Northern NY Agricultural Development Program
2017-2018 Project Report

Understanding the Interaction of Western Bean Cutworm Damage and Mycotoxin Risk in Corn Silage

Project Leader(s):

- Joe Lawrence, Cornell University PRO-DAIRY, 315-778-4814, jrl65@cornell.edu

Collaborator(s):

- **Elson Shields**, Cornell University Entomology Department, 4144 Comstock Hall, Ithaca, NY 14853
- **Gary C. Bergstrom**, Cornell University Department of Plant Pathology and Plant-Microbe Biology, 334 Plant Science Building, Ithaca, NY 14853-5904
- **Kenneth Wise,** NYS Integrated Pest Management Program, 2715 U.S. 44, Millbrook, NY 12545
- **Mike Hunter and Kitty O'Neil,** Cornell University Cooperative Extension North Country Regional Ag Team Field Crop Specialists

Cooperating Producers:

- Greenwood Dairy, St. Lawrence County
- Willsboro Research Farm, Essex County

Background:

The presence of Western Bean Cutworm (WBC) in New York corn fields has grown over the last decade as shown by the WBC Pheromone Trap Network coordinated by the NYS Integrated Pest Management (IPM) program, though the insect's apparent population varies significantly across the state (Figures 1 and 2).

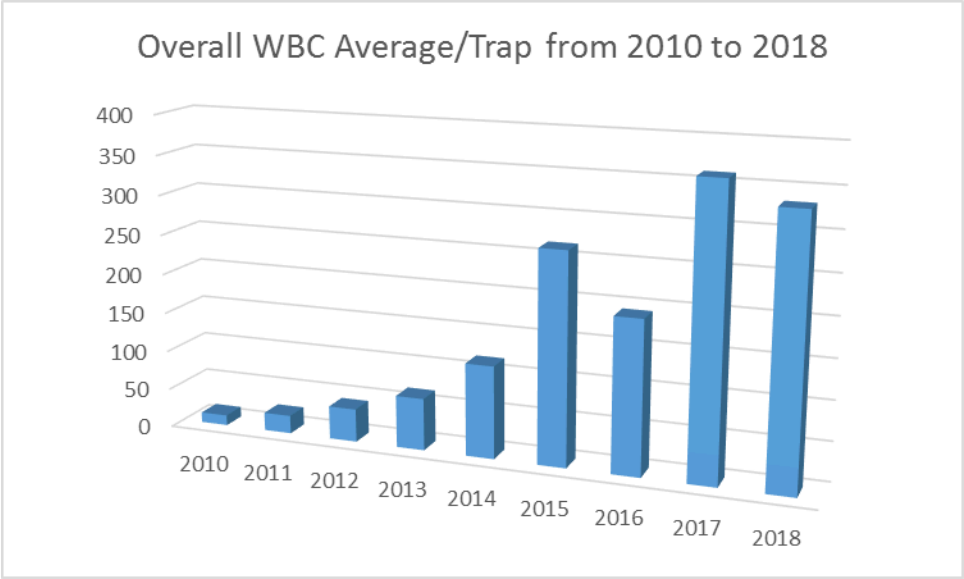

Figure 1. Overall average of Western Bean Cutworm moth/trap captures statewide from 2010 to 2018 in New York State (includes traps in field corn, sweet corn and dry beans). Source: NYS IPM.

