Integration of Alternative and Conventional Strategies for Management of Grape Berry Moth in Severe Risk Vineyards

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Abstract:
Consistent economic losses due to grape berry moth, lack of control using conventional insecticides and requests for assistance from grape growers and industry personnel are the factors involved in looking for answers with alternative approaches to grape berry moth management. The use of mating disruption, parasitic wasps, conventional insecticides and an insecticide that mimics the action of the molting hormone in moth larvae (Intrepid 2 F) were integrated to manage grape berry moth in vineyards. Potential outcomes for the project include; 1) a new GBM management program for severe and high risk vineyards, and 2) adoption of alternative strategies resulting in a reduction in the use of conventional insecticides in the Lake Erie Grape Belt.

Background and Justification:
Grape berry moth (GBM) is the most important insect pest of grapes in the Lake Erie Region. GBM larvae feed on flower clusters and grape berries and can cause substantial economic losses in commercial vineyards (Gleissner 1943, Nagarkatti et al. 2001.). The vineyards participating in this project have experienced between 86 to 100% cluster injury levels over the past several growing seasons and substantial losses due to GBM damage were seen belt wide in the Lake Erie Region in 2002. In response to this problem, National Grape Cooperative hosted a Grape Berry Moth Summit with researchers, extension personnel and processor representatives from New York, Pennsylvania, Ohio, Michigan and Ontario, Canada participating in an effort to determine possible causes of increased GBM population levels and to outline potential remedies. This project aims to address the problems defined at the summit and defined by individual growers of vineyards classified as being at high and/or severely-high risk of grape berry moth damage.

Objective:
To evaluate the efficacy of integrating pheromone mating disruption and releases of parasitic wasps in conjunction with an insect growth regulator and conventional insecticides for management of grape berry moth in severe risk vineyards.

Procedures:
Two vineyard blocks with a history of high grape berry moth populations were used to conduct this study. These blocks were designated as severe risk sites at the beginning of this project.

Severe risk is one level above the high risk classification developed by Hoffman and Dennehy (Martinson et al. 1991). The two vineyard blocks are owned by different growers and have similar GBM populations. These blocks are approximately 150 feet apart and are separated by brushy areas and railroad tracks which run parallel to the vineyard rows.

ISOMATE-GBM PLUS pheromone dispensers were placed in both vineyards before the initial GBM flight period at a rate of 200 dispensers/acre during the second week in May. These are slow release, long lasting dispensers (150+) days which last the entire season. Pherocon 1C traps with GBM lures were used (4-5 traps/vineyard block) to monitor flight periods and to determine the efficacy of the dispensers. Pheromone traps were checked on a weekly basis (May-September) thought the season. Innundative weekly releases of parasitic wasps, *Trichogramma ostriniae* were conducted during a 5 week period starting in mid-July at a rate of 200,000 wasps/acre per release. Releases took place only on the border rows of both vineyard blocks. This tactic is being employed in an attempt to alleviate the pressure caused by mated GBM females flying into the vineyard from outside the pheromone treated areas and laying high concentrations of eggs on clusters in the border rows. Past research in the Lake Erie Region has shown that innundative releases of *Trichogramma minutum* and *T. ostriniae*, both species which are egg parasites, can reduce GBM cluster injury levels (Nagarkatti et al. 2003, Weigle et al. 2003). However, use of *Trichogramma* alone has not consistently reduced injury levels to a commercially acceptable level.

At least two insecticide applications were also applied to each vineyard block during the season. One vineyard block received 2 applications of Intrepid 2F while the other block was on a rotational schedule of Imidan 70W and Danitol 2.4EC. Timing of spray applications were expected to be around the third week of July and the first week in August. However, adjustments to spray application timings were made based on a combination of factors such as pheromone trap catches and egg-laying by GBM. Applications were applied to every row at a minimum of 50 gallons of water/acre at insecticide rates suggested in the current New York and Pennsylvania Pest Management Guidelines for Grapes (Weigle and Muza 2006).

Preharvest evaluations were also conducted in three vineyards classified as being at high-risk of grape berry moth damage using the same protocol as the treatment vineyards. All vineyards involved in the project were within close proximity to each other.

