

ISOLATION OF MALTOL FROM SIBERIAN FIR BARK BY THE CARBON DIOXIDE METHOD

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The wood and needles of various coniferous species contain maltol, which is used as an aromatizer, a food seasoning, and an intensifier of aroma and taste [1, 2].

A method exists for the processing of the bark of deciduous species with the aim of obtaining maltol [3] but it yields only one product from a large amount of extracted bark.

For a more rational use of wood bark, which is a waste material of the timber industry and with the aim of extracting other biologically active substances in addition to maltol, we propose the carbon dioxide method of extraction.

The essence of the method developed for isolating maltol and other valuable components consists in comminuting wetted coniferous bark and extracting it with liquefied carbon dioxide at an elevated pressure (56-65 atm.) and a temperature of 18-22°C for 4 to 5 h. The carbon dioxide extract obtained is separated into lipid and aqueous fractions by decantation. The lipid fraction, the so-called carbon dioxide extract, is used as a commercial product, and the aqueous fraction is extracted with chloroform at 20°C (ratio of chloroform to the aqueous fraction of the CO₂ extract 5:1 by volume) to obtain crude maltol. Then the chloroform is distilled off and the desired product is sublimed. The degree of extraction of the maltol from its content in the absolutely dry raw material is 0.26-0.30. The regeneration coefficient for the chloroform is 0.75. The maltol so isolated has been shown to be identical with an authentic "pure" sample by physicochemical methods of analysis, the absence of a depression of the melting point, and a comparison of IR, UV, and PMR spectra, which corresponded to those of maltol [2].

In addition to this, we have investigated the physicochemical indices of the initial aqueous fraction of the carbon dioxide extract of fir bark before and after the isolation of the maltol. The results are given in Table 1.

A study of the mineral components showed the presence of macro- and microelements, such as potassium, sodium, calcium, magnesium, iron, aluminum, copper, zinc, and manganese.

TABLE 1. Physicochemical Indices of the Initial Aqueous Fraction of a Carbon Dioxide Extract of Fir Bark Before and After the Isolation of Maltol

Index	Aqueous fraction of the carbon dioxide extract of fir bark	
	initial	after the isolation of maltol
External form, color, smell	Pale pink liquid with sharp smell	Pale yellow liquid with delicate smell
Refractive index, n_D^{20}	1.3362	1.3342
Density, g/cm ³ (20°C)	1.002	0.995
content, %:		
reducing substances	0.40	0.10
mineral components	0.021	0.017
vitamin C, mg-%	25.8	25.8
dry matter	0.019	0.019
volatile organic acids,	0.61	0.31
%:		
free	0.032	0.053
bound	0.011	0.034
Acid No., mg KOH	4.9	2.1

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The proposed method of extracting Siberian fir bark with liquefied gas permits the isolation of a series of other components, besides maltol.

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