Effect of Nitrogen Management Practices on Souvignier Gris Wine Sensory Qualities

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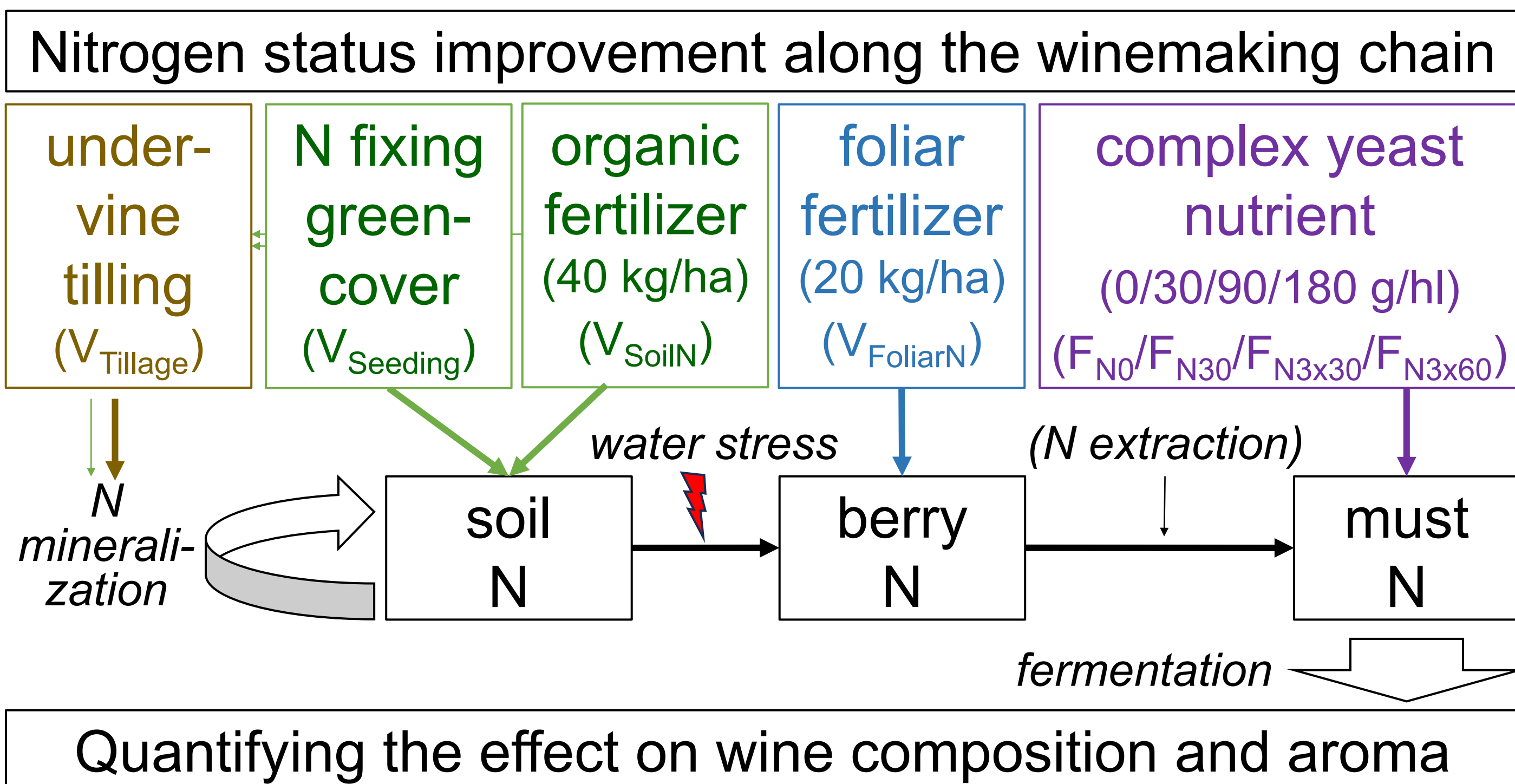
INTRODUCTION

The quantity of yeast assimilable nitrogen (YAN) in grape must is crucial for reliable fermentation, preventing off-flavours and augmenting fermentation aroma in wine. The fungus resistant grape variety (FRG) Souvignier Gris (SG) has shown promising properties but has been observed to poorly accumulate YAN in its grapes. Countermeasures can be taken in the vineyard through fertilization, irrigation and optimizing leaf to fruit ratio or in the cellar by yeast nutrient additions.

Interventions in the field and in the cellar have been shown

to affect wine aroma differently as varietal aroma precursors are formed in the vineyard. Especially levels of the varietal thiols have been shown to increase with fertilization.

