5 lb	Broadcast
Mustang Max*	2.72 to 4.0 oz	Broadcast
Penncap-M*	2 pt	Over whorls
Penncap-M*	3 to 4 pt	Broadcast
Pounce 1.5G*	6.7 to 13.3 lb	Broadcast
Pounce 3.2EC*	4 to 8 oz	Broadcast
Tracer 4SC	1 to 3 oz	Broadcast
Warrior*	2.56 to 3.84 oz	Broadcast

*Use restricted to certified applicators only.
Note: Granular formulations are more effective than sprays when applied by air for control of first-generation borers. Sprays are most effective when directed by ground equipment over the row rather than broadcast.

Whorl-feeding does not always cause economic injury. It's important to remember that the mortality rate of both eggs and larvae is quite high. About 20% to 70% of larvae fail to establish due to natural enemies and environmental conditions such as high temperatures and moisture stress. Even larvae that make it into the whorl could be subject to drowning. Even if whorl-feeding is present, larval survival may be very poor. It may also indicate that the larvae have started to bore into the midrib and stalk. Larvae remain in the whorl only until they reach the third instar. Once the larvae begin to bore into the stalk, rescue treatments are no longer an option. Snapped or broken leaves along the midribs are usually an indication of larvae burrowing in the stalks. Larvae tunnel up and down the midrib and eventually leave an exit hole that weakens the leaf at that point. The life cycle and biology of the European corn borer are summarized thusly:

Moth longevity: 1 to 2 weeks
Preoviposition period: 2 to 3 days
Egg-laying period: 7 to 10 days
Each moth lays about 2 egg masses per night.
One egg mass contains an average of 23 eggs.
Eggs per female: about 4000
Egg hatch takes 3 to 7 days.
Larval survival varies from 10 to 20%.
Number of larval instars: 5

Scouting is still essential to determine the extent of feeding in the field and make decisions for treating for first-generation corn borer. Watch for future updates in the *Bulletin*. We look forward to hearing from you about what's happening in fields this summer.–*Kelly Cook*

Confirmation of Corn Rootworm Hatch

On May 29, first-instar western corn rootworm larvae were detected in root tissue of corn plants dissected by entomologists with Purdue University. The plants were obtained from plots of corn grown in Tippecanoe County, Indiana. To detect larval hatch, Larry Bledsoe, research entomologist, Purdue University, had been dissecting 50 plants per day. Based upon his observations, he believes the initial hatch occurred on May 25. These findings indicate that corn rootworm larvae have been feeding on root tissue for about 2 weeks across much of central Illinois. In extreme northern Illinois counties, larval hatch likely began during the last few days of May or very early June. In the coming weeks, please let us know if you experience any control problems. We look forward to sharing your observations with our readers.—*Mike Gray*

WEEDS

Corn Size Limits with Postemergence Herbicides

While some areas of Illinois have struggled to plant corn between frequent rains, other areas have corn that is close to closing the rows. We wanted to remind producers that many postemergence corn-herbicide labels indicate a maximum corn size or development stage for broadcast applications. If these restrictions are not followed, the likelihood of corn injury may increase dramatically.

When application restrictions are found on the labels of postemergence herbicides, they are generally stated with respect to corn height, developmental stage, or both. While corn height appears self-explanatory, some ambiguity often exists with respect to where on the corn plant you measure to. In general, many people determine corn plant height by measuring from the soil surface to the top of the whorl or to the arch of the uppermost leaf that is more than 50% emerged. Restrictions based on corn developmental stage are usually stated with respect to the number of leaf collars present on the plants. Many agree that the leaf-collar method is a more accurate method to determine physiological plant age than is plant height. In 2002, several cases of severe corn injury occurred when some postemergence herbicides were applied to corn shorter than the maximum height listed on the product labels but having more leaf collars than would be expected for corn that height. The take-home message is to follow the most restrictive corn stage (height or leaf collar) listed on the product label. Table 3 summarizes the recommended timings for several postemergence corn herbicides. Always check the product labels for specific directions and use limitations.

During the weekend of May 30, nighttime low temperatures dropped into the mid- to upper 30s in some areas of

Table 3. Postemergence herbicide application timings in corn.

