Monitoring and Controlling Grape Berry Moth in Texas Vineyards

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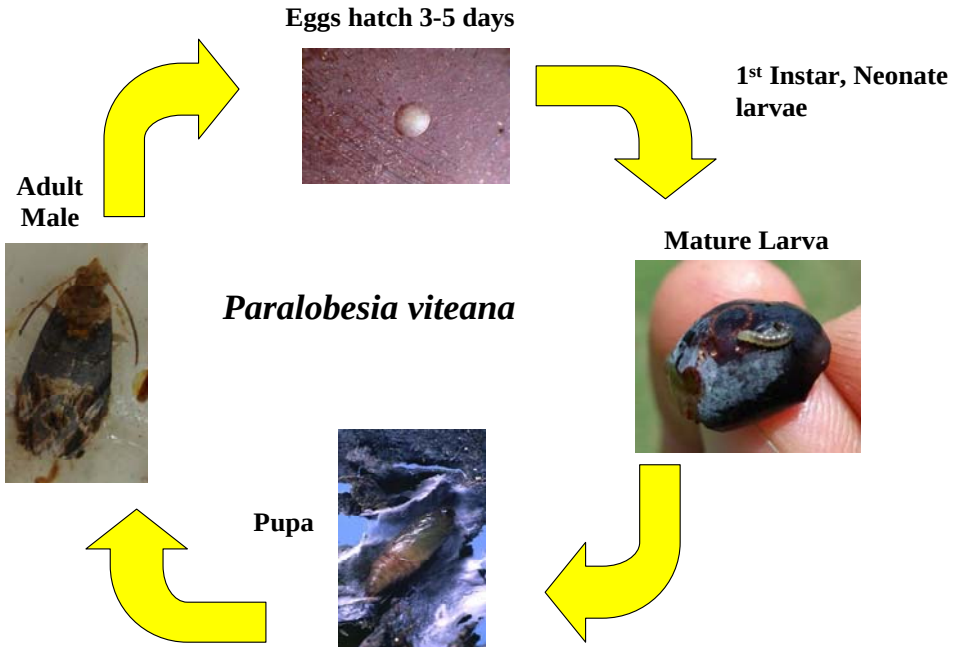
Lifecycle of Grape Berry Moth

The Grape Berry Moth (GBM) over-winters within pupae in leaf litter on the vineyard floor or in nearby wooded borders of vineyards. In the spring, after temperature requirements are met, the adult moths emerge from pupae and mate in the vineyard or surrounding wooded areas. Female moths then lay eggs directly onto young grape clusters, near or shortly after the time of bloom. Young, "neonate" larvae emerge from eggs (3-5 days) and feed on flower clusters or young berries. Mature larvae then spindle down to the vineyard floor or to edges of leaves, where they molt into pupae. New generations of adult moths then emerge from those pupae and the cycle continues several times throughout the growing season.

Figure 1: Life cycle of Grape Berry Moth



Recently renamed from *Endopiza viteana* by J. Brown, USDA-ARS Beltsville, MD.

Monitoring

Growers can monitor the adult emergence and flight of male moths by using sticky traps baited with sex pheromone lures. Wing traps, such as Pherocon traps by Trece Inc. are the most commonly used (Figure 2). Trap tops and hanging wires can be used over several years, but growers will need to change the pheromones lures every 30 days. The sticky cards will need to be changed every 15 to 30 days, depending on the amount of insects trapped. Traps and pheromone lures can be purchase from Great Lakes IPM, or Gemplers. Be sure to request fresh stock of pheromone lures. A minimum of three traps per site should be placed near the vineyard edge, bordering wooded areas, or otherwise in areas of high historical infestation. Traps should be placed in the vineyard when shoots are about 12 inches long.

Figure 2: Trece Pherocon trap showing pheromone lure. Adult male GBM Shown on upper right corner.

The trapping of male moths is only one part of an effective integrated pest management (IPM) program. Trap catches can be affected by rainfall patterns, possibly by wind, and by competition with the synthetic sex pheromone by live female GBM's. Growers should also monitor grape clusters on a weekly basis, to check for physical signs of GBM. Eggs are very small and not easily detected by eye, but the neonate larvae emerging from eggs will typically produce a silken web within young developing fruit clusters, which is detectable to the eye (Figure 3). Infection of young berries can also be detected from the first and successive generations of larvae. The neonate larvae penetrate the berry skin, leaving a tiny puncture wound about the size of a needle puncture. The hard green berries develop abnormal coloration; pinkish red in red varieties and brownish black in white varieties. Second and third generation larvae feed on the insides of berries, and can transfer into neighboring berries. One larva can infest up to 7 berries per

cluster. Infested berries may be found attached to one another in affected clusters (Figure 4).

Figure 3: Silken web of neonate larva in young clusters

Figure 4: Berries attached show feeding movement of GBM larva and exit hole of mature larva

When to spray for control of GBM

The first sign of GBM may appear as male moths in pheromone traps near bloom (if you have them up in time) or shortly thereafter, as silken webbing in very young developing clusters. Control sprays are not aimed at adult moths. Control sprays are directed at the eggs or the neonate larvae that emerge from them. Once the neonate larva is in the grape, it is more protected from sprays. Thus, it is important to apply control sprays just prior to egg laying (oviposition) and up until the larvae enter young berries. Currently there are no growing degree day (GDD) models available for timing control sprays of GBM in Texas. Thresholds of damage used to determine to spray or not to spray should be based on historical site data.

