Phenolic, antioxidant, and sensory heterogeneity of oenological tannins: what are their possible winemaking applications?

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This study aims to understand the heterogeneity of commercial formulations of oenological tannins and to assess their PHENOLIC CONTENT, ANTIOXIDANT ACTIVITY, and SENSORY PROPERTIES.

Introduction

Oenological tannins (OETs) are winemaking processing aids. Their use is regulated by OIV resolutions (OIV-OENO 612-2019 and OIV-OENO 613-2019, OIV) to facilitate the stabilization and fining of musts and wines, as well as to increase the antioxidant and antioxidasic capacity of grape juice and to promote color stability.

OETs are usually classified depending on their constituents in hydrolysable tannins (gallotannins and ellagitannins) from wood, and proanthocyanidins from grape skins and seeds (prodelphinidins and procyanidins) and from exotic wood (prorobinetinidins and profisetinidins), i.e., *Mimosacecae* spp. and quebracho.

Therefore, the different OETs origin determines different constituents and the formulations available on the market can be pure or deriving from a mix of sources.

Tannin formulations

3 formulations of proanthocyanidins from grape (Sd1, Sd2, Sk3) and 3 from exotic wood (Ac1, Q1, Q2), 3 hydrolysable (Et1, Et2, Gt1), and 8 mixed formulations were evaluated.

Material & Methods

Wine-like solution (Vignault et al., 2018)
(4 g/L tartaric acid, pH 3.5, 12% ethanol)

Polyphenolic characterization (PF-tannin):
Folin Ciocalteu method (FC, as gallic acid)
Bate Smith method (BS, as cyanidin chloride)
Methyl-cellulose method (MTC, as gallic acid)

Antioxidant assays (AC-tannin):
DPPH (as mMol Trolox)
ABTS (as mMol Trolox)
FRAP (as mMol Trolox)
CUPRAC (as mMol Trolox)

Water and red wine (0,4 g/L)

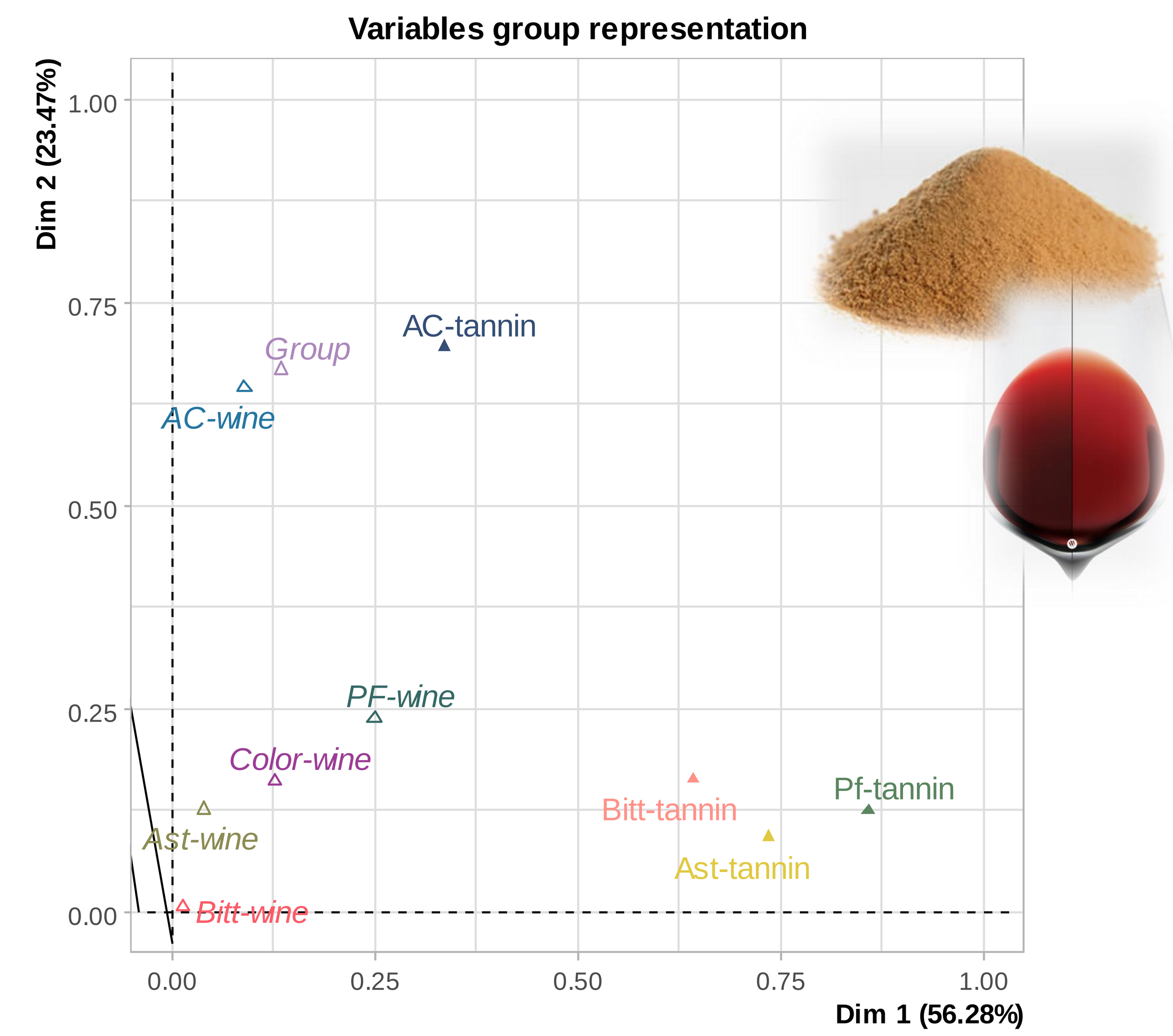
Sensory analysis:
Intensity scales of astringency (AST) and bitterness (BIT)
Check-all- that apply (CATA) on aroma descriptors

Red wine analysis after 1 months:

Total phenolic index (PF-wine, as g of gallic acid/L), DPPH and FRAP (AC-wine, as mMol of Trolox/L),
Total anthocyanins (as g of malvidin /L) and pigments polymerization (both represented in Color-wine group).

