

ANGOLINE AND OTHER ALKALOIDS FROM THE ROOTS OF *GLAUCIUM OXYLOBUM* BOISS. AND BUHSE

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ABSTRACT

Glaucium oxylobum Boiss & Buhse population Golestan forest was shown to contain four major alkaloids, protopine (0.2%), bulbocapnine (0.1%), corydine (0.3%), isocorydine (0.1%) and three minor alkaloids, dihydrochelerythrine, angoline and isocorytuberine. *Glaucium oxylobum* Boiss & Buhse population Roodbar was shown to contain two major alkaloids, protopine (0.39%) and dicentrinone (0.2%) and three minor alkaloids, angoline, 8-acetyl-dihydrosanguinarine and α -allocryptopine. Angoline was detected for the first time in *Glaucium*.

Key Words: Angoline, *Papaveraceae*, *Glaucium*, *Glaucium oxylobum*

INTRODUCTION

In continuation of the phytochemical studies of Iranian wild species of the *Papaveraceae* (1-2), the alkaloids of *Glaucium oxylobum* Boiss & Buhse were studied. *Glaucium oxylobum* Boiss & Buhse is a biennial plant scattered near the Golestan forest and Roodbar in the northern part of Iran. The height of the plant is 20-30 cm. The plant blooms from May to June.

The species of *Glaucium* have been used in Iranian herbal medicine as laxative, hypnotic, antidiabetic and in the treatment of dermatitis (3). The plants were identified by the department of Botany of the Faculty of Pharmacy, Tehran University of Medical Sciences.

Voucher Specimens (No. 6508 A, B) were deposited in the herbarium of the faculty.

MATERIALS AND METHODS

Melting points were taken on a Kofler hot stage apparatus and are uncorrected. The $[\alpha]_D$ was obtained using a polarimeter Perkin-Elmer Model 241. The UV spectra were obtained using a Shimadzu UV-160-A. The IR spectra were obtained using a Perkin-Elmer Model 781 or Nicolet FT-IR 550 Spectrographs (potassium bromide disks). The $^1\text{H-NMR}$ spectra were recorded on a

Bruker FT-80 or a Varián 400 unity plus spectrometers and chemical shifts (δ) are in ppm relative to the internal tetramethylsilane. The mass spectra were run on a Varian Model MAT-311 or Finigan TSQ-70 spectrometer at 70 eV.

Plant Materials: The roots of *Glaucium oxylobum* Boiss & Buhse were collected from Golestan forest, north east of Iran and from the suburb of Roodbar, north of Iran in May 1996, were air dried in the shade and then at 60 °C to a constant weight and powdered so that all materials could be passed through a mesh not larger than 0.5 mm.

Extraction procedure: To 200 g of powdered plant root three liters of methanol were added. The mixture stirred overnight at room temperature and filtered. The marc was washed with two liters of methanol. The extraction procedure was repeated three times and combined methanol extracts were evaporated under reduced pressure. To the residue 200 ml of acetic acid-water (50:50) was added and the mixture was filtered. The filtrate was extracted with petroleum ether (5×150 ml) to remove colored materials. The aqueous layer was then made alkaline with 25% ammonia and extracted with chloroform (5 × 200 ml). Evaporation of the solvent gave

acrude mixture of alkaloids (1.9 g in population Golestan forest and 2.2 g in population Roodbar).

Chromatography: The alkaloidal mixtures of *Glaucium oxylobum* Boiss & Buhse population Golestan forest (1.9g) and population Roodbar (2.2 g) were chromatographed on two columns of silica gel (150 g, 3 × 60 cm). The columns were eluted with chloroform-petroleum ether (b.p.40-60 °C) (10%; 30%; 40%; 50%; 70%; 90%; 100%) and methanol-chloroform (10%; 20%) 5L of each mixture successively. The resulting eluates were further purified using preparative TLC on silica gel with solvent systems A: ethylacetate-methanol-ammonia (85:10:5) and B: ether-acetone-diethylamine (90:5:5).

The following alkaloids were isolated from *Glaucium oxylobum* Boiss & Buhse population Golestan forest:

Dihydrochelerythrine I: This fraction was eluted with 30% chloroform-petroleum ether and was crystallized from chloroform/methanol to give dihydrochelerythrine; m.p. 163-166 °C [lit.4,m.p. 163-166 °C]. The m.p. and spectral data were identical to those already reported (4).

