

Season-Long Use of Horticultural Oil on Vinifera Grapevines Statement of Work

The Long Island grape industry focuses on the production of premium vinifera winegrapes such as Chardonnay and Merlot. Due to growing-season rainfall and inherent susceptibility, vinifera varieties must be treated with prophylactic fungicides season long. For both philosophical and environmental reasons, growers are interested in using less toxic methods. Avoiding contamination of Long Island's sole source aquifer with both pesticides and nitrates remains the most significant challenge for agriculture.

The management of grape insects and diseases can be achieved utilizing a number of low impact techniques. The majority of businesses use recycling sprayers which provide improved deposition as well as tremendous reductions in pesticide use. Growers routinely use a number of reduced risk and organic pesticides. Horticultural oils are important for both residual and postinfection control of powdery mildew. Oil offers a lot of advantages including the availability of organic formulations, a short reentry and no preharvest interval. Compared to sulfur (it is often substituted for sulfur in the spray schedule), it is also less irritating to workers. Disadvantages include phytotoxicity risk due to incompatibility with other pesticides and the need to avoid application during hot weather. Several studies have also found a reduction in sugar accumulation at harvest following summer use of oils due to reduced photosynthesis by leaves [1]. For this reason, in vineyards, oil is most commonly used in a tank mix with mancozeb prebloom only.

In three of the last four years, we have conducted experiments in our research vineyard with the organic formulation of JMS Stylet Oil to address specific industry concerns. In 2003, in order to address winemaker concerns about sulfur residues, we compared oil, Serenade and sulfur application for the last two sprays of the season. Both oil and sulfur provided good control of powdery mildew (PM). In 2005 and 2006, we evaluated season-long use of oil due to interest in organic practices despite concerns about ripening. In both years, oil treated vines were compared to vines sprayed according to a conventional sulfur-based schedule. Results in both years verified found in other studies – Brix (sugar) is reduced by summer use [2, 3]. Furthermore, in both years, after cessation of fungicide sprays for the season, we saw an unexpected result. The canopy of oil-treated vines succumbed to powdery and downy mildew (DM) at an accelerated rate compared to conventional schedule. It is uncommon to have such significant powdery and downy infections present simultaneously.

It is important to clearly understand this late season phenomenon. We have examined our application techniques, rates, etc. with no obvious gaps. It is possible that the loss of efficacy could be due to either the low rate (1% used in 06 vs. more commonly used 1.5%) or early cessation of sprays (late August, one month prior to harvest). Equally, if not more, puzzling is the widespread downy mildew in oil plots. Due to the frequent rainfall in 2006, DM was present at low levels throughout the summer and fall. The oil and conventional plots received exactly the same DM treatments, mancozeb then after fruit set, then phosphonate. However, after cessation of sprays, the oil plots quickly developed severe DM, leading to early defoliation. Combined with poor PM control, this phenomenon leads us to question whether the increased disease in season-long oil plots was the result of damage to the leaves' waxy cuticle by the oil. Oils are known to increase absorption of pesticides and fertilizers into leaves, suggesting an altering of cuticle structure [4].

We propose to conduct a trial with replicated plots to examine if season-long horticultural oil is detrimental to the leaf cuticle, rendering the leaf more susceptible to infection and whether late PM infection is related to early cessation of sprays or is more rate dependent. This experiment would take place in Chardonnay at LIHREC, a block which is highly susceptible to PM. Treatments will be replicated on four times in a randomized complete block design, four vines per plot. All vines will receive the same fungicides for black rot, Phomopsis and downy mildew. An estimated 9-12 fungicide tank mixes will be applied through the course of the season. Vineyard management will otherwise be identical among all treatments.

Trt	Sprays	Termination of fungicides
1	Conventional (sulfur)	Late August
2	Oil 1%	Late August
3	Oil 1.5%	Late August
4	Oil 1%	Oil until end Sept.; terminate DM control late Aug.

Data to be collected will include rating of plots for disease in late September. For both PM and DM, we will evaluate ≥ 5 shoots per panel, 5 leaves per shoot for % infection per leaf. In order to gauge the effect of oil on cuticle development, samples will be sent 2-3x during the season from treatments 1, 2, 3. Cuticle thickness and leaf anatomical features will be determined by a protocol established by Dr. Martin Goffinet, Cornell University NYSAES, Geneva. Methodology involves embedding leaf cross sections in wax, sectioning and mounting on slides, staining then taking measurement data under a 1000X oil emersion lens. This project has been conceived and designed with the input of Dr. Wayne Wilcox, Geneva. The travel budget will facilitate one trip by Wilcox to help evaluate plots. JMS Flower Farms has agreed to provide additional support for this project.

We aim to establish the feasibility of oil for season long powdery mildew control. This is of great interest to growers interested in organic techniques. We will further address the issue of fruit quality in a related project. It is absolutely essential to have a healthy preharvest canopy to maximize fruit ripeness, the holy grail of winegrape growers. We will be able to determine the impact of repeated oil application on cuticle development, if control of late season PM is enough to keep DM in check, and if loss of PM control is related to rate of oil. This work will lay the foundation for future work to fully understand strategies for the use of horticultural oil in winegrape vineyards.

- 1 Finger, SA, Wolf, TK, Baudoin, AB. 2002. Effects of Horticultural Oils on the Photosynthesis, Fruit Maturity, and Crop Yield of Winegrapes. *Amer.J.Enol.Vit.* 53:116-124.
- 2, 3 Wise, AV and Tarleton, EC. LIHREC Annual Reports, 2005 and 2006 (pending).
- 4 Bondada, BR, Sams, CE, Deyton, DE. 199. Oil emulsions enhance transcuticular movement of captan into apple leaves. 96th Int'l Conf. of the Amer. Soc. For Hort.Sci. *HortScience* 34 (3): 485 (Abstr.)