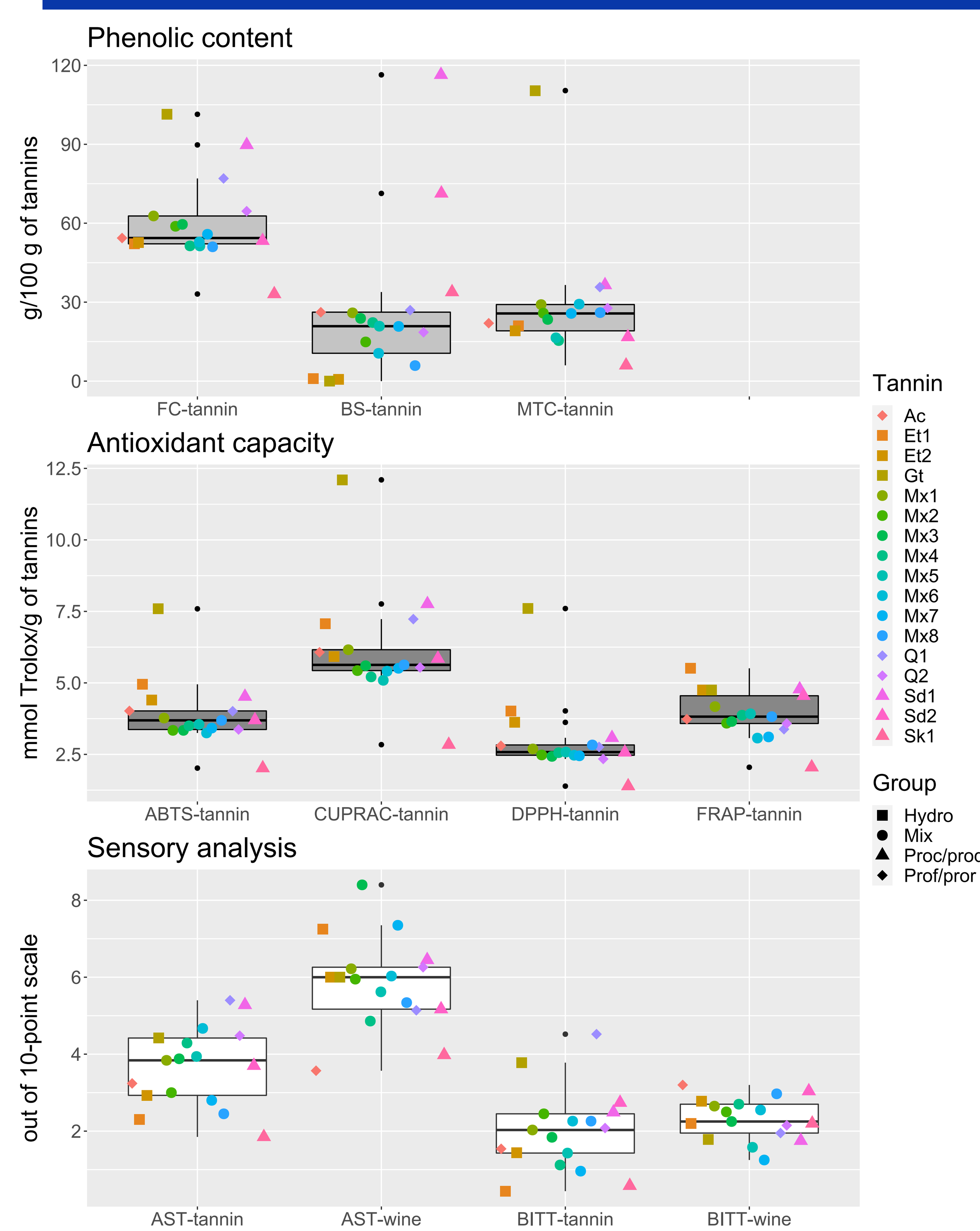
Results of wine analysis

Multifactorial Analysis of tannins characteristics in model solution and wine



In wine, the polyphenolic richness is the main driver of OETs impact. Ellagitannins favour pigments polymerization. Wine antioxidant capacity is correlated with the one of tannins and, hydrolysable are the most involved.

Results of OETs characterization



Polyphenolic characterization

OETs formulations present high variability in tannin content.

Antioxidant characterization

Ellagitannins own the highest antioxidant capacity, followed by quebracho tannins.

Sensory characterization

Quebracho tannins are the most bitter and astringent in water. No differences in astringency and bitterness at tested dose (0.4 g/L) were found between added red and control. Aroma descriptors of tannins in water were not correlated with those found in added wines.

References:
OIV, 2019. Resolution OIV-OENO 612-2019
OIV, 2019. Resolution OIV-OENO 613-2019
Vignault et al., 2018. *Food chemistry*, *268*, 210-219.

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