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"Worms" in Corn Ears

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I've had a few calls as well as personnel observations regarding "worms" and their damage in corn ears. European corn borer seems to be making a bit of a comeback. Although these reports have been locally heavy, they have not been widespread. Western bean cutworm complaints have certainly increased from previous year, especially on traited corn. Fall armyworms, which migrate to Wisconsin, had a surprisingly early migration and their damage can mimic injury caused by other ear feeding insects. Finally, corn earworm is another one of those late-season migrants which arrived in very heavy numbers at some locations during the 2016 growing season. Normally it is not a field corn pest but when migrating populations are this high, field corn can be a host. One clue that you have an infestations of corn "worms" can be significant bird damage to the ears. Diagnosis of the injury can be important when planning for the future. However, diagnosis of injury symptoms can be a little tricky and not always definitive based on symptoms. Below is a quick synopsis that can be used for identification of both the larvae as well as type of damage.

European corn borer (ECB), as mentioned earlier, is making a bit of a comeback presumably because more conventional corn is being planted. They are normally controlled by hybrids expressing above ground trait(s). ECB have a very dark head (usually black) and a lighter cream to tan colored body and may grow up to an inch in length. Depending on the area of state, there is either 1 or 2 generations/year. However, I have had a few reports of a third generation this summer. Larvae from the third generation do not mature in time to overwinter successfully. Diagnosing injury can always be a little difficult, however, ECB larvae may still be present in the ear and the injury is typically confined to a smaller area on the ear tip if compared to other insects. ECB are also more likely to burrow into individual kernels and/or the cob. You also would expect to find ECB injury in ear shanks as well as tunneling within the stalks.

Western bean cutworms (WBC) are dark to light brown, without distinguishable stripes or dots and their skin is smooth. They will grow up to 1 ½ inch and the later instars will have two short/broad strips behind the head. WBC complete 1 generation/year and leave the ear to pupate in the soil. Injury to the ear can vary from light surface feeding on kernels to complete consumption of

Left: CEW Larvae and damage; **Right:** ECB

Left: Western Bean Cutworm. Photo credit: Frank Peairs, Colorado State University, Bugwood.org

large areas of kernels. Molds may be found on the ear but this is not diagnostic of only WBC. They are not cannibalistic; therefore, more than one larvae may feed on each ear. WBC injury is often associated with sandy soils. Several states in the Midwest, have had repots of significant WBC injury to traited corn.

Fall Armyworm (FA) is a species which occasionally migrates to our state. Larvae may be up to 1 ½ inch long, have variable coloration (green, light brown to almost black), smooth skin and light striping on their backs. A diagnostic feature of FA is an inverted white "y" on their head located between their compound eyes. Damage depends on crop stage and can range from leaf feeding to significant kernel injury on both the tip and sides of the ear.

Corn earworms (CEW) feed on a variety of crops, including sweet corn. Although an infrequent field corn pest, feeding can be significant during years of heavy pressure. CEW vary in color and can be green, yellow, brown, tan to almost black. All CEW larvae will have a tan head. CEW can easily grow to 1 ½ inches long and later instars have easily recognizable striping. Early instars will have small black hairs identifiable if you have magnification. Earworms usually enter the ear through the silk and damage is concentrated at the ear tip, however injury can be severe on any part of the ear. What can separate CEW injury from WBC and FA is that the latter two species may chew holes into the husks.

Above: Fall Armyworm, note inverted "y" on head. Photo credit: Steve L. Brown, University of Georgia, Bugwood.org

There are no effective control treatments for these insects once these insects have entered the ear. However, proper identification can help develop management plans for the future, if needed.

Considerations when using the end-of-season corn stalk nitrate test

Carrie Laboski, Professor & Extension Soil Fertility/Nutrient Management Specialist

There continues to be interest in taking end-of-season corn stalk samples to assess nitrogen (N) management practices. The purpose of this article is to briefly describe the end-of-season corn stalk nitrate test with regard to the intent of the test, sampling guidelines, and interpretation of test results.

