EFFECT OF GRAPE MATURITY ON CARBOHYDRATES COMPOSITION OF RED SPARKLING WINES

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INTRODUCTION

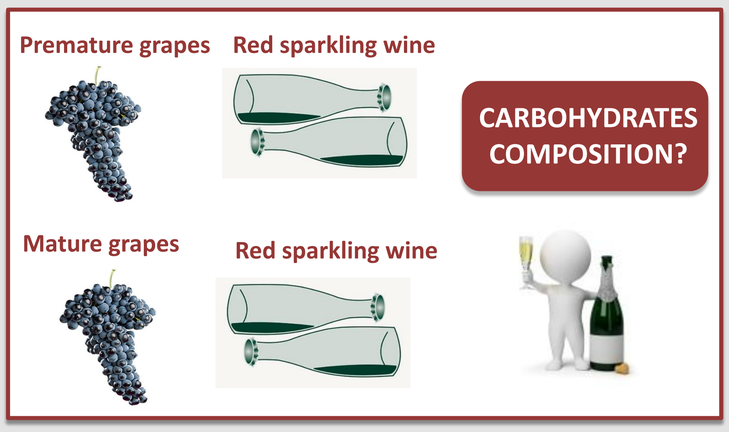
- Sparkling wines elaborated following the traditional method undergo a second fermentation in closed bottles of base wines, followed by aging of wines with lees for at least 9 months.
- Although the most of the sparkling wines elaborated are white and rosé ones, the production of red ones is highly increasing.
- One of the initial problems in red sparkling wine processing is to obtain suitable base wines that should have moderate alcohol content therefore, grapes must be harvested at low maturity stage. This fact could affect the polysaccharide and oligosaccharide content of wines in turn it could have implications for sparkling wine sensory properties.

EXPRIMENTAL

- Grapes from Tempranillo variety were harvested in two maturity moments: prematurity grapes (PM) and grapes at their optimum degree of maturity (M). Then, two red sparkling wines were manufactured using the traditional method champenoise.
- Samples for analyses were taken from the base wines and then after 3 months, 6 months and 9 months of aging on yeast lees.
- Isolation of polysaccharide and oligosaccharide fractions were made according to the previously method described [1].
- The polysaccharide composition was estimated from the concentration of individual glycosyl residues determined by GC–MS after hydrolysis, reduction and acetylation as described elsewhere [2].
- Oligosaccharide fraction was determined after solvolysis by GC of their per-O-trimethylsilylated methyl glycosided derivatives [3].

OBJECTIVE

To analyze the changes occurring on oligosaccharides and polysaccharide families during the red sparkling wine processing by the traditional method, as well as to study the effect of grape ripening stage on carbohydrate composition.



RESULTS AND CONCLUSIONS

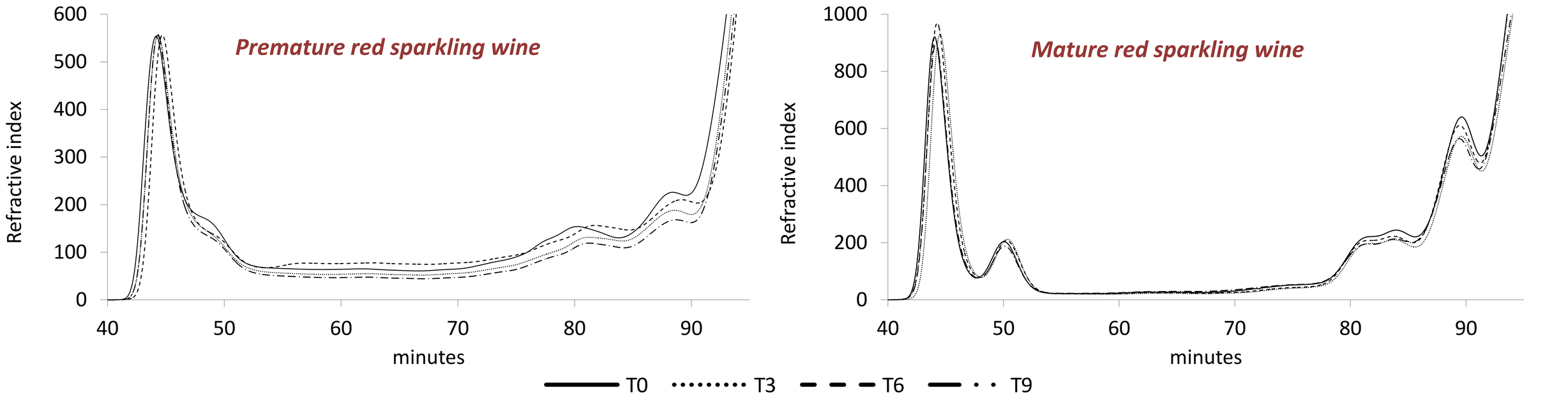


Figure 1 Purification by high-resolution size-exclusion chromatography of polysaccharides and oligosaccharide fractions isolated on Superdex 30-HR column from premature and mature red sparkling wines during different stages of sparkling wine production: base wines (T0), sparkling wines after 3 months (T3), 6 months (T6), and 9 months (T9) of aging on yeast lees. (Refractive index versus Retention Time (Minutes)).

