Phenolics content and Antioxidant Activity of Aqueous Extracts from Bio-residues of *Agrocybe cylindracea*

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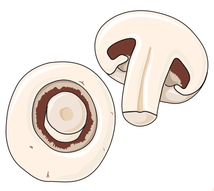
Introduction

Edible mushroom

The production of mushrooms results in a large quantity of bio-residues, with a high environmental impact and costs for the industry

Bio-residues include caps, stalks, mushrooms of irregular dimensions and shape and basal material

The valorisation of these bio-residues provides an opportunity for the development of innovative high-value products and can lead to an increase of the sustainability of mushroom productive chain.



Potential bioactive properties

Antioxidant
Antimicrobial
Anti-inflammatory
Prebiotic

Essential nutrients

Proteins
Dietary fibre
Vitamins
Minerals

Mushrooms are a source of several antioxidants. These include phenolic compounds

These bio-residues have a high nutritional value and bioactive properties

Figure 1. Examples of mushroom bio-residues

Objectives

In the present work, the antioxidant potential and total phenolic content from bio-residues obtained from *Agrocybe cylindracea* were evaluated in order to develop a circular bioeconomy approach.

Methods

A. cylindracea bio-residues were provided by Voz da Natureza, Lda and were cleaned and frozen after harvest. Before extraction, the dry matter (DM) of *A. cylindracea* bio-residues were determined (10.03 g/100 g DM). The extraction was performed using water as the only solvent, in order to obtain a process as green as possible and with minimal costs. In addition, it can be easily scaled up at industrial level. The aqueous extracts were obtained according to two different methods (1 and 2).

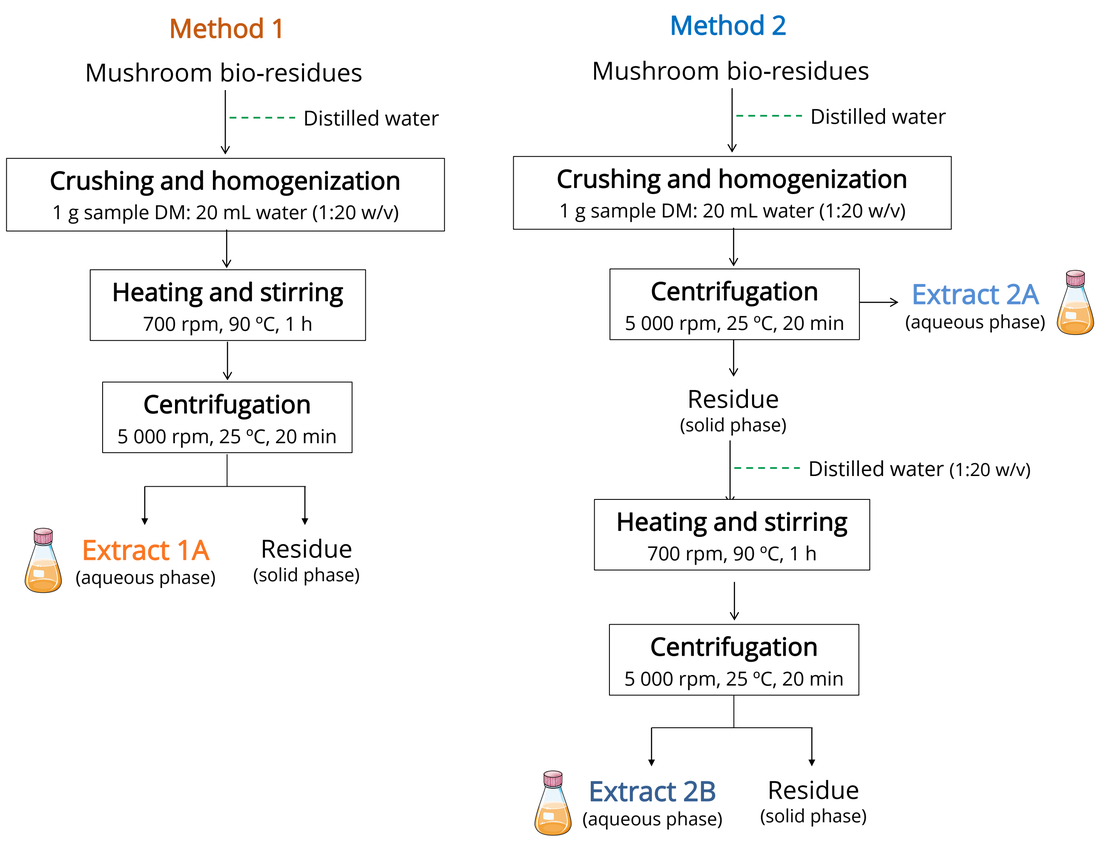
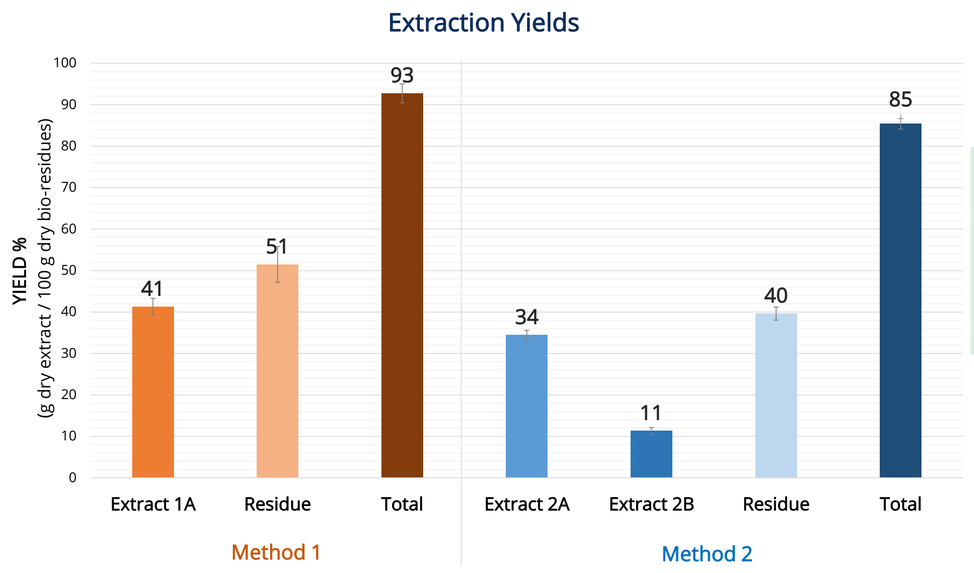