Intent of the test

Many corn growers feel that their crop needs to be dark green throughout the growing season to achieve high yields and be profitable. As a result of this belief, high fertilizer N rates are often applied to maintain dark green leaves. Research in Wisconsin and throughout the Midwest has consistently shown that the most profitable rate of N fertilizer will result in plants that are less green late in the growing season. The end-of-season stalk nitrate test is intended to be tool to help corn growers determine if their N management practices were adequate or if adjustments could be made to improve profitability and/or reduce N losses to the environment.

Sampling guidelines

The following criteria must be followed to ensure that samples are properly acquired:

- Samples should be taken 1 to 3 weeks after black layer
- An 8" segment of stalk should be taken from 6 to 14 inches above the soil surface, remove leaf sheaths
- Stalk segments from 15 plants make one sample
- A sample should not represent more than 20 acres
- If soil characteristics or past management practices vary across the field, then separate samples should be collected for each area.
- Stalks severely damaged by insect or disease should not be used

Following the sampling criteria outlined above is important for collecting samples that can be interpreted. The guidelines were developed because each criterion is known to influence stalk nitrate results.

Samples should be placed in paper bags and sent to a laboratory for analysis. Samples should be refrigerated (not frozen) if they are to be stored for more than one day before shipping. Most soil testing laboratories will conduct this test. Contact your laboratory to confirm that they run the stalk nitrate test.

Interpretation of stalk nitrate test results

The interpretation of the stalk nitrate test was developed using data from 98 sites in Wisconsin collected over four years (Bundy, 1996). Results from the stalk nitrate test are reported in parts per million (ppm) of nitrate-N. Stalk nitrate test interpretations are provided in Table 1.

It is important to keep in mind that the stalk nitrate test has several limitations. First, the test identifies excessive and optimal N rates more accurately on medium yield potential soils compared to high yield potential soils (Table 2). In addition, a little more than one-third (37%) of the high yield potential soils categorized as having excess N supply actually had optimal, not excessive, rates of fertilizer. Second, research in Wisconsin has shown that the test may occasionally incorrectly indicate that excess N was supplied to fields with recent (within two years) history of manure application and/or alfalfa in the rotation; particularly on high yield potential soils. Third, the test does not provide an indication of the amount of N that was over or under supplied. Fourth, the test can be impacted by weather. In extremely dry years, the stalk nitrate values tend to be high; in contrast, test values tend to be low in an extremely wet year.

Because the adequacy of any given N rate on a field is dependent upon environmental conditions, basing future N rate decisions solely on one year's stalk nitrate values could result in poor management decisions. Stalk nitrate data collected over several years coupled with fertilizer and manure application history, growing season weather conditions and general crop management history may be useful in determining if N fertilizer rates should be reduced to improve profitability.

References and other reading

Blackmer, A.M. and A.P. Mallarino. 1996. Cornstalk testing to evaluate nitrogen management. Iowa State University Extension Bulletin PM 1584.

Bundy, L.G. and T.W. Andraski. 1996. End-of-season soil and plant nitrate tests to evaluate nitrogen management practices for corn. Proc. Wisconsin Fertilizer, Aglime, and Pest Management Conference. 35:247-256.

Table 1. Interpretation of end-of season corn stalk nitrate test.

Category	Nitrate-N concentration	Interpretation
Excessive	> 2000 ppm	High probability that N availability was greater than if fertilized according to UW-Extension guidelines
Optimal	700–2000 ppm	High probability that N availability was within the range needed to maximize profitability
Low	< 700 ppm	High probability that greater N availability would have resulted in increased yields

Table 2. Accuracy of the end-of-season stalk nitrate test to categorize sites as having low, optimal, or excessive N rates on 49 medium and 49 high yield potential soils.

Soil yield potential	Stalk nitrate test category		
	Low	Optimal	Excessive
	% of sites correctly categorized		
Medium	60	92	71
High	75	56	63

Wet Wisconsin: Moldy Corn and Crop Insurance

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It's been a warm and wet summer and flooding has recently hit many areas hard in Wisconsin. Due to the heavy moisture we have seen during the 2016 growing season, Wisconsin farmers should be especially aware of moldy corn this year. Molds can cause serious problems if fed to livestock and can be food safety problems in the supply chain. Buyers will also be looking for moldy corn and other quality problems; ear rots have been reported, as well as some grain sprouting on the ear. For those with crop insurance, quality losses due to moldy corn can trigger indemnities if losses are large enough. Farmers suspecting losses due to moldy grain should contact their crop insurance agents before they harvest. The company will follow-up and tell you how to proceed.

