EXTRACTION AND FORMULATION INTENSIFICATION PROCESSES FOR NATURAL ACTIVES OF WINE

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Spain has over 1.2 million hectares of planted vines, making it the most widely planted wine producing nation (over 15% of the world total) and the third largest producer of wine in the world, following France and Italy.[1] The winemaking process generates large amounts of by-products such as grape seeds and skins which are rich in polyphenols[2] with strong antioxidant properties that are interesting from a chemical, pharmaceutical and biological viewpoint. They have been proved to have numerous health benefits as antioxidants, i.e. reducing the incidence of cardiovascular diseases, improving the cognition and neuronal function with aging and neurodegenerative diseases, antitumor, anti-inflammation, and anti-microbial.[3] The incorporation of these natural substances into cosmetics, food, or pharmaceutical products represents an interesting market opportunity for wine producers that could lead to sustainable growth and development of the sector.

Traditionally, polyphenols have been extracted from plants using solid-liquid extraction techniques, generally consisting in a maceration stage in which a moderate temperature is maintained for a relatively long time. Process intensification using microwave technology allows us to improve this process, since the damage caused to the cell wall by the microwaves facilitates the extraction of the phytochemicals.[5] We have studied the use of microwaves as a pretreatment in the so called microwaved assisted extraction (MAE), where a higher temperature (close to the evaporation temperature of the solvent) is reached by means of microwave energy during a short time, followed by a shorter traditional extraction.

Formulation of the extracted material is also an important part of the project. Formulation of model water-soluble (epigallocatechin gallate) and water-insoluble (quercetin) compounds has been carried out using different carrier materials and techniques such as supercritical fluid extraction of emulsions (SFEE) and particles from gas saturated solutions (PGSS-Drying).

References:

[1] MacNeil K., in: *The Wine Bible* pp. 410, Workman Publishing (2001)

[2] Spigno G. and De Faveri D.M.: *J. of Food Eng.* **78**, 793 (2007)

[3] Xia E., He X., Li H., Wu S., Li S., Deng, G.: *Chapter 5*, in: *Polyphenols in Human Health and Disease* pp. 47, Academic Press (2014)

[4] Kammerer D.R., Kammerer J., Valet R., Carle R.: *Food Res. Int.* **65**, 2 (2014)

[5] Sólyom K.: *Enhanced Extraction of Natural Substances using Microwave Energy* PhD dissertation, University of Valladolid, Spain (2013)

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