We tested whether the sensory quality of wines differed between a vineyard fertilization trial and yeast nutrient additions in the cellar. Over three years five fertilization regimes and four levels of yeast nutrient addition were tested and wine volatile compounds as well as sensory qualities were measured.

METHODOLOGY

Nitrogen status improvement along the winemaking chain

- under-vine tilling ($V_{Tillage}$)
- N fixing green-cover ($V_{Seeding}$)
- organic fertilizer (40 kg/ha) (V_{SoilN})
- foliar fertilizer (20 kg/ha) ($V_{FoliarN}$)
- complex yeast nutrient (0/30/90/180 g/hl) ($F_{N0}/F_{N30}/F_{N3x30}/F_{N3x60}$)

N mineralization → soil N → *water stress* → berry N → *(N extraction)* → must N

fermentation

Quantifying the effect on wine composition and aroma

➢ General must and wine composition analysis

➢ Volatile compound analysis

- Screening by untargeted head-space vacuum in-tube extraction GC-MS (Fuchsmann *et al.*, 2019)
- Varietal thiol analysis by derivatization with DTDP and UPLC-MS/MS analysis (Capone *et al.*, 2015)

➢ Sensory analysis

- Descriptive analysis with a scaling test
- Similarity analysis by a doubled free sorting test
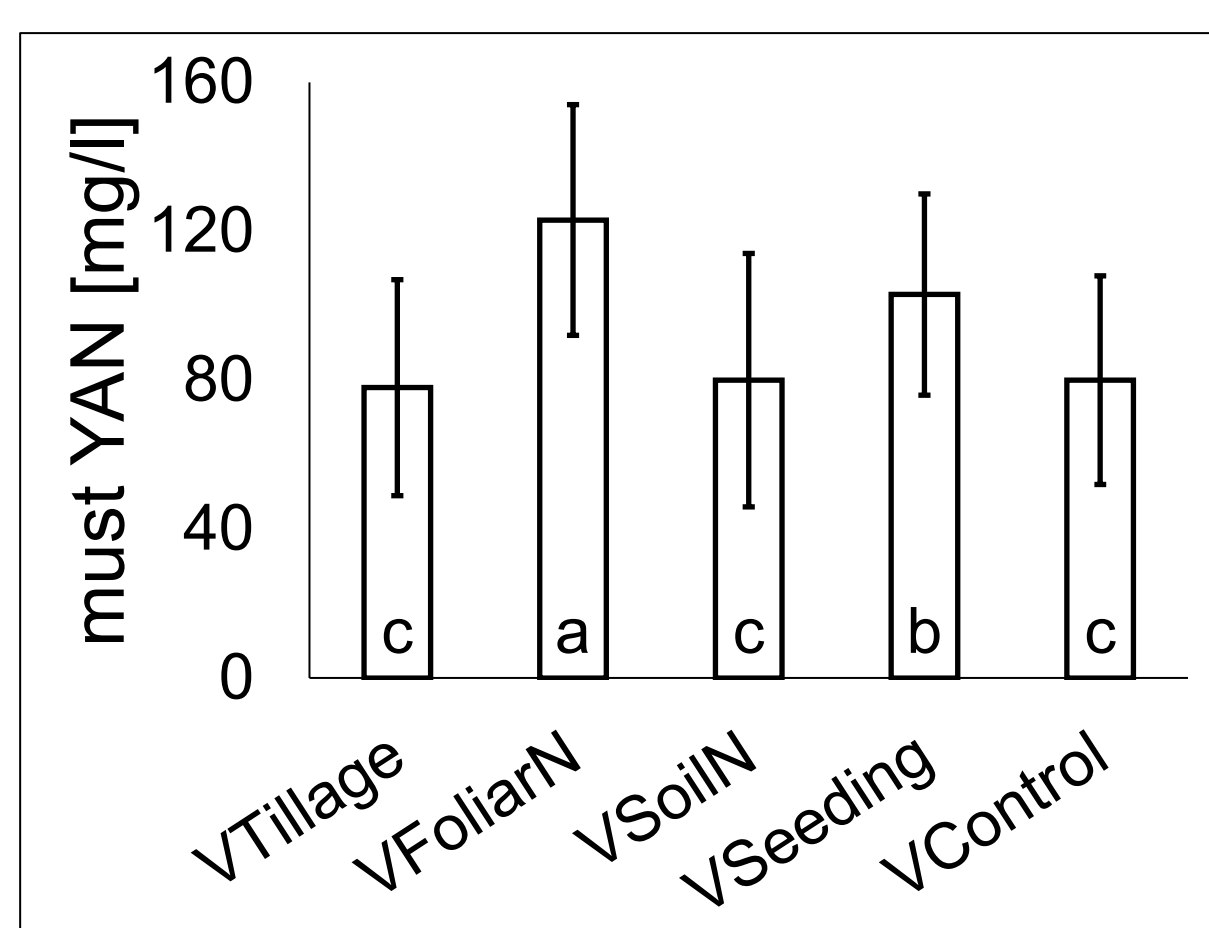
RESULTS

