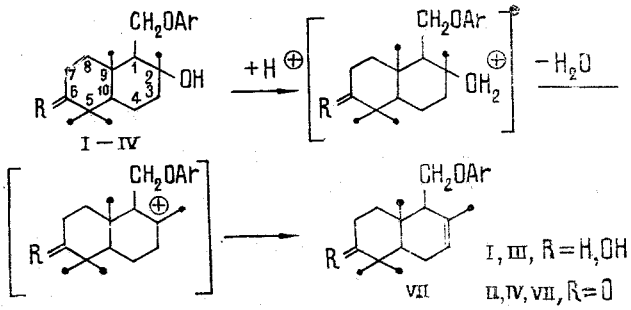
The reaction was carried out at room temperature. It was found that its rate in diols was much higher than in ketols. While in diols the reaction was complete in a few minutes, in ketols it lasted for hours. At the same time, the time of formation of (VII) from (II) was approximately twice that from (IV).

The formation of a product with an endocyclic double bond takes place via a carbocation formed after the splitting out of a molecule of water from the initial compound protonated on the OH group at C-2.



LITERATURE CITED

1. A. A. Savina, Yu. E. Sklyar, V. I. Sheichenko, I. A. Kir'yanova, and D. A.Fesenko, Khim. Prir. Soedin., 733 (1979) [in this issue].
2. N. P. Kir'yalov and S. D. Movchan, Khim. Prir. Soedin., 73 (1968).
3. V. Yu. Bagirov, Khim. Prir. Soedin., 652 (1978).
4. V. Yu. Bagirov, V. I. Sheichenko, and A. I. Ban'kovskii, Khim. Prir. Soedin., 450 (1976).
5. N. V. Veselovskaya, Yu. E. Sklyar, M. E. Perel'son, and M. G. Pimenov, Khim. Prir. Soedin., 227 (1979).
6. V. V. Vandyshev, Yu. E. Sklyar, M. E. Perel'son, M. D. Moroz, and M. G. Pimenov, Khim. Prir. Soedin., 670 (1972).
7. A. I. Saidkhodzhaev and B. M. Malikov, Khim. Prir. Soedin., 707 (1978).

FLAVONOID AGLYCONES OF THE ROOTS OF *Rhaponticum carthamoides*

V. V. Vereskovskii

UDC 547.972

Continuing a study of the phenolic compounds from plants of the family Compositae [1, 2], by means of paper chromatography we have established that the roots and rhizomes of *Rhaponticum carthamoides* (Willd.) Iljin, collected in October, 1977, on the experimental plantation of the Central Botanical Garden of the Academy of Sciences of the Belorussian SSR, contained not less than ten flavonoid aglycones.

To establish the nature of the aglycones the combined glycosides (an amorphous powder from the ethyl acetate fraction, the yield of which was 0.5% calculated on the air-dry raw material) was hydrolyzed with a 10% solution of hydrochloric acid with heating on the boiling water bath for 5 h. The aglycones were extracted with diethyl ether. The ethereal extracts were washed with distilled water to neutrality and dried with anhydrous sodium sulfate. After elimination of the organic solvent, the dry residue was again dissolved in ether. The powder obtained after the elimination of the ether again was dissolved in 80% ethanol.

The combined aglycones were separated into their individual components by two-dimensional chromatography on Filtrak FN-16 paper in the following solvent systems: 1) chloroform–acetic acid (3:2), and 2) 40% acetic acid [3, 4]. Preparative paper chromatography and elution with ethanol yielded the individual components (I-IV), which were identified by comparison

Central Botanical Garden, Academy of Sciences of the Belorussian SSR, Minsk. Translated from Khimiya Prirodnykh Soedinenii, No. 5, pp. 723-724, September-October, 1979. Original article submitted April 4, 1979.

0009-3130/79/1505-0637$07.50

with known flavonoid compounds [5-7]. The positions of the free hydroxy groups in the components investigated were confirmed by spectral investigations in the UV region with diagnostic reagents [7]. These compounds were also characterized from the specific color reactions, the colors of the spots on chromatograms in visible and UV light, mobilities in paper chromatography in various solvent systems, and the products of alkaline cleavage, and also by direct comparison with authentic samples and from literature information [3, 5-9].

