Impact of must nitrogen deficiency on white wine composition depending on grape variety

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Agroscope, 1260 Nyon; www.agroscope.ch

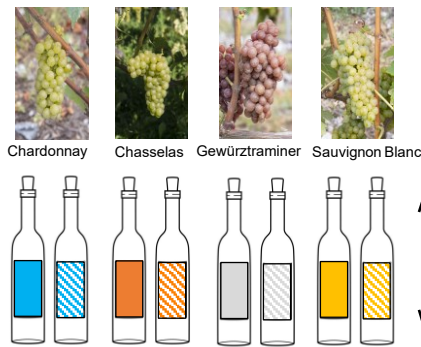Chardonnay   Chasselas   Gewürztraminer   Sauvignon Blanc

Figure 1: Experimental design including four grape varieties repeated in 3 consecutive vintages.
■ are variants with low YAN
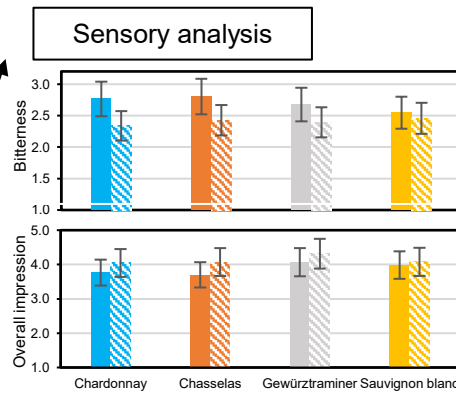▨ are the variants with high YAN in the must.

Sensory analysis

Figure 2: Sensory analysis of wines carried out by 12 expert panellists. Values are the mean of 3 vintages.

Objectives

Grapevine nitrogen status affects grape composition and wine quality. Chemical markers in wine have been proposed for the cultivar Chasselas, as indicators of N deficiency in the grape must at harvest [1]. This study evaluates the relevance of these chemical markers for three other grape varieties, as genetics influences N accumulation in grapes. Wines produced from grapes containing low and high concentration of yeast available nitrogen (YAN) were compared (Fig.1).
Sensory analysis confirmed the quality difference between wines from low and high YAN variants. (Fig.2)

Chemical composition of wine

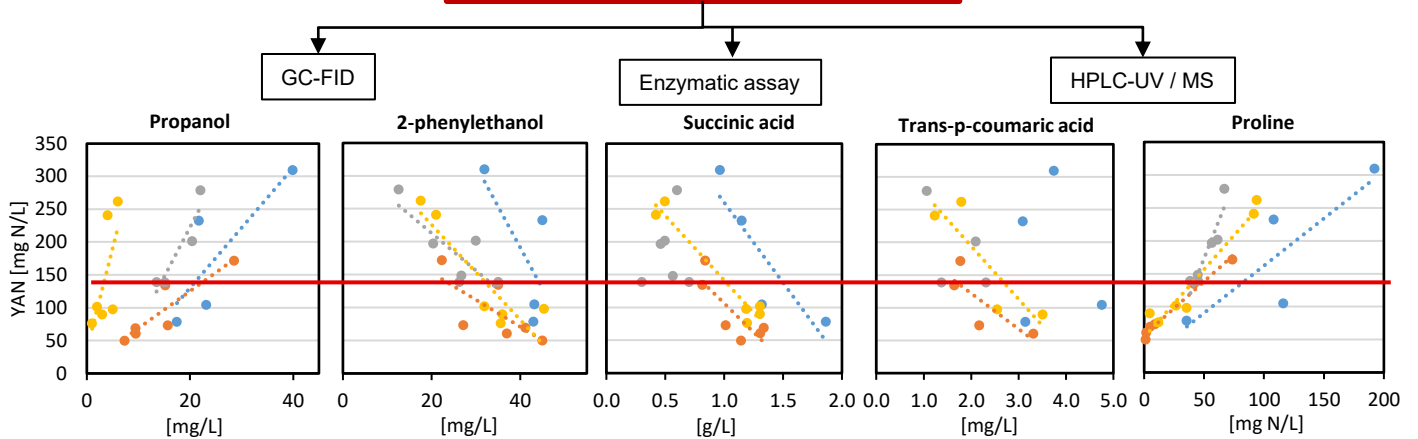GC-FID   Enzymatic assay   HPLC-UV / MS

Figure 3: Correlation of chemical markers in the wine with the YAN in the corresponding must. Colour code : Chardonnay, Chasselas, Gewürztraminer and Sauvignon Blanc. Red line show the critical value of YAN (140 mg N/L). Below this value the must is considered as deficient in nitrogen.

	Pr > F Variety	Pr > F Nitrogen
Propan-1-ol	0.051	0.002
2-phenylethanol	0.107	0.024
Succinic acid	<0.0001	0.000
Trans-p-coumaric acid	0.012	0.033
Proline	0.004	0.003
2,3-MeBuOH	0.126	0.110

Table 1: p value results of ANOVA of different factors. (confidence interval 95%)

Results

Indicators of N deficiency proposed for Chasselas were quantified in all wines (Fig.3). The concentration of propanol, 2-phenylethanol and proline in the wine is well correlated with the YAN in the must for all grape varieties. However the critical value to indicate N deficiency depends on the grape variety. Contrary to earlier observation, 2,3-methyl-butanol (MeBuOH) was not correlated with the YAN (Table 1). Chardonnay shows significantly different behavior, which could be partly explained by differences in the nitrogen species composition of the grapes.(Fig.4)
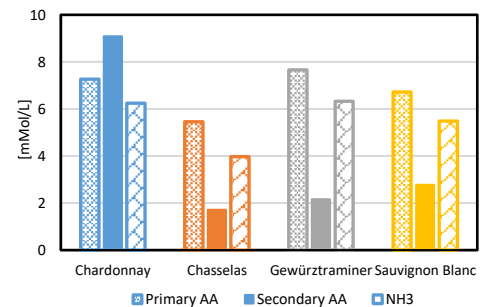

Figure 4: Concentration of different nitrogen species in the grape. The values are the mean of both variant (low N and high N) in 3 years.

Conclusion

- These results confirm that most chemical markers, initially proposed for Chasselas, can be used for other white wines.
- The threshold of the markers in wine, indicating N deficiency in grape juice, must be determined for each grape variety separately.
- Proline and 2-phenylethanol are the most promising indicators, as they show good correlations for all the grape varieties.

[1] Dienes-Nagy, Á, et al. (2020). *OENO One*, *54*(3), 583–599.

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