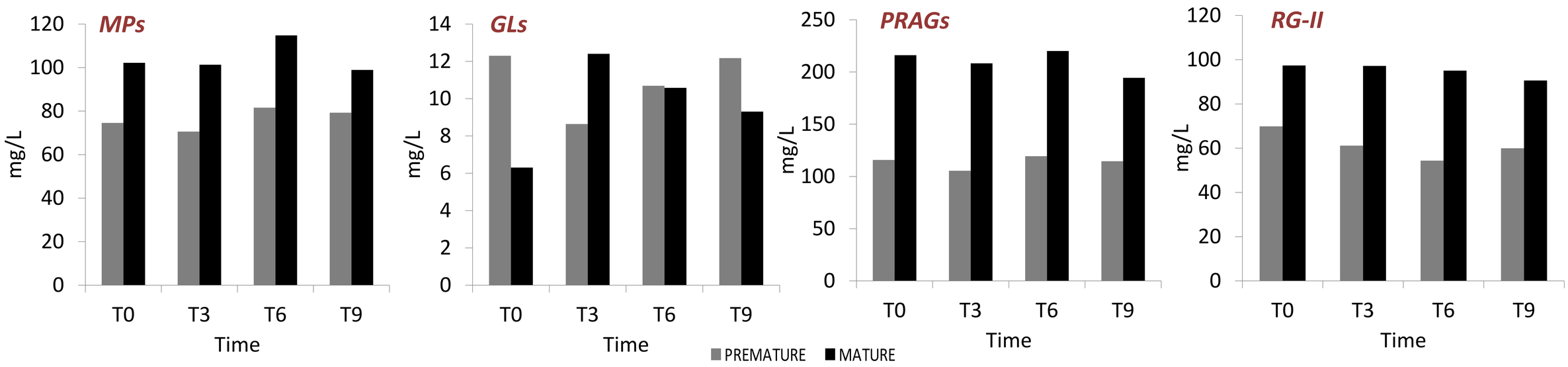


Figure 2 Concentration of mannoproteins (MPs), glucans (GLs), polysaccharides rich in arabinose and galactose (PRAGs), and rhamnogalacturonan II (RG-II) in premature and mature red sparkling wines during different stages of sparkling wine production: base wines (T0), sparkling wines after 3 months (T3), 6 months (T6), and 9 months (T9) of aging on yeast lees.

Table 1 Glycosyl composition (mg/L) of oligosaccharides from red sparkling wines during different stages of sparkling wine production: base wines (BW), sparkling wines after 3 months (T3), 6 months (T6), and 9 months (T9) of aging on yeast lees.

	Rha [a]	Fuc [a]	Ara [a]	Xyl [a]	Man [a]	Gal [a]	Glc [a]	Gal A [a]	Glc A [a]	Xylitol	4-OMeGlc A [a]	Total
PM[b]												
T0	4.3	3.3	11.6	17.9	26.0	7.5	41.1	176.8	3.1	1.8	5.6	299.0
T3	3.4	2.2	10.3	15.1	21.6	7.3	34.5	144.0	2.6	2.0	4.9	247.9
T6	4.1	2.6	12.5	17.0	24.4	7.9	50.0	172.9	3.1	2.1	5.3	301.9
T9	2.6	2.1	6.7	10.8	18.1	6.2	36.2	91.8	1.7	1.3	3.0	180.5
M[b]												
T0	3.2	2.7	18.0	20.9	24.2	11.0	42.2	174.2	3.9	3.3	7.6	311.2
T3	3.0	3.0	16.8	21.1	26.0	9.3	54.7	172.8	3.6	3.2	7.2	320.7
T6	2.5	2.5	13.7	16.4	20.6	6.9	44.4	160.2	3.7	2.0	6.0	278.9
T9	2.5	2.5	15.0	18.8	21.6	7.0	56.8	147.0	3.3	2.8	6.0	283.3

[a] Rha, Rhamnose; Fuc, Fucose; Ara, Arabinose; Xyl, Xylose; Man, Mannose; Gal, Galactose; Glc, Glucose; Gal A, Galacturonic acid; Glc A, Glucuronic acid; 4-OMeGlc A, 4-O methyl Glucuronic acid.
[b]PM, premature grapes; M, mature grapes.

- Grape ripening stage affected the concentration, composition and evolution of polysaccharides and oligosaccharide during the aging on lees of sparkling wines.
- Polysaccharides rich in arabinose and galactose and oligosaccharides were the two most prevalently carbohydrates detected in all vinification stages.
- More studies should be carried out to further investigate the possible influence that different polysaccharides and oligosaccharides from different grape maturity could have on the physic-chemical and sensory properties of sparkling wines.

REFERENCES

[1] Ducasse et al. (2010). Carbohyd. Polym. 79, 747-754.
[2]Apolinar-Valiente et al. (2013). J. Agr. Food Chem. 61, 2538-2547.
[3] Doco et al. (2001). Carbohyd. Polym. 46, 249-259.

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