Effect of application of kaolin and pinolene on grape berry physiology and oxygen distribution in different cultivars.

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BACKGROUND

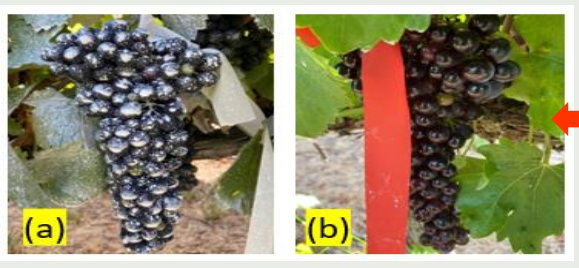
Varietal dependent cell death in grape berries and loss of mass late in ripening can cause up to 30% yield loss and reduce grape quality. Techniques to ameliorate its effects are limited.

The effects of kaolin and pinolene coatings on berry physiology during ripening were examined on Shiraz and Grenache bunches. Oxygen distribution in berries of some other cultivars were also compared.

METHODS

6% (w/w) Kaolin, 1% (w/w) pinolene and water were sprayed on Shiraz and Grenache bunches during ripening.

Change in berry mass, cell vitality, internal oxygen concentration (oxygen microprobe), ethanol accumulation and bunch and canopy temperature were recorded.



a) Kaolin and b) pinolene on bunches

Fig.1 Berry mass, cell vitality, total soluble solids (TSS), and sugar per berry as a function of days after anthesis (DAA) on Shiraz (a, b, c, d) and Grenache (e, f, g, h) . No significant difference was observed between Kaolin and water treatment.

Loss of berry mass and increase in TSS was reduced by pinolene in both cultivars, while it did not influence sugar per berry, cell vitality or oxygen distributions (QR-Fig.6).

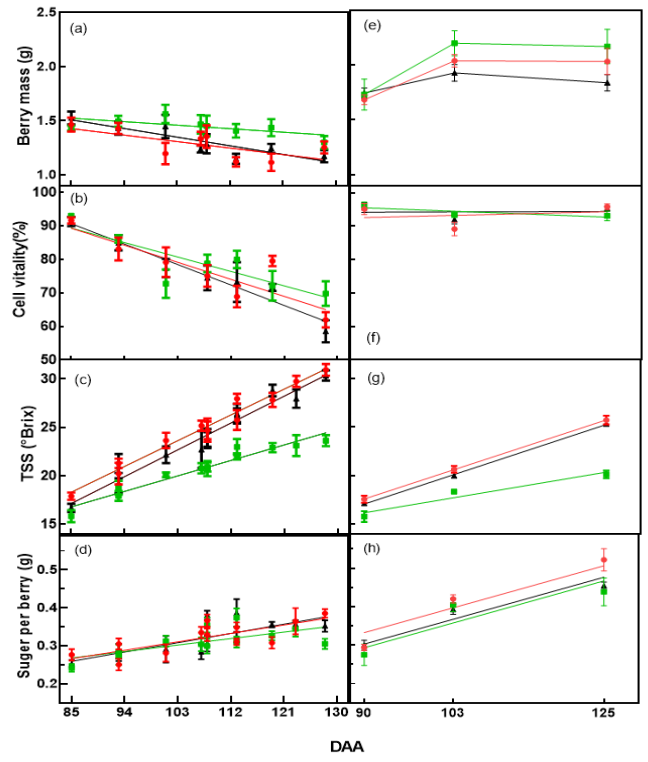
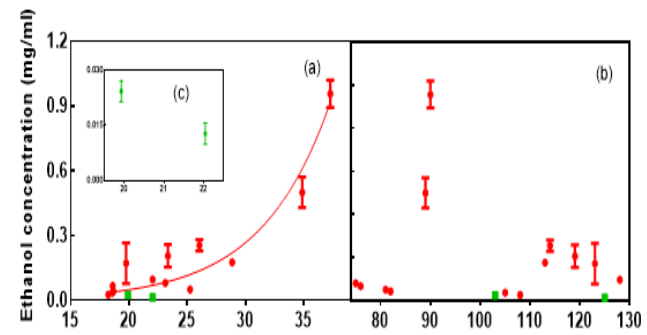


Fig.3 Ethanol concentration ([EtOH]) in juice as a function of 24-hour mean temperature (a) and DAA (b) in Shiraz (red) and Grenache (green) berries.



An exponential growth relationship between [EtOH] and mean daily temperature (previous 24 h) was observed; no obvious trends between DAA and [EtOH]. Grenache [EtOH] was much lower than that of Shiraz under similar temperatures.

Figure 5-7, and other details are presented from the QR code in centre of this poster

