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ASSESSING THE RISK OF GRAPE BERRY MOTH ATTACK IN NEW YORK VINEYARDS:

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Some Practical Results of Studies Supported by the New York Wine/Grape Foundation and the Cornell IPM Program

INTRODUCTION

Research on assessing risk of grape berry moth (GBM) damage is the result of questions raised by New York State grape growers about: (1) the possibility of reducing expenditures on insecticides, (2) the possibility of treating only problem areas within vineyards, and (3) why the grape berry moth (GBM) is such a problem in some areas and not in others. Our objective is not to make decisions for growers but to provide the information and methods necessary for the grower to decide what solution for berrymoth control is best for a particular vineyard and financial situation. That is the purpose of studying risk assessment for the GBM. The following are some observations we have made that show the differences between high-risk and low-risk vineyards and a method is presented that may be used to determine what the actual levels of GBM are in particular vineyards.

GBM LIFE HISTORY

The GBM is a small moth that is native to the Eastern United States. The larvae feed only on species of *Vitis,* which includes both wild and cultivated grapes. The adults begin to emerge in mid-to late-May but, in most years, do not lay eggs in commercial grapes until the beginning of July. The eggs are laid on the grape berry, and the newly-hatched larvae bore directly into the berry, leaving only to enter another berry or to form a cocoon (pupate). The cocoon is made by folding a grape leaf or other plant material. The insects spend the winter in the pupal stage within their cocoon. There are 2-3 generations per year, the exact number depending mainly upon weather conditions.

DIFFERENCES IN GBM INFESTATIONS IN VINEYARDS

One aspect of berry moth ecology that seems to stand out is the extreme variability of population levels. Several vineyards have been monitored in the Finger Lakes, Chautauqua/Erie, Wayne County, and Long Island grape growing regions for the past 2 years. GBM infestation rates vary, not only from region to region, but also from vineyard to vineyard within regions (see Fig. 1). Each of the pairs of vineyards in this figure received similar insecticide treatments or were not treated with insecticides (like the vineyards in Branchport). Infestations in the treated vineyards ranged from .01% to 1.25% berry damage and ranged from .01% to 0.6% berry damage in untreated vineyards. These findings illustrate that the intensity of GBM problems varies widely within New York Vineyards.

There are more dramatic differences in the average intensity of GBM infestations in different regions of the Eastern United States. GBM is reported to be an uncommon pest in North Carolina, while it is a serious problem in Missouri. There are vineyards on the Niagara Peninsula in Canada that, without seven applications of insecticide, would not have a marketable crop.

Besides differences from region to region, differences were found from year to year. The same vineyards were monitored in both 1985 and 1986 and infestation levels for these are shown in Figure 2. Prolonged periods of rainfall in 1986 made it a banner year for fungal pathogens of grapes, yet only a moderate year for insect problems. The vineyards in Fredonia and Branchport depicted in Figure 2 were not treated with insecticides and GBM was not a serious problem in either vineyard during 1986 (below the 2% industry threshold). Several possible reasons for these differences are being investigated. One of the most important factors appears to be how well the berry moth survives the winter. Through the cooperation of Dr. Robert Pool, Horticultural Sciences, Geneva, we determined that the overwintering pupae can tolerate short-term exposure to temperatures down to -10F without freezing. Below this temperature they will instantiy freeze and die. With this information, we have related berry moth infestations to weather patterns in different grape-growing regions.

Table 1. Effect of climatic region upon grape berry moth Infestation rate.

Region	Odds of reaching GBM freezing point	Level of winter snow cover	Infestation rates
Finger Lakes	Once in 10 years	Low	Light
Western NY	Once in 20 years	Medium	Moderate
Niagara Pennin.	Extremely low (a 67-year record low)	High	Heavy

Table I shows general infestation rates (during most years), the level of permanent snow cover, and the odds of berry moth cocoons freezing during the winter in three different grape growing regions. This lethal temperature (-10 F) happens about once in 10 years in the Finger Lakes Region, once in 20 years in Fredonia, and is a 67-year record low on the Niagara Peninsula in Canada. The amount of permanent snow cover, which may act as a blanket to protect cocoons from freezing, also increases as you approach the Niagara Peninsula. This suggests that the more likely a berry moth is to be exposed to low temperatures, the higher the mortality and the lower the observed infestation rate for the region the following year.

Additional experiments are currently being conducted to determine the actual effect that snow cover and leaf litter have on the survival of the GBM. Patterns of snow cover may be of useful for predicting problem areas-areas you should watch more closely for GBM damage.

