BETULA TURKESTANIKA ROTH. COMPARATIVE STUDY OF PLANT BARK EXTRACT SUBSTANCES

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Abstract

In this article *Betula Turkestanika Roth*. which grows on the territory of our republic the results of a comparative study of extractive substances of white birch bark using different solvents are presented.

Аннотация

В этой статье *Betula Turkestanika Roth*. произрастающая на территории нашей республики представлены результаты сравнительного исследования экстрактивных веществ бересты белой с использованием различных растворителей.

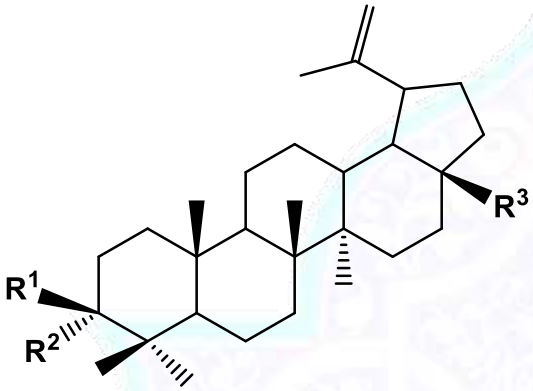
Keywords: betulin, lupeol, betulinic acid, isopropanol, ethyl acetate, hexane, extraction, HPLC.

Ключевые слова: бетулин, лупеол, бетулиновая кислота, изопропанол, этилацетат, гексан, экстракция, ВЭЖХ.

White birch is one of the most common tree species in the forests of Siberia and the European part of Russia. *Betula Turkestanica Roth*. it grows naturally in the Maidontol reserve of the Bostonlyk district of our republic. In recent years, white birch (*Betula pendula Roth*) has been introduced in a number of forest farms of our republic (Samarkand, Bakhmal, Burchmulla) [1].

White birch bark contains various classes of extractive biologically active substances. Extracts of the outer bark are rich in pentacyclic triterpenoids such as lupane and β-amyrin. The most common among them is betulin, the amount of which can reach 35-40% in the outer bark, depending on the type of white birch, the place of growth and environment, age and other factors [2]. In addition to betulin, its oxidized derivatives - betulinic acid (1), betulinic aldehyde (2), betulonic acid (30, betulonic aldehyde (4), etc.) are found in bark extracts. Also, the extract contains betulin's companion, lupeol, which is one-tenth of it (5) is also found, but in some sources it is

stated that its amount can be equal to the amount of betulin [3]. The content of the inner bark extract is low in betulin and consists mainly of phenolic compounds [4].



1. $R^1 = OH$, $R^2 = H$, $R^3 = CH_2OH$
2. $R^1 = OH$, $R^2 = H$, $R^3 = COOH$
3. $R^1 = OH$, $R^2 = H$, $R^3 = CHO$
4. $R^1 = R^2 = H$, $R^3 = CHO$
5. $R^1 = OH$, $R^2 = H$, $R^3 = CH_3$

White birch bark extracts exhibit anti-inflammatory, hypocholesterolemic, hepatoprotective, wound healing activities. Extracts containing lupeol, betulin, betulinic acid have been found to show anticancer activity [5].

In recent years, betulin and betulinic acid derivatives with activity against viruses (including HAIS) have attracted interest as a basis for creating new antiviral drugs for medicine and pharmaceuticals.

Taking into account that the chemical composition of the bark of white birch (*Betula Turkestanica Roth*) growing in our country has not been studied, we aimed to do a comparative study of the extraction yield of extractive modes in different solvents.

In extracting betulin from birch bark, the yield of the extract depends on the size of the raw material, that is, the level of grinding. Much research has been done on the extraction of betulin with various organic solvents, particularly ethanol, benzene, diethyl ether, dichloromethane and acetone [6].

First, the plant bark was dried at 105℃ until its moisture content was less than 1% and crushed to the desired size, then extracted 3 times each with isopropanol, ethylacetate, hexane solvents in a Soxhlet apparatus under the conditions given in the literature [5]. The mass of the extractives was calculated by the gravimetric method after the solvent had been evaporated. To separate the neutral and acidic substances of the extract, it was boiled for 3 hours in the presence of 20% NaOH aqueous solution and ethanol. Ethanol was removed and washed with distilled water until neutral. The betulin contained in the extractives was purified by recrystallization from ethanol. The amount of betulin in the extract was determined using the high-performance liquid chromatography (HPLC) method and compared with literature data.

