



Extension FactSheet

Entomology, 1991 Kenney Road, Columbus, OH 43210

Monitoring Western Corn Rootworm Activity in Soybeans to Predict Rootworm Injury in First-Year Corn

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Rootworm Injury on First-Year Corn

Two species of corn rootworm have been a problem on field corn in Ohio. The two species are the Northern corn rootworm, *Diabrotica barberi* (Smith and Lawrence), which is a native species of Ohio, and the Western corn rootworm, *Diabrotica virgifera virgifera* (LeConte), which spread across Ohio during the 1970s from its western origin. Injuries caused by both species were primarily limited to continuous corn, since adult rootworm beetles only deposited their eggs in plantings of corn that overwinter. The eggs hatch the following spring into larvae that feed on the root systems of corn planted after corn.

In the 1980s, a rootworm problem in first-year corn developed in the northwestern region of the Corn Belt; this problem has been attributed to the extended diapause of Northern corn rootworm eggs. In this situation, eggs deposited in corn one year would remain dormant for more than one year, resulting in a hatch in corn the following year when corn followed soybeans in a two-year rotation system. Research has demonstrated that extended diapause is a common trait of the Northern corn rootworm throughout the Corn Belt and may be the cause of isolated incidents of rootworm injury in first-year corn in Ohio.

In the late 1980s, cases of rootworm injury on first-year corn by the Western corn rootworm were identified in northeastern Illinois and soon thereafter in northwestern Indiana. In this case, adult rootworms were depositing eggs in soybean fields, rather than corn; the eggs then hatched the following year in corn planted after soybeans. This new egg-laying behavior of a bio-

type of the Western corn rootworm enabled populations of Western corn rootworm to thrive under a system of intense two-year rotations of corn and soybeans. This new biotype of the Western corn rootworm spread throughout Illinois and Indiana during the 1990s, especially in an eastward direction towards the Indiana-Ohio border. By 1996, OSU Extension entomologists had confirmed that the new biotype of Western corn rootworm had become established in Ohio counties bordering Indiana.

At the turn of the millennium, the new biotype of Western corn rootworm, commonly referred to as the first-year corn rootworm, is assumed to have immigrated into about 20 Ohio counties based on observations of adult Western corn rootworm beetle activity in soybean fields. Verification of significant rootworm injury in first-year corn has been limited to a few field cases in northwestern Ohio near the Indiana border. However, the potential for widespread rootworm injury on first-year corn, similar to that experienced in northern Illinois and Indiana, may develop over time in Ohio. Since 85% of Ohio corn is produced under annual crop rotation, the implications for additional investment in rootworm protection on first-year corn that is normally treated with a soil insecticide are significant.

Prediction of Rootworm Injury in First-Year Corn

The potential risk for rootworm injury in first-year corn can be predicted by monitoring adult rootworm beetle activity in soybeans during the previous season. Adult rootworm beetle activity can be measured by the use of yellow sticky traps or sweep net

sampling of soybean foliage. The preferred method for monitoring rootworm beetle activity in soybeans is the use of the Pherocon AM yellow sticky trap. MultiGard yellow sticky traps are also effective in monitoring adult rootworm activity, but they tend to become full of beetles as economic levels of activity are approached. Sweep net sampling can be used to monitor rootworm beetles in soybeans, but the results of such sampling are dependent on the daily fluctuations in beetle behavior.

During the past two years, statewide surveys of adult Western corn rootworm activity in Ohio soybeans were implemented using Pherocon AM yellow sticky traps. In these surveys, adult rootworm populations in soybean fields were monitored on a biweekly schedule from mid-July to late August using a minimum of four trap stations per field. If the number of trap stations per field was increased and trap replacement was maintained on a weekly schedule, accuracy of adult rootworm beetle information could be improved. However, the use of a minimum of four traps serviced on a biweekly schedule is recommended in Ohio as an optimal system for generating an index of adult rootworm activity in return for field effort invested.

