Northern NY Agricultural Development Program
2014 Project Report

Project Title: Biological Control Nematodes: Demonstrating their Culture, Application and Economic Benefit When Utilized to Control Alfalfa Snout Beetle

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Cooperating Producers:
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Lewis County: Gary Campany, Phil Kubinski
St. Lawrence County: Dave Stout
Franklin County: Dave Moore

Background:

Alfalfa snout beetle (ASB) continues to limit alfalfa producer success year after year and is the most economically important pest of NNY alfalfa production. The ASB infested region includes 500,000 acres of farmland (13% of NY State) and this insect continues to spread.

With the long-term support of NNYADP and NYFVI, a long-term management strategy for ASB has been developed using native biocontrol nematodes to attack ASB in both the larval and adult stages. Multi-year research monitoring of 146 fields on 72 farms across all 6 NNY counties have shown nematode persistence across a corn rotation and in numerous instances, the nematode population continues to increase in the corn rotation. Positive nematode response to invasion of snout beetle in alfalfa several years after nematode application has also been documented. Multi-year field persistence from a single application has been documented in all fields with the longest persistence field inoculated in 2007. Biocontrol nematodes have been applied to an estimated 250 fields across NNY and some farmers are reporting a reduction in ASB on their farms while non-participating neighbors continue to observe record numbers of beetles exiting their fields during spring migration.

Recent advances in application strategies has reduced the cost of the biocontrol nematodes to $5-10 per acre if the farmer rears their own nematodes or $10-20 per acre if the "ready-to-spray" nematodes are purchased from the Shields' Lab at Cornell University. Application costs are in addition to the above cost of the nematodes. Research strongly suggests that the biocontrol nematode application will persist for multiple years, controlling ASB for the life of the alfalfa stand and beyond. At these relative low prices to manage this serious insect, producers have been encouraged to participate in the program during the next 5 years while native NY nematodes are available.

A 2012 survey of alfalfa producers within the six county ASB infested region provided feedback indicating interest in viewing demonstration plots of the program's success if they are established locally. In 2013, NNY alfalfa producers began volunteering sections of their fields with road access for the establishment of demonstration plots where bio-control nematodes would be applied for the management of ASB. A single demonstration trial site was located in Jefferson and Lewis counties, while two additional sites were established in Clinton Co. in 2013. This past year, we returned to each of the sites established in 2013 to; collect soil bioassays to document the continuing persistence of the bio-control nematodes, and take alfalfa stand counts in treated and untreated blocks to estimate yield. Plots located in Clinton Co., were abandoned in 2014 as the producers who farmed the fields in which the plots were located decided to re-plant to corn after significant winter kill from the 2013-2014 winter.

In 2014, our goal was to establish additional alfalfa snout beetle-biological control demonstration sites in different centrally located producer fields throughout the 6 count NNY region. With assistance from our collaborators, 3 NNY alfalfa producers volunteered sections of their fields with road access for the establishment of demonstration plots where bio-control nematodes were applied for the management of ASB. The establishment of the demonstration plot in each production area will provide a hands-on teaching tool to assist with the education of producers, industry representatives, dairy profit teams, farm advisory teams, and crop consultants in understanding the potential of increased stand longevity and reduced ASB damage on their operation or clients. Our efforts to manage ASB in NNY infested counties using bio-control nematodes are aided in the continued support of NNY alfalfa producers.

Our plans for 2014 included expanding the education and outreach plan with a two-fold approach. The primary focus was the non-participating growers who have not been convinced to apply biocontrol nematodes to control ASB. The second focus would be educating the "producer agribusiness support network" who often spends more time with the producers than the Cornell/CCE educators. With the assistance of NNY CCE agents and agribusiness individuals covering Jefferson, Lewis, St. Lawrence, and Franklin Counties, 14 farmers purchased and applied biocontrol nematodes to approximately 1000 acres in 2014. In addition, a new ASB brochure was developed which address potential ASB populations on producers' farms. The brochure has been handed out at the 2015 winter meetings across NNY, as well as turned over to CCE educators to have on hand for discussion or sent out as a mailer to producers in their counties.