Herbicide	*Maximum corn heights and growth stages*[a]
2,4-D	Broadcast before corn exceeds 8" tall; use drop nozzles from >8" to tassel emergence.
Accent	Broadcast up to 20" tall or 6 collars (V6). Apply with drop nozzles from 20 to 36" tall. Do not apply to corn >36" tall or exhibiting >10 collars (V10).
Accent Gold	Apply up to 12" tall or 6 collars (V6).
Aim EW	Apply up to 8-leaf collar growth stage (V8).
Atrazine	Apply up to 12" tall.
Basagran	No height specified
Basis	Apply to corn spike to 4-leaf (V2). Do not apply to corn with 3 fully emerged collars or >6" tall.
Basis Gold	Apply up to 12" tall; do not apply to corn exhibiting 6 leaf collars.
Beacon	Broadcast between 4 and 20" tall. After corn is 20" tall or exhibits more than 6 collars, use directed applications up to tassel emergence.
Buctril	Before tassel emergence
Buctril + atrazine	Apply up to 12" tall.
Callisto	Broadcast up to 30" tall or 8-leaf corn.
Celebrity Plus	Broadcast between 4 and 24" tall.
Clarity or Banvel	At 1 pt/A rate, apply through the 5-leaf stage or 8" tall; at 0.5 pt/A rate apply from 8 to 36", or if 6th leaf is emerging, or if 15 days before tassel emergence. Use directed applications when corn leaves prevent proper spray coverage, when sensitive crops are growing nearby, or when tank-mixing with 2,4-D.
Distinct	At 6 oz/A rate from 4 to 10" tall; at 4 oz/A rate from 10 to 36" tall.
Equip	Broadcast up to 12" tall or through V4 stage. Use drop nozzles from 12 to 36" or V4 through V7.
Hornet WDG	Apply until corn reaches 20" tall or V6 stage. Apply with drop nozzles from 20" to 36" tall.
Liberty (LL-corn)	Broadcast up to 24" tall or V7 corn. Use drop nozzles from 24 to 36" tall corn.
Liberty ATZ (LL-corn)	Apply up to 12" tall.
Lightning (Clearfield-corn)	Apply up through 20" tall corn or corn with 6 leaf collars (V6); apply with drop nozzles when corn exceeds these stages or if crop canopy prevents adequate weed coverage. Do not apply within 45 days of harvest.
Marksman	Apply up through 5-leaf corn or 8" tall.
NorthStar	Broadcast between 4 and 20" tall (V2-V6). Use directed applications from 20 to 36" tall corn.
Option	Broadcast up to 16" tall or through V6 growth stage. Use drop nozzles from 16 to 36" tall corn.
Permit	Spike through layby
Resource	Apply to 2- to 10-leaf corn.
Glyphosate (RR-corn)	Apply through 30" tall or V8 corn.
ReadyMaster ATZ (RR-corn)	Apply up to 12" tall.
Sencor	Before tassel emergence
Shotgun	Broadcast up to 4-leaf or 8" tall; directed spray 5-leaf or 8 to 12" tall.
Spirit	Broadcast between 4 and 24" tall. Use drop nozzles when field corn is 20 to 24" tall or exhibits more than 6 collars (V6).
Steadfast	Broadcast up to 20" tall or exhibiting 6 collars (V6).
Steadfast ATZ	Broadcast up to 12" tall.
Stinger	Apply through 24" tall.
Yukon	Apply broadcast or with drop nozzles from spike to 36" in height.

[a]Follow the most restrictive labeling.

Illinois. Within a few days, several corn plant samples sent to the Plant Clinic showed leaf damage caused by these low temperatures. Any cornfields that were treated within a few days before or after these cold temperatures should be scouted carefully, as herbicide injury may be accentuated.—*Aaron Hager and Christy Sprague*

PLANT DISEASES

Stripe Rust of Wheat in Illinois

Stripe rust of wheat is typically uncommon in Illinois. This year, the cool and moist weather has been favorable for the development of stripe rust, and this disease has been reported at various locations in the southern half of Illinois over the past 2 weeks. Progress of stripe rust should stop if the weather becomes hot and dry, but severity and incidence of this disease may increase if the weather stays cool and moist.

Stripe rust (also called yellow rust) was reported in early to mid-May 2 to 3 weeks ago in Arkansas, Oklahoma, western Tennessee, and southwestern Missouri (http://www.cdl.umn.edu/crb/2003crb/03crb5.html). The spores of the stripe rust fungus have likely been blown up from these southern states to Illinois, where the environmental conditions have favored its infection and spread. Minor levels of this disease were reported in central Illinois in 2000 and 2001, and in southern Wisconsin in 2001. This year, reports suggest stripe rust is common in many areas and may be severe enough in some fields (such as western Macoupin County) to potentially cause yield loss.

Stripe rust often appears earlier in the season than leaf and stem rust of wheat. These different types of rust on wheat are distinguished by the color and pattern of the infected areas. The stripe rust pustules are more yellow than rusty brown and usually appear closely arranged in yellow stripes parallel to veins on leaves. Heads may also be infected with the yellow pustules. The pustules of leaf and stem rust are dark to light red–brown in color and are scattered in an arbitrary pattern over the leaves or stems.

