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Extraction of biologically active substances from Lithuanian balsam poplar buds and research of their quality and antioxidant activity

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INTRODUCTION. In nature there are unlimited amounts of biologically active compounds. Balsam poplar buds (*Populus balsamifera* L.) are well known and appreciable in alternative medicine for their anti-inflammatory and antimicrobial effects. There are very few examples of research about the phytochemical composition of this raw material and its application to pharmaceutical ophthalmic preparations.

AIM. The aim of the study is to evaluate the predominant phenolic compounds in the extracts of balsam poplar buds and to evaluate the antioxidant activity of these extracts.





METHODS. Extracts prepared by extraction using ultrasonic bath of raw material and solvent with ratio 1:10. As extractants used 70% ethanol (V/V), purified water, a mixture of PEG200 and purified water (20%) and a mixture of purified water and β -cyclodextrins (10%).

Predominant phenolic compounds evaluated by high performance liquid chromatography.

The antioxidant activity of the extracts evaluated by the DPPH• radical scavenging method and the ABTS•+ radical cation binding capacity method in vitro. Reductive activity evaluated by the FRAP method in vitro.





RESULTS

Extract	Raw material to extractant ratio	Extraction solvent	Total phenolic compounds mg CAE/ml	Total flavonoids mg RE/ml
P5U	1:10	Purified water+PEG200 20%	11.930±0.529	0.891±0.041
P6U	1:10	Purified water+β-CDs 10%	12.671±0.633	0.624±0.029
P7U	1:10	70% ETOH	25.822±1.283	1.541±0.628
P8U	1:10	Purified water	9.324±3.722	0.402±0.017

Table 1. Total phenolic compounds (mg CAE/ml±SD mean, n=3) and total flavanoids (mg RE/ml) in balsamic poplar buds different extracts (70% ethanol (v/v) solution (**P7U**), aqueous solution (**P8U**), aqueous PEG200 20% solution (**P5U**), aqueous CD 10% solution (**P6U**)) extracted by ultrasonic bath for 60 min.

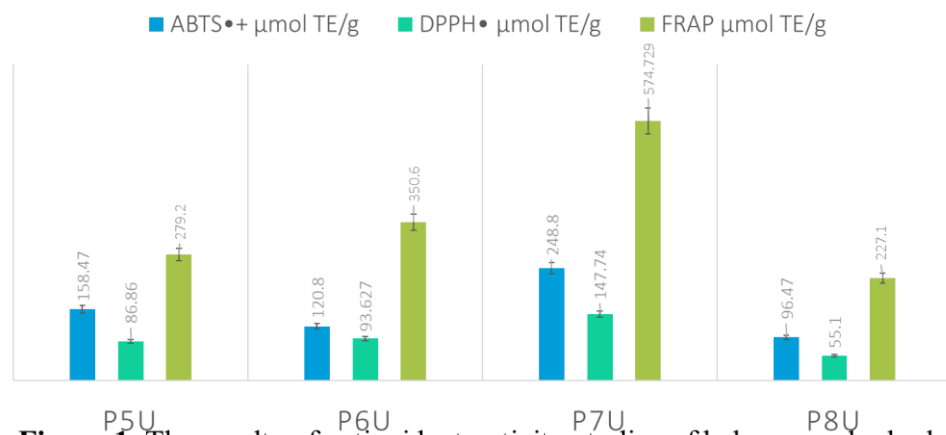


Figure 1. The results of antioxidant activity studies of balsam poplar buds different extracts P5U, P6U, P7U, and P8U (mg TE/g±SD, n=3), p<0.05.

Active compounds	Analysis of balsamic poplar bud extracts made by ultrasound (duration 60min.) ESC μg/ml			
	P5U	P6U	P7U	P8U
P-Coumaric acid	369.473±17.71	387.72±14.20	1330.72±55.27	287.333±13.48
Caffeic acid	22.922±1.15	24.71±1.99	73.2±2.84	17.331±0.85
Kaempferol	10.359±0.90	4.513±0.79	166.9±7.84	2.599±0.12
Quercetin	3.054±0.51	1.737±0.06	32.65±1.12	0.979±0.04
Apigenin	10.582±0.81	2.993±0.19	169.46±1.63	1.777±0.08
Galangin	3.021±0.13	2.945±0.17	27,547±2.04	1,978±0.10
Total flavanoids (μg/ml)	27.016	12.188	396.557	7.333
Total phenolic acids (μg/ml)	392.395	412.43	1403.92	304.661
Total amount of identified compounds (μg/ml)	419.411	424.618	1800,477	311.994

Table 2. The extracts of balsam poplar buds made by using ultrasound for 60 min. Analysis of P5U, P6U, P7U, and P8U by HPLC method (μg/ml±SD mean, n=3, p<0.05).



CONCLUSION. 70% ethanol extracts more phenolic compounds compared to aqueous mixtures of PEG200 and β -cyclodextrins, but these solvents are promising in the production of balsam poplar bud extracts. All extracts showed antioxidant activity, the results correlate with the concentrations of predominant phenolic compounds in the extracts of balsam poplar buds obtained by high performance liquid chromatography. From the obtained results it can be stated, that Lithuanian balsam poplar buds are promising plant raw material for pharmaceutical purposes.