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ALKALOIDS FROM VERBASCUM SONGORICUM

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Abstract: Three pyridine alkaloids were isolated and identified from the leaves of *Verbascum songoricum Shrenk* (Scrophulariaceae family): anabazine (1), plantagonine (2), indicaine (3) and 4 acid amides: acetamide (4), benzavide (5) cinnamic (6) and isoferulic (7). All alkaloids in this plant species were isolated for the first time. A new plant-based source of insecticidal alkaloid-*anabazine* was found.

Keywords. Scrophulariaceae, Verbascum songoricum Schrenk, pyridine alkaloids: anabazin, plantagonine, indicaine, acid amides, acetamide, benzamide, cinnamon and isoferulic acid amides.

Alkaloids of plants belonging to the genus *Verbascum* have not been studied in depth. In the scientific literature, there is information about the alkaloids of only two endemic species of this genus: *Verbascum nobile Velen* [1] and V. Phoenicum [2]. The alkaloids of the plant Verbascum songoricum Schrenk were first studied in our country.

Verbascum songoricum Schrenk is a biennial medicinal plant belonging to the Scrophulariaceae family, growing up to 2 meters in height, with leaves covered with thick hairs. This plant is widespread in the foothills of the Republic of Uzbekistan and other Central Asian republics, in places where it grows up to the middle part of the mountain region [3].

We prepared a 0.25% mixture of alkaloids by soaking Verbascum songoricum Schrenk leaves collected during flowering from the slopes of the Chimyon Mountains in the Tashkent region with a 10% ammonia solution using the usual chloroform extraction method [4].

Thus, we isolated 3 alkaloids and 4 carboxylic acid amides belonging to the pyridine group from the leaves of Verbascum songoricum Schrenk. Isoferulic acid was synthesized. The main component of the leaves of the plant is the anabasine alkaloid, which accounts for 60-65% of the mixture of alkaloids obtained. The presence of anabasine in plants belonging to the family of Cowslips was first detected by us. Thus, it was determined that the Dzungarian cowslip, which has a large natural reserve, can be a new natural source for obtaining the highly effective insecticidal alkaloid-anabasine sulfate.

5 kg of V. Songoricum Schrenk, collected during the flowering period from the Chimyon Mountains, Bostonlik district, Tashkent region, dried in a place without sunlight, crushed, soaked in 10% ammonia solution and extracted with chloroform according to the usual method.

As a result of extraction, we isolated 5.2 g of a mixture of ethereal and chloroform alkaloids (total 12.5 g or 0.25% of the dry plant mass).

We treated 5.2 g of the ethereal part of the mixture of alkaloids with petroleum ether. After removing the solvent, we obtained 1.86 g of a residue consisting mainly of one alkaloid with R_f 0.42.

Anabasine (1). Purification of 1.86 g of the residue on a silica gel column yielded 1.63 g of liquid alkaloid. $[\alpha]_D$ – 76° (c 0.3; chloroform), R_f 0.42 in the solvent system benzene-ethanol (4:1)[8].

UF – spectrum, λ_{max}, nm: 263 (lgε 3,18).
IQ – spectrum, ν_{max}, cm^{-1}: 720, 1060, 1600,2920, 2980, 3200-3400.
Mass – spectrum, m/z: 162(M^+), 161, 133,119,105,84(100%), 56, 42.

Anabasine picrate. We formed anabasine picrate crystals by adding an alcoholic solution of picric acid dropwise to an alcoholic solution of anabasine. The picrate recrystallized in water gave a liquid. b. 203 – 205°C.

Separation of a mixture of chloroform alkaloids. By treating 7.3 g of a mixture of chloroform alkaloids with boiling benzene, we isolated 0.75 g of acetamide (4). The 6.50 g residue insoluble in benzene was chromatographed on a column of silica gel. The column was washed with pure benzene, then with a mixture of benzene-ethanol (99:2), and (95:5) solvents. From the pure benzene eluate, we isolated 0.75 g of benzamide (5) crystals with a liquid. b. 128 – 130°C. From the benzene-ethanol (98:2) eluate, we isolated 0.55 g of plantagonin (2) and 0.75 g of benzamide (5); from the benzene-ethanol (98:5) eluate, we isolated 1.05 g of isoferulic acid amide (7) and 0.25 g of indicaine (3).

Plantagonin (2). Plantagonin, isolated from a benzene-ethanol (99:2) eluate and crystallized in acetone, was obtained as a liquid. mp. 218 – 220°C, [α]D + 38° (c 0.2; ethanol), R_f 0.58 in the benzene-ethanol (4:1) solvent system.

Indicaine (3). Benzene-ethonal (98:5) eluate was passed through an aluminum oxide column, and an oily base with Rf 0.45 was isolated.

Indicaine picrate. As a result of adding alcoholic solutions of indicaine and picric acid, crystals of indicaine picrate with a liquid. mp. 150 -152°C were formed.

In the identification of plantagonin and indicaine alkaloids, we used real samples of these alkaloids isolated from the plant *Pedicularis olgae Rgl* [7-8].

Conclusion

1. The alkaloids of the plant *Verbascum songoricum Schrenk*, belonging to the family Scrophulariaceae, were first studied, and 3 pyridine alkaloids - anabasine, plantagonine, indicaine, and 4 carboxylic acid amides: acetamide, benzamide, cinnamic acid, and isoferudic acid amide were isolated in pure crystalline form.

2. It was found that the main alkaloid of the aboveground part of this plant is anabasine, which accounts for 60-65% of the mixture of isolated alkaloids, and that this plant, which has a large natural reserve, can be a new natural source of highly effective insecticide - anabasine.

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