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CARDIAC GLYCOSIDES OF *Erysimum leptophyllum*

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Erysimum leptophyllum (M.B.), fam. Brassicaceae (Cruciferae), is a little-investigated source of cardiac glycosides of the cardenolide group. We have previously reported the presence of cardenolides in this plant [1]. In the seeds, by paper chromatography, we identified erysimoside, erycordin, and canescein. We have now continued the study of the seeds of this plant grown on an experimental plot of GNTsLS [State Scientific Center for Drugs].

The ground seeds were defatted with petroleum ether, giving 23%, on the weight of the initial raw material, of a fatty oil. Then the glycosides were extracted and purified; they formed a light brown powder in a yield of 2.6% on the weight of the initial raw material.

Analysis of the total glycosides so obtained by paper chromatography showed that they included not less than 14 compounds of cardenolide nature. Preparative separation of these substances was achieved by adsorption chromatography in columns of silica gel. The eluents were chloroform and chloroform—alcohol mixtures of increasing polarity. Ten compounds were isolated in the individual crystalline state and two in the amorphous state, with slight impurities. They were provisionally designated as E.L.1, ... E.L.12. From their physicochemical properties and by direct comparison with authentic specimens the pure cardenolides that had been isolated were identified as digitoxigenin (E.L.1), strophanthidin (E.L.2), erysimin (E.L.3), helveticosol (E.L.4), glucodigifucoside (E.L.5), desglucoerycordin (E.L.6) erysimoside (E.L.7), erycordin (E.L.8), glucoerysimoside (E.L.9), and digifucocellobioside (E.L.10).

Acid and enzymatic hydrolysis of the glycosides obtained confirmed unambiguously the conclusions concerning their structures. The two glycosides, E.L.11 and E.L.12, obtained in the form of amorphous concentrates were also identified by direct comparison with authentic specimens and from their hydrolysis products as canescein and glucocanescein, respectively. For the chemical structures of all 12 compounds, see the monographs [2 and 3].

Digitoxigenin (E.L.1) was crystallized from ethyl alcohol; mp 232-236/250-256°; $[\alpha]_D^{20}$ +18.3±2° (c 0.45; chloroform); $C_{23}H_{34}O_4$.

Strophanthidin (E.L.2) was crystallized from 40% ethyl alcohol; mp 143-146°; $[\alpha]_D^{20}$ +43.7±2° (c 1.0; methanol); $C_{23}H_{32}O_6$.

Erysimin (E.L.3) was crystallized from 30% ethyl alcohol; mp 179-183°; $[\alpha]_D^{20}$ +27.3±2° (c 0.95; methanol); $C_{29}H_{42}O_9$.

Helveticosol (E.L.4) was crystallized from acetone; mp 167-171°; $[\alpha]_D^{20}$ +27.0±2° (c 0.57; methanol); $C_{29}H_{44}O_9$.

Glucodigifucoside (E.L.5) was crystallized from acetone—water; mp 194-197°; $[\alpha]_D^{20}$ -7.8±2° (c 0.42; methanol); $C_{35}H_{54}O_{13}$.

Desglucoerycordin (E.L.6) was crystallized from acetone; mp 162-164°; $[\alpha]_D^{20}$-21.0±2° (c 0.35; methanol); $C_{29}H_{44}O_9$.

Erysimoside (E.L.7) was crystallized from ethyl alcohol: mp 235-241°; $[\alpha]_D^{21}$ +19.0±2° (c 1.0; methanol); $C_{35}H_{52}O_{14}$.

Erycordin (E.L.8) was crystallized from acetone; mp 201-203°; $[\alpha]_D^{22}$ -25.1±2° (c 0.80; methanol); $C_{35}H_{54}O_{14}$.

Glucoerysimoside (E.L.9) was crystallized from isopropanol; mp 144-147°; $[\alpha]_D^{20}$ +11.5±3° (c 0.21; methanol); $C_{41}H_{62}O_{19}$.

Digifucocellobioside (E.L.10) was crystallized from acetone—water; mp 238-242°; $[\alpha]_D^{22}$ -1.3±2° (c 0.32; methanol); $C_{41}H_{64}O_8$.

The results obtained show a considerable diversity of structures: two native aglycons, four monoglycosides, four diglycosides, and two triglycosides. The structures of the *Erysimum leptophyllum* cardenolides are represented by five aglycons

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— digitoxigenin, strophanthidin, strophanthidol, cannogenol and nigriscigenin — and four monosaccharides *D*-digitoxose, *D*-gulomethylose, *D*-fucose, and *D*-glucose.

In addition, we have made a semiquantitative analysis of the total cardenolide content of the seeds of the plant under investigation and have found that it amounts to 0.85% of the weight of the air-dry raw material.

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