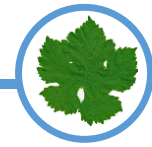


# Summerland Research & Development Centre

## *Wine Grape Research*



## Horticultural Oils for Grape Pest Management

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**Disclaimer:** the author and AAFC do not recommend or support the use of any of the materials mentioned in this article. It is the responsibility of the end-user to verify registrations and observe recommended usage and cautions.

### INTRODUCTION

On a personal note, my experience with horticultural oils began in 1985 with work at the AAFC Research Centre in Fredericton, NB, on aphid-borne virus diseases of potato. Spray oils have changed considerably and it seems an appropriate time to discuss the utility of horticultural oils, also known as plant spray oils (PSO), and how they can contribute to an integrated pest management program for grapes. There is resurgent interest in oils due to the availability of highly refined products, their multiple uses, demonstrated effectiveness, and competitive cost. They can be used to help control the spread of certain plant viruses and also used as adjuvants, surfactants, insecticides, or fungicides. The reader is referred to the website 'Horticultural Spray Oils' (Pscheidt 2021, adapted from Walsh et al. 2000), Pacific Northwest Pest Management Handbooks, for information on the properties of petroleum spray oils. Broadly speaking there are three types: refined lightweight mineral oils (petroleum oils) used mainly as dormant sprays to woody perennial crops; highly refined narrow range mineral oils (HROs) that can be applied as dormant or summer (foliar) sprays; and formulated plant oils (POs) used mostly as adjuvants or as summer sprays. Referring to their ability to interfere with the transmission of non-persistent plant viruses that are carried on the mouthparts (stylets) of aphids, Stylet Oils are also HROs. Three horticultural oils are currently registered for use on grapes in BC for specified uses: SuffOil-X<sup>®</sup>, PureSpray Green 13E<sup>®</sup>, and Vegol Crop Oil<sup>®</sup>. For registered uses and restrictions, please refer to the labels and to 'Pest Control Products Recommended for Use on Grapes in British Columbia', at: [https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/agriculture-and-seafood/animal-and-crops/plant-health/grape\\_pesticides.pdf](https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/agriculture-and-seafood/animal-and-crops/plant-health/grape_pesticides.pdf).

### OILS AS FUNGICIDES

Horticultural mineral oils denature powdery mildew mycelia growing on the outside of the grape tissues. They can be effective stand-alone fungicides or be used in alternation with demethylation inhibitor fungicides (DMIs) and strobilurin fungicides. Exclusive use of oils does not provide the same level of protection against powdery mildew as do synthetic fungicides and repeated use might reduce photosynthetic activity and delay ripening. Oils provide only a moderate level of protection for about four days, but they reportedly have excellent pre- and post-lesion curative action and anti-sporulant activity and HROs might be a good recovery option when a mildew problem is out of control (Pscheidt 2021).

PureSpray Green, Suffoil-X, and Vegol at spray concentrations of 1%, 1.3% and 2%, respectively, are registered in Canada for the management of grape powdery mildew. Consult the individual product labels for recommended use patterns - timing, spray intervals, and number of applications. As for mite and insect control, effective management of powdery mildew requires that oils are applied in high volume sprays using appropriate equipment to provide thorough coverage.

### OILS AS ADJUVANTS

Plant and mineral oils are sometimes included as formulation adjuvants in commercial pesticides, particularly for organic materials. Although pesticides are formulated with adjuvants, the addition of a low rate of oil, commonly 0.25% to 0.5%, to the tank mixture as a spray adjuvant, has been shown to enhance the effectiveness of certain materials. Activator adjuvants reduce surface tension and increase absorption into the leaf. Caution must be taken, however, to ensure compatibility of the oils with the pesticide and to prevent any possible phytotoxic effects. The PureSpray Green label states that the oil **should not be mixed with sulphur or sulphur-containing products** (i.e. Captan®, Folpet®) and to ensure that spray equipment is free of sulphur before use. Carefully read the product labels for the names of other pesticides that could result in phytotoxicity when used in a spray program with oils.

### DORMANT OIL SPRAYS

Petroleum spray oils have been used on dormant woody ornamentals and tree fruits for the control of mites, scale, and other wintering pests and diseases since the late 1800's. In comparison to other regions, widespread use of oils on grapes in BC has lagged until recently. The 1976 Spray Guide for Grapes in Eastern Washington (WSU-CES), for example, included Dormant Oil® (8-12 gpa) or Superior Oil® (4-6 gpa) as dilute sprays for the control of Cottony maple scale (now known to be Cottony vine scale) and European fruit lecanium scale. For mealybug, the recommendation included addition of an insecticide to the oil as a late (delayed) dormant spray.

