

Vineyard management practices: effects on winegrape composition

Wendy Cameron¹, Paul R. Petrie^{2,3,4}, Marcos Bonada^{2,3}

¹The University of Melbourne ²South Australian Research and Development Institute ³Flinders University ⁴The University of Adelaide

Context

Vineyard management practices are costly and time consuming to implement. These practices are designed to improve production outcomes such as winegrape quality, but do they?

Method

We used a meta-analysis approach to understand the effects of cluster thinning, irrigation, leaf removal, pruning, shoot thinning and shoot trimming on the grape composition parameters total soluble solids (TSS), pH, titratable acidity, anthocyanins, tannins and total phenolics and their ratios. Meta-analysis allowed us to aggregate the results from research conducted all over the world and improved the robustness of our conclusions.

We used response ratios to analyse the effect of the practice. Response ratio = (treatment result/control result) - 1.

A response ratio >1 indicated the treatment caused a significant increase in the composition parameter, zero, no change and <1 a decrease.

Some results for Leaf Removal

TSS and anthocyanins increased when leaf removal occurred prior to berry ripening (E-L 34-39) (Figure 1). The increases in TSS were greater when leaf removal occurred before or during flowering (E-L ≤18 and E-L 19–26). There was no significant change to TSS or anthocyanins when leaf removal occurred during berry ripening (E-L 34-39) (Figure 1). When applied pre-ripening, the combination of leaf area removal and yield reduction (see yield poster) was such that the leaf area-to-fruit ratio increased, and this assisted carbohydrate partitioning to the clusters. The leaf removal also allowed increased light and a higher temperature in the fruit zone, increasing the anthocyanin accumulation.

The ratio of TSS:anthocyanins decreased significantly when leaf removal occurred prior to berry ripening (E-L 34-39) indicating a higher anthocyanin content at a given TSS value (Figure 1). This could be considered a fruit quality improvement, particularly in warmer and warming climates.

Anthocyanins only increased significantly when >25 – 50% leaf area was removed (Figure 2), again consistent with higher leaf area-to-fruit ratio and increased light and temperature in the cluster zone. The TSS:anthocyanins ratio was not altered when different proportions of leaf area were removed (Figure 2), suggesting that the timing of leaf removal had more impact on colour than its severity.

The larger response ratios for anthocyanins compared to those for TSS show that it is easier to manipulate anthocyanins than TSS when using leaf removal.

