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DETERMINATION OF HEAVY METALS IN WHITE BIRCH BARK

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Abstract
White birch (Betula pendula) is a perennial tree up to 25 meters high and a trunk up to 50 sm thick. As a biological agent, betulin and its derivatives contained in white birch have great potential in the treatment of HIV and cancer. It is also one of the most effective treatments for psoriasis. The article presents the results of the determination of heavy metals in 7- and 9-year-old white birch bark by dry mineralization using the polarographic method.

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INTRODUCTION

Since ancient times, birch has been widely grown as an ornamental tree. Of course, in addition to its decorative value, it is recognized throughout the world as a tree rich in nutrients. The juice which it produces has anti-fatigue, cough relief and other pharmacological effects.

It mainly contains carbohydrates, amino acids, organic acids and various inorganic salts, including essential oils, betulin, saponin compounds, cytokinins, various fructoses, amino acids, vitamins, biotin, minerals, etc. In addition, this plant is rich in more than 20 types of amino acids, 24 types of inorganic elements, vitamins B1, B2 and vitamin C, polysaccharides [1].

Birch bark extract has unique medicinal properties and is very beneficial for human health. Europeans call it “natural beer” and “forest drink.” The main active ingredient of birch extract is betulin. Betulin has anti-inflammatory and antiviral effects and is very effective in the treatment of psoriasis [2].

It is known that different amounts of heavy metal salts accumulate in different parts of plants. Heavy metals are actually an important environmental problem. It enters the human body through food, water and air. Heavy metals are toxic even in relatively low concentrations and pose a negative risk to human health. In this regard, various tests are carried out in advanced laboratories to assess the health risks of these metals by determining the concentration of heavy metals [3]. Heavy metals in white birch bark have been studied by several researchers. In particular, heavy metals in different parts of white birch were studied at the Ufa Institute of Biology.

There is no information on the determination of heavy metals in the bark of white birch growing in Uzbekistan in the scientific literature on this topic. Therefore, we considered it important to determine heavy metals in the bark of white birch growing in local conditions and make recommendations based on the results obtained.

EXPERIMENTAL PART

For this purpose, using the polarographic method, we determined the types and amounts of heavy metals in the bark of 7- and 9-year-old white birch trees growing in the center of Andijan. For the experiment, the bark of 7- and 9-year-old white birch trees was extracted. First, the sample was finely ground in a porcelain mortar for dry mineralization. Then 2 grams of the sample were taken and placed in porcelain crucibles, and the plant material was heated on an electric stove until the smoking stopped. Then the crucibles were placed in a muffle furnace heated to 300 °C for 1 day.

After heating, the crucibles were removed from the furnace and cooled to room temperature. Then 25 ml of mercury salt was added to the sample and dissolved. The dissolved sample was passed through a filter. Then the filtrate was analyzed on an ABS 1.1 polarograph.

RESULTS OBTAINED AND THEIR CONCLUSION

Table 1 below presents the results of the analysis carried out by employees of the Ufa Biological Institute E.R. Radosteva and A.Yu. Kulagin using the stripping voltammeter method. For analysis, white birch growing in the territory of Bashkortostan was taken as a sample. These analyzes were carried out by Ufa scientists to compare the content of heavy metals in spruce (Pinus sylvestris L.) and white birch (Betula pendula) trees [4].

Table 1. Concentration of metals in dry sample (mg/kg).

Plant organs	Cu	Zn	Pb	Cd
Root	72,08±21,5	152,14±32,29	13,17±1,84	1,80±0,03
Bark	15,9±4,60	186,37±36,64	8,13±0,80	1,49±0,04
Branches	14,55±3,81	192,96±37,96	7,23±0,84	1,04±0,08
Leaves	14,97±4,31	179,65±35,29	5,27±0,48	1,66±0,05

Polarographic analyzes were carried out in the laboratory of the SEO and JS Andijan Regional Branch using ABC 1.1 equipment (St. Petersburg, Russia). Below is a polarogram of the amount of heavy metals in white birch bark (Fig. 1).

Table 2. Amount of heavy metals in white birch bark.

