



# PEST MANAGEMENT & CROP DEVELOPMENT

## BULLETIN

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## INSECTS

### Preliminary Results of the 2001 European Corn Borer Fall Survey

The preliminary results of the 2001 European corn borer fall survey are presented in Table 1. The results are presented as preliminary because we do not have completed surveys from 16 cooperators as of yet. So far, the results suggest that densities of the European corn borer surged ahead of 2000 levels in many counties. Infestation levels were very impressive in Jo Daviess, LaSalle, Livingston, and Winnebago counties. In general, many fields in southern Illinois appeared to escape economic infestations of European corn borers once again. Producers in central and north-central counties undoubtedly noticed many broken stalks as they combined fields this fall.

We'll report the results from the completed survey in next month's issue of the *Bulletin*. For now, we hope these early findings offer some insight regarding the impact of this key insect pest on 2001 corn yields. Historically,

**Table 1. Preliminary results of the 2001 European corn borer fall survey.**

<i>Counties</i>	<i>% plants infested, 2000</i>	<i>% plants infested, 2001</i>	<i>Borers/plant, 2000</i>	<i>Borers/plant, 2001</i>
Bureau	37.2%	61.6%	0.55	0.94
Christian	22.0%	48.4%	0.15	1.03
Clark	53.2%	26.8%	0.17	0.18
Effingham	28.4%	49.2%	0.09	1.13
Franklin	94.0%	0.4%	0.15	0.00
Fulton	30.4%	63.2%	0.31	0.71
Greene	21.6%	25.2%	0.15	0.22
Jo Daviess	51.2%	70.4%	1.13	2.91
Kendall	----	73.2%	----	3.11
LaSalle	54.8%	90.4%	0.62	1.93
Lawrence	----	35.6%	----	0.27
Livingston	-----	76.0%	----	2.23
Logan	26.7%	55.6%	0.05	1.09
Madison	54.0%	18.4%	0.56	0.25
Marion	30.8%	6.0%	0.18	0.03
McLean	24.0%	64.8%	0.11	0.93
Monroe	26.0%	12.4%	0.08	0.09
Saline	78.0%	11.2%	0.10	0.05
Shelby	18.0%	49.2%	0.11	0.66
Washington	60.0%	28.8%	0.92	0.21
White	81.6%	29.6%	0.20	0.30
Winnebago	46.4%	77.2%	1.04	2.11

fall survey data have not proved to be useful in predicting infestation levels for the upcoming season. However, these data do suggest that European corn borers may be “rebuilding” their numbers following recent years of extremely low densities. Ultimately, the level of diseases (*Nosema pyrausta* and *Beauveria bassiana*) in overwintering larvae and environmental conditions during the first flight of moths next spring will be the key factors in regulating European corn borer populations in 2002.—*Mike Gray and Kevin Steffey*

### Bt Corn for 2002?

We are still waiting for word from EPA about whether they will renew the registration period for Bt corn. We have just learned that the conditional registration of Bt cotton has been extended for 5 years, but still there is no word on Bt corn. We assume we will learn something soon. In the meantime, it might be helpful to understand the conditions associated with the renewed registration of Bt cotton. Many, if not all, of these same conditions probably will apply to Bt corn if a renewed registration is granted.

EPA has determined that there is reasonable certainty that Bt cotton will not pose unreasonable risks to human health or to the environment. They arrived at this conclusion after an exhaustive review of information and a huge amount of public input. However, some conditions with the renewed registration of Bt cotton were amended to the registration. According to Stephen Johnson, assistant administrator for EPA’s Office of Prevention, Pesticides and Toxic Substances, “As a condition of EPA’s approval of the Bt cotton registration, we have adopted several provisions to strengthen insect resistance management, improve grower awareness and stewardship, and prevent gene flow from Bt cotton to weedy relatives.”