Figure 1: Must YAN level by fertilization method. Averages and standard deviation with significance groups are shown (vintages 2022 and 2023).
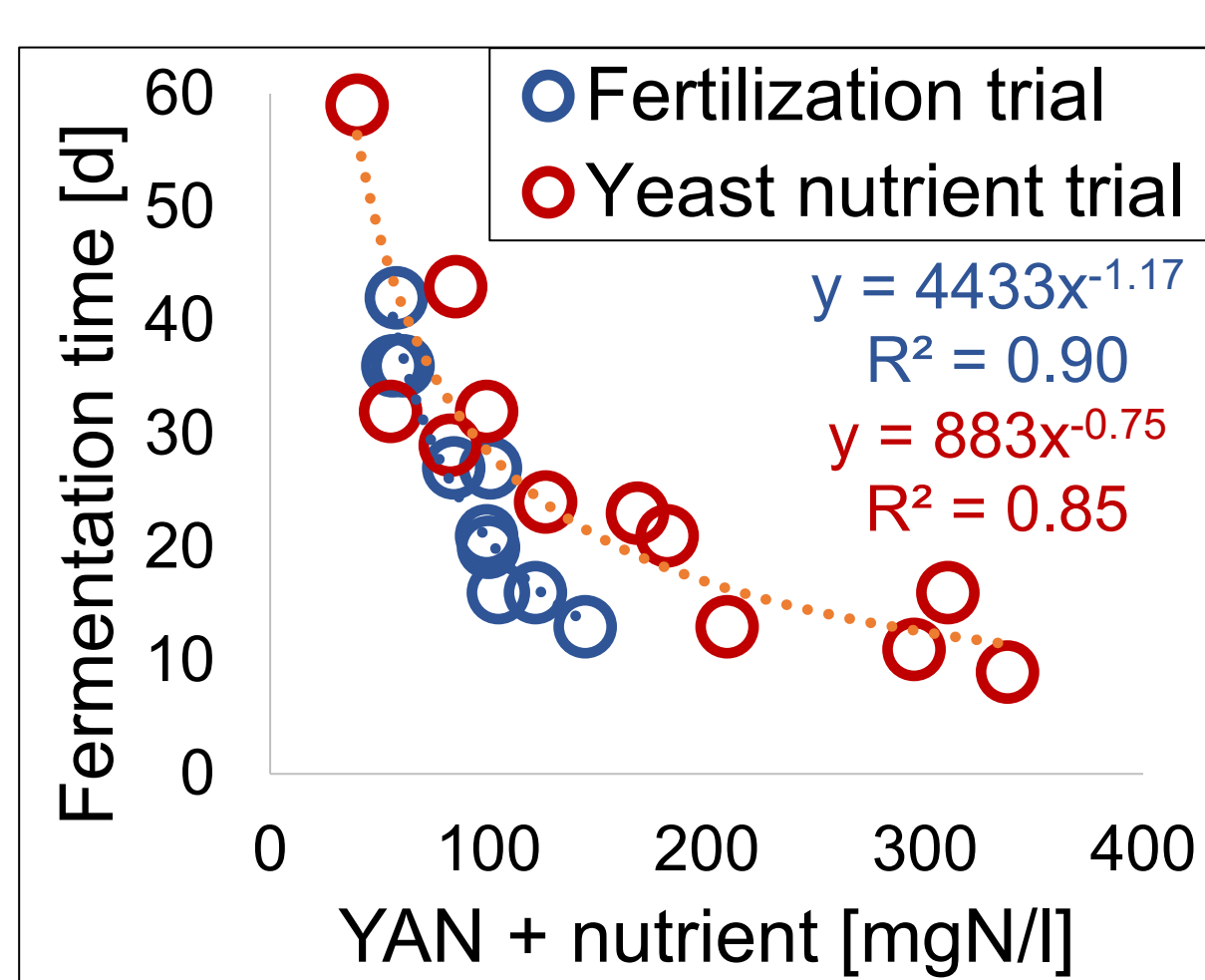