Corn Ear Rots and Mycotoxins

Ear rots caused by fungi in the groups *Diplodia, Fusarium,* and *Gibberell*a will be the most likely candidates in 2016. *Fusarium* and *Giberrella* are typically the most common fungi on corn ears in Wisconsin. This group of fungi not only damage kernels on ears, but can also produce toxins called mycotoxins. These toxins (fumonisins and vomitoxin) can threaten livestock that are fed contaminated grain. Thus grain buyers actively test for mycotoxins in corn grain to monitor mycotoxin levels to be sure they are not above certain action levels established by the U.S. Food and Drug Administration (FDA).

The FDA has established maximum allowable levels of fumonisins in corn and corn products for human consumption ranging from 2-4 parts per million (ppm). For animal feed, maximum allowable fumonisin levels range from 5 ppm for horses to 100 ppm for poultry. Vomitoxin limits are 5 ppm for cattle and chickens and 1 ppm for human consumption.

Diplodia ear rot does not produce mycotoxins, but can damage grain. This disease is often more severe in years where dry weather precedes silking, followed by wet weather immediately after silking. While this disease does not result in mycotoxin accumulation, it can cause grain yield loss and quality issues.

For more information about ear rots and to download a helpful fact sheet produced by a consortium of U.S. corn pathologists, visit this webpage: http://cropprotectionnetwork.org/corndiseases/ear-rots/. For more information on mycotoxins and to download a fact sheet, visit this webpage: http://cropprotectionnetwork.org/corn-diseases/mycotoxin-faqs/.

Reducing Mycotoxin Risks

Before harvest, farmers should check their fields to see if moldy corn is present. Similarly, during harvest they should carefully monitor the grain for mold. If substantial portions of fields appear to be contaminated with mold, it does not mean that mycotoxins are present and vice Learning for life versa. Appropriate grain samples should be collected and tested by a reputable lab. Work with your corn agronomist or local UW Extension agent to ensure proper samples are collected and to identify a reputable lab. If tests show high levels of mycotoxins in grain, that grain SHOULD NOT BE BLENDED with non-contaminated corn.

Helpful information on grain sampling and testing for mycotoxins can be found here: http://cropprotectionnetwork.org/corn-diseases/grain-sampling-mycotoxin-testing/.

If you observe mold in certain areas of the field during harvest, consider harvesting and storing that corn separately, as it can contaminate loads and the fungi causing the moldy appearance can grow on good corn during storage. Harvest corn in a timely manner, as letting corn stand late into fall promotes Fusarium ear rot. Avoid kernel damage during harvest, as cracks in kernels can promote fungal growth. Also, dry corn properly as grain moisture plays a large roll in whether corn ear rot fungi continue to grow and produce mycotoxins. For short term storage over the winter, drying grain to 15% moisture and keeping grain cool (less than 55F) will slow fungal growth. For longer term storage and storage in warmer months, grain should be dried to 13% moisture or less. Also, keep storage facilities clean. Finally, mycotoxins are extremely stable compounds: freezing, drying, heating, etc. do not degrade mycotoxins that have already accumulated in grain.

For more information on properly storing grain and to download a fact sheet on the subject, visit this webpage: http://cropprotectionnetwork.org/corn-diseases/storing-mycotoxin-affected-grain/.

Crop Insurance Rules

Quality losses due to moldy corn are insurable losses for those with crop insurance, but to claim indemnities, growers must follow crop insurance rules. If you suspect mold issues, contact your crop insurance agent before harvesting, storing or selling the corn. The key is to communicate with your crop insurance agent before

harvesting. Your crop insurance agent will tell you how to proceed. Samples will have to be collected by a third party, such as a crop adjustor, plus many grain elevators will collect and store grain samples short-term for crop insurance purposes for loads with discounted prices due to low quality. Also, growers may be asked to leave unharvested rows for crop loss adjustors to use to determine indemnities. If fumonisin or vomitoxin tests indicate contamination above safety limits, insured growers following proper procedures will be compensated for the reduction in value of the grain if it is large enough to trigger insurance indemnities. An issue some farmers will face this year is that small price reductions due to grain quality problems will not be enough to trigger crop insurance indemnities when combined with above average yields.

