

Exploring the effect of ripening rates on the composition of aroma and phenolic compounds in Cabernet Sauvignon wines

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Warmer and drier climate conditions decouple berry ripening processes and affect the relationship between sugars and secondary metabolites. Mitigation strategies are necessary to resynchronise berry quality traits and their effect on wine quality needs to be explored.

Objectives/aims

Crop load manipulation (1 week pre-veraison) and late season irrigation (+ 50% irrigation starting at 20 °Brix) were applied to vines of the cv. Cabernet Sauvignon in the Lodi AVA of California in 2019. Experimental treatments returned three kinetics of sugar accumulation (**Figure 1**): fast, control and slow ripening. Aroma and phenolic compounds were analysed in the resulting wines to explore the relationship between grape ripening rates and wine quality.

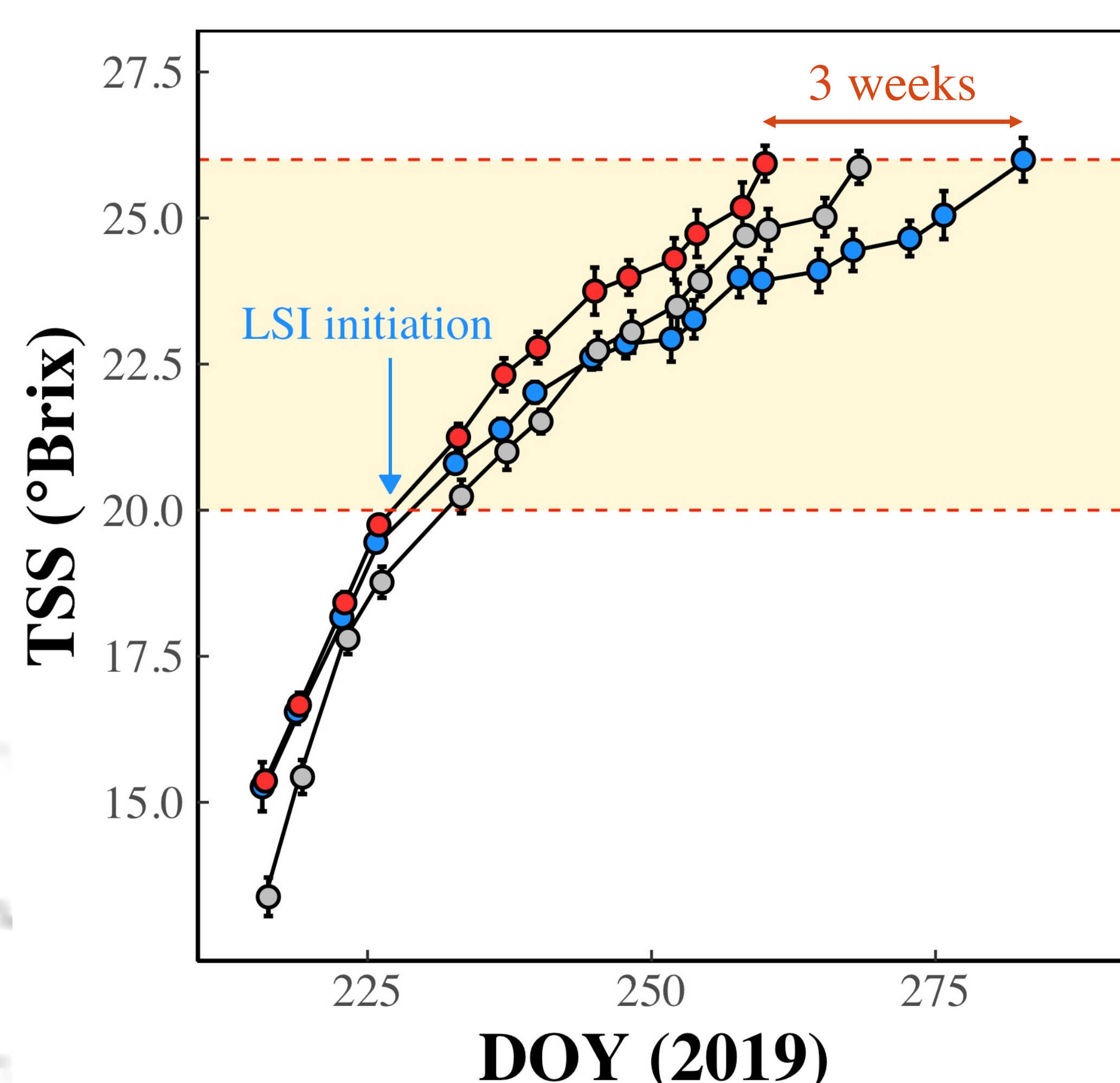
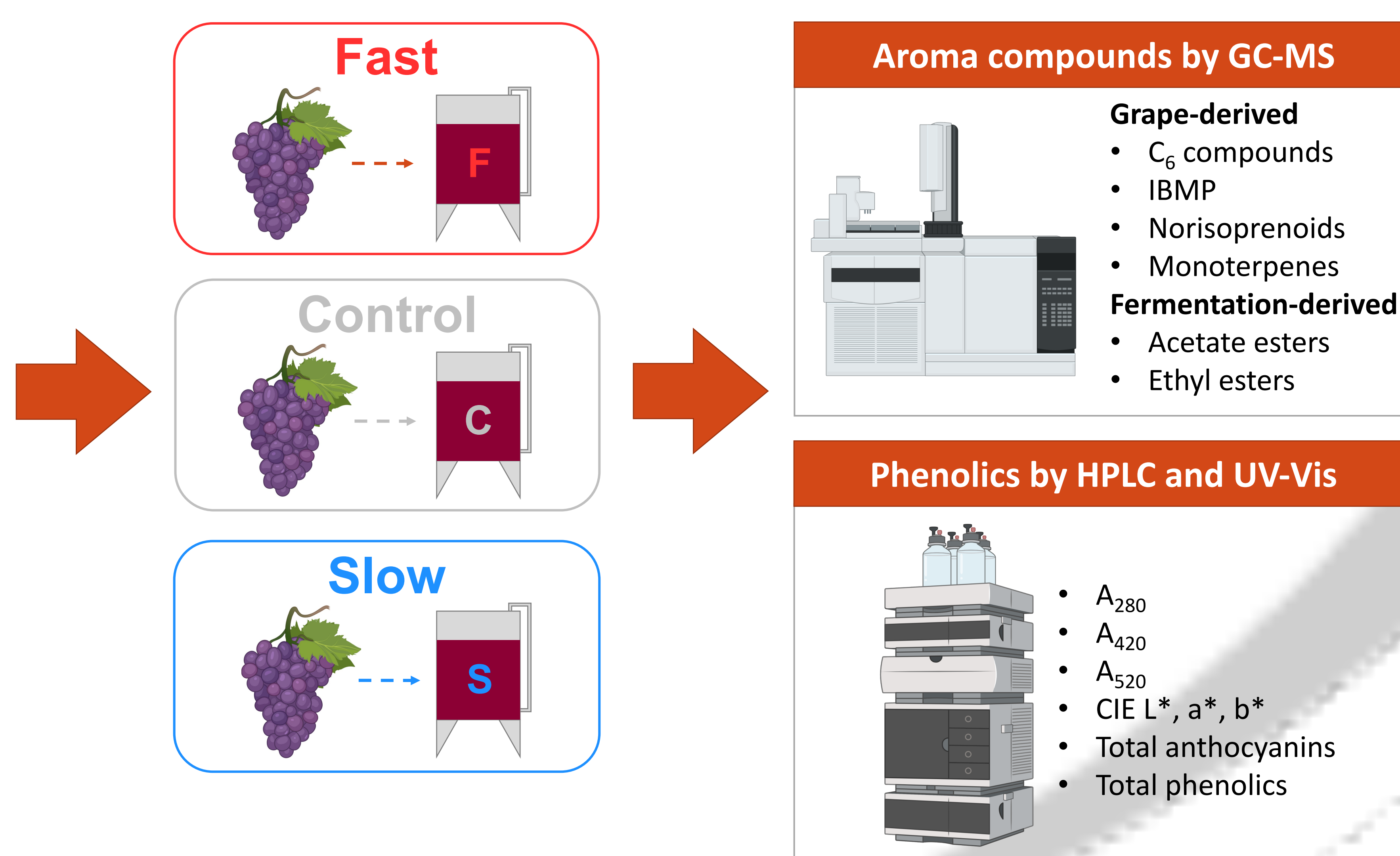


Figure 1: TSS accumulation of Cabernet Sauvignon grapes submitted to cluster thinning and late season irrigation. DOY, day of the year; LSI, late season irrigation



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Key findings

PCA separated the wine samples and highlighted differences in the aroma and phenolic composition of wines from grapes ripening at different rates (**Figure 2**).

- Aroma compounds.** Delayed ripening, achieved by late season irrigation, led to an increase in “fruity” compounds (linalool and β -damascenone) and a decrease in “green/grassy” compounds (hexanol). Differences in aroma compounds were partly driven by crop load (along PC3).
- Phenolic compounds.** Slower sugar accumulation in grapes enhanced the phenolic composition of Cabernet Sauvignon, improving both red wine colour (higher A₅₂₀ and lower hue) and mouthfeel profile.

