OPTIMISATION OF POLYPHENOLIC COMPOUNDS EXTRACTION FROM RED GRAPE POMACE

OPTIMIZAREA EXTRACŢIEI COMPUŞILOR POLIFENOLICI DIN TESCOVINA STRUGURILOR NEGRI

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Abstract. *Grape pomace represent the main by-product of wine industry containing polyphenolic compounds with antioxidant and antibacterial activity. The aim of our study was to optimize their extraction using different organic solvents with different concentrations and different temperatures of extraction.The material used for extraction was grape pomace from three red varieties. As solvents, were used aqueous solutions from: ethanol, citric acid, acetone, sodium sulfite and glycerol, with different concentrations. The experimented temperatures for extraction were: 30, 60 and 90 °C and the time of extraction was two hours for all the solvents. The best extraction was registered in case of acetone and ethanol. The nature of solvents influenced the proportion between the different classes of polyphenolic compounds extracted. The increasing temperature of the extraction had a positive effect on the extraction in case of all the solvents. Also, the increase of solvents concentration had a positive effect, up to a certain limit.*
Key words: polyphenolic compounds, extraction methods, chemical composition

Rezumat. *Tescovina reprezintă principalul subprodus obţinut în industria vinului, fiind bogată în compuşi polifenolici. Scopul cercetărilor întreprinse a fost de a optimiza extracţia acestor compuşi prin utilizarea unor solvenţi organici, în concentraţii diferite şi a unor temperaturi diferite de extracţie. Materialul utilizat pentru extracţie a fost tescovina provenită de la trei soiuri negre. Ca solvenţi de extracţie au fost utilizate soluţii apoase de etanol, acid citric, acetonă, sulfit de sodiu şi glicerină, cu diferite concentraţii. Temperaturile de extracţie experimentate au fost: 30, 60 şi 90 °C, iar timpul de extracţie a fost de două ore pentru toţi solvenţii. Cea mai bună extracţie s-a înregistrat în cazul utilizării acetonei şi etanolului. Natura solvenţilor a influenţat proporţia dintre diferitele clase de compuşi polifenolici extrase. Creşterea temperaturii de extracţie a avut un efect pozitiv asupra extracţiei în cazul tuturor solvenţilor. Şi creşterea concentraţiei solvenţilor a avut un efect pozitiv, până la o anumită limită.*
Cuvinte cheie: compuşi polifenolici, metode de extracţie, compoziţie chimică

INTRODUCTION

Grape pomace is the main by-product of wine industry that concentrates bioactive metabolites of polyphenolic nature with antioxidant

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and antibacterial activity (Mendoza *et al.*, 2013; Sousa *et al*., 2014). Different methods based on the use of different solvents, enzymes and physical procedures were tasted for the extraction of these compounds (Pinelo *et al*., 2005; Kireche, 2012; Libran *et al*., 2013).

MATERIAL AND METHOD

The aim of our study was to optimize the polyphenolic compounds extraction from red grape pomace using different organic solvents, different concentrations of solvents and different temperatures of extraction.

The material used for extraction was represented by dry pomace obtained from three black varieties: Fetească neagră, Merlot and Burgund mare. As solvents were used aqueous solutions from: ethanol, citric acid, acetone, sodium sulfite and glycerol. The experimented temperatures for extraction were: 30, 60 and 90 °C and the time of extraction was two hours for all the solvents. For ethanol and citric acid it was determined the influence of solvent concentration on the extraction process. The following concentration were used: 20, 40, 60, 80 and 96% (v/v) in case of ethanol and 1.3 and 5% in case of citric acid. There were determined the following parameters: total polyphenol content (Folin-Ciocâlteu method), anthocyanins content (bleaching by sulfur dioxide method), tannins content (LA method), phenolic acids content (vanilin reaction method) and catechins content (Mazza *et al*., 2003, method).

RESULTS AND DISCUSSIONS

From the organic solvents used in the experiment the best extraction was registered in case of acetone (15097 GAE mg/L) and ethanol (8338 GAE mg/L) (fig. 1). These quantities were much over the quantities extracted with the other solvents.

The increasing temperature of the extraction had a positive effect on the extraction process in case of all the solvents (especially for tannins and catechins), the best temperature of extraction ranging between 60 – 90 °C, depending on the polyphenolic compounds (fig. 2).

The increase of solvents concentration had a positive effect on the extraction up to a certain limit. Thus, in case of ethanol the increase of the concentration had a positive effect up to 60%, after which the increase of concentration up to 80%, or 96%, determined a slow reduction of the quantities extracted (fig. 3).

In case of citric acid the increase of solvent concentration determined a continous increase of the quantity extracted, but with a tendency of reaching a limit (fig. 4).

The nature of solvents influenced the proportion between the different classes of polyphenolic compounds extracted, according to their affinity with the solvent (fig. 5).

The high quantity of anthocyanins was extracted with ethanol, while in case of tannins, catechins and phenolic acids the high quantities were extracted with acetone (especially for tannins and catechins).

