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Huperzine W, a Novel 14 Carbons Lycopodium Alkaloid from *Huperzia serrata*

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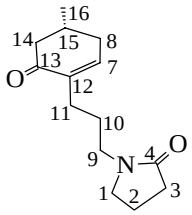
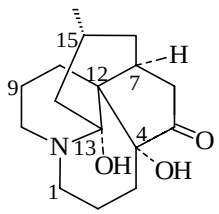
Abstract: Huperzine W, a novel 14 carbons Lycopodium alkaloid, was isolated from the whole plant of *Huperzia serrata*, and its stucture was determined by spectroscopic analysis.

Keyword: Huperzine W, *Huperzia serrata*, Lycopodium alkaloids.

Lycopodium plants have long been studied and many alkaloids have been reported thus far. Most of the compounds reported have a common formula of $C_{16}N$[1]. During the course of chemical investigation on *Huperzia serrata*, we gained huperzine W (**1**, 25 mg from 10 kg dry whole plant), a novel compound which possessed a unique structure among Lycopodium alkaloids, along with a known compound, alopecuridine (**2**)[2]. In present paper, we report on the isolation and structural elucidation of **1**.



1



2

Huperzine W (**1**), obtained as yellowish oil, showed a positive effect on Dragendorff′s reagent and was attributed to the molecular formula $C_{14}H_{21}NO_2$ from HR-EIMS analysis in which the M^+ appeared at *m/z* 235.1569 (calculated for $C_{14}H_{21}NO_2$ 235.1572). The ^{13}C NMR spectrum (**Table 1**) displayed 14 carbon signals, which were resolved into one methyl, eight methylene, two methine and three quarternary carbons through DEPT experiments. As shown in **Figure 1**, its ^1H-^1H COSY and HMQC spectra indicated the presence of three isolated segments and HMBC spectrum exhibited links among the three segments *via* a lactam group (δ_C174.99) and a conjugated lactone group (δ_C138.39, δ_C145.38, and δ_C199.65), respectively. On account of the coupling

constants of the protons of 14-CH_2 (dd, J=15.1, 11.5 and ddd, J=15.1, 3.0, 1.6), we concluded H-15 as axial orientation. Therefore, the structure of huperzine W was decided as **1**.

Figure 1 ^{1}H-^{1}H COSY and important HMBC correlations of **1**

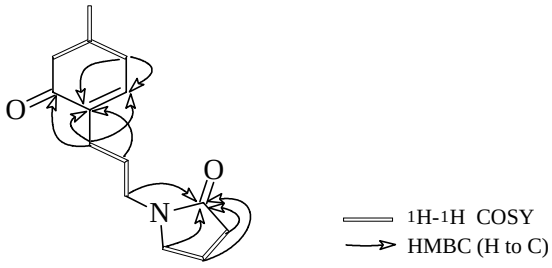


Table 1 ^{1}H and ^{13}C assignments for compound **1**[a] (δppm)

Site	δ_H (*J* in Hz)	δ_C	Site	δ_H (*J* in Hz)	δ_C
1	3.38 t (7.1) 2H	46.99 t	10	1.61 qui (7.4) 2H	26.22 t
2	2.00 qui (7.6) 2H	17.93 t	11	2.15 t (7.6) 2H	26.96 t
3	2.37 t (8.1) 2H	31.12 t	12	----	138.39 s
4	----	174.99 s	13	----	199.65 s
7	6.73 dd (5.6, 2.6)	145.38 d	14α (ax)	2.08 dd (15.1,11.5)	46.65 t
8α (ax)	2.02 [b];	34.36 t	β (eq)	2.47 ddd (15.1, 3.0, 1.6)	
β (eq)	2.40 br.d (14.9)		15 (ax)	2.16 m	30.62 d
9	3.25 t (7.2) 2H	42.04 t	16 (eq)	1.03 d (6.3)	21.13 q

a. Solution in $CDCl_3$, δ values referenced to $CHCl_3$ residue at δ_H 7.26 and δ_C 77.30, respectively.
b. Overlapping signal.

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