



Northern NY Agricultural Development Program 2016 Project Report

Evaluation of Efficacy of Bt Corn for Control of Western Bean Cutworm in NNY

Project Leader(s):

- **Michael H. Hunter, Field Crops Specialist**, Cornell University Cooperative Extension Northern New York Regional Ag Team, 315.788-8450
- **Kitty O'Neil, Field Crops and Soils Specialist and Team Leader**, Cornell University Cooperative Extension Northern New York Regional Ag Team, 315-379-9192 x253, 315-854-1218

Collaborator(s):

- **Elson Shields**, Entomology Department, 4144 Comstock Hall, Cornell University, Ithaca, NY 14853
- **Gary C. Bergstrom**, Department of Plant Pathology and Plant-Microbe Biology, Cornell University, 334 Plant Science Building, Ithaca, NY 14853-5904
- **Jaime Cummings**, Research Support Specialist, Department of Plant Pathology and Plant-Microbe Biology, Cornell University, Ithaca, NY
- **J. Keith Waldron**, New York State IPM Program Office, NYS Agricultural Experiment Station - Cornell University, Geneva, NY
- **Kenneth Wise, NYS IPM Program, 2715 US 44, Millbrook, NY 12545**

Cooperating Producers:

- **Franklin County:** JPL Farm, Logue Farms Inc.
- **Jefferson County:** Murcrest Farm
- **Lewis County:** Conway Farm

Background:

Western Bean Cutworm (WBC; *Striacosta albicosta*) is a new pest of field and sweet corn and dry beans in the Eastern United States. The WBC larva feed on the ears of field and sweet corn and the pods and seeds of dry beans. It has established itself as a significant pest in the Western United States and is an increasing concern for corn growers in the Eastern United States. It is an emerging threat to corn yield and quality.

Low numbers of WBC were first detected in New York State in 2009. In 2010, the NYS Integrated Pest Management program implemented an extensive monitoring network used to survey the presence and/or populations of WBC in New York. Cornell Cooperative Extension field crops specialists and agribusinesses continue to document increases in the number of WBC moths caught in locations in Northern NY where we had previous year trap counts.

Northern New York continues to record the highest WBC traps counts in the state. In fact, NNY recorded four of the top five highest individual trap counts (see Table 1 below) in 2016. Nine of the top ten highest trap count sites in NY in 2016 were in St. Lawrence, Jefferson, Franklin and Lewis counties.

Table 1. Top five WBC trap counts by county recorded in YEAR in New York State, New York State IPM’s Western Bean Cutworm Monitoring Network.

County	Town or Township	Total
Jefferson	Rutland	1688
Franklin	Malone	1463
Lewis	Turin	1243
Lewis	Croghan	1147
Erie	Eden	959

While no economically-significant infestations of WBC have been documented in field corn in NY, there is a growing concern from corn growers in NNY that WBC feeding on corn ears may increase the susceptibility of plants to fungal infection, which in turn can lead to increased mycotoxin levels.

Current management strategies available for the control of WBC in corn would be the use of foliar insecticides or selecting transgenic corn hybrids with specific Bt traits. Foliar insecticide treatments are effective but timing applications correctly is difficult. Two Bt events, Cry 1F and Vip 3A have been reported to have activity on WBC. There have been reports from Michigan, Indiana, Ohio, and Ontario, Canada suggesting varying levels of control of WBC with the Bt corn trait containing the Cry 1F protein.

Methods:

This project involved establishing four large-scale replicated corn trials planted on farms in Jefferson, Lewis and Franklin counties. Comparisons of different Bt corn traits for the control of Western Bean Cutworm, identification of ear molds on WBC-damaged corn ears and corn grain samples from the different treatments were tested for the presence of mycotoxins. Each trial was replicated four times and had four different corn hybrids with different Bt traits: Cry1F + Vip 3A, Vip 3A, Cry 1F, Cry 1A.05 + 2Ab2. Sampling was done at the end of the 2016 season just prior to corn harvest.

Results:

Based on our on-farm research findings in NNY, varying levels of WBC control from the Cry 1F trait were confirmed in New York corn fields. Results from two of the sites

(Table 2 and 3) showed that the Cry 1F Bt trait provided no control of the WBC when compared with the susceptible corn variety planted in the trial.

Another site (Table 4) demonstrated that Cry 1F hybrid provided suppression, but not control of the WBC.

The earliest planted trial (Table 5) had minimal to no WBC damage across all treatments. The lack of Western Bean Cutworm presence in the corn at this site was likely due to the fact that the corn had tasseled prior to the arrival of the WBC moths in the season. The WBC moths do not like to lay eggs on corn with emerged tassels.

Table 2, left. 2016 Western Bean Cutworm Trial Site: Copenhagen, Jefferson County. Table 3, right. 2016 Western Bean Cutworm Trial Site: Turin, Lewis County.

