Western corn rootworm beetles are being observed commonly in cornfields throughout the state and also in soybean fields in east-central Illinois counties. So the larval feeding period will soon end, and reports of silk clipping likely will escalate during the next several weeks. Within the last week, growers have reported performance problems with soil insecticides in rotated cornfields of east-central Illinois and also in continuous corn in northwestern Illinois. The lack of performance of some products is most likely due to early planting, a delayed egg hatch, impressive densities of corn rootworm larvae, and the extended larval feeding period. This page.

Spider mites require attention in a few soybean fields in areas that have been extremely dry. Some fields in northern Illinois have been treated for control of twospotted spider mites. Thus far we have received only a handful of reports of spider mite injury, but their appearance in one area of the state should stir up some scouting activity elsewhere. If the weather continues to be hot and dry, the prospects for more instances of spider mite damage increase. Start watching field edges for yellow soybeans. Page 147.
threshold for western corn rootworm adults in soybean fields, progress is being made on this front. Unlike last year, corn rootworm larval injury in first-year cornfields appears to have made a comeback in 1997. We’ve had numerous reports from growers in east-central Illinois that suggest larval injury is more intense this season. In some areas of eastern Illinois where storms have brought abundant precipitation and high winds, many cornfields have severely lodged plants. During the last week of July and throughout early August, we will be evaluating roots for larval injury in about 25 producers’ first-year cornfields in east-central Illinois counties. During these “root digs,” we will compare root injury in strips treated with a soil insecticide at planting with roots from other areas of the field in which no insecticide was used. As soon as these results are available, we will share our findings.

Reports of poor performance of soil insecticides have been common during the past 2 weeks. Complaints have arisen from growers who produce continuous corn, as well as those who rotate corn with soybeans in eastern Illinois.

**What factors might contribute to poor performance this season?** Several explanations should be considered. First of all, because many fields were planted very early this season, soil insecticide persistence may be an issue for some products. Secondly, the delayed corn rootworm egg hatch has effectively extended the larval feeding period well into the third week of July. Together, these factors have likely pushed performance of some products to the edge. Add to this scenario the impressive densities of corn rootworm larvae, and you have severely lodged corn plants in many fields; you also have unhappy producers.

**Are there other factors that can contribute to insecticide performance complaints?** Yes. These other factors are most often attributed to application problems such as improper calibration. Bottom line—before root lodging is blamed solely on the soil insecticide, do your homework by checking application and calibration records. Based upon the numerous reports of insecticide performance problems this season, it is very unlikely that all growers’ complaints are due to misapplication factors.

Thus far, this “rootworm season” has been a good reminder to those who believe that rootworm problems in continuous or first-year corn can always be dealt with effectively simply by applying a soil insecticide and remaining unconcerned about increasing our basic understanding of the biology and ecology of an insect pest. The shortcomings of this philosophy should be apparent.

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**European Corn Borers in Bt-Corn**

During the past couple of weeks, several of us have been walking through fields of Bt-corn and looking for evidence of injury caused by first-generation European corn borers. For the most part, whorl-feeding injury has been difficult to find. However, in some fields, plants with whorl-feeding injury and living, breathing corn borers have been found. The Bt endotoxin kills young instars but is not effective against older instars. However, some of the corn borer larvae found in Bt-corn had reached their third instar of development.

**Does this mean that the Bt-corn is not working?** The answer to this question probably is “no.” Representatives with the seed corn companies that have sold Bt-corn hybrids will tell you that expression of the Bt endotoxin probably will not occur in 100 percent of the plants. I have heard from some sources that a lack of expression of the endotoxin may occur in as many as 5 percent of the plants. This obviously would not result in an economic problem. However, growers may be expecting to observe 100 percent control.

As folks walk through Bt-corn, maybe to assess its performance, finding a few injured plants should not be alarming. However, if live larvae are found, the seed company should be contacted. The seed company representatives should be able to determine whether the plant(s) on which the borers survived are expressing the endotoxin. When we have tested plants on which borers survived in Bt-corn fields, we have found that the plants were “negative” (not expressing the endotoxin). Thus far we have found only one corn borer larva that survived on a Bt-expressing plant, and we have not deduced the reason for this.

I have been very impressed with the performance of Bt-corn against first-generation corn borers this year. However, we urge anyone who has planted Bt-corn to scout the field for assessing the level of performance. Let us know what you find.

