Managing Insect Pests in Grapes: Grape Berry Moth & Mealybugs/Soft Scales

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Introduction

Our applied grape research activities at Cornell over the past 3 year years have primarily focused on grape berry moth phenology and control and on the abundance of mealybugs and soft scales and their role in spreading grape leafroll disease in NY Finger Lakes vineyards. For this year's viticulture session I would like to provide you with an update on this research.

Grape Berry Moth

Grape berry moth (GBM) is a direct pest of grapes in much of the eastern US and Canada. The larvae feed on flowers and fruit, causing reduced yields, contamination, and in some wine grapes, entry points for serious fruit diseases such as bunch rot. GBM overwinters as pupae and the first flight gets started in May and into early June. There can be between 2 and 4 generations during the season. Prior to the 1980s in New York and other grape producing states in the east most growers applied broad-spectrum insecticides three to four times during the season to manage GBM, with insecticides applied mostly on a calendar basis. In the 1980s researchers initiated studies to evaluate risk factors for GBM damage (presence of woods, snow cover, history of damage) and developed the Grape Berry Moth Risk Assessment protocols. They categorized vineyards as high, intermediate and low risk for GBM damage and assigned spray recommendations according to risk. Because perhaps 50% of grape acreage in NY is considered low risk, wide adoption of these recommendations resulted in reduction of insecticide applications to an average of 1.5 from 3.

Despite the successes of the risk management protocols, problems have emerged. Perhaps the most important issue has to do with recommended timing of insecticide applications or monitoring for the middle and later part of the season. The protocols called for insecticides at the end of July/early August and end of August if warranted for high risk vineyards. We know, though, that GBM development and timing of egg-laying for each generation is mostly dependent on temperature, not specific calendar date. We therefore initiated research to test a temperature-driven phenology model to better predict the timing of adult flight and egg-laying for the second and third GBM generations. Based on laboratory estimates of GBM development at different temperatures, Michael Suanders' lab at Penn State estimated that GBM develops from egg to egg-laying female in about 810 degree days (°F), using 47.1° as a lower developmental threshold.

We (my lab at Cornell, along with Mike Saunders at PSU and Rufus Isaacs at Michigan State) have been testing this phenology model in 2008 and 2009 in high risk vineyards in NY, PA, and MI. The first step was deciding on a biofix to initiate the model in the spring. We have been using bloom date of a common species of wild grape (*Vitis riparia*). At two sites in the Finger Lakes we assigned small plots of grapes to one of three treatments: spray three times according to the risk assessment protocols (after bloom, end of July/early August, and end of August), spray twice according to the phenology model at 810 DD after bloom and 1620 DD after bloom, and no spray control. We also assessed adult female grape berry moth at these sites using panel traps or light traps. The adult traps were not very effective but did indicate peak

flights of females mostly consistent with model predictions. More importantly, damage of fruit was either the same or less in plots treated according to the model compared to the calendar-based risk assessment protocols even though they were treated twice compared to three times. These results, if replicated at more commercially relevant scale, will be used to develop new management recommendations for grape berry moth.

Mealybugs, Soft Scales and Leafroll Disease

Do you have soft scale or mealybugs in your vineyard? What are they and why should you care? I will briefly address these questions. Soft scales and mealybugs are sucking insects in the same insect order (Homoptera) as leafhoppers and aphids. They have fairly unusual life cycles and there is some variation among different species. They typically overwinter on canes or the trunk and then spend some of their time on leaves and fruit. The females are flightless and if males exist, they have wings. Mealybugs are more insect-like than soft scale, having some mobility and recognizable structures. The first instar stage of soft scale is mobile but later instars have greatly reduced structures and are not very mobile. They usually only have one or two generations during the season. Females are capable of laying large numbers of eggs.

There are two reasons you might be interested in soft scales and mealybugs. First, if populations get large enough they can cause damage to the vine (reduced vigor, perhaps overwintering survival) and also contaminate fruit with their sugary excrement or honeydew. In our surveys of Finger Lakes vineyards over the last few years we have found grape mealybug or soft scales (both European fruit leucanium scale and cottony maple scale) in most vineyards, but only very rarely have we found large populations of these insects. The other reason to be concerned about mealybugs and soft scales is all three species present in our area have been shown to be competent vectors of some grape leafroll-associated viruses. Survey work in Finger Lakes vineyards by my colleague Marc Fuchs has revealed high incidence of several strains of grape leafroll virus. Virus-infected *V. vinifera* vines tend to be less vigorous, show delayed fruit ripening and may be more vulnerable to winter damage. Marc and I now have documented that 1) grape mealybug and the soft scales are infected with several distinct "strains" of grape leafroll virus and 2) although most grape leafroll disease probably initially comes from infected nursery stock, natural spread of disease within vineyards does occur and that this is probably caused by insect vectors. The question then becomes when, if ever, does it make economic sense to control mealybugs or soft scale to manage spread of grape leafroll disease? We have started a study to investigate this question but the results are not yet available. I will say that some of the insecticides available probably are not sufficiently effective to reduce rate of spread. We do hope to try a new, systemic insecticide (Movento) next season that may be much more effective.