Agronomic Spotlight

Don't Overlook European Corn Borer

- Annual yield loss continues to occur from European corn borer (ECB) even though the use of B.t. corn products have contributed to an area-wide suppression of ECB populations.
- Multiple insecticide applications may be necessary to provide adequate control of first and second generations of ECB. Expected control of ECB larvae with insecticide applications ranges from 60 to 80%.
- Corn products with B.t. technology are an effective option to help protect yield potential from ECB damage.

B.t. corn products for European corn borer (ECB), corn rootworm, and corn earworm were estimated to have been planted on 76% of the United States corn acres in 2013.[1,2] Despite widespread use of B.t. corn thats contributed to a suppression of ECB populations, ECB still threatens non B.t. corn products.[2] Growers using non-B.t. corn products still face a potential challenge from ECB infestations and may need to rely on precisely timed insecticide applications for yield and grain quality protection.

ECB Life Cycle and Field Scouting

Fifth instar ECB larva overwinter in corn stalks, stems of other host plants, or in plant debris on or in the soil. Larvae pupate when temperatures reach 50 °F in the spring and emerge as moths about 7 to 10 days after pupation. Male and female moths are similar in appearance and have alternating yellow and brown wavy lines across each wing.

Table 1. ECB life stages and feeding activity.

Life Stage	Accumulated Degree Days (base 50 °F)	Larval Activity
First spring moth	0	
Larval hatch	212	Pinhole leaf feeding
First Generation 2nd to 5th instars	318 to 792	Shot-hole leaf feeding, mid-rib and stalk boring
Second generation larval hatch	1404	Pollen and leaf axil feeding
Second generation 2nd to 5th instar	1510 to 1984	Sheath, collar, and mid-rib feeding; stalk boring

Source: Cook, K.A., Ratcliffe, S.T., Gray, M.E., and Steffey, K.L. 2003. European corn borer. Insect fact sheet. University of Illinois. https://ipm.illinois.edu.

Moths lay eggs for the first-generation in corn fields or on secondary grass hosts and are attracted to taller corn as an egg-laying site. Eggs are about the size of a pin head and are laid in clusters which can contain as many as 60 eggs but average about 23 eggs/cluster. Eggs hatch in about 5 to 7 days. Larvae can be seen inside the egg with a visible brown head capsule, just prior to hatching. Larvae feed on leaf collars and in the whorl. Mature ECB larvae are about 1 inch long with flesh colored bodies, exhibit two distinct brown spots on each abdominal segment, and have brown to black heads.

First Generation

ECB. Beginning at moth activity, accumulated growing degree days (GDD), base 50 °F, can be used as an aid to decide when to scout for first generation larvae and whorl damage (Table 1). Larvae feed on plant leaves in the whorl, chewing small holes in the leaves which create a "buckshot" or “shot-hole” effect when leaves unfurl (Figure 1). Third to fourth instar larvae begin to tunnel into the stalk or leaf midribs where they develop, mature, and later pupate. Larvae may be found in unrolled leaves in the whorl or behind leaf sheaths. Stalks need to be split to find older larvae.

Figure 1. ECB larvae "shot-hole" effect from whorl feeding.

Second Generation

ECB. Begin scouting for second generation egg masses when ECB moths are found in light or pheromone traps. Fields most likely to be infested have green, succulent corn shedding pollen or with green silks in late July and early August. Count egg masses on the underside of leaves above and below the ear zone for a 3 to 4 week period during egg laying. The second-generation larvae pass through the same larval stages as the first generation. A third generation may occur in southern areas.

Figure 2. ECB frass in leaf axil. Photo courtesy of Jan Samanek, State Phytosanitary Adminstration, Bugwood.org.

The second-generation is normally present after corn tassels. Young larvae feed on pollen in leaf axils or on leaves. Larger larvae feed on leaf sheaths, collars, and midribs until tunneling into the stalk (Figure 2). Second generation ECB larvae may also tunnel into the ear or ear shank. Stalk tunneling by larvae affects the plant's ability to transfer nutrients and yield

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losses are due primarily to this physiological damage. Ear droppage, stalk breakage, and secondary invasion of stalk rot into susceptible corn products also contribute to yield loss.