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**Corn Leaf Aphid Densities Impressive in West-Central Illinois**

Don Rhoads, a research agronomist with Burrus Hybrids, reported that many fields throughout west-central Illinois are heavily infested with corn leaf aphids. In several counties, concern over the potential economic impact of corn leaf aphids will escalate if dry conditions persist. Our threshold in commercial corn for corn leaf aphid control suggests that treatments may be warranted when at least half the corn plants in the early tassel stage have light to moderate infestations (50 to 400 aphids per plant) and plants are under drought stress. If soil moisture is adequate, a treatment may be warranted if there are more than 400 aphids per plant.
As indicated in an earlier issue of this Bulletin (no. 15), treatments for corn leaf aphids in seed-production fields, according to the Seed Corn Pest Management Manual for the Midwest (published by Purdue University), is “most effective 2 to 3 weeks prior to tasseling, after which, it is rarely advisable.” The manual also provides the following information for the management of corn leaf aphids during pollen shed: Although control is not normally required once the tassels have emerged, on occasion aphids may interfere with pollination and treatment may be warranted. If aphids are sufficiently numerous to limit the flow of pollen, an insecticide may be needed. However, anthers and tassels covered with honeydew at the time of treatment will not benefit from the insecticide—treatment would only benefit plants with aphids, but not yet enough honeydew to limit the flow of pollen. Thus, the status of pollination and percent of plants with inhibited pollen flow should be carefully considered.

For additional information about corn leaf aphids, please refer to issue 15 of this Bulletin.

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Grape Colaspis Adults Observed in Some Cornfields

With scouting efforts under way for corn rootworm adults and corn leaf aphids in many areas of the state, some observers have indicated the presence of very small brown beetles feeding on corn leaves. Don’t be alarmed. Grape colaspis adults are common inhabitants of cornfields by the time mid-July “sends” our way high temperatures and humidities for us to enjoy. Recall that the larval stage of this insect can cause root injury in corn as well as soybeans, although corn is most often at economic risk, particularly if grown in rotation with clover. Soybeans have been affected most significantly when drought conditions persist.

Following the completion of the larval stage, adults begin to emerge during July as light brown beetles that are about 1/6 inch in length. The wing covers have several rows of evenly spaced punctures. Don’t be surprised to see some very minor defoliation on corn leaves that, although noticeable, is rarely, if ever, of any economic importance.

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Japanese Beetles: A Potential Threat to Corn and Soybean Fields

Robert Bellm, a crop systems educator at the Edwardsville Extension Center, indicated recently that Japanese beetles are becoming a force in many corn and soybean fields in southwestern Illinois. Japanese beetles begin to emerge in July and are evident in many fields well into August. Observations of these attractive insects are most often made on sunny days, with the beetles feeding on the sunny leaf surfaces of plants.

Most concern for this insect pest in corn centers on protecting the pollination process. A rescue treatment in field corn is normally not warranted unless three or more beetles per ear are actively clipping silks and the pollination process is not yet complete. For seed-production fields, control of Japanese beetles may be necessary if the silks on 20 percent of the plants have been clipped to a length of 3/4 inch or less, pollination is still taking place, and beetles are still present (Seed Corn Pest Management Manual for the Midwest). Insecticides labeled for use against Japanese beetles in field corn include Sevin XLF Plus (2 to 4 pints of product per acre) and Warrior 1EC (2.56 to 3.84 ounces of product per acre). The use of Warrior 1EC is restricted to certified applicators only.

Prior to the bloom and pod-fill stages of development, soybeans can generally withstand a considerable amount of defoliation (up to 30 percent) before a rescue treatment is warranted. During the reproductive period of soybean development, a 20 percent loss of foliage may warrant an insecticide treatment for this pest. Products labeled in soybeans include *Ambush 2E (6.4 to 12.8 ounces of product per acre), *Asana SL (5.8 to 9.6 ounces of product per acre), *Penncap-M (3 to 4 pints of product per acre), *Pounce 3.2EC (2 to 4 ounces of product per acre), Sevin XLR Plus (1 to 2 pints of product per acre), and *Warrior 1EC (3.2 to 3.84 ounces of product per acre). Use of an insecticide preceded by an * is restricted to certified applicators only.

Before you make any management decision, take the time to walk the entire field when you determine the average number of beetles per ear tip and when you estimate soybean defoliation. Japanese beetles commonly reach their greatest densities in the outer 12 to 15 border rows. The number of beetles found per corn ear tip or feeding on soybean leaves may decline sharply when you move farther into the field.

