FLAVONOIDS OF *Triadenum japonicum*

N. P. Krasovskaya, N. I. Kulesh,
N. A. Vasilevskaya, and O. B. Maksimov

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As the result of a screening process performed among the flowering plants of the Far East, we have found a number of species enriched with compounds exhibiting antioxidant actiivty [1, 2]. Of them we have investigated the herbaceous plant *Triadenum japonicum* (Blume) Makino (family Hypericaceae) which has not been chemically characterized previously.

The raw material was gathered in the flowering period in the flood plain of the R. Bogataya (Suburb of Vladivostok). After repeated extraction with ethanol, the concentrated extracts were diluted with water and were reextrated successively with hexane, ethyl acetate, and butanol. The resulting fractions were separated with the aid of chromatography on silica gel. On elution with benzene, the hexane extract yielded compound (I) — white crystals with the composition $C_{30}H_{48}O_3$, mp 318°C, M^+ 456.

From its ^1H and ^{13}C NMR spectra and also a comparison with an authentic sample, the compound was identified as betulinic acid.

The ethyl acetate extract, on elution with benzene and mixtures of benzene and methanol, yielded five substances (II-VI).

Compound (II): yellow-green crystals with the composition $C_{15}H_{10}O_7$, mp 316°C. UV spectrum, nm: $\lambda_{max}^{C_2H_5OH}$ 255, 373, M^+ 302, (mass spectrometry). It was identified as quercetin.

Compound (III): white crystals with the composition $C_{15}H_{14}O_6$, mp 178°C. UV spectrum, nm: $\lambda_{max}^{C_2H_5OH}$ 291, $[\alpha]_D^{20}$ +17° (c 1.0; ethanol), M^+ 290. This was identified as (+)-catechin.

Compound (IV): cream-colored crystals with the composition $C_{15}H_{18}O_6$, mp 177°C. UV spectrum, nm: $\lambda_{max}^{C_2H_5OH}$ 223, 294 nm. The addition of diagnostic reagents caused the following changes: $\lambda_{max}^{C_2H_5OH+AlCl_3}$ 316, 382 nm, $\lambda_{max}^{C_2H_5OH+AlCl_3+HCl}$ 312, 380 nm, $\lambda_{max}^{C_2H_5OH+MeONa}$ 243, 294 nm, $\lambda_{max}^{C_2H_5OH+NaAc}$ 332 nm. The structure of compound (IV) was not fully established because of its small amount.

Compound (V): yellow crystals with the composition $C_{20}H_{18}O_{11}$, mp 214°C. UV spectrum, nm: $\lambda_{max}^{C_2H_5OH}$ 260, 360.

Compound (VI): yellow crystals with the composition $C_{21}H_{20}O_{12}$, mp 237°C. UV spectrum: nm: $\lambda_{max}^{C_2H_5OH}$ 254, 359.

On acid hydrolysis, substances (V) and (VI) gave the same aglycon — quercetin (TLC, UV). L-arabinose was found in a hydrolysate of compound (V), and D-galactose in the hydrolysate of (VI) (PC, GLC). 3-O-Glycosylation followed from the results of UV spectroscopy with diagnostic additives, and the prysence of only one monosaccharide residue in each of the molecules of (V) and (VI) was confirmed by their ^{13}C NMR spectra [3, 4]. On the basis of the results obtained, (V) was identified as avicularin and (VI) as hyperin.

Using the autooxidation of methyl oleate as a model, the main phenolic components of the plant exhibited the following antioxidant activities (ratios of the incubation [induction? — Translator] periods on the addition of the substance under investigation and on the addition of Ionol in concentrations of 0.03 and 0.10 mg/ml, respectively): quercetin 0.93, 1.01; (+)-catechin 0.71, 0.76; hyperin 0.23, 0.64.

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FLAVONOIDS OF *Astragalus eupeplus*

R. K.Yasinov

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Continuing an investigation of plants of the genus *Astragalus*, (family Fabaceae) [1] we have studied the chemical composition of *Astragalus eupeplus* Barneby. The plant was collected in the flowering period in the territory of Tadzhikistan (environs of the kishlak of Novabad).

To obtain the total flavonoids, 500.0 g of the dried herb was extracted with 70% ethanol in an apparatus of the Soxhlet type. The ethanolic extracts were evaporated to an aqueous residue and this was treated with chloroform. The purified aqueous extract was reextracted exhaustively with ethyl acetate, the latter was evaporated, and the combined flavonoids were precipitated with chloroform.

Individual compounds were isolated by preparative chromatography on Filtrak FN-3 paper in the BAW (4:1:5) and 15% CH_3COOH systems and by column chromatography on polyamide. Six flavonoid compounds were isolated from *Astragalus eupeplus*.

Substance (I) – $C_{27}H_{30}O_{16}\cdot 2H_2O$, mp 188-190°C (from ethanol), $[\alpha]_D^{20}$ –12.5° (c 0.68; methanol), λ_{max} 359, 363 nm – was characterized as quercetin 3-O-rutinoside (rutin) [2].

Substance (II) – $C_{21}H_{20}O_{12}$, mp 232-235°C (from ethanol), $[\alpha]_D^{20}$ –60° (c 0.15; methanol), λ_{max} 259, 365 nm – was quercetin 3-O-β-D-galactopyranoside (hyperoside) [3].

Substance (III) – $C_{15}H_{10}O_7$, mp 312-313°C (from ethanol), λ_{max} 372, 256 nm – was characterized as quercetin [4].

Substance (IV) – $C_{15}H_9O_6$, mp 276-277°C (from ethanol), λ_{max} 370, 265 nm – was characterized as kaempferol [4].

Substance (V) – $C_{21}H_{20}O_{11}$, mp 180-181°C (from ethanol), $[\alpha]_D^{20}$ –69° (c 0.5; ethanol), λ_{max} 350, 266 nm – was kaempferol 3-glucoside (astragalin) [5].

Substance (VI) – $C_{33}H_{40}O_{19}$, mp 189-190°C, $[\alpha]_D^{20}$ –120.4° (pyridine–ethanol (1:1)), λ_{max} 350, 265 nm – was identified as robinin [6].

The structures of all the compounds isolated were confirmed by the results of elementary analysis and of UV and IR spectroscopy and by a study of the products of acid and alkaline hydrolysis, and also by a comparison with authentic samples.

This is the first time that the flavonoids of *Astragalus eupeplus* have been studied.

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