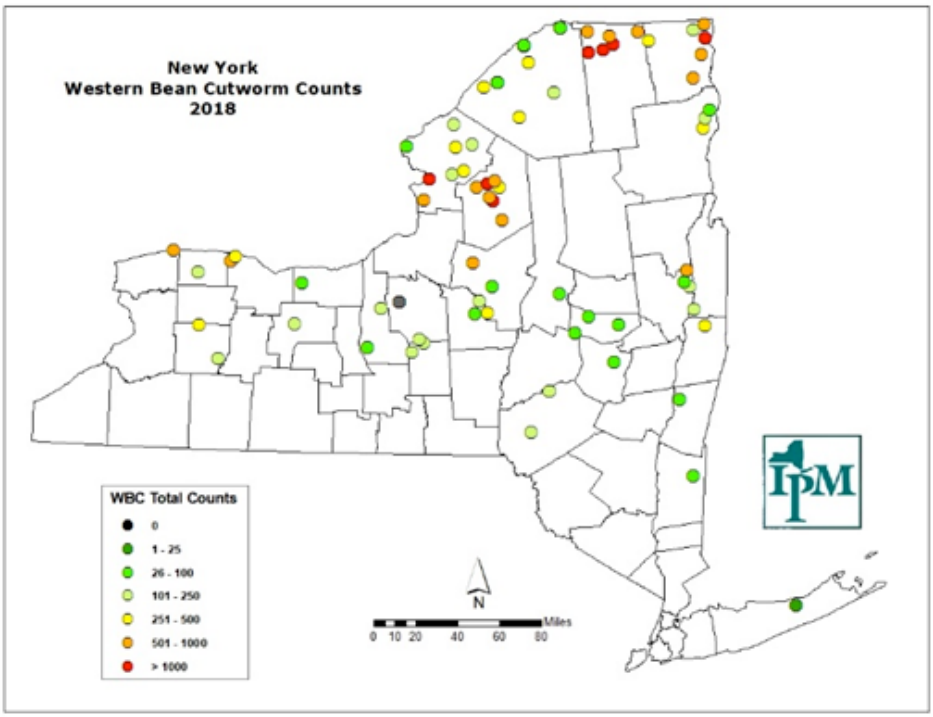

Figure 2. Western Bean Cutworm Trap Counts in New York State in 2018. Source: NYS IPM WBC Pheromone Trapping Network.

Where WBC populations are high, the corresponding ear damage from WBC feeding can leave wounded corn ears (Figure 3) more susceptible to pathogen development, but a clear relationship between ear damage and mycotoxin development has not been

documented. A number of mold species may develop on corn ears and relatively few of these produce mycotoxins.

There are numerous mycotoxins that can develop from fungal pathogens on living plants. These toxins can impact livestock health and performance — from subclinical health issues to severe problems, including death. The impact on livestock depends on the specific type of toxin, the level of toxin in feed, and the type of animal (ruminant or monogastric).

Principal concern in New York is with the mycotoxins deoxynivalenol (DON or vomitoxin) and zearalenone, both produced by the fungus *Fusarium graminearum*.

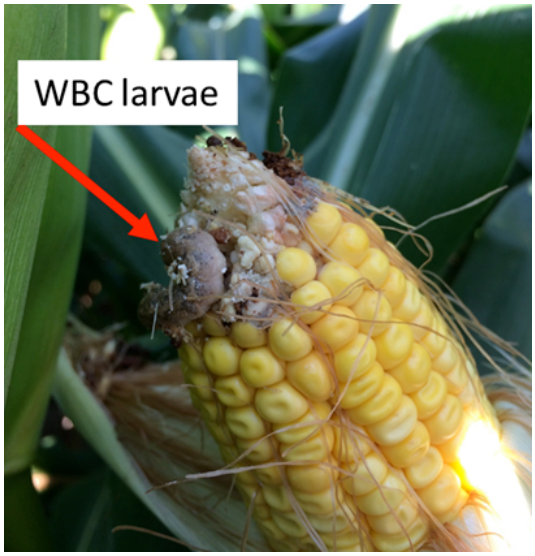

Figure 3. WBC larvae feeding on tip of corn ear. Photo: Joe Lawrence.

While WBC damage to corn ears can be significant and may have detrimental effects on corn grain yield and quality, the economic impact on corn silage is less understood. For corn silage growers, understanding whether or not this pest significantly impacts the yield or quality of the forage is critical to their decision making for managing this pest.

Methods:

Screening of the NY & VT Corn Silage Hybrid Evaluation Program

The Commercial Corn Silage Testing program conducted by Cornell University in collaboration with the University of Vermont and the Northeast dairy industry offers a good opportunity to evaluate numerous hybrids for ear damage from WBC and mycotoxins. In 2018, in Northern New York, 57 hybrids were planted in a replicated plot in St. Lawrence County and an additional 20 hybrids were planted in a replicated plot in Essex County. The plots were scouted prior to harvest for WBC feeding damage to the ears.

Field Sampling in NNY

A second component of the project was field scouting and sampling by Cornell Cooperative Extension staff and agricultural professionals in NNY. Based on interactions

with corn silage growers, fields were scouted for WBC and plans were made with each grower to obtain corn silage samples from fields where WBC damage was significant.

All samples from both aspects of the project were submitted to the Dairy One Forage Laboratory for a mycotoxin screening package which included aflatoxins B1, B2, G1, G2, vomitoxin, 3-acetyl DON, 15-acetyl DON, zearalenone, and T2 toxin.

Results:

Screening of the NY & VT Corn Silage Hybrid Evaluation Program

Two years of data from Northern NY (Tables 1a: 2017 and 1b: 2018) as well as additional data from trial locations in Central and Western NY covered by funding from the New York Corn Growers Assocation (Tables 2a and 2 b) revealed large differences in the pheromone trap counts and the number of plots damaged by WBC. There was also a wide variation in the prevalence of samples testing positive for mycotoxins. However, there was a lack of correlation between WBC damage and incidence of mycotoxins in both years.