Development and spread of stripe rust is strongly influenced by climate, and weather conditions are typically too warm and/or dry in most of Illinois after mid-May to favor this disease. Stripe rust develops most rapidly when temperatures are between 50˚ and 60˚F, and stops when temperatures exceed 70˚F. Stripe rust can develop and spread quickly when weather is cool with frequent dew or rainfall.

Another factor that has contributed to increased incidence of stripe rust in parts of the United States is new races of the stripe rust fungus *(Puccinia striiformis).* At this point, we don't know which races may be most common in Illinois although it is reasonable to consider that the common race(s) in states south and west of Illinois may also become common in Illinois.

Stripe rust can be managed with fungicides and to some degree with wheat varieties that differ in susceptibility. Fungicides labeled for control of stripe rust include Tilt, PropiMax, Quadris, Headline, and Stratego. None of these compounds can be applied after flowering (Feekes growth stage 10.5), and some cannot be applied after the ligule of the flag leaf emerges (Feekes growth stage 8). Product labels should be consulted for proper application of fungicides. It is too late to apply fungicides in many Illinois wheat fields. All of these compounds are systemic. If stripe rust is observed in fields with high yield potential prior to the end of the application period allowed on the label, the decision of whether or not to apply a fungicide should be made quickly because the disease has the potential to develop rapidly if weather conditions are favorable.—*Dean Malvick*

CROP DEVELOPMENT

Thinking About Crop Stress

It's become the excuse of last—and sometimes first—resort: When we are stressed about the condition of a crop and by unusual weather conditions, we tend to say that crops must be under stress as well. (Crops tend not to respond very noticeably to what we think or say about them, giving us a free hand to believe or say what we might.) Sometimes crops look as if they are under stress (growing more slowly than we expected or not the color we would like) and sometimes they look normal, but we tend to think that they must be under stress if it has been wetter, cooler, warmer, or drier than "normal." By normal we really mean average; those of us who have lived in Illinois for a long time know that it is normal for weather conditions to deviate considerably from average on any given date. In fact, weather conditions in recent weeks have precedence—they have happened at this time of the year in some previous years—and so they are within the "normal range."

Even if soil moisture and temperatures are within the normal range, however, they can still cause plant stress. In the past week (May 28 to June 3) at Urbana, we have accumulated the grand total of 70 growing degree-days (GDD), and it has rained some on 4 of the 7 days, with much less bright sunlight than average. Still, the crop has shown some growth, seen mostly as some filling of the row middles rather than as an increase in plant height. Corn planted here on April 23 is in stage V6, and so continues to develop faster than Bob Nielsen's guidelines predict. This crop has experienced only about 480 GDD since it was planted, while the Nielsen method (125 GDD to emerge and 85 GDD per leaf through V10) would suggest that corn with 480 GDD should have reached only past V4.

The fact that the GDD growth-stage formula is underestimating development can be seen as a positive factor, in that the plant is obviously making the most of the temperatures it is getting. In a way, this probably tells us that the crop is undergoing less stress than we might think it is. My working definition of stress is anything that reduces the rate of photosynthesis, which is the rate at which green plant leaves convert sunlight to sugars. Sugars are the means by which plants grow and develop, so if growth has been better than we expected, stress may have been less than we thought. This does not mean that the crop would not look better and grow faster under warmer conditions with more sunlight, but I think we can conclude that the root system is in place and functioning well, and that the leaves are making good use of what solar energy they are receiving. If we think back over the years, having a corn crop with good color and four to six leaves by June 1 tends to indicate good potential for the season, though there is no guarantee about that potential being realized.

Unfortunately, not every field is the picture of health that I described above. Some fields were planted late, and often in less-than-ideal conditions, so their root systems will probably struggle to establish well and their top growth may develop slowly, especially if cool, cloudy conditions continue. A much more widespread problem has been leaf-wrapping (buggy-whipping) in plants. Kevin Black of Growmark reported that some fields with plants as small as 6 inches tall are showing this symptom. Because this phenomenon is somewhat related to growth rate, and growth rates in plants that small are relatively slow, we expect that some of these fields may be showing effects related to acetanilide-class herbicides (which tend to slow growth) and/or to growth regulator-type herbicides (dicamba, 2,4-D), which tend to increase growth rates. But many fields that show this symptom had neither type of herbicide applied. Anecdotally, hybrids showing this symptom that did not have either type of herbicide applied tend to be those with higher growth rates following emergence. There might be other genetic factors, but these are not well-defined.

