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# FLAVONOIDS OF SIBERIAN-FAR-EASTERN SPECIES OF RHODODENDRONS OF THE SUBSPECIES *Rhodorastrum*

**M. V. Belousov, T. P. Berezovskaya, N. F. Komissarenko, and L. A. Tikhonova**

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Investigations have been made of leafy shoots of four morphologically very close species of rhododendrons belonging to the subspecies *Rhodorastrum* (Maxim.) Drude: *Rh. sichotense* Pojark, *Rh. mucronulatum* (Turcz.) Worosc., *Rh. dauricum* L., and *Rh. ledebourii* Pojark [1-3]. The raw material for analysis was collected in regions of the natural area (Altai, Kharaborovskii krai, Primor'e).

The total flavonoids were extracted with 80% ethanol. Purification was carried out with chloroform. The flavonoids were isolated with ethyl acetate from the concentrated aqueous alcoholic extract. After elimination of the ethyl acetate, 10 g of total flavonoids was deposited on a column (2.8 × 60 cm) of Woelm polyamide. Elution was performed with chloroform and a chloroform–methanol gradient with increasing concentrations of methanol. The eluates were monitored with the aid of thin-layer chromatography on Silufol UV-254 plates in chloroform (7:3) and by chromatography on FN-12 paper in the butan-1-ol–acetic acid–water (4:1:2.2) system. The fractions freed from accompanying substances (coumarins and phenolic acids) were combined and subjected to separation into individual components with the aid of two-dimensional paper chromatography in the butan-1-ol–acetic acid–water (4:1:2.2) (first direction) and water (second direction) systems.

A mixture of substances of flavonoid nature was isolated. The four predominating components (**1**)-(**4**) were identified.

Substances (**1**) and (**2**), having the nature of glycosides, were subjected to acid hydrolysis. One and the same aglycon was isolated from the products of their hydrolysis, and this was identified from physicochemical characteristics, the results of UV spectroscopy with complex-forming and ionizing reagents, and comparison with an authentic specimen as 3,3′,4′,5,7-pentahydroxyflavone (quercetin). The sugar component of substance (**1**) was D-galactose and that of substance (**2**) was L-arabinose, as was shown by paper chromatography of the hydrolysates in comparison with standard sugars.

Substance (**1**) — $C_{21}H_{20}O_{12}$, mp 238-240°C, $\lambda_{max}(C_2H_5OH)$ 361, 258 nm. By comparison with an authentic specimen it was identified as 3,3′,4′,5,7-pentahydroxyflavone 3-O-β-D-galactopyranoside — hyperoside.

Substance (**2**) — $C_{20}H_{18}O_{11}$, mp 210-213°C, $\lambda_{max}(C_2H_5OH)$ 360, 260 nm. By comparison with an authentic specimen it was identified as 3,3′,4′,5,7-pentahydroxyflavone 3-O-β-*L*-arabofuranoside — avicularin. Substances (**3**) and (**4**) were free aglycons: (**3**) — quercetin, mp 318-320°C, $\lambda_{max}(C_2H_5OH)$ 370, 270 nm; (**4**) — myricetin — mp 351-355°C, $\lambda_{max}(C_2H_5OH)$ 375, 255 nm.

In all four of the rhododendron species studied we detected quercetin, myricetin, hyperoside, and avicularin chromatographically and preparatively, which agrees with literature reports for other species of Dahurian rhododendrons [4-7]. In view of the results of investigations of other rhododendron species [8-11], hyperoside, avicularin, and quercetin may be assigned to the constant substances of the whole *Rhododendron* L. genus.

This is the first time that hyperoside, avicularin, quercetin, and myricetin have been isolated and identified for *Rh. sichotense*, *Rh. mucronulatum*, and *Rh. ledebourii*.

## REFERENCES

1. Vascular Plants of the Soviet Far East [in Russian], Nauka, St. Petersburg, Vol. 5 (1951), p. 119.
2. Flora of the USSR, Vol. 18, The Genus *Rhododendron* [in Russian], Moscow–Leningrad (1952).

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 0009-3130/98/3404-0510$20.00 

3. V. N. Voroshilov, Flora of the Soviet Far East [in Russian], Nauka, Moscow (1966).
4. É. T. Oganesyan, Author's Abstract of Dissertation ... Candidate of Pharmaceutical Sciences [in Russian], Moscow (1968).
5. N. F. Komissarenko, I. G. Levashova, and T. P. Shnyakina, Khim. Prir. Soedin., 665 (1973).
6. É. T. Oganesyan, V. A. Bandyukova, and A. A. Shinkarenko, Khim. Prir. Soedin., 279 (1974).
7. N. F. Komissarenko and I. G. Levashova, New Drugs from Siberian and Far Eastern Plants [in Russian], Tomsk, Vol. 2 (1989), p. 81.
8. É. T. Oganesyan and A. L. Shinkarenko, Khim. Prir. Soedin., 179 (1969).
9. É. T. Oganesyan, Rastit. Resurs., **6**, No. 2, 232 (1970).
10. É. T. Oganesyan, V. A. Bandyukova, and A. L. Shinkarenko, Khim. Prir. Soedin., 370 (1971).
11. V. M. Starchenko, The Chemical and Medicobiological Evaluation of New Phytopreparations, A Collection of Scientific Papers [in Russian], Moscow (1989), p. 54.