The Managing Heat in Vineyards project entailed working with local growers to assess and analyse data trends of various heat mitigation techniques being trialled in the Langhorne Creek wine region during the 2019-20 growing season.

This communique is a summary of key findings as this project concludes. A full report and four case studies have been produced for this project.

Background

In recent years extreme heat impacting the Langhorne Creek wine region has led growers to become more focussed and inventive with trialling means to help mitigate negative impacts of these events. Activities include altering irrigation programs, mulching and methods to cool the vineyard environment such as low emission overhead sprinklers, under vine misters and misting fans. The methods being employed often reflect the resources and capacity available to each grower for their site. Data is often collected in various forms but not used to the extent that it could be to better understand the impact of treatments or inform further decision making.

Growers

Several Langhorne Creek wine grape growers agreed to provide some standard in-canopy data for assessment from blocks where heat mitigating methods were being trialled.
The growers were trialling a variety of in-vineyard techniques and treatments hoping to help manage the impacts of heat events on their vines (Table 1).

Table 1: Growers and treatments

Grower ID	Block/Variety	Treatment
Grower 1	Malbec	Overhead Wobbler Sprinklers
Grower 2	Malbec	Undervine Mister Sprinklers
	Shiraz	Mounding
Grower 3	Malbec	Foliar Spray, Mulch, Pulse Irrigation, Mist Fan
Grower 4	Malbec	Undervine Misters
	Malbec	Undervine Misters
Grower 5	Malbec	Misting Fan
	Malbec	Misting Fan + Foliar Spray
Grower 6	Malbec	Mulching
Grower 7	Shiraz	Overhead Mister Sprinklers

Equipment

Kestrel drop tags were used at grower sites 1-6 to measure in-canopy conditions for treated sites as well as nearby untreated areas for comparison. https://kestrelmeters.com.au/

The small battery operated Kestrel units were already in use by one of the project growers and were found to be reliable, easy to use, price appropriate, responsive, robust, and adequate for recording the key vineyard canopy climatic measures in a format useful for the comparisons in this project (Figure 1).

Primary data collected

- Time
- Date
- Temperature
- Humidity
- Heat Index
- Dew Point Temperature

Figure 1: Example of the Kestrel drop units used in the project.

Grower 7 joined the project later and provided data from a prototype TEMPStick device being trialled at the site. This device recorded temperature at multiple levels from the soil surface to the top of the canopy (Figure 2).

Figure 2 (L-R): TEMPStick with controller, TEMPStick data collector/controller, TEMPStick with loggers at various canopy heights.

Data from the Natural Resources SA Langhorne Creek central automated weather station was also used as a regional climate reference.

Heat Events

The project used the data loggers to continuously measure temperature and humidity in the vine canopy from an area undertaking a mitigation activity compared to a control area, capturing key heat events during the season.

A heat event was defined as air temperature greater than 36˚C and eleven key events were identified between November 2019 and January 2020. The maximum air temperature recorded from the central Langhorne Creek automated weather station (managed by the Natural Resources, SA) is presented in the Table 2.

Month	November	December						January			
Temp ˚C	20	8	17	18	20	27	30	3	9	30	31
Air	42.3	37.7	40.6	43.6	44.6	41.3	42.2	41.4	40.8	43.4	36.7

Table 2: Main heat events that occurred in the Langhorne Creek wine region November 2019-January 2020 with maximum daily temperatures as recorded by the central regional weather station.

Results

Activities that had the greatest effect on reducing canopy temperature are detailed in the following:

- Overhead low emission sprinklers on average reduced canopy temperature by 10˚C (Grower 1) for key heat events compared to the control block. The trial by Grower 7 showed a similar reduction of 8˚C on the 30 January 2020.
- Cooling fans at Grower 3 site reduced temperature between 3°C to 6˚C on the 9 and 30 January 2020. On other dates there was short-term or negligible reduction in temperature that requires further investigation.

Within site water and infrastructure constraints, these activities show promise to reduce canopy temperature and hence grape bunch temperatures and could be a viable option especially for specific high value vineyard sites.

Unfortunately, due to strong winds on the extreme heat days, the misting fans at Grower 5 site were not able to be used to see if they had a similar cooling effect or indeed showed similarities to Grower 3.

Activities that had minor effect on canopy temperature are detailed in the following:

- Undervine misters at the Grower 2 and Grower 4 sites. Although they did not reduce canopy temperature to the extent that overhead misters did, the 1-2 ˚C decrease was sufficient to reduce the hours that canopy temperature was above 35˚C or 38˚C compared to the control block.

Undervine misting has been successfully demonstrated in research trials funded by Wine Australia. In this research in-canopy, undervine and supplementary irrigation variations were investigated with undervine misting showing particular promise *(Using in-canopy misters to mitigate the negative effects of heatwaves on grapevines; Vinay Pagay, University of Adelaide, 2018;* https://www.wineaustralia.com/research/projects/using-in-canopy-misters-to-mitigate-the).

Activities that were found to have no effect on canopy temperature during this project included:

- Pulse irrigation
- Mulching and or mounding of vine rows

While these activities may not have directly affected canopy temperature, they may have affected the resilience of the vines in other ways e.g. a decrease in soil/root temperature, which was outside the scope and capacity of this project to investigate, record or analyse.

Conclusion

The project used portable data loggers to continuously measure temperature and humidity in the vine canopy from an area undertaking a mitigation activity compared to a control area. While this was not a replicated trial, the trends identified in this novel project have identified activities that reduced canopy temperatures and that have potential for easy and economical adoption by growers.

Of the trials assessed during this project, the use of overhead misting or wobbler sprinklers presented the most promising results.

It is expected that the structural layout and functional capacity of overhead or undervine systems would be critical for success.

Future

Further work would better optimise systems to sites and improve understanding of the effect of cooling on root systems and other vine physiological traits.

Cost-benefit analysis of successfully implemented systems would provide confidence for these vineyard management decisions.

Resources:

A project final report and four case studies are available.
Case Study 1: Overhead wobbler sprinklers
Case Study 2: Undervine misters | Mounding
Case Study 3: Overhead sprinklers
Case Study 4: Cooling fan | Mulch

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Images from participating growers.