Methods & **Results**:

2013 Demonstration Plot Locations

Doubledale Farm, Mannsville, NY - A two acre demonstration plot was established in a 100 acre field (N 43.7600, W -76.1075) owned and operated by Dan Rossiter in 2013. On July 24, 2014, soil bioassays to verify presence of bio-control nematodes were collected, along with stand counts to estimate yield. Based on Year 1 data, assessments in differences between the treated and untreated plots were inconclusive. ASB has not moved into the field to significantly provide evidence of bio-control from nematodes.

Homestead Farm, Croghan, NY - A four acre demonstration plot was established in a 9 acre field (N 43.9170, W -75.3777) owned and operated by Gary Campany in 2013. On July 24, 2014, soil bioassays to verify presence of bio-control nematodes were collected, along with stand counts to estimate yield. Based on Year 1 data, assessments in differences between the treated and untreated plots showed no immediate impact as ASB pressure at the time of the application indicated the alfalfa stand was under heavy pressure resulting in significant stand loss one year later. As a result, this demonstration site will be abandoned.

Table 1.Mean number of alfalfa crowns found during stand counts

Rossiter Site	**Block 1**		**Block 2**		**Block 3**		**Block 4**	
	TRT	**UT**	**TRT**	**UT**	**TRT**	**UT**	**TRT**	**UT**
Mean Crowns	2.60	2.32	2.60	2.36	0.84	1.32	1.56	1.52
STD Crowns	1.80	1.60	1.32	1.50	1.07	1.14	1.36	1.23
SE Crowns	0.36	0.32	0.26	0.30	0.21	0.23	0.27	0.25
	Treated Blocks		**Untreated Blocks**					
Mean Crowns	1.90		1.88					
STD Crowns	0.86		0.54					
SE Crowns	0.43		0.27					
Campany Site	**Clover Block 1**		**Clover Block 2**		**Alfalfa Block 1**		**Alfalfa Block 2**	
	TRT	**UT**	**TRT**	**UT**	**TRT**	**UT**	**TRT**	**UT**
Mean Crowns	1.56	2.80	1.52	1.20	0.48	1.12	0.56	0.12
STD Crowns	1.56	2.84	1.92	1.66	0.96	1.24	0.82	0.44
SE Crowns	0.31	0.57	0.38	0.33	0.19	0.25	0.16	0.09
	Clover Treated Blocks		**Clover Untreated Blocks**		**Alfalfa Treated Blocks**		**Alfalfa Untreated Blocks**	
Mean Crowns	1.54		2.00		0.52		0.62	
STD Crowns	0.03		1.13		0.06		0.71	
SE Crowns	0.01		0.57		0.03		0.35	

Table 2.Percentage of positive samples in 2013 EPN establishment

Producer	Days Post Inoc	# Soil Samples Treated Blocks	% Sc Positive Samples	% Sf Positive Samples
Rossiter	205	100	21	43
Campany	189	50	20	52

The number of soil samples indicating the presence of biocontrol nematodes at both sites (Rossiter – Sc = 21% & Sf = 43%, total = 64%, Campany – Sc = 20%, Sf = 52%, total = 72%) indicates that the applied biocontrol nematodes are actively killing and reproducing in alfalfa snout beetle larvae on each site. This biological control activity is actively reducing the insect population in the field and within the area.

2014 Demonstration Plot Locations

Lewis County

A four acre demonstration plot was established in a 14 acre field (N 43.6964, W -75.4007) owned and operated by Phil Kubinski, Turin, NY. Plot design included eight, 0.5 acre blocks. Four blocks were treated with nematodes and the other four blocks remained untreated. Each block was assayed prior to nematode establishment on August 14, 2014, to determine if an existing nematode population was present.

St. Lawrence County

A four acre demonstration plot was established in a 10 acre field (N 44.5081, W -75.6959) owned and operated by Dave Stout, Briar Hill, NY. Plot design included eight, 0.5 acre blocks. Four blocks were treated with nematodes and the other four blocks remained untreated. Each block was assayed prior to nematode establishment on July 31, 2014, to determine if an existing nematode population was present.