Bt Trait(s)	WBC Damaged Ears %
Cry1F + Vip 3A	0 b
Vip 3A	0 b
Cry 1F	21.5 a
Cry 1A.05 + 2Ab2	13.5 a
<i>WBC Trap Count: 553</i>	
<i>Planted May 17, 2016</i>	

Bt Trait(s)	WBC Damaged Ears %
Cry1F + Vip 3A	0 b
Vip 3A	0 b
Cry 1F	18.75 a
Cry 1A.05 + 2Ab2	18.00 a
<i>WBC Trap Count: 190</i>	
<i>Planted May 21, 2017</i>	

Table 4 left. 2016 Western Bean Cutworm Trial Site: Nicholville, Franklin County. Table 5, right. 2016 Western Bean Cutworm Trial Site: Chateaugay, Franklin County.

Bt Trait(s)	WBC Damaged Ears %
Cry1F + Vip 3A	0 b
Vip 3A	2.25 b
Cry 1F	9.75 ab
Cry 1A.05 + 2Ab2	21.25 a
<i>WBC Trap Count: 756</i>	
<i>Planted May 25, 2017</i>	

Bt Trait(s)	WBC Damaged Ears %
Cry1F + Vip 3A	0 a
Vip 3A	0 a
Cry 1F	1.75 a
Cry 1A.05 + 2Ab2	1.25 a
<i>WBC Trap Count: 313</i>	
<i>Planted May 11, 2017</i>	

One of the concerns corn growers have is that the kernel feeding damage from the WBC larva presents an opportunity for favorable pathogen growth. If the environmental conditions are right, this could lead to mycotoxins developing in the damaged grain. Six ear molds and rots were identified on the damaged corn ears in the trial. We found

Fusarium Ear Rot, Gibberella Ear Rot, Rhizopus Ear Rot, Pennicillium Ear Rot, Trichoderma and Cladosporium. Some of these were likely attributed to the WBC damage.

We also collected corn grain samples from each treatment in the individual trials and sent them to Dairy One for a mycotoxin panel screening. Despite as much as 21.5% damage to the ears, there were no mycotoxins detected in corn grain samples.

The feeding damage of the Western Bean Cutworm larva is typically limited to ear tip kernel feeding. While this trial was not designed to evaluate yield losses attributed to the Western Bean Cutworm, we do not feel that corn yields were affected by WBC feeding damage found at any of these locations. At the current WBC damage levels observed in NNY, it is not likely that WBC has reduced corn yields.

Conclusions/Outcomes/Impacts:

WBC has become a significant pest of corn NNY. WBC feeding on corn ears can also lead to fungal infection of ears, which can lead to increased mycotoxin levels. Two Bt traits, Cry 1F and Vip 3A are available in some corn varieties to control WBC, however Cry 1F has shown varying levels of control in the Midwest US and Canada. Many NNY farmers face high and increasing WBC pressure and need to select effective controls. Incomplete control of WBC with the Cry 1F trait was confirmed in NNY corn fields in 2016. Efficacy of the Cry 1F trait ranged from no control to some suppression of WBC while the Vip 3A trait provided full control in the same sites. Field trials comparing these same Bt traits are planned for 2017 to confirm these results.

Outreach:

The results from these on-farm research trials are being disseminated to corn growers, crop consultants, agribusinesses, and extension field crops staff members throughout New York State. To date, it has been presented at the Cornell Ag In-service in Ithaca and the Cornell Field Crop Dealer Meeting in Syracuse, Northwest New York Cornell Cooperative Extension Corn Congresses in Batavia and Waterloo, the Northern New York Crop Congress in Canton, and the W.H. Miner Institute Crop Congress in Chazy. At the time of the report, results were scheduled for presentation at the Lowville Farmers Coop Winter Crop meeting in Lowville, Hallett Spraying grower meeting in Depeyster, Madison County Cornell Cooperative Extension Crop Congress in Cazenovia, and Rudds Spray Service Spring Grower Meeting in Adams.

Next Steps:

We will continue this project in 2017 with funding from the Northern New York Agricultural Development Program to further evaluate the control of WBC with Bt corn hybrids under a different set of growing conditions and WBC populations with four replicated trials on farms in NNY.

Acknowledgments:

The farmer-driven Northern New York Agricultural Development Program provided financial support for this project. We would also like to acknowledge the following for

assisting with the weekly WBC trap monitoring efforts in NNY: Melissa Spence (CCE Lewis County), Joel Kloster (CCE Lewis County), Joe Lawrence (Cornell PRO Dairy), Mike Kiechle (Garden of Eden Farm, Jefferson County), Cassondra Kiechle (CCE Jefferson County), Glen Yousey (Seedway), Harry Fefee (CCE Franklin County), Billy Bullock (CCE St. Lawrence County).

For More Information:

- Mike Hunter, Regional Field Crops Specialist, 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 and Soils Specialist, Cornell University Cooperative Extension Northern New York Regional Ag Team, 2043B State Hwy 68, Canton, NY 13617, kao32@cornell.edu, 315-379-9192