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University of California Cooperative Extension

Grape Notes

San Luis Obispo & Santa Barbara Counties



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Wind machine performance trial summary

The performance of conventional and upward-blowing wind machines was compared at a vineyard site east of Templeton during the 2010 and 2011 spring seasons. The conventional wind machine provided useful protection, while the pair of upward-blowing wind machines did not produce significant vine-level warming at this study site.

Background

Wind machines are one of the primary tools available to growers to provide active frost protection of vineyards. With limitations on water availability restricting the use of sprinkler frost protection in many areas, there is increasing interest in the use of wind machines in many vineyard regions.

Conventional horizontal-blowing wind machines have been in use for many decades, and many thousands are currently in use throughout California. The ability of these machines to raise crop-level temperatures has been well documented; they typically require about 12-15 fan horsepower (measured at the blades) to protect one acre¹. Provided that the temperature conditions (minimum crop level temperatures and the temperature inversion strength) are within their operational range, these machines can be predicted to provide useful levels of frost protection².

However, conventional wind machines are not without their shortcomings; chief complaints are the high initial cost and the noise of operation. The high initial cost can be justified in cases where the value of the crop saved with wind machine operation reliably offsets the purchase and operation costs; this is more likely with high-value crops such as winegrapes. In locations with low frost risk and/or low crop value, the purchase of a wind machine may not be economically justifiable. The use of more modern blade designs and adequate engine mufflers can help reduce noise levels, but given the need to move large volumes of air over large distances, it will be very difficult to eliminate all noise issues completely.

More recently, novel upward-blowing wind machines have been developed which potentially reduce the main shortcomings of conventional wind machines. These

upward-blowing wind machines are cheaper, quieter, more fuel-efficient, and more readily portable than conventional wind machines, and hence have attracted considerable interest from the vineyard industry as well as growers of other frost-sensitive crops. However, relatively little independent research has been conducted to determine how their operation actually changes crop temperatures. The purpose of this trial was to quantify the temperature changes that occur with the operation of upward-blowing wind machines as compared to a conventional wind machine at the same location.

Field experiment

Field measurements were conducted during the 2010 and 2011 spring seasons at a vineyard east of Templeton, CA. The two upward-blowing wind machines (Shur Farms #925 powered by 9 hp gasoline engines) were installed according to the manufacturer's specifications, including air drainage barrier curtains deployed immediately downslope of each wind machine when the machines were operated. The conventional wind machine (Amarillo Portable Low Crop, powered by a 130 hp liquid propane engine) was installed during the 2011 season in between the two upward-blowing wind machines, and was operated on separate nights from the upward-blowing machines. A large number of meteorological towers and vine-level air temperature sensors were used to document the changes in temperature which occurred as a result of the operation of the machines (see Fig. 1 on the following page).

The differences in performance between the two types of wind machines were very clear; the conventional wind machine produced useful temperature gains which

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Fig. 1. The trial site east of Templeton. The two upward-blowing wind machines are shown with their respective air drainage barrier curtains deployed; these curtains were retracted when these wind machines were not operating. The meteorological towers are visible as slender poles; temperatures were measured at the cordon level, and at 13, 23, and 33 ft. heights on these towers. Additional vine-level temperature sensors were placed along the vine rows near the wind machines.



were similar to those which have been observed in past research studies, while the pair of upward-blowing wind machines did not produce useful warming under the conditions of this study. Under weak temperature inversion conditions, the operation of the upward-blowing wind machines tended to produce crop-level temperatures which were even colder than what was expected if no wind machine had been in operation. A recently published journal article describes the results of this research work in more detail, and is available at the following website:

<http://dx.doi.org/10.1016/j.agrformet.2012.01.009>

It should be kept in mind that the results of this trial represent the behavior of these two types of wind machines at one single location under a particular set of conditions; their respective performance may be quite differ-

ent under another set of conditions. Improving our understanding of how the various wind machine configurations and site conditions affect frost protection outcomes will be an important step forward for helping growers choose the most appropriate types of wind machines for their individual locations.

References

1. Evans, R.G. 2000. The art of protecting grapevines from low-temperature injury. *In* Proceedings of the ASEV 50th Anniversary Meeting, Seattle, WA. June 19-23.
2. Battany, M.C. 2011. Improved information on temperature inversion conditions help guide frost protection decisions. *Grape Notes* newsletter, Dec. 2011. <http://ucanr.org/grapenotes>

Frost protection information

A wide variety of useful frost-protection information is available at the following UCCE website, both in English and Spanish:

http://cesanluisobispo.ucdavis.edu/Viticulture/Frost_Protection/

University of California Agriculture and Natural Resources

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<http://ucanr.org/grapenotes>

See the following page for the announcement of the free UC Davis Department of Viticulture & Enology Outreach Event to be held on April 11, 2012 at the J. Lohr Winery in Paso Robles.

Outreach Event

Wednesday, April 11, 2012, 9:00 am - 3:00 pm

J. Lohr Paso Robles Wine Center

Wine and cheese reception from 3:00 - 4:00 pm

- **Meet our new Department Chair, Dave Block**
- **Meet our new Extension Specialist in Enology, Anita Oberholster**
- **Other featured speakers are: Linda Bisson and Andy Walker**

Topics to be presented:

- Influence of winemaking practices on wine composition and quality: research past, present and future
- Examining the effect of sterile membrane and pad filtration on the sensory and chemical properties of wine
- Yeast cell membrane composition and its effect on ethanol tolerance and problem wine fermentations
- Overview of off character formation
- Impact of Brettanomyces on wine flavor
- Breeding rootstocks for salt and drought tolerance
- A checklist/discussion of how to replant vineyards

There are a limited number of seats. So, please RSVP by April 4th to Karen Block at: klblock@ucdavis.edu.

If you would like, you can bring a bottle of your wine to share...

