Managing cover crop pests for corn and soybean production

Erin Hodgson, associate professor and Extension entomologist, Entomology, Iowa State University; Mike Dunbar, graduate student, Entomology, Iowa State University; Matt O'Neal, associate professor, Entomology, Iowa State University; Aaron Gassmann, associate professor, Entomology, Iowa State University

Introduction

Cover crops can provide many benefits to row crop agriculture, such as reducing water loss and soil erosion, increasing soil organic matter and nutrients, and suppressing weeds. The incorporation of cover crops is also generally perceived as an important forage and refuge for natural enemies of insects and weeds. Diverse agroecosystems that include cover crops can have decreased pest pressure compared to monocultures (Root 1973). For example, soybean aphid populations can be lower in soybean fields with a rye cover crop (Koch et al. 2012).

For the Midwest, there are many cover crop options depending on the goals of the farmer (visit this decision tool for examples: http://mcccdev.anr.msu.edu/VertIndex.php). Rye is commonly selected as a fall-seeded cover crop in Iowa because of its cold tolerance and rapid growth in the spring. A common practice of cover crop management is to remove the rye before the row crop is planted. The current recommendations for rye termination are intended to prevent overlap between rye and corn, which could result in reduced yields (De Bruin et al. 2005, Kladivko et al. 2014). It has been recommended that removing the cover crop two weeks before planting corn will avoid competition with the main crop (Kladivko et al. 2015). However, this period of time may not always be possible, given constraints imposed by field conditions and weather.

The timing of rye termination in the spring seems to be especially critical for suppressing spillover pests on corn and soybean seedlings. If not mowed or terminated with herbicides, cover crops can serve as a green bridge until corn and soybean seedlings emerge. Showers (1997) recommends 8-14 days between tillage or herbicide application and corn planting because caterpillar populations will be severely reduced through dispersal and starvation.

In addition to timing of cover crop termination, other practices can influence pest abundance. For example, higher incidence of predators were found in fields with mowed cover crops compared to herbicide-killed cover crops, and subsequently fewer armyworms in corn (Laub and Luna 1992). Conversely, there are certain practices that can promote row crop pests when cover crops are used (e.g., poor weed control, planting date, etc.). In this presentation, common cover crop pests will be discussed, including life cycle, plant injury, scouting and management tactics. Preliminary research on cover crop pests in Iowa will also be discussed.

Life cycle and identification

Although many insects are found in cover crops, three economically important species can spillover to corn and soybean and cause significant yield loss: true armyworm, black cutworm and common stalk borer. All three species are geographically widespread throughout the U.S. and have a wide host range (Showers 1997, Capinera 2008, Rice and Davis 2010).

True armyworms have 2-3 generation per year in Iowa and do not overwinter in the Corn Belt. Moths migrate north each spring, and females lay eggs on cover crops and weeds. True armyworm females lay egg masses on the leaf sheath and blades of dry grass (Capinera 2008). Typically females deposit eggs in the same vicinity, creating high density pockets within or nearby fields. True armyworm caterpillars are grayish green with dark stripes along the top of the body, and white and orange stripes along the sides of the body. The head is yellowish brown with a dark, net-like pattern. Caterpillars have four pairs of abdominal prolegs. A fully developed true armyworm caterpillar reaches about 1 1/2 inches long.

Black cutworms have 2-3 generation per year in Iowa and do not overwinter in the Corn Belt. Moths migrate north each spring and females lay eggs on cover crops and weeds. Black cutworm females lay eggs singly or in small masses on low-lying plants or debris. Black cutworm caterpillars are black to pale grey, with dark tubercles (bumps) along the side of the abdomen. The body appears greasy in texture. Larvae have four pairs of abdominal prolegs. A fully developed black cutworm caterpillar reaches about 1 3/4 inches long.

Common stalk borers have one generation per year and overwinter as eggs in the Corn Belt. Overwintering eggs develop into caterpillars early in the spring. Young caterpillars have dark purple patches, sometimes referred to as a saddle, on the thorax, and creamy white stripes on the abdomen. The head is orange with a dark stripe on each side. Larvae have four pairs of abdominal prolegs. A fully developed common stalk borer caterpillar is about 1 1/2 inches long.

Plant injury

Although not preferred hosts, these three species often find and feed on corn or soybean seedlings. Injury to corn and soybean seedlings typically occurs when cover crops or weeds are no longer available due to mowing, tillage, or herbicide burndown (Rice and Pedigo 1997, Showers 1997, Capinera 2008). With common stalk borers, grass stems eventually becomes too small and the caterpillars are forced to move to find more food.

