Rachis segmentation reveals variation of 3-isobutyl-2-methoxypyrazine in *Vitis vinifera* L. cv Cabernet Sauvignon and Shiraz: Implications for managing wine flavour

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Methoxypyrazines (MPs) can impart desirable varietal aroma attributes to red wine, but at concentrations in excess of 15 ng/L, overpowering "herbaceous" notes may predominate. MP concentrations in the rachis are orders of magnitude greater than in the berry and can be readily extracted during winemaking, with current remediation techniques being ineffective. Therefore, MPs are ideally regulated in the vineyard or by excluding rachis material from fermentation.

Aims & Methodology

Although the rootstock influence on MP concentrations in Shiraz and Cabernet Sauvignon rachis has been investigated, little is understood about the variation in concentration of 3-isobutyl-2-methoxypyrazine (IBMP) across different segments of the rachis. Furthermore, it is unknown whether IBMP distribution in rachis can be impacted by rootstock selection or *Vitis vinifera* scion variety

To examine this, bunches were sampled at multiple timepoints throughout maturation from Shiraz grown on Ramsey rootstock and own roots in the Barossa Valley, and Cabernet Sauvignon on 110 Richter and Schwarzmann rootstock from Coonawarra. Berries were removed by hand and rachis was segmented into the peduncle, top rachis, bottom rachis, and pedicel (Figure 1). MPs were quantified using stable isotope dilution assay with gas chromatography- tandem mass spectrometry.

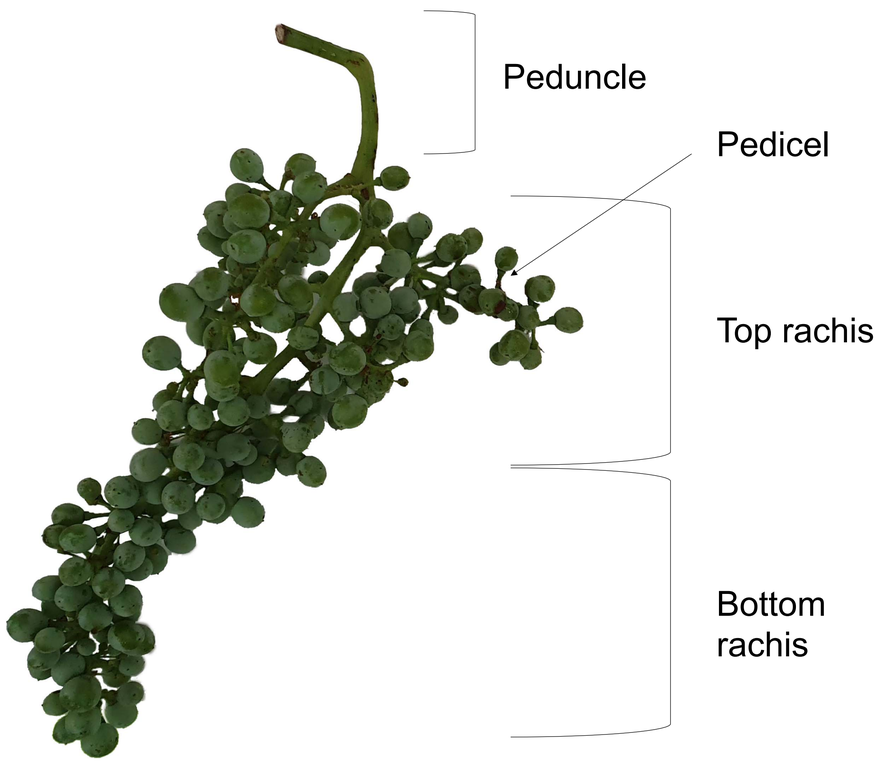

Figure 1: Shiraz grapes sampled at 8 weeks post-flowering (wpf) with annotations highlighting how rachis was segmented into different components.

Key findings

Shiraz rachis. The concentration of IBMP in different components of Shiraz rachis was dependent upon rootstock and timing of sampling (Figure 2). Rootstock effects were only evident at harvest, where IBMP concentrations in peduncle of own roots were significantly lower than peduncle from Ramsey.

