SHIKONIN FROM Echium lycopsis

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Continuing a study of plants of the genus Echium (family Boraginaceae) we have investigated the pigments of the rhizomes and roots of Echium lycopsis L. (syn. E. plantagineum L.) [1-2].

The plants were grown from seeds of different geographical origins and were investigated in the rosette phase and during flowering. The pigment was extracted from the comminuted air-dry rhizomes and roots with petroleum ether (fraction boiling at 45-65°C). The intensely red extracts were investigated by chromatography on paper impregnated with a 5% solution of silicone oil in cyclohexane in the ethanol–water–acetic acid (75:22.5:2.5) system. The chromatograms showed three red spots, of which the closest to the solvent front coincided in color and R_f value with shikonin, which has been isolated from Echium rubrum Jacq. [3] and Onosma visianii Clem [4].

The petroleum extracts were treated by Brockmann's method [5] (1 N solution of NaOH, saponification at room temperature for 30 min, acidification with 10% H_2SO_4 to pH 3-4).

The dark-brown crystalline precipitate was recrystallized from petroleum ether. The purified product, with the composition $C_{16}H_{16}O_5$, mp 145-146°C, gave only one spot of chromatograms, which coincided in color at R_f value with shikonin. A mixture with an authentic sample of shikonin did not lead to a change in the melting point.

The IR spectrum of the substance obtained coincided completely with that of shikonin. Solutions in benzene (0.005-0.01%) possessed dextrorotation.

Thus, the substance with the composition $C_{16}H_{16}O_5$ from the rhizomes and roots of Echium lycopsis L. is (+)-shikonin [5,8-dihydroxy-2-(1-hydroxy-4-methyl-pent-3-enyl)-1,4-naphthaquinone]. Yield 0.17-0.35% of the air-dry weight of the roots, depending on the age and, possibly, on the geographical origin of the plants.

Shikonin was not found in the leaves and stems of E. lycopsis.

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