

Major Pests of Florida Grapevines and their Management



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Significance of Grape Production

- Grapes are the highest fruits produced by volume in the United States. In 2019, grape production was estimated to be 6.9 million tons.
- Revenue of US\$5.93 billion was generated in 2022 (USDA/Statistica 2023)
- Cultivation of muscadine grapes has become popular due to their:
 1. extraordinary ability to thrive in varied climates
 2. high resistance to diseases
 3. use in a wide variety of delicious food products, and
 4. excellent shady landscaping property



Common Pests of Grapes in North-Central Florida

- Grape Root Borer (*Vitacea polistiformis*)
- Grapevine Aphid (*Aphis illinoisensis*)
- Grape Phylloxera (*Daktulosphaira vitifoliae*)
- Grape Leafhoppers (*Erythroneura* spp. and *Empoasca* spp.)
- Grape Berry Moth (*Endopiza viteana*)
- Mealybugs (*Pseudococcus* spp.)
- Two-spotted Spider Mites (*Tetranychus urticae*)



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Grape Root Borer (GRB) (*Vitacea polistiformis*)

Ecology:

- **Life Cycle:** The GRB has a two-year life cycle. The adult moths emerge from the soil in late spring to early summer.
- **Habitat:** Larvae feed on the roots of grapevines, causing significant damage by girdling the roots, which can kill the vines.
- **Activity:** Adults are active during the day, and females lay eggs at the base of grapevines.



The Damage to Grape Vines

1 Root Damage

Grape root borer larvae burrow into the roots, compromising the plant's ability to absorb water and nutrients.

2 Reduced Vigor

Infested vines exhibit stunted growth, reduced yields, and overall poor vigor, leading to decreased grape production.

3 Susceptibility to Diseases

The damage caused by the grape root borer can make the vines more vulnerable to diseases and other pest infestations.



Monitoring and Scouting Techniques

Regular monitoring and scouting are crucial for early detection of GRB infestations.

This involves inspecting grapevines for signs of damage, adult GRB, or egg masses.

Visual Inspection

Visually inspect grapevines for signs of grape root borer damage, such as wilting leaves, stunted growth, or dieback.

