Agriculture and Agri-Food Canada
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Developing a Sustainable Pest Management Program for BC Grapes

As part of the research team conducting studies relating to the sustainable production of high quality wine grapes, entomologists at Agriculture and Agri-Food Canada's Pacific Agri-Food Research Centre (PARC) in Summerland are investigating alternative pest management strategies that contribute to greater sustainability while further enhancing the reputation of BC wines.

A number of insects attack grapes in British Columbia. For example, climbing cutworms feed on developing buds in the spring and leafhoppers damage leaves in the summer. Traditional methods of controlling these pests relied on sprays of highly toxic, broad spectrum insecticides that posed concerns regarding exposure to chemicals. These methods often also caused outbreaks of secondary pests, such as grape mealybug and thrips.

Grapevines severely damaged by leafhoppers.

Getting the big picture on (small) pests

Research was initiated in 1997 and originally included surveys of vineyards and grower questionnaires to determine what species of pests were present, what population densities resulted in damage, and how best to monitor pest numbers and measure damage.

Western grape leafhopper, Erythroneura elegantula, a new grape pest in British Columbia.

Some insects, such as adult click beetles, were previously thought to damage grapes but were shown to be of minor importance. It was also revealed that the European earwig feeds on the eggs of leafhoppers and causes no damage to the shoots or leaves of grapes. A potentially serious pest, the western grape leafhopper, *Erythroneura elegantula*, was found for the first time in Canada. As this species is more resistant to insecticides than the closely related Virginia creeper leafhopper, *E. ziczac*, surveys were required to determine its distribution, and insecticides had to be evaluated for its control.

Insects that damage grapes have to be present in sufficiently high numbers to justify the expense of using controls. Establishing baselines for economic injury levels and developing techniques to accurately monitor grape pests has helped reduce the number of insecticide applications.

Research being conducted at PARC also includes the production of temperature-based developmental models for leafhoppers and the use of female sex attractants, known as pheromones, to monitor adult cutworms.

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Reduced-risk insecticides

Researchers at PARC use laboratory bioassays and field assessments to evaluate the suitability of new reduced-risk insecticides that are less toxic and more selective in action. Botanical insecticides derived from the Indian neem tree, for example, are less damaging to non-target organisms and degrade rapidly in the environment.

Materials that provide only partial protection are often useful when used in combination with other strategies and as long as pest numbers can be kept sufficiently low. Insecticides are evaluated not only for their activity against the target pests, but also for their effects on beneficial insects and suitability for inclusion in an integrated pest management (IPM) program.

Researchers at PARC-Summerland are experts in the development of alternative methods to control pests of tree fruits and grapes. Some of these methods include the use of synthetic female sex pheromones to disrupt mating, the sterile insect release program (SIR), and the use of biological control agents. The latter includes beneficial insects and diseases specific to the insect pests.

Non-chemical controls

Non-chemical methods to manage grape pests reduce the reliance on chemical sprays. Previous research has shown that yellow sticky tape applied below the vine cordon in spring can reduce leafhopper numbers by 95%. Although costly to purchase and apply, this technique is useful for small areas and vineyard edges where large numbers of leafhoppers congregate for the winter. In spring, these overwintered females deposit their eggs on the lower leaves around the fruiting zone. Research conducted at PARC has demonstrated that removal of these leaves early in the season reduces leafhopper numbers significantly and also lowers the incidence of bunch rot and other grape diseases.

Balanced vine nutrition can also help reduce damage from pests and diseases. Excessive vigour results in a dense canopy that promotes the growth of leafhoppers and diseases such as bunch rot and powdery mildew, while undernourished vines are less able to tolerate damage and are more prone to hard scale, wood boring insects, and trunk diseases. In collaboration with researchers studying vine physiology, research is being conducted to evaluate the effects of different levels of nitrogen nutrition and irrigation on pest populations.

Groundcover vegetation influences not only vine growth, but also numbers of pests and beneficial insects. Increased plant diversity and inclusion of flowering plants is known to increase numbers of predators and parasites that help control pest populations. Research has shown that winter annual mustards, such as whitlow grass, growing in the vine row effectively controls climbing cutworm. Laboratory and field studies will help determine how these mustards reduce cutworm damage and suggest how best to cultivate these beneficial plant species. Increased diversity and possible use of native, drought resistant species will also contribute to greater environmental sustainability.

Previous work at PARC showed that species of small parasitic wasps that develop in the eggs of leafhoppers are the most important natural control agents for these pests of grapes. Research indicated that the distribution and numbers of western grape leafhoppers are regulated by *Anagrus erythroneurae*, while due largely to a small number of suitable overwintering hosts, *Anagrus daanei* is unable to provide adequate control of the Virginia creeper leafhopper. A third species of parasite that attacks the eggs of both leafhopper species could be considered for importation. Methods to enhance the activity of these and other beneficial insects, and the possible use of parasitic nematodes and naturally occurring insect diseases is an important component of a sustainable management program for the control of grape pests.

Pest Management Programs at PARC include collaborations with international Scientists as well as AAFC researchers at other Centres across Canada. Much of the research is conducted in commercial vineyards or orchards, and is supported by industry groups such as the BC Wine Grape Council.

To learn more about research conducted by AAFC scientists, please visit www.agr.gc.ca/scienceandinnovation.

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