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ESTERS OF PHENOLIC ACIDS OF THE BARK OF *Picea ajanensis*, *P. koraiensis*, AND *P. obovata*

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There is information in the literature on the isolation from the bark of coniferous plants of a phenolic wax consisting of esters of phenolic acids and n-aliphatic alcohols. Thus, from the bark of some species of spruce [1a], fir [2], broad-leaved trees [3, 4], and pines [1b, 2, 5] esters of ferulic acid have been isolated, and from the bark of the Norway spruce esters of p-coumaric acid, in addition [1a].

On studying the phenolic compounds of the bark of *Picea ajanensis* Fisch. (Yeddo spruce), *P. koraiensis* Nakai (Korean spruce), and *P. obovata* Ledeb. (Siberian spruce) [6, 7], from a benzene extract by treatment with solvents [1, 5] and by column chromatography on silica gel [chloroform–methanol (99:1)], we obtained a phenolic wax fraction. By preparative thin-layer chromatography on Silufol in the same system, from the phenolic waxes of *P. koraiensis* and *P. obovata* we isolated alkyl coumarates and alkyl ferulates, and from *P. ajanensis* only alkyl ferulates.

From the point of view of chemotaxonomy, it is interesting that alkyl coumarates are found only in the bark of species of *Picea* belonging to the section Morinda (Norway, Korean, and Siberian spruces).

In the products of the alkaline hydrolysis [2] of the alkyl ferulates and alkyl coumarates we identified ferulic and coumaric acids, respectively, in the form of their TMS derivatives [8] by GLC.

The neutral fraction of the esters consisted of a homogeneous series of C_{16}–C_{25} n-aliphatic alcohols, those with odd numbers of carbon atoms being present in trace amounts. The predominating alcohols were C_{22} and C_{24} (see Table 1).

The alcohols were analyzed by the GLC method on a "Khrom-4" chromatograph with a flame-ionization detector using as stationary phase 5% of SE-30 on Chromaton N-AW-HMDS, column

TABLE 1. Neutral Fraction in the Esters of Coumaric and Ferulic Acids

Alcohol	Elution temperature, °C	Amount of alcohols,* C_{16}-C_{25} fraction, %				
		P. koraiensis		P. obovata		P. ajanensis
		coumarates	ferulates	coumarates	ferulates	ferulates
C_{16}	194	+†	+	+	+	+
C_{18}	216	+	9	4	17	4
C_{20}	230	+	+	+	+	+
C_{22}	246	17	43	43	33	37
C_{24}	261	64	32	34	30	38

*Calculation by the method of internal normalization.
†Amount less than 4%.

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250 × 0.3 cm, rate of flow of nitrogen 29 ml/min, of hydrogen 26 ml/min, and of air 400 ml/min, column temperature programmed from 194 to 270°C at a rate of heating of 5 deg/min.

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METHOD OF INVESTIGATING THE QUALITATIVE COMPOSITION OF THE VOLATILE EMANATIONS OF WOODY PLANTS

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By means of a method we have developed, we have studied the qualitative composition of the volatile emanations of the pine, the spruce, and the cedar, which were concentrated in chambers with a volume of 30-70 m^3 fitted with dismountable windows. To vary the temperature and the humidity of the air, the value of which increases during the period of an experiment, an air-conditioner and a fan forming a closed cyclic system were connected to the chamber.

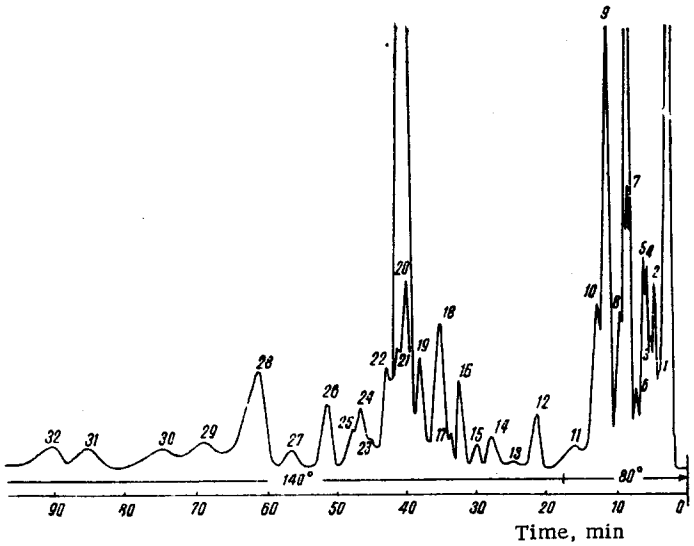

Fig. 1

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