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Extraction of phenolic compounds and quantification of the total phenol of grape pomace

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ABSTRACT

Total phenols of grape pomace were determined using the Folin-Ciocalteu method. Total phenols of the grape pomace were extracted with aqueous ethanol (80 % v/v) using a pomace-to-solvent ratio of 1:4 (w/v). Total phenolic content of grape pomace was 8.33 mg tannic acid equivalent/g. Grape pomace extract was rich in total phenolic content showed its potential for antioxidant activity and could be further evaluated as dietary supplements.

Key words: Extraction, grape pomace, phenolic compounds.

INTRODUCTION

The annual amount of produced agro-by-products in Iran is generous, whereas, production of grape exceeds 2.87 billion tonnes/year, that proportion of grape yield is used for production of dried grape. In this process, dried grape by-product (DGB) (grape cluster stems plus rejected raisins) is produced in high level. These wastes are usually burned causing environmental pollution. The potential use of these wastes to extraction of phenolic compounds in order to use in ruminant nutrition will participate in modifying the fatty acid composition and increasing conjugated linoleic acid concentration of ruminant-derived food products (i.e. milk or meat). Grape pomace is a natural product rich in dietary fiber and polyphenols. Also an increasing interest on dietary phenolic compounds intake has been observed due to their well-known antioxidant properties and health benefits. Health benefits of polyphenols have been widely described, especially the prevention of diseases associated with oxidative stress such as cancer, cardiovascular, inflammatory and neurodegenerative diseases [1, 2, 3, 4]. Biological activity of polyphenols depends on their bioavailability. A major part of dietary polyphenols is not absorbed in the small intestine and can interact with colonic microbiota [3]. Phenolic extracts from different plant sources such as green tea, cinnamon, curry, mustard, herbs, spices and grapes have been shown to have antioxidant as well as antimicrobial activity [5, 6, 7]. Their potential for use as preservatives has been documented and interest has been focused on the use of these extracts in the preservation of food [6, 7]. The objectives of this study were therefore to determine the levels of phenolic compounds in extracts prepared from grape pomace for further evaluation of their potential in animal nutrition.

MATERIALS AND METHODS

Reagents

Sodium carbonate, ethanol, Folin-Ciocalteu phenol reagent, tannic acid were obtained from Merck.

Tannin extract preparation

A fresh sample of GP (450 g DM/kg fresh weight) was dried and ground to pass a 1 mm sieve. Fifty grams (oven-dry matter) of grape pomace was treated with 100 ml of an aqueous solution of ethanol (80%). The mixture was heated for 5 minutes. After heating, the pomace was cooled, washed and filtered through filter paper. Then 100 ml of the ethanol was again added to pomace and heated for 10 minutes and filtered through filter paper. The washed liquid was evaporated to a moderate concentration (rotary evaporator, temperature: 50 °C) for 30 minutes [8].

Determination of total phenol content of grape pomace

The Folin-Ciocalteu method [9] as described by reference [10] was used to determine total phenols. Aliquots (1 ml) of each of the extracts were mixed with 5 ml Folin-Ciocalteu reagent in 100 ml volumetric flasks that contained 70 ml of deionised water. Sodium carbonate solution (15 ml of 20 % m/v anhydrous sodium carbonate in deionised water) was added after 1 min but before 8 min. The volumetric flasks were then made up to volume with deionised water. After standing for 2 h at room temperature, the absorbance was read at a wavelength of 640 nm in the visible range of the spectrum using a UV/Vis- spectrophotometer (Perkin Elmer, New York, USA). The estimation of total phenols in the extracts was carried out in triplicate. Tannic acid was used as a standard and the results obtained were expressed as mg tannic acid equivalent/g of sample, on a dry weight basis.

Statistical analysis

The student’s t-test was used to compare the data and all the tests were considered significantly different at $p \leq 0.05$.

RESULTS AND DISCUSSION

Standard curve was obtained from plotting of light absorption against different concentration of tannic acid and are shown in figure 1. The contents of total phenols of grape pomace extract are given in Table 1.

Figure 1: Standard curve was obtained from plotting of light absorption against different concentration of tannic acid

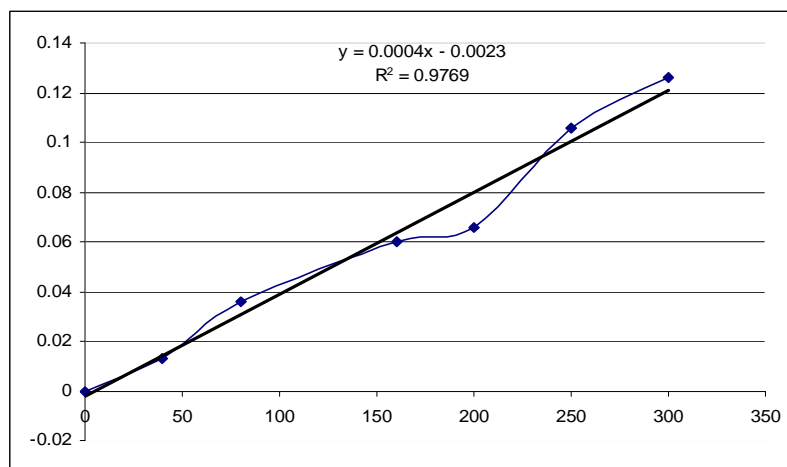


Table 1: Total phenol content (expressed as mg tannic acid equivalent/g) of grape pomace extract on a dry matter basis

Sample	Total phenols (± SD)
Grape pomace extract	8.33 (0.59)

Reference [11] reported that the total phenolic content was highest in the grape seed extract (116.73 g gallic acid equivalent /100 g db), followed by the grape skin extract (75.20 g gallic acid equivalent /100 g db) and the whole grape extract (48.04 g gallic acid equivalent /100 g db). The phenolic composition of grapes depends on multiple factors, including climate, degree of ripeness, berry size and grapevine variety. Grape pomace extract was rich in total phenolic content showed its potential for antioxidant activity and could be further evaluated as dietary supplements.

CONCLUSION

Grape pomace is a natural product rich in dietary polyphenols. The results obtained from this work show that grape pomace may be exploitable as a potential source of phenolic compounds for possible use as antimicrobial agents and to be use in animal nutrition.

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