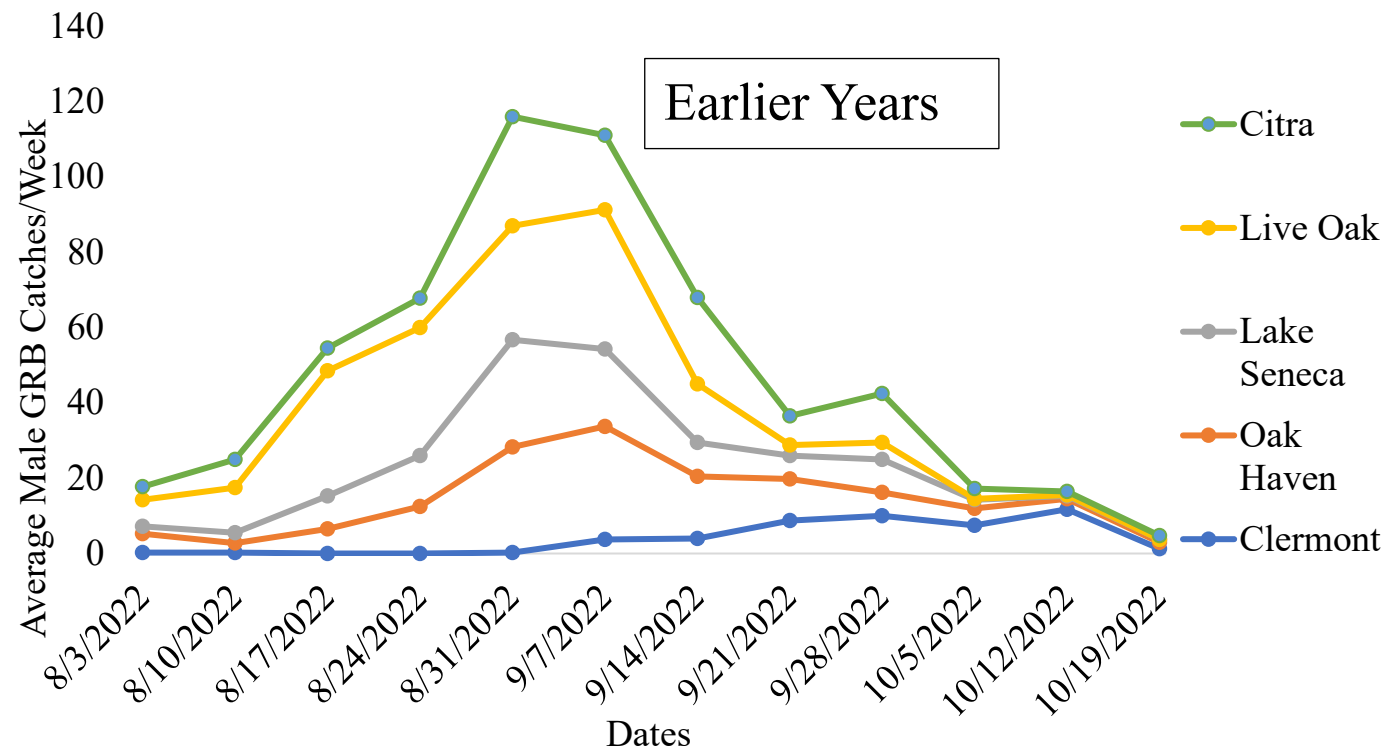
Trap Monitoring

Utilize pheromone traps to attract adult grape root borers, allowing for population monitoring and assessing infestation levels.