When using yellow sticky traps to monitor adult rootworm beetle activity, two traps should be stationed in soybeans about 50 to 100 ft. away from a neighboring corn field. This placement will detect movement of the rootworm beetles from the corn. Two more traps should be stationed on another side of the soybean field that is preferably adjacent to a non-corn crop. This placement will detect movement of rootworm beetles in soy-



Yellow sticky trap posted in a soybean field about 100 ft. away from corn.

beans that are distant from a corn-field source. The traps should be placed in a soybean field in mid-July, when adult rootworm beetles are beginning to emerge from a corn field. The traps should be replaced at 14-day intervals, around Aug. 1 and Aug. 15. Trap monitoring of rootworm beetle activity should be terminated around Sept. 1, when adult rootworm beetle activity has likely peaked and is on the decline.

The average number of beetles collected per trap per day over the entire six-week monitoring period provides an index of adult rootworm beetle activity. This activity can be compared to the



Example of yellow sticky trap placement in a soybean field.

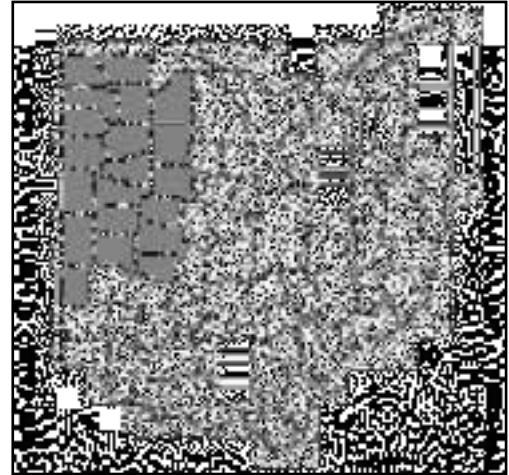
relative activity of beetle collections on traps statewide. In general, an average collection of two rootworm beetles per trap per day is regarded as an indication of potential economic rootworm injury if corn is planted in the field the following season. Average beetle collections as high as five to six beetles per trap per day have been proposed as an economic threshold predicting economic rootworm injury by Illinois and Indiana entomologists. Rootworm beetle collections of five to six beetles per trap per day have not been observed in Ohio, but economic rootworm injury has been observed in areas having trap captures of beetles ranging from one to two rootworm beetles per trap per day.

Results of Surveys of Rootworm Activity in Ohio Soybeans

In 1998, 1999, and 2000, statewide surveys of adult Western corn rootworm activity in Ohio soybeans were conducted using Pherocon AM yellow sticky traps. These cooperative surveys were conducted by agri-business representatives, independent crop consultants, and Ohio State University Extension personnel. Some 1,000 sites were monitored using four traps per field serviced on a biweekly schedule from mid-July to late August. Results of collections of rootworm beetles in three tiers of counties in western Ohio are presented in the graphs shown on the following pages. These counties exhibited first-year corn rootworm activity. The graphs provide county-specific profiles of rootworm activity in soybeans and may be used as indicators of the relative regional risk for rootworm injury in first-year corn.

Average trap captures of rootworm beetles per site are pooled into four levels of rootworm activity. The lowest level of activity is < 0.2 beetles per trap per day, which is 10% or less of the economic threshold of 2.0 beetles per trap per day. The next level of activity includes sites having an average capture of > 0.2 but < 0.5 beetles per trap per day, which is assumed to represent the presence of first-year corn-rootworm activity since such activity is rarely observed in soybeans in most of Ohio. The third level of activity involves sites having an average capture of > 0.5 but less than 1.0 beetles per trap per day, which is likely associated with risk of rootworm injury that is not economic. The fourth level of activity includes sites having an average capture of > 1.0 beetle per trap per day, which to date has been only observed in a limited number of soybean sites in a few counties in northwestern Ohio.

The county-specific results presented in the charts on the following pages provide a baseline of observations on Western corn rootworm activity in soybeans to which current trap cap-



The shaded area represents the three tiers of Ohio counties exhibiting first-year corn-rootworm activity.

tures of adult rootworm beetles can be compared. For counties not included in the illustrations, rootworm beetle captures are generally less than 0.2 beetles per trap per day.