Angoline II: This alkaloid was eluted with 40% chloroform-petroleum ether and was crystallized from chloroform/methanol; m.p. 209 °C (CHCl₃-CH₃OH) [lit. 5, m.p. 210 °C]; IR (CHCl₃):ν 1480, 1345, 1276, 1240, 1070, 1040, 945 cm⁻¹; ¹HNMR (CDCl₃): 7.78 (d, 1H, H₆, J_{5,6}=8.5 Hz), 7.69 (1H, s, H-1), 7.63 (d, 1H, H₁₂, J_{11,12}=9 Hz), 7.46 (d, 1H, H₅, J_{5,6}=8.5 Hz), 7.12 (1H, s, H-4), 7.04 (d, 1H, H₁₁, J_{11,12}=9 Hz), 6.05 (2H, OCH₂O), 5.55 (1H, s, H-8), 3.96, 3.92 and 3.46 (3H each, 3s, 3 × OCH₃), 2.76 (3H, s, NCH₃); ms: m/z (%) 379 (M⁺, 14), 348(100), 318 (10), 290 (13).

Protopine III: Combined fractions which were eluted with 70% chloroform-petroleum ether contained mainly one alkaloid, which was purified by preparative TLC and crystallized from methanol to give protopine; m.p. 205-207 °C [lit. 7, m.p. 205-207 °C]. The m.p. and spectral data were identical to those already reported (7).

Bulbocapnine IV: This fraction was eluted with 90% chloroform-petroleum ether and was crystallized from ethanol to give bulbocapnine; m.p. 199-200 °C [lit. 4, m.p. 199-200 °C]. The m.p. and spectral data were identical to those already reported (4).

Isocorydine V and corydine VI: The combined fraction which, was eluted with 10% methanol-chloroform contained two alkaloids on TLC using solvent system A. The fastest moving fraction (R_f=0.73) was crystallized from methanol to give Isocorydine; m.p. 185 °C [lit. 4, m.p. 185 °C].

The next fraction (R_f=0.68) was crystallized from ethanol to give corydine; m.p. 147-148 °C [lit. 4, m.p. 148 °C]. The m.p. and spectral data of these alkaloids were identical to those already reported (4).

Isocorytuberine VII: This alkaloid was eluted with 20% methanol-chloroform; m.p. 219-222 °C [lit. 8, m.p. 220-221 °C]. The m.p. and spectral data were identical to those already reported (8).

The following alkaloids were isolated from *Glaucium oxylobum* Boiss & Buhse population Roodbar:

8-Acetyldihydrosanguinarine VIII: This alkaloid was eluted with 30% chloroform-petroleum ether and crystallized from chloroform-methanol; m.p. 194-195 °C [lit. 5, m.p. 194-195.5 °C]. The m.p. and spectral data were identical to those already reported (5).

Angoline II: Combined fractions which were eluted with 40% chloroform-petroleum ether contained mainly one alkaloid, which was purified by preparative TLC and crystallized from chloroform/methanol; m.p. 209 °C [lit. 5, m.p. 210 °C].

Protopine III and α-Allocryptopine IX: The combined fraction, which was eluted with 70% chloroform-petroleum ether, showed two spot on TLC using solvent system B. The fastest moving fraction (R_f=0.51) was crystallized from methanol to give protopine; m.p. 205-207 °C [lit.7, m.p. 205-207 °C]; the next fraction (R_f=0.47) was crystallized from ethanol to give α-alkaloids identical to those already reported (4,7).

Dicentrinone X: This alkaloid was eluted with 100% chloroform and crystallized from chloroform; m.p. 299° [lit. 4, m.p. 299 °C]. The spectral data of this alkaloid were identical to those already reported (4).

RESULTS AND DISCUSSION

The following alkaloids were isolated from *Glaucium oxylobum* Boiss & Buhse population Golestan forest (Table 1, Figure 1) and population Roodbar (Table 2, Figure 1) through column chromatography and preparative TLC.

The m.p. and spectral data of all alkaloids were similar to those already reported (4-8). Angoline was detected for the first time in *Glaucium*. Dihydrochelerythrine, Bulbocapnine and 8-Acetyldihydrosanguinarine were detected for the first time in *Glaucium oxylobum* Boiss & Buhse.