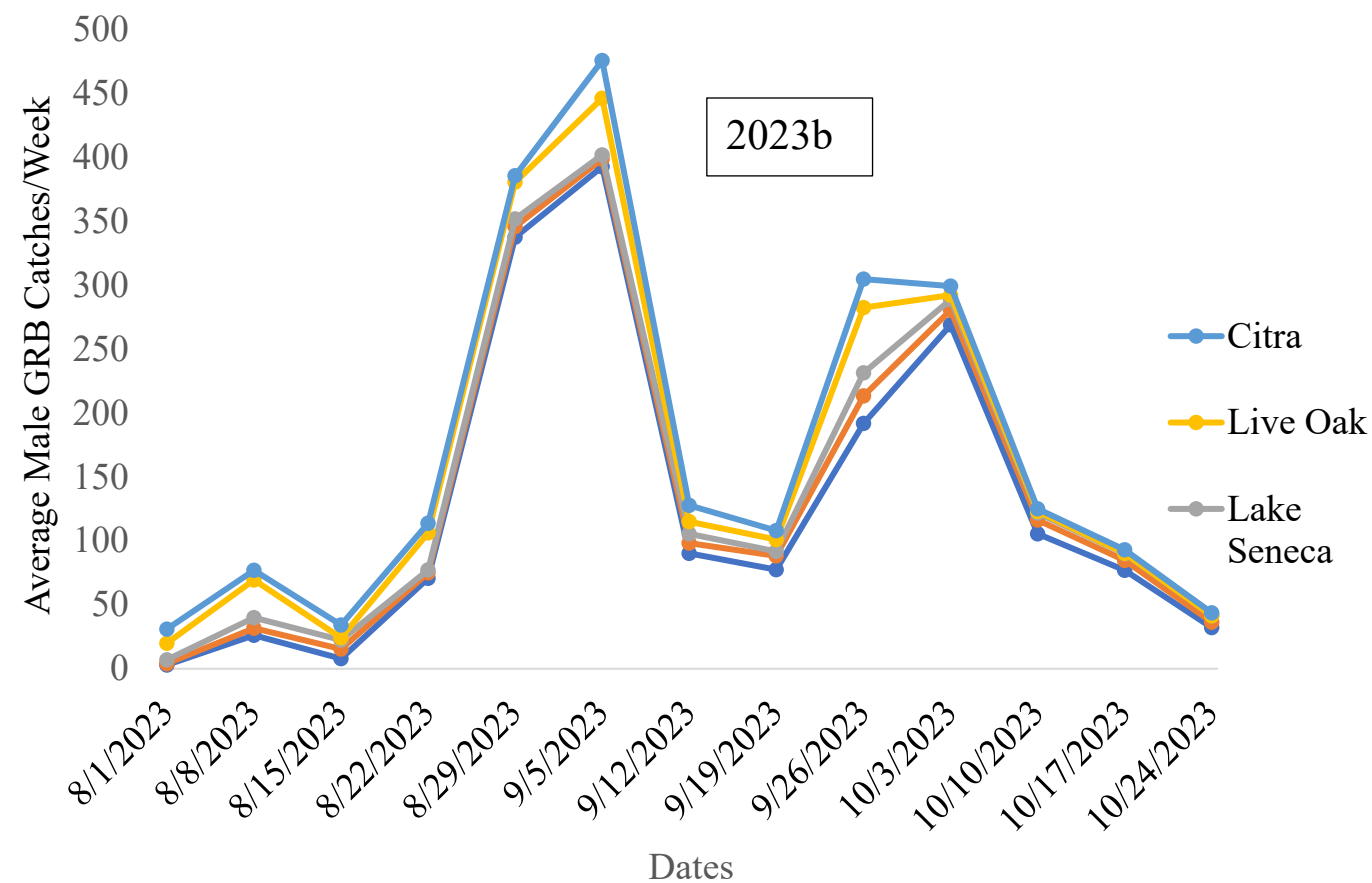
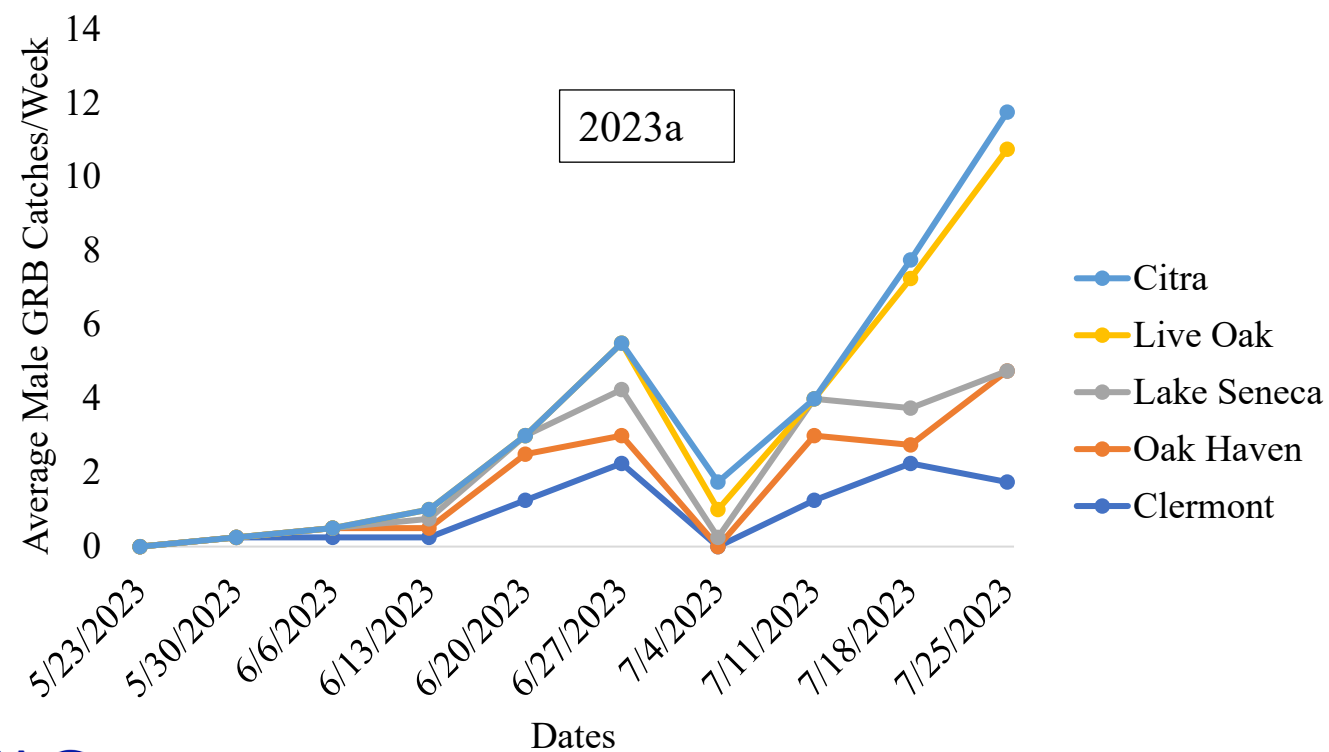
Soil Sampling

