

Anticholinesterase Inhibitory Activity of Quaternary Alkaloids from *Tinospora crispa*

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ABSTRACT

Quaternary alkaloids are the major alkaloids isolated from *Tinospora* species. A previous study pointed to the necessary presence of quaternary nitrogens for strong acetylcholinesterase (AChE) inhibitory activity in such alkaloids. Repeated column chromatography of the vine of *Tinospora crispa* extract led to the isolation of one new protoberberine alkaloid, 4,13-dihydroxy-2,8,9-trimethoxydibenzo[a,g]quinolizinium (**1**), along with six known alkaloids—dihydrodiscretamine (**2**), columbamine (**3**), magnoflorine (**4**), *N*-formylannonaine (**5**), *N*-formylnornuciferine (**6**), and *N*-*trans*-feruloyltyramine (**7**). The seven compounds were isolated and structurally elucidated by spectroscopic analysis. Two known alkaloids, namely, dihydrodiscretamine and columbamine are reported for the first time for this plant. The compounds were tested for AChE inhibitory activity using Ellman's method. In the AChE inhibition assay, only columbamine (**3**) showed strong activity with IC₅₀ 48.1 μM. The structure–activity relationships derived from these results suggest that the quaternary nitrogen in the skeleton has some effect, but that a high degree of methoxylation is more important for acetylcholinesterase inhibition.

KEYWORDS: *Tinospora crispa*; Menispermaceae; ethnoremedy; anticholinesterase inhibitory activities; quaternary alkaloids; 4,13-dihydroxy-2,8,9-trimethoxydibenzo[a,g]quinolizinium; dihydrodiscretamine; columbamine