These findings showed that achieving a slower rate of sugar accumulation is needed to improve wine colour and aroma compounds and counteract accelerated ripening caused by climate change.

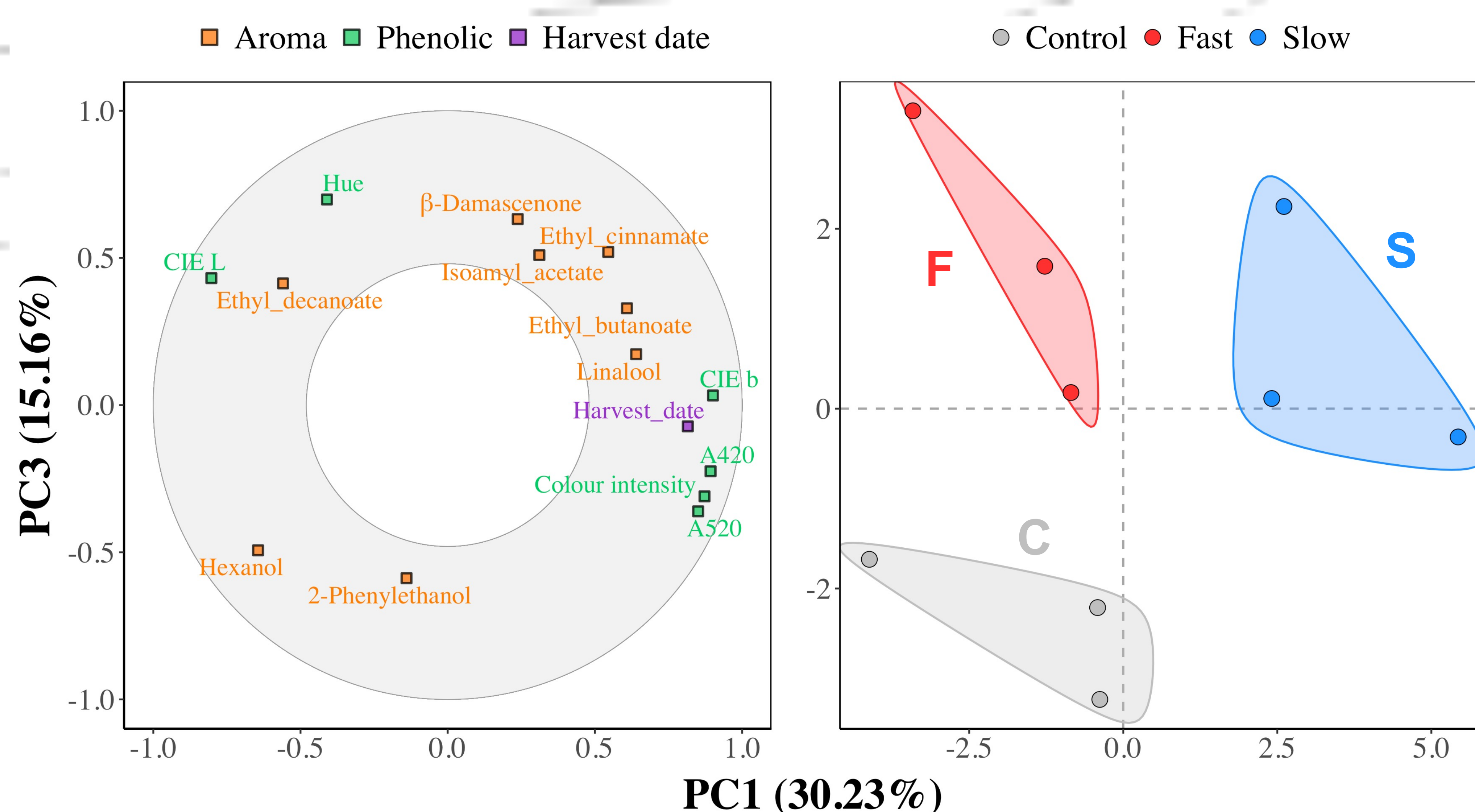


Figure 2: PCA of the chemical composition (aroma compounds and phenolic compounds) of Cabernet Sauvignon wines. Score plot (right) of wines from fast (red) and slow ripening (blue) grapes compared to the control. Loading plot (left) of variables with loadings < -0.5 or > 0.5 on at least one of the two components: aroma compounds (orange), phenolic compounds (green), harvest date (purple).

FOR MORE INFORMATION

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