By comparing the data obtained with those known from the literature, we concluded that from the substance (I) we have isolated is a new 4',5'-dihydrofurocoumarin, and we have called it ulopterole.

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FLAVONOIDS OF SORBARIA SORBIFOLIUM

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We have studied the flavonoids of Sorbaria sorbifolium L. (Ural falsespirea) collected in the Khekhtsirskii reserve (Khabarovsk territory).

From the distilled alcoholic extracts purified with chloroform and by repeated chromatographic separation on a column of polyamide sorbent, we isolated an individual substance (I) with the composition $C_{21}H_{20}O_{11} \cdot 2H_2O$, mp 230–231° C, $[\alpha]_D^{20}$ −44.1° (c 0.1; ethanol); λ_{max} 267, 354 mμ, the chemical properties and UV and IR spectra of which corresponded to kaempferol 3-(β-D-galactopyranoside)–trifolin [1, 2]. A direct comparison of substance (I) with trifolin confirmed their complete identity (the sample of trifolin was obtained from Prof. Aritomi Masakazu, Japan).

In the mother liquor, after the extraction of substance (I), substances were detected which could not be separated on a column of polyamide sorbent. Substances (II) and (III) were isolated by preparative separation on Fn-16 paper in the ethyl acetate–formic acid–water (10 : 2 : 3) system. Substance (II) with R_f 0.68 was eluted with ethanol and was then subjected to acid hydrolysis. Quercetin and the sugar xylose were obtained. The attachment of the sugar at position 3 was shown by the citric acid–zirconium test [3], and, on the basis of this, substance (II) was characterized as quercetin 3-(xyloside). The hydrolysis of substance (III) (R_f 0.59) gave the aglycone kaempferol and the sugar xylose. The position of attachment of the sugar was shown in a similar manner to that for substance (II). Substance (III) is kaempferol 3-(xyloside).

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FLAVONOLS OF PRUNUS SPINOSA

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By separating on a Kapron column the flavonoids of the leaves of Prunus spinosa L. (family Rosaceae) we isolated glycoside 2, identified as kaempferol 7-(O-α-L-rhamnofuranoside) [1]. This glycoside was obtained by desorption with 45% ethanol. On elution with 40% ethanol, we obtained a mixture of glycoside 2 and glycoside 4, giving the color reactions characteristic for 3-substituted flavonols [2]. Attempts to separate glycoside 4 from glycoside 2 on Kapron were unsuccessful. To isolate glycoside 4, we used the different stabilities of the 3-glycosides and 7-glycosides in an alkaline medium. The action of a 0.5% aqueous solution of caustic potash in the boiling water bath for 2 hr led to the complete cleavage of the kaempferol 7-(rhamnoside), and the 3-glycoside was obtained in the pure state after the neutralization of the solution and purification on Kapron. Mp 210–212° C, $[\alpha]_D^{20}$ −154° (c 0.1; methanol).

The aglycone (yield 68.5%) had mp 309–312° C and the acetyl derivative mp 187–189° C. The products of alkaline degradation were phloroglucinol and protocatechuic acid. On the basis of what has been said and also the chromatographic behavior of the substance, the absence of a depression of the melting point of a mixture with authentic quercetin, and the results of IR and UV spectroscopy, the aglycone studied can be characterized as quercetin. The identity of the sugar component as L-arabinose was shown by paper chromatography and the preparation of the osazone. Hydrolysis with an enzyme preparation from the fungus Aspergillus oryzae led to the cleavage of the glycoside.

The results obtained, together with the results of spectroscopic (in the IR and UV regions), polarimetric, and polarographic analyses enable us to regard the glycoside isolated as quercetin 3-(O-α-L-arabofuranoside) (avicularin). An authentic sample of avicularin was supplied by N. F. Komissarenko (KhNIKhFI [Khar'kov Chemical and Pharmaceutical Scientific-Research Institute]).

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FLAVONOIDS OF SALIX PURPUREA

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We have studied the flavonoid composition of the leaves of Salix purpurea L. (purpleosier willow) collected in the neighborhood of Pyatigorsk. By two-dimensional paper chromatography with the subsequent use of qualitative reactions we have established the presence of six compounds of a flavonoid nature, of which four were isolated in the pure state.

The dried leaves (3.5 kg) were exhaustively extracted with 70% ethanol. The ethanolic extracts were concentrated under vacuum, diluted with water, and treated with chloroform. Luteolin 7-(O-β-D-glucopyranoside), $C_{21}H_{20}O_{11}$, crystallized out at the chloroform–aqueous extract boundary; it had mp 258–260° C (methanol); $[\alpha]_D^{20}$ −54° (c 0.523; methanol–pyridine (5 : 1)]; λ_{max} 352, 257 (264) mμ; λ_{max} with CH_3COONa 351, 258 mμ; mp of the acetyl derivative 232–235° C [petroleum ether–chloroform (4 : 1)] [1, 2].

Then, the purified aqueous extract was diluted with a five- to sixfold amount of 50% ethanol and the tanning substances were precipitated with a 5% solution of gelatin. After the elimination of the tanning substances, the aqueous ethanolic extract was concentrated under vacuum to minimum volume and exhaustively extracted with butyl acetate.

Luteolin and quercetin were isolated from the butyl acetate extract. The quercetin dissolved in diethyl ether at the boil: $C_{15}H_{10}O_7$, mp 308–309° C (ethanol); λ_{max} 370, 256 mμ; λ_{max} with CH_3COONa 380, 258 mμ; mp of the acetyl derivative 195–197° C (ethanol) [3]. The luteolin remained in the residue: $C_{15}H_{10}O_6$; mp 328–331° C (methanol); λ_{max} 353, 265 mμ; λ_{max} with CH_3COONa 373, 270 mμ; mp of the acetyl derivative 222–225° C [methanol–chloroform (4 : 1)] [2].

The concentrated aqueous extract was evaporated to eliminate traces of butyl acetate and was then left in the refrigerator at 3–4° C. After 10–12 days quercetin 7-(O-β-D-glucopyranoside) (quercimeritrin) crystallized out: $C_{21}H_{20}O_{12}$; mp 255–258° C (acetone); $[\alpha]_D^{20}$ −59° [c 0.21; methanol–pyridine (5 : 1)]; λ_{max} 372, 257 mμ; λ_{max} with CH_3COONa 371, 258 mμ; mp of the acetyl derivative 209–212° C [petroleum ether–chloroform (4 : 1)] [2].

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