Ramsey had higher average IBMP concentrations, although not significantly different, than own roots in all segments across all sampling timepoints. Segmentation of Shiraz rachis from Ramsey revealed that the peduncle, top rachis, and bottom rachis segments all decreased in average IBMP concentration from flowering to veraison and again to harvest. However, the opposite trend was observed for pedicel, which increased in IBMP concentration during ripening. At harvest, the pedicel had higher concentrations of IBMP than any other component at any time during berry maturation.

The segmentation of own roots rachis showed that the peduncle, top rachis, and bottom rachis all decreased in IBMP concentration between flowering and veraison, then stayed largely consistent between veraison and harvest. IBMP concentrations in pedicel from Own roots followed a similar trend to pedicel from Ramsey but with a decreased magnitude in difference to other rachis components.

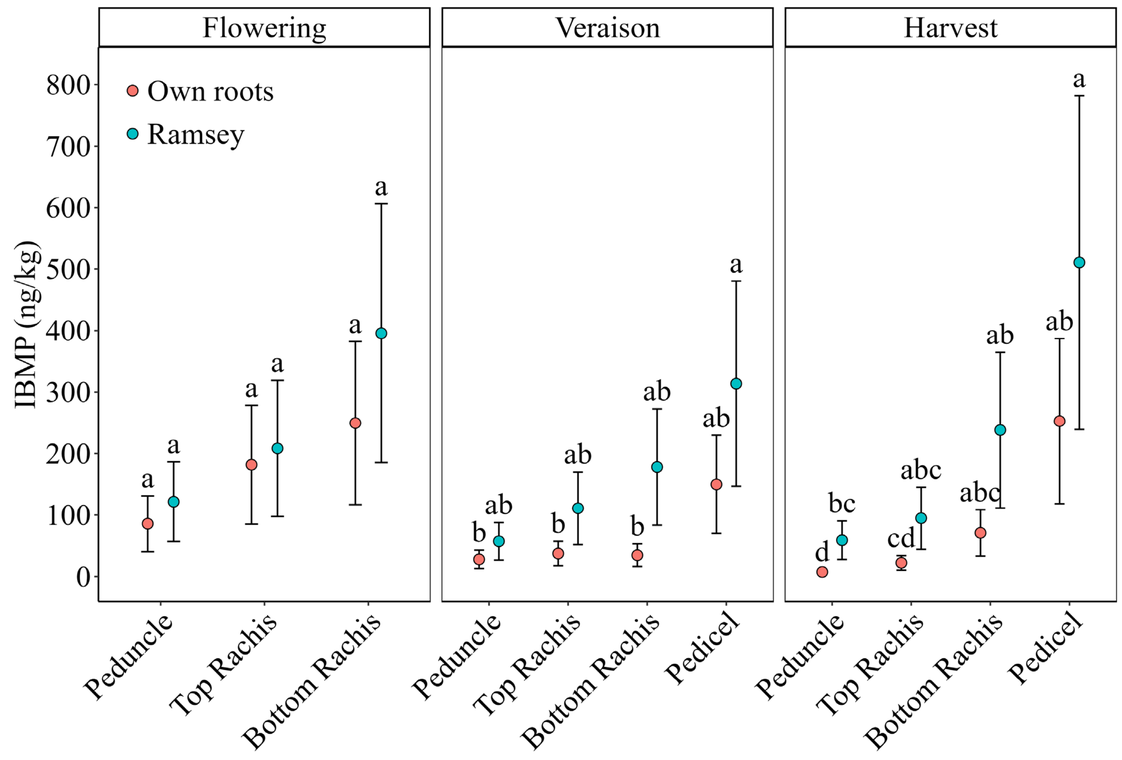

Figure 2: Concentration of IBMP (ng/kg ± SE) in different segments of Shiraz rachis at flowering, veraison, and harvest from own roots and Ramsey rootstock. Bars sharing the same letter within a sampling timepoint are not significantly different (linear mixed model, α = 0.05, Bonferroni-adjusted).