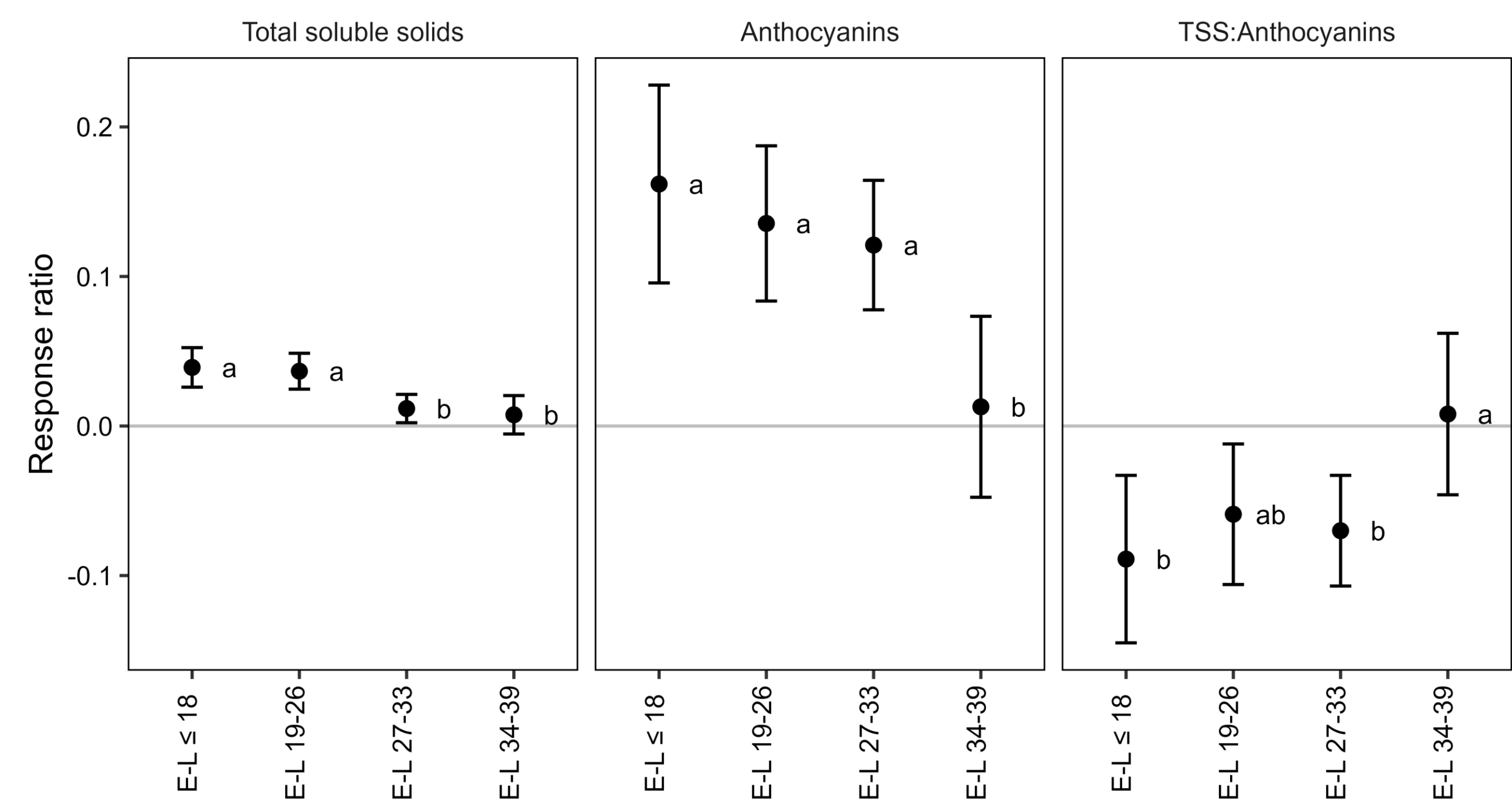


Figure 1. Grape composition response ratios for leaf removal at different phenological timings. Different letters indicate significant differences between the levels. 95% confidence intervals are shown. Confidence intervals crossing the zero line indicate that the response ratio is not significantly different from zero.

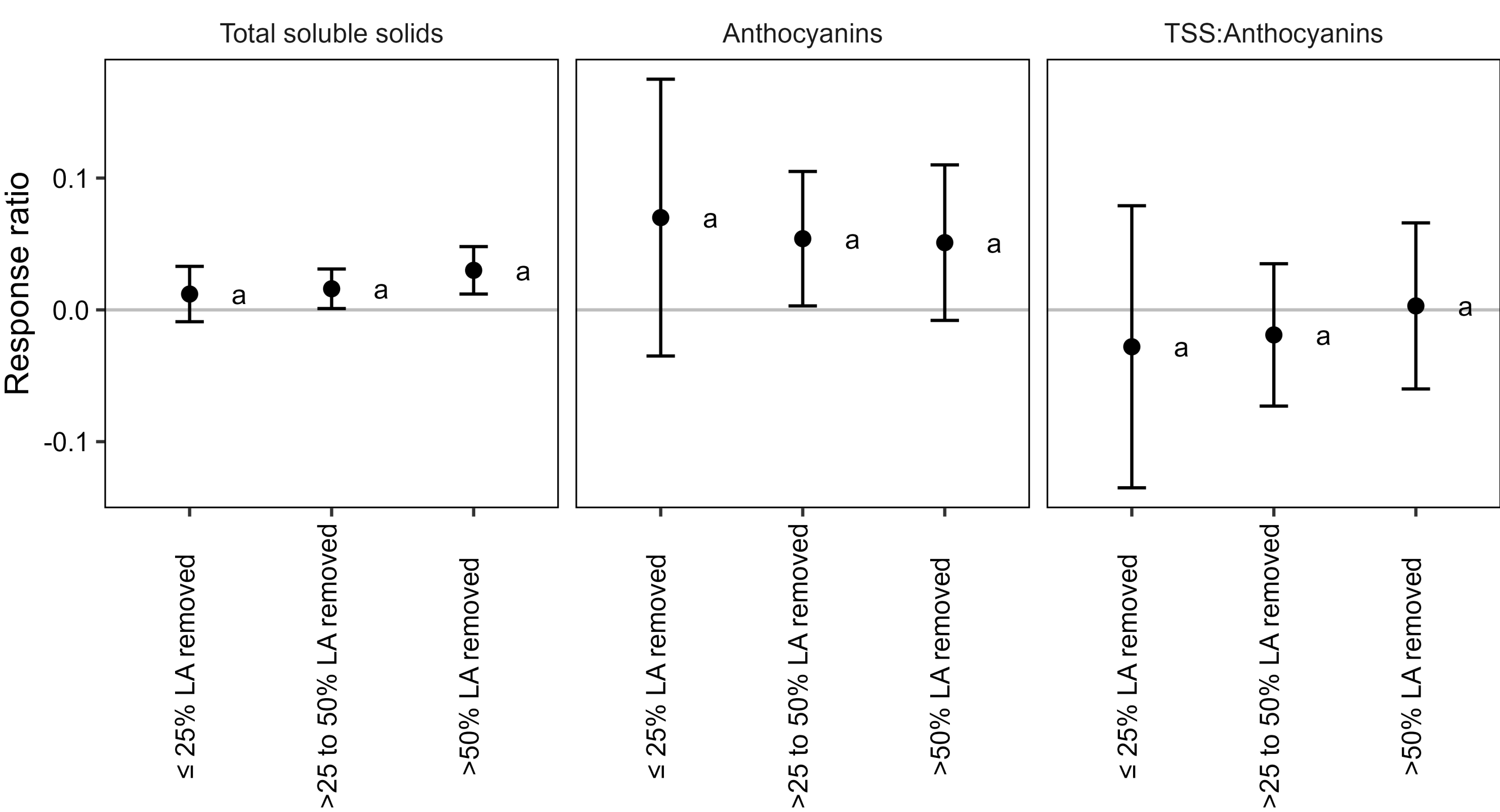


Figure 2. Grape composition response ratios for leaf removal with different proportions of leaf area removed. Different letters indicate significant differences between the levels. 95% confidence intervals are shown. Confidence intervals crossing the zero line indicate that the response ratio is not significantly different from zero.

... in conclusion

Canopy management techniques provide options to change grape composition, and these depend on timing and severity. Many of these practices result in decreased yield, the basis of most grape payments. More imaginative payment systems are required to compensate the grower for implementing these management practices.

