Progress Report to Lake Erie Regional Processors, New York Grape Production Research Fund and New York Wine & Grape Foundation

# MANAGING GRAPE ROOTWORM IN NY VINEYARDS

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## INTRODUCTION

Historically (early 1900s) grape rootworm (GRW) was the major insect pest of grapes growing in New York and surrounding states (Johnson and Hammar 1910). Grape rootworm adults do some minor leaf feeding in early to mid-summer. However, larval feeding on grape roots can reduce vine vigor or even cause vine death at high densities. For various reasons, including the seasonal use of broad-spectrum synthetic insecticides, the pest status of GRW declined during the second half of the 20th century. However, with the advent of more selective insecticides and the overall reduction in the number of applications during the season, reports of GRW adult feeding damage have greatly increased in recent years, especially in the Lake Erie Grape Belt. This was the first year of a multi-year project examining the need for managing grape rootworm populations, the optimal timing of insecticides for control of grape rootworm and the use of entomopathogenic nematodes (a biological control used successfully for alfalfa snout beetle) against grape rootworm larva. This was done through 3 objectives.

## METHODS

Objective 1. *Determining optimal timing of insecticide control of adult grape rootworm.*

5 growers participated in the project, providing 10 vineyard blocks with a history of grape rootworm damage. The project was comprised of 10 paired blocks, 5 treated with insecticide for grape rootworm (timed according to weekly scouting results) and 5 that would serve as a control with no treatment. Scouting started on June 2, 2015, a full month before the traditional timing. This allowed us to document the time of first emergence of grape rootworm adults in the vineyards. Scouting for grape rootworm is targeted at the adult stage as it presents the best option for determining the presence of this pest. Scouting was accomplished using a two-foot square catch frame constructed using a 1"X4" wooden frame covered by white cloth. The catch frame was placed under the middle vine in a panel and the top wire was given a solid shake in an up and down manner. Adults fell onto the catch frame and were counted. This process was repeated on every other panel down the length of the row. Scouting was conducted every 4-6 rows, depending on the size of the vineyard block. Grape rootworm adults that fell on the catch frames were captured for use in the potted vine study. Scouting information was relayed to cooperators to help them determine the need to spray.

Objective 2. *Assessing the efficacy of entomopathogenic nematodes against larval grape rootworm.*

20 dormant Concord vines were planted in 5-gallon pots with vineyard soil to test the efficacy of a mixture of three species of entomopathogenic nematodes known to cause mortality

to beetle larvae against larvae of GRW. The three nematode species are *Steinernema carpocapsae*, *S. feltiae* and *Heterorhabditis bacteriophora* and were supplied Dr. Elson Shields. Four treatments consisting of 1) *S. carpocapsae + H. bacteriophora*, 2) *S. carpocapsae + S. feltiae, S. feltiae + H. bacteriophora* and 4) a control with no nematodes applied were used. Dormant one year Concord vines were planted in 5 gallon black nursery pots filled with top soil from CLEREL that had been stockpiled for 3 years. The nematodes were applied on June 16 as the four treatments in 5 replications of pots for a total of 20 pots. The potted vines were caged using welded wire fencing and netting and a total of 25 grape rootworm adults (collected during scouting of the 10 project vineyards) were introduced to each pot over a two week period from June 24 to July 2. On October 5, all the pots were destructively sampled for the presence of grape rootworm larva.

Objective 3. *Assessing vineyard productivity in response to insecticide control of grape rootworm.*

As 2015 was the first year of the project we developed baseline information of vine size differences in the grower vineyard blocks participating in the project. The participating vineyard blocks were assessed using NDVI (Normalized Difference Vegetation Index) sensors mounted on either a grower's tractor, or on a John Deere Gator operated by LERGP/CLEREL staff. This information was compiled into maps by Rhiann Jakubowski, LERGP. This was done for both the treatment and control vineyards involved in the project to allow for comparison of changes in vine size due to treatment/no treatment of grape rootworm populations as well as any changes that may occur over time. Yield maps were created using a yield monitor mounted on a harvester for 2 of the paired vineyard blocks in the project.

**RESULTS**

Objective 1. *Determining optimal timing of insecticide control of adult grape rootworm.*

The growing degree days for Table 1 were calculated by taking the average growing degree day from our NEWA weather station in Portland, NY and the NEWA weather station in Ripley, NY reflecting to the locations of the vineyard blocks in this experiment. As shown in Table 1, the first emergence of grape rootworm was recorded on June 10$^{th}$ and emergence continued for approximately 8 weeks, ending on August 4 (587.9 – 1,050 growing degree days). Table 1 also indicates that control of grape rootworm populations was achieved in treatment blocks that received an insecticide application when scouting indicated the need (timing indicated by the bolded boxes in Table 1). Only in one vineyard block was a second application of insecticide required. The average number of grape rootworm shown at the bottom of Table 1 indicates a peak emergence of adult grape rootworm during the period from June 17 through July 2, depending on location. With traditional timing of scouting being the Fourth of July weekend, first year results would indicate that this timing might be too late to effectively manage this pest. Growers were allowed to choose the insecticide used for management of grape rootworm in their vineyards. Materials used were Sevin, Leverage 360, and Sniper and Admire Pro. We were unable to complete the small plot trials of insecticide timings as the vineyard blocks identified for this objective never attained significant or uniform grape rootworm populations.

Table 1. Number of grape rootworm found during scouting of participating Concord vineyards by date and growing degree day accumulation.

| "spray applied after date" | 6/2/2015 | 6/10/2015 | 6/17/2015 | 6/24/2015 | 7/2/2015 | 7/7/2015 | 7/21/2015 | 7/28/2015 | 8/4/2015 |
|---|---|---|---|---|---|---|---|---|---|
| **Site** | **467.9** | **587.9** | **718.5** | **843.95** | **954.8** | **1050.85** | **1320** | **1470.2** | **1628.75** |
| Vineyard 1 (Treatment) | 0 | 1 | 393 | 11 | 5 | 12 | 0 | 0 | 0 |
| Vineyard 2 (Treatment) | 0 | 1 | 60 | 0 | 1 | 1 | 0 | 0 | 0 |
| Vineyard 3 (Treatment) | 0 | 1 | 66 | 1 | 0 | 1 | 0 | 0 | 0 |
| Vineyard 4 (Control) | 0 | 1 | 26 | 24 | 8 | 40 | 0 | 0 | 0 |
| Vineyard 5 (Control) | 0 | 0 | 8 | 35 | 38 | 11 | 0 | 0 | 1 |
| Vineyard 6 (Control) | 0 | 0 | 9 | 18 | 58 | 19 | 1 | 3 | 0 |
| Vineyard 7 (Treatment) | 0 | 0 | 22 | 4 | 3 | 6 | 0 | 0 | 0 |
| Vineyard 8 (Treatment) | 0 | 0 | 0 | 6 | 0 | 8 | 0 | 0 | 0 |
| Vineyard 9 (Treatment) | 0 | 0 | 16 | 54 | 0 | 1 | 0 | 1 | 0 |
| Average | 0 | 0.44 | 67 | 17 | 13 | 11 | 0.11 | 0.44 | 0.11 |

Objective 2. *Assessing the efficacy of entomopathogenic nematodes against larval grape rootworm.*

For unknown reasons, no grape rootworm larvae or larvae of any kind, were found in any of the treatment pots. We are currently exploring different methods of promoting the production of eggs by the captured grape rootworm adults. This includes the caging of entire vines to allow release of captured GRW adults in the field. Using eggs to "seed" the pots with grape rootworm should promote uniformity of GRW larva in the pots.

Objective 3. *Assessing vineyard productivity in response to insecticide control of grape rootworm.*

As this was the first year of the grant we are not able to show differences in vine size attributed to management of grape rootworm. NDVI sensing will be accomplished in 2016 and future years in these blocks. This will allow us to compare future maps to the baseline maps developed this year. An example of an NDVI map of a vineyard with grape rootworm is shown in Figure 1 below. This year also gave us baseline data for examining the impact of grape rootworm on yield in 4 vineyard blocks where a yield monitor, attached to a harvester, was used as shown in Figure 2 below.


Figure 2. Baseline yield map showing comparison of paired blocks in grape rootworm project.

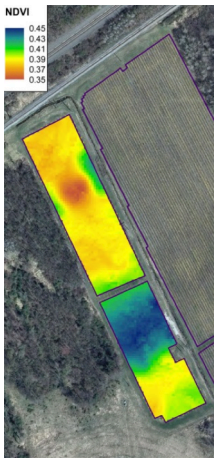


Figure 1. Baseline NDVI map showing comparison of vine size within paired blocks in grape rootworm project