A primary focus of the renewed registration of Bt cotton is resistance management, a strategy we have discussed at length as it relates to Bt corn. For Bt cotton, to reduce the possibility of insects developing resistance to Bt, the amended registration requires that some acres be set aside where non-Bt cotton will be grown to serve as a “refuge.” These refuges support populations of insects that have not been exposed to the Bt toxin. The insect populations in the refuges will help prevent resistance development when they breed with any insects that survive Bt cotton fields. All of this should sound familiar because the companies and we have been strongly encouraging the use of non-Bt corn refuges for resistance management of European corn borers since Bt corn became commercially available. However, there are even more conditions regarding resistance management for the renewed registration of Bt cotton.

Other provisions to maximize protection of the public and environment include an EPA requirement that Monsanto, the company that developed Bt cotton, be responsible for monitoring for any potential impacts from its continued use. Monsanto also is responsible for educating growers about the best methods of planting Bt cotton to minimize any potential development of insect resistance or gene transfer to other plants.

So, there you have it. Good news for cotton growers. However, still no news for corn growers. One of the reasons for the delay of the decision regarding Bt corn was that new information about the potential effects of Bt corn on monarch caterpillars has become available, and EPA needed more time to review this information and invite public input. This issue is discussed in the following article.

Detailed information about EPA’s decision regarding Bt cotton has been made available on the Office of Pesticide Program’s “Biopesticides” Web site, <http://www.epa.gov/pesticides/>

biopesticides/. Detailed information about EPA’s decision regarding Bt corn will also become available at this Web site.—*Kevin Steffey and Mike Gray*

### Recently Published Information About Bt Corn and Monarch Butterflies

Recently published scientific studies have revealed that Bt corn presents a low risk to monarch butterflies. These studies refute most of the negative statements that have been generated in the press as a result of two previously published articles:

Losey, J. E., Rayor, L. S., and M. E. Carter. 1999. Transgenic pollen harms monarch larvae. *Nature* 399: 214.

Jesse, L. C. H., and J. J. Orbycki. 2001. Field deposition of Bt transgenic corn pollen: Lethal effects on the monarch butterfly. *Oecologia* 125: 241–248.

More recently, Obrycki et al. published an article that interpreted many of the ecological issues related to Bt corn:

Obrycki, J. J., J. E. Losey, O. R. Taylor, and L. C. H. Jesse. 2001. Transgenic insecticidal corn: Beyond insecticidal toxicity to ecological complexity. *BioScience* 51: 353–361.

Obrycki et al. published their article, which highlights the potential negative aspects of Bt corn, before the more recent studies were published in the Proceedings of the National Academy of Sciences (PNAS).

The studies to which I am referring comprise the results of collaborative research conducted by scientists from universities and research institutions in the United States and Canada. The studies were designed to investigate the potential for any adverse effects of *Bacillus thuringiensis* (Bt) corn on the monarch butterfly, *Danaus plexippus*. Each study addressed a specific research area, and the collective results

address the potential risk of Bt corn to monarchs under natural field conditions. Ecological risk is determined when both toxic effects and exposure are jointly assessed. These studies provided quantitative data from laboratory studies with different Bt proteins from different sources and from fields in which Bt corn hybrids were grown, with a variety of exposure scenarios.

Most of the research was supported by a pooled grant provided by the United States Department of Agriculture (USDA), Agricultural Research Service and the Agricultural Biotechnology Stewardship Technical Committee, and funding from the Canadian Food Inspection Agency, Environment Canada, the Ontario Ministry of Agriculture, Food and Rural Affairs, the Ontario Corn Growers Association, the Maryland Agricultural Experiment Station, and the Leopold Center for Sustainable Agriculture (Ames, Iowa).

In a nutshell, the studies provide science-based evidence that potential risks of Bt corn to monarchs are low. The explanation for this rather simple conclusion is too lengthy for this article, so I invite you to read the articles for yourself. The papers are available on-line using the following link: <http://www.pnas.org/papbyrecent.shtml>. Because articles are added to this site weekly, you'll need to scroll to the bottom to get to the articles that were posted on September 14, 2001. The PNAS "Early Edition" contains papers published online before they are printed. When the papers appear in print, they are removed from this feature and grouped with other papers in an issue. The publication date appears below each title, followed by the article's unique Digital Object Identifier (DOI). So, if you want to review the articles, you'll need to do it soon before they no longer are available on the Web.