It is noteworthy to mention that angoline and protopine existed in *Glaucium oxylobum* Boiss & Buhse population Golestan forest and Roodbar while other alkaloids existed in only one of the species. This demonstrated that similar species from different regions may have different alkaloids.

Table 1. Chromatography results of *Glaucium oxylobum* Boiss & Buhse population Golestan forest.

Alkaloids	Solvent for column elution (%)	TLC (R _f value) ^c
Dihydrochelerythrine	30 ^a	0.83
Angoline	40 ^a	0.8
Protopine	70 ^a	0.77
Bulbocapnine	90 ^a	0.65
Isocorydine	10 ^b	0.73
Corydine	10 ^b	0.68
Isocorytuberine	20 ^b	0.46

^a chloroform-petroleum ether.

^b methanol-chloroform

^c solvent system for TLC: ethyl acetate-methanol-ammonia (85:10:5)

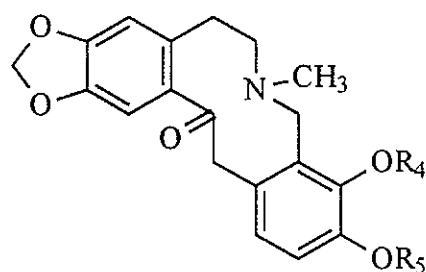
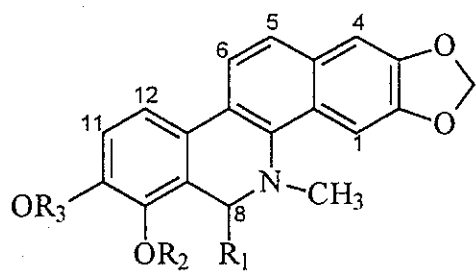
Table 2. Chromatography results of *G. oxylobum* Boiss & Buhse population Roodbar

Alkaloids	Solvent for column elution (%)	TLC (R _f value) ^c	
		A	B
8-Acetyldihydro sanguinarine	30 ^a	0.91	-
Angoline	40 ^a	0.8	-
Protopine	70 ^a	-	0.51
α-Allocryptopin	70 ^a	-	0.47
Dicentrinone	100 ^b	0.6	-

^a chloroform-petroleum ether.

^b chloroform.

^c solvent system for TLC: A, ethylacetate-methanol-ammonia(85:10:5); B, ether-acetone-Diethylamine (90:5:5).



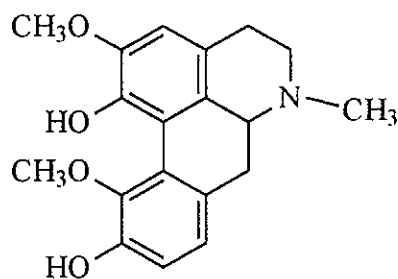
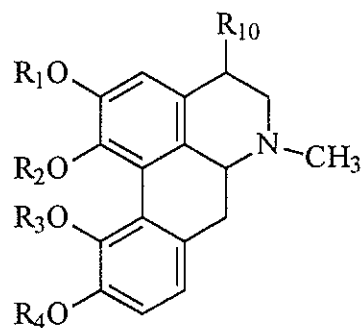
I: $R_1 = H, R_2 = R_3 = Me$

II: $R_1 = OMe, R_2 = R_3 = Me$

VIII: $R_1 = CH_3-CO-CH_2-, R_2 = R_3-CH_2-$

III: $R_4, R_5 = -CH_2-$

IX: $R_4 = R_5 = CH_3$

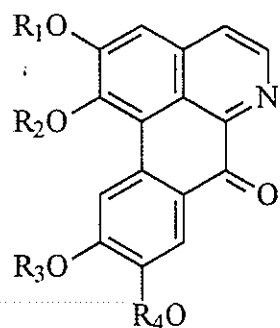


VII

IV: $R_1, R_2 = -CH_2-, R_3 = H, R_4 = CH_3$

V: $R_1 = R_2 = R_4 = CH_3, R_3 = H$

VI: $R_1 = R_3 = R_4 = CH_3, R_2 = H$



X: $R_1, R_2 = -CH_2-, R_3 = R_4 = CH_3$

Fig 1.

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