

Application of Particle Film Influences Yeast Communities on the Surface of Touriga Nacional and Touriga Franca Grape Berries in the Douro Region

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1. Introduction



The application of particle films as a strategy to mitigate abiotic and biotic stress has gained increasing attention in viticulture; however, their effects on the natural grape berry microbiota remain poorly understood



Microbial community present on the surface of grape berries plays a key role in the initial stages of wine fermentation

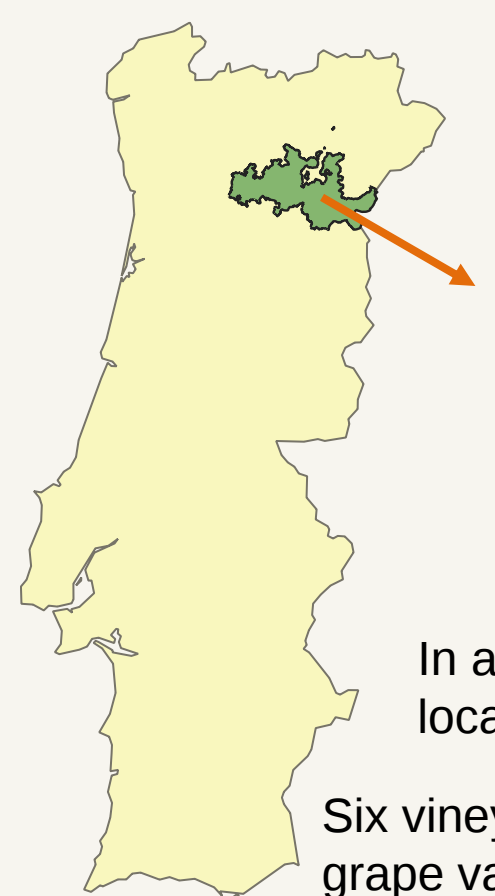
Can also affect the microbiological stability and sensory characteristics of the final product



Objectives

This study aims to investigate the effects of particle film applications, specifically kaolin and potassium silicate, on the indigenous yeast communities associated with two key grape varieties, “Touriga Nacional” and “Touriga Franca”, cultivated in Portugal’s Douro region

2. Materials and Methods

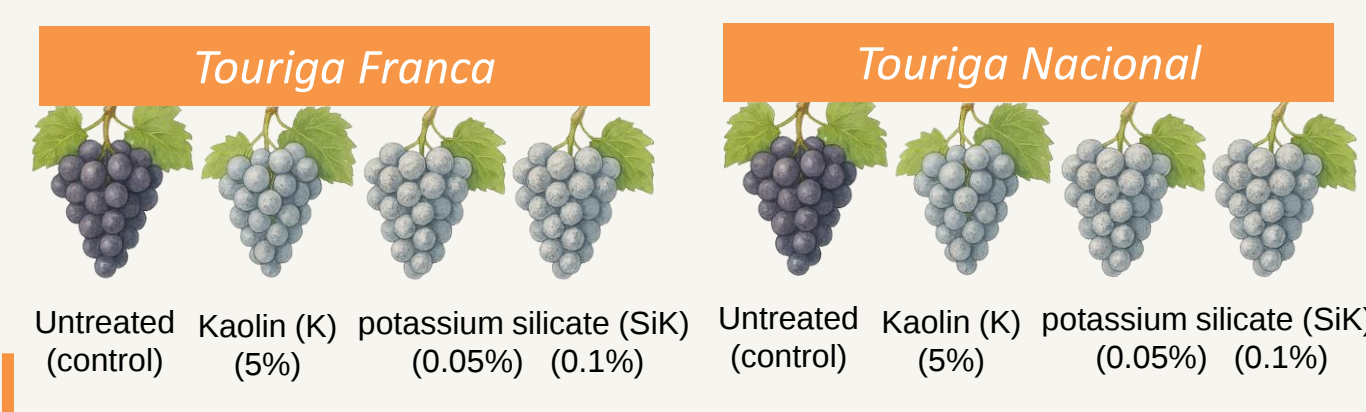


Douro Demarcated Region



In a commercial vineyard “Quinta do Orgal”, located in Vila Nova de Foz Côa

Six vineyard rows were selected, comprising two grape varieties that were treated at veraison with different particle film applications



300 g of berries in isotonic peptone water

shaken at 150 rpm for 3 hours

wash solution was filtered through a sterilized medical compress

A dilution series was plated on agar and yeast peptone dextrose (YPD) agar

Yeasts were identified by sequencing the D1/D2 domain of the 26S rRNA encoding gene.

