Consequently, substance (III) was either calycosin (4',7-dihydroxy-4'-methoxyisoflavone). The physical constants and spectral characteristics of (III) and its acetate coincided with whose of 3'-hydroxyformononetin [5].

Substance (IV): $C_{16}H_{12}O_5$, M^+ 284, mp 332-334°C, λ_{max} 231, 262, 321 nm (log ε 3.63, 3.72, 3.39). It was assigned on the basis of its UV and PMR spectra to the 4',6,7-trihydroxyisoflavone derivatives and contained one methoxy and two hydroxy groups. Intense peaks of ions with m/z 166 and 151 in the mass spectrum of (IV) showed the presence of OH and OCH_3 groups in ring A. On comparing the physicochemical and spectral properties of (IV) with those of glycetein (4',7-dihydroxy-6-methoxyisoflavone) and kakkatin (4',6-dihydroxy-7-methoxyisoflavone), we came to the conclusion that the isoflavone that we had isolated was kakkatin [4, 6].

Substance (V): $C_{22}H_{22}O_9$, M^+ 430, mp 213-215°C, $[a]_D - 59.2°$ (methanol), λ_{max} 232, 250 infl., 261, 303 nm (log ε 3.94, 4.01, 4.04, 3.57). It was, according to its IR and PMR spectra, a glycoside. The acid hydrolysis of (V) gave formonononetin and D-glucose (TLC and GLC). On the basis of these chemical and spectral characteristics, compound (V) was identified as formononetin 7-O-β-D-glucopyranoside (ononin) [2-4].

This is the first time that the above-mentioned flavonoids have been isolated from A. mongolica.

LITERATURE CITED

1. A. Sélėngė, M. V. Telezhenetskaya, and S. Yu. Yunusov, Khim. Prir. Soedin., 559 (1976).
2. I. J. Mabry, K. R. Markham, and M. B. Thomas, The Systematic Identification of Flavonoids, Springer, New York (1970), p. 165.
3. Rodd's Chemistry of Carbon Compounds, (ed. S. Coffey), Elsevier, Amsterdam, Vol. IV, Part E (1977), p. 214.
4. V. A. Bandyukova and A. L. Kazakov, Khim. Prir. Soedin., 669 (1978).
5. M. R. Parthasarathy, R. N. Puri, and T. R. Seshadri, Indian J. Chem., 7, No. 2, 118 (1969).
6. M. Kubo, M. Sasaki, K. Namba, S. Naruto, and H. Nishimurar, Chem. Pharm. Bull., 23, 2449 (1975).

CHEMICAL STUDY OF PLANTS OF THE MONGOLIAN FLORA

COUMARINS OF Salsola laricifolia

S. Narantuyaa, D. Batsurén,
É. Kh. Batirov, and V. M. Malikov

UDC 547.9:582.89

Plants of the genus Salsola (family Chenopodiaceae) have long been used in Chinese and Tibetan medicine [1]. However, the chemical composition of representatives of this genus has been studied far from adequately. Salsola laricifolia Turcz. et Litw. is a perennial subshrub found in the desert region of the Mongolian People's Republic [2]. The local population use it in diseases of the liver and stomach.

Qualitative reactions and TLC showed that the epigeal part of the plant collected in the fruit-bearing period in the South Gobi arimak contained coumarins. The comminuted plant was extracted with ethanol, the concentrated ethanolic extract was diluted with water, and it was shaken out successively with hexane, chloroform, ethyl acetate, and butanol. By column chromatography on silica gel, the chloroform fraction yielded compounds (I-V), and the ethyl acetate and butanol fractions compound (VI).

Compound (I) — $C_{11}H_{10}O_5$, mp 195-197°C, $\lambda_{max}^{CH_3OH}$ 210, 257, 313 nm; +CH_3COONa, 328 nm (increase in intensity) — and (II) — $C_{11}H_{10}O_5$, mp 149-151°C, $\lambda_{max}^{CH_3OH}$ 226, 256 infl., 343 nm;

Institute of Chemistry, Academy of Sciences of the Mongolian People's Republic, Ulan-Bator. Institute of the Chemistry of Plant Substances, Academy of Sciences of the Uzbek SSR, Tashkent.

Translated from Khimiya Prirodnykh Soedinenii, No. 2, 243-244, March-April, 1986. Original article submitted July 22, 1985.