Cabernet Sauvignon rachis. Segmentation of rachis from Cabernet Sauvignon revealed IBMP concentration across all components was dependent upon bunch maturity but not rootstock (Figure 3). There was a decrease in IBMP concentration from veraison to harvest in all components of the rachis (Figure 3.) The average IBMP concentrations in Cabernet Sauvignon rachis generally followed a trend of pedicel > bottom rachis > top rachis > peduncle, although the difference was not always significant.

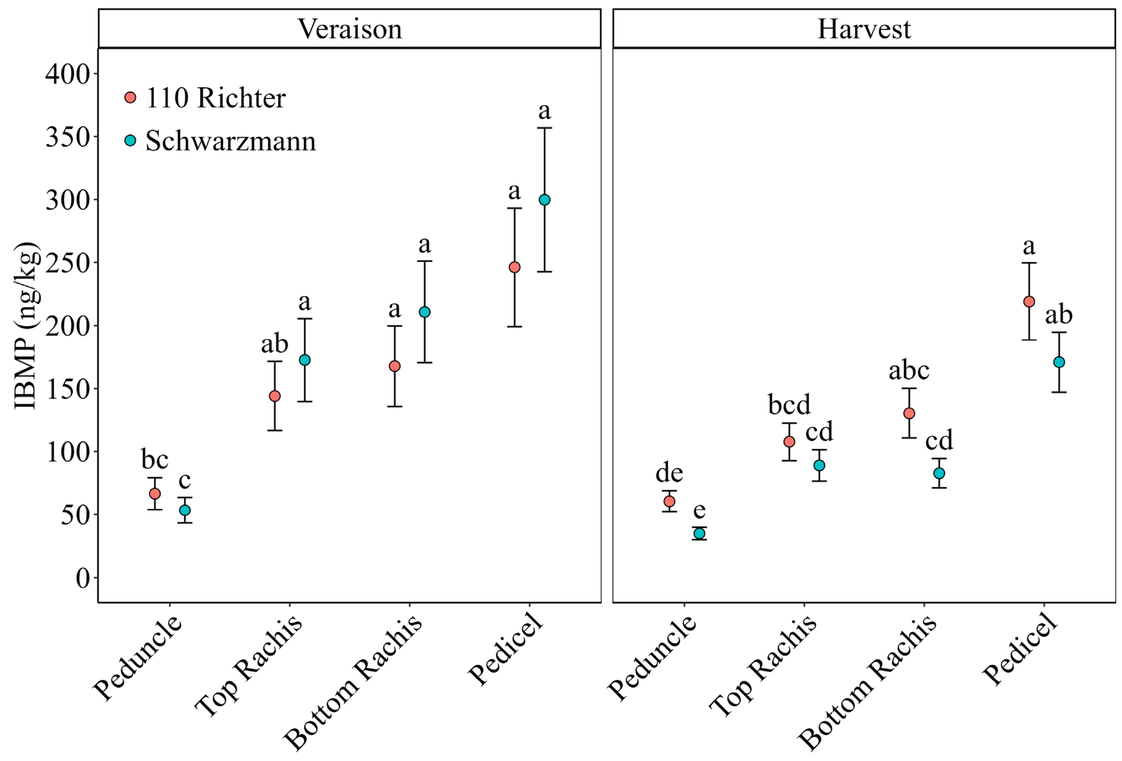

Figure 3: Concentration of IBMP (ng/kg ± SE) in different segments of Cabernet Sauvignon rachis at veraison and harvest from 110 Richter and Schwarzmann rootstock. Bars sharing the same letter within a sampling timepoint are not significantly different (linear mixed model, α = 0.05, Bonferroni-adjusted).

Conclusions & Outlook

The concentrations of IBMP in segments of the rachis at harvest could be an important consideration for winemakers who are looking to control the concentration of MPs and limit their associated flavour attributes in red wine. However, the prospective contribution of each rachis component relative to grape berries needs further investigation. This is especially relevant for Shiraz, a variety not usually associated with MPs, with rachis concentrations potentially exceeding those of Cabernet Sauvignon.

FOR MORE INFORMATION

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