We think that the basic cause of leaf-wrapping is the inability of the older leaves to relax quickly enough to allow the younger leaves to push up through the center of the whorl. One way this could happen is for the older leaves to simply be growing more slowly than the newer ones. Cool weather may, for example, reduce the rate of growth of the outer, older leaves more than that of the inner, newer leaves. Or the older leaves may stay more "folded" than normal, or they might develop leaf surface characteristics that make it hard for young leaves to slide past. Once a leaf gets caught up and unable to push out, then the "tie-up" takes place rapidly, and all leaf tissue on the plant can become a tightly rolled mass. At some point, this restricts the growth rate of the newest leaves due to physical restriction. More importantly, curling up all the leaves into a tight roll cuts the rate of photosynthesis of the green leaves, by making the leaves upright and thus unable to intercept sunlight and by cutting down on movement of carbon dioxide into the leaves. Thus tightly rolled leaves probably do almost no photosynthesis; the longer plants stay this way, the more sunlight is wasted. Plants do not grow when there is no photosynthesis: This is a true example of "stress."

It is possible that leaf-wrapping can cut yield potential, especially if it persists much past V6 or so, when ears initially start to form. If we get some warm weather, the pressure from the new leaves will eventually cause the whorl to break open. When this happens, the leaves that have been rolled up with no access to sunlight will suddenly appear as pale yellow or white "flashes" as you look out over the fields, especially when it is breezy. Leaves can green up only when they encounter sunlight, so it's no surprise that such leaves aren't green when they first break out. They might have inadequate nitrogen as well. But they will recover quickly, especially if sunlight and temperatures are both favorable. So, appearance of these yellow-white leaves is a sign that the crop is starting to break out of this problem, but it also is a reminder that the crop has not been able to function fully for a period. Leaves should green up within a day or so, but as new ones appear, the yellow-leaf symptom may continue to show up in the field for some days.

Cool weather by itself also represents a stress, in that photosynthesis is low when temperatures are low. There has also been some light frost damage in low parts of fields, especially where there is crop residue that keeps the soil from radiating heat to help protect the leaves. Temperatures in the low 40s can also cause some leaf damage that may not show up very well, but that can reduce leaf function for a day or two. While we don't have a good way to link these early-season problems with yield potential, we do think that temperatures in the 30s last year when some corn was in the V4 to V5 stage may have caused some abnormalities in plants later, including loss of yield. This year, crop condition is considerably better in most fields than it was a year ago, so we are optimistic that the crop can grow out of its present condition without loss of yield potential. In the meantime, both the crop and those who watch it will continue to be stressed.—*Emerson Nafziger*

REGIONAL REPORTS

Extension center educators, unit educators, and unit assistants in northern, west-central, east-central, and southern Illinois prepare regional reports to provide more localized insight into pest situations and crop conditions in Illinois. The reports will keep you up to date on situations in field and forage crops as they develop throughout the season. The regions have been defined broadly to include the agricultural statistics districts as designated by the Illinois Agricultural Statistics Service, with slight modifications:

North (Northwest and Northeast districts, plus Stark and Marshall counties)

West-central (West and West Southwest districts, and Peoria, Woodford, Tazewell, Mason, Menard, and Logan counties from the Central district)

East-central (East and East Southeast districts [except Marion, Clay, Richland, and Lawrence counties], McLean, DeWitt, and Macon counties from the Central district)

South (Southwest and Southeast districts, and Marion, Clay, Richland, and Lawrence counties from the East Southeast district)

We hope these reports will provide additional benefits for staying current as the season progresses.

Northern Illinois

The main activities the past week include finishing up soybean planting, sidedressing anhydrous ammonia, corn postemergence herbicide application, and baling hay. Cool temperatures throughout the region continue to delay crop development. Few insect infestations have been reported.

Several reports have been received from rural homeowners concerning suspected herbicide drift on ornamentals. Further investigation suggests some herbicide-drift injury did occur. However, several instances of ornamental foliar disease and winter injury have also been confirmed.

West-Central Illinois

Planting is winding down. Local estimates put corn and soybean planting progress at 99% and 95% complete, respectively. There has been some replanting of corn acres in wet areas, but the extent of replanting pales in comparison to last year. Corn development is beginning to progress at a more rapid pace, with earliest-planted corn near the V8 growth stage. Soybean stands look excellent in most cases, with most fields in the cotyledon to unifoliate stage. Soybeans planted in late April and early May are in the first-trifoliate stage.

Cutting of corn plants by black cutworm has been reported in some fields, with about half those fields receiving treatment. However, the degree of the problem has not been as severe as was anticipated. Some reports of grape colaspis feeding on corn have been received, but very few fields are exhibiting symptoms indicating severe damage. Evidence of feeding of wireworms can still be found in many corn fields throughout the region, and herbicide injury in corn has been more widespread than usual, most likely a result of the cooler-than-normal weather that has been prevalent for the past few weeks.

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