FLAVONOIDS OF Potentilla erecta

N. F. Goncharov, É. P. Stupakova, and N. F. Komissarenko

UDC 547.972:582.734.4

The isolation from the epigeal part of tormentilla cinquefoil, Potentilla erecta L. family Rosaceae, of coumarins – coumarin, umbelliferone, and scopoletin – has been reported previously [1]. There is information according to which tormentilla cinquefoil contains seven substances of flavonoid nature [2], of which kaempferol and its glycoside astragalin have been isolated [3].

Continuing a study of this species, we have investigated the flavoids of its epigeal part and also of the rhizomes. The flavonoids were isolated by a procedure described previously [4].

As a result, three flavonoids were obtained, and they have been designated as substances (I), (II), and (III).

Substance (I) – $C_{27}H_{30}O_{16}$, mp 190-192°C, $[\alpha]_D^{20}$ – 108° (c 0.8; ethanol). Acid hydrolysis yielded the aglycon quercetin ($C_{15}H_{10}O_7$, mp 309-311°C), while D-glucose and L-rhamnose were detected in the hydrolysate. The positions of attachment of the sugar residues to the aglycon was determined by UV spectroscopy with ionizing and complex-forming reagents [5, 6, 8]. Alkaline hydrolysis [7] of glycoside (I) led to the formation of isoquercitrin (mp, 218-221°C, $[\alpha]_D^{20}$ –38° (c 0.5; pyridine) and L-rhamnose. The results obtained permitted substance (I) to be identified as quercetin 3-O-β-D-glucopyranoside 7-O-α-L-rhamnopyranoside (antoside) [4].

Substance (II) – $C_{28}H_{32}O_{16}$, mp 220-223°C, $[\alpha]_D^{20}$ –104° (c 0.4; methanol) – was split on acid hydrolysis into an aglycon $C_{16}H_{12}O_7$, mp 305-307°C, identified as isorhamnetin, and two sugars: L-rhamnose and D-glucose. After the enzymatic hydrolysis of the glycoside with rhamnodiastase [10], isorhamnetin 7-O-α-L-rhamnopyranoside, $C_{22}H_{22}O_{11}$, was isolated with mp 117-120°C, $[\alpha]_D^{20}$ –122° (C 0.5; dimethylformamide) [11]. The results obtained permitted substance (II) to be identified as isorhamnetin 3-O-β-D-glucopyranoside 7-O-α-L-rhamnopyranoside [11].

Substance (III) – $C_{28}H_{32}O_{16}$, mp 178-180°C, $[\alpha]_D^{20}$ –28° (c 0.6; dimethylformamide). On acid hydrolysis it was split into isorhamnetin, D-glucose, and L-rhamnose. When the glycoside was fermented with rhamnodiastase, the aglycon isorhamnetin and the sugar rutinose were formed. The further identification of the glycoside was carried out in a similar manner described above. It was found that the compound under investigation was identical with isorhamnetin 3-O-β-rutinoside (narcissin) [9].

The comparative study of the epigeal part and rhizomes that we carried out showed that the same flavonoid glycosides were also present in the rhizomes but in considerably smaller amounts. This is the first time that any of these compounds has been isolated from Potentilla erecta.

LITERATURE CITED

1. N. F. Goncharov, É. P. Stupakova, N. F. Komissarenko, and É. V. Gella, Khim. Prir. Soedin., 299 (1982).
2. R. N. Zozulya and L. V. Selenina, The Investigation of Drugs of Natural and Synthetic Origin [in Russian], Tomsk (1975), p. 124.
3. Fuchs, Zur Kenntnis der Inhaltsstoffe von Prunus spinosa L. and einigen Rosaceae Arten, Dissertation, Münich (1959).
4. N. F. Komissarenko and I. F. Satsyperova, Rast. Res., No. 4, 567 (1974).
5. V. I. Litvinenko and N. P. Maksyutina, Khim. Prir. Soedin., 420 (1965).

All Union Scientific-Research Institute of Drug Chemistry and Technology, Kharkov.
Translated from Khimiya Prirodnykh Soedinenii, No. 2, pp. 286-287, March-April, 1989. Original article submitted July 1, 1988; revision submitted September 14, 1988.