Figure 2: Relationship between must YAN including nutrient additions and fermentation duration
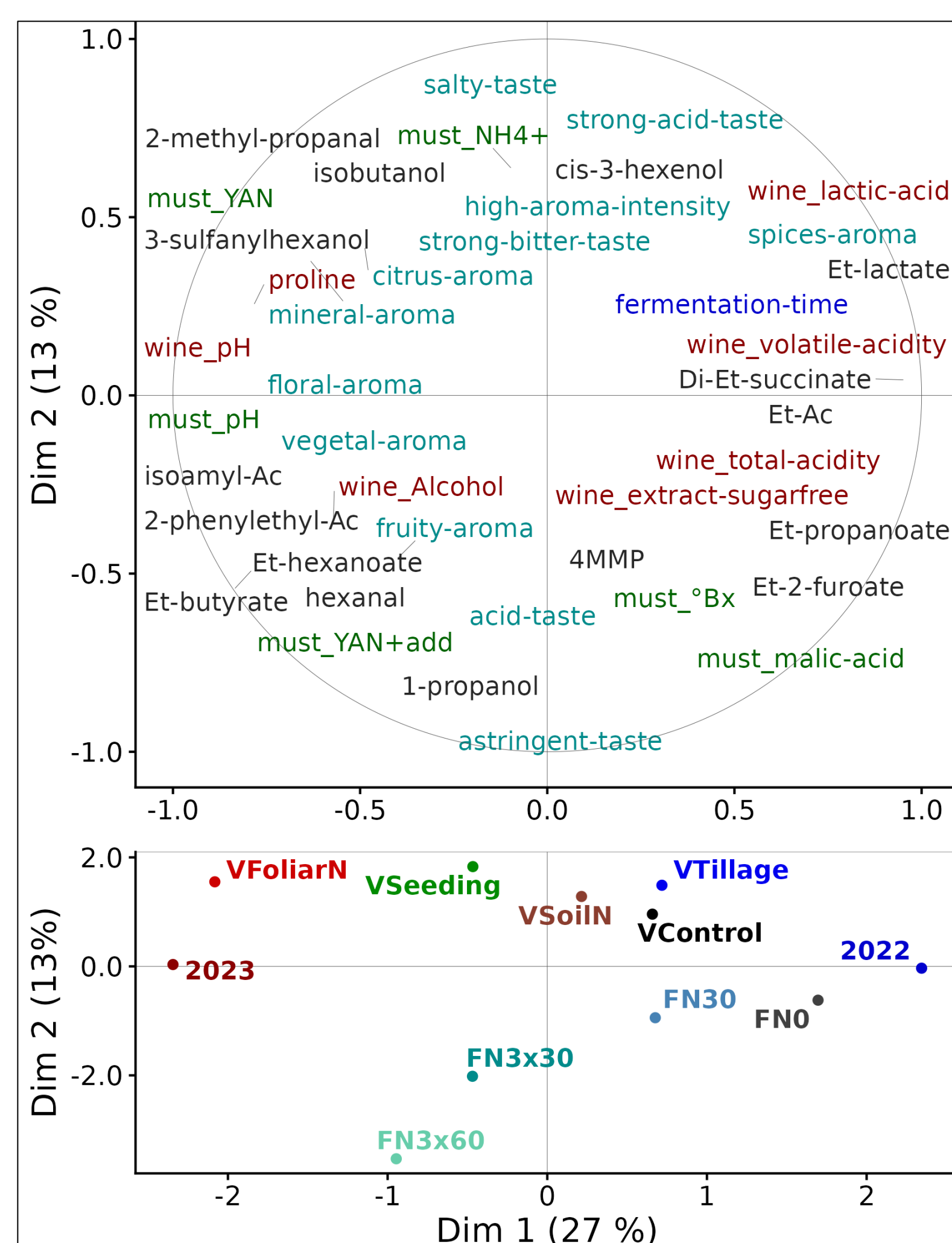

Figure 3: Multi factor analysis correlating data of the two trials from must and wine composition to volatile aroma compounds and sensory analysis. The most influential factors are shown in the top graph. On the bottom the correlating position of the treatments and vintages is shown. (Et = ethyl, Ac = acetate)

CONCLUSIONS

Augmenting vine nitrogen status, especially through foliar fertilization, was shown to improve YAN levels in SG must and positively affected wine quality by favouring thiol levels, especially 3-sulfanylhexanol. The leguminous cover crop was not shown to improve wine quality.

Yeast nutrient addition remains necessary in must deficient in YAN to ensure a thorough fermentation. Higher nutrient additions consistently increased fermentation ester abundance as well as fruity and exotic aroma of the wines. Lower additions led to a preferable result on the palate with decreased astringence, bitterness and more body.