Sample the soil around the base of the grapevine to search for grape root borer larvae or pupal chambers.





- Earlier emergence detected
- Shift in population not yet seen



GRB Management

- **Cultural Control:** Remove wild grapevines and other host plants around vineyards. Mound soil around the base of vines to discourage egg-laying.
- **Biological Control:** Utilize natural predators and parasitoids that target the borer larvae.
- **Mating Disruption:** Pheromone twist ties deployed just before adult emergence. E.g. Isomate-GRB
- **Chemical Control:** Apply insecticides to the base of the grapevines during the egg-laying period.



Chemical Control

Concerns with Chlorpyrifos Use

1 Environmental Impacts

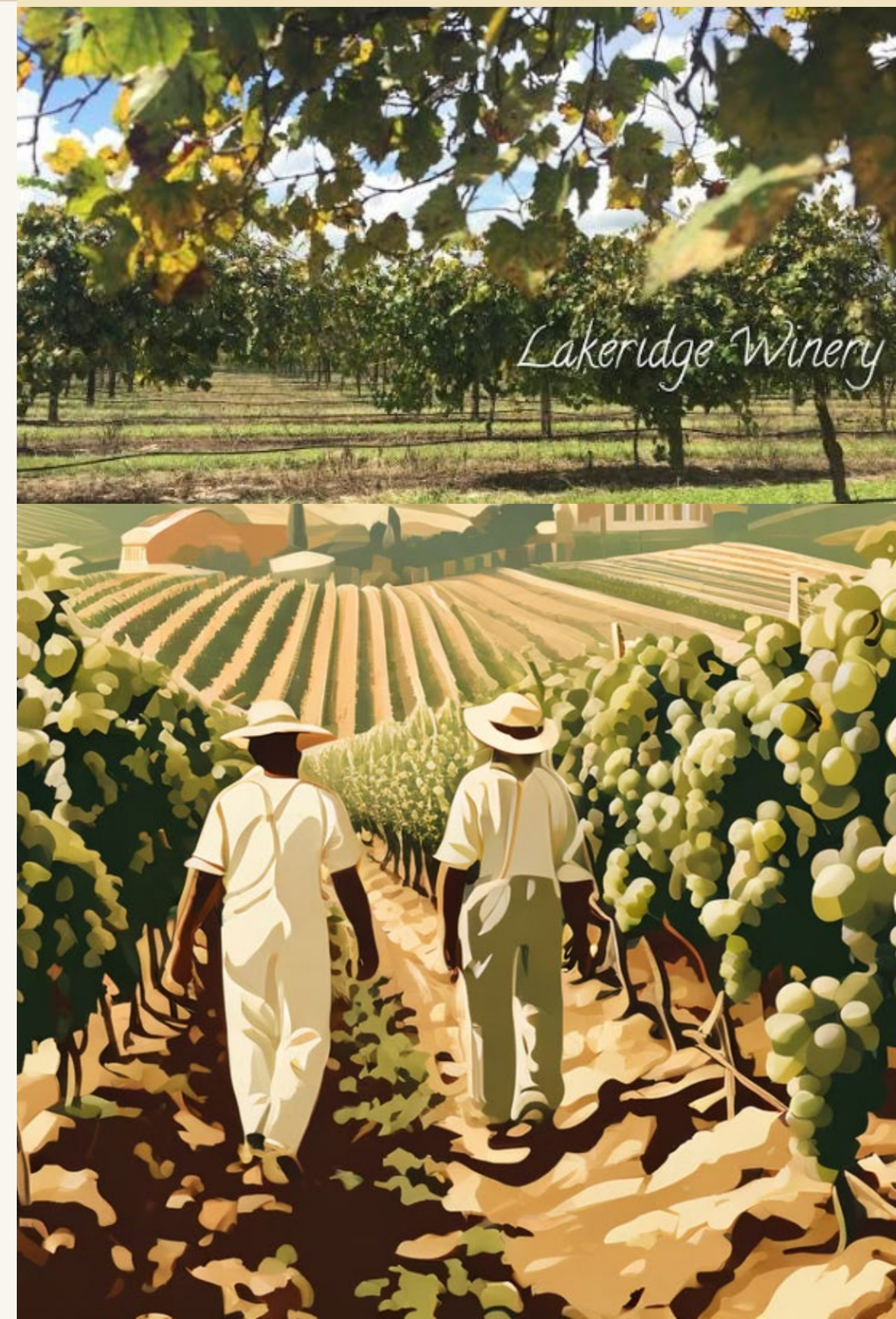
Chlorpyrifos is a widely used organophosphate insecticide with concerns about its potential harm to the environment and non-target organisms.

