

MALATYAMINE, A 4-QUINOLONE ALKALOID FROM  
*HAPLOPHYLLUM CAPPADOCICUM*

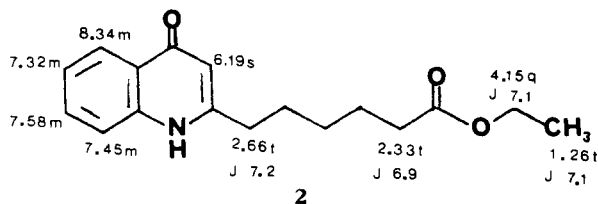
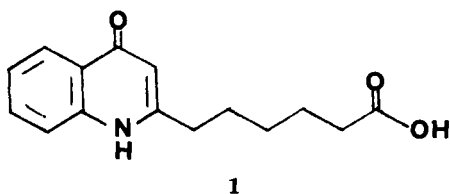
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The genus *Haplophyllum* (Rutaceae) numbers some 70 species spread out from the Mediterranean to eastern Siberia. It is an abundant source of quinoline alkaloids which may belong to a variety of different subgroups, such as the 4-hydroxy-2-quinolones, the 4-quinolones, the furoquinolines, and the dihydropyrano-4-quinolones (1). Most studies on *Haplophyllum* species so far have been carried out in the Soviet Union (1). However, because Turkey is also rich in *Haplophyllum*s, possessing no fewer than eight native species, an investigation of *Haplophyllum cappadocicum* Spach., collected near Malatya in eastern Anatolia, was initiated. This endeavor has now resulted in the isolation and structure elucidation of the 4-quinolone malatyamine (1) in the form of its ethyl ester 2.



**2.** A triplet and quartet combination at  $\delta$  1.26 and 4.15, respectively, denoted the presence of an ethyl ester. Within the downfield vinylic and aromatic range, one proton was evident as a singlet at  $\delta$  6.19, while four others were in the form of mutually split peaks in the  $\delta$  7.32 to 8.34 range. The presence of a 4-quinolone system was suggested by a one-proton multiplet at  $\delta$  8.34, whereas in the 2-quinolones this proton is found near  $\delta$  7.95 (2).

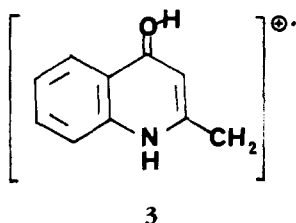
The ir spectrum,  $\nu$  max ( $\text{CHCl}_3$ ) 1635 and 1725  $\text{cm}^{-1}$ , indicated the presence of a conjugated carbonyl as well as an aliphatic ester. The pattern of the uv absorption,  $\lambda$  max (MeOH) 212, 234, 315, 327 nm ( $\log \epsilon$  4.40, 4.43, 4.01, 3.98) strongly pointed to a 4-quinolone system and excluded the alternate 2-quinolone possibility (1, 3).

The mass spectrum of malatyamine ethyl ester afforded the required balance of evidence in favor of structure 2. The molecular ion,  $m/z$  287 (13%), was accompanied by ion  $m/z$  258 (1%) due to loss of the ethyl moiety, and by ion  $