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Spider Mites Cause a Few Problems in Northern Illinois

In areas of Illinois that have received little rainfall since May, twospotted spider mites are beginning to cause injury to soybeans. I have received reports from people in northern counties (LaSalle, Lee, Ogle) that spider mite injury is apparent in field margins and that some soybean fields have been treated with miticides. Obviously, this situation will get worse if the weather remains hot and dry. However, there’s no reason yet to assume that the situation will parallel what happened in 1988. During that infamous drought, spider mite populations began building up in June, and the
outbreak was widespread and intense in July. What has occurred thus far in 1997 is more similar to the circumstances in 1983, when spider mites were problematic in late July and August.

Let’s review some fundamental information about twospotted spider mites and the knowledge we gained in 1988. Twospotted spider mites are not insects; rather, they are related more closely to ticks and spiders. An adult female is oval and has eight legs; an adult male is narrower and has a somewhat pointed abdomen. The mites are usually pale yellow to brown. The food contents accumulate in two spots on either side of the mite, and you can see these spots through their cuticle (skin); hence the name of the mite. After mating, females lay light-colored, spherical eggs, usually on the undersides of leaves. The eggs hatch into six-legged larvae, which grow into adults in a matter of days. Spider mites complete their life cycle from egg to adult in less than a week (4 to 5 days) when temperatures are high. Thus, you usually can find all stages of the mites on soybean leaves. In addition, as the mites continue to reproduce, overlapping generations occur and densities increase rather rapidly.

As experience and research have shown us, outbreaks of twospotted spider mites in soybeans occur only during hot, dry weather. These spider mites overwinter in Illinois in undisturbed areas, including grassy and weedy areas adjacent to soybean fields. However, during most years when rainfall is plentiful and temperatures are not very high, spider mites usually remain in these noncrop areas, reproducing and feeding contentedly. When the weather becomes hot and dry, spider mites begin showing up in the edges of soybean fields. If these weather conditions persist, densities of spider mites increase rapidly and the problem spreads into the fields.

Although the information in the research literature is not entirely consistent, it is clear that drought conditions favor outbreaks of twospotted spider mites. There are numerous explanations for this: (1) Drought provides a more favorable thermal environment for the mites’ growth and development; (2) drought-stressed plants are more attractive and acceptable for the mites; (3) drought-stressed plants are physiologically more suitable for the mites; (4) drought conditions do not favor natural enemies and pathogens of spider mites; and (5) drought might induce genetic changes in the mites.

Some research has shown that high temperatures significantly increase spider mites’ reproductive rates and decrease generation times. Another researcher found that high temperatures increase the mites’ metabolic rate by increasing demand for dietary fluids. However, other research has suggested that outbreaks of twospotted spider mites during drought years should not be attributed solely to drought-induced physiological parameters within soybean plants. Research at Iowa State University published in the early 1990s showed that the spread of a fungal disease occurs only during sustained cool and humid weather. We can speculate that this fungus suppresses spider mite populations in Illinois when conditions are not hot and dry. The bottom line is that no single factor causes an outbreak of spider mites when drought conditions prevail. The relationship among the mites, soybean plants, and weather is rather complicated.

Twospotted spider mite adults are quite small (about 1/60 inch, or less than 1 mm), often compared to a period at the end of a sentence. Consequently, a good magnifying lens comes in handy as you begin to scout for these pests. As mentioned, infestations usually begin at field edges, so that’s where symptoms of injury first appear. The mites use their piercing–sucking mouthparts to remove fluids from plant cells; and the cells collapse, resulting in stippling of the leaves. A symptom of feeding injury caused by spider mites are leaves that turn yellow, bronze, and then brown as they die. Lower leaves typically are injured first. Also, webbing usually is evident on the undersides of infested leaves. As the infestation increases, dead leaves begin to fall from the plants, and the injury in the field spreads.

Although symptoms of injury usually appear first at the field edges, yellow spots in the interior of the field also may occur. The mites sometimes move by “ballooning,” a process by which they extrude a strand of webbing that catches the wind and carries them elsewhere. Consequently, when you scout for spider mites, you need to look throughout the field, even on apparently healthy plants, to assess the extent of the infestation.

To examine plants for spider mites, hold a sheet of paper or cardboard under the leaves and tap the leaves to dislodge the mites. Yellow or brown specks that move across the paper or cardboard probably are spider mites. Remember, sample both injured and healthy plants to determine if the infestation is spreading. Also, be certain that the yellowed soybeans are caused by spider mites. Other factors can result in soybeans that turn yellow.