2 Human Health Risks (Carcinogenic)

There are growing concerns about the potential human health risks associated with the use of Chlorpyrifos, particularly for farmworkers and nearby communities.

3 Regulatory Restrictions (Banned)

Regulatory agencies are increasingly placing restrictions on the use of Chlorpyrifos, necessitating the exploration of alternative management options.



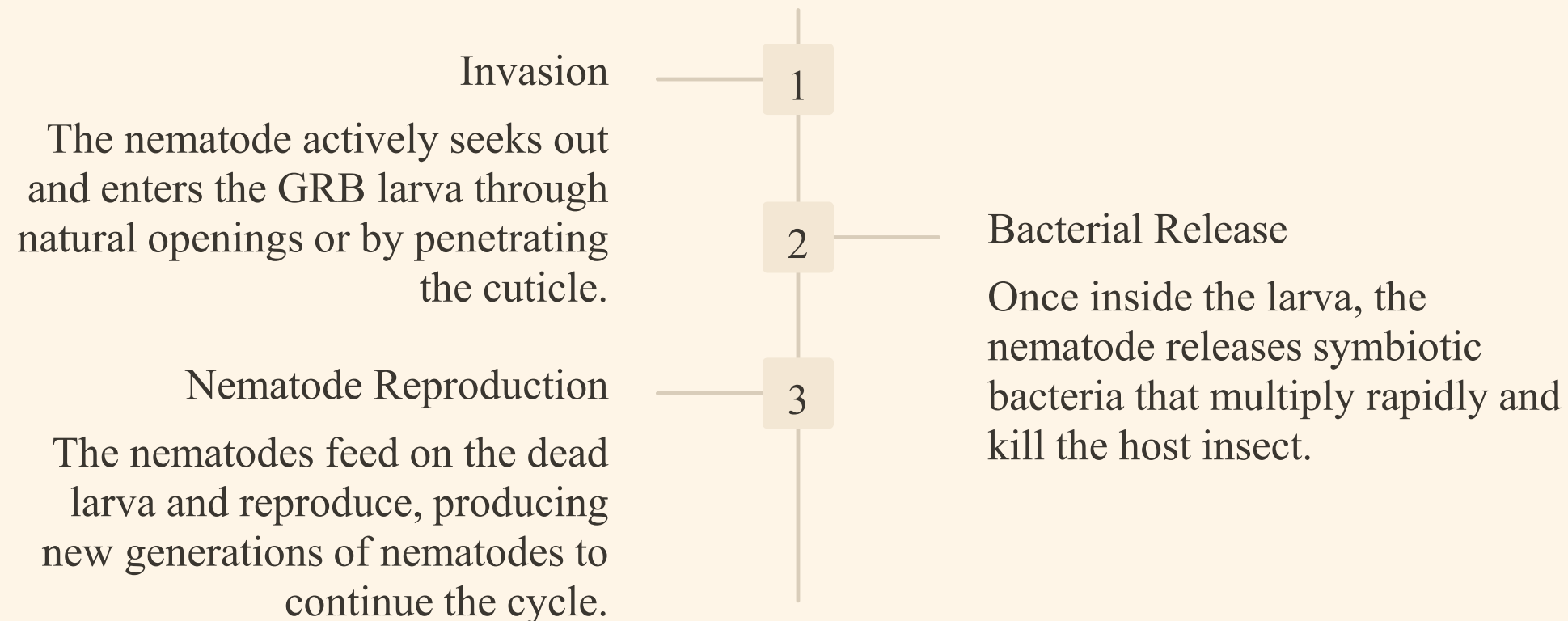
Exploring Alternative Insecticides for Grape Root Borer Management

