



“An evaluation of biological and abiotic controls for grapevine powdery mildew. 2. Vineyard trials”

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In a previous paper, the authors found that *Bacillus subtilis*, whey, milk, potassium bicarbonate and canola oil were able to reduce powdery mildew infection in the *greenhouse*. In this paper they test these and other products in the *vineyard*.

- I wish I could say that, because we are already familiar with the materials & the methods, we are jumping right into the results. But the authors conduct, once again, not one but 3 experiments: 1) In the first experiment (2000-2001 season), they evaluate the products that showed encouraging results in the greenhouse, at the same concentrations. 2) In the second experiment (2001-2002 season), their effort is to use materials available to everyone (replace the *B. subtilis* strain with one commercially available, and include two new materials, a methionine-riboflavin mix and a fungicide, both commercially available). 3) In a final experiment (2002-2003 season), the emphasis is twofold: to test whether surfactants improve the efficiency of the materials tested, and to determine how the quality of the treated grapes compares with the untreated ones. (See *Table 1* of original text for a complete list of materials tested in each experiment).
- The authors tested the materials in 2 vineyard sites: Vineyard 1 and Vineyard 2 (but not all materials were tested at both sites). Vineyard 1, located south of Adelaide, consists of a mature Verdelho and a 1-yr-old Syrah. The canopies in this vineyard were thin (<30cm) and open, particularly that of the young Syrah. Vineyard 2, north of Adelaide, is a mature Chardonnay field. The canopies here were thick (>1 m). When interpreting the results, we can think of Vineyard 1 as the “weak vineyard”, and Vineyard 2 as the “vigorous vineyard”.
- Test materials were applied every 10-14 days from early October to late December (our April through June). The application equipment also varied for both vineyards. Vineyard 1 was treated with a pressurized spray-pack with a hand-held wand. Vineyard 2 required a tractor-drawn air-blast sprayer. Spray volumes in both cases ranged from 300 L/ha, for the first applications, to 1000 L/ha, as the canopy matured.
- Disease severity for each of the materials tested was evaluated monthly by assessing 10 random leaves from each of the 6 vines in the center of the each plot. At the end, all bunches were also removed from the data vines and sorted into “acceptable” (<=5% mildew) or “unacceptable” (>5% mildew).
- **Results.** I will report the main findings for all experiments combined. 1) Milk and whey were more effective than *B. subtilis* in controlling powdery mildew in the field, and equally effective between them. Their effectiveness was similar to that of the commercial fungicide “*Topas*” (Vineyard 1). 2) Whey + canola oil (Synetrol Horti-Oil) were significantly more effective than canola oil alone (Vineyard 1). 3) Fixed programs alternating compounds (please refer to text table for details) were equally as effective as the whey, milk or sulfur, and less effective than canola oil and potassium bicarbonate (Vineyard 2).

- 4) What happened in Vineyard 2 three seasons in a row was truly revealing. None of the products tested was able to control powdery mildew in this vigorous vineyard. In fact, the trials were abandoned half way through the season, and the treatments replaced with wettable sulfur at 4g/L to save the crop (this was, after all, a commercial vineyard).

- **Yield and quality.** Vines treated with any of the new materials had significantly more yield (12.5 kg/vine on average) than untreated vines (9.3 kg/v). The sulfur treatment had the highest yield (15.2 kg/v). All of the materials significantly increased the amount of “acceptable yield” (<5% powdery mildew) compared to the untreated controls, particularly sulfur and whey (87% of the Verdelho crop in Vineyard 1 was acceptable for winery standards when treated with sulfur; 76% was acceptable when treated with whey; and without treatment only 40% was acceptable).

- In view of the results, the authors leave us with some words of wisdom:

- *Bacillus subtilis*: Very effective in the greenhouse, but did not perform as well in the field, despite adequate coverage. Authors believe environmental factors (mainly temperature and humidity) may play a role, or alternatively, the bacteria was unable to compete with other organisms that had already colonized the leaves.

- *Canola oils*: Have been associated with reduced yields, and with leaf burn when applied in full sun or above 30°C. Phytotoxicity has also been associated with high rates (8 L/ha), but the authors found no problems at the rates used in the study (1.8 L of oil per hectare).

- *Coverage*: the authors emphasize that all of these products depend on good coverage (they are “*contact fungicides*”). The authors believe poor coverage was the main reason why materials failed in Vineyard 2. When they placed water-sensitive paper inside the canopy, they were able to confirm that only 10% of internal leaves and bunches had been covered.

- *Variety*: the authors believe the greater susceptibility to powdery mildew in Chardonnay, compared to Verdelho, played a role. To them, this emphasizes the need for a fully integrated approach to the fight against powdery mildew, one that includes vigor management. They also recommend that, when planting new vineyards for organic production, to use a trellis that keeps the canopy open and limits the vine size.

- *Location, location*: Even though milk and whey were successful in controlling powdery mildew in Syrah and Verdelho in vineyards around Adelaide, we need to assess a range of vineyard locations, particularly those with greater rainfall, higher humidity, and lower light intensity.

The authors conclude that all of the new materials tested controlled powdery mildew to some degree, and milk and whey did so to levels similar to sulfur and “*Topas*”. Powdery mildew did develop with these materials only when coverage was compromised. At the time of publication, wines made from grapes sprayed with milk or whey did not show flaws or taints. I will quote the authors to end: “With further research in progress to optimize spray schedules, and to assess the effects on wine quality and on grapevine microorganisms and arthropod communities, these novel materials have potential to become part of powdery mildew control programs in both organic and chemically-assisted viticulture”.

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