Exceptional cases may be observed in areas where rootworm activity is above normal due to significant rootworm activity generated from fields of continuous corn. In areas where the planting of continuous corn is a common practice, it is important to compare the rootworm beetle captures in traps nearest to continuous corn to captures in traps isolated from continuous corn.

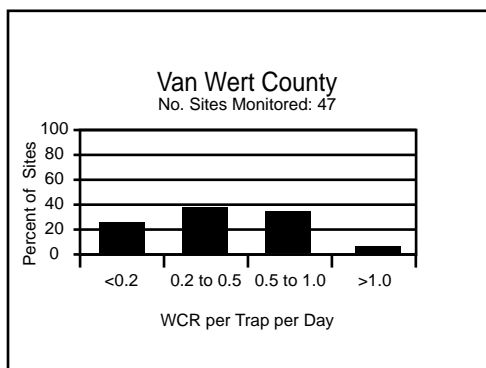
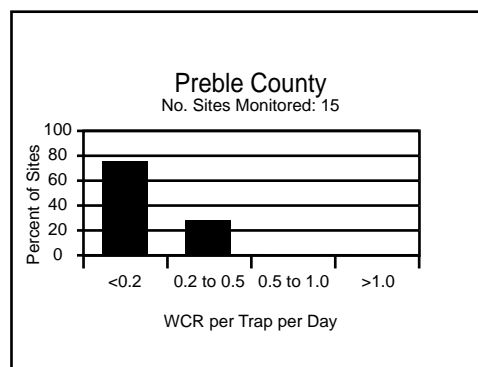
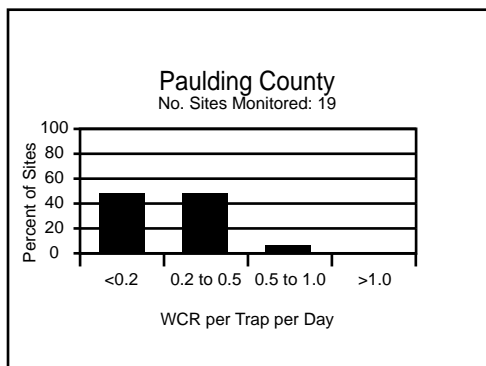
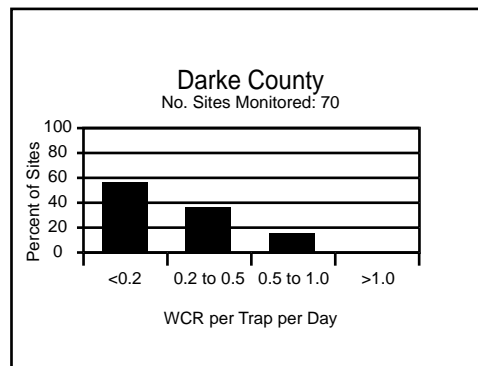
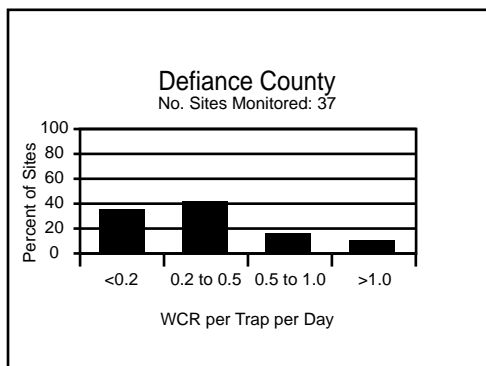
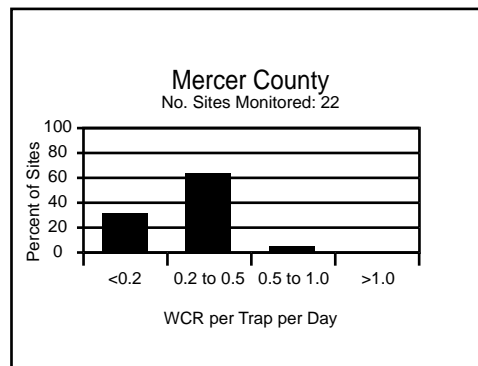
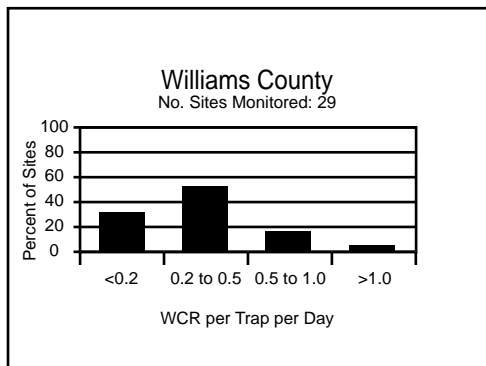
Alternative methods exist for determining that a first-year corn-rootworm problem is present on a farm. Where lodging of first-year corn is detected, root systems may be inspected to confirm that the lodging is due to rootworm-feeding injury. Root-system inspections should be performed in late June or July, when rootworm-feeding injury is fresh and regrowth of root systems has not occurred to mask the injury. A second method of assessing the presence of first-year corn-rootworm activity includes monitoring of adult rootworm activity in first-year corn.

