[2] indicated that the neohesperidose and rutinose were linked to the aglycones of substances (I) and (II), respectively, in the C-7 position.

The physisochemical constants, spectral indices (UV and IR spectra), and a chromatographic comparison with authentic samples permitted substances (I) and (II) to be identified as naringin (naringenin 7-neohesperiodoside) and isorhoifolin (apigenin 7-rutinoside).

LITERATURE CITED

1. R. M. Horowitz, J. Org. Chem., 22, 173 (1965).
2. T. S. Mabry, K. R. Markhan, and M. B. Thomas, The Systematic Identification of Flavonoids, Springer, New York (1970).
3. B. V. Chandler and K. A. Harper, Aust. J. Chem., 14, 586 (1961).
4. J. B. Harborne, Physochemical Methods, Chapman and Hall, London (1973), p. 212.

GLYCOSIDES OF QUERCETIN, APIGENIN, AND LUTEOLIN FROM ORANGE LEAVES

A. G. Shalashvili, I. L. Targamadze, and I. D. Amashukeli

UDC 547.972

We have investigated the flavonoid compounds of the leaves of the orange Citrus sinensis Macf., variety Washington navel, collected in the Sukhumi experimental station of subtropical crops of VNIIR (All-Union Scientific-Research Institute of Plant Breeding). The leaves were treated with steam and dried and were then communuted and extracted with 80% methanol on the boiling water bath. The extracts were evaporated in vacuum to drive off the methanol, and the aqueous residue was treated repeatedly with chloroform. More than 10 flavonoic compounds were detected by two-dimenstional paper chromatography (direction I: butan-1-ol—acetic acid—water (4:1:5); direction II: 2% acetic acid) in the extract obtained. The fractionation of the combined flavonoids was performed on a column of polyamine sorbent. Water and increasing concentrations of ethanol in water (10-96%) were used as eluents. A fraction of flavone and flavonol glycosides (eluted from the polyamide by 50% ethanol) was separated on a column of microcrystalline cellulose (with elution by water) in subfractions of flavone and flavonol glycosides from which individual compounds were isolated on columns of Sephadex LH-20 (with acetone—methanol—water (2:1:1) as the eluent). This gave three substances (I-III).

The positions of the main obsorption maxima in the UV spectra of substances (I-III) characterized them as flavonol and flavone derivatives [1]. In the products of the acid hydrolysis [2] of substances (I-III) quercetin (substance (I)), apigenin (substance (II)), luteolin (substance (III)), and D-glucose and L-rhamnose (substances (I-III)) were detected by PC in various solvent systems. The oxidative degradation [3] of substances (I-III) gave the disaccharide rutinose (6-O-α-L-rhamnosyl-D-glucose). When qualitative reactions [4] and spectral investigations were performed with ionizing and complex-forming reagents [1], it was established that the rutinose was attached to the aglycone of substance (I) in the C-3 position and to the aglycones of substances (II) and (III) in the C-7 position.

The physicochemical constants and spectral indices (UV and IR spectra) obtained and the chromatographic behavior of the substances with authentic samples, and also literature information permitted substances (I), (II), and (III) to be identified as rutin, isorhoifolin, and luteolin 7-rutinoside [5].

LITERATURE CITED

1. T. J. Mabry, K. R. Markham, and M. B. Thomas, The Systematic Identification of Flavonoids, Springer, New York (1970).
2. B. V. Chandler and K. A. Harper, Aust. J. Chem., 14, 586 (1961).
3. J. B. Harbone, Phytochemical Methods, Chapman and Hall, London (1973), p. 212.

Institute of Plant Biochemistry, Academy of Sciences of the Georgian SSR, Tbilisi. Translated from Khimiya Prirodnykh Soedinenii, No. 3, pp. 409-410, May-June, 1985. Original article submitted July 23, 1984.

 0009-3130/85/2103-0384$09.50

4. L. Horhammer and R. Hansel, Arch. Pharm., 286, 425 (1953).
5. A. G. Shalashvili and I. L. Targamadze, in: Methods of Biochemical Investigations of Plants [in Russian], Tbilisi (1983), p. 82.

C-GLYCOSIDES OF Stellaria holostea

L. I. Boguslavskaya, A. I. Tikhonov,
P. D. Pashnev, Bekkari Zhemal',
and V. I. Sklyar

UDC 547.972

Continuing a search for biologically active substances from plants of the genus Stellaria L. [1, 2], we have studied the flavonoid composition of the epigeal part of Stellaria holostea L. (easterbell starwort) collected in the environs of Khar'kov in the flowering period.

Qualitative reactions and one- and two-dimensional chromatogrphy showed the presence in the herbage of the plant under investigation of about six flavonoids. Column chromatography on polyamide sorbent led to the isolation of substance A with mp 237-241°C, $[\alpha]_D^{20}$ +28° (c 0.1; ethanol), $E_{1cm}^{1\%}$ = 530, R_f (15% acetic acid, asc.) 0.42; λ_{max} (in ethanol): 350, 258, 270 nm.

The IR specrum showed absorption bands characteristic for C-glycosides (1010-1040 cm^{-1}) [3].

For exhaustive hydrolysis we used a mixture of 30% solutions of sulfuric and acetic acids [3]. Hydrolysis for 10 h gave the aglycone, D-glucose, and D-arabinose. From the results of UV spectroscopy, alkaline degradation, and a mixed melting point with an authentic sample, the aglycone was identified as luteolin. Hydrolysis in 10% ethanolic hydrochloric acid permitted the following isomerization to be observed. On acid hydrolysis, substance A gave two compounds (A → A + B) with R_f 0.42 and 0.16 (15% acetic acid). Substance B with mp 263-265°C, $[\alpha]_D^{20}$ +20° (c 0.1; ethanol) gave the same products. This enabled us to state that they were luteolin C-glycosides. Spectral investigations in the UV regions of substances B revealed free 3',4',5,7-hydroxy groups.

It chromatographic mobility on paper, the absence of a depression of the melting point of mixtures with authentic samples, and the identity of the IR spectra of these compounds permitted substances A to be identified as homoorientin and substance B as orientin [4]. This is the first time that flavonoids from Stellaria holostea have been investigated.

LITERATURE CITED

1. V. A. Bandyukova and V. A. Yugin, Khim. Prir. Soedin., 13 (1981).
2. A. I. Shreter, The Medicinal Flora of the Soviet Far East [in Russian], Moscow (1975), p. 93.
3. G. N. Zemtsova and V. A. Bandyukova, Khim. Prir. Soedin., 107 (1974).
4. G. A. Drozd, K. E. Koreshchuk, and V. I. Litvinenko, Farm. Zh., No. 1, 56 (1969).

Khar'kov State Pharmaceutical Institute. Translated from Khimiya Prirodnykh Soedinenii, No. 3, pp. 410, May-June, 1985. Original article submitted July 31, 1984.

0009-3130/85/2103-0385$09.50