“Direct spray to trunk and main laterals. Use 200-300 pounds pressure with hand gun application. Apply in 300-600 gallons of water per acre.”  
1976 WSU Spray Guide

The 2021 Pest Management Guide for Wine Grapes in Oregon (P. Skinkis) includes recommendations for dormant sprays of 1-2% JMS Stylet Oil® or Superior-type mineral oils for the control of mealybug, scale and other pests, and the same rates of JMS Stylet Oil for wintering rust and bud mite. For BC growers, Vegol is currently approved for use as a dormant spray for the control of mealybug, scale, and mites. The BC grape industry would benefit from additional registered uses for dormant and summer applications of oils.

The caustic material lime sulphur (calcium polysulfide) applied as a dormant spray for the control of pests and diseases has been used as an alternative to oil for a considerable number of years. As outlined in the article ‘Lime sulfur sprays can improve spring disease control’ (M. Longstroth, MSU), co-applications of oil with lime sulphur as a dormant spray before any green tissue is present is effective against black rot, powdery mildew and phomopsis on grape. Oil helps sulphur penetrate the surface of the infected plant tissues, increasing effectiveness. Lime Sulphur as an insecticide, miticide and fungicide includes grapes on the Canadian label (United Agri-Food Canada Ltd.). For fungus and mite problems, the combination of dormant oil and lime sulphur is stated to be “an excellent clean up spray for dormant fruit trees”.

Management of powdery mildew is the only listing for lime sulphur on grapes and there is a cautionary note that UAP assumes no liability when it is used for that purpose.

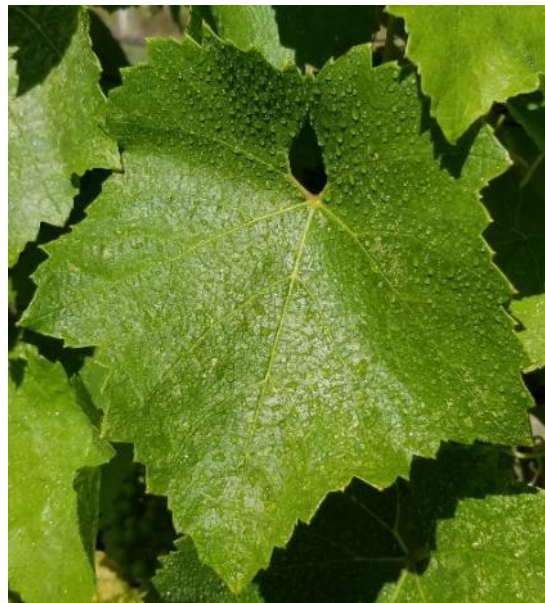
For dormant sprays to be effective, oils need to make direct contact with the pest or disease organism. Soaking sprays need to be directed to the trunk and cordon with volumes adjusted to the age of the vine and amount of loose bark. Late dormant oil sprays can be more effective for certain grape pests, but greater caution is required to avoid possible damage to developing buds. Sprays should not be applied within two weeks of bud break. It won't be discussed here, but oil has been used to delay bud break in attempts to avoid spring frosts. Apply dormant oils when there is no risk of rain or freezing temperatures for at least 24 hrs.

A review of the literature and labels for oils with properties (98% or 99% mineral oil) similar to those registered in Canada shows dormant spray concentrations most often ranging between 1% and 3% and dilute spray volumes from 935 L/ha to 5,612 L/ha. **The Canadian label for Vegol (96% formulated canola oil) is for a 2% oil spray concentration applied in a dilute spray volume of 700 to 1,900 L/ha.**