Franklin County

A four acre demonstration plot was established in a 35 acre field (N 44.8381, W -74.4014) owned and operated by Dave Moore, Carsada Dairy, Malone, NY. Plot design included eight, 0.5 acre blocks. Four blocks were treated with nematodes and the other four blocks remained untreated. Each block was assayed prior to nematode establishment on July 31, 2014, to determine if an existing nematode population was present.

Bio-control Nematodes

Using the multi-species approach, two native NY strains of bio-control entomopathogenic nematodes (EPNs), (*Steinernema carpocapsae* and *Steinernema feltiae*), were reared for each demonstration site. EPN infective juveniles (IJ) were applied at a rate of 63 million per species per treated block. Each treated block received a two-species combination, the

total number of IJs per treated block were 125 million. A total of 500 million nematodes were reared for each demonstration site.

Application of Nematodes

For each demonstration site, infective juveniles were washed from rearing containers and strained twice through screens before being added to the 2-50 gallon spray tanks inside the truck (Figure 1 & 2). Nematodes were applied using a spray boom fitted with 0010 fertilizer steam nozzles (screens removed). Nematodes were applied at a water rate of 50 gpa.

Franklin County-Moore Site

A population of nematode infective juveniles, (IJs) *S. carpocapsae* and *S. feltiae*, was applied to the soil surface on July 31, 2014.

St. Lawrence County – Stout Site

A population of nematode infective juveniles, (IJs) *S. carpocapsae* and *S. feltiae*, was applied to the soil surface on July 31, 2014.

Lewis County – Kubinski Site

A population of nematode infective juveniles, (IJs) *S. carpocapsae* and *S. feltiae*, was applied to the soil surface on August 14, 2014.

Biocontrol Nematode Establishment Assay

Soil cores were collected in the three demonstration plots to verify a successful inoculation within 75 days post nematode application. A total of 100 samples were collected from each demonstration site by randomly taking 25-samples per treated block. Each sample was removed from the soil and split into upper 2" and 3-6" portions that would be used to bioassay for nematode presence. Soil cores were returned to the laboratory and bioassayed using a standard technique with wax moth larvae as an indicator for the presence of biocontrol nematodes in the sample. The level of nematodes in each sample will also be used as an indicator to the presence of host insects within the area of the field.

Table 3.Percentage of positive samples in 2014 EPN establishment

Producer	# Soil Samples	Days Post Inoc	% Sc Positive Samples	% Sf Positive Samples
Moore	100	75	13	24
Stout	100	75	9	35
Kubinski	100	61	0	25

This level of biocontrol nematodes indicates a positive inoculation and establishment of these native nematodes in the field site. Next year, the numbers will rise as the nematodes seek out soil insect to attack, kill and reproduce in.

Conclusions/Outcomes/Impacts:

As more producers become aware of the potential of this low-cost program and successes of past participants, biological control of ASB in NNY can be achieved by those producers willing to adapt. Positive reinforcement from past participants has continued to grow the program in 2014. With the assistance from CCE agents and agribusiness individuals, farmers were able to apply nematodes using the new recommendations for 2014 which reduced the cost of treating a field to $5-10 per acre if the farmer rears their own nematodes or $10-20 per acre if the "ready-to-spray" nematodes are purchased from the Shields' Lab at Cornell University. In 2014, seven additional farmers joined the program along with seven farmers renewing their interest and applying nematodes to additional acres on their farm. These farmers were presented two options for obtaining their requested nematodes; 1) rearing their own nematodes with the purchase of a starter package or 2) purchasing sufficient ready-to-apply nematodes for the desired acreage. The cost per acre for rearing your own nematodes was $30/per applied acre while the cost per acre to purchase ready to apply was $60/per applied acre. For example, if nematodes were applied using the skip nozzle technique where only 33% of the field was actually treated, the applied cost would be $10/acre of the field.