0009-3130/89/2502-0251 $12.50

6. L. Turd, Spectral properties of flavonoid compounds, in: The Chemistry of Flavonoid Compounds (ed. T. A. Geissmann), Pergamon, Oxford (1962), p. 107.
7. V. I. Litvinenko and N. P. Maksyutina, Khim. Prir. Soedin., 366 (1969).
8. I. P. Kovalev and V. I. Litvinenko, Khim. Prir. Soedin., 233 (1965).
9. V. E. Sokolova, E. A. Vasil'chenko, and N. F. Komissarenko, in: Proceedings of the Second Congress of Pharmacologists [in Russian], Zdorov'ya, Kiev (1973), p. 126.
10. N. F. Komissarenko, V. T. Chernobai, and D. G. Kolesnikov, Dokl. Akad. Nauk SSSR, 158, No. 4, 904 (1962).
11. D. B. Rasputina, N. F. Komissarenko, D. Ts. Tsibikova, and A. M. Popova, Khim. Prir. Soedin., 96 (1975).

FLAVONE C-GLYCOSIDES FROM Gentiana macrophylla

L. A. Tikhonova, N. F. Komissarenko, and T. P. Berezovskaya

UDC 547.972

We have investigated the epigeal part of large-leaved gentian, Gentiana macrophylla Pall., family Gentianaceae, gathered in the flowering period in August, 1985, in various regions of the Altai.

No less than four flavonoids were detected in alcoholic extracts from the epigeal part of the species under investigation by paper chromatography in 15% acetic acid, butan-1-ol–acetic acid–water (4:1:2), and ethyl acetate–formic acid–water (10:2:3) systems.

To isolate the substances detected, the air-dried comminuted herbage of large-leaved gentian was extracted with 80% methanol. The alcohol was distilled off and the aqueous residue was treated successively with chloroform, ethyl acetate, and n-butanol.

In the present communication we give the results of an investigation of the ethyl acetate fraction.

The total flavonoids from the ethyl acetate fraction were deposited on a column of polyamide and were eluted successively with chloroform and mixtures of chloroform and methanol (with gradientwise increasing concentrations of methanol). As a result, two individual substances were isolated which have been designated as compounds (I) and (II).

Both substances were resistant to acid hydrolysis. They were cleaved to an aglycon and a carbohydrate residue by hydriodic acid in liquid phenol and acetic anhydride [1], which showed the C-glycosidic nature of the substances isolated, and they were identified by comparison with authentic samples.

Substance (I), $C_{21}H_{20}O_{10}$, mp 193-194°C (methanol), $[\alpha]_D^{20}$ +46° (methanol), $[\alpha]_{max}^{CH_3OH}$ 271.333 nm.

Under the action of hydriodic acid, substance (I) was cleaved into apigenin and D-glucose; it was isomerized by 5% HCl into apigenin 8-C-β-D-glucopyranoside (vitexin) [2]. On the basis of the results of UV spectroscopy and also from the products of cleavage and isomerization, compound (I) was identified as saponaretin [3].

Substance (II) had the general formula $C_{21}H_{20}O_{11}$, mp 227-231°C (methanol), $[\alpha]_D^{20}$ +22° (methanol), $\lambda_{max}^{CH_3OH}$ 257 sh., 272, 350 nm. It was cleaved by hydriodic acid into luteolin and D-glucose. It was isomerized by 5% HCl into luteolin 8-C-β-D-glucopyranoside [2, 3]. Thus, the results obtained permitted the conclusion that substance (III) was homoorientin (isoorientin) – 6-C-β-D-glucopyranosyl-3',4',5,7-tetrahydroxyflavone.

Tomsk State Medical Institute. All-Union Scientific-Research Institute of Drug Chemistry and Technology, Khar'kov. Translated from Khimiya Prirodnykh Soedinenii, No. 2, pp. 287-288, March-April, 1989. Original article submitted July 18, 1988; revision submitted October 14, 1988.

 0009-3130/89/2502-0252 $12.50