Integrated Pest *Management*

IPM

And the bottom line *Grapes*

Wine Grapes in the Midwest: Reducing the Risk of the Multicolored Asian Lady Beetle

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Overview

MALB feeding in grapes

Wine grape production has increased significantly in Minnesota and other Midwestern states during the past 20 years. Even though the acreage of Minnesota grapes is low (about 220 ac.), the high value of the crop, ranging from $4,000 to $7,000/ac, depending on the grape variety, has increased its importance in Minnesota and enhanced the diversity of agriculture and the economy. This growth in the wine industry has been attributed to the releases of new wine grape varieties, such as Frontenac and La Crescent, which are more winter hardy, tolerating temperatures as low as -30 °F. These varieties also are resistant to plant diseases such as downy mildew and powdery mildew. In the past, Minnesota and surrounding states had not typically experienced problems with any particular insect pest, but in 2001, wine makers began to notice a foul taste in their wines.

The new taste resembled "burnt peanut butter" and later it was found to be associated with the presence of the multicolored Asian lady beetle (MALB), *Harmonia axyridis*, which was found in the clusters during harvest and wine processing. Since then, MALB has become an economically significant contaminant pest of the wine-making process. The beetles tend to aggregate on clusters just before harvest, and subsequently, some beetles may be incorporated with the grapes during wine processing. Once crushed, MALB releases their foul smelling hemolymph (insect blood) that can taint the flavor and aroma of the resulting wine. Tainted wine and the unacceptable taste associated with it has caused millions of dollars in losses (unpublished data) to the wine industry throughout the Eastern U.S. and Southern Canada.

Even though MALB can be observed in vineyards throughout the growing season, control measures are not justified until 1-2 weeks before harvest. There are three reasons why grape growers should not manage MALB earlier in the season. First, this insect cannot directly damage, or penetrate grape skins. To date, MALB have only fed on berries that have been previously damaged by other insects, birds, diseases, or "splitting." Although berries can be damaged as early as the berry set stage, damage increases dramatically as the sugar content rises over the last few weeks of ripening. Second, MALB is a contaminant pest and its presence in the vineyard throughout the growing season does not affect grape yield. Finally, MALB is one the most abundant predators of several insect pests, including pests of grapes, and in several other crops (e.g., soybeans, sweet corn), where they may further contribute to reducing insect pest populations.

IPM Approach

Sampling MALB in vineyards

Yellow sticky card, 6" x 6", for monitoring MALB infestation

As part of our research in Minnesota, we found that both yellow sticky cards and visual sampling of clusters were effective at detecting the early arrival and buildup of MALB infestations. Sticky cards allow the grower to monitor changes in the MALB population, with minimal sampling effort (cost) and may help with the timing of control decisions. Based on our preliminary results, four weeks before harvest, growers should set up yellow sticky cards throughout the vineyard (4-6 cards per acre) as an early-warning tool. Direct, visual sampling of clusters during grape ripening can then be used to provide a more accurate estimate of MALB population densities. Research is underway to precisely determine the optimum sample size and treatment thresholds for MALB in clusters.

RESULTS

MALB densities were correlated with an increase in the percentage of clusters with damaged berries **(Fig. 1)**. Our results suggest that many of the MALB arrive in the vineyard 2 to 3 weeks before harvest, and that the increase in beetle density in clusters depends primarily on the increase in clusters with damaged berries. Most of the damage was caused by splitting that penetrates deep into the flesh. Additional sources of damage were birds, such as starlings, or black rot, and grape berry moth larvae. Since MALB cannot cause initial damage on berries, preventing or minimizing splitting damage to berries should decrease MALB infestations on grapes.

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IPM decisions before harvest: Chemical control if needed

Our insecticide trials have shown that Sevin® (carbaryl) is the most effective insecticide available, based on a cost-benefit analysis. Plots treated with Sevin resulted in 85% of clusters being MALB-free. Higher levels of control were observed in larger vineyard trials. This level of control reduced the cost of excessive washing of clusters or removal of MALB, cluster by cluster, which greatly hinders grape harvest and processing.

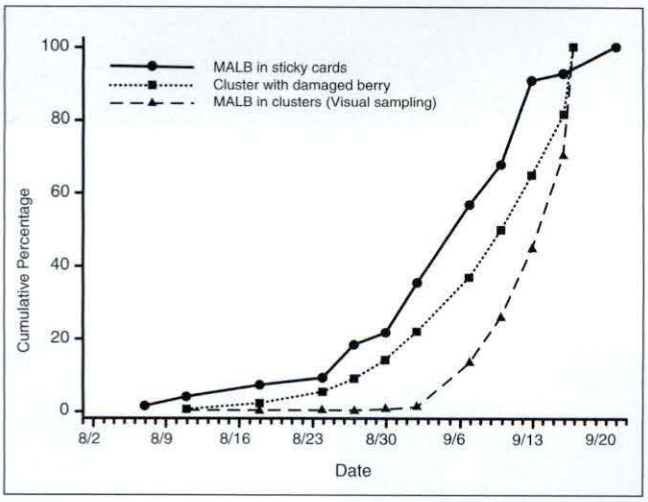

Fig. 1. Multicolored Asian Lady Beetle (MALB) and the timing (phenology) of related events; vineyard near Hastings, MN, 2004.

Decisions after harvest & before wine processing

If MALB is present at harvest, beetles must be removed by shaking clusters and covering bins where clusters are held. Growers may also float clusters in buckets of water or vacuum clusters to remove beetles. However, each method has resulted in significant increases in time and labor, and increased the costs of harvest **(Table 1).** According to these estimates, based on recent prices in Minnesota, growers that use a pre-harvest IPM strategy (sampling, or sampling and a single spray), for MALB in wine grapes will save at least $200.00/ac when compared with growers that rely only on physical or mechanical removal of beetles. From 2003-2005, 78% of the vineyards that we have monitored have had significant infestations of MALB, making it likely that the use of IPM will provide increased net returns and reduce the risk of MALB infestations in the final product.

Table 1. Comparative costs and Net Returns ($/ac) among different strategies to control MALB in wine grapes.

	IPM (Sampling & Insecticide spray applied)	IPM (Sampling only; no spray needed)	No IPM (No sampling and No Insecticide)
Production costs	2,480.00	2,480.00	2,480.00
Chemical control[1]	10.25		
Sampling	12.00	12.00	
Mechanical removal[2]	27.00[3]	27.00[3]	270.00
Total costs	2,529.25	2,519.00	2,750.00
Total Revenue[4]	4,000.00	4,000.00	4,000.00
Net return	1,470.75	1,481.00	1,125.00

[1]$5.25 (Sevin) + 5.00 (application cost) = $10.25/ac (one spray).
[2]Includes inspection and removal of MALB cluster by cluster, and floating clusters in buckets of water. Estimates are based on harvest labor costs: $9.00/hr x 30 h = $270.00.
[3]10% of mechanical removal costs.
[4]4 ton x $1,000.00 ea. = $4,000.00/ac.

DISCLAIMER

Reference to products in this publication is not intended to be an endorsement to the exclusion of others. Any person using products listed in this publication assumes full responsibility for their use in accordance with current manufacturer directions.

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