NYWGF RESEARCH - FINAL REPORT

Funding for fiscal year: 2025-2026

SECTION 1:

Project title: Fluctuation of grape berry moth populations in Concord vineyards throughout the growing season

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New Research ☒ **Continued Research** ☐

Amount Funded **$**13,189

SECTION 2:

Project Summary Impact Statement:
This proposal aimed to determine the fluctuation of grape berry moth (GBM) populations in vineyards with high GBM pressure and the accuracy of the current degree day model for timing pesticide sprays for GBM control. The GBM is one of the most destructive pests of grapes in the northeast U.S. This insect is commonly managed with pesticides that are sprayed following a degree-day model. However, despite current management recommendations, there is substantial damage caused by this insect in high-risk vineyards. We conducted weekly sampling of GBM-infested grapes in three different vineyards over the 2025 growing season and documented the developmental stage and the number of larvae feeding inside. Using degree day (DD) data, we estimated the oviposition time from which these larvae emerged. We found larvae at different stages of development over the growing season and found two main oviposition peaks. The first oviposition peak occurs over a period of ~5 weeks. The current spray recommendation at 810 DD appears to be too late to control GBM early in the season. The second spray at 1620 seems to be timed more appropriately. This information is critical for adjusting current management strategies and reducing the populations of this insect in the field.

Objectives:

1) To determine the fluctuation of GBM populations in vineyards with high GBM pressure.

2) To determine the accuracy of the current degree day model for timing pesticide sprays for GBM control.

Materials & Methods:

To determine the fluctuation of GBM populations in vineyards with high GBM pressure, we selected three privately owned Concord vineyards in Erie County, Pennsylvania, with a history of high GBM infestation. In these vineyards, we conducted weekly samplings of about 100 GBM-infested grapes throughout the growing season (June – mid-September). The grapes were taken to the PI's laboratory in Penn State Behrend and were dissected under a stereomicroscope to determine the developmental stage of the larvae (known as larval instars) feeding inside. To do this, we measured the head capsule of each larva using a micrometer and determined its instar based on information from Table 1. Additionally, we installed a small device (HOBO Temperature/RH data logger) at the border of each of these vineyards to register local fluctuations in temperature and humidity during the season.

Table 1. Head capsule measurements of GBM larvae at different instars reported by Gleissner 1943.

Instar	Average width (mm)
First	0.206
Second	0.296
Third	0.489
Fourth	0.767

Data analysis: The proportion of each larval instar was calculated based on the total number of GBM larvae obtained at each sampling. We also calculated the proportion of grapes containing GBM larvae from the total number of grapes collected at each time point.

To determine the accuracy of the NEWA model to predict peaks of GBM egg-laying in field conditions.

a) We used the temperature data from the HOBO devices (described above) to calculate the GDD in each research vineyard using the formula GDD= ((Maximum temperature + Minimum temperature)/2 -Base temperature). We used a base temperature of 8.41C (47F) based on previous research on GBM (Tobin et al. 2001).

b) We used the larval development data from the samples collected in objective one above (instars) to back-calculate the days at which the eggs were laid based on the number of GDD that eggs and larvae require to develop. Our previous research identified the following GDD required for the development of GBM eggs and each larval stage in laboratory conditions (Table 2. Laiton-Jimenez et al., 2024).

Table 2. Growing degree days (GDD) required for GBM eggs and larvae to develop in laboratory conditions at 25C and 70% RH.

Stage	GDD
Egg	66.36
First	82.95 – 182.49
Second	182.49 – 232.26

Third	232.26 – 265.44
Fourth	265.44 – 381.57

c) We graphed and compared the predicted egg-laying period for the larvae found in the field samplings and the one predicted by the NEWA model. This information allowed us to determine the accuracy of the model for predicting peaks of GBM egg-laying in the sampled vineyards.

Data collection:
The following data were collected in this study:
- Number of GBM larvae and stage of development per sampling site
- Temperature in each sampling site

Our Results are presented in a graph in the Attachments section below.

