BC FoodWeb

BRITISH COLUMBIA WINE GRAPE COUNCIL

Based on a Government Publication

Managing leafhoppers in BC vineyards: Identification, monitoring, and control

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KEY TAKEAWAYS

- Leafhopper management is a balancing act, and understanding how pesticide applications and other control methods affect the presence of each leafhopper species is essential. The 3 main ways to manage leafhoppers are:
  - **1. Routine monitoring and identification:** Use population estimates from yellow sticky cards and field counts to guide targeted, area- and species-specific pesticide applications.
  - **2. Incorporate preventative practices:** Removing leaf litter in the fall and basal leaves in the spring helps significantly reduce early-season leafhopper populations.
  - **3. Limit pesticide applications:** Repeated pesticide use can worsen outbreaks by increasing pest resistance and removing beneficial insects that naturally control leafhoppers and other pests like mealybugs and scale.

Production Type
- Wine grapes

Practice Benefit(s)
- Pest management
- Reduced pesticide inputs
- Grapevine health and yield

Research Location
- Okanagan Valley and Similkameen Valley

Key Terms
- *Nymph:* The immature stage of an insect. Nymphs are usually wingless and do not have functional reproductive organs.
- *Parasitoid:* An animal, often an insect, that relies on another animal (the host) to grow and develop. Unlike a parasite, a parasitoid ultimately kills its host during its development.

Introduction

In the early 2000s, a wine grower in North Penticton noticed unusually high insect numbers that persisted despite repeated pesticide applications. Heavy infestations of leafhoppers result in damaged and dried leaves that fall prematurely, affecting the quality of fruit.

Researchers from Agriculture and Agri-Food Canada later identified the culprit as a new-to-BC species, the Western Grape Leafhopper (WGL). Today, both WGL and the Virginia Creeper Leafhopper (VCL) are established throughout the Okanagan Valley and parts of the Similkameen Valley, although they do not always appear together.

Managing these two species is a balancing act. Methods that suppress one leafhopper can unintentionally boost the other. For instance, pesticides may suppress VCL but can lead to WGL outbreaks because of resistance and the loss of 'beneficials' (predatory and parasitic insects) that normally keep their numbers down.

These beneficials, sometimes called beneficial insects, eat or attack the life stages of pest species and help suppress their numbers.

This factsheet outlines information about leafhopper characteristics and control options to support on-farm pest management.

Identifying Leafhoppers

Both leafhopper species are ~0.5 cm long and are distinguishable by their colour and markings. It is easiest to identify these leafhoppers with yellow sticky cards and a hand lens.

Western Grape Leafhopper (WGL)

WGL nymphs (left) are white with pale eyes and can develop 1-3 pairs of yellow spots as they grow. As adults (right), these leafhoppers have **pale eyes** and **irregular reddish-orange markings on white bodies**.

Virginia Creeper Leafhopper (VCL)

VCL nymphs (left) are pale yellow with dark eyes and can develop dark spots behind the head and on the body. VCL adults (right) have darker eyes and more **defined reddish-brown zigzag patterns on their yellowish bodies**.

Figure 2. Photos by M. Gardiner, AAFC.

