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Antiradical Activity of Birch Outer Bark Extracts

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I. INTRODUCTION

Birch bark contains various secondary metabolites such as terpenes, flavonoids, hydrocarbons, polyphenols, tannins, steroids and methyl salicylate [1]; the main triterpenoids found in birch bark are lupeol, betulin, betulinic acid [2]. Birch bark is the main source of betulin – triterpenoid which lowers cholesterol level and exhibits wound-healing and anti-inflammatory activity. Derivatives of betulin exhibit antioxidant properties as well as anti-HIV and anti-cancer activity [3]. Bark extracts possess antiradical properties [4, 5]; the main antioxidants are polyphenols, flavonoids, tannins, terpenoids, catechin and epicatechin [6].

Herein we present research on antiradical properties of Latvian origin birch outer bark.

II. MATERIALS AND METHODS

A. Preparation of birch outer bark extracts

Purified birch outer bark was extracted with petroleum ether (boiling range 100–140 °C) in the intensive mass exchange extractor (MEE), which was constructed at Latvian State Institute of Wood Chemistry. During the extraction process birch outer bark samples were taken from extractor each hour and further were extracted with ethanol in Soxhlet apparatus [7]. The obtained extracts were analyzed.

B. Analysis of the birch outer bark extracts

The total amount of polyphenols (TAP) was determined according to the Folin–Ciocalteu method. TAP was expressed as mg of gallic acid equivalents per 100 g of birch bark extract (mg GAE/100 g birch bark extract). Antiradical activity was determined by 1,1-diphenyl-2-picrylhydrazyl (DPPH) and galvinoxyl (GO) tests and was expressed as IC₅₀ – the concentration of the ethanol solution of birch bark extract (mg/ml) that inhibits 50 % of 100 μM solution of DPPH or GO.

III. RESULTS AND DISCUSSIONS

The TAP and antiradical activity against DPPH and GO of birch outer bark extracts were determined. The obtained results are presented in Table I. TAP increases

with duration of extraction. Good correlation between total amount of polyphenols and concentration that inhibits 50 % of DPPH is observed – IC₅₀ value decreases with the increase of TAP value. The birch outer bark extracts exhibit noticeably better scavenging activity against GO rather than DPPH. It was observed that the scavenging of GO increases along with the TAP, but the correlation is not so explicit as in case of DPPH.

TABLE I

TOTAL AMOUNT OF POLYPHENOLS IN THE BIRCH OUTER BARK EXTRACTS AND THEIR ANTIRADICAL ACTIVITY

No	Extraction time in MEE, h	TAP, GAE mg/100 g extract	IC ₅₀ , mg/ml	
			DPPH test	GO test
1	0	3927.4	354.0	0.19
2	1	8959.7	170.0	0.31
3	2	11691.4	143.0	0.01
4	3	11623.5	153.8	0.03
5	4	14062.2	126.5	0.02
6	5	13357.6	124.7	0.01
7	6	14628.5	119.3	0.01

IV. CONCLUSIONS

It was found out that prolongation of the extraction of birch outer bark provides extracts with higher TAP values and better antiradical activity against free radicals DPPH and GO.

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