Economic Thresholds for Insecticide Treatments

Table 2. Percentage yield loss caused by European corn borers at various corn growth stages*

Plant Stage	Number of ECB/plant		
	1	2	3
Early Whorl	5.5	8.2	10.0
Late Whorl	4.4	6.6	8.1
Pre-tassel	6.6	9.9	12.1
Pollen shedding	4.4	6.6	8.1
Blister	3.0	4.5	5.5
Dough	2.0	3.0	3.7

*Percentage yield loss are based on physiological stresses and do not include loss due to stalk breakage and/or ear breakage.

Source: Krupke, C.H., Bledsoe, L.W., and Obermeyer, J.L. 2010. European corn borer in field corn. Bulletin E-17-W. Purdue University.

ECB economic thresholds change based on crop growth stage at time of infestation (Table 2), expected yield and price per bushel, and insecticide treatment cost per acre. To assess first-generation infestation levels, additional field information such as percentage of plants with whorl feeding and average number of larvae per infested plant should be determined. For second and later generations, determine average number of egg masses per plant. Management worksheets that outline scouting procedures and help calculate thresholds are available from state Extension Services.[2]

Granular or liquid insecticide applications directed over the whorl provide about 80% control of first-generation larvae.[1,2,3,4] Insecticide applications for second-generation larval control is estimated to be 60 to 75%.[1,2,4]

Field scouting and timing of insecticide application are critical for ECB control. Once larvae begin boring into the stalk, insecticide applications are ineffective. Multiple applications may be necessary to provide adequate control for both first and second generations of ECB. It's important to remember that insecticides can contribute to a resurgence of two-spotted spider mite populations, primarily due to the loss of natural enemies killed by the insecticides.[8] Scout for mites within 5 days after an insecticide application.

B.t. Corn Products for ECB Control

Corn plants may still be at risk for ECB infestations even though ECB populations may have declined. According to Purdue University, an infestation averaging 1.0 ECB larvae per plant just prior to tasselling may reduce yield potential by 6.6% (Table 2).[5]

Corn producers may want to consider protecting yield potential by selecting B.t. corn products that provide protection against ECB yield loss. VT Double PRO® technology has dual modes of action against ECB and other above ground insects. Genuity® VT Triple PRO® and SmartStax® technologies provide protection against ECB, other above ground insects, and corn rootworms.

Sources

[1]Fernandez-Cornejo, J., Wechsler, S., Livingston, M., and Mitchell, L. 2014. Genetically engineered crops in the United States. Economic research report number 162. Economic Research Service. USDA. http://www.ers.usda.gov/. [2] Gray, M.E. 2014. Remember the European corn borer? the Bulletin, June 30, 2014. University of Illinois. http://bulletin.ipm.illinois.edu/?p=2354. [3] Ostlie, K.R., Hutchison, W.D., and Hellmich, R.L. Bt corn and European corn borer, long-term success through resistance management. University of Minnesota Extension Service. http://www.extension.umn.edu/agriculture/corn/pest-management/bt-corn-and-european-corn-borer/. [4] Cook, K.A., Ratcliffe, S.T., Gray, M.E., and Steffey, K.L. 2003. European corn borer. Integrated pest management. University of Illinois. https://ipm.illinois.edu/. [5] Krupke, C.H., Bledsoe, L.W., and Obermeyer, J.L. 2010. European corn borer in field corn. Bulletin E-17-W. Purdue University Extension. https://extension.entm.purdue.edu/. [6] Boyd, M.L. and Bailey, W.C. 2001. European corn borer: A multiple-crop pest in Missouri. Bulletin G7113. Outreach and Extension University of Missouri-Columbia. http://extension.missouri.edu/p/G7113. [7] Bissonnette, S.M., Pataky, N.R., Nafziger, E.D., et al. 2010. Field crop scouting manual. Publication X880e. University of Illinois Extension. [8] Ostlie, K. and Potter, B. 2012. Managing two-spotted spider mite on corn. University of Minnesota Extension. https://swroc.cfans.umn.edu/.
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For additional agronomic information, please contact your local seed representative.
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