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Recovery of bioactive compounds from grape pomaces and stems

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1. INTRODUCTION

During the last decade, there is an increasing concern of the food industry in diminishing the environmental impact of their residues and wastes (González-Centeno et al., 2010). Grape is one of the major worldwide fruit crops, being Spain the first region in vine cropped area and the third major wine producer worldwide. The volume of the of winery by-products generated is estimated arround 1300 million kilograms.

The revalorization of food by-products is gaining on attention due to the possibility to obtain bioactive constituents such as antioxidants.

Wine by-products are rich in polyphenolic compounds, which present protective effects again certain diseases (Krondrashov et al., 2009).

2. OBJECTIVES

The aim of this study was to select the winery by-product with the highest bioactivity potential.



Pomace Stem

The **total polyphenol content, anthocyanins and tannins content**, together with the **antioxidant potential** was determined. The comparison among red and white grape varieties was also evaluated. Red grape White grape

3. MATERIALS AND METHODS

By-products material

Wine by-products, pomaces (S) and stems (S) were obtained during the vinification process from different grape varieties (red and whites). The selected grapes were:


Escursac

Gorgollassa

Sabater

Giró ros

Quigat

Total polyphenol content and antioxidant potential

The total polyphenol content (TPC) was spectrophotometrically determined according to the Folin-Ciocalteu's method and using gallic acid (GAE) as standard (50-500 mg L^{-1}). Anthocyanin (ANT) and tannin (TC) contents were estimated according to Ribéreau-Gayón et al. (2006). The antioxidant potential was tested by the ABTS $^{\bullet+}$ method, by the method described by Re et al., 1999). The spectrophotometrical determinations were carried out by a Thermo Scientific Multiskan® Spectrum. Results were reported as trolox equivalent calculated from a calibration curve (25-800 µM trolox). Statistical analyses were performed by using the *Statgraphics*® plus software package for Windows.

4. RESULTS AND DISCUSSION

The TPC, anthocyanin and tannin contents of grape pomaces and stems are shown in table 1. Since all by-products were grown under the same experimental conditions, the differences within the same by-products detected in the total phenol content are mainly due to the intrinsic properties of each grape variety. TPC values ranged from 0.91 to 2.30 g/100 g dm and from 4.39 to 7.95 g/100 g in pomaces and stems, respectively. Stems exhibited higher TPC values compared with pomaces ($p < 0.05$) as previously reported Llobera & Cañellas (2008). *Escursac* stems exhibited the highest polyphenolic content. Among pomaces, whites presented higher TPC values than reds.

Table 1. TPC, ANT and TC contents of grape by-products. Values are means (n=6) ± SD.

Grape variety	By-product	TPC (g GAE/100 g dm)	ANT (g/100 g dm)	TC (g/100 g dm)
Escursac	PP	1.96 ± 0.01	0.40 ± 0.03	3.94 ± 1.42
	S	7.95 ± 0.22	0.18 ± 0.01	13.05 ± 2.90
Gorgollassa	PP	0.91 ± 0.02	0.30 ± 0.01	2.19 ± 0.29
	S	4.92 ± 0.31	0.02 ± 0.00	2.16 ± 1.31
Sabater	PP	1.77 ± 0.05	0.15 ± 0.01	2.84 ± 0.57
	S	4.39 ± 0.11	0.05 ± 0.01	9.89 ± 1.68
Giró ros	PP	2.21 ± 0.03	0.02 ± 0.01	3.28 ± 0.28
	S	5.31 ± 0.05	0.04 ± 0.03	7.08 ± 1.20
Quigat	PP	2.30 ± 0.04	0.02 ± 0.01	2.87 ± 0.64
	S	5.06 ± 0.17	0.02 ± 0.01	11.21 ± 0.32

TPC values in red pomaces were slightly lower to those reported by Deng et al. (2011), varying between 2.14 and 2.67 g/100 g dm in *Pinot noir*, *Merlot* and *Cabernet S.* However, in white pomaces, the same author reported TPC values for *Muller Thurgau* and *Morio Muscat* varieties clearly lower to those obtained in the present study.

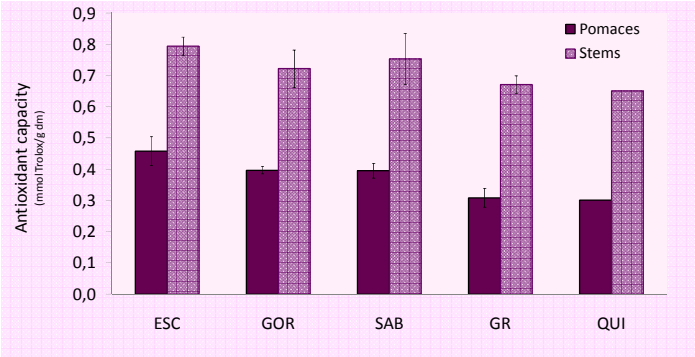
Anthocyanins were almost despicable in stems and white pomaces (<0.04 g/100 g), except in *Escursac* stems.

This is probably because anthocyanins are mainly concentrated within the vacuoles of red grape skins but missing in grape stems and pomaces from white varieties. Within red pomaces, *Escursac* showed the highest anthocyanin content ($p < 0.05$). In the case of tannins, stems by-products presented significantly larger amounts of tannins than pomaces. *Escursac* stems depicted the highest tannin values.

Antioxidant potential

Results of the antioxidant potential evaluated by ABTS $^{\bullet+}$ assay, expressed as mmol Trolox equivalent is presented in figure 1. Results revealed that both grape by-products, pomaces and stems, are interesting free radical-scavengers compared with other fruits. Stems, showed a significantly larger potential (from 0.65 to 0.79 mmol/g) than pomaces (from 0.30 to 0.46 mmol/g). In stems, *Escursac* exhibited the larger antioxidant power, which agreed with the larger content of TPC. In the case of pomaces, the ABTS$^{\bullet+}$ assay did not reflect statistical differences among pomaces ($p > 0.05$). PP by-products showed lower antioxidant potential for the white varieties ($p < 0.05$). This is in agreement with the statistical differences between red and white pomaces reported by González-Paramás et al. (2004) and Deng et al. (2011).

Figure 1. Antioxidant activity of grape by-products from different grape varieties.



5. CONCLUSIONS

In general, results indicate that the winery residues constitute a considerable rich source of bioactive compounds with an interesting antioxidant potential. In particular, stems presented significantly major amounts of total polyphenols and tannins than pomaces. Anthocyanins were almost negligible in stems and white PP, being important in pomaces from red varieties. Regardless of the grape variety considered, the winery by-products denoted a great antioxidant effect. Concerning to stems, the local *Escursac* variety pointed out the major values for total polyphenol, anthocyanin and tannin contents.

Winery by-products, residues without any important commercial use, displayed promising potentials for their exploitation by the food and pharmaceutical industries for the prevention of oxidative stresses, specially, when stem residues are considered.

References

Deng, Q., et al., (2011). *Food Research International*, 44(9): 2712-2720.
González-Centeno, R. et al., (2010) *LWT-Food Science and Technology*, *43*, 1580-1586.
González-Paramás et al. (2004). *Journal of the Agricultural and Food Chemistry*, *52*, 234-238.
Llobera, A., Canyellas, J. (2008). *Food Chemistry*, *101*, 659-666.
Kondrashov, A. et al., (2009). *The European e-Journal of Clinical Nutrition and Metabolism*, *4*, 41-46.
Re et al., (1999). *Free Radical Biology and Medicine*, *26*, 1231-1237.
Ribéréau-Gayón, P., et al., (2006). Handbook of Enology, 2.

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