

carrier gas nitrogen, rate of flow of nitrogen 1.8 liter/h. The column temperature was programmed linearly from 150 to 220°C at a rate of heating of 5 deg/min. Evaporator temperature 250°C. The glucose issued at 196°C.

The amount of phenolic acids did not exceed 0.02% of the absolutely dry weight of the phloem.

Thus, the phloems of the Khyngan spruce, Siberian pine, and Scotch pine contain the set of hydroxybenzoic and hydroxycinnamic acids that is characteristic for coniferous plants. Within each species, the qualitative composition of the free phenolic acids of the phloem and of the rhytidome proved to be similar, with the exception of caffeic acid, found only in the rhytidome of the Scotch pine. Glycosidated phenolic acid was found only in the phloem.

It is an interesting that the presence of glycosidated phenolic acids is characteristic for the phloem of all the species, and the presence of phenolic esters with higher n-aliphatic alcohols for the rhytidome [3].

This is the first time that glycosidated phenolic acids have been found in the bark of the genera Abies and Pinus.

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#### PHENOLIC ACIDS OF *Ephedra equisetina*

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A concentrated aqueous extract of green sprigs of Mongolian ephedra (*Ephedra equisetina*) was treated with a 5% solution of sodium bicarbonate and extracted with ethyl acetate and with n-butanol to eliminate phenols. The aqueous fraction was acidified to Congo Red and extracted with ethyl acetate. The ethyl acetate was distilled off to dryness, and the residue was dissolved in water and chromatographed on polyamide with elution by 30% methanol. After concentration of the eluate, a mixture of acids was obtained which was analyzed by paper chromatography and gas-liquid chromatography.

The paper chromatography of this mixture in the systems benzene-acetic acid-water (6:7:3) and sodium formate-formic acid-water (10:1:200) and diazotization with p-nitroaniline to reveal the spots showed the presence of four acids: p-hydroxybenzoic, protocatechic, vanillic, and p-coumaric.

The gas-liquid chromatography of the phenolic acids was performed on a "Khrom 3-1" chromatograph with a flame-ionization detector. Nitrogen was used as the carrier gas at a rate of flow of 25 ml/min. The phenolic acids were separated best in a steel column (0.5 × 0.98 cm) filled with 30/60 mesh glass beads. The liquid phase was Apiezon L (0.05 wt.%), and the column temperature was 210°C and the evaporator temperature 270°C. The acids were analyzed in the form of their methyl ethers by comparing the retention times of known substances and of the components of the acid fraction under investigation and from the increase in the area under a peak with the addition of the corresponding authentic substance. The amounts of the components in the fractions were determined from the areas of the peaks by multiplying the height of each peak by its width at half-height. The relative retention times and amounts of the components in the phenolic acid fraction are given below:

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Phenolic Acid Methyl Esters	Relative Retention Time	Amount %
Benzoic	1.00	59.0
p-Hydroxybenzoic	1.75	23.5
Cinnamic	2.98	3.7
p-Coumaric	5.89	9.3
Vanillic	10.27	4.5
Protocatechuic		

The retention time of benzoic acid (56 sec) was taken as 1.

Thus, it has been established by paper and gas-liquid chromatography that Mongolian ephedra contains six phenolic acid: benzoic, p-hydroxybenzoic, cinnamic, p-coumaric, vanillic, and protocatechuic.

#### COUMARINS OF *Ferula syreitschikowii*

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On studying the roots of *Ferula syreitschikowii* K. Pol. (Syreishchikov's giant fennel) collected by us in April in the mountains of Karaktau, we found in them a considerable amount of coumarins, consisting of a mixture of six substances. Extraction with ethanol and adsorption chromatography on a column of KSK silica gel with elution by mixtures of petroleum ether and ethyl acetate in various proportions led to the isolation of three furocoumarins with the compositions  $C_{18}H_{20}O_5$ , mp 138-140°C,  $C_{16}H_{14}O_4$ , mp 102-103°C, and  $C_{16}H_{15}OCl$ , mp 145°C. On the basis of mixed melting points and IR spectroscopy they were identified, respectively, as pranchimgin, isolated previously from *Ferula nuda* Spreng [1], imperatorin, and saxalin.

From the fraction of water-soluble substances we isolated two furocoumarins with the compositions  $C_{16}H_{14}O_5$ , mp 141-143°C, and  $C_{16}H_{16}O_6$ , mp 132-134°C; these were identified by means of their IR spectra as oxypeucedanin and oxypeucedanin hydrate, which have been isolated previously from *Peucedanum officinale* L. [2], *Angelica sylvestris* L. [3] and other plants. Furocoumarins have been detected previously in only one species of *Ferula* - *Ferula nuda* Spreng., which belongs to the section Xeronarthex. This is the first time that they have been isolated from the section Neonarthex to which *Ferula syreitschikowii* belongs.

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