The educational benefit of the demonstration plots is already being utilized. Area farmers observed the ease of the nematode application and two of the farmers each treated approximately 120 acres on their respective farms. Additionally a farmer, who operates also as a commercial applicator, found the entire process to be applicable in a potential business opportunity in his region and will pursue in going forward. Despite abandoning three sites from 2013, the experience at the Homestead Farm (Gary Campany) demonstration site in Lewis Co. provided an additional learning moment once we observed the stand loss experienced throughout his alfalfa stand despite the treated areas. From this observation, two new recommendations are being told to producers wishing to apply biocontrol nematodes. The first recommendation, deemed the ***33% nematode application strategy***, requires blocking 2 of every 3 nozzles so that nematodes are applied out of every 3rd nozzle. By driving the entire field, only ⅓ of the field is treated with ⅓ of the nematode rate. Within a year, the entire field has coverage from nematodes at a cost of $10/20 acre. The second recommendation focuses on the application of nematodes on new seedings and 1st production year alfalfa fields. If biocontrol nematodes are focused on this age of fields each year, the entire farm will be treated within 3-5 years and the cost of treatment can be spread out over the same period.

Outreach:

2014 Twilight Workshop
Demonstration Plot Application – Carsada Farm – Franklin County – July 31, 2014

2015 NNY Meetings:
NNYADP - West committee - January 30, 2015 @ Watertown
Franklin Co On-Farm producer meeting – February 16, 2015 @ Rieff Shop
NNY – East Crop Congress – February 17, 2015 @ Plattsburgh
St Lawrence Agribusiness dinner/conference – February 17, 2015 @ Canton
NNY – West Crop Congress – February 18, 2015 @ Lowville, NY
NNYADP - East committee – February 27, 2015 @ Plattsburgh

NNYADP Alfalfa Snout Beetle Media Hits
March 1, 2014 – March 31, 2015

03-01-14	Farming Magazine	03-03-14	Peru Gazette
03-05-14	Ogdensburg Journal	03-05-14	Massena-Potsdam Courier
03-08-14	Malone Telegram	03-10-14	North Country Now
03-10-14	Country Folks	03-11-14	North Countryman
03-11-14	The Burgh	03-18-14	Dairy Business
03-18-14	Morning Ag Clips	03-19-14	Morning Ag Clips
03-19-14	New York Ag Connection	03-19-14	North Country Now
03-20-14	CCE Oneida Facebook	03-22-14	Farm and Garden
03-23-14	Plattsburgh Press Republican	03-24-14	Dairy Business
03-27-14	Denton Publications	03-28-14	Morning Ag Clips
04-04-14	CCE News Blog	04-09-14	Empire State Farmer
04-15-14	Morning Ag Clips	04-15-15	AgriForaging FB
04-15-14	North Country Now	04-15-14	Peru Gazette
04-15-14	Topix: Madrid NY	04-15-14	DairyBusiness Magazine
04-17-14	AgriForaging FB	04-17-14	New York Ag Connection
04-20-14	Plattsburgh Press Republican	04-21-14	Country Folks
04-21-14	Madison County Courier	04-22-14	Adirondack Almanack
04-22-14	Adirondack Explorer	04-23-14	ADK Review Board.com
04-24-14	Empire State Farmer	04-28-14	Empire State Farming
05-05-14	Country Folks		
10-16-14	planthealth.org	10-17-14	Lowville Journal
10-17-14	Watertown Daily Times	10-17-14	Ogdensburg Journal
10-17-14	Carthage Republican Tribune	10-17-14	Massena-Potsdam Courier
10-17-14	My Malone Telegram		
01-15-15	New York Ag Connection	01-15-15	Cornell Field Crops News
01-17-15	Plattsburgh Press Republican	01-18-15	Watertown Times

01-18-15	Ogdensburg Journal	01-18-15	Massena-Potsdam Courier
01-18-15	Malone Telegram	01-18-15	Carthage Republican Tribune
01-18-15	Plattsburgh Press Republican	01-18-15	Cornell Events
01-18-15	Agriculture Industry Today EIN	01-18-15	Lowville Journal
01-24-15	Dairy Agenda Today	01-24-15	Dairy Herd Management
01-26-15	Country Folks		
02-24-15	Clinton County Farm Bureau FB	02-24-15	Morning Ag Clips
02-24-15	New York Ag Connection	02-24-15	US Ag Network
02-27-15	Empire State Farming		
03-01-15	Morning Ag Clips	03-02-15	Hoards Dairyman
03-02-15	CALS Notes	03-02-15	North Country Now
03-02-15	Greenhorns Blog	03-03-15	US Ag Network
03-03-15	Peru Gazette	03-03-15	New York Ag Connection
03-05-15	Cornell Field Crop News	03-09-15	Cornell Chronicle
03-08-15	Plattsburgh Press Republican	03-09-15	myscience.com
03-09-15	Focus on Farming	03-10-15	farms.com
03-11-15	PRO-DAIRY Newsletter	03-11-15	Morning Ag Clips
03-11-15	Minnesota Farm Guide	03-11-15	4-traders.com
03-11-15	seedquest.com	03-12-15	Empire State Farming
03-12-15	Farm and Livestock Directory	03-12-15	International Horti-Daily
03-16-15	American Agriculturist		