Additionally, despite the damage to corn kernels inflicted by WBC, in plots with up to 60% of ears showing some level of WBC damage, the WBC feeding did not correlate to any negative impact on silage yield or forage starch content in this study.

The most prevalent species of mycotoxin-producing mold found in the screening was *Fusarium graminearum*. This fungal pathogen can also infect corn ears through the silk channels at the time of pollination during favorable weather conditions and result in contamination of the grain and silage with the mycotoxins DON, 3-ADON, 15-ADON, or zearalenone. A review of the weather data from both years (despite very different overall weather patterns) showed wet conditions at silking conducive to this type of infection. The fungus associated with aflatoxins is *Aspergillus Flavus*; this fungus is not common in the Northeast, and as expected for New York State, no aflatoxins were detected.

Field Sampling in NNY

Based on scouting by Cornell Cooperative Extension staff and area agricultural professionals, silage samples were collected from six fields at harvest where significant WBC damage had been observed through in-season scouting.

Only two of the six samples tested positive for any mycotoxins and the toxin levels were low (Figure 4). While a small data set, this information corroberates the findings of the evaluation of the Corn Silage Hybrid Evaluation in showing little evidence that high levels of WBC damage increases the risk of mycotoxin development.

Conclusions/Outcomes/Impacts:

While there are numerous ways in which molds can establish themselves in forages, this study reflects a common challenge researchers face while attempting to document the conditions where mycotoxin development is likely. Our results collected over two growing seasons provide no evidence that WBC damage is an added risk factor for corn silage growers who are worried about deoxynivalenol and zearalenone in their silage. In

areas of the U.S. where other toxins are more prevalent, the impact of WBC and other insect pests may differ.

It is important to note that these results do not reflect what may occur in corn harvested for grain because the time between silage harvest and grain harvest offers additional opportunities for infection and growth.

Growers should continue to scout for Western Bean Cutworm and weigh the cost of control with the potential for damage. However, it does not appear that controlling WBC should be viewed as a significant management consideration for reducing the risk of mycotoxin development in corn for silage.

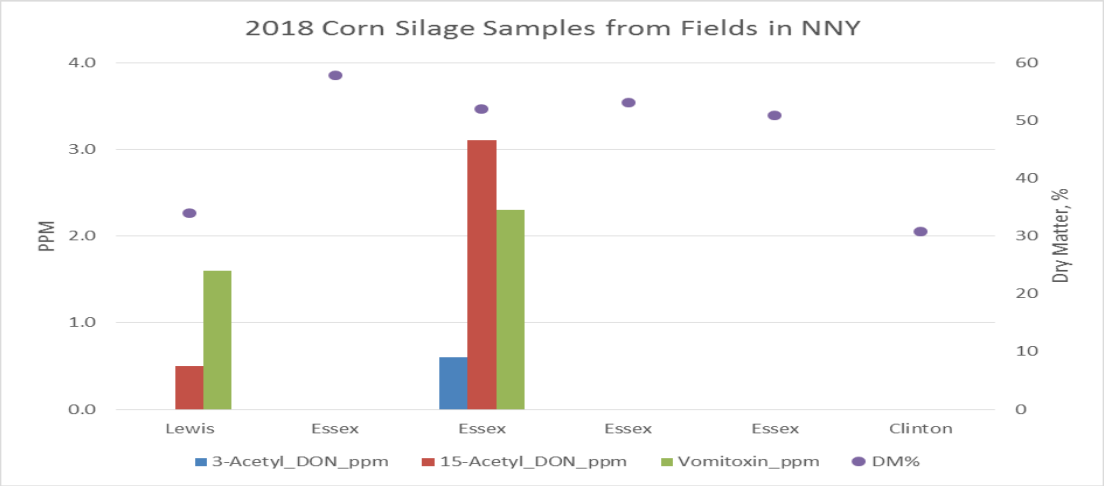

Figure 4. Results of mycotoxin screening for corn silage samples collected from fields with significant WBC damage in NNY.