Table 1

Betula Turkestanica Roth. results of extraction of white birch bark with different organic solvents

№	Amount of bark (g)	Solvent	Extraction time (hours)	Amount of extractives		Amount of betulin in the extract
				g	%	(%)
1	50	Isopropanol	12	13,2	26,4(20,6*)	46,0(46,0*)
2	50	ethyl acetate	12	17,1	34,2(15,5*)	68,0(60,0*)
3	50	Hexane	30	15,2	30,4(10,5*)	82,0(90,0*)

*[5]

Qualitative analysis and quantitative calculation were compared with information in the literature. Table 1 shows that the amount of white birch bark extracts in all three solvents: isopropanol, ethyl acetate, and hexane is higher than the amount reported in the literature, that is, 5.8% in isopropanol, 18.7% in ethyl acetate, and 19.9% in hexane. When the amount of betulin in the extracts was analyzed using the HPLC method, it was observed that betulin was transferred to hexane with a high yield (82%). Also, betulin is efficiently separated into ethylacetate by 68% and isopropanol by 46%.

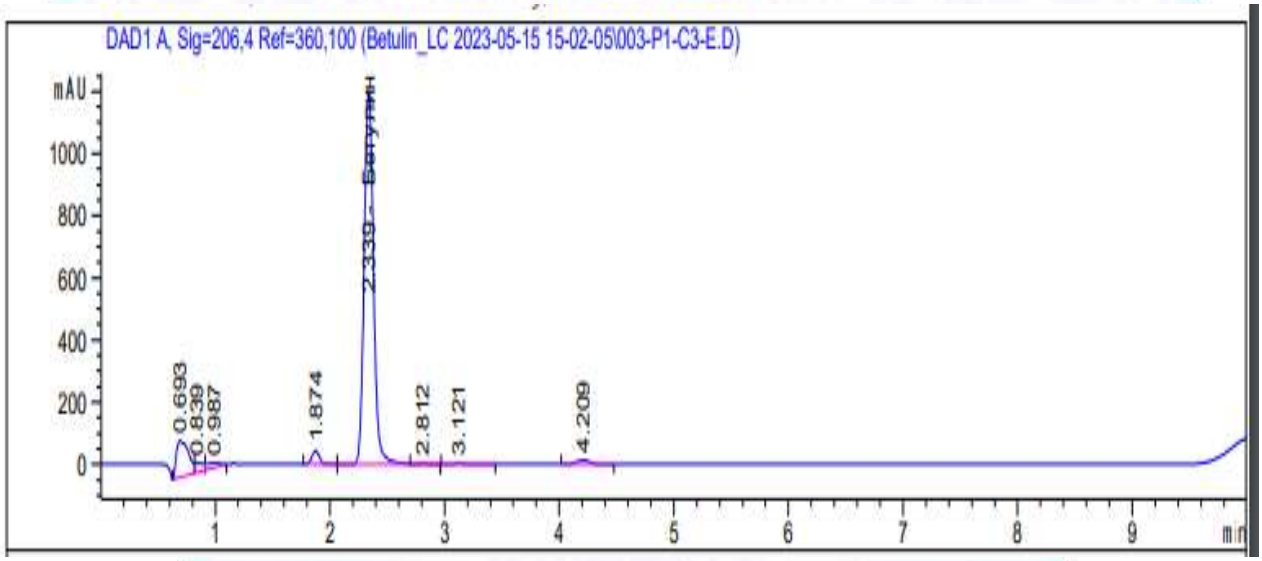


Figure 1. HPLC chromatogram of the hexane extract

So, from the preliminary results, it can be concluded that *Betula Turkestanika Roth.* grows naturally in the territory of our republic. white birch bark isopropanol, ethylacetate, hexane extracts contain pentacyclic triterpene compounds higher than *Betula Pendula Roth.* white birch bark extract growing in Russia.

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