Young true armyworms skeletonize leaves while older caterpillars can eat partial or entire leaves. Corn from VE to V8 is most susceptible to feeding, with the last larval instar inflicting 80% of the crop injury associated with this pest (Capinera 2008). This pest is mobile and nocturnal, and seeks shelter under debris or in soil crevices during the day. The aggregated nature of true armyworm can cause severe outbreaks in row crops. Black cutworms can defoliate the leaves, tunnel inside plants, and cut seedlings at the soil line. In some cases, these caterpillars can kill plants and cause significant stand reduction. Caterpillars are nocturnal and can feed on VE-V7 corn. Common stalk borers attack V5-V10 corn and are sometimes found in soybean. Larvae feed on developing leaves in the whorl and cause emerging leaves to have numerous holes in a repeating pattern. Older larvae can also burrow directly into the stalk, stunting or killing the growing point (sometimes called a dead heart). Outbreaks can cause significant stand reduction, particularly around the field perimeter.

Scouting and management

True armyworms and black cutworms migrate to Iowa every spring, making it difficult to predict when and where infestations will occur. Baited pheromone traps can help determine when these migrating pests arrive each spring. Female moths are attracted to green plants in the spring, and therefore, cover crops and weeds are commonly infested. No-till or strip-tilled field residue is also attractive to egg-laying females. While scouting, look for caterpillars, and injured or missing plants, especially in low-lying areas. Common stalk borer overwinter as eggs along field edges and their infestations are more predictable.

Proper cover crop termination is important to avoid reduced crop yields and to reduce the attractiveness of fields to all three of these pests. Soil moisture and tillage regimes should be taken into consideration when deciding row crop planting. Guidelines produced by USDA-NRCS (2013) recommend terminating cover crops:

- at or before the planting of the row crop [Zone 3, or western Iowa]; or
- at or within five days after planting, but before crop emergence [Zone 4, or eastern Iowa].

There are limited preventative management tactics available for caterpillars. Currently, the high rate of insecticidal seed treatments can suppress black cutworm caterpillars, but no seed treatments are labeled for either true armyworm or common stalk borer. There are genetically modified corn hybrids expressing insecticidal proteins from *Bacillus thuringiensis* (Bt) that are labeled for management of common stalk borer and black cutworm; however, there are no Bt corn hybrids labeled for true armyworm. Foliar organophosphate insecticides applied at corn planting can provide protection from true armyworm injury following a rye cover crop.

Since these pests sporadically reach economically important populations, the prophylactic use of insecticides is not cost effective. An alternative approach includes scouting for caterpillars and feeding injury, and applying insecticides as needed. During 2015, farmers who experienced extreme true armyworm populations and corn defoliation used a foliar pyrethroid insecticide and successfully protected corn seedlings (M. Dunbar, *personal observation*).

References

Capinera, J. L. 2008. Armyworm. In J. L. Capinera (ed.), Encyclopedia of Entomology. Springer, Netherlands.

De Bruin, J. L., P. M. Porter, and N. R. Jordan. 2005. Use of a rye cover crop following corn in rotation with soybean in the upper Midwest. Agronomy Journal. 97: 587-598.

Laub, C. A., and J. M. Luna. 1992. Winter cover crop suppression practices and natural enemies of armyworm in no-till corn. Environmental Entomology 21: 41-49.

Kladivko, E., C. H. Krupke, C. K. Gerber, J. L. Obermeyer, and K. D. Johnson. 2014. Midwest Cover Crops Field Guide, 2nd ed. Pub No: 433. Purdue Extension. https://mdc.itap.purdue.edu/.

Kladivko, E., R. Nielsen, S. Casteel, K. Johnson, J. Camberato, C. Krupke, W. Johnson, B. Young, and K. Wise. 2015. An introduction to integrating cover crops into a corn-soybean rotation. Pub No: AY-353-W. Purdue Extension. http://www.mccc.msu.edu/states/indiana.html.

Koch, R. L., P. M. Porter, M. M. Harbur, M. D. Abrahamson, K.A.G. Wyckhuys, D. W. Ragsdale, K. Buckman, Z. Sezen, and G. E. Heimpel. 2012. Response of soybean insects to an autumn-seeded rye cover crop. Environmental Entomology 41: 750-760.

Rice, M. E., and L. P. Pedigo. 1997. Stalk borer ecology and pest management options in corn and soybeans. Iowa State University Extension, Ames, IA. IPM-41.

Rice, M. E., and P. Davis. 2010. Stalk borer ecology and integrated pest management in corn. Journal of Integrated Pest Management DOI: 10.1603/IPM10006.

Root, R. B. 1973. Organization of a plant-arthropod association in simple and diverse habitats: the fauna of collards. Ecological Monographs 43: 95-124.

Showers, W. B. 1997. Migratory ecology of the black cutworm. Annual Review of Entomology 42: 393-425.

USDA -NRCS [United States Department of Agriculture - Natural Resourced Conservation Service]. 2013. NRCS cover crop termination guidelines, non-irrigated cropland. June 2013. www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1167871.pdf.