If the infestation of twospotted spider mites is isolated within a soybean field, a “spot” treatment with either Dimethoate 400 or Lorsban 4E is warranted. However, I re-emphasize that scouting the entire field is necessary. Apparently healthy plants may be infested, in which case a spot treatment does not prevent additional injury to the soybeans.

A word of caution about Dimethoate 400. I am aware of at least one instance in which two sprays of the miticide did not control spider mites adequately. The applicator then applied Lorsban 4E, which provided effective control. This individual contacted the supplier of Dimethoate and was told that some resistance of twospotted spider mites to dimethoate (the active ingredient) is a possibility. However, this does not mean that we have resistance to dimethoate in the
twospotted spider mite population in Illinois. Our use pattern with this product on spider mites in soybeans is infrequent, so it seems unusual that resistance to dimethoate could occur so quickly in spider mites. Nevertheless, you need to be aware of this information when you make a decision to apply a miticide. Also, when you evaluate the performance of a miticide, be certain you evaluate as accurately as possible. If performance seems poor, review your application records. Because the mites are usually on the undersides of the soybean leaves, adequate pressure and sufficient gallons per acre are required to obtain effective results. Be sure to let us know if you have any concerns about the performance of either Dimethoate or Lorsban.

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Alfalfa and Oats and Leafhoppers: What Can Be Done?

During the past week, I received about a half dozen telephone calls concerning severe infestations in alfalfa intercropped with oats. The infestations of leafhoppers were so severe that the alfalfa had turned completely yellow and then red-purple, and some of the plants were dying. However, the oats were still 2 weeks from harvest. The obvious question was “What can I use to control the leafhoppers on the alfalfa that is also labeled for use on oats?”

After reviewing our recommendations and a few insecticide labels, I have determined that the only two products labeled for leafhopper control in alfalfa and labeled for use on oats after the heads have emerged are malathion and Penncap-M. Both products are reasonably effective for control of potato leafhoppers, but malathion will not provide long residual. Furadan 4F is labeled for use on both alfalfa and oats, but it cannot be applied after the oat heads have emerged from the boots. The harvest intervals (the limitations in days between insecticide application and crop harvest) for malathion and Penncap-M are 7 and 15 days, respectively.

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PLANT DISEASES

Karnal Bunt Update

Karnal bunt of wheat (KB), caused by the fungus Tilletia indica, is still a concern in the United States, primarily to the wheat exporters and not to the producers. The disease causes little yield loss but does impart a fishy smell to wheat products, even at kernel infection levels as low as 3 percent. KB was initially found in March of 1996 in Arizona and subsequently in New Mexico, California, and Texas. At present, it has not been found in midwestern states.

Currently, USDA is continuing to sample fields in most wheat-producing states. The sampling scheme for this year is a bit different because a pre-defined number of samples are to be collected from each county, depending on the estimated size of the wheat crop. County Extension workers are again assisting in this effort, and samples have already been received and are being processed. In Illinois, we will process about 400 samples this year. Each sample will be checked microscopically for spores and additional tests performed if a positive is found. However, this is very unlikely, based upon our experiences.

In addition to this survey, the USDA is actively involved in determining if a ryegrass bunt mixture did cause Karnal bunt disease in wheat. The Animal, Plant Health Inspection Service (APHIS) of USDA, the agency charged with regulation of KB has since issued a statement that they do not anticipate a change in their policies concerning this bunt until further research can be undertaken.

In early July, USDA proposed to amend the KB regulations by adding compensation provisions for certain growers, millers, and others who incur losses and expenses due to KB in the 1996–1997 crop season. Compensation would be based upon a confirmed detection of KB by APHIS and would vary depending upon the situation. Growers eligible for assistance are those in designated areas of the Southwest, as well as wheat handlers in these areas.

USDA is also actively working to maintain wheat export markets to countries with concerns about KB. As of May 7, many countries have agreed to accept US wheat products with no changes to phytosanitary requirements or to accept wheat products with a standard APHIS additional declaration. Other countries are currently negotiating with USDA to clarify the language of agreements.

For more information, there is an APHIS web page at http://www.aphis.usda.gov or the KB page at http://www.aphis.usda.gov/oa/bunt/kbqa97.html

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CROP DEVELOPMENT

Is Corn in Trouble from Drought?

For some fields in Illinois, the answer to this question on July 15, 1997, is “yes”; while in most, it’s “maybe, depending on what happens in the next week or two.” Without doubt, corn in most fields has been under mild to moderate stress at some time during the past month. There are a number of common themes that are being discussed with increasing anxiety around the state as the rain continues to miss many areas, and to miss parts of the areas that are getting some rain.