In general, first-year corn isolated from continuous corn is characterized by low levels of adult corn-rootworm activity until migrations of rootworm beetles occur from continuous corn plantings that are in the area. Detection of one or more adult rootworm beetles per plant in a first-year corn field isolated from continuous corn, especially in late July, should be regarded as abnormal. Yellow sticky traps may also be used to monitor adult rootworm activity in corn.

(Continued on the following pages.)

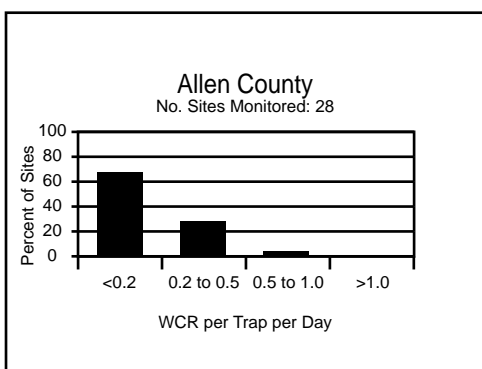
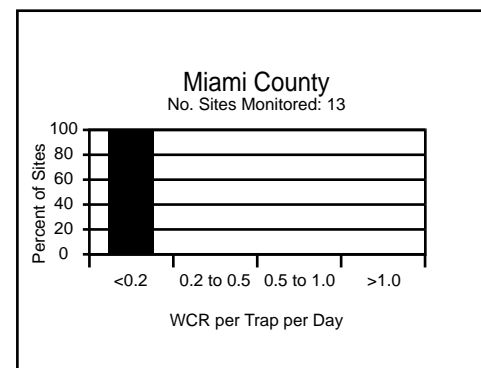
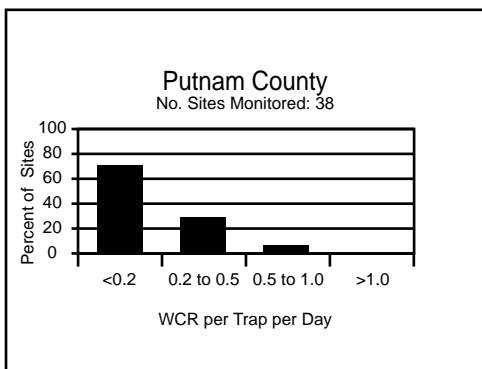
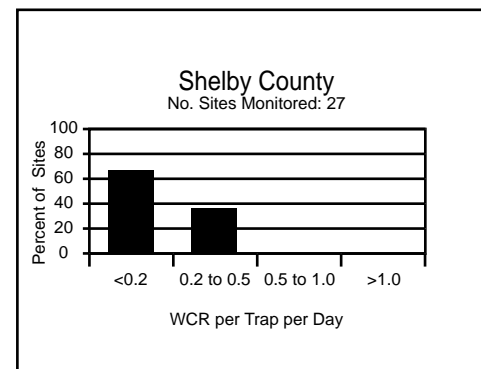
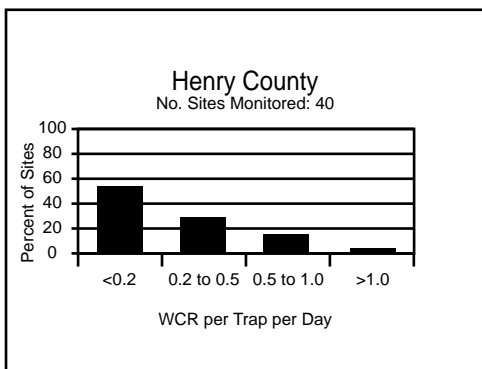
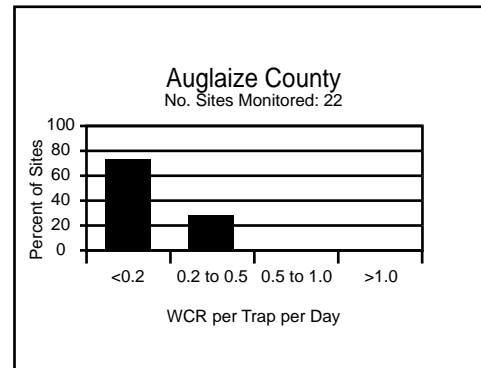
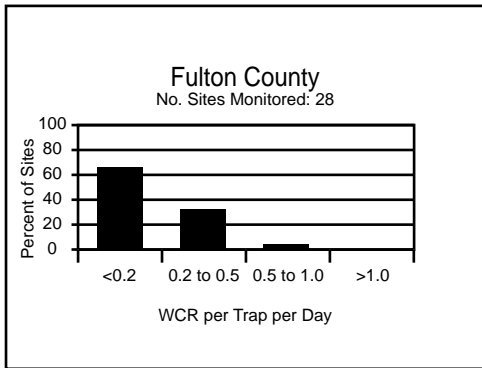
First Tier of Counties Adjacent to Indiana State Line

