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Major Alkaloids of *Glaucium flavum* Grantz, Population Ghom

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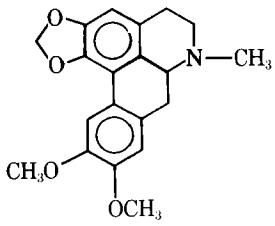
Abstract □ *Glaucium flavum* Grantz, population Ghom, contains 1.24% dicentrine, 0.89% bulbocapnine, and 0.05% salutaridine in dry aerial parts and root of the flowering plant. These alkaloids were detected for the first time in the *Glaucium* genus.

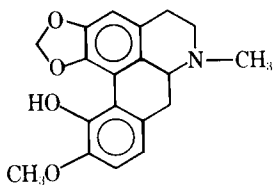
Keyphrases □ *Glaucium flavum*—dried whole plant extract, dicentrine, bulbocapnine, and salutaridine isolated and identified □ Alkaloids—dicentrine, bulbocapnine, and salutaridine isolated from *Glaucium flavum* whole plant extract □ Dicentrine—isolated from *Glaucium flavum* whole plant extract □ Bulbocapnine—isolated from *Glaucium flavum* whole plant extract □ Salutaridine—isolated from *Glaucium flavum* whole plant extract

In a continuation of chemotaxonomic studies of Iranian wild Papaveraceae (1–4), the major alkaloids of *Glaucium flavum* Grantz[1], a perennial wild plant scattered near the salt lake of Ghom, in the southern part of Tehran at about 900 m above sea level, were isolated and identified. The height of the plant is about 60 cm. The plant blooms from April until September. The four petals are yellow with orange spots on the base. The fruit consists of a long silique.

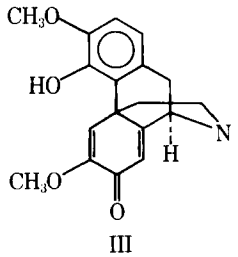
The total alkaloid content of this plant (dried aerial parts and root) was found to be 3.12%. TLC of the total alkaloids revealed that two major alkaloids existed. The dominant alkaloid was dicentrine (I) (1.24%). The second major alkaloid was bulbocapnine (II) (0.89%). A third alkaloid was separated from the total alkaloid and



I



II



III

was identified as salutaridine (III) (0.05%).

The structures were assigned on the basis of physical properties, elemental analysis, and spectral data. The isolated salutaridine was identical with an authentic sample.

A literature survey (5–7) revealed that none of these alkaloids was reported previously in the *Glaucium* genus.

Several minor alkaloids were detected in this plant. The structure elucidation of the minor alkaloids is under investigation.

[1] The plant was identified by Professor H. Golgolab, Tehran University, and Professor K. Hummel, Tubingen University. A herbarium sample was deposited in the Herbarium of the College of Pharmacy, Tehran University.

EXPERIMENTAL[2]

Plant Material—The whole aerial parts and roots were collected during May, air dried in the shade, finally dried at 60° to a constant weight, and powdered so that all material passed a mesh not greater than 0.5 mm.

Extraction—Powdered plant material, 100 g, was moistened with 100 ml of 15% ammonia and stirred with 600 ml of chloroform at room temperature for 1 hr. The extraction was repeated four times. After evaporation of the solvent, the dark oily residue was extracted with 50 ml of 5% sulfuric acid. The solution was filtered and extracted with petroleum ether (3 × 20 ml) to remove the colored material.

The aqueous layer was made alkaline with 15% ammonia and extracted with chloroform (4 × 25 ml). After evaporation of the solvent, the dry residue (3.12 g) was subjected to preparative TLC on silica gel plates, using petroleum ether–chloroform–diethylamine (70:20:10) as the eluting solvent.

Dicentrine—The first major fraction was extracted with chloroform–methanol (85:15) and recrystallized from ethanol to give 1.24 g of I, mp 166–169° [lit. (8) mp 168–169°]; molecular weight by mass spectroscopy *m/e* 339; UV: λ_{max} (CH_3OH) 303 ($E^{1\%}_{1cm}$ 494) and 280 ($E^{1\%}_{1cm}$ 400) nm; IR (KBr): 1600, 1575, 1508, 1466, 1389, 1312, 1266, 1242, 1212, 1098, 1040, 955, 865, 838, and 769 cm^{-1}; NMR ($CDCl_3$): τ 7.46 (s, 3H, NCH_3), 6.1 (s, 6H, OCH_3), 4.0 (d, 2H, CH_2), 3.47 (s, 1H, aromatic), and 2.28 (s, 1H, aromatic)[3].