How much has the yield potential been reduced already due to dry soils? The answer to this question depends primarily on what stage the crop is in, and on the extent of water deficit the crop has experienced to this point. It is difficult to measure directly the amount of water stress a plant is undergoing, but a number of indicators of the cumulative effects of drought that can be monitored are discussed here.

Water is lost during the day through tiny openings in the leaves called stomata, with more rapid loss when leaf temperatures are higher and when relative humidity is lower. Soils dry out as plant roots extract water from the soil to replenish that lost from leaves. Though the root systems are quite good this year due to early planting and dry surface soils, plant stress is increasing as soil water is extracted by the roots. It is not easy to measure soil drying directly, but one of the earliest signs that a corn crop is experiencing stress is a silvery gray appearance of the upper leaves, especially on their lower surface.

Leaf rolling for a few hours during late afternoon is an indicator of mild stress. Leaves roll earlier in the day as stress increases, to the point under extreme stress at which leaves may not unroll completely at night. Thus, the time of day when leaf rolling starts can give some indication of the degree of stress. There is, however, a fairly strong genetic influence on leaf rolling, and so it may not be a good indicator for all hybrids. Although the tendency to roll early probably does prevent water loss as the leaf area exposed to the sun is decreased and the humidity inside the rolled leaf rises, leaf rolling also means the leaf has stopped photosynthesizing. It is not clear, therefore, if rapid leaf rolling helps a plant survive drought.

One of the best indicators of the cumulative effect of dry soil is plant height and, in more extreme cases, leaf size. The longer the plants have been under stress, and the more severe the stress has been, the shorter the plants are. Plant height, and to some extent leaf area, increases almost entirely at night. High evaporative demand during the day means that young, expanding cells cannot compete for water until water loss through the stomata stops at night. If soils are dry and plants need to rehydrate at night before cell expansion begins, there is less time for cell expansion, and thus less growth.

Leaf firing—loss of chlorophyll and proteins, with yellowing and eventual death of leaf tissue—is an indicator of fairly serious drought. Firing starts in the leaves at the bottom of the plant and moves up with increasing dryness. Although this may allow the plant to better provide nutrients to the upper leaves, firing is irreversible, and it reduces yield in direct proportion to the extent to which it decreases the ability of the plant to maintain light interception and photosynthesis during grainfill.

Slow emergence of silks, or failure of the silks to emerge at all during the pollen-shedding period, can be a most devastating consequence of very dry soils. Like the rest of the plant, silks grow primarily at night. But they are more sensitive to dry soils (that is, less able to compete with the soil and air for water) than are the stem and other plant tissues. If silks fail to emerge by 2 or 3 days after the first pollen is shed, then they may be growing more slowly than normal. One way to monitor this directly is to cut silks of a few plants off at the tip of the ear in late morning, then to see how much new growth appears in 24 hours. Silks usually grow 2 inches or so per night, so less than an inch of growth means that silks are probably being delayed. Look also for the number of silks that merge each day: If there are only a few dozen, then problems with final kernel number are likely.

For high yield potential, a normal ear needs to have 600 to 800 silks emerge to receive pollen before pollen-shedding ends. If pollen-shedding ends before silking is complete, silks may continue to emerge and elongate, with very slow browning. One can also check the success of the fertilization process by removing the husks and pulling gently on the silks; those from kernels that have been fertilized detach easily from the kernels.

Continued dry weather after pollination often results in kernel abortion, which is death of kernels that have been fertilized. Such abortion affects kernels near the tip of the ear first and can reduce kernel number substantially. The effect of such kernel loss on yield is usually proportionately less than the percentage loss of kernel number—because remaining kernels usually fill to a larger size.

Pollination is a critical time in the life of the corn plant; the success or failure of pollination and kernel establishment directly affects kernel number and yield potential. Unfortunately, because the pollination period is the time when vegetative growth is concluding while rather involved reproductive growth processes are taking place, shortage of photosynthetic products (sugars) in the plant can be devastating. Studies have shown this to be a period of low sugar content even under good conditions, and so
lowered levels of photosynthesis for any reason (drought, hail, disease, or insect damage) can seriously reduce yield potential.

With the generally good color of the corn canopy and the reasonable amount of growth so far in most fields signaling the efficient extraction of soil water by the plants, there is reason for cautious optimism that pollination and fertilization will proceed reasonably well in most fields. If dry weather continues, along with high temperatures, however, the crop will deteriorate rapidly, especially in soils with lower water-holding capacity.

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