

Abstract Book

6th IWA specialized conference

Winery 2013 Viticulture and Winery wastes environmental impact and management

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May 26-30 2013 Narbonne, France



6th IWA specialized conference "Winery 2013"

"Viticulture and Winery wastes: environmental impact and management"

Session X

By-product biorefinery

Wednesday 29 May 2013

11:05-12:40

✓ French wine distilleries, environmental workshops for the wine sector - Claire DOUENCE & Frédéric PELENC (FRANCE)

✓ Winemaking co-products and other grape by-product - Nelly URBAN (FRANCE)

✓ Valorvitis – valorization of the wine industry by products - G. SPIGNO, L. MAGGI, D. AMENDOLA, L. FIORI, S.K. DUBA, et al. (ITALY)

 Tannin from Grape Pomace: Extraction and Utilization as Adhesive for Wood Particle Board -François GAMBIER, Franck JOLIBERT & Nicolas BROSSE (FRANCE)

VALORVITIS – Valorization of the wine industry byproducts for the production of high-added value compounds

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Keywords: Winery by-products; phenolic compounds; grape seed oil

Abstract: Winemaking is one of the most important agricultural activities that contribute substantially to national economy in many countries, but this process generates a substantial volume of solid by-products. The main ones are grape marcs and stalks, considered as source of polyphenols, grape seed oil, hemicelluloses, lignin and cellulose and different methods are used for their extraction. The evaluation of the availability and the potential of wine by-products (grape skins, stalks and seeds) for their valorization is the first objective of VALORVITIS (Contract n^o: 2010-2222). Fig 1 shows the work plan of the project.

In order to valorize the typical production of the Italian regions involved in the project, by-products were collected from the most important cultivars of these areas. Three of these varieties are typical Italian cultivars (Barbera and Nebbiolo, red ones, and Moscato, white), whereas the other varieties, Pinot noir (red), Chardonnay and Müller-Thurgau (white) are also internationally cultivated and subjected to different vinification processes.

Employment of different cultivars is also necessary to evaluate the influence of the variable cultivar on the chemical-physical-functional properties of the recovered products (skin and seed flours, seed oil and phenols extracts).

Stalks, undistilled and distilled marcs of these grapes were collected from winemakers and distilleries, oven-dried at 60°C and milled for subsequent chemical/physical characterization and in order to obtain fibrous fractions to be used as food ingredients for functional foods. Skins and seeds were separated before milling.



Fig. 1. VALORVITIS Work plan.

In order to obtain a chemical characterization of grape marc or skins gross composition, total phenols (TP), flavonoids (TF), flavonols (TFV), cinnamic acids (CA) and antioxidant activity were determined. There were significant differences between red and white varieties for TP, TF and TFV. TP content varied between 2.4 and 7.0 g of Gallic Acid Equivalent (GAE)/100 gskins, TF ranged from 40.3 to 188.7 mg Quercetin Equivalent (QE)/100 gskins and TFV were between 88.2 and 196.1 mgQE/100gskins, finally CA values varied from 1.1 and 2.9 g Caffeic Acid Equivalent (CAE)/ 100gskins. Pinot Noir showed the highest content for all phenolic fraction, followed by Barbera and Nebbiolo, as concerned white cultivars the highest values were found for Müller-Thurgau followed by Moscato and Chardonnay.

Grape seed oil was extracted by supercritical CO2 (and for comparative purposes by hexane at atmospheric pressure and by mechanical pressing). The oil from the six cultivar was analyzed in terms of fatty acid profile, tocopherol and tocotrienol content, aroma profile (E-nose analysis). At first, extraction tests with supercritical CO2 were conducted in the temperature and pressure ranges of, respectively, 40-60°C and 200-500 bar utilizing Chardonnay seeds. Later on, extraction tests were performed for all the six cultivars at the best operational conditions (60°C, 500 bar) to compare the different oil extraction yield. The fatty acid profile of the various oils resulted very similar, while significant differences were found on the tocopherol and tocotrienol content. Interestingly, the e-nose was capable to distinguish among grape seed oil from different cultivars.

The influence of grape varieties on the lignocellulosic fractionation of grape-stalks (GS) was also investigated, observing that the cultivar significantly influences this fractionation and it was possible to recover from 9 to 24 % of GS dry matter as monosaccharides (glucose, fructose and xylose).

Some foods including: bread, fruit-based products, cheese and yogurt were then chosen as models to develop new formulations enriched with the fibrous fractions. The effects of fortification on the main quality indexes of the model foods were investigated. This characterization included evaluation of color, rheological properties, antioxidant activity and stability under processing conditions. Specifically designed processing conditions were applied in order to get the best food prototypes.

The developed food prototypes were also investigated in terms of sensory properties. Results obtained by descriptive analysis performed by a panel of trained judges allowed to determine the sensory profiles of the innovative foods and identify the texture properties as main sensory attributes influenced by the by-product addition. Liking tests conducted with consumers have shown a good acceptability for the first food prototypes. From these results, we can assume that if these functional foods are launched on the market they will have a positive feedback.