Following are the authors and titles of six related articles:

Hellmich, R. L., B. D. Siegfried, M. K. Sears, D. E. Stanley-Horn, M. J.

Daniels, H. R. Mattila, T. Spencer, K. G. Bidne, and L. C. Lewis. 2001. "Monarch larvae sensitivity to *Bacillus thuringiensis*—purified proteins and pollen."

Oberhauser, K. S., M. D. Prysby, H. R. Mattila, D. E. Stanley-Horn, M. K. Sears, G. Dively, E. Olson, J. M. Pleasants, W. F. Lam, and R. L. Hellmich. 2001. "Temporal and spatial overlap between monarch larvae and corn pollen."

Pleasants, J. M., R. L. Hellmich, G. P. Dively, M. K. Sears, D. E. Stanley-Horn, H. R. Mattila, J. E. Foster, T. L. Clark, and G. D. Jones. 2001. "Corn pollen deposition on milkweeds in and near cornfields."

Sears, M. K., R. L. Hellmich, D. E. Stanley-Horn, K. S. Oberhauser, J. M. Pleasants, H. R. Mattila, B. D. Siegfried, and G. P. Dively. 2001. "Impact of Bt corn pollen on monarch butterfly populations: A risk assessment."

Stanley-Horn, D. E., G. P. Dively, R. L. Hellmich, H. R. Mattila, M. K. Sears, R. Rose, L. C. H. Jesse, J. E. Losey, J. J. Obrycki, and L. Lewis. 2001. "Assessing the impact of Cry1Ab-expressing corn pollen on monarch butterfly larvae in field studies."

Zangerl, A. R., D. McKenna, C. L. Wraight, M. Carroll, P. Ficarello, R. Warner, and M. R. Berenbaum. "Effects of exposure to event 176 *Bacillus thuringiensis* corn pollen on monarch and black swallowtail caterpillars under field conditions."

So, you can judge for yourself. In my opinion, these studies allay most, if not all, of the fears that have been associated with the potential negative impact of Bt corn pollen on monarch butterflies, at least for now. This is not to say that additional studies are not necessary. Nor am I suggesting that the broader ecological consequences of growing transgenic crops should be ignored. Rather, I am suggesting that reporting of issues associated with transgenic crops should be responsible and as objective as possible. Sensa-

tionalism usually does not lead to a balanced presentation of controversial issues.—Kevin Steffey

## PLANT DISEASES

### Green Stem of Soybean

Reports and questions have come in recently concerning individual soybean plants that are staying green in fields of brown soybean plants. It is natural to ask why this is happening. Frequently a first thought is to question whether the seed was contaminated or mixed with a different variety. Another common thought is that the variety may be expressing genetic mutations. It is unlikely that these are the reasons; the more likely explanation is that it is a problem called "green stem."

Green stem is a problem in many areas of Illinois and in bordering states. It is not new but seems to have increased in the past 5 to 10 years. Green stem refers to plants that maintain green stems and leaves well past the time when they are normally brown and mature. This problem is associated with yield loss due to reduced pod numbers and seed numbers per pod. Seed quality may also be affected because seeds from plants with green stem tend to express more mottled discoloration than seeds from healthy plants. Green stem can also cause delays in harvest and may disrupt harvest by obstructing combines.

Incidence of green stem varies from location to location in a given year and can vary from year to year. Differences for incidence of green stem among varieties and locations have been reported in Illinois this year. For example, in Monmouth, differences in incidence were observed among varieties. In addition, green stem incidence for one soybean variety varied from minimal to significant levels among three locations in central Illinois. In southern Wisconsin in recent years (<http://www.plantpath.wisc.edu/soyhealth>), incidence of green stem ranged from 1 to 50% in different

fields. Similar observations have been reported for Illinois.