For More Information Contact your crop insurance agent with specific questions regarding your crop insurance coverage. Contact your local UW Extension agent or the authors with questions or for more detailed information. For a list of laboratories that can test corn grain for mycotoxins, consult Table 2-16 in UW Extension publication A3646 – Pest Management in Wisconsin Field Crops: https://learningstore.uwex.edu/Assets/pdfs/A3646.pdf.

Slug Feeding in Cereal Rye Cover Crop Seedings

Bryan Jensen & Mike Travis, UW Extension

Brian Briski, Mark Biel and Dana Swanson, NRCS

During a brief survey of recent cereal rye cover crop seedings in NW Wisconsin (Pierce, Pepin and Dunn Counties) we observed severe slug feeding on cereal rye seed that was broadcast onto the soil surface in standing corn and soybeans. This feeding was severe enough that it will undoubtedly affect establishment. The broadleaf seeds (vetch and tillage radish) appeared unaffected. Two species of slugs (grey field slug and marsh slug) were found feeding on the "germ" (reproductive portion of the seed) leaving that area of the seed hollowed out.

Left: Grey Field Slug; **Right:** Marsh Slug

Above: Slug Damaged Cereal Rye Seed

Common factors among all the fields with severe slug feeding was no-till and heavier soil types, which are both understandable because of the amount of residue present and moist environment. Certainly, the recent wet weather was also a factor. What was a little surprising was that early season slug damage was not noticed in some of these fields.

Using a slug bait to control feeding is not a good suggestion at this point. Several factors including cost and legal issues must be well-thought-out. Before considering a bait, please read the label and make sure that application is within label, including whether the standing crop is labeled for use in Wisconsin and that PHI can be met. You must also consider whether the specie(s) of cover crop is listed on the label and the application timing/rate is acceptable for it. Labeling for the cover crop species is not required if you will not be harvesting the cover crop for forage, feed or seed (i.e., that crop does not leave the field where it was planted). This can be a lot to understand and digest at first. Another issues before considering a slug bait is that proper slug management needs to be thought about within a "systems" context, not as a quick fix. That is, short term solutions are unlikely to be effective and that several management options should be considered including, but not limited to, time of planting, planting method, crop rotation, residue management, use of insecticide seed treatment and foliar application of insecticides.

Scouting is suggested prior to broadcasting cereal rye seed. Slugs can be difficult to find during daylight hours. However, scouting during cool/cloudy days can be effective but time consuming. One trick that might help is to place a flat object like a board, weighted down cardboard, paneling, etc on the soil surface. These objects provide good cover for slugs during the day and provide you with a quick method of assessing populations. The boards we used were a little over 1 sq. ft. in size and we found a range of 4-10 or more slugs/board. There are

no established thresholds for slugs, however, this information can be used to help decide if drilling is a better alternative than broadcast.

At this point we are unsure if other grass seeds will be similarly affected.

UW-Madison/Extension Plant Disease Diagnostic Clinic (PDDC) Update

Brian Hudelson, Sean Toporek, Jake Kurczewski and Ann Joy

The PDDC receives samples of many plant and soil samples from around the state. The following diseases/disorders have been identified at the PDDC from September 3, 2016 through September 23, 2016.