0009-3130/86/2202-0228 $12.50

+ CH_3ONa, 398 nm (decrease in intensity) – were identified on the basis of their IR, UV, and PMR spectra, and also by a comparison with authentic samples, as fraxidin and isofraxidin, respectively [3, 4]. The methylation of both (I) and (II) with diazomethane gave 6,7,8-trimethoxycoumarin with mp 102-104°C [3, 5].

Compound (III) – $C_{10}H_8O_5$, M^+ 208, mp 227-228°C, $\lambda_{max}^{CH_3OH}$ 230, 345 nm – was identical with the known coumarin fraxatin [3-5].

Compound (IV) – $C_{17}H_{20}O_{10}$, mp 191-192°C, $\lambda_{max}^{CH_3OH}$ 228, 293, 338 nm (log ε 3.76, 3.58, 3.43) – was a glycoside. Its PMR spectrum showed the signals of H-3, H-4, and H-5 protons (6.35 ppm d, 9.8 Hz; 7.62 ppm, d, 9.8 Hz, and 6.80 ppm, S, respectively), of two methoxy groups (3.64 and 4.03 ppm), of an anomeric proton (6.05 ppm, d, 6.5 Hz), and of the other protons of a sugar residue. The acid hydrolysis of (IV) formed fraxidin and D-glucose. Thus, compound (IV) was identified as fraxidin 8-O-β-D-glucopyranoside [4, 6].

Compound (V) – $C_{17}H_{20}O_{10}$, mp 217-218°C, λ_{max} 230, 308 infl., 342 nm (log ε 3.48, 3.60, 3.79) – was identified on the basis of the formation of isofraxidin and D-glucose on acid hydrolysis, a study of spectral properties, and comparison with literature information, as isofraxidin 7-O-β-D-glucopyranoside (calycanthoside) [4, 7].

Compound (VI) – $C_{16}H_{18}O_2$, mp 209-210°C, λ_{max} 230, 282, 340 nm (log ε 3.85, 3.27, 2.79) – was identified from spectral characteristics and by comparison with an authentic sample as scopoletin 7-O-β-glucopyranoside [3, 4, 8].

This is the first time that coumarins have been isolated from *Salsola laricifolia*.

LITERATURE CITED

1. A. I. Shreter, The Medicinal Flora of the Soviet Far East [in Russian], Miditsina, Moscos (1975), p. 91.
2. V. I. Grubov, The Plants of Central Asia, No. 2, *Chenopodiaceae* [in Russian], Moscow–Leningrad (1966), p. 91.
3. G. A. Kuznetsova, Natural Coumarins and Furocoumarins [in Russian], Leningrad (1967), pp. 75-80.
4. R. D. H. Murray, "Naturally occurring plant coumarins," in: Fortschritte Chem. Org. Naturstoffe, 35, 199 (1978).
5. É. Kh. Batirov, A. D. Matkarimov, V. M. Malikov, M. R. Yagudaev, and E. Seitmuratov, Khim. Prir. Soedin., 785 (1980).
6. S. R. Jensen and B. J. Nielsen, Phytochem., 15, 221 (1976).
7. V. Plouvier, Compt. Rend., 266D, 1526 (1968).
8. M. P. Yuldashev, É. Kh. Batirov, and V. M. Malikov, Khim. Prir. Soedin., 168 (1980).

ACTION OF THE FLAVONOIDS QUERCETIN 3-RUTINOSIDE AND KAEMPFEROL 3,7-DIRHAMNOSIDE ON THE BIOSYNTHESIS OF MELANIN IN Verticillium dahliae

N. Navrezova, M. Agzamova,
N. N. Stepanichenko, and B. Makhsudova

UDC 547.972+632.428

We have previously isolated the flavonoids quercetin 3-rutinoside and kaempferol 3,7-dirhamnoside from the leaves of the cotton plant of the Tashkent-1 variety and of kenaf of the Uzbekskii-1574 variety [1, 2]. A connection between the amount of flavonoids and the degree of wilt-resistance of the plants was observed.

The aim of the present investigation was to study the action of the flavonoids isolated from the cotton plant and kenaf on the biosynthesis of melanin in the fungus *Verticillium dahliae* Kleb., which will assist in the elucidation of the participation of flavonoids in the protective reactions of plants on their attack by verticillium wilt.

V. I. Lenin Tashkent State University. Translated from Khimiya Prirodnykh Soedinenii, No. 2, pp. 244-245, March-April, 1986. Original article submitted August 7, 1985.

0009-3130/86/2202-022912.50