Results and Discussion:

The results presented here are preliminary as statistical analysis has not been completed at this time. A full report is being prepared for submission to the funding agency, the Pennsylvania IPM Program early in 2007. However, there are some interesting trends that can be seen between treatments. Table 1 and 2 show the vineyard blocks treated with *Trichogramma ostriniae* reduced the number of clusters damaged (one or more damaged berries equals a damaged cluster) by an average of 17.5%. More importantly, the number of berries damaged was reduced by 39-53% when T. ostriniae was incorporated into the GBM management strategy.

Table 1. Cluster and Berry Damage Comparisons for Vineyard Blocks With And Without Trichogramma ostriniae In Vineyard 1, Treated With Isomate-GBM Plus and Traditional Insecticides.

Block	Treatment	% Cluster Damage	% Berry Damage
1	Trichogramma	92	11.1
1	Control	84	12.8
2	Trichogramma	20	1.0
2	Control	100	26.1
3	Trichogramma	64	6.0
3	Control	76	5.6
4	Trichogramma	76	6.3
4	Control	60	8.0
Avg. 1-4	**Trichogramma**	**63**	**6.1**
Avg. 1-4	**Control**	**80**	**12.9**

Table 2. Cluster and Berry Damage Comparisons for Vineyard Blocks With And Without Trichogramma ostriniae In Vineyard 2 Treated With Isomate-GBM Plus and Intrepid 2F.

Block	Treatment	% Cluster Damage	% Berry Damage
1	Trichogramma	76	6.3
1	Control	88	9.8
2	Trichogramma	60	4.4
2	Control	68	5.7
3	Trichogramma	92	19.3
3	Control	100	36.6
4	Trichogramma	76	8.2
4	Control	96	12.5
Avg. 1-4	**Trichogramma**	**76**	**9.7**
Avg. 1-4	**Control**	**88**	**15.9**

Table 3 shows a comparison of the vineyard blocks treated with all alternative management tools (T. ostriniae, mating disruption and insecticide) and those where a conventional growers spray program of 2 – 3 insecticides (July and August) were used for management of grape berry moth. Again, while statistics have not yet been used to examine the data there is a definite trend that shows a dramatic decrease in the amount of both cluster and berry damage when all alternative management strategies are used. An average of 17.1% reduction in berry damage would be a loss of 2052 pounds, or just over 1 ton of fruit per acre along the vineyard edge (assuming the statewide average tonnage of 6 tons per acre). Due to a spring frost and lower processor juice inventories (which helped to reduce the oversupply nationwide), the stated 2006 cash market price for Concord was elevated to $205 per ton, resulting in a potential loss due to grape berry moth of $205/acre. Unfortunately, the combination of the Concord juice market price being

predicted to more reflect the trend toward oversupply in coming years combined with the increased costs of labor and materials for applications of Isomate-GBM Plus as well as repeated applications of *T. ostriniae* leave some doubt as to the economic feasibility of this type of management strategy in Concord. Similar work needs to be accomplished in wine grape varieties where the higher economic return may result in a more favorable economic evaluation.

Table 3. Comparison of Treatment Vineyards With Control Blocks With Grower Conventional Insecticide Program for Grape Berry Moth.

Treatment	% Cluster Damage	% Berry Damage	% Difference from treatment average
Average Vineyard 1 and Vineyard 2 with *Trichogramma ostriniae*	69.5	7.9	-
Control Vineyard 1	96	28.0	20.1
Control Vineyard 2	85	18.3	10.4
Control Vineyard 3	99	28.8	20.9

Project Location:
All the vineyards involved with this project are located Erie County Pennsylvania in the vicinity of Lake City. This allowed for the use of Intrepid 2F, a insect growth regulator, which is labeled for use in grapes in Pennsylvania but has not been registered in New York State at this time. While the results involving the use of Intrepid 2F not applicable in New York state at this time, results involving the use of pheromone mating disruption and Trichogramma ostriniae have potential impact in all of New York State, the North East region and the eastern United States where grape berry moth is the primary insect pest of grapes.