THE SAPONIN OF ACANTHOPHYLLUM GYPSOPHILOIDES

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Khimiya Prirodnykh Soedinenii, Vol. 1, No. 2, p. 143, 1965

Turkestan soaproot, or gypsophilous spinepink (Acanthophyllum gypsophiloides Rg., family Caryophyllaceae), is the best known saponin-bearing plant of (Russian) Central Asia, being widely used in different branches of industry. Its roots contain about 18% of saponins of undetermined composition [1].

From a methanolic extract of the roots of the plant we have obtained an individual saponin which proved homogeneous on chromatography on paper in the butan-1-ol-acetic acid-water (4 : 1 : 5) system and in a thin fixed layer of silica gel in the same system and also in the butan-1-ol-ethanol-water (7 : 2 : 5), the butan-1-ol-ethanol-25% NH_4OH (7 : 2 : 5), and the butan-1-ol-acetic acid-water (4 : 1 : 1) systems. The mp of the saponin is 215-220° (decomp), $[\alpha]_D^{20} + 22.1 \pm 2°$ (c 3.07; water). Mp of the acetate of the saponin 154-160° (decomp), $[\alpha]_D^{20} + 6.8 \pm 1°$ (c 2.04; chloroform).

Hydrolysis of the saponin with 5 N HCl gave gypsogenin with mp 270-272°, $[\alpha]_D^{20} + 89.9 \pm 3°$ (c 1.29; ethanol). Hydrolysis with 3% H_2SO_4 led to a compound with mp 202-204°, $[\alpha]_D^{20} + 17 \pm 1.5°$ (c 1.19; ethanol); the main frequencies in the IR spectrum are: 3440 (OH); 1725 (C=O); and 1696 (C=O of a carboxyl group) cm^{-1}. This compound proved to be identical with the vacaroside (β-D-glucopyranuronoside) of gypsogenin obtained by the hydrolysis of the saponins of the seeds of Vaccaria segetalis [2]. Paper chromatography showed the presence in the hydrolyzate of D-galactose, D-glucose, D-Xylose, L-arabinose, L-rhamnose, and D-fucose.

Gyposide – the saponin of Gypsophila pacifica – the structure of which was shown by N. K. Kochetkov, A. Ya. Khorlin, and Yu. S. Ovodov [3], has the same composition. The same saponin is found in Gypsophila paniculata [4]. A direct comparison of the saponin of A. gypsophiloides with gypsoside, (a sample of the saponin was kindly provided by Kochetkov et al. [3]) by chromatography on paper and on silica gel in the systems given above, showed their identity. Consequently, the saponin of A. gypsophiloides is gypsoside. The transition from gypsoside to vacaroside simultaneously shows that the aglycone in the saponin is linked to the glucuronic acid by a β-glycosidic bond. Only the considerable discrepancy in the specific rotations of the saponins and, in particular, their acetates still remains unexplained.

According to the data of Kochetkov et al. [3], gypsoside always shows an equilibrium mixture of two forms on chromatography: an acid form and a polyacylal form. In our experiments, only one form was found which, judging from the IR spectrum (carbonyl CHO 1725 cm^{-1}), corresponds to the acid form. Moreover, in experiments with vacaroside it has been found that on passage through Al_2O_3 glucuronosides of triterpenic acids give mono- and dialuminates, while the monosubstituted salts are not decomposed by acetic acid.

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1 February 1965

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