



Northern NY Agricultural Development Program 2019-2020 Project Report

Evaluation of Alternative Application Methods of Biocontrol Nematodes in Alfalfa and Corn

Project Leader(s):

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Collaborators:

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Cooperating Producer(s):

- Birch Creek Dairy, Ellisburg
- Horst Farm, Belleville
- Locust Hill Farm, Ellisburg
- Milkstreet Dairy, Tylerville
- North Harbor Dairy, Sackets Harbor
- Porterdale Farms, Adams Center

Background:

Research, funded by the Northern New York Agricultural Development Program, has shown that biological control with entomopathogenic (insect-attacking) nematodes (EPN) is effective in reducing snout beetle populations to sub-economic levels in alfalfa fields where the native NY-adapted nematodes have been established. Ongoing research in Northern New York and New York State has indicated these same biocontrol nematodes have the potential to control corn rootworm, a significant pest of field corn in NY, at the same level as GE-CRW (genetically-engineered corn rootworm) corn varieties, in growing seasons following the initial application. To date, biocontrol nematodes have been applied to nearly 25,000 acres in Northern New York (NNY).

The currently recommended application method of biocontrol nematodes is to rinse the biocontrol nematodes with high volumes of water through fine mesh screens into a holding tank. The biocontrol nematode solution is then placed into a field sprayer equipped with streamer nozzles or drop tubes. The biocontrol nematodes are field applied using high volumes of water, 50 gallons or more per acre. This is a vast improvement over earlier-tested application methods, yet it is still a very time-consuming process. This water-based application technique was utilized to inoculate 25,000 acres in NNY to date.

Nematodes are also very sensitive to UV light; therefore, applications are made in the evening to protect the nematodes from sunlight until they enter the soil.

In response to farmers asking for a simpler and more farmer-friendly method to apply biocontrol nematodes to their fields, we established a replicated, small plot field trial on a farm in Jefferson County using liquid manure as the “carrier” of biocontrol nematodes in 2016. Biocontrol nematodes were held in the manure for 15, 30 and 45 minutes prior to application to the soil surface.

Soil samples were taken several weeks after the manure/nematode treatments to determine if biocontrol nematode establishment was successful. While our establishment results were not as good as with a water/nematode application, this initial trial certainly showed that application via liquid manure may be a viable method of biocontrol nematode application. If the manure containing biocontrol nematodes was applied to soil surface within 30 minutes, nematode mortality in the manure was reduced to acceptable level and adequate nematode establishment was quantified in the field after 30-45 days.

The successful application of biocontrol nematodes through liquid manure field applications can eliminate the need for an additional field operation to apply the nematodes alone. The manure may be effective in protecting the biocontrol nematodes from UV light, potentially eliminating the requirement to apply biocontrol nematodes in the evening hours. Our goal with this research is to increase the number of application methods farmers can use to apply biocontrol nematodes. Simpler application methods will likely increase the adoption of this biocontrol for both alfalfa snout beetle and corn rootworm in NNY.

Methods:

In 2019, we applied biocontrol nematodes using liquid manure as the delivery method in 6 fields on participating farms in NNY. For comparative purposes, two of the field sites included use of the currently-used field sprayer streamer application using water as the delivery method as the standard application treatment method.

We applied different rates (Figures 1, 2) of biocontrol nematodes with the manure delivery method. Our initial work in 2016 indicated that we experienced higher biocontrol nematode mortality if they were held in liquid manure for longer than 30 minutes. The length of time the biocontrol nematodes were in each individual load of manure was recorded for comparison to establishment percentage. Approximately 45 to

90 days after the manure applications we sampled the soil to determine the success of the biocontrol nematode establishment.

Results:

In 2018, biocontrol nematodes were applied to six different fields on six farms in NNY using liquid manure as the carrier and application method. Soil sample results confirmed positive establishment of biocontrol nematodes in all fields sampled. One interesting outcome was that increasing the number of cups of biocontrol nematodes applied per acre did not influence the number of positive soil samples in each treatment (Figure 1).

