FLAVONOIDS OF Bidens tripartita. I.

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On studying the chemical composition of the herb Bidens tripartita L. (bur beggarticks), family Compositae collected in August, 1970, in the environs of Khar'kov, we detected in it no less than 10 substances of flavonoid nature by two-dimensional paper chromatography in the ethyl acetate–formic acid–water (10:2:3) system (system 1, 1st direction) and the 50% formic acid system (system 2, 2nd direction). By making use of column chromatography on a polyamide sorbent for the separation of the compounds found with aqueous ethanol and mixtures of chloroform and ethanol of various concentrations as eluents, we isolated four substances in the individual state.

Substance (1), $C_{15}H_{10}O_6$ [mp 328-330°C (acetate, 224-226°C), λ_{max} 253, 268, 350 nm] was identified as luteolin by its UV and IR spectra, the products of alkaline degradation, the results of elementary analysis, and by a mixed melting point.

Substance (2), $C_{21}H_{10}O_{11}$ [mp 257-259°C (from ethanol), $[\alpha]_D^{20}$ −41° (c 0.1; dimethylformamide)] is, according to UV spectroscopy with ionizing and complex-forming reagents, a derivative of a tetrahydroxyflavone glycosidated at C_7. It was established by acid hydrolysis that the sugar residue in it is D-glucose. Enzymatic hydrolysis showed that the glycosidic bond had the β configuration. The aglycone of this substance was identified by its melting point, elementary analysis, UV spectra, and alkaline degradation as luteolin. Thus, substance (2) is luteolin 7-O-β-D-glucopyranoside and, like substance (1), has been isolated previously [1].

Substance (3) was obtained in the form of concreted colorless needles with mp 165-167°C (from ethanol), $[\alpha]_D^{20°}$ −78° (c 0.1; methanol–dimethylformamide (1:1)]. On a chromatogram it did not fluoresce in filtered UV light, but after treatment with ammonia vapor or with a 10% aqueous methanolic solution of alkali a blood-red spot appeared with R_f 0.63 (system 1) and 0.75 (system 2). With sodium tetrahydroborate and conc. hydrochloric acid [2], it formed a greenish blue coloration, with ferric chloride a green coloration changing to yellow, and with alkali a blood-red coloration [3]. The substance is a glycoside. Its sugar moiety consists of D-glucose. On standing, a colorless solution of the glycoside acquired a reddish tinge, and on a chromatogram, in addition to the initial spot another one was found with R_f 0.36 (system 1) with a yellow-green fluorescence in UV light which disappeared when the chromatogram was treated with acid.

Substance (4) consists of crystals in the form of colorless needles associated into druses, mp 236-239°C (from ethanol), $[\alpha]_D^{20}$ −88° [c 0.05; methanol–dimethylformamide (1:1)]. Like substance (3), on a chromatogram it did not fluoresce in UV light, but after treatment with ammonia vapor or with alkali it showed up in the form of a brick-red spot with R_f 0.50 (system 1) and 0.72 (system 2). With sodium tetrahydroborate and conc. hydrochloric acid and with ferric chloride and alkalis it behaved similarly to substance (3). Its sugar moiety consists of glucose. On standing in solution, it isomerized in a similar manner to substance (3), forming a compound with R_f 0.30 (system 1), revealed on the chromatogram in the form of a yellow-green spot.

On the basis of the investigations performed, it has been established that substances (3) and (4) are flavanone glucosides.

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