Figure 2. Extraction methods.

→ Extracts obtained from each method were freeze-dried and the extraction yields were calculated according to the following equation: [(dry matter of the extract) ÷ (dry matter of the mushroom bio−residues)] × 100.

→ The total phenolic content of aqueous extract was determined using Folin-Ciocalteu colourimetric method. The total antioxidant activity of the *A. cylindracea* extracts was measured by the ABTS radical cation decolorization assay, oxygen radical absorbance capacity (ORAC) assay and DPPH radical scavenging activity.

Results



The yield of extract 1A was higher than extracts 2A and 2B.

Figure 3. Extraction yields of aqueous extracts (1A, 2A and 2B) and of residues from *A. cylindracea* bio-residues. Each value is expressed as mean ± standard deviation (n=3). Means values of extracts are significant different ($p < 0.05$).

Antioxidant activity

Table 1. Total phenolic content and antioxidant activity of extracts from *A. cylindracea* (mean ± SD).

		Aqueous Extracts from *Agrocybe* cylindracea by-products		
		Extract 1A	**Extract 2A**	**Extract 2B**
Reducing Power	**Folin-Ciocalteu** (mg GAE/ g dry extract)	13.3 ± 0.6[a]	13.4 ± 0.8[a]	13.6 ± 0.8[a]
Scavenging activity	**ABTS assay** (mg AAE/ g dry extract)	15.3 ± 0.7[a]	13.1 ± 0.4[b]	12.1 ± 0.7[c]
	DPPH assay (mg TE/ g dry extract)	7.6 ± 0.3[a]	6.1 ± 0.2[b]	3.1 ± 0.1[c]
	ORAC assay (mg TE/g dry extract)	80.6 ± 4.5[a]	79.4 ± 8.0[a]	75.9 ± 4.3[a]

In each row different letters (a-c) mean significant differences between extracts ($p < 0.05$). *Abbreviations:* GAE - Gallic acid equivalent; AAE - Ascorbic acid equivalent; TE – Trolox equivalent.

Phenolic compounds were found in all aqueous extracts and no significant differences were observed among the extracts. Regarding the antioxidant activity the results showed that the extracts of *A. cylindracae* are a possible source of natural antioxidants. In general, the antioxidant activity of extract 1A was higher than the other extracts; higher value were observed by ORAC assay, which allow to predict a potential biological antioxidant activity of these extracts.

Conclusions

According to the outcome, these aqueous extracts from bio-residues of *A. cylindracea* could be considered as a natural source of antioxidants and phenolic compounds. Thus, the valorisation of these bio-residues is viable through the development of value-added "green" products with a great potential of application in nutraceutical and food products, contributing to a circular economy.

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