In the first tier of counties adjacent to the Indiana border, collections of WCR ranged from 0.2 to 0.5 beetles per trap per day in approximately 41% of sites monitored. Collections ranged from 0.5 to 1.0 beetles per trap per day at 15% of the sites. The catch declined in the southern region of the state.

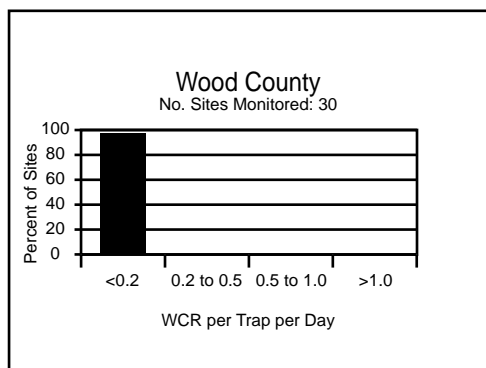


Second Tier of Counties from Indiana State Line

In the second tier of counties east of the Indiana border, WCR collections averaged less than 0.2 beetles per trap per day at 67% or more of the sites. About 27% of the sites collected 0.2 to 0.5 beetles per trap per day. Collections of WCR greater than 0.5 beetles per trap per day were observed in a few counties.

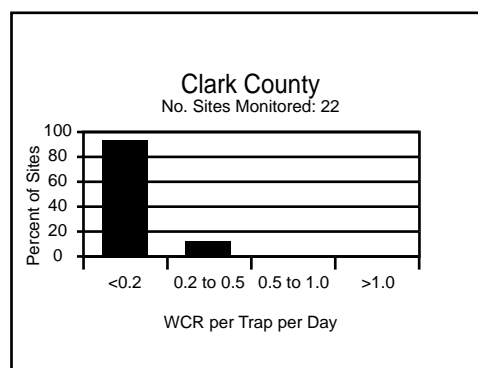
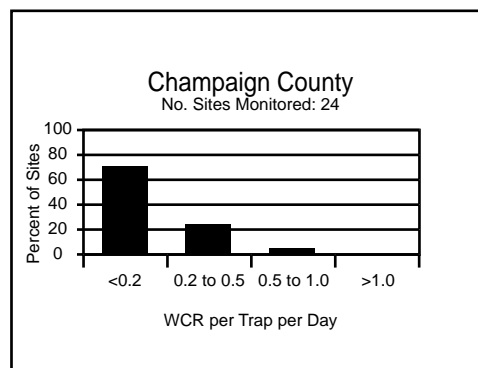
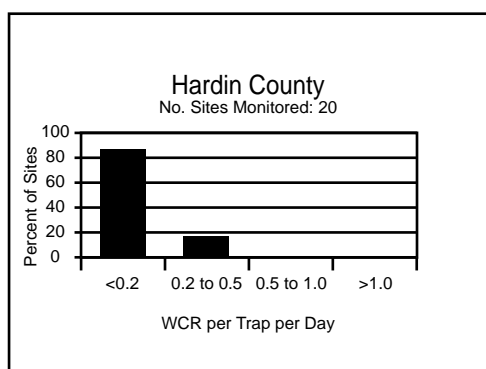
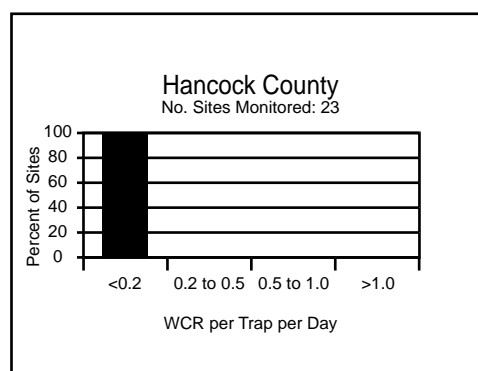
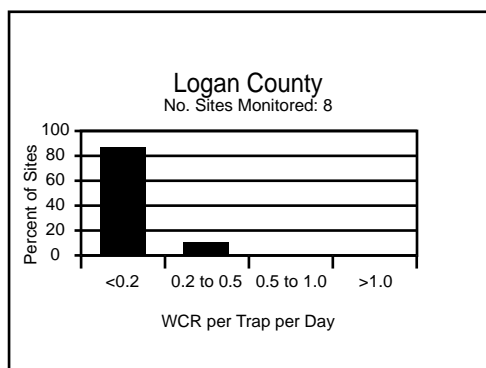


Third Tier of Counties from Indiana State Line



In the third tier of counties east of the Indiana border, WCR collections at 89% of soybean sites averaged less than 0.2 beetles per trap per day. Collections at the remaining sites rarely exceeded 0.5 beetles per trap per day. These counties represent the eastern front of first-year corn-rootworm activity.