Rates of infestation can vary dramatically within a single vineyard as well. Many growers and researchers have noticed hot spots in vineyards, usually along wooded edges. What they may not know is how dramatic this "edge effect" actually is and what factors are responsible for it. Figure 3 shows a pattern of GBM damage throughout the season. The area of highest damage is adjacent to a wooded area which, we hypothesize, provides shelter for the GBM during the winter in the form of increased levels of snow-cover and leaf-litter, and provides a natural barrier for leaf-bound GBM pupae to blow into in the fall. There were also several wild grapevines in this wooded area. Figure 4 shows the high infestation rates in these wild grapes compared to those in the vineyard. Differences in infestation rates illustrate that berry moths lay far more eggs/cluster on wild grapes relative to cultivated varieties. This would contribute to, but may not be totally responsible for, the edge-effect of GBM damage within the vineyard.

CONCLUSIONS

It must be emphasized that, because of the variability in infestations, the need to treat with insecticides for GBM varies from year to year, location to location, and from vineyard to vineyard. The challenge is to accurately determine when it is worth investing money to control GBM. This can be done easily. The first step is to re-evaluate the long-standing recommendation of three insecticide treatments (post bloom, 10-dayspost bloom, and August) for berry moth. From insecticide trials conducted in Fredonia in 1985 and 1986, we found that, during years of average GBM development, there was little difference between three applications of carbaryl and a two-application schedule of 10-days post bloom and August. Therefore, for processing grapes, it is possible during most years and in all but the most high-risk locations, to cut out the first post-bloom application. Additionally, research has shown that the need for the late season (August) application varies from vineyard to vineyard. There are many vineyards in the Finger Lakes that do not need this late treatment in most years.

Although the berry moth is by far the most serious insect pest of grapes in New York, it is by no means the only pest. However, growers who are in their vineyard at least once a week can easily detect problems of build-up of periodic pests like steely beetle, rose chafer, and leafhoppers.

In conclusion, we suggest that growers monitor GBM damage in their vineyards during July and August of each year to assess the intensity of infestations. At present, we recommend that a GBM treatment be routinely made at 10-days post-bloom and that monitoring be done in July to determine if an early August treatment is warranted. In unusually warm seasons, monitoring in August is recommended to determine if late August treatments are needed.

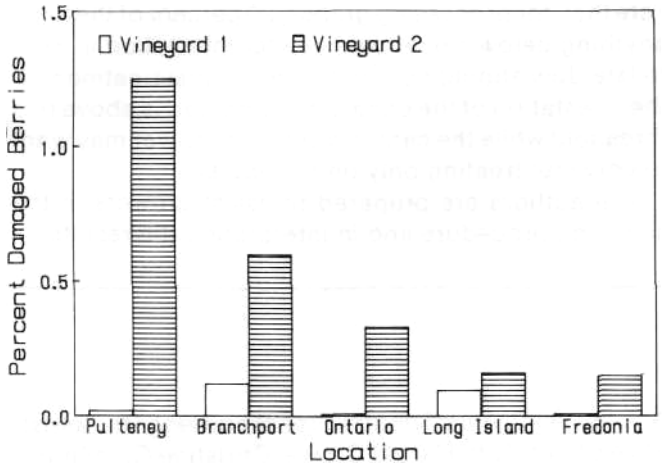


Figure 1. Grape berry moth infestation rates vary dramatically from vineyard to vineyard within each of the New York grape-growing regions (1986 data).

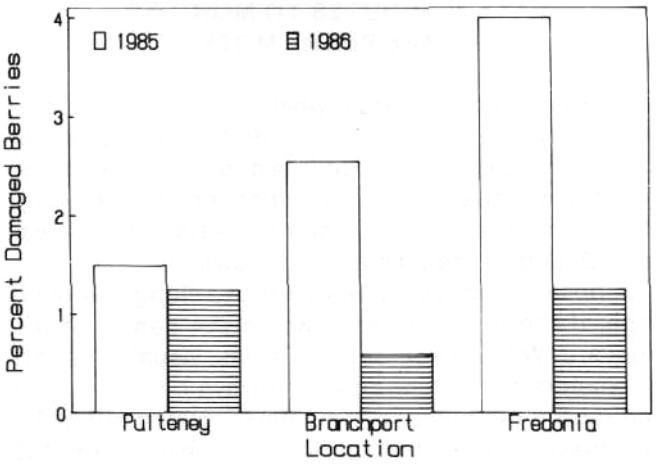


Figure 2. Grape berry moth infestation rates vary dramatically from year to year.