On the basis of the results obtained, compound (I) was identified as quercetin, (II) as quercetagetin, (III) as luteolin, (IV) as kaempferol, and (V) as isorhamnetin.

The presence of quercetin in the roots of *Rhaponticum carthamoides* has been reported previously [9], but we are the first to have detected the other flavonoids.

LITERATURE CITED

1. V. V. Vereskovskii and I. I. Chekalinskaya, Khim. Prir. Soedin., 525 (1978).
2. V. V. Vereskovskii and I. I. Chekalinskaya, Vestsi Akad. Nauk BelorussSSR, Ser. Biol. Nauk, 2, 14 (1978).
3. N. A. Laman and R. G. Tsytovich, Vestsi Akad. Nauk BelorussSSR, Ser. Biol. Nauk, 1, 99 (1978).
4. E. T. Bryant, J. Am. Pharm. Ass., Sci. Ed., 39, No. 8, 481 (1950).
5. V. S. Batyuk and L. F. Kol'tsova, Khim. Prir. Soedin., 121 (1969).
6. J. B. Harborne, Phytochemistry, 4, 647 (1965).
7. T. J. Mabry, K. R. Markham, and M. B. Thomas, The Systematic Identification of Flavonoids, Springer, New York (1970).
8. J. F. Gonnet and M. Jay, Phytochemistry, 11, 2313 (1972).
9. E. Tarpo, Farmacia (Bucharest), 19, No. 1, 25 (1971).
10. L. I. Bargman, R. L. Khazanovich, and R. Kh. Ruzieva, in: Proceedings of the Tashkent Pharmaceutical Institute [in Russian], Tashkent, Vol. 4 (1966), p. 114.

QUERCITRIN FROM PLANTS OF THE GENUS *Hypericum*

L. V. Shatunova

UDC 547.972

I have investigated the epigeal parts of *Hypericum perforatum*, *H. quadrangulum*, *H. hirsutum*, *H. elegans*, and *H. montanum* (family Guttiferae) collected in Kursk province in the flowering period. The herbage was extracted with 96% ethanol in a ratio of 1:10 with heating on the water bath. After evaporation in vacuum, the extracts were treated with boiling distilled water. The resinous substances were separated off by filtration. The extracts were chromatographed on a column of polyamide sorbent. Elution with aqueous ethanol yielded an individual substance in the form of pale yellow acicular crystals with mp 185-187°C, $C_{21}H_{20}O_{11}$. UV spectrum, nm: $\lambda^{C_2H_5OH}$ 257, 355; λ^{CH_3COONa} 272, 361; $\lambda^{CH_3COONa+H_3BO_4}$ 262, 375; $\lambda^{C_2H_5ONa}$ 275, 387.

The IR spectrum of the substance showed absorption bands characteristic of the carbonyl group of a flavonol (1655-1600 cm^{-1}) [1, 2] and of hydroxy groups (3300-3500 cm^{-1}).

Acid hydrolysis of the substance (2% H_2SO_4, 40 min) yielded quercetin and L-rhamnose [3].

Thus, the substance that I have isolated from plants of the genus *Hypericum* has been identified as quercetin 3-O-α-L-rhamnoside, or quercitrin.

LITERATURE CITED

1. T. A. Geissman, The Chemistry of Flavonoid Compounds, Pergamon, New York (1962), p. 107.
2. L. Hörhammer and H. Wagner, Dtsch. Apoth. Ztg., 14, No. 1, 15 (L962).
3. N. P. Maksyutina and V. I. Litvinenko, in: Phenolic Compounds and Their Biological Functions [in Russian], Moscow (1968), pp. 7-26.

Kursk State Medical Institute.

Translated from Khimiya Prirodnykh Soedinenii, No. 5, p. 724, September-October, 1979. Original article submitted April 5, 1979.

0009-3130/79/1505-0638$07.50