

POLYPHENOLIC COMPOUNDS OF PLANTS  
OF THE GENUS *Codonopsis*

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We have investigated the epigeal part of *Codonopsis clematidea* (Schrenk) C. B. Clarke (Western Tien-Shan, Kungei-Alatau range close to Tur-Aigyra) and *Codonopsis lanceolata* (Sieb. et Zucc.) Benth. et Hook (Maritime Territory, Sudzukhe State Reserve) coll. Wahlenbergiae Endl., family Campanulaceae [1]. The air-dry herbage collected in the period of flowering of the plants was extracted successively with petroleum ether, chloroform, methanol, ethanol, and water. The ethanolic extracts of both plants, by treatment of their concentrated residues with water and ethyl acetate, yielded the total polyphenols.

The results of chromatography on paper showed that *C. clematidea* contained eight, and *C. lanceolata* six flavonoid compounds. The use of chromogenic reagents showed that aglycones and glycosides were present [2]. The combined substances were separated on a composite polyamide sorbent (upper layer acidic, lower layer alkaline). Elution was performed with 30-70% ethanol and also with mixtures of chloroform and methanol [3]. The fractions were purified by repeated desorption with polyamides on a hydrocellulose column. Flavonoids were isolated which were identified repeated desorption their physicochemical constants and cleavage products.

1. Apigenin,  $C_{15}H_{10}O_5$ , mp 344-348°C,  $\lambda_{\text{max}}^{C_2H_5OH}$  340, 268 nm; triacetate with mp 183-186°C.
2. Luteolin,  $C_{15}H_{10}O_6$ , mp 328-330°C,  $\lambda_{\text{max}}^{C_2H_5OH}$  256, 268, 350 nm; tetraacetate with mp 224-226°C.
3. Cynaroside,  $C_{21}H_{20}O_{11} \cdot 0.5 H_2O$ , mp 256-258°C,  $[\alpha]_D^{20} -40^\circ$  (c 0.1; DMFA); acetate with mp 237-240°C.
4. Luteolin 7-rutinoside, small needles (from ethanol), mp 187-190°C,  $\lambda_{\text{max}}^{C_2H_5OH}$  350, 266, 256 nm.

Acid hydrolysis yielded D-glucose and L-rhamnose (10%  $H_2SO_4$ , 4 h), rutinose (1%  $H_2SO_4$ , 0.3 h on the water bath), and also luteolin (yield 46% [4-6]).

Substances 5 and 6 were obtained preparatively from paper and were identified by their melting points, hydrolysis products and spectroscopy as apigenin 7-glucoside and luteolin 7-galactoside [7].

Substance 7 (still under study) formed yellow microscopic crystals with mp 190-192°C (from ethanol-water, 7:3),  $R_f$  0.48, BAW (4:1:5), 0.32 (30%  $CH_3COOH$ ). In UV light it has a light blue fluorescence, which changes to intense yellow under the action of  $NH_3$  vapors. UV spectrum:  $\lambda_{\text{max}}^{C_2H_5OH}$  345, 251 nm,  $\lambda_{\text{max}}^{CH_3COONa}$  365, 265 nm ( $\Delta\lambda +20$  nm);  $\lambda_{\text{max}}^{CH_3COONa + H_3BO_3}$  373, 260 nm; ( $\Delta\lambda +28$  nm);  $\lambda_{\text{max}}^{AlCl_3}$  348 nm ( $\Delta\lambda +3$  nm);  $\lambda_{\text{max}}^{AlCl_3 + HCl}$  346 nm ( $\Delta\lambda +1$  nm);  $\lambda_{\text{max}}^{C_2H_5ONa}$  410, 263 nm ( $\Delta\lambda +65$  nm). It was hydrolyzed with 10%  $H_2SO_4$  in aqueous alcohols for 4 h to give the aglycone - crystals in the form of small needles with mp 264-268°C -, D-galactose, and L-arabinose. In UV light the aglycone formed a dark brown spot with  $R_f$  0.86 [BAW (4:1:2)], 0.16 [ $C_6H_6$ -EtOAc-AcOH (70:3:2)], and 0.60 [sec-butanol- $CH_3COOH$ - $H_2O$  (3:1:1)]. The results of UV and IR spectroscopy permit the assumption that substance 7 is a new flavonol glycoside with substituted hydroxyls at  $C_3$  and  $C_5$  of the flavone nucleus [8].

The first six substances were isolated from *C. clematidea* (Schrenk) C. B. Clarke. Substances 1, 2, and 7 were obtained from *C. lanceolata* (Sieb. et Zucc.) Benth. et Hook. A sample of luteolin 7-rutinoside for comparison was kindly given to us by Prof. W. Olechnowicz-Stepien (Wroclaw, Poland).

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