3. Results

Total yeast count ranged from 10^3 to 10^4 CFU/berry (Fig. 1A)

Touriga Franca variety, in general, presented significantly higher populations of yeasts, However, within this variety, grapes samples treated with potassium silicate (at both concentrations) presented the lowest yeast counts (Fig. 1A)

Untreated grapes exhibited significantly higher species compared to treated grapes (Fig. 1A)

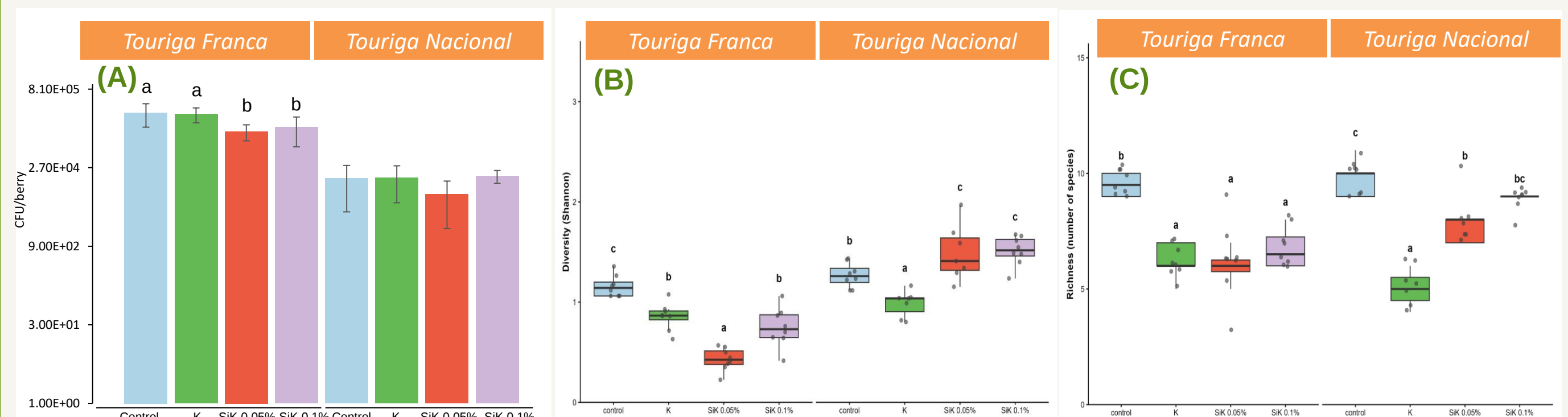


Fig. 1 (A) Total abundance (mean $\pm$ SD); (B) Species richness; (C) Shannon diversity index of yeast communities in Touriga Franca and Touriga Nacional grape varieties under different treatments: control, kaolin (5%), and potassium silicate (SiK at 0.1% and 0.05%). Different letters indicate significant differences within the same grape variety.

