portion by weight of TPs of 197.4-271.7 mg/kg, they were found in the greatest amount in the Gorvala variety.

LITERATURE CITED

1. A. A. Akhrem and A. I. Kuznetsova, Thin-Layer Chromatography [in Russian], Nauka, Moscow (1964), p. 143.
2. J. G. Kirchner, Thin-Layer Chromatography, 2nd edn., Wiley-Interscience, New York (1978).
3. O. E. Schultz and S. D. Straus, Arzneim.-Forsch., 5, 342 (1955).
4. K. J. Whittle and J. F. Pennock, Analyst, 38, 1244 (1967).

FLAVONOID COMPOSITION OF *Artemisia xanthochroa*

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UDC 547.972

The flavonoids cirsilineol, cirsimaritin, eriodictyol 7-methyl ether, and rhamnetin have been isolated from the epigeal part of *Artemesia xanthrochroa* Krasch.

Continuing an investigation of the flavonoid composition of this species of wormwood, from a chloroform fraction of the ethanolic extract we isolated the additional substance (VI), and from the ethyl acetate fraction substance (VII).

Substance (VI) — $C_{16}H_{14}O_7$, mp 217°C (chloroform—methanol), $[\alpha]_D^{24}$ +9.3° (c 1.51; ethanol) — consisted of colorless crystals. Its UV spectrum (295 nm) and also spectra with ionizing additives permitted the assumption of a dihydroflavonoid structure of the substance, of the presence of free OH groups in positions 3' and 4', and of their absence from position 7 [2]. The presence of an ortho-dihydroxy group in ring B was confirmed by the alkaline degradation of substance (VI), as a result of which protocatechuic acid was detected in the reaction products by paper and thin-layer chromatography.

PMR spectrum (DMSO, δ, ppm): 6.77 (d, J = 7 Hz, H-5'); 6.72 (m, 2H, H-6' and H-2'); 6.06 (d., J = 2 Hz, 2H, H-6, H-8); 5.05 (d, J = 11 Hz, H-2); 4.50 (d, J = 11 Hz, H-3); 3.74 (s, 3H, OCH_3). The splitting of the signals at 5.05 and 4.50 into doublets with SSCCs of 11 Hz showed that the H-2 and H-3 protons were in the trans orientation with respect to one another.

The structure of the flavonoid put forward on the basis of the spectral characteristics — 3,3',4'-5-tetrahydroxy-7-methoxyflavanone — was confirmed by the dehydrogenation of (VI) by boiling it in 4 N H_2SO_4 solution for 2 h [3], as the result of which a substance was obtained which was identified with rhamnetin on the basis of the identity of the IR spectra and the absence of a depression of the melting point of a mixture with an authentic sample. The capacity of the dihydroflavonol (VI) for being oxidized to a flavonol confirmed that it belonged to the trans series [4]. The tetraacetate of (VI) had mp 133-135°C (according to the literature, the melting point of dihydrorhamnetin acetate is 130°C) [5].

Summarizing the experimental results, we determined the structure of compound (VI) as trans(+)-3,3',4',5-tetrahydroxy-7-methoxyflavanone. A dihydroflavonol described by the authors as 3,3',4',5-tetrahydroxy-7-methoxyflavanone, padmatin, was isolated previously from *Prunus puddum* but its melting point differed considerably from that of substance (VI) (mp 171°C [6]). The authors concerned did not give optical rotation values. This is the first time that compound (VI), being a dextrorotatary isomer of the trans series has been described in the literature.

Substance (VII) — $C_{17}H_{14}O_8$, mp 297°C, M^+ 346. UV spectrum: $\lambda_{max}^{CH_3OH}$ 266, 273 nm. PMR spectrum (DMSO, δ, ppm): 7.38 (s, H-6'); 7.01 (s, H-3'); 6.62 (s, H-8); 6.58 (s, H-3); 3.80 (s, OCH_3); 3.76 (s, OCH_3). UV spectra with ionizing and complex-forming additives permitted the assumption that free OH groups were present at C-4', C-5, and C-7 of the flavone nucleus.

In its UV spectrum, flavonoid (VII) had an absorption maximum at 373 nm, which is not characteristic for flavones, but may occur when an OH group is present in the C-2' position

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V. L. Komarov Botanical Institute, Academy of Sciences of the USSR, Leningrad. Translated from Khimiya Prirodnykh Soedinenii, No. 1, pp. 141-142, January-February, 1987. Original article submitted July 14, 1986.

0009-3130/87/2301-0120$12.50

[7, 8]. The flavonoid gave a slight bathochromic shift in the presence of $AlCl_3$ + HCl (12 nm), such a shift also being characteristic for flavonoids having a substituent, in the present case, a methoxy group, at C-6 [9]. The mass spectrum of substance (VI) confirmed the hypothesis of the presence of two methoxy groups and of four hydroxy groups in the molecule, fragments with m/z 139 and 169 ($C_6H_3O_4$ and $C_7H_3O_5$) showing the presence of two OH groups and one OCH_3 group in ring A, and a fragment with m/z 164 ($C_9H_8O_3$) the presence of the same groups in ring B [10].

The chemical shifts (δ) of the signals observed in the ^{13}C NMR spectra of substance (VII) were assigned to the carbon atoms of the flavonone under investigation by analogy with the similarly structured flavonoid arcapillin [10]

C-2	161,82 (s)	C-5	152,69 (s)	C- 8	94,28 (d)
C-3	106.60 (d)	C-6	131,24 (s)	C- 9	152,90 (s)
C-4	182 27 (s)	C-7	156,98 (s)	C-10	104,50 (s)
C-1′	107,08 (s)	C-4′	152,36 (s)	OCH_3	59,97 (q)
C-2′	151,80 (s)	C-5′	141,57 (s)	OCH_3	56,67 (q).
C-3′	103,96 (d)	C-6′	111,99 (d)		

On the basis of an analysis of the spectral characteristics of substance (VII) and its acetate (mp 203°C) and a comparison of the literature information, substance (VII) was identified as 2',4',5,7-tetrahydroxy-5',6-dimethoxyflavone, which has been isolated by American scientists from *Artemesia ludoviciana* (mp 294°C) [8]. *A. xanthrochroa* is the second source of this compound.

Assistance in the interpretation of the spectra of the compounds described was provided by T. V. Bukreeva.

LITERATURE CITED

1. I. I. Chemesova, L. M. Belenovskaya, and L. P. Markova, Khim. Prir. Soedin.,789 (1984).
2. R. M. Horowitz and L. Jurd, J. Org. Chem., 26, 2446 (1961).
3. V. M. Litvinenko and T. P. Nadezhina, Rast. Res., 8, No. 1, 38 (1972).
4. V. M. Litvinenko and O. I. Shevchuk, in: Physiologically Active Substances [in Russian], Kiev, No. 2 (1969), p. 168.
5. R. D. Tiwari and O. P. Yadava, Phytochemistry, 10, No. 9, 91 (1959).
6. R. N. Goel and F. R. Seshadri, Tetrahedron, 5, No. 1, 91 (1959).
7. B. Voirin, M. Jay, and M. Hauteville, Phytochemistry, 14, No. 1, 257 (1975).
8. Y. L. Liu and T. J. Mabry, Phytochemistry, 21, No. 1, 209 (1982).
9. J. A. Mears and T. J. Mabry, Phytochemistry, 11, No. 1, 411 (1972).
10. Y. Koso R. Sasaki, Y. Oshima, and H. Hikino, Heterocycles, 19, No. 9, 1615 (1982).