

# Testing Whey as an Effective Control for Powdery Mildew

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## Introduction

- Effects of powdery mildew infection in vineyards:
  - Crop loss
  - Reduced yields
  - Economic loss
  - Quality control

## Introduction

- Variety of products available to growers
    - Ex: Kaligreen, Stylet Oil, Sulfur, Rally etc.
- Organic alternatives are also available for use
- Ex: compost teas, vegetable and mineral oils

## Introduction

### Sulfur

#### Pros:

- Excellent control
- History of use
- Currently registered organic

#### Cons:

- Lbs. used in CA
- Worker safety
- Effect on natural enemies

## Introduction

- Why whey powder as an alternative?
  - Dairy industry by-product from cheese and butter processing
  - Cost of disposal to dairy industry
  - Sustainable product if put to use in vineyards
    - The “green” triangle: Environmental, social and economically sound.

## Introduction

- History of using whey to control powdery mildew
  - Bettiol, Brazil (1997) tests on cucumbers
  - Peter Crisp, Australia (2001) tests on grapes

## Key Question

- Can whey be an effective control against powdery mildew in high pressure climates?

## Methodology

Vines

Row 11	Row 10	Row 9	Row 8	Row 7	Row 6
Buffer	White	Red	Blue	Yellow	Buffer
Buffer	White	Red	Blue	Yellow	Buffer
Buffer	White	Red	Blue	Yellow	Buffer
Buffer	White	Red	Blue	Yellow	Buffer
Buffer	White	Red	Blue	Yellow	Buffer
Buffer	Yellow	Blue	White	Red	Buffer
Buffer	Yellow	Blue	White	Red	Buffer
Buffer	Yellow	Blue	White	Red	Buffer
Buffer	Yellow	Blue	White	Red	Buffer
Buffer	Yellow	Blue	White	Red	Buffer
Buffer	Blue	Yellow	Red	White	Buffer
Buffer	Blue	Yellow	Red	White	Buffer
Buffer	Blue	Yellow	Red	White	Buffer
Buffer	Blue	Yellow	Red	White	Buffer
Buffer	Blue	Yellow	Red	White	Buffer
Buffer	Red	White	Yellow	Blue	Buffer
Buffer	Red	White	Yellow	Blue	Buffer
Buffer	Red	White	Yellow	Blue	Buffer
Buffer	Red	White	Yellow	Blue	Buffer
Buffer	Red	White	Yellow	Blue	Buffer

Vines



## Methodology

- Treatments: Four Replications
  - White = control or no treatment
  - Red = Sulfur + Kaligreen + Stylet oil
  - Blue = whey1\* + Kaligreen + Stylet oil
  - Yellow = whey2\* + Kaligreen + Stylet oil

\* Whey1 received more whey applications than whey2 treatment.

## Methodology

- Research Sites:
  - Laetitia Vineyard (Coastal)
  - James Berry Vineyard (Inland)
- Variety Tested:
  - Chardonnay, clone 4
- Application Rates Used:
  - Sulfur: 3lbs./acre
  - Kaligreen: 4lbs./acre
  - Stylet oil: 1% Solution (100-200 gal/acre)
  - Whey: 45g/l (500-600 liters/ha)

## Results

- ANOVA: General Linear Model
  - p-value < .05
  - Percent Leaf Infection
    - There was statistical difference between the control treatment (white) and the other treatments.
    - No statistical difference between the sulfur (red), whey1 (blue) and whey2 (yellow) treatments.

## Results

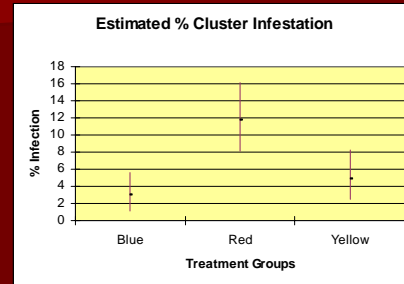
■ ANOVA: General Linear Model

$p\text{-value} < .05$

Percent Cluster Infection

- No noticeable difference between sulfur (red) and whey2 (yellow) treatments or between whey1 (blue) and whey2 (yellow) treatments.
- Sulfur (red) treatment showed a higher percent infection compared to the whey1 (blue) treatment.

## Results



## Results



## Results



## Results



## Results



## Results



## Results



## Conclusions

- Whey powder can be used as an effective treatment for powdery mildew.
- Proper spray equipment and spray protocols should be followed.
- Further research should be conducted to assess soil/water impacts, ecological interactions, and effect (if any) on wine quality

## Resources and Acknowledgements

Crisp et. al. Novel control of grapevine powdery mildew, *Uncinula necator*. 7<sup>th</sup> Int'l Congress on Organic Viticulture and Wine. August 20-21 2002.

Bettiol et. al. Effectiveness of cow's milk against zucchini squash powdery mildew in greenhouse conditions. Crop Protection, v.18, no.8.1999.

[www.naturescontrol.com/pestcidewaitperiods.html](http://www.naturescontrol.com/pestcidewaitperiods.html)

[www.panna.org/resources/pestis/PESTIS.burst674.html](http://www.panna.org/resources/pestis/PESTIS.burst674.html)

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Laetitia Vineyards

James Berry Vineyard