

ISOLATION OF A NEW C₁₉-DITERPENOID ALKALOID FROM DELPHINIUM OREOPHILUM EXHIBITING ANTIOXIDANT ACTIVITY

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INTRODUCTION

The family Ranunculaceae comprises 20 genera, among which Delphinium L. is distributed mainly in the Northern Hemisphere, with some species also occurring in the high mountains of tropical Africa. Delphinium is well known for its characteristic diterpenoid alkaloids (DAs), the most frequently identified of which are C₁₉-DAs. Over the past four decades, numerous biologically active and structurally complex DAs have been isolated from many Delphinium species [1, 2].

Materials and methods. In our previously reported studies, the essential oil, macro- and microelement composition, as well as the alkaloid profile of Delphinium oreophilum [3, 4], were investigated. As a continuation of our research on the alkaloid composition of the aerial parts of D. oreophilum, a new lycoctonine-type C₁₉-diterpenoid alkaloid, 19-oxo-14-acetylbrowniine (1), along with the known compound shavurensine (2), was isolated [5]. The structure of alkaloid 1 was elucidated using IR spectroscopy, one- and two-dimensional NMR spectroscopy (1D and 2D), and high-resolution electrospray ionization mass spectrometry (HR-ESI-MS). The novelty of the new compound was confirmed by a comprehensive search in the updated SciFinder database (a chemical structure database maintained by the American Chemical Society). The known compound 2 was identified by comparison of its spectroscopic data with those reported in the literature [5].

These results demonstrated that diterpenoid alkaloid 1 is a 19-oxo 14-acetylbrowniine. The ¹H and ¹³C NMR spectral data, as well as the HMBC correlations of compound 1. Thus, based on the above-mentioned data, the chemical structure of the new alkaloid was established as 19-oxo-14-acetylbrowniine (Fig. 1).

Results and their discussion.

19-Oxo-14-acetylbrowniine (1) is a yellowish amorphous compound with the molecular formula C₂₇H₄₁NO₉. The ESI-MS spectrum shows an ion at m/z 524.2859 [M+H]⁺ (calculated for C₂₇H₄₂NO₉, 524.2860). This compound belongs to the lycoctonine-type C₁₉-diterpenoid alkaloids, specifically to the N-C(19)=O amide subgroup.

Shavurensine (2) is an amorphous substance and belongs to the lycoctonine-type C₁₉-diterpenoid alkaloids. Its molecular formula is C₃₇H₅₂N₂O₁₁. MS (ESI⁻) m/z 699.3498 [M-H]⁻ (calculated for C₃₇H₅₁N₂O₁₁, 699.3491).

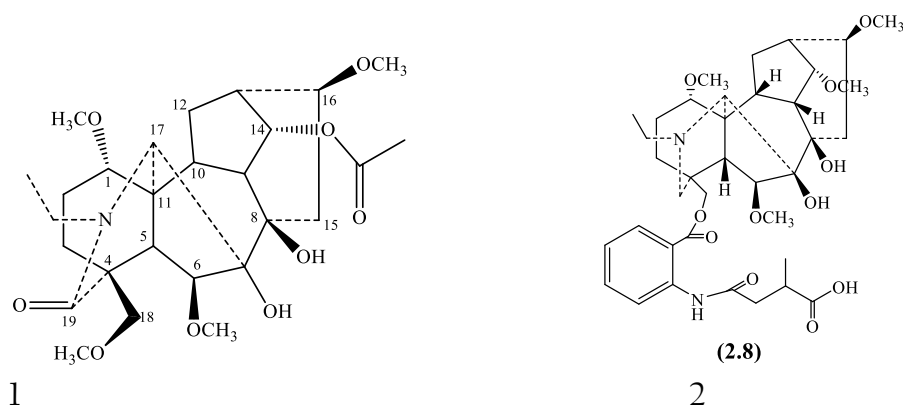


Fig. 1. Chemical structures of 19-oxo-14-acetylbrounin (1) and shavurensine (2).

Antioxidant activity. The antioxidant activity of 19-oxo-14-acetylbrounin (1) was evaluated based on its ability to scavenge DPPH radicals (2,2-diphenyl-1-picrylhydrazyl). Free radical scavenging activity was assessed using the DPPH assay. The study was conducted at a concentration of 5 mg/mL to determine the DPPH radical scavenging capacity. The results demonstrated that compound 1 exhibits high antioxidant activity (78.6%) in neutralizing DPPH free radicals.

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