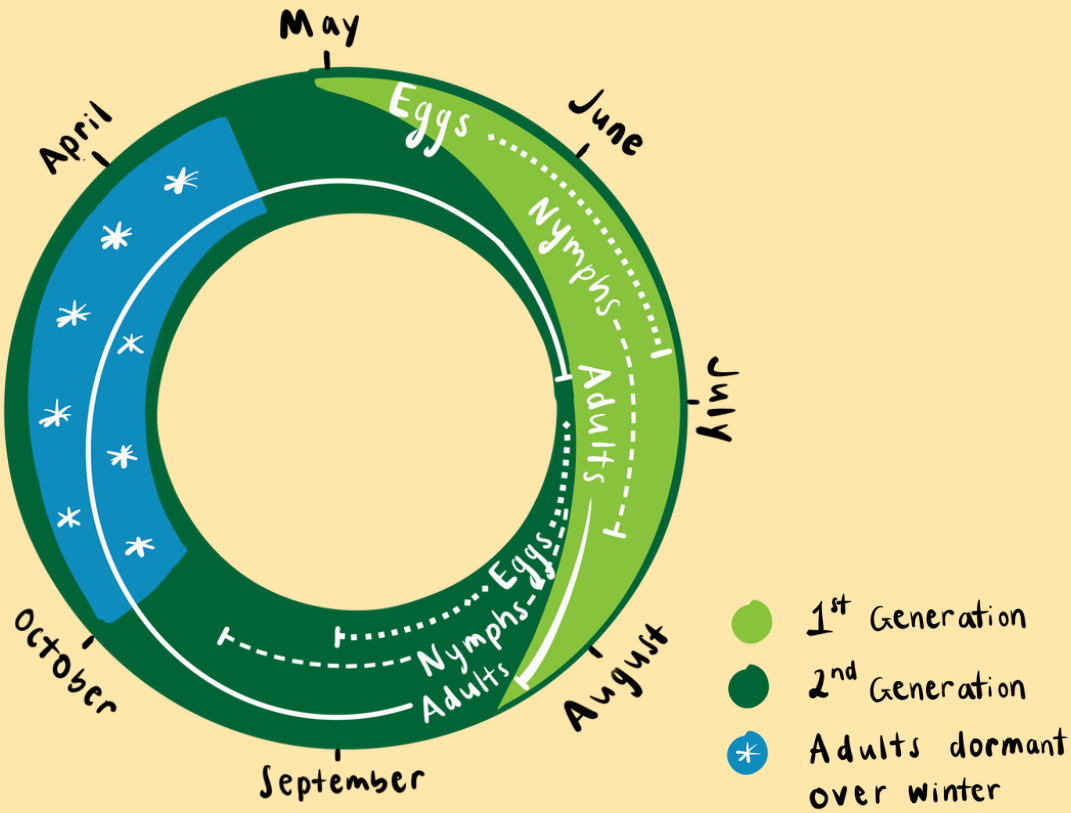
Leafhopper Lifecycle & Monitoring

WGL and VCL have at least two generations per growing season in the Okanagan.

In late April and May, adults emerge from leaf litter and begin feeding on nearby plants, often congregating in higher numbers along the vineyard edges. Yellow sticky cards can help monitor these emerging adults and identify potential reservoirs and entry points, though they provide only relative infestation levels to that specific area.

As grapevines leaf out, adults migrate throughout the vineyard. By late May and June, females lay eggs on the undersides of leaves. WGL lay single eggs, while VCL lay clusters of eggs averaging 2–6. Eggs begin hatching in mid-June to July, forming the first generation. By July and August, these nymphs become winged adults and start producing the second generation.

Leafhopper Lifecycle



Routine monitoring is recommended to identify hotspots for targeted management. **Early to mid-June** is the best time to check for 1st-generation nymphs, and **late July and August** for 2nd-generation nymphs. At each block or variety, select five random locations on the north and east sides where populations concentrate, and count nymphs on 5–10 older leaves. Note that later in the season, nymphs will have moved further into the vineyard and farther up the vine, so sample adequately to generate robust estimates.

Average the number of nymphs per leaf to estimate infestation and determine if control is necessary. No formal action threshold exists for conventional growers for the first generation, but for the second generation, **20–25 nymphs** per leaf is commonly used. Higher action thresholds may be acceptable for the first generation if beneficial insects are abundant. Organic growers will need to take action to control leafhoppers throughout the season.

Plant Damage

Leafhopper nymphs and adults damage grape leaves by sucking out the contents of individual leaf cells. At low numbers, this causes stippling on grape leaves (Figure 3) while heavy feeding leads to browning, drying, and premature leaf drop.

Excessive leaf loss reduces photosynthesis, which can delay fruit maturity, lower yield, and affect fruit quality. High leafhopper populations also leave sticky excrement that is a concern for table grape producers, and large swarms can bother pickers during harvest, making their work more difficult and unpleasant.

Figure 3. Damaged grape leaves from leafhopper feeding. Photo by A. Brauner, AAFC.

Control Options

A note on organic vineyards:
Other than the use of natural pyrethrum sprays, few chemical options exist in organic vineyards, and soaps and oils are less effective than conventional methods. The use of soap or oil can require a high volume of product applied with equipment that is capable of achieving good coverage on the underside of the leaves, like high air speed turbine style spray heads. For this reason, using multiple complementary practices is recommended, along with maintaining a low action threshold.