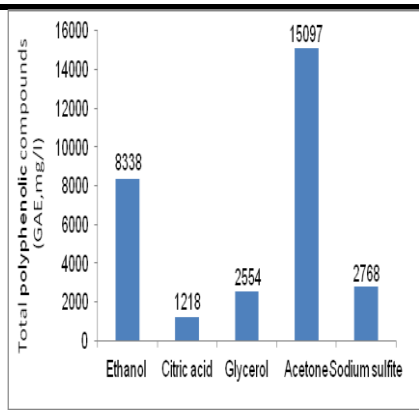


Fig. 1 Influence of the extraction solvent on the total quantities of polyphenolic compounds extracted

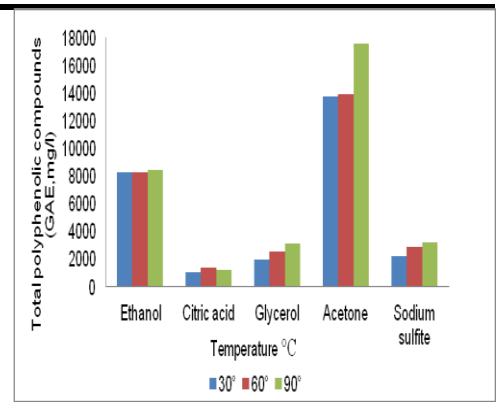


Fig. 2 Influence of the extraction temperature on the total quantities of polyphenolic compounds extracted

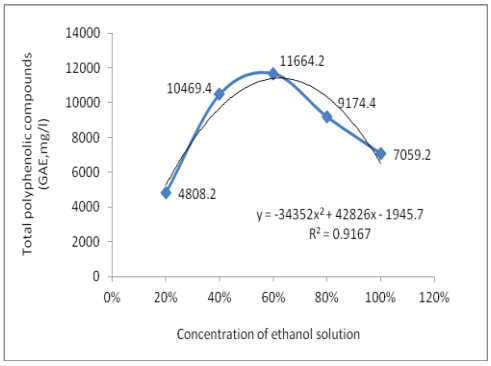


Fig. 3 Evolution of the quantity of polyphenolic compounds extracted with ethanol solution according to the increase of solvent concentration

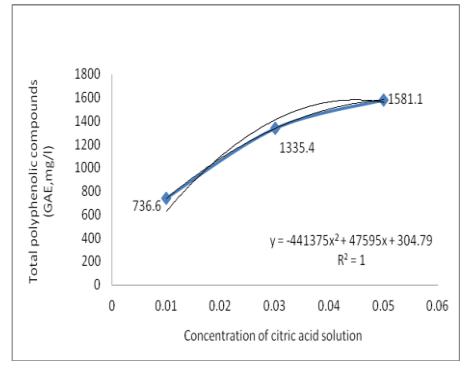
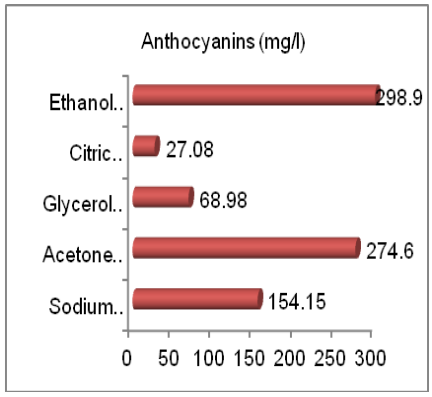
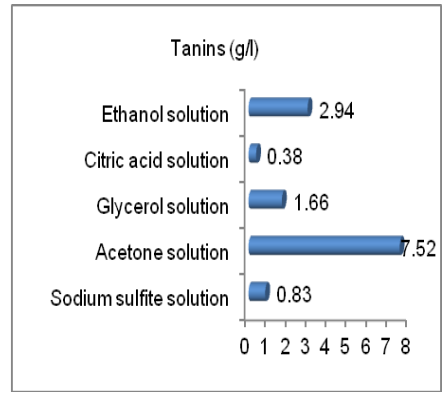


Fig. 4 Evolution of the quantity of polyphenolic compounds extracted with citric acid solution according to the increase of solvent concentration





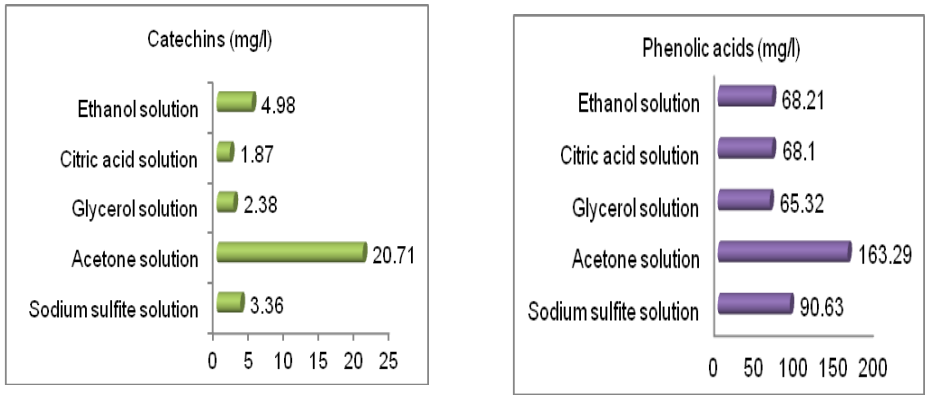


Fig. 5 Influence of solvents nature on the different classes of polyphenolic compounds extracted

CONCLUSIONS

1 The total quantity of poliphenolic compounds extracted from grape pomace was influenced both by the nature of extraction solvent, the extraction temperature and the solvent concentration.

2. The nature of solvent extraction and the extraction temperature influenced also the proportion between the different classes of polyphenolic compounds extracted.

3. For obtaining a high quantities of polyphenolic compounds from grape pomace is recomented to use as solvent for extraction an acetone solution (70% v/v), or an ethanol solution (60% v/v), the best temperature of extraction being 90 ^{o}C.

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