Grapes ripen heterogeneously within and between bunches, leading to differences in the composition of individual berries, which can impact wine quality and style. Heterogeneity remaining at harvest results in the presence of unripe and/or overripe/shrivelled grapes, which contribute ‘green’ and ‘herbaceous’, or ‘cooked’ and ‘jammy’ sensory attributes in wine, respectively.

**Aims**

The aims of this project are to analyse the extent of heterogeneity in any given vineyard, further our understanding in the relation between heterogeneity in grape maturity and wine quality and to explore vineyard practices with a view to ease heterogeneity in grape maturity. To begin, we investigated spatiotemporal variation of grape maturity within a vineyard in relation to total soluble solids (TSS) and fresh berry weight (FW). We also examined the effect of LalVigne® MATURE foliar spray on the heterogeneity of grape maturity of Cabernet Sauvignon clusters.

**Method**

- Trials were conducted in 2019 on Cabernet Sauvignon in Eden Valley.
- Images of 15 clusters were taken in the vineyard at pre-véraison, véraison, post-véraison and harvest.
- A MacBeth colour chart was placed beside each cluster for sunlight correction and black cardboard was placed behind to facilitate background segmentation for image analysis (Figure 1).
- After imaging, clusters were removed and brought to the laboratory for individual berry analysis and imaging.
- For the LalVigne® MATURE foliar spray trial, 15 clusters were tagged and images were taken at four time points. Clusters were only sampled at harvest and individual berry analysis was performed in the laboratory.

**Monitoring the Heterogeneity of Grape Berry Maturity Throughout Ripening**

**Spatiotemporal Heterogeneity**

Heterogeneity of grape maturity existed throughout ripening across the vineyard in relation to both TSS and FW (Figure 2 and 3). Heterogeneity of grape maturity based on TSS lessened by the time of harvest (Figure 2), whereas heterogeneity in relation to FW increased as the harvest date approached (Figure 3).

**Intra-cluster Heterogeneity**

Assessing heterogeneity at four levels, vineyard, vine, cluster and berry, it has been previously identified that between berry variation (intra-cluster variance) was the most significant (Pagay et al. 2010). Figure 4 and 5 demonstrate that the shoulder of the cluster had lower variability in relation to both TSS and FW, and the bottom of the cluster had the highest variability. Using this data, we could aid the focus of maturity sampling and vineyard practices.

**Vineyard Management Trial**

LalVigne® MATURE is a yeast derivative foliar spray designed to advance grape flavour maturity. Untreated clusters had lower heterogeneity than those which were treated with the foliar spray in relation to both TSS and FW (Figure 6 and 7). However, this trial will have to be continued over subsequent years to determine the true effects of the foliar spray on heterogeneity of grape maturity.

**Summary**

- Significant heterogeneity in grape berry maturity remained at harvest, particularly within a cluster.
- Preliminary vineyard trial using LalVigne® MATURE foliar spray did not ease heterogeneity in grape maturity present at harvest.
- Further research will explore the impact of heterogeneity in grape maturity on wine sensory profiles using a Rate-All-That-Apply sensory analysis method.