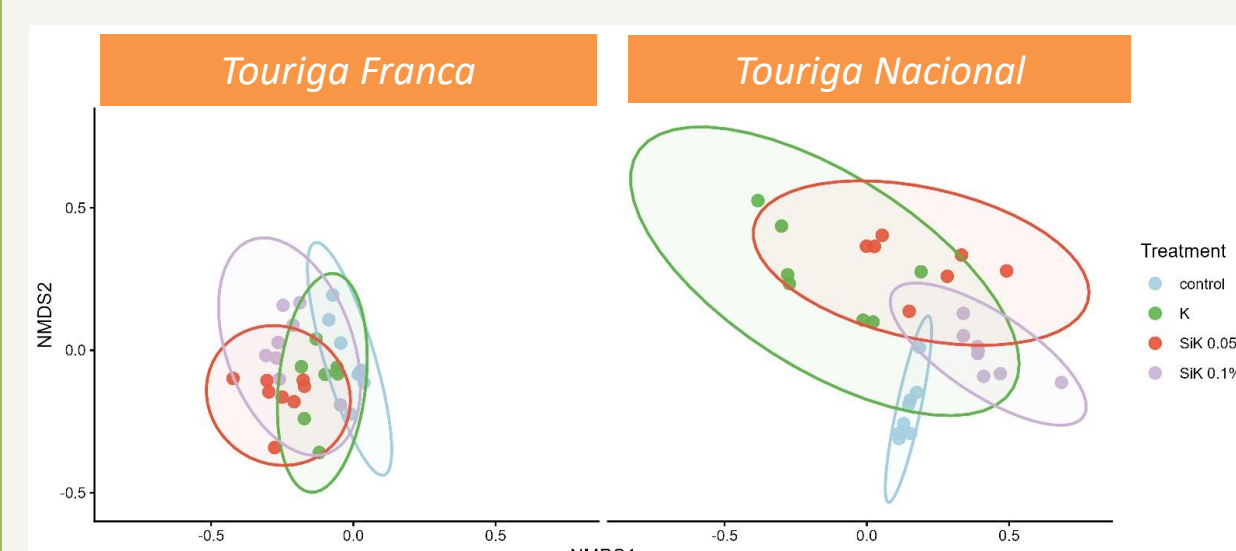


Fig. 2 Non-metric multidimensional scaling (NMDS) analysis of yeast community composition on the surface of Touriga Nacional (A) and Touriga Franca (B) grape varieties under different treatments: control (untreated), kaolin (5%), and potassium silicate (SiK at 0.05% and 0.1%).

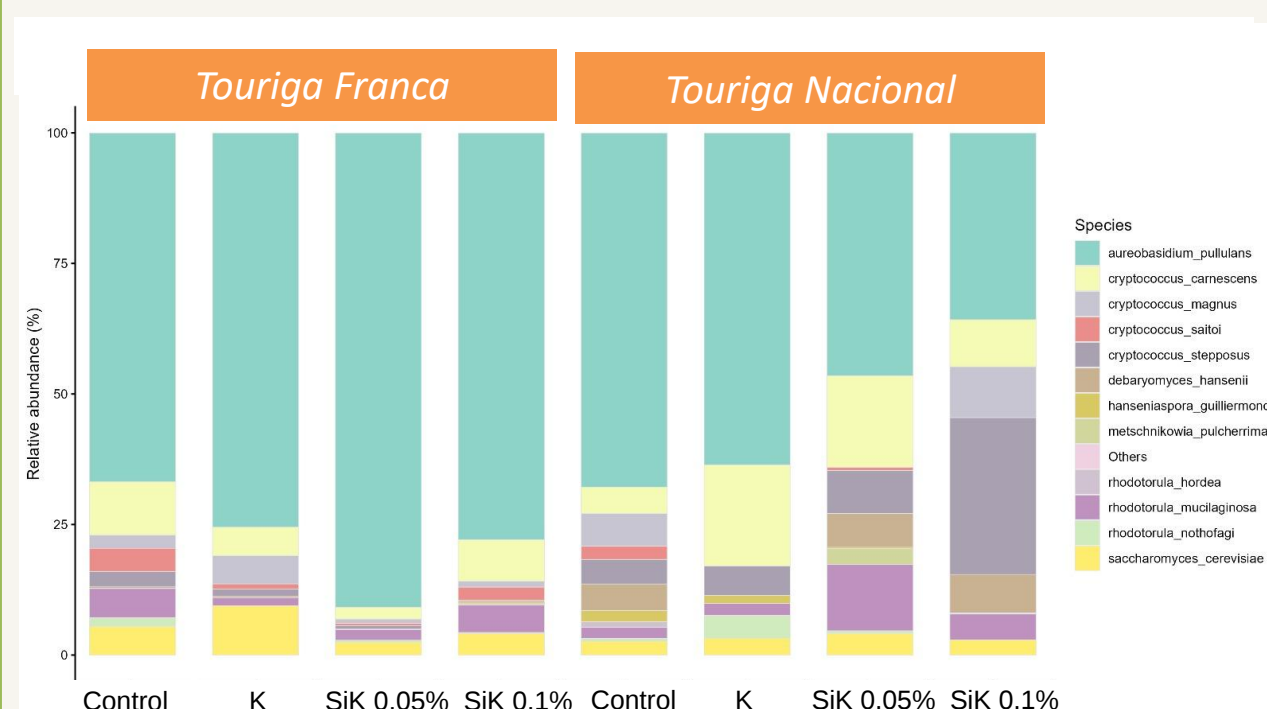


Fig. 3 Relative frequency of yeast species isolated from the surface of Touriga Nacional (A) and Touriga Franca (B) grape varieties under different treatments: control (untreated), kaolin (5%), and potassium silicate (SiK at 0.05% and 0.1%).

