IRIDOIDS AND FLAVONOIDS OF *Verbascum lychnitis*

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We have investigated the leaves and inflorescences of *Verbascum lychnitis* L., family Scrophulariaceae [1], collected in July, 1974, in the environs of Pyatigorsk. The raw material (2.5 kg), flowers and leaves separately, was exhaustively extracted with 50% ethanol. After the elimination of the solvent, the combined flavonoids were extracted with ethyl acetate, and the aqueous residue containing iridoids was subjected to preliminary purification on columns of polyamide sorbent and alumina. Paper chromatography using color reactions [2-5] showed the presence of six substances assigned to the iridoids and eighteen compounds of polyphenolic nature.

By column chromatography on Kapron and preparative paper chromatography, the following compounds were isolated in the individual state:

Substance (I), $C_{15}H_{22}O_9$ – colorless needles with mp 180-181°C (petroleum ether–ethanol (1:1)), $[\alpha]_D^{21}$ – 165° (c 0.01; H_2O), $\lambda_{max}^{C_2H_5OH}$ 271 nm, 240 nm (subsidiary), melting point of the hexaacetate 127-128°C (ethyl acetate–ether (1:1)) [8]. This was identified as aucubin 10-O-β-D-glucopyranoside (aucuboside) [9, 10].

Substance (II), $C_{15}H_{22}O_{10}$, mp 202-205°C (methanol), $[\alpha]_D^{20}$ –117° (c 0.01; ethanol), $\lambda_{max}^{C_2H_5OH}$ 262 nm was characterized as catalpol.

Substance (III), $C_{16}H_{12}O_5$, mp 261-263°C, $\lambda_{max}^{C_2H_5OH}$ 335, 325, 255 nm; was identical with 5,7-dihydroxy-4'-methoxyflavone (acacetin).

Substance (IV), $C_{15}H_{10}O_5$, mp 348-350°C (ethanol), λ_{max} 335, 268 nm was identical with 4',5,7-trihydroxyflavone (apigenin).

Substance (V), $C_{15}H_{10}O_6$, mp 330-331°C (methanol), $\lambda_{max}^{C_2H_5OH}$ 350, 256 nm was 3',4',5,7-tetrahydroxyflavone (luteolin).

Substance (VI), $C_{16}H_{12}O_6$, mp 258-259°C (methanol) $\lambda_{max}^{C_2H_5OH}$ 338, 270 nm was 3',4',5-trihydroxy-7-methoxyflavone.

Substance (VII), $C_{21}H_{20}O_{11}$, mp 265-268°C (from CH_3OH), $\lambda_{max}^{C_2H_5OH}$ 352, 268 nm was identified as luteolin 7-glycoside (cynaroside).

Substance (VIII)(obtained from a chloroform extract of the flowers of *V. lychnitis*) composition $C_{20}H_{24}O_4$, mp 285-287°C (from acetic anhydride) was characterized as an **unsaturated dicarboxylic acid (crocetin).**

We also detected methylcatechol, isocatechol, catalposide, luteolin 5-glucoside, and patuletin (the last two only in the flowers). The structures of the compounds isolated were shown by chemical reactions, by comparison with authentic samples, and by structural methods of analysis.

The samples of iridoids were kindly provided by Prof. R. Hegnauer (Leyden, Holland).

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DETECTION OF n-HEPTANE IN THE ESSENTIAL OIL OF REPRESENTATIVES OF THE FAMILY Pinaceae

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There is information in the literature on the presence of n-heptane in the turpentine from some representatives of the genus *Pinus*, family Pinaceae [1, 2]. We are the first to have investigated the essential oils of representatives of all the genera of the family Pinaceae for n-heptane. It has been found that the essential oils, unlike the turpentines, of all the representatives of this family contain n-heptane.

We studied the essential oils of the needles and of one-year winter fruits and established that in representatives of the genus *Pseudotsuga* n-heptane is present in traces, in a genus *Abies* its amount is ~0.70%, in *Picea* traces, in *Larix* about 2.0%, and in *Pinus* about 1.5%.

The analysis of the essential oils was performed on a "Tsvet-3" chromatograph with a column 6 m × 3 mm containing as the stationary phase 12 wt.% of poly(ethylene adipate) on diatomite brick, 0.25-0.5 mm; the temperature of the column was 125°C and that of the evaporator 150°C; the carrier gas was helium, 35 ml/min; FID with a sensitivity in the analysis of n-heptane of 0.25×10^{-8} A, and in the analysis of monoterpenes 10^{-7} A. The rate of flow of air was 300 and of hydrogen 30 ml/min, the speed of the recorder paper 360 ml/h, and the log of the retention volume, log V_R on poly(ethylene adipate) 1.85.

The n-heptane was identified by adding the chromatographically pure substance.

The presence of the n-heptane confirms the uniform synthesis of the essential oils in all the derivatives of the family Pinaceae.

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