Plant/Sample Type, Disease/Disorder, *Pathogen*, County

Field Crops

Corn, Anthracnose Leaf Blight, *Colletotrichum graminicola,* Portage
Corn, Anthracnose Stalk Rot, *Colletotrichum graminicola*, Kenosha
Corn, Common Rust, *Puccinia sorghi,* Dodge, Grant
Corn, Eyespot, *Kabatiella zeae,* Grant, Portage
Corn, Giberella Stalk Rot, *Fusarium graminearum,* Kenosha
Corn, Goss' Wilt, *Clavibacter michiganensis subsp. nebraskensis*, Buffalo, Sawher
Corn, Northern Corn Leaf Blight, *Exserohilum turcicum,* Dodge, Portage, Shawano
Corn, Northern Corn Leaf Blight, *Bipolaris zeicola,* Portage
Corn, Southern Rust, *Puccinia polysora,* Grant
Corn, Tar Spot, *Phyllachora maydis,* Iowa
Sunflower, Alternaria Head Rot, *Alternaria spp.,* Marathon
Sunflower, Alternaria Leaf Blight, *Alternaria spp.,* Marathon
Sunflower, Botrytis Head Rot, *Botrytis cinerea,* Marathon

Fruit Crops

Apple, Bitter Rot, *Colletotrichum gloeosporioides*, Fond du Lac
Apple, Elsinoe Fruit Spot, *Sphaceloma pirinum,* Lafayette
Grape, Phomopsis Fruit Rot, *Phomopsis viticola*, Marinette
Strawberry, Root/Crown Rot, *Phytophthora sp., Pythium sp., Fusarium sp.,* Dane

Vegetable Crops

Basil, Downy Mildew, *Peronospora belbahrii,* Jefferson, Outagamie
Cabbage, Alternaria Leaf Spot, *Alternaria sp.*, Portage
Cabbage, Black Rot, *Xanthomonas campestris pv. campestris,* Rock
Cauliflower, Verticillium Wilt, *Verticillium sp.*, Rock
Potato, Black Leg, *Dickeya sp.*, Rock
Rutabaga, Black Rot, *Xanthomonas campestris pv. campestris,* Rock
Pumpkin, Phytophthora Fruit Rot, *Phytophthora capsici*, Portage
Squash (Butternut), Alternaria Leaf Blight, *Alternaria sp.,* Portage
Squash (Butternut), Powdery Mildew, *Oidium sp.,* Portage
Tomato, Septoria Leaf Spot, *Septoria lycopersici*, Dane

Specialty Crops

Hop, Alternaria Cone Disorder, *Alternaria sp.*, Sauk
Hop, Carlavirus, *Unidentified carlavirus,* Sauk
Hop, Cone Tip Blight, *Fusarium sp.,* Sauk
Hop, Downy Mildew, *Pseudoperonsopra humuli,* Sauk

For additional information on plant diseases and their control, visit the PDDC website at pddc.wisc.edu.

Wisconsin Fruit News, Issue 12

Janet van Zoeren, Christelle Guédot, and Amaya Atucha, University of Wisconsin – Madison, Departments of Entomology and Horticulture

Click here for the 12th issue of the Wisconsin Fruit News.

In it you will find information about:

- Insect Diagnostic Lab update
- Blueberry virus survey
- Diversifying your fruit crops: Aronia
- Cranberry degree-day map and update
- Spotted wing drosophila management for Wisconsin grape growers
- Late season downy mildew management
- Grape developmental stages
- Hazelnut harvest and processing
- Apple fruit maturity: how to determine the optimal harvest date

Potato Disease Risk Values

Amanda J. Gevens, Associate Professor & Extension
Vegetable Plant Pathologist

Below is a chart of Potato Disease Risk Values, including new totals from September 16.

Location	Planting Date	Emergence	NEW totals Sep 16		Previous Totals Sep 10		Added since Sep 10	
			P Day	S Val	P Day	S Val	P Day	S Val
Antigo area	earliest May 1	June 2	832	160	794	155	38	5
	mid May 18	June 7	797	150	759	145	38	5
	late June 3	June 21	695	135	657	130	38	5
Grand Marsh area	earliest April 15	May 22	914	193	868	181	46	12
calculated with data	mid May 1	May 27	877	187	831	175	46	12
from Hancock through 6/10	late May 15	June 3	818	176	772	164	46	12
Hancock area	earliest April 18	May 24	850	204	807	190	43	14
	mid May 3	May 29	809	191	766	177	43	14
	late May 18	June 5	752	182	709	168	43	14
Plover area	earliest April 20	May 25	813	222	770	206	43	16
	mid May 5	May 30	770	207	727	191	43	16
	late May 20	June 6	714	198	671	182	43	16

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