Treatment	Active Ingredient	Rate
Brigade 2EC	Bifenthrin	6.4 fl oz/A
Assail 70 WP	Acetamiprid	2.3 oz/A
Agri-Mek SC	Abamectin	3.5 fl oz/A
Altacor eVO	Chloranthraniliprole	2.2 fl oz/A
Cormoran*	Acetamiprid + Novaluron	28 fl oz/A
Exirel*	Cyantraniliprole	20.5 fl oz/A





Mechanisms of Action of Entomopathogenic Nematodes





Grapevine Aphid (*Aphis illinoisensis*)

Ecology

Life Cycle

Egg Stage: Grape aphids overwinter as eggs on grapevines. Eggs hatch in early spring (coincide with bud break).

Nymph: Eggs hatch into nymphs after a few weeks.

Adult: Winged or wingless, reproduce asexually

Habitat

Inhabit young leaves, shoots, and stems.
Found in vineyards, home gardens and wild grape hosts

Activity

Feed by piercing and sucking plant sap - causes stunt, weakness, and deformities in leaves and shoots. Honeydew causes sooty mold growth to reduce photosynthesis.
Highest activity from spring through early fall.



Grapevine Aphid (*Aphis illinoisensis*)

Management

1

Identification

Regularly inspect grapevines for aphid presence

2

Monitoring

Use sticky traps and visual inspections to track population levels

3

Cultural Practices

Good air ventilation, avoid excessive nitrogen fertilization to prevent tender growth

4

Biological Control

Natural predators like lady beetles, lacewings, and parasitic wasps

5

Chemical Control

Insecticidal soaps, horticultural oils or systemic insecticides (applied by drenching).



Grape Phylloxera (*Daktulosphaira vitifoliae*)

Ecology:

- **Life Cycle:** Complex life cycle with both root and leaf forms. Root-feeding forms cause the most damage.
- **Habitat:** Prefers grapevine roots, especially susceptible *Vitis vinifera* varieties.
- **Activity:** Active throughout the growing season, causing galls on roots and leaves.



Grape Phylloxera (*Daktulosphaira vitifoliae*)

Management:

- **Cultural Control:** Plant resistant rootstocks such as *Vitis labrusca* or hybrids.
- **Biological Control:** Utilize natural predators where feasible. E.g. EPNs
- **Chemical Control:** Soil insecticide treatments can reduce populations, but are often expensive and less effective.