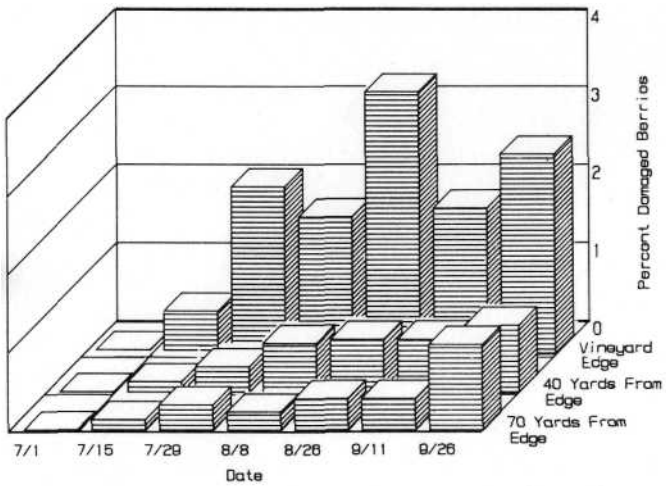


Figure 3. Grape berry moth damage at field edges is much greater than throughout the interior of vineyards.

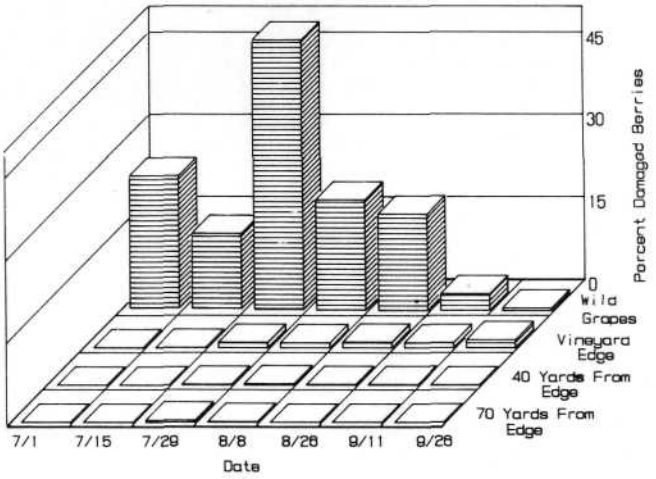
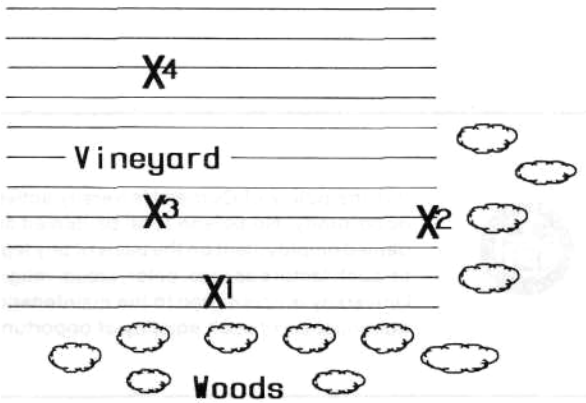


Figure 4. Wild grape vines adjacent to vineyards often are heavily infested with berry moth while adjacent vineyards have relatively little damage.

Procedure:

Select four areas in the vineyard to be sampled: Two on the vineyard edge (1 and 2) and two in the center (3 and 4). Visually inspect, at random, 10 clusters on each of five vines (a total of 50) in each of the four areas. Record the number of GBM-damaged clusters in each area. Compute separate totals for areas 1 and 2 (edge) and 3 and 4 (center) to determine the percent damaged clusters (to convert this to percent damaged berries, divide by the average number of berries per cluster). See the IPM factsheet No. 1 on Grape Berry Moth for photographs of damage.



TAKE 30 MINUTES TO MONITOR GRAPE BERRY MOTH

By sampling vineyards weekly in July, one can determine if a treatment for GBM is warranted in August. The sampling procedure doesn't require much time and will give growers an indication of the severity of berry moth attack and whether treatment is necessary. Details of the plan are as follows:

Choose four areas in a vineyard: two along a wooded edge, if there is one, and two in the center of the vineyard. Within each of these areas, visually inspect 10 clusters at random on each of five different vines and record the number of clusters infested out of 50. This makes a total of 100 clusters on the edge and 100 clusters in the center of the vineyard.

If, for example, eight of 100 clusters on the vineyard edge are infested, this is an 8 percent cluster infestation. If, in the same vineyard, three clusters are infested in the center, this is a 3 percent infestation. Data indicate that, for processing grapes, 90 percent of the time, anything below a 6 percent cluster infestation in mid- to late-July should not require an August treatment. If the infestation of the edge of the vineyard is above this threshold while the center is below, a grower may want to consider treating only on the edges.

The authors are prepared to assist growers in the sampling procedure and in interpreting the results.

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