Next steps:

Funding has been awarded for three separate alfalfa snout beetle related trials which are being combined into one project funded by NNYADP for the 2015 growing season. The first trial will consist of convincing alfalfa producers in ASB infested areas to apply biocontrol nematodes to their farms using a cost sharing program. Trial two includes additional demonstration plots in Clinton and Essex Co. as well as continuing assays in existing demonstration plots to evaluate presence of nematodes and stand effect. The final trial will be a comprehensive survey of the northern 6 counties to describe the current status of ASB infestation. In addition, development of a practical guide for scouting and assessing alfalfa and clover fields for ASB infestations.

Acknowledgments:

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Photos:

Figure 1.Washing rearing cups

Figure 2.Emptying rearing cups onto screens

Figure 3.Removing sawdust and nematodes from cups

Figure 4.Rinsing through screen

Figure 5.Moore Demo Site

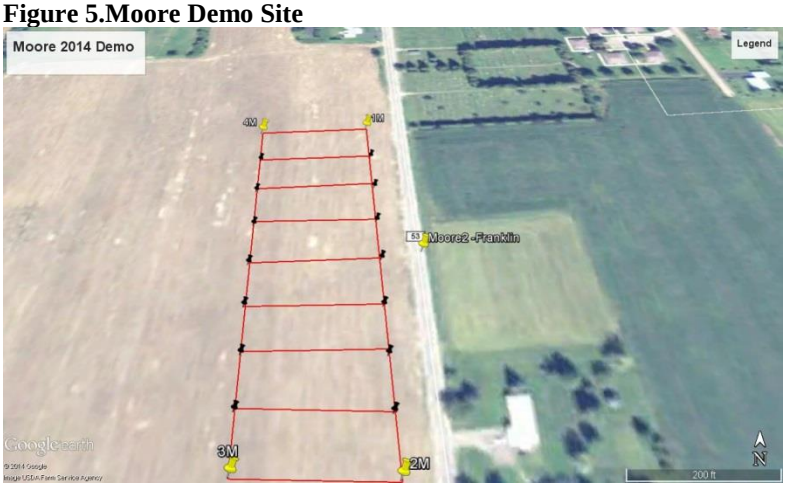

Figure 6.Stout Demo Site

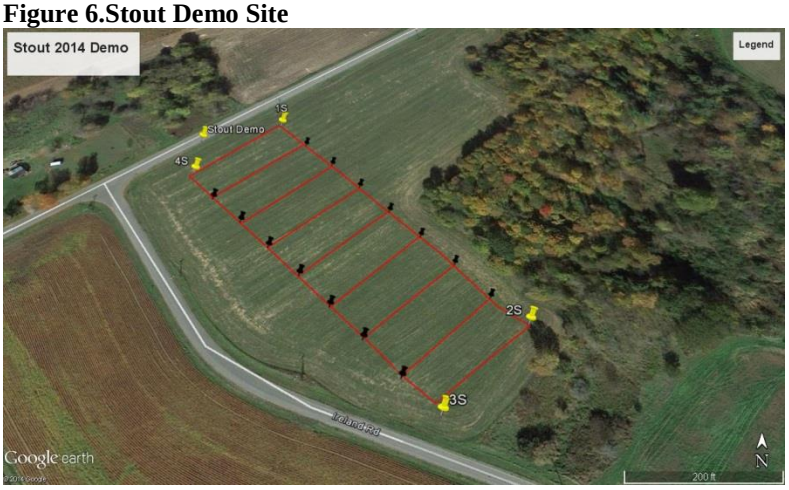

Figure 7.Kubinski Demo Site