Biological Control

Supporting **beneficial insects** is one of the **most effective** long-term strategies for managing leafhoppers. Broad-spectrum pesticides can harm predators and parasitoids, such as spiders, earwigs, and parasitoid wasps, that naturally keep leafhopper populations in check.

Parasitoid wasps are particularly important because they attack leafhopper eggs, reducing adult numbers later in the season, while posing no threat to humans. *Anagrus erythroneurae* parasitizes WGL, while *Anagrus daanei* (Figure 4) parasitizes VCL. These wasps are most active in the second half of the season (mid-July to end of August), so avoiding unnecessary sprays during this time helps maintain their populations.

Figure 4. Leafhopper eggs parasitized by *Anagrus daanei* **(left).** *Anagrus daanei* **(right).** Photos by A. Brauner, AAFC, and M. Weis, AAFC.

Growers can further support parasitoids and predators by planting nectar-producing and habitat-providing beneficial plants such as catnip, catmint, roses, apples, or commercial blackberries. These can be planted along vineyard edges and waste areas. Establishing these plants can be costly or labour intensive, especially for larger operations. However, this method reduces the chances of a secondary pest, one that becomes problematic after another pest is suppressed, from causing economic damage and becoming more expensive to manage. It is worth considering the cost of preventative management methods versus the cost of managing outbreaks from secondary pests like scale and mealybug.

Cultural Control

Leafhoppers thrive on excessively vigorous vines, so it is recommended to manage irrigation and fertilization to maintain moderate growth. An effective technique is the use of **yellow sticky tape** placed **below the cordon prior to bud break** (Figure 5). This can help trap adults early in the season, although this method becomes costly in large blocks.

Figure 5. Yellow sticky tape placed below the cordon prior to bud break. Photo by A. Brauner, AAFC.

Another effective cultural practice is **early-season basal leaf removal.** Research from the Summerland Research and Development Centre shows that removing basal leaves around the second or third week of June, when first generation eggs begin to hatch, can reduce leafhopper numbers by up to 70% with only slight impacts on yield and berry size. This approach works best in vigorous vineyards that are not highly susceptible to heat stress or sunburn.

Overall, cultural practices help shift the vineyard environment to be less favourable for leafhoppers while maintaining vine health.

Chemical Control

Adult leafhoppers tend to tolerate insecticides and can be repelled by certain products, making them difficult to control. For this reason, **applying sprays** during the **first generation**, while nymphs are concentrated around the fruiting zone and foliage is sparse, is the most effective approach. Spraying in this narrow zone improves coverage and reduces the need for broad vineyard applications that kill off predatory insects. Vineyards with a **history of heavy infestation** may benefit most from this strategy.

It is also crucial to **identify leafhopper species** present, as some products work on certain species but not others. **Malathion** is registered for leafhopper control in grapes but is ineffective against Western Grape Leafhopper, whereas Virginia Creeper Leafhopper has not developed resistance. Soap and oil-based products, like **Safer's Insecticidal Soap** or **PureSpray Green Spray Oil**, can provide some control for early nymphs and have fewer non-target impacts compared to broad-spectrum options.

Figure 6. Spraying pesticides using a spray gun and hose **(left)** and recapture sprayer **(right)**. Photos by A. Brauner, AAFC.

For a list of registered pest control products, refer to the BC Wine Grape Council's guide at https://bpg.bcwgc.org/crop-protection/pesticides/. Check it regularly for up-to-date information.

What's Next?

Researchers from Agriculture and Agri-Food Canada are studying methods that contribute to a robust leafhopper Integrated Pest Management (IPM) program for BC vineyards, including the effectiveness of oils and new insecticides, as well as feeding deterrents.

About this Brief

This brief was prepared by Nisa Chavez and Juliana Cao from the BC Food Web team, with the help of Andrea Brauner and Tom Lowery, and is based on the following publication:

- Lowery, D.T. (2020). Best Practices Guide for Grape for BC Growers: Chapter 5.3 Insect and mite pests of grape. BC Wine Grape Council & BC Ministry of Agriculture and Food. Retrieved from https://www.grapegrowers.bc.ca/sites/default/files/resource/files/Insect

Want to learn more?

- For any questions regarding this research, contact Andrea Brauner at andrea.brauner@agr.gc.ca or Tom Lowery at tom.lowery@agr.gc.ca.

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