

Two New Isoquinoline Alkaloids from *Carduus crispus*

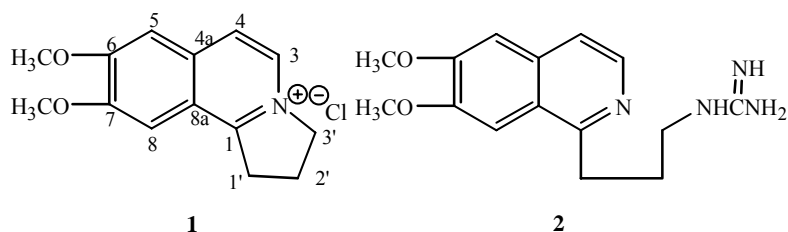
Wei Dong XIE, Zhong Jian JIA*

Department of Chemistry, National Laboratory of Applied Organic Chemistry,
Lanzhou University, Lanzhou 730000

Abstract: Two new isoquinoline alkaloids: carcrisine A and B, have been isolated from the whole plant of *Carduus crispus* L.. Their structures were elucidated by chemical and spectroscopic methods.

Keywords: *Carduus crispus*, Compositae, isoquinoline alkaloid, carcrisine A, carcrisine B.

The report of chemical constituent of *Carduus crispus* L. has not been found. The structural determination of two new isoquinoline alkaloids isolated from this plant: carcrisine A (**1**) and B (**2**), is presented in this paper.



Compound **1**, mp 206-208 °C, was isolated as white plates. It showed $UV_{\max}^{\text{CH}_3\text{OH}}$ at 237, 360 and 308 nm. Its HRESIMS spectrum exhibited a strong peak at m/z 230.1160, indicating a cation of $C_{14}H_{16}NO_2$. The result of chemical analysis revealed the presence of chloride anion. So the molecular formula is $C_{14}H_{16}ClNO_2$. The ^1H NMR spectrum demonstrated two singlets for aromatic protons at δ 6.96 and 7.05, a pair of doublets for two *ortho* coupled protons at δ 7.67 and 8.09 ($J=6.4\text{Hz}$), two singlets for aromatic methoxyl groups at δ 3.70 and 3.71. In the aliphatic part of the spectrum, there are three methylene protons at δ 2.46, 3.51 and 4.72. Its ^{13}C NMR and DEPT spectrum (**Table 1**) indicated the presence of 14 carbons: two methoxyl carbons, three methylene carbons, four methine carbons and five quaternary carbons. The signals in downfield were similar to quaternary isoquinoline¹. The ^{13}C NMR data of the methylene at δ 59.1 suggested it

* E-mail: jiazj@lzu.edu.cn

maybe linked to nitrogen atom. The ^1H - ^1H COSY spectrum indicated that **1** contained a $-\text{CH}_2-\text{CH}_2-\text{CH}_2-$ moiety. The structure was further established by the long-range correlation in the HMBC spectrum (**Table 2**). Its HMBC spectrum shows the correlations of δ 8.09 (H-3) with δ 158.1 (C-1), δ 59.1 (C-3'), δ 6.96 (H-8) with δ 158.1 (C-1), δ 3.51 (H-1') with δ 158.1 (C-1), δ 120.6 (C-8a), δ 4.72 (H-3') with δ 158.1 (C-1). On the basis of the above spectroscopic studies, the structure of compound **1** was elucidated, it was named as carcrisine A.

Table 1 ^1H NMR (400MHz), ^{13}C NMR (100MHz) and DEPT spectral data of **1** and **2** (δ ppm)*