2018	% EPN Positive Soil Samples – NNY Manure Trials				Cups/Ac	Minutes in Manure	Manure Tank Circulation
	Sc	Sf	Hb	Combo			
Copenhagen-Trt 1	6±4	35±5	0±0	41±9	8	20	YES
Copenhagen-Trt 2	2±2	28±7	0±0	30±6	4	22	YES
Copenhagen-Stream	0±0	37±4	0±0	37±4			
Lowville-Blue Trt	0±0	25±4	0±0	25±4	10.34	20	NO
Lowville-Pink Trt	2±2	32±6	0±0	33±7	6.89	21	NO
Lowville-Orange Trt	0±0	28±3	0±0	28±3	3.44	22	NO
Philadelphia-Right	3±2	30±3	0±0	33±3	5	4	YES
Philadelphia - Left	0±0	26±3	0±0	26±3	10	11	YES
Ellisburg-Field 1	1±1	37±6	0±0	38±6	10	13	NO
Ellisburg-Field 2	0±0	29±4	0±0	29±4	5	10	NO
Adams Center-Trt 1*	0±0	34±1	0±0	34±1	2.94	8	NO
Adams Center-Stream*	0±0	24±1	0±0	24±1			
Adams Center-Trt 2*	0±0	34±1	0±0	34±1	5.84	7	NO
Martinsburg-Trt 1*	1±2	38±0	0±0	39±2	6	17	YES
Martinsburg-Trt 2*	4±2	31±0	0±0	35±2	12	19	YES
Martinsburg-Trt 3*	3±3	39±0	0±0	42±3	4	22	YES

Figure 1. 2018 Biocontrol Nematode Establishment Assay Using NNY Manure Trials in Northern New York, NNYADP project. *Sites with asterisks were assayed in May 2019 to verify establishment, and determine overwintering and persistence of the EPNs.

In 2018, applying high rates of EPNs with manure resulted in successful establishment of the biocontrol nematodes in all fields. In 2019, we applied lower rates of EPNs with manure to determine if we could achieve successful establishment of biocontrol nematodes at the lower rate. The most important benefit of lower application rates of EPNs is the reduction of the overall treatment cost per acre.

In 2019, we applied biocontrol nematodes to six different fields on six different farms in NNY using liquid manure as the carrier and application method. The soil sample results confirmed positive establishment of biocontrol nematodes in all fields sampled. Even when applying much lower rates of EPNs per acre, the number of cups of biocontrol nematodes applied per acre did not influence the number of positive soil samples in each treatment (Figure 2). One remaining field, due to weather, late harvest, and field conditions was not sampled in 2019. This site will be assayed in May 2020 to verify establishment of biocontrol nematodes.

2019	% EPN Positive Soil Samples – NNY Manure Trials				Cups/Ac	Minutes in Manure	Manure Tank Circulation
	Sc	Sf	Hb	Combo			
Adams Center-Trt 1	2±3	28±1	0±0	30±4	4.8	18	NO
Adams Center-Trt 2	4±4	48±3	0±0	52±7	3.6	19	NO
Adams Center-Trt 3	0±0	26±1	0±0	26±1	2.4	18	NO
Belleville-Trt 1	0±0	37±0	0±0	37±0	2.14	4	NO
Belleville-Trt 2	0±0	36±0	0±0	36±0	3.57	5	NO
Tylerville-Trt 1	0±0	36±0	0±0	36±0	2	6	NO
Tylerville-Trt 2	0±0	27±0	0±0	27±0	4	5	NO
Ellisburg-Row 1	0±0	29±1	0±0	29±1	3.7	7	NO
Sackets Harbor-Trt 1	0±0	37±0	0±0	37±0	3.5	15	YES
Sackets Harbor-Trt 2	0±0	33±1	0±0	33±1	1.75	5	YES
Sackets Harbor-Stream	0±0	34±1	0±0	34±1			

Figure 2. 2019 Biocontrol Nematode Establishment Assay Using NNY Manure Trials in Northern New York, NNYADP project.

Conclusions:

The application of EPNs with manure as a carrier resulted in similar biocontrol nematode establishment success when compared with the application of EPNs using water as a carrier and applied with streamer nozzles.

The application of EPNs using liquid manure as the delivery method:

- eliminates the need for an additional field operation to apply the biocontrol nematodes alone,
- is effective in protecting EPNs from damaging ultraviolet light, and
- allows for applications to be made at any time of day.

The results of this project demonstrate that biocontrol nematodes can be effectively applied to fields via liquid manure as the carrier and delivery method using EPN rates similar to the currently recommended application rate of 2 cups of nematodes per acre (~42 million nematodes per acre).

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 New York State. The data has been included in presentations in late 2019 and early 2020 at the Cornell Field Crop Dealer Meeting, CCE NWNYS Corn Congresses in Batavia and Waterloo, CCE Delaware County Winter Crop School and through the CCE NCRAT agricultural newsletter and other CCE agricultural newsletters.

For More Information:

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