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Extended Abstract

Optimization of Aroma Compounds Extraction from Wine Lees Using a Taguchi Design †

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In this study, we aimed to optimize the aromatic compounds' extraction from wine lees which are responsible for cognac oil aroma. The concentration of cognac oil represents the sum of the ester concentrations of: octanoic acid ethyl ester (ethyl octanoate—EO), decanoic acid ethyl ester (ethyl decanoate—ED), dodecanoic acid ethyl ester (ethyl dodecanoate—EDD), and hexadecanoic acid ethyl ester (ethyl hexadecanoate—HDE), which are the main organic compounds in hydroalcoholic extracts [1–3]. The optimization of the extraction conditions necessary to obtain the maximum concentration of cognac oil, from red wine lees, was made by Taguchi design, using the response surface methodology (RSM) with a statistical model with three independent variables (A = solid/liquid ratio, w/w; B = extraction temperature, °C, and C = extraction time, h) and two levels, to maximize the relative extraction efficiency. The analysis of the experimental program was performed using Design-Expert® Software Version 11 (Stat-Ease, Inc., Minneapolis, MN, USA). The experimental Taguchi model for obtaining volatile organic compounds was performed using the Clevenger hydrodistillation method. Different quantities of red wine lees liquid sediment were mixed with distilled water in the Clevenger installation, at different extraction temperatures and different extraction times, heated in an oil bath on a heating magnetic stirrer with a temperature, at 650 rpm. For every experiment, the distillation head was collected separately to remove the odor of pomace. At the end of each experiment, the obtained concentrated hydrodistillate was collected and analyzed by gas chromatography–mass spectrometry (GC–MS) to identify the volatile compounds, by comparing to a standard cognac oil produced by Sigma-Aldrich (Germany). The main extracted volatile compounds were between 5.8 and 32.2 mg, where the minimum content obtained was for A = 1/1 w/w, B = 125 °C and C = 4 h, and the maximum was for A = 1.5/1 w/w, B = 150 °C and C = 4 h. The polynomial equation coefficients were established using the analysis of variance (ANOVA) for the selected factorial model. The optimum concentration of aromatic compounds was for A = 1.3/1 w/w at B = 141 °C and C = 4.3 h, which is in accordance with the predicted values obtained using RSM. The importance of the factorial model was calculated using ANOVA. Our study shows that the solid/liquid ratio and the extraction temperature have significant influence on the aroma compounds' extraction from wine lees, while the time has less influence. This study could represent a starting point in optimizing the extraction of aroma compounds for a higher valorization of wine lees.

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