

# Research in Plain English

## Impact of Undervine Management on Vine Growth, Yield, Fruit Composition, and Wine Sensory Analyses of Cabernet Franc

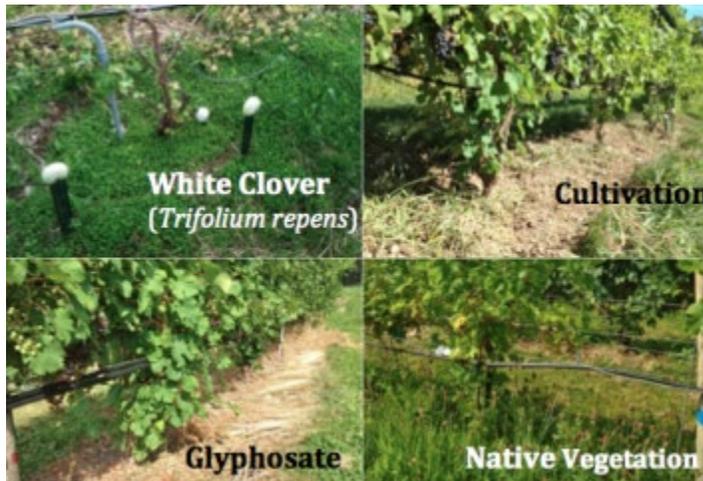
*Research in Plain English provides brief, non-technical summaries of journal articles by Cornell faculty, students, and staff.*

Authors: Adam Karl,<sup>1</sup> Ian A. Merwin,<sup>2</sup> Michael G. Brown,<sup>3</sup> Rebecca A. Hervieux,<sup>4</sup> and Justine E. Vanden Heuvel<sup>5</sup>

<sup>1</sup> Former Master of Science Student, <sup>2</sup>Professor Emeritus, <sup>3</sup>Research Support Specialist, and <sup>4</sup>Former Master of Professional Studies Student, Horticulture Section, 134A Plant Science, Cornell University, Ithaca, NY 14853; and <sup>5</sup>Associate Professor, Horticulture Section, School of Integrative Plant Science, Cornell University, Ithaca, NY 14853 and NYSAES, Geneva, NY 14456.

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Summary by Alex Koeberle



Researchers compared four different under-vine management treatments for this study in a research vineyard in Lansing, NY.

### **Background:**

In cooler growing climates like the Northeast United States, fertile soils and ample precipitation make excessive vegetative growth a common challenge for vineyard managers. Large, dense canopies and heavily shaded fruit zones may increase disease pressure and also reduce fruit and wine quality. To reduce shading and improve fruit quality, grape growers utilize common practices such as hedging, leaf removal, lateral pulling, and shoot and cluster thinning.

Standard practices for vineyard floor management include maintaining a weed-free strip beneath the trellis using herbicides or cultivation. Other techniques include planting cover crops under grape vines, which can mitigate the environmental impacts of using herbicides and cultivation. Cover crops may reduce management costs and improve fruit quality due to vine competition for water and nutrients, potentially reducing the need for some management practices including hedging and leaf removal.

Given these diverse practices, the goal of this study was to determine how different under-vine management techniques in a vineyard impact vine growth, fruit composition, wine characteristics, and the cost of production. The researchers hypothesized that under-vine cover crops would reduce vine size and fruit shading by competing with the vine for water and nutrients, thereby improving fruit composition.

### **Experimental Design:**

This study was conducted from 2011-2013 in a young research vineyard located along the shore of Cayuga Lake in Lansing, New York. Four under-vine management treatments were applied to different rows within a Cabernet franc vineyard. These treatments consisted of: cultivation (CULT), native vegetation (NV), white clover (WC), and glyphosate herbicide application (GLY). Each treatment was then monitored and evaluated throughout this entire three-year period.

### **Results:**

Data collected from each treatment was then analyzed for each of the following attributes:

- **Weather.** 2012 was the warmest growing season, while 2011 was the driest and 2013 the wettest. This shows treatments were exposed to a diverse range of weather conditions.
- **Plant cover and biomass.** GLY treatments were mostly clear of under-vine vegetation. NV, WC, and CULT treatments established more variable ground cover, ranging from near complete to moderate to poor coverage in different growing seasons.
- **Vegetative and reproductive growth.** GLY treatment vines were the largest and most vigorous vines each year, and also produced the greatest yields (thanks to heavier clusters with more berries).
- **Canopy structure and density.** Overall, GLY canopies were the densest, while NV canopies were the least dense.
- **Vine water and nutrients.** Vines during this study were not water stressed, even during the hottest stretches of summer 2012. In addition, all vines among treatments had acceptable ranges of nutrient levels.
- **Bud survival.** Low and variable temperatures during winter 2013-2014 led to significant cold damage to buds. CULT and NV treatments had greater

survival compared to the GLY treatment. Greater light penetration and moderate cane growth from CULT and NV vines likely contributed to increased bud cold hardiness.

- **Soil moisture.** CULT treatments showed the highest soil moisture content throughout growing seasons for all three years.
- **Wine chemistry and sensory analysis.** Sensory panels were conducted with regular consumers who drink wine at least twice a month. Sensory tests showed there was little impact of treatments on the wine. Similar basic juice and wine chemistry led to no perceived sensory differences in wines for all three vintages among different treatments. In other words, this may mean that differences in vine size, canopy density, and yields among treatments did not consistently impact sensory properties of finished wines.
- **Economic analysis.** Overall, cover crops were the least expensive treatment to maintain, while CULT treatments were the most expensive. GLY generated more revenue than other treatments due to greater yields (i.e. more fruit to sell). This was because GLY treatments were applied when vines were younger, and the resulting greater yields outweighed the cost of under-vine cultivation, cover crop seeding, and/or maintenance. Even though herbicide application was more expensive up front than cover crops, the revenue from greater yields offset these initial costs.

### **Conclusions:**

This research demonstrated that under-vine groundcovers have the potential to impact vine growth and yield. In cooler, temperate climates, under-vine cover crops – compared to herbicide treatment – were shown to reduce vine size, proving a useful tool for growers to reduce vigor. Each management technique led to different outcomes with both advantages and disadvantages. For example, although GLY vines produced larger, denser canopies, growers may need to spend more time and resources on cluster-zone leaf removal, cluster thinning, and hedging than with cover crop treatments that limit canopy size. Furthermore, although cover crops were effective in limiting vine vigor, WC as a cover crop may not be practical to out-compete other plant species.

In general, under-vine cover crops provided a useful tool for vigor reduction. Greater bud hardiness of CULT and NV vines during a cold winter could also have significant implications for the wine industry as temperatures become more variable with climate change.

### **The Bottom Line:**

Different under-vine management techniques can have varying impacts on factors such as vine growth, fruit composition, cold hardiness, production costs, and economic revenue in cool climates. Grape growers may consider incorporating various treatments as part of an adaptive management strategy to potentially reduce management costs without significantly impacting fruit composition.

*Alex Koeberle '13 is a writer and managing editor for Appellation Cornell*