In summary, first-year corn-rootworm activity in Ohio soybeans is concentrated along the Indiana border in the northwestern region of the state. WCR activity observed to date in most sites monitored indicates minimal rootworm problems in first-year corn following soybeans.



Data Sheet for Recording and Reporting Trap Collections of Adult Rootworm Activity in Soybeans

Farm Operation:	County / Township:
Address:	Nearest Intersection:
Phone:	Field Observer:
Area of Site Monitored (acres):	Prior Crop at Site Monitored:
Tillage of Site Monitored:	Planting Date at Site Monitored:

Time Period	Date Trap Set	Date Trap Collected	No. Days for Period
Late July			
Early August			
Late August			

Rootworm Species	Sta. 1	No. Beetles per Trap			4 Station Total	Average per Trap	Average per Day
		Sta. 2	Sta. 3	Sta. 4			
		<i>Late July Captures (ca. July 15 to July 31)</i>					
WCR							
NCR							
		<i>Early August Captures (ca. August 1 to August 15)</i>					
WCR							
NCR							
		<i>Late August Captures (ca. August 15 to August 31)</i>					
WCR							
NCR							
		<i>Average of Three Biweekly Collection Periods</i>					
WCR							
NCR							

Return copy of completed data sheet to:

Bruce Eisley
 Extension Entomology
 The Ohio State University
 1991 Kenny Road
 Columbus, OH 43210

In the grid below, draw a map of the soybean field monitored, noting adjacent crops and location of all trap stations.

For Additional Information

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