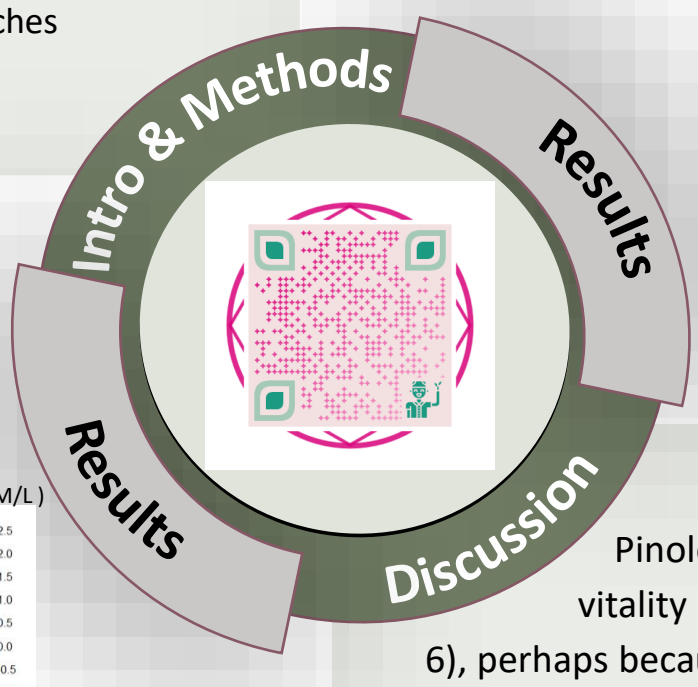
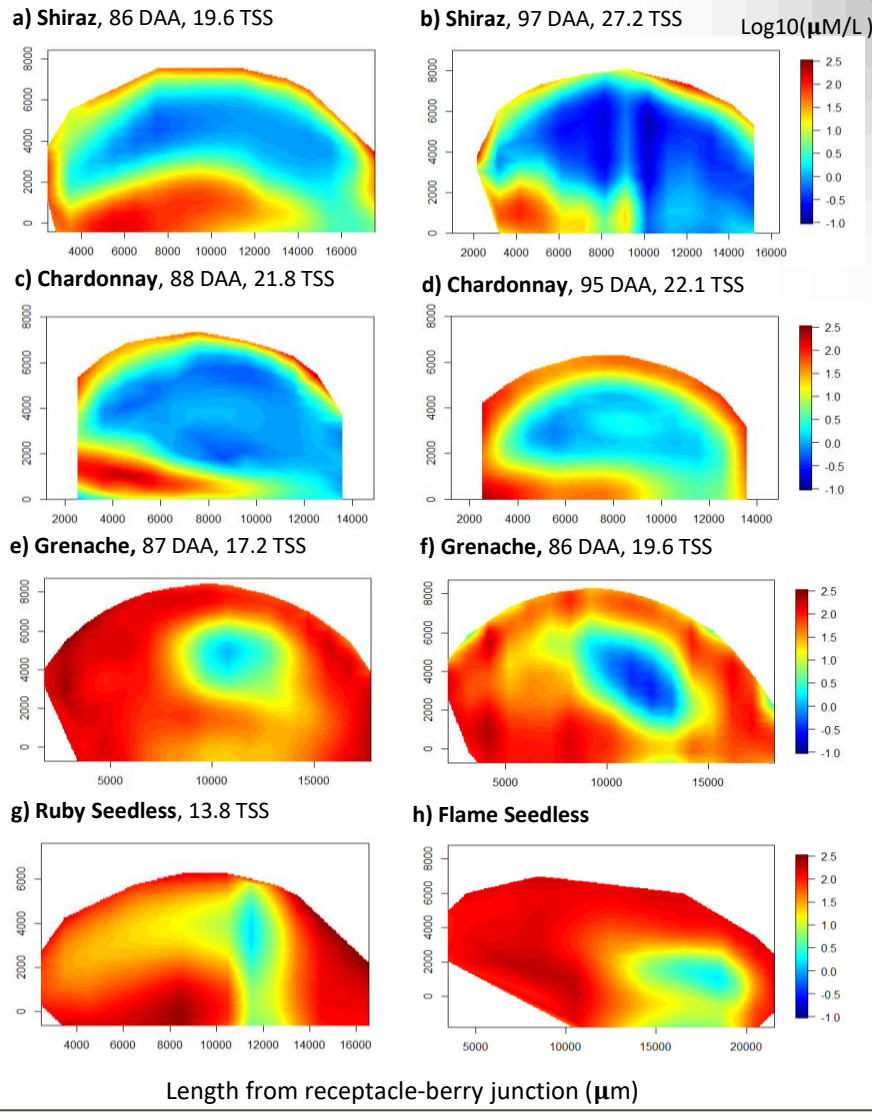


Fig.4 Oxygen profiles (heatmap with Log10 scale of µM/L O_2) from single berries of 5 different cultivars, Shiraz (a, b), Chardonnay (c, d), Grenache (e, f), Ruby Seedless (g), Flame Seedless (h) . (GAM applied)



Single berry oxygen distributions are different between cultivars. Shiraz and Chardonnay tend to have more hypoxic/anoxic regions in the berry than Grenache, or the two table grape cultivars. Berries from all cultivars tend to have hypoxic regions even at early stages of development.

Pinolene and kaolin did not affect berry cell vitality (Fig.1), internal oxygen concentration (QR-Fig. 6), perhaps because it did not prevent high berry temperatures (QR-Fig. 7).

- Pinolene decreased berry shrinkage probably by reducing berry transpiration without impacting sugar content while Kaolin did not show impacts on berry mass (Fig.1).
- Oxygen distribution within the berry is most likely cultivar dependent, but all berries showed regions of hypoxia/anoxia during development (Fig.4).
- Cultivars with more extensive hypoxia/anoxia (Shiraz, Chardonnay) (Fig.4) have also been reported to have more cell death in the mesocarp and higher ethanol accumulation (Fig.3). There appears to be a close relationship between cell death and hypoxia (QR-Fig.5) (see Tyerman presentation).
- High temperatures lead to high ethanol accumulation (Fig. 3) probably resulting from more severe hypoxia.

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