No.	1 δ_{H}	2 δ_{H}	1 δ_{C}	2 δ_{C}
1			158.1 (C)	155.9 (C)
3	8.09 (d, $J=6.4$)	8.31 (d, $J=6.4$)	129.7 (CH)	130.7 (CH)
4	7.67 (d, $J=6.4$)	8.10 (d, $J=6.4$)	122.6 (CH)	122.1 (CH)
4a			135.1 (C)	137.0 (C)
5	7.05 (s)	7.65 (s)	106.2 (CH)	107.2 (CH)
6			156.2 (C)	157.4 (C)
7			151.8 (C)	152.9 (C)
8	6.96 (s)	7.71 (s)	105.2 (CH)	105.3 (CH)
8a			120.6 (C)	122.5 (C)
1'	3.51 (dd, $J=8.0, 7.6$)	3.44 (dd, $J=8.4, 7.2$)	31.4 (CH_2)	28.6 (CH_2)
2'	2.46 (m)	1.96 (m)	20.7 (CH_2)	29.0 (CH_2)
3'	4.72 (dd, $J=8.8, 6.8$)	3.27 (dd, $J=12.8, 6.4$)	59.1 (CH_2)	40.1 (CH_2)
-OMe	3.70, 3.71	4.01, 4.02	56.4, 56.6 (CH_3)	57.1, 57.3 (CH_3)
guanidino		7.71 (s), 6.8-7.5 (brs)		157.3 (C)

* D_2O as solvent for **1** and DMSO-d_6 as solvent for **2**.

Table 2 HMBC correlations data of **1** and **2**

1	2
H-3/C-1, C-4, C-4a, C-3'	H-3/C-1, C-4, C-4a
H-4/C-3, C-5, C-8a	H-4/C-3, C-5, C-8a
H-5/C-4, C-6, C-7, C-8a	H-5/C-4, C-6, C-7, C-8a
H-8/C-1, C-4a, C-6, C-7	H-8/C-1, C-4a, C-6, C-7
CH_3 -6/C-6	CH_3 -6/C-6
CH_3 -7/C-7	CH_3 -7/C-7
H-1'/C-1, C-8a, C-2', C-3'	H-1'/C-1, C-8a, C-2', C-3'
H-2'/C-1, C-1', C-3'	H-2'/C-1, C-1', C-3'
H-3'/C-1, C-1', C-2'	H-3'/C-1', C-2', C-Guanidino

Compound **2**, mp 214-216 °C, was isolated as a pale amorphous powder. It showed $\text{UV}_{\text{max}}^{\text{CH}_3\text{OH}}$ at 230,266,278,312 and 325 nm. Its HRESIMS spectrum showed the elemental composition to be $\text{C}_{15}\text{H}_{20}\text{N}_4\text{O}_2$ (observed $[\text{M}+1]^+$ at m/z 289.1660, calcd for 289.1659). The ^1H NMR, ^{13}C NMR and DEPT spectrum of compound **2** (**Table 1**) were very similar to that of compound **1**, except the presence of another hydrogen at δ 7.71 (the integration of this signal is two hydrogens) and a broad singlet at δ 6.8-7.5 in ^1H NMR, a quaternary carbon signal at δ 157.3 ppm in ^{13}C NMR spectrum. These observations indicated the presence of a guanidino group². HRESIMS spectrum showed a fragment ion peak m/z 230.1174 ($[\text{M}-\text{CH}_4\text{N}_3]^+$) in accordance with the cleavage of the guanidino moiety. The presence of guanidino moiety further confirmed by a positive Sakaguchi test². ^1H - ^1H

COSY spectrum exhibited the cross peaks of δ 3.44 (H-1') with δ 1.96 (H-2'), δ 1.96 (H-2') with δ 3.27 (H-3') and δ 3.27 (H-3') with δ 7.71 (a hydrogen of guanidino group), indicating the partial substructure: $-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{NH}-\text{C}(=\text{NH})-\text{NH}_2$. Compared with the HMBC spectrum (see **Table 2**) of compound **1**, there were no correlation between H-3 with C-3' and H-3' with C-1, but there is a correlation between δ 3.27 (H-3') with δ 157.3 (C-guanidino), indicating the substituent of the isoquinoline ring attached at C-1 as a chain. Analysis of other HMBC data of compound **2** further supported the proposed structure, and named as carcrisine B.

Acknowledgment

This project was supported by the NNSFC (No. 2997201).

References

1. J. M. Anita, A. R. Edmundo, A. M. R. Francisco, *Phytochemistry*, **1978**, *17* (9), 1655.
2. R. Goobes, A. Rudi, Y. Kashman, M. Ilan, Y. Loya, *Tetrahedron*, **1996**, *52* (23), 7921.

Received 29 July, 2003