### FOLIAR OIL SPRAYS

The direct toxic effect of oils to all stages of insects, including eggs, results mostly from suffocation. To achieve effective pest suppression oils need to be applied in high spray volumes using appropriate spray equipment. In the case of leafhoppers and mildew, choice of spray pressure and nozzle type and direction can improve coverage of the bottom leaf surface. Medium to coarse droplet sizes applied using 200-300 pounds spray pressure is recommended. Oils can be applied using airblast or high pressure hydraulic sprayers, or small areas can be treated using a hand gun or backpack sprayer. Specialty spray equipment with air-assisted directional nozzles will improve coverage and efficacy. Our recent field spray trials with oils against leafhopper nymphs showed a tower sprayer to be nearly as effective as the air-assisted sprayer. Timing of oil sprays is also important as they provide little prophylactic protection and are best used against smaller, earlier growth stages of insects that are more susceptible to suffocation. For BC growers, the differing spray concentrations, spray volumes, and uses among the three registered oils provides possibilities for suppression of leafhoppers, grape phylloxera, mealybug, spider mites, erineum mite, scale, and powdery mildew. An effective level of control will likely require more than one application. Suffoil-X and PureSpray Green can be used up to eight times per season; Vegol up to four times.

Additional research is required to evaluate summer oils for the control of other grape pests and to determine methods to optimize effectiveness and prevent possible phytotoxicity. To this end, oils are currently being evaluated for efficacy against leafhoppers and scale insects in projects funded by AAFC and the CGCN (GF2 projects #2 and #17). Results from three separate field spray trials\* conducted in collaboration with Dave Nield (SuRDC Minor Use Program) and Hans Buchler (Parkhill



Oil spray covering the upper leaf surface – thorough coverage of the lower leaf surface is important for the effective control of most vineyard pests.

Vineyard) using different spray equipment (hand-gun, tower, air-assisted) consistently showed 2% Vegol to be more effective than 1% PureSpray, with the best control (81% reduction) achieved with Vegol applied using an air-assisted sprayer. In addition to additional efficacy spray trials, plans for the next phase of research on PSOs (CGCN and AAFC GF3) for the management of grape pests also includes studies of possible effects of oils on vine physiology and fruit maturation that will be led by SuRDC's new Viticulturist Dr. Ben-Minn Chang.

### CAUTIONARY NOTES

Improvements in oil refinement technology have resulted in HROs that are safer to use during the growing season when the weather is warmer. HROs and POs as summer sprays offer sustainable approaches for the management of several grape pests, but they must be used with some caution. Due to a limited amount of experience with summer oils, growers might first want to experiment with reduced spray rates and volumes until confidence is gained on the use of these products. **Observe all cautions outlined on the product labels.**

Oils should not be used during the growing season within 14 days prior to or following sprays of a fungicide containing sulphur (e.g. Captan®) as the active ingredient. Grape cultivars differ in their tolerance and it is suggested that oils should first be evaluated on a small number of vines of a particular cultivar. It is advisable not to apply oil to drought-stressed vines and to avoid applications when the temperature exceeds ~32° C (90° F). Oil should not be applied to table grapes within 14 days of harvest as it will reduce the waxy bloom on the fruit.

### TIMING OF OIL SPRAYS

Finding suitable times to apply oils during the growing season can sometimes prove difficult. Sulphur-containing fungicides need to be avoided, temperatures should not be too high, and oils should not be applied to grapevines stressed by drought or heat. Fungicides such as Kumulus® that contain sulphur as the active ingredient are advised for the control of grape leaf rust mite beginning at woolly bud stage and are commonly followed by additional early season applications for the management of powdery mildew. Other than dormant sprays, the first and most critical window for applying oils is for the control of first generation leafhopper nymphs and scale crawlers post-bloom. As temperatures vary between years and vineyard locations, populations would ideally be monitored and the first of two oil sprays applied when most eggs had hatched. Oils have minimal effect on winged adults. Assuming earlier fungicide applications had been effective, oils should also suppress the growth of mildew over this time period, or a compatible fungicide could be co-applied with the oil. The second window for use should be for the control of



Photo credit: H. Buchler



leafhopper nymphs of the second generation – sometime around mid-August. Spray schedules would need to be adjusted if the primary target was mites, thrips, or scale and mealybug crawlers.

### CONCLUSION

The availability of several oil products to BC grape growers offers the opportunity to manage certain pests in a more sustainable manner. The utility of oils allows their use as spray additives or fungicides, or they can be applied as dormant or summer sprays for the management of various grape pests. Thorough coverage of the lower leaf surface is critical for the effective management of pests and diseases, while some care is required to avoid possible damage when oils are applied too near to sprays of sulphur-containing materials. With experience and additional research to support and expand registrations, horticultural oils are poised to assume a greater role in grape pest management in the future.



Photo credit: A. Brauner, AAFC. Virginia creeper leafhopper nymphs.



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