Preliminary data from a survey of 6 vineyard sites in the Texas Gulf Coast in 2007 showed that the first peak in male trap catches was about 7 to 10 days after full bloom of the earliest blooming white variety, Blanc Du Bois. The vineyards in this study were located in Austin and Fort Bend Counties. Silken webbing could be found in these vineyards 10 to 17 days after full bloom. This data represents only one season of observation, however it appears that a spray from 5 to 7 days after full bloom of the early season variety will provide coverage of the control material just prior to oviposition and feeding activity of neonate larvae. Based on trap data from this study and from recommendations by other University research, the second control spray for the season would be about 10 to 15 days after the first spray.

Growers who are trapping male moths will have a better gauge for timing the third spray application, which would be timed according to peaks in trap catches. Because there are overlaps of generations of GBM, the peak trap catch dates are currently one method to determine when a spay application will have the greatest return. Under the climatic conditions of the Gulf Coast region, a third spray application would have been warranted two weeks after the second control spray in 2007. For late season varieties, a fourth spray may be necessary for vineyards with historically high damage from GBM. In this case, the grower must monitor for peaks in traps, monitor cluster infestation, and consider the pre-harvest intervals of the insecticide to be applied.

Insecticides:

There are several options for control of GBM in Texas vineyards. Growers who do not wish to use restricted use chemicals will likely rely heavier on Sevin XLR Plus, Intrepid 2F, and perhaps some integration of "softer" materials such as soil actinomycetes based Spinosad (Spintor, Entrust) or bacterial based toxins: *Bacillus thuringiensis*: (Dipel, Javelin). Sevin XLR and Intrepid 2F should be roughly the same cost per acre. Sevin XLR tends to have a longer residual activity than other Sevin formulations and Intrepid has been touted to have up to 10 days residual activity if mixed with a surfactant. Research at Michigan State has shown that Intrepid has some ovicidal activity if applied before eggs are laid. Therefore, if using Intrepid for the first spray of the season, it would be advisable to apply it with surfactant and slightly earlier than with other products (bloom time instead of immediate post bloom). Below are some insecticide products and comments derived from research in the northeastern US. Follow all pesticide label instructions.

Methoxyfenozide (Intrepid 2F)
- Efficacy: Good-Excellent (if good cluster coverage)
- Insect growth regulator
- Should be applied just before, during or just after egg hatch
- Highly selective to moth pests
- No disruption of natural enemies
- Needs good cluster coverage to be effective
- Usage later in the season (within PHI = 30d)
- Expensive? (about same as Sevin XLR per acre)

Carbamates: carbaryl (Sevin)
- Efficacy: Fair to Good
- Widely used for grape berry moth control, active on other pests.
- Provides good control of larvae, but with relatively short residual for the 80S formulation.
-XLR Plus formulation tends to have longer residual: Greater wash-off resistance; solupaks make use easier.

Pyrethroids (Danitol, Capture/Brigade, Baythroid):

Fenpropathrin (Danitol)
- Efficacy: Good-Excellent
- Common insecticide for grape berry moth control
- Broad activity on other pests
- Restricted use pesticide
- 8-10 oz rates used

Bifenthrin (Capture/Brigade)
- Efficacy: Good-Excellent
- Recently registered (2006)
- Cheaper than many alternatives
- Two sprays allowed per season at the 3.2oz rate

beta-cyfluthrin (Baythroid XL)
- Efficacy: excellent on grape berry moth at the higher labeled rate. Shorter residual at half rate.
- Recently registered (2006); not widely used yet

Spinosad (Spintor, Entrust)
- Efficacy: Good
- Requires ingestion to be lethal, not fast acting
- Expensive
- Susceptible to washing off
- Entrust registered for use in organic production, 7-10 day residual control

Bacillus thuringiensis: (Dipel, Javelin, etc.)
- Efficacy: good if repeat applications
- Small plot trials indicate high activity
- Adoption low due to short residual, meaning multiple applications needed.
- May be useful for organic growers, or late season.

Tips for maximizing insecticide use

- Vineyard monitoring using pheromone traps and scouting for grape berry moth eggs, webbing, and damage can reduce unnecessary use of insecticides and improve timing of sprays.
- Treating vineyard perimeters or historical GBM "hot spots" rather than entire vineyards can be an effective way to reduce insecticide use, if the distribution of GBM is known.
- Optimizing coverage of clusters is critical for control. Direct spray to fruit zone.
- Use surfactant if not in product (e.g. with Intrepid 2F)
- Leaf pull lightly if needed before spraying (for sprays after fruit set)
- Rotate with different modes of action chemicals (e.g. Intrepid -> Sevin -> Intrepid)
- Removal of wild grape from woods has shown to have no effect on GBM populations in adjacent vineyards. (Michigan State)
- Track phenology and GDD's for future reference (at least bud break, bloom, veraison, harvest)

Resources

Grape Berry Moth Fact Sheet. Texas Winegrape Network
http://winegrapes.tamu.edu/grow/insects/gbm.shtml#Signs

Grape Pest Management Strategic Plan. Michigan State University
http://www.grapes.msu.edu/grapeplan.htm

Controling late season Grape Berry Moth. Michigan State University
Rufus Isaacs & Paul Jenkins, Department of Entomology
http://www.grapes.msu.edu/pdf/8-04GBMhandout.pdf