A COMPARATIVE STUDY OF MYCOCHEMICAL COMPOSITION, ANTIOXIDANT AND ANTI-ACETYLCHOLINESTERASE ACTIVITY OF *F. FOMENTARIUS* (L.) FR. 1849 FROM BALKAN REGION

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INTRODUCTION:

From the ancient times, mushrooms have been consumed by humans due to their taste, aroma and texture, being part of the normal diet as well as a delicacy. The interest in consumption of non-edible mushrooms is increasing in many countries, especially in the view of their medicinal value and importance. The non-edible and medicinal mushroom species ***Fomes fomentarius*** is a member of higher Basidiomycete, which is historically, from Hippocrates time, one of the first mushrooms used for wound cauterization. Iceman, a prehistoric mummy discovered in the Tyrolean Alps in 1991, carried some ***F. fomentarius*** pieces, probably used as tinder, first aid or in spiritual purposes. Hieronymus Bock in the 15th century recommended it as an emetic against mushroom poisoning. In many regions of Europe it was used by barbers, dentist, surgeons and in pharmacies. Potential in terms of medicinal use of ***F. fomentarius***, which is rich in mycochemicals with antioxidant properties, and which can potentially contribute in reducing the risk of human diseases such as diabetes mellitus, different type of cancers, heart diseases, as well as Alzeimer´s disease, has not yet been extensively analyzed.

Figure 1. *Fomes fomentarius*

Figure 2. Localities of mushroom samples

OBJECTIVES:

The present study was designed in order to evaluate the potential application of different types of extracts (chloroform, water, ethanol and methanol) of ***F. fomentarius*** from three different localities from Balkan region, as a new source of valuable bioactive compounds with positive effect on health. Fruiting bodies were collected during January of 2018 (National park "Štrbački Buk", Donji Lapac, Croatia, FC), April of 2018 (National park "Fruška Gora", Serbia, FS) and October 2018 (Vrelo Bosne, Sarajevo, Bosnia and Herzegovina, FB).

METHOD / DESIGN:

In order to thoroughly evaluate phenolic profile of the extracts, quantitative analysis of 45 phenolic compounds was performed using LC-MS/MS technique, while total phenolic content (TP) was determined according to Folin-Ciolcateu procedure. The antioxidant potential of extracts was determined using several assays: DPPH, ABTS and NO scavenging ability, Ferric Reducing Antioxidant Power (FRAP) and lipid peroxidation inhibition (LP). Anti-acetylcholinesterase assay (anti-AChE) was used with the aim to determine potential application in treatment of some neurological diseases, such as Alzeimer´s.

RESULTS:

To the best of our knowledge, this is the first report of the mycochemical characterization and biological activities of ***F. fomentarius*** from Croatia (FC) and Bosnia and Herzegovina (FB), while there are some reports for the same species from the territory of the Republic of Serbia (FS). The LC-MS/MS analysis of the selected extracts showed the presence of some bioactive phenolic compounds and some of them were quantified for the first time (amentoflavone, baicalein, chrysoeriol, esculetin and scopoletin). The water and the ethanol extracts of FC and FS exhibited higher amounts of TP than the other analyzed extracts. These extracts and all methanol extracts showed high antioxidant activity, and, therefore, ***F. fomentarius*** polar extracts could be used as potential natural source of antioxidant additives. These antioxidant, as well as anti-AChE activity results, could support the medicinal interest of the analyzed ethanol and methanol extracts. In comparison to usually used commercially available synthetic antioxidant and anti-AChE substances, analyzed extracts showed moderate activity.

Class	Compound	Amount of detected compound (μg/g d.w.)											
		F. fomentarius species and extract type											
		FB, $CHCl_3$	FB, H_2O	FB, 70 % EtOH	FB, 80 % MeOH	FC, $CHCl_3$	FC, H_2O	FC, 70 % EtOH	FC, 80 % MeOH	FS, $CHCl_3$	FS, H_2O	FS, 70 % EtOH	FS, 80 % MeOH
Flavones	Baicalein	<12.2	<12.2	<12.2	<12.2	**213.87**	<12.2	<12.2	<12.2	<12.2	**147.46**	**44.63**	<12.2
	Chrysoeriol	<3.05	<3.05	<3.05	<3.05	**3.41**	<3.05	<3.05	<3.05	<3.05	<3.05	<3.05	<3.05
Biflavonoid	Amentoflavone	<3.05	<3.05	<3.05	<3.05	<3.05	<3.05	**10.97**	<3.05	<3.05	<3.05	<3.05	<3.05
Hydroxybenzoic acids	*p*-Hydroxybenzoic acid	<6.1	<6.1	**32.79**	**420.03**	<6.1	<6.1	<6.1	<6.1	<6.1	<6.1	<6.1	**56.03**
	Protocatechuic acid	<6.1	<6.1	**10.90**	**13.28**	<6.1	<6.1	<6.1	<6.1	<6.1	<6.1	<6.1	**25.48**
	Gentisic acid	<12.2	<12.2	<12.2	<12.2	<12.2	<12.2	<12.2	**15.91**	<12.2	<12.2	<12.2	**22.46**
	Gallic acid	<12.2	<12.2	<12.2	<12.2	<12.2	<12.2	<12.2	<12.2	<12.2	<12.2	<12.2	**15.30**
	Cinnamic acid	**179.88**	<97.5	<97.5	**106.10**	<97.5	<97.5	<97.5	<97.5	<97.5	<97.5	<97.5	<97.5
Hydroxycinnamic acids	*p*-Coumaric acid	<12.2	<12.2	<12.2	**83.12**	<12.2	<12.2	<12.2	<12.2	<12.2	<12.2	<12.2	**19.23**
	Caffeic acid	<6.1	<6.1	**22.18**	**83.36**	<6.1	<6.1	<6.1	**6.95**	<6.1	**105.95**	**63.32**	**49.23**
Coumarins	Esculetin	<6.1	**51.36**	**73.66**	<6.1	<6.1	<6.1	<6.1	<6.1	<6.1	<6.1	<6.1	**84.03**
	Scopoletin	<6.1	<6.1	**9.77**	**88.02**	<6.1	<6.1	<6.1	**23.63**	**209.05**	**511.69**	**853.07**	**580.83**
Cyclohexanecarboxylic acid	Quinic acid	<48.85	**58.99**	**414.18**	**996.78**	<48.85	**207.49**	**211.73**	**379.28**	<48.85	**247.81**	<48.85	**454.16**
Chlorogenic acid	5-*O*-caffeoylquinic acid	<6.1	<6.1	<6.1	<6.1	<6.1	<6.1	<6.1	<6.1	<6.1	<6.1	<6.1	**6.74**
Total		**179.88**	**110.35**	**563.48**	**1790.69**	**217.28**	**207.49**	**222.70**	**425.77**	**209.05**	**1012.91**	**961.02**	**1313.49**

CONCLUSIONS:

According to the obtained results, it can be concluded that primarily polar extracts of ***F. fomentarius*** from Balkan region are a valuable source of natural antioxidants, which could indicate their potential application for therapeutic purposes in the form of functional ingredients, preferably for chronically diseases which are associated with oxidative stress.

KEYWORDS:

bioactive compounds; *Fomes fomentarius*; oxidative stress; neuroprotective agents; phenolics

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