Multivariate analyses revealed distinct yeast community structures shaped by grape variety ($df = 1$; $F = 151.65$; $p < 0.001$), treatment ($df = 3$; $F = 9.03$; $p < 0.001$), and their interaction ($df = 1$; $F = 151.65$; $p < 0.001$) (Fig. 2)

Thirteen yeast species were identified, belonging to the phyla Ascomycota and Basidiomycota (Figs 3 and 4)

Aureobasidium pullulans was the dominant species across all treatments, although its relative frequency varied according to treatment type and grape variety (Fig. 3)

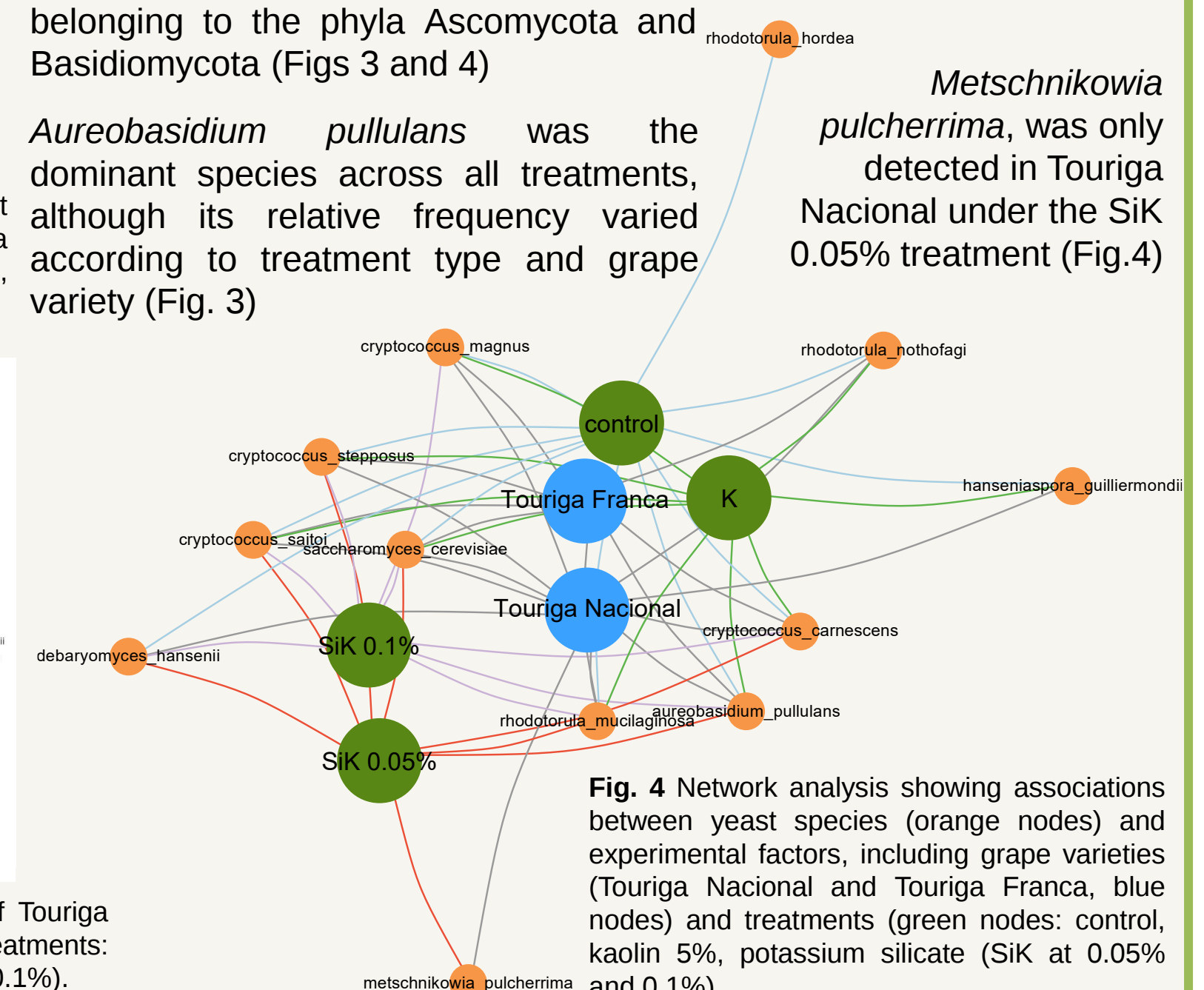


Fig. 4 Network analysis showing associations between yeast species (orange nodes) and experimental factors, including grape varieties (Touriga Nacional and Touriga Franca, blue nodes) and treatments (control, kaolin 5%, potassium silicate (SiK) at 0.05% and 0.1%).

4. Conclusion

Grape samples treated with potassium silicate (at both concentrations) showed the lowest yeast counts, but this effect was only observed in the Touriga Franca variety.

M. pulcherrima, a non-*Saccharomyces* yeast known for enhancing aroma and color stability in wine, was detected only in Touriga Nacional under the SiK 0.05 treatment

These findings suggest that particle film applications can change the indigenous yeast community on grape surfaces, potentially affecting fermentation dynamics and modifying the wine's profile

Acknowledgements

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