Anal.—Calc. for $C_{20}H_{21}NO_4$: C, 70.78; H, 6.24; N, 4.13. Found: C, 70.69; H, 6.30; N, 4.11.

Bulbocapnine—The second major fraction was extracted in a way similar to that used for dicentrine to give 0.89 g of II, mp 199–200° [lit. (11) mp 199°]; molecular weight by mass spectroscopy *m/e* 325; UV: λ_{max} (CH_3OH) 303 ($E^{1\%}_{1cm}$ 214), 275 ($E^{1\%}_{1cm}$ 370), and 268 ($E^{1\%}_{1cm}$ 432) nm; IR (KBr): 3175, 1645, 1618, 1515, 1488, 1466, 1404, 1299, 1235, 1136, 1082, 1062, 1033, 998, 959, 934, 853, 827, 806, and 735 cm^{-1}; NMR ($CDCl_3$): τ 7.44 (s, 3H, NCH_3), 6.1 (s, 3H, OCH_3), 3.97 (d, 2H, CH_2), 3.36 (s, 1H, aromatic), and 3.16 (s, 2H, aromatic)[4].

[2] Melting points were taken on a Kofler hot-stage microscope and are uncorrected. UV spectra were obtained on a Varian Techtron 635 instrument. IR spectra were recorded on a Leitz model III spectrograph. NMR spectra were obtained on a Varian T60A instrument, using tetramethylsilane as the internal standard. Mass spectra were recorded on a Varian Mat III spectrograph.

[3] NMR data were identical with those reported in the literature (9) for dicentrine.

[4] UV and NMR data were identical with those reported in the literature (10, 11) for bulbocapnine.

Anal.—Calc. for $C_{19}H_{19}NO_4$: C, 70.78; H, 6.24; N, 4.13. Found: C, 70.69; H, 6.20; N, 4.23.

Salutaridine—The third fraction was extracted as already described and recrystallized from ether to give 0.05 g of III, mp 197–199° [lit. (4) mp 196–198°]. The isolated material was identical to an authentic sample of salutaridine according to melting-point, mixed-melting point, IR, UV, NMR, and mass spectroscopic analyses (4).

Anal.—Calc. for $C_{19}H_{21}NO_4$: C, 69.72; H, 6.42; N, 4.28. Found: C, 70.01; H, 6.43; N, 4.31.

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This paper is the fifth in a series on plant alkaloids.

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Simultaneous Quantitative GLC Determination of Chlorpheniramine Maleate and Phenylpropanolamine Hydrochloride in a Cold Tablet Preparation

R. E. MADSEN [*] and D. F. MAGIN [x]

Abstract □ A GLC method was developed for the simultaneous determinations of chlorpheniramine maleate and phenylpropanolamine hydrochloride in a cold tablet preparation containing a large amount of aspirin. The method utilizes a solid sampling device to eliminate interference from solvent, and it is rapid and precise. The total analysis time is less than 1.5 hr, thereby permitting its use for quality control purposes.

Keyphrases □ Chlorpheniramine maleate—GLC analysis, commercial cold tablets □ Phenylpropanolamine hydrochloride—GLC analysis, commercial cold tablets □ GLC—analysis, simultaneous, chlorpheniramine maleate and phenylpropanolamine hydrochloride, commercial cold tablets □ Dosage forms—commercial cold tablets, simultaneous GLC analysis of chlorpheniramine maleate and phenylpropanolamine hydrochloride

Analyses of chlorpheniramine maleate and phenylpropanolamine hydrochloride have been performed in various formulations by several means. Partition (1, 2), ion-exchange (3), liquid (4), and gas (5) chromatography are among the forms applied to these analyses. The purpose of this study was to develop a rapid, precise, and simple method for the simultaneous determination of chlorpheniramine maleate and phenylpropanolamine