Table 1a. 2017 Hybrid Screening for Western Bean Cutworm and Mycotoxins in NNY.		
		Madrid
WBC Trap Counts (seasonal total)		356
# Hybrids Screened		49
# Hybrids with WBC Damage		32 (65.3%)
Hybrids Testing Positive For Mycotoxins	Total Hybrids	19 (38.8%)
	NO WBC Damage	6
	WBC Damage Present	13

Table 1b. 2018 Hybrid Screening for Western Bean Cutworm and Mycotoxins in NNY.			
		Madrid	**Willsboro**
WBC Trap Counts (seasonal total)		385	135
# Plots Screened		63	33
# Plots with WBC Damage		13 (21%)	8 (24%)
Plots Testing Positive For Mycotoxins	Total Plots	7 (11%)	6 (18%)
	NO WBC Damage	5	4
	WBC Damage Present	2	2

Table 2a: 2017 Hybrid Screening for Western Bean Cutworm and Mycotoxins in NNY.			
		Aurora	**Madrid**
WBC Trap Counts (seasonal total)		211	356
# Hybrids Screened		49	49
# Hybrids with WBC Damage		14 (28.6%)	32 (65.3%)
Hybrids Positive For Mycotoxins	Total Hybrids	17 (34.6%)	19 (38.8%)
	NO WBC Damage	13	6
	WBC Damage Present	4	13

Table 2b: 2018 Hybrid Screening for Western Bean Cutworm and Mycotoxins in NNY.					
		Aurora	**Madrid**	**Albion**	**Willsboro**
WBC Trap Counts (seasonal total)		84	385	220	135
# Plots Screened		63	63	33	33
# Plots with WBC Damage		15 (24%)	13 (21%)	4 (12%)	8 (24%)
Plots Positive For Mycotoxins	Total Plots	57 (90%)	7 (11%)	15 (45%)	6 (18%)
	NO WBC Damage	46	5	14	4
	WBC Damage Present	11	2	1	2

Outreach:

The results from this on-farm research trial are being disseminated to crop growers, crop consultants, agribusinesses, and extension field crops staff members throughout Northern New York and New York State. To date, the 2018 data from this project has been included in presentations at the Cornell Cooperative Extension Inservice, the Oneida County Crop Congress and the South Central NY Winter Crop Meeting. It is also scheduled for presentation at the Lowville Farmers Cooperative Winter Forage Forum in Lewis County in NNY in February 2019.

The 2017 results were included in presentations at the Northwest New York Cornell Cooperative Extension Corn Congresses in Batavia and Waterloo, the North Country

Crop Congress, the W.H. Miner Agricultural Research Institute Crop Congress, Hallett Spraying grower meeting, Lowville Farmers Co-op Forage Forum, Cayuga County Pesticide Meeting, Delaware County CCE Meeting, SCNY CCE Winter Crop Meeting, Oneida County Crop Congress, Channel Seed Dealer Trianing, Cornell Seed Conference, Certified Crop Advisor Training, Cornell Field Crop Dealer Meeting, and the Cornell Nutrition Conference.

Next Steps:

As it pertains to the molds and mycotoxins prevalent in this study (and common to NYS) the findings do not indicate the need for continued extensive sampling in corn silage fields with high infestations of Western Bean Cutworm. The Corn Silage Hybrid Evaluation program continues to offer a good opportunity to track insect and disease pest in corn grown for silage in NNY through scouting and data collection. If other molds and mycotoxins become more common in this area further work may be warranted to determine their risk relative to the finding of the molds and mycotoxins prevalent in this project.

Acknowledgments:

The Northern New York Agricultural Development Program provided financial support for this project.

Reports and/or articles in which results of this project have been published.

- Lawrence, J., G. Bergstrom, J. Cummings, E. Shields, K. Wise, M. Hunter. 2018. Western Bean Cutworm and Mycotoxin Screening – 2017 New York and Vermont Corn Silage Hybrid Trials. What's Cropping Up? Vol. 28, No. 2

- http://blogs.cornell.edu/whatscroppingup/2018/03/09/western-bean-cutworm-and-mycotoxin-screening-2017-new-york-and-vermont-corn-silage-hybrid-trials/

- Lawrence, J., G. Bergstrom, J. Cummings, E. Shields, K. Wise, M. Hunter. 2019. Western Bean Cutworm and Mycotoxins in Corn Silage. THE MANAGER" by PRO-DAIRY published in Progressive Dairyman. Estimated Print Date March 2019

For More Information:

- Joe Lawrence, Dairy Forage Systems Specialist, PRO-DAIRY, Cornell University, 5274 Outer Stowe St., Lowville, NY 13367; jrl57@cornell.edu; (315)3765-270

- Mike Hunter, Regional Field Crops Specislist, Cornell University Cooperative Extension Northern New York Regional Ag Team, 203 North Hamilton Street, Watertown, NY 13601; meh27@cornell.edu; 315-788-8450

- Kitty O'Neil, Regional Field Crops Specislist, Cornell University Cooperative Extension Northern New York Regional Ag Team, 2043B State Hwy 68, Canton, NY 13617; kao32@cornell.edu; 315-379-9192