Element	Countername	Cx, µg/l	C_{mid}, µg/l	X_{mid} mg/kg	δ, %	Δ, mg/kg
Zn	Graphic 5	25.6456	25.6456	0.3210	25	0.08
Cu	Graphic 7	73.5186	73.5186	0.9190	25	0.2300
Cd	Graphic 8	0.8218	0.8218	0.0100	25	0.0030

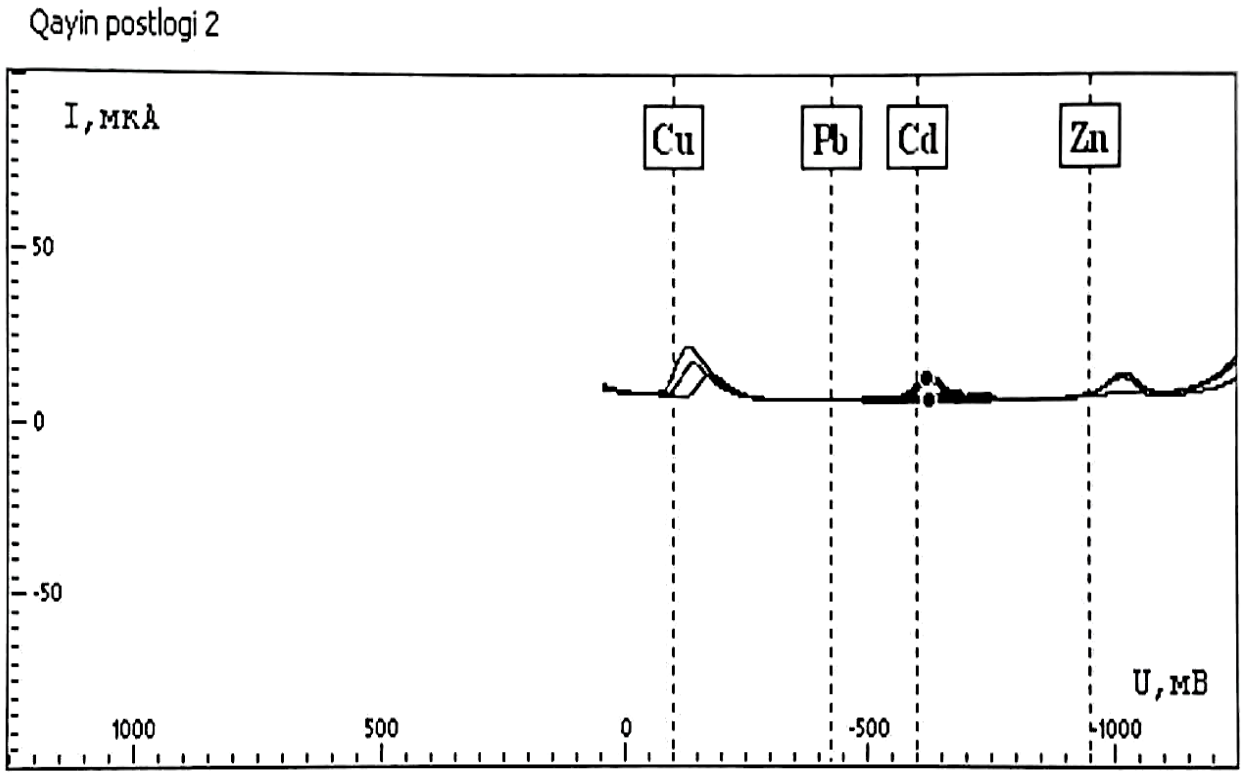


Figure 1. Polarogram of white birch bark.

When comparing the data presented in the tables, it is shown that there are much less heavy metals Zn, Cu, Cd in the bark of white birch growing in the Andijan region than heavy metals in the bark of white birch grown in Bashkortostan. No metallic lead was found in local white birch bark. The reason for this may be differences in climatic conditions and soil composition, tree age and identification method [5].

CONCLUSION

Briefly, the results obtained show that the amount of heavy metals in the studied white birch bark complies with the requirements of SanKvaM No. 0366-19 [7]. Therefore, white birch bark, grown locally, can be used in the preparation of cosmetics, medicines and biologically active food additives.

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