Leafhoppers (*Erythroneura* spp. and *Empoasca* spp.)

Ecology:

- **Life Cycle:** Several generations per year. Nymphs and adults feed on leaf undersides, causing stippling and reduced photosynthesis.
- **Habitat:** Prefer warm, dry conditions. Overwinter in leaf litter and other debris.
- **Activity:** Active throughout the growing season.



Leafhoppers (*Erythroneura* spp. and *Empoasca* spp.)

Management:

- **Cultural Control:** Maintain proper irrigation and avoid excessive nitrogen fertilization to reduce susceptibility.
- **Biological Control:** Promote beneficial insects such as spiders, lacewings, and parasitic wasps.
- **Chemical Control:** Use systemic insecticides or insecticidal soaps when necessary, targeting nymphs.



Grape Berry Moth (*Endopiza viteana*)

Ecology:

- **Life Cycle:** Multiple generations per year. Larvae feed on grape berries, causing direct damage and providing entry points for pathogens.
- **Habitat:** Prefers forested areas near vineyards. Overwinters as pupae in leaf litter.
- **Activity:** Adults emerge in spring and lay eggs on flowers or berries.



Grape Berry Moth (*Endopiza viteana*)

Management:

- **Cultural Control:** Implement proper sanitation by removing fallen berries and pruning to reduce overwintering sites.
- **Biological Control:** Encourage natural enemies such as parasitic wasps.
- **Chemical Control:** Use insecticides during critical periods based on monitoring with pheromone traps.



Mealybugs (*Pseudococcus* spp.)

Ecology:

- **Life Cycle:** Multiple generations per year. Feed on grapevines by sucking sap, leading to sooty mold growth on honeydew excretions.
- **Habitat:** Found on all parts of the vine, especially hidden areas like under bark.
- **Activity:** Active year-round in Florida's mild climate.



Mealybugs (*Pseudococcus* spp.)

Management:

- **Cultural Control:** Remove infested plant parts and maintain good vineyard hygiene.
- **Biological Control:** Introduce and conserve natural enemies like lady beetles and parasitic wasps.
- **Chemical Control:** Use insecticidal soaps, systemic insecticides and insect growth regulators as needed.



Twospotted Spider Mites (*Tetranychus urticae*)

Ecology:

- **Life Cycle:** Rapid life cycle with multiple generations per year. Feed on undersides of leaves, causing stippling and potential defoliation.
- **Habitat:** Thrive in hot, dry conditions. Overwinter in plant debris and soil.
- **Activity:** Most active during hot, dry periods.



Spider Mites (*Tetranychus urticae*)

Management:

- **Cultural Control:** Maintain adequate irrigation and avoid dusty conditions.
- **Biological Control:** Encourage predatory mites and other natural enemies.
- **Chemical Control:** Use miticides when populations reach damaging levels, rotating chemicals to prevent resistance.



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Integrated Pest Management (IPM)

It aims to minimize the use of synthetic insecticides and reduce the risk of pesticide resistance, protecting the environment and human health.



Monitoring

Regularly monitor grapevines for signs of grape root borer infestation to identify and address problems early.



Cultural Practices

Maintain healthy vines, use appropriate pruning techniques, and keep the vineyard clean to reduce pest pressure.



Biocontrol

Utilize beneficial insects and nematodes to naturally control target pest populations.



Insecticide Application

Use insecticide application methods strategically to target infestive stage of pest and minimize environmental impact.

Conclusion and Future Research Directions

- Climate change is creating challenges for grape production in Florida.
- As the climate gets warmer, pest outcome becomes frequent, and this will require more intensive management.
- Key pests in Florida require strategic and effective management.
- Further research is needed to understand the specific impacts of climate change on pest populations and effective management of damage-causing stages using sustainable methods for a sustainable future.
- More funds needed for research on biocontrol agents.

