

ANTIHYPERGLYCEMIC POTENTIAL OF HEMP EXTRACTS (*Cannabis sativa*, Cannabaceae)

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INTRODUCTION

Cannabis sativa L. Cannabaceae is the only representative of *Cannabis* L. genus. The exploitation of *C. sativa* by mankind has a long history. It is important to highlight the classification of *Cannabis* species based on their primary purpose of utilization. Namely, the species containing more than 0.2. or 0.3% (depending on national regulations) of Δ^9 -tetrahydrocannabinol (Δ^9 -THC) are considered psychoactive and are in most of the countries illegal to possess and use. On the other hand, species containing lower amounts of Δ^9 -THC and higher amounts of cannabidiol (CBD) are legal for cultivation and are better known as industrial hemp, or simply hemp. They show demonstrated history of usage for production of fiber, as well as different food products, because of the exceptional nutritional value of hemp fruits, commonly marked as "seeds". Besides the previously mentioned terpenophenolic compounds, *Cannabis* species contain other classes of secondary metabolites which have the potential to exhibit beneficial biological effects.

OBJECTIVES

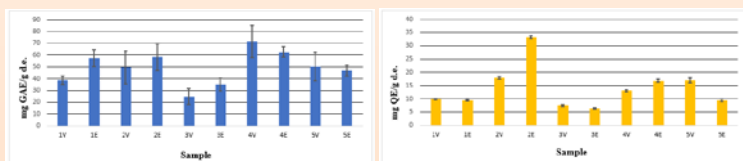
The aim of the conducted study was to evaluate the antihyperglycemic and antioxidant potential of water and ethanolic hemp extracts, followed by preliminary and detailed chemical characterization of the obtained extracts.

METHODS

The plant material included five samples of commercially available hemp teas which were further extracted in a form of infusion(V) and ethanolic macerate (70% v/v. 24h) (E). The solvents were evaporated and dry extract yield was quantified. The obtained dry extracts were preliminary chemically characterized in term of total phenolics (expressed as mg of gallic acid equivalents (GAE) per g of dry extract (d. e.)) and flavonoids content (expressed as mg of quercetin equivalents (QE) per g of d. e.), as well as by high performance liquid chromatography (HPLC-DAD) for the quantities of gallic (GA), caffeic (CA), *trans*-cinnamic (tCA), *p*-coumaric (pCA), chlorogenic (CHA), rosmarinic (RA) and ferulic acid (FA), quercetin(QT), rutin (R) and quercitrin (QTN). The potential of the prepared extracts to inhibit α -amylase and α -glucosidase was evaluated *in vitro* at two concentration levels, as well as the potential to scavenge 2,2-diphenyl-2-picrylhydrazyl (DPPH), nitroso (NO) and hydroxyl (OH) radicals. Furthermore, the ability of extracts to inhibit lipid peroxidation process and to reduce ferric ions (FRAP-test) was also tested.

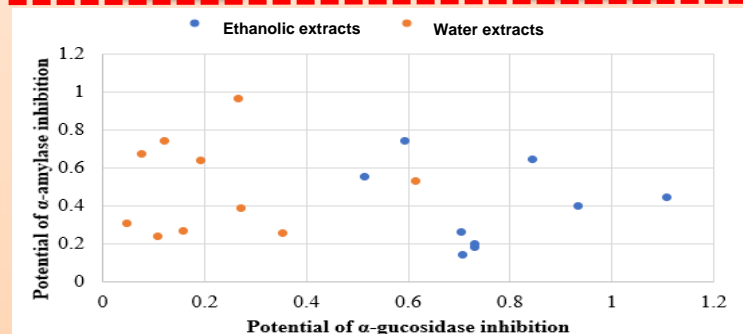
Sample	Name	Producer
1	Hemp tea	Svet Konoplje
2	Hanf blatter	Sonnenor
3	Hemp tea	BEHEMPY
4	Hemp tea	Taste
5	Bio hemp tea	BioMlin Strašar

RESULTS

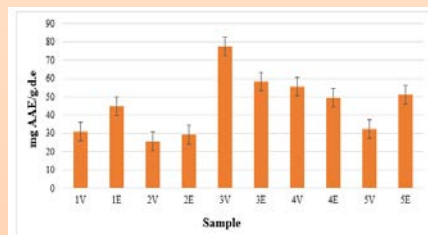


HPLC-DAD chemical characterization

Sample	µg/mg extract									
	GA	CA	tCA	pCA	QT	CHA	RA	FA	R	QTN
1E	<LOD	0.052	<LOD	0.009	<LOD	2.661	<LOD	<LOD	<LOD	0.210
2E	<LOD	0.104	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
3E	<LOD	0.052	<LOD	<LOD	<LOD	<LOD	<LOD	0.190	<LOD	<LOD
4E	<LOD	0.559	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
5E	<LOD	0.166	0.081	0.149	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
1V	<LOD	0.166	<LOD	<LOD	<LOD	0.068	<LOD	<LOD	<LOD	<LOD
2V	<LOD	0.115	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
3V	<LOD	0.102	0.102	<LOD	<LOD	0.119	<LOD	<LOD	<LOD	<LOD
4V	<LOD	0.054	0.052	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
5V	<LOD	<LOD	<LOD	<LOD	<LOD	0.048	<LOD	<LOD	<LOD	<LOD



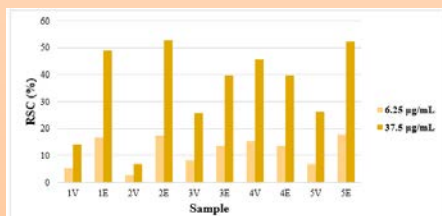
The position of the examined extracts in coordinate system defined by relative ratio of α -amylase/ α -glucosidase inhibition and examined extracts concentration



FRAP test

CONCLUSION

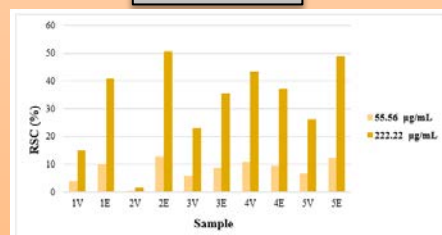
The obtained results show promising antihyperglycemic and antioxidant potential of hemp water and ethanolic extracts. However, of particular importance is the recorded anti- α -glucosidase activity of hemp ethanolic extracts, especially when compared with antihyperglycemic potential of acarbose obtained under the same experimental condition (IC₅₀=45.87 µg/mL). This highlights the importance of conducting future preclinical *in vivo* studies in order to better evaluate the possible beneficial effects of hemp ethanolic extracts in treatment of diabetes type 2.



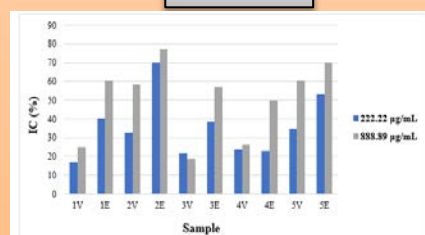
DPPH• neutralization



NO• neutralization



OH• neutralization



LP inhibition