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RECOVERY OF BIOACTIVE POLYPHENOLS FROM *ALOE VERA* (*ALOE BARBADENSIS* MILL.) RIND USING BINARY MIXTURES OF PROPYLENE GLYCOL AND WATER

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INTRODUCTION

Aloe vera (*Aloe barbadensis* Mill.) is a succulent plant species cultivated worldwide for its jelly-like parenchyma that is used by cosmetic, pharmaceutical and nutraceutical industries. This gel fillet is found protected by a thick layer (green rind) that constitutes 20-30% of the whole leaf weight [1], which is often discarded as waste (Figure 1). However, this biowaste can be valorised as a source of high added-value phenolic compounds [2]. Today, the principles of green chemistry have been introduced into extraction schemes with the aim of making processes more sustainable. Some studies have also shown that polyols in aqueous solution may constitute a very suitable extraction medium for polyphenol recovery [3]. Therefore, this study was carried out to characterize the phenolic profile of *Aloe vera* rind, evaluate antioxidant properties of the obtained extracts, and investigate the suitability of propylene glycol-water mixtures for extracting these bioactive phenolic compounds.

Fig. 1. *Aloe vera* leaves.

METHODOLOGY

Samples preparation

The *Aloe* leaf rind was separated from the parenchyma (fillet) with a knife, freeze-dried and reduced to a fine powder.

Extracts preparation

The sample underwent to solid-liquid extraction twice with ethanol/water (80:20, *v/v*) for 1 h at room temperature. After filtration, ethanol was separated from the supernatant in a rotary evaporator and the aqueous phase was lyophilized.

Analysis of phenolics compounds

The analysis was carried out in a Dionex Ultimate 3000 UPLC system equipped with a diode array detector (DAD) coupled to a electrospray ionization mass detector (ESI/MS).

Evaluation of antioxidant properties

The cell-based assays of TBARS (thiobarbituric acid reactive substances) and OxHLIA (oxidative haemolysis inhibition assay) were applied [4]. The first *in vitro* assay measures the extracts capacity to inhibit the formation of TBARS, which are generated from the *ex vivo* decomposition of lipid peroxidation products resulting from the oxidation of brain cell membranes. In turn, the OxHLIA assay provides information on the extract ability to protect the erythrocyte membranes from oxidative haemolysis caused by hydrophilic and lipophilic radicals that are generated in the system.

Extractions with propylene glycol

Binary mixtures of propylene glycol (propane-1,2-diol)-water (0 to 95 %, *w/w*) were used in extractions performed at 50 ºC for 60 min, whose efficiency was monitored based on the total phenolic and flavonoid contents, measured by the Folin-Ciocalteu and aluminium chloride colorimetric methods [5].

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RESULTS & DISCUSSION

Different phenolic compounds were identified in the *Aloe* rind extract, including chromones (aloesin or aloeresin B), anthrones (aloin A or barbaloin and aloin B or isobarbaloin), and flavones (luteolin and apigenin glucoside derivatives). Aloesin and aloin (Figures 2 and 3) are recognized for their skin regeneration (wound healing) and laxative effects, respectively, being among the most important physiologically active compounds found in this species [6,7].

The combined extract also had interesting antioxidant properties, being particularly effective in protecting the erythrocytes population from the free radical-induced oxidative damage, with an IC_{50} value close to that of the positive control, trolox.

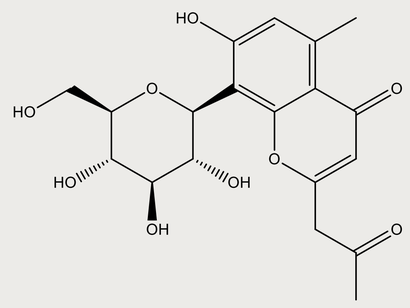


Fig. 2. Chemical structure of aloesin.

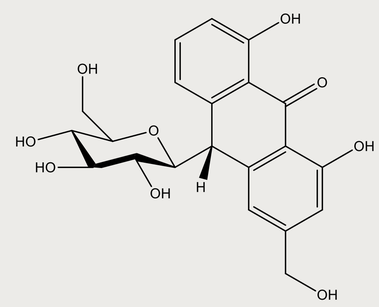
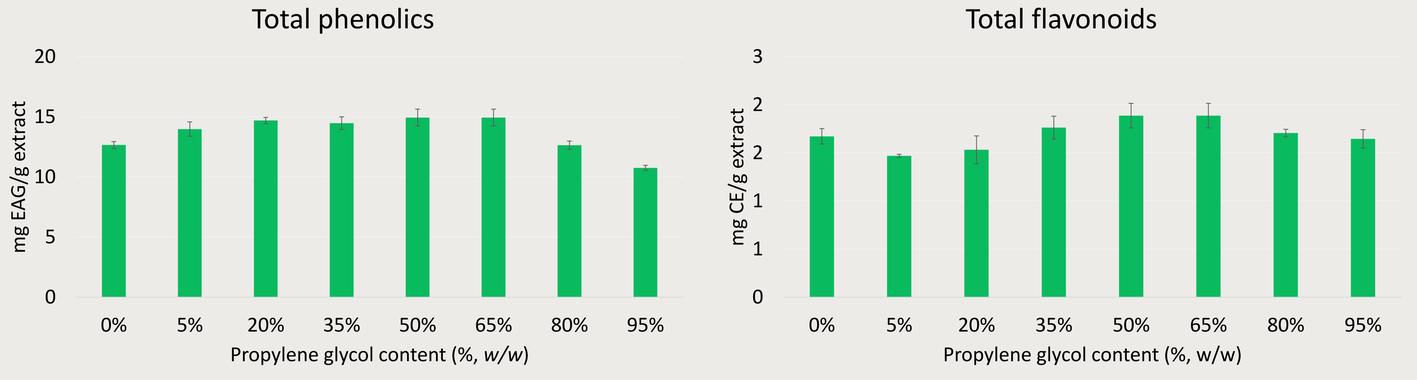


Fig. 3. Chemical structure of aloin A.

Regarding the effect of the extraction solvent on the recovery of total phenolics and flavonoids, it was found that intermediate propylene glycol-water mixtures lead to higher amounts than when used alone (Figure 4). Thus, this study showed that *Aloe* rind can be used as an interesting source of bioactive compounds and that propylene glycol in aqueous solution may improve its extraction.



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