The cause of green stem is uncertain. This problem has been attributed to many different causes. These include plant viruses, low soil moisture, potassium deficiency, phytoplasmas, soybean population density, genetic mutations in soybean plants, and insect damage. Plant viruses seem to be most commonly associated with green stem. Bean pod mottle virus, which is transmitted by the bean leaf beetle, has been strongly associated with green stem. Soybean mosaic virus has also been linked to this disorder. However, specific viruses are not always detected in plants with green stem, and plants with specific viruses may not have green stem. Based on what is known at this time, green stem is probably caused by virus infection combined with other factors. Green stem and its causes are being studied at the University of Illinois and other midwestern universities. As more is learned, we will increase our ability to predict and manage this complex disorder of soybean.—*Dean Malvick*

## WEEDS

### Planting Wheat This Fall? Check Herbicide Rotational Intervals

The harvest has been progressing at a good pace so far this fall, and wheat planting will soon begin. We would remind producers to check herbicide labels for rotational intervals before planting wheat. Several herbicide labels have lengthy rotational intervals that will preclude planting wheat this fall. The following rotational intervals were reproduced from Tables 1 and 2 of the 2001 Illinois Pest Management Handbook.

#### Corn herbicide rotational intervals:

Anytime—Stinger

2 months—Permit

3 months—Beacon, Pursuit, NorthStar, Spirit

4 months—Degree, Harness,

DoublePlay, TopNotch, Hornet, Python, Lightning, Pursuit Plus, Accent, Accent Gold, Basis, Celebrity Plus

6 months—Balance Pro

10 months—Marksman, Basis Gold

12 months—Epic, Axiom

15 months—Degree Xtra, Harness Xtra, FulTime, Laddok S-12

Next year—AAtrex, atrazine, Bicep II Magnum, Bicep Lite II Magnum, Buctril + atrazine, Bullet, Guardsman, LeadOff, Liberty ATZ, Princep, ReadyMaster ATZ

2 years—Axiom AT

#### Soybean herbicide rotational intervals:

3 months—Classic, Synchrony STS, FirstRate, Scepter<sup>b</sup> (Region 2), Extreme, Pursuit, Raptor

4 months—Canopy<sup>a</sup>, Python, Backdraft (Region 2), Squadron<sup>b</sup> (Region 2), Steel (Region 2), Pursuit Plus, Sencor, Authority, Canopy XL<sup>a</sup>, Flexstar

4.5 months—Boundary

12 months—Axiom, Domain, Command

18 months—Backdraft (Region 3), Scepter (Region 3)

<sup>a</sup>Midwest states' rate, soil pH <6.8.

<sup>b</sup>Rotational interval increases to 15 months with sequential (soil followed by postemergence) imazaquin applications.

—*Aaron Hager and Christy Sprague*

## 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 for-

age 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

Soybean harvest began in many areas last midweek and is in full activity.

Corn harvest progress north of Interstate 80 will average less than 10% harvested. Although not as widespread as last year, poor stalk quality due to stalk rot has been observed throughout the region. Based on Extension educators' fall European corn borer (ECB) survey, second-generation egg laying and survival were higher than expected. ECB populations going into the winter are higher than the last few years.

Soybean cyst nematode screening clinics, sponsored by Extension, have been scheduled throughout November in Grundy, LaSalle, Bureau, Peoria, and Woodford counties. Interested participants are encouraged to call the host Extension Unit office for program dates and locations.

## West-Central Illinois

Harvest is progressing rapidly, with some farmers finished. Most yields reported are average to slightly above average. The majority of corn yields are 160 to 180 bushels, and most soybean yields are in the range of 45 to 55 bushels per acre. There are scattered reports of yields above and below those ranges.

Normal postharvest activities have begun. These include soil testing, dry fertilizer application, and tillage. Farmers are waiting for lower soil temperatures before applying anhydrous ammonia.

Fertilizer dealers are reporting anhydrous ammonia prices will be well below spring prices and possibly below prices a year ago.

Alfalfa harvest now will be delayed until dormancy.

Wheat planting has begun in the southern part of the region. There still is not much interest in the crop, even though farmers had excellent yields and quality this year. Therefore, wheat acres are not expected to increase much.

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