



# PEST MANAGEMENT & CROP DEVELOPMENT

## BULLETIN

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## INSECTS

### EPA Revokes All Tolerances for Carbofuran—Labeled Uses May Continue Throughout 2009

This information is an addendum to the article published last week in *the Bulletin* (issue 12, June 10) regarding carbofuran. Although the revocation of tolerances for carbofuran will be effective on August 13, 2009, distributors and retailers may continue to sell carbofuran and farmers may use the insecticide according to label instructions until December 31, 2009. Crops treated with carbofuran after January 1, 2010, cannot enter the marketplace. FMC intends to challenge the EPA's revocation of tolerances for carbofuran.

For additional information about the ruling, please review the *Federal Register* article at [www.epa.gov/fedrgstr/EPA-PEST/2009/May/Day-15/p11396.htm](http://www.epa.gov/fedrgstr/EPA-PEST/2009/May/Day-15/p11396.htm).—Mike Gray

### New Report on GM Crops Available: Significant Economic and Environmental Impacts Achieved by Farmers Since Mid-1990s

A report titled *GM Crops: Global Socio-economic and Environmental Impacts 1996-2007* was published in May by Graham Brookes and Peter Barfoot, PG Economics Ltd., United Kingdom. The full document (128 pages) is available at [www.pgeconomics.co.uk/pdf/2009globalimpactstudy.pdf](http://www.pgeconomics.co.uk/pdf/2009globalimpactstudy.pdf). The report provides a thorough global analysis and review of the socio-economic and environmental impacts made by transgenic crops since their commercial introduction. Below are some highlights from the "Executive Summary and Conclusions" that begins on page 7.

- "In 2007, the direct global farm income benefit from biotech crops was \$10.1 billion. This is equivalent to having added 4.4% to the value of global production of the four main crops of soybeans, maize, canola and cotton."
- "Since 1996, farm incomes have increased by \$44.1 billion."
- From Table 1 (p. 8): Global farm income benefits from 1996 to 2007 attributed to transgenic crops: GM herbicide-tolerant soybeans, \$21.8 billion; GM herbicide-tolerant maize, \$1.5 billion; GM insect-resistant maize, \$5.7 billion.
- From Table 2 (p. 9): United States farm income benefits from 1996 to 2007 attributed to transgenic crops: GM herbicide-tolerant soybeans, \$10.4 billion; GM herbicide-tolerant maize, \$1.4 billion; GM insect-resistant maize, \$4.8 billion.
- From page 11: "In relation to the nature and size of biotech crop adopters, there is clear evidence that size of farm has not been a factor affecting the use of the technology. Both large and small farmers have adopted biotech crops. Size of operation has not been a barrier to adoption. In 2007, 12 million farmers were using the technology globally, 90% plus of which were resource-poor farmers in developing countries."

• From page 13: “Since 1996, the use of pesticides on the biotech crop area was reduced by 359 million kg of active ingredient (8.8% reduction), and the overall environmental impact associated with herbicide and insecticide use on these crops was reduced by 17.2%.”

• From page 15: “Reduced fuel use from less frequent herbicide or insecticide applications and a reduction in the energy use in soil cultivation. The fuel savings associated with making fewer spray runs (relative to conventional crops) and the switch to conservation, reduced and no-till farming systems, have resulted in permanent savings in carbon dioxide emissions. In 2007 this amounted to about 1,144 million kg (arising from reduced fuel use of 416 million litres). Over the period 1996 to 2007 the cumulative permanent reduction in fuel use is estimated at 7,090 kg of carbon dioxide (arising from reduced fuel use of 2,578 million litres).”

I encourage readers of *the Bulletin* to review this impressive report. My very brief summary here barely skims the surface. In short, the benefits, both economic and environmental, that have taken place since the commercialization of transgenic crops are very impressive and are of increasing global significance. Continuing stewardship (adherence to resistant management protocols and use of refuges) of these transgenic crops to prevent the evolution of resistant pests is paramount in securing the longevity of this technology. —Mike Gray

### Insect Activity Sporadic and Variable Across the North-Central Region

During a teleconference on June 15, extension entomologists from the north-central region shared with each other some observations and reports of insect activity in field crops. The pest continuing to generate the most interest this spring has been the soybean aphid. In Michigan, Chris DiFonzo, extension entomologist, reported on

June 11 that some soybean research plots near campus have 5% to 20% infestation levels. Entomologists at Purdue University indicated June 12 that soybean aphids have been found in northern Indiana, with some plants having 40 aphids per plant. Infestations in Minnesota (south-central and southwest areas) have been relatively low so far. Ohio entomologists have reported soybean aphids in northwestern areas of the state and more recently near Wooster, with some plants infested at 40 to 50 aphids per plant. I’ve had no confirmation of aphid infestations in Illinois soybean fields to date, but no systematic survey has been conducted. Today we will have a research team sample some plots near DeKalb, and I will share their findings with *the Bulletin* readers.

Other insect infestations reported across the north-central region include sporadic infestations of white grubs and wireworms in corn, occasional black cutworm damage, bean leaf beetles (infestations appear to be light), potato leafhoppers in alfalfa, and armyworms in some wheat fields. Entomologists in Iowa and Nebraska also reported finding more European corn borer moths in action sites and traps than they have observed in recent years. The hatch of corn rootworms is well underway across central Illinois and is very likely in its early phase across northern areas of the state. I look forward to sharing more reports of insect activity and management recommendations throughout the summer. —Mike Gray

## PLANT DISEASES

### Soybean Rust Update

Thus far in 2009, soybean rust has been observed in five states and 21 counties in the United States and in two states and five municipalities in Mexico. There has been a flurry of soybean rust activity in the last two weeks, with new finds confirmed in Louisiana, Alabama, Georgia, and Florida. Some of these finds were on soybean and others on kudzu.

**Monitoring.** Sentinel plots are being used to monitor for soybean rust in North America. These plots, made up of soybean, kudzu patches, or other susceptible hosts (such as yam bean in Mexico), are scouted regularly, generally every week, for soybean rust.

In Illinois, 28 sentinel plots are being established across the state in 2009. University of Illinois Extension educators, research personnel from the University of Illinois and Southern Illinois University, and some industry personnel are involved in collecting leaf samples from the sentinel plots in Illinois and sending those to the University of Illinois Plant Clinic, where the samples are examined microscopically for soybean rust and other diseases.

As data become available from the plots, they are uploaded onto the Integrated Pest Management—Pest Information Platform for Extension and Education (IPM–PIPE) website, where maps are generated that show where soybean rust has been observed in North America ([www.sbrusa.net](http://www.sbrusa.net)).

**Implications for Illinois.** Soybean rust has been observed in Illinois every year since 2006. Every confirmation in the state has occurred later in the season (late September and October), so as yet no yield loss has resulted from the disease.

For 2009, the risk of soybean rust in Illinois may be slightly elevated, because many soybean fields have been planted later than normal, with some fields not yet planted. Because soybean rust cannot overwinter in Illinois, spores of the fungus must be moved into the state via weather systems. Even if spores do arrive, the environment must be favorable for infection (frequent rainfall, cloudy weather, heavy dews), and soybean plants must be at a susceptible growth stage (flowering through seed development) for rust to develop and spread.

**Management.** Currently, the only tool available for managing soybean rust

is foliar fungicides. Many products are available to Illinois growers, but not all have equal ability to control soybean rust and other diseases.

A list of registered products available for soybean rust control is published in the updated online version of *Using Foliar Fungicides to Manage Soybean Rust* ([oardc.osu.edu/soyrustr](http://oardc.osu.edu/soyrustr)), created by soybean pathologists and agronomists from a number of states. The list of registered fungicides for soybean rust control is in Appendix B; information on product efficacy against soybean rust and other foliar diseases is in the chapter titled “Managing Late-Season Soybean Diseases and Soybean Rust: A Southern Perspective.”

It is important to know where soybean rust has been observed in North America before making any management decision, so check the soybean rust maps on the IPM-PIPE website regularly. You can also sign up there to receive an e-mail alert when a new soybean rust observation is made. — *Carl A. Bradley*

## CROP DEVELOPMENT

### Still Wet, and Corn Not Planted?

While corn planting in Illinois was officially 96% complete by June 14, a considerable number of fields remain unplanted, especially in the southern part of the state, where less than 90% was planted. Wet weather continues in much of that region, though there are places where some progress has been made this week.

While I’ve tried to paint a realistic picture of what to expect with regard to late-planted corn, I’ve also emphasized that past observations are so variable that any estimate we make is a guess. Corn planted after June 15 in southern Illinois has yielded from zero to more than 200 bushels per acre, with an average of no more than 100 bushels. At this point in the season, we have no way to predict where in this range yields are likely to land. We still

have a reasonable chance to get a corn crop planted this week (by June 20) to maturity with growing degree-days left in southern Illinois, but it would likely help now to shorten hybrid maturity by 10 days RM compared to hybrids normally used.

Prospects for corn planted the last week of June are not great, and it’s likely that some acreage set for corn but not yet planted in such areas will be planted to another crop. The first choice for many will be to grow soybeans on these acres. Vince Davis has been covering late planting for soybean. Given that wet weather is starting to delay wheat harvest, it’s likely that “full-season” soybeans will have little or no head start on double-crop soybeans in many areas this year. In fact, wheat dries out the soil as long as the wheat plants are still green, so fields following wheat harvest may in some cases be ready to plant sooner than those planned for a “full-season” crop.

One issue that has changed is the need to plant corn to recoup N applied earlier. Given how wet it has been for the past two months in fields not yet planted, a substantial portion of N applied early has likely been lost by now, especially if any of the applied N was in nitrate form (as in UAN). Most of the N from anhydrous ammonia and a considerable amount from urea applied in the past month is likely still present, but much of it is in the nitrate form by now and so subject to movement downward in better-drained soils and to loss by denitrification in fields where soils remain wet. In any event, the expenditure to apply N has diminished, and even though it’s not pleasant to write off such an expense, it is likely that the value of yield loss from delayed corn planting will exceed the value of the N left in most fields, making the switch to another crop more logical.

Prospects for other crops planted this late are considerably less than prospects for soybean. One crop often mentioned for late planting in south-

ern Illinois is grain sorghum. Grain sorghum is a true warm-season crop, with tolerance for high temperatures and some ability to withstand periods of low soil moisture. But its yields respond to the summer weather much like soybean yields do—because the flowering process in corn is not as sensitive to weather as is flowering in corn, and because grain sorghum flowers later than corn, it thrives on good conditions in August, much like soybean.

Still, planting grain sorghum in late June or early July diminishes its prospects considerably. One reason is that it flowers relatively late (the “days” attached to grain sorghum maturity are tied to flowering, not maturity) and so needs good late-summer weather to fill its grain well. Grain sorghum is also sensitive to cool weather; it can nearly stop filling if September is cooler than normal. It also has some insects that other crops don’t, weed control is more difficult, and markets are spotty. Grain sorghum simply isn’t a magic bullet as a late-planted crop. In the northern half of Illinois, its sensitivity to cool weather makes it generally unsuitable for late planting, at least as a grain crop.

Another possibility in the “desperation category” of late-planted crops is buckwheat. Buckwheat is an indeterminate crop, but it will usually produce some seed even when planted in mid-July. It continues to flower and set seeds up to frost in some cases, so late planting is not the way to get high yields, though in rare cases buckwheat might thrive if it survives through late summer and late September and October are cool and moist. More importantly, buckwheat is a cool-season crop, and hot, dry weather can mean no crop to harvest at all. Some people give it credit as a cover crop, but it does not fix N, and it would not be preferred as a soil-building cover crop over one like red clover.

There may be some market for buckwheat, but buyers look for large seeds, and buckwheat that comes

under high-temperature stress will often not compete well in price.

If there is a market for forage crops, warm-season grasses like sorghum-sudan might be possibilities for late planting. Keep in mind that late planting of such crops may compromise their productivity, like it does for other warm-season crops. Most warm-season forage crops do not produce high-quality forage, so markets are often limited. It might even be better to plant corn as a possible forage crop than to plant sorghum-sudan, since corn might produce similar forage yields if it doesn't produce grain, and if the weather is favorable it might even produce grain for sale or feed. Some pests like corn rootworm are less likely to be a problem with corn planted very late, so it may be possible to use seed with fewer traits and a lower cost.

I learned this past week of some unplanted acres where the prevented-planting payment is expected to exceed the profit from a cash crop that could be planted this late. We would not normally give up on soybean until July in southern Illinois, but some unplanted (and still wet) fields in northern and central Illinois might be reaching the point where no crop will be grown for sale in 2009.

Planting a cover crop of some sort on such acres is often preferable to leaving it fallow. A cover crop will maintain microbes (VA mycorrhizae) that will help next year's crop to take up P better, thus preventing the "fallow" effect. A leguminous cover crop like red clover will provide some N to next year's crop. And cover crops usually help keep weeds down, thus reducing the amount of weed seed produced. Some producers may also choose to tile or haul manure on uncropped fields. While we would never wish for uncropped acres due to weather in Illinois, cover crops may in some cases be preferable to getting little income from very late-planted cash crops. —  
*Emerson Nafziger*

## Identifying Nutrient Deficiencies in Corn

Last week (issue 12, June 12) I addressed some of the possible factors affecting nutrient availability and causing plant foliage to show deficiency symptoms. The Illinois State Water Survey says that wet conditions in March, April, and May were the fifth-wettest on record since 1895. Wet conditions and cloudy (low-light intensity) days this spring are causing crops to look nutrient-deficient. As I mentioned last week, the fact that plants look deficient does not mean that you need to hurry and apply nutrients to take care of the "problem." Many of what appear to be symptoms of nutrient deficiency will take care of themselves without the need for additional fertilizers once soils dry a little and the sun starts to shine on more regularly. If a deficiency continues after growing-season conditions improve, then corrective measures will be necessary to reverse the problem. Whether or not symptoms are true problems at this time, it is important to know the deficiency symptoms for various nutrients and under what conditions a deficiency is most likely to occur.

Once nutrients enter a plant, some are mobile and others are not. Mobile nutrients will cause deficiency symptoms to develop in older leaves, because nutrients present in the older leaves will move to new leaves to maintain the new growth. On the other hand, immobile nutrients will cause new leaves to show greater deficiency symptoms, while older leaves might be completely green.

Deficiency symptoms for many of the essential nutrients have not been verified, or are very rare, in Illinois and will not be discussed here. Mobile nutrients that are known to cause deficiencies in corn include nitrogen, phosphorus, potassium, and magnesium. Sulfur is another nutrient that has been known to cause deficiency in corn, but it is not easily translocated

in the plant. The only immobile nutrient known to cause deficiency in corn under some Illinois conditions is zinc.

Nitrogen (N) deficiency makes the older leaves (the bottom portion of the corn plant) turn pale or yellowish-green. The deficiency then starts to create a V shape, starting at the tip of the leaf. If the problem continues, the deficiency works its way up the plant from older to newer leaves. The stalks tend to be thin and spindly. N deficiency develops commonly in wet to saturated soils or under cool soil temperatures in the spring. N can leach out with heavy rainfall in light-textured (sandy) soils or can be denitrified in flooded soils when temperatures are warm. N deficiency can be induced after midseason or during other periods when soils tend to be dry. N deficiency can also occur in soils with large amounts of low-nitrogen-containing residues.

Phosphorus (P) deficiency causes a distinct dark green with reddish to purplish leaf margins, typically starting from the tip. The deficiency is observed in the older leaves. Stunted growth is also typical. At early development stages some hybrids show purple colors even though P is not deficient, while other hybrids might not show this coloration even when P levels are limiting. P deficiency symptoms normally disappear by the time the plant is waist-high. Since P is fairly immobile in the soil, any soil condition that limits root growth (cool temperature, wet or very dry conditions, compaction) can induce the deficiency.

Potassium (K) deficiency is observed as yellowing and necrosis (death) of the edge of older leaves. When the problem persists, this deficiency will continue to move up from older to newer leaves, while the top leaves may look completely green. K deficiency can cause lodging of the crop later in the season because stalks are thin and not strong. As with P, soil conditions that restrict root growth can induce deficiency, especially at early

stages of development when the root system is small. Soils with low K buffer capacity can cause the deficiency if an appropriate fertilization plan is not followed.

Magnesium (Mg) deficiency appears in lower leaves as yellow or white streaking between veins. The leaves eventually become reddish-purple, and the edge and tip die if the deficiency is severe. Deficiencies have been seen in isolated situations in Illinois. The soils most likely to be deficient in Mg include acidic and sandy soils throughout Illinois and low-CEC soils in southern Illinois. Deficiency is more likely where calcitic limestone ( $\text{CaCO}_3$ ) rather than dolomitic limestone ( $\text{CaMg}[\text{CO}_3]_2$ ) has been used in those soils.

Sulfur (S) deficiency causes yellowing of the foliage. S deficiency is often confused with N deficiency. Since S is not easily translocated, deficiency tends to be more visible in the newer leaves, differently from the older leaves with N deficiency. It is not uncommon to see interveinal chlorosis of the newer leaves. The condition is typically observed in soils with low organic matter (including sandy soils), low pH, and cold and wet conditions that reduce mineralization (release) of S from organic matter. Since S is leachable, corn will often grow out of a S deficiency once the root system taps into the S that has accumulated in the subsurface soil.

Zinc (Zn) deficiency is observed as light green to white stripes between veins or as wide bands starting at the base of the leaf and extending toward the tip of the newer leaves. The edge of the leaf as well as the midrib usually stay green. Usually corn can outgrow this problem, but in cases of severe deficiency, new leaves can be almost white. Zn deficiency is most commonly observed in soils low in organic matter, sandy soils with high pH (>7.3), cool and wet soils, or soils with very high P levels where Zn levels are marginal.

As I mentioned, the unfavorable conditions for crop growth this spring mean that observing some deficiency symptoms in young corn plants should not be cause for immediate alarm. However, if deficiencies continue after growing season conditions improve, it is important to confirm any deficiency before trying to correct the problem. Since the visual symptoms are sometimes not clear-cut, it could be beneficial to collect affected plants and conduct tissue nutrient analysis.—*Fabián G. Fernández*

### Early-Season Soybean Growth

Soybean planting progress was reported 73% complete by the USDA, NASS Illinois Weather and Crops Report on June 14, which was actually 1% ahead of our 2008 progress but still 19% behind the 5-year average. Nearly half (49%) of soybeans are reported as emerged, and 91% of the emerged soybeans are reported to be in fair or better condition. I suspect that some of the earliest planted soybeans are developing the 3rd trifoliolate (V3), while a majority of soybeans are developing the 1st trifoliolate (V1). Under ideal conditions, plants will develop a new node (increasing V-stage) every 3 to 5 days. For the late-May and early-June planting dates, this is probably closer to 3 days for most soybeans this year.

Observation of soybean plants at these early growth stages should be focused on certain developmental areas of the plant. For instance, plants can look “bad” due to leaf defoliation from hail or insect damage (e.g., from bean leaf beetles) but be under little threat of yield loss. Many previous research experiments have shown that little yield loss occurs due solely to leaf defoliation until the reproductive growth stages. This is due to a high leaf area index compared to cereal grass crops like corn. However, damage from disease or insect feeding or other physical damage to the hypocotyl (the upper growing point in the stem, or primary

meristem) could be more detrimental, although less visible. Whether you’re evaluating soybean plant damage due to insect feeding or a hailstorm, look closely at these different plant developmental areas for damage and signs of growth and recovery.

Also, somewhere between the V1 and V3 growth stages is when yield loss due to weed competition could start to occur. This interval when soybean yields begin to be affected by weeds is known as the critical period of weed control. When postemergence applications of herbicides are delayed beyond the critical period, significant yield losses can occur.

Because fields vary in the weed species present and their densities, it is difficult to make broad rules about the amounts of yield lost per day. Weeds compete for light, water, and nutrients, and when the demand for these resources is small early in the growing season, weeds and soybeans can coexist without yield loss; this becomes less possible, however, as both the weeds and the soybean plants increase in size. In general, research has shown that the critical period of weed control starts between the V1 and V3 growth stages, or between the second and third week after planting. The length of time soybeans should remain free of weeds is usually 5 to 7 weeks, before the development of a full soybean canopy will begin to increasingly help suppress later-emerging weeds.—*Vince M. Davis*

### 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.

#### East-Central Illinois

A few fields still need to be planted, and many ponds need to be planted or replanted. The recent rains have been more spotty and allowed some farmers to get into fields briefly. Most corn runs from V6 to V3. Wheat is turning.

Big concerns now are postemergence weeds that are rapidly approaching maximum labeled size. Also, some farmers are trying to sidedress N and can't get into the fields that need it most.

#### Northern Illinois

Numerous corn fields throughout the region are exhibiting areas of stunted yellow corn. Contributing factors include wet and compacted soils, seedling blights, herbicide injury, nitrogen deficiency, and overall poor growing conditions. However, the earliest planted corn does not exhibit these symptoms. Scattered showers ranging from 0.5 to 1.5 inches last weekend slowed

field activity for a few days. Primary activities during the week included sidedressing nitrogen, postemergence herbicide application, hay harvest, and some planting. Planting is nearly complete throughout the region, though scattered fields remain unplanted.

Soybean emergence appears uniform so far. Wheat has started to turn, and there have been a few reports of scab.

#### Southern Illinois

The calendar is rapidly bringing an end to corn planting, whether the seed is in the ground or not. A significant amount of planting was forced in spite of field conditions, and now VE- to V1-stage corn is trying to keep its head above water in ponded fields. Earlier-planted corn remains variable, with poorly drained areas either drowned out or stunted and yellowed. Fields with better drainage don't look bad, and growth is rapidly accelerating.

Although some soybeans are at V1, large areas remain to be planted. There will be little if any difference again this year between "full-season" and double-crop soybean planting.

Much wheat would be ready to harvest if weather conditions were drier. Even if the grain dries down, fields remain saturated, and there will be some serious rutting during harvest. With the onset of Fusarium head scab, wheat quality deteriorated rapidly in late May and early June. Although the market indicates an advantage to storage and deferred sales, this is a crop that may not store very well and should be monitored closely if stored on-farm.

#### West-Central Illinois

It is wet! Most corn is planted at this time, with growth stages ranging from just-planted to V7; a few fields remain yet unplanted. The early corn seems to be doubling in size over the

past several weeks, but newly planted corn is struggling in the wet soils. In the southern part of the region, growers have replanted some fields up to three times and are facing the decision of whether to give up on corn in these waterlogged fields and make the switch to soybeans. Some reports of Japanese beetles have been received, but these could be False Japanese beetles. Some fields in the western part of the region have weed issues.

Depending on the area and the amount of precipitation received, 70% to 90% of soybeans are planted. Growth stages range from just emerging up to 2nd trifoliolate and appear to be doing okay.

The first cutting of alfalfa has been done, but very little has been baled due to rain. There are reports of potato leafhoppers being back in the area.

Wheat is starting to turn and is filling the head. There are concerns over the amount of moisture received at flowering. A few wheat fields were scouted for disease in Montgomery County last week, and all showed signs of scab and glume blotch on heads. Heavy amounts of Septoria/Stagonospora leaf blotch were also found on flag leaves. Rust or powdery mildew did not appear to be a problem.

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