Results/Outcomes/Next Steps:

Our results in three different vineyard sites found a constant GBM population with larvae present during the entire season in different stages of development (**Figure 1A-C**). Using temperature data collected in each vineyard and information on the GDD required by each GBM larval instar to develop, we estimated the time at which egg-laying may have occurred following the methods described above (see Materials and Methods section). We identified a large number of eggs laid early in the season, from late Mid-June to early July, followed by a reduction in eggs laid in July and an increase in eggs laid from late July to mid-August (**Figure 1D-F**). These results suggest that the first insecticide spray at 810 GDD seems to be too late and provides very little GBM control. Therefore, the current recommendations for insecticide treatments need to be revised. Egg laying seems to happen constantly, and different GBM generations appear to overlap during the growing season. The current spray recommendations may need to be revised to improve GBM management. However, these results are based on a single growing season; field experiments require data from at least two years to ensure robust conclusions that account for seasonal variability.

Technology Transfer Plan:
Results from this project have been shared with growers in an online webinar on Dec 3, 2025, that discussed vineyard spray programs in the Lake Erie region. Our results will be published in a peer-reviewed scientific journal. We will also prepare an extension article to disseminate these results. Additionally, these results will be presented in growers' meetings in both NY and PA.

Attachments

Figure 1. Number of GBM larvae and developmental stage (instar) obtained from infested grapes in the 2025 growing season in **A**) vineyard 1, **B**) vineyard 2, and **C**) vineyard 3 in Erie, Pennsylvania. One hundred grapes with signs of GBM infestation were sampled at each time point. **(D-F)** Projection of egg-laying periods in each of the three vineyards sampled in the 2025 growing season using degree days. The two vertical bars represent the time at which the 810 (July 7) and the 1620 (Aug 6) growing degree days were estimated by the current NEWA model in Northwest Pennsylvania.

SECTION 3:

Project summary and objectives:

This proposal monitored the fluctuation of grape berry moth (GBM) populations in vineyards with high GBM pressure and the accuracy of the current degree day model for timing pesticide sprays for GBM control. This insect is commonly managed with pesticides that are sprayed following the NEWA degree-day model. However, despite current management recommendations, there is substantial damage caused by this insect in high-risk vineyards. The information provided by this project is critical for adjusting current management strategies and reducing the populations of this insect in the field.

Importance of research to the NY wine industry:

The grape berry moth has been a problem in vineyards in the Northeast U.S. for several decades. This insect is commonly controlled with insecticides, but despite following the current management recommendations, high infestation levels are still seen in vineyards, and growers deal with significant crop losses every year. Therefore, there is a need to understand the fluctuation of GBM populations in the field and to assess the accuracy of the

growing degree day (GDD) model in predicting peaks of egg-laying. This project provides data on GBM population fluctuations and suggests that one spray early in the season doesn't seem to provide sufficient control for this insect.

Project Results/next steps:

We found GBM larvae at different stages of development over the growing season and found two main oviposition peaks. The first oviposition peak occurs over a period of ~5 weeks. The current spray recommendation at 810 DD appears to be too late to control GBM early in the season. The second spray at 1620 seems to be timed more appropriately. We will repeat this experiment in 2026 to ensure consistency over varying growing seasons.

Supporting attachments:

Figure 1. Number of GBM larvae and developmental stage (instar) obtained from infested grapes in the 2025 growing season in **A**) vineyard 1, **B**) vineyard 2, and **C**) vineyard 3 in Erie, Pennsylvania. One hundred grapes with signs of GBM infestation were sampled at each time point. **(D-F)** Projection of egg-laying periods in each of the three vineyards sampled in the 2025 growing season using degree days. The two vertical bars represent the time at which the 810 (July 7) and the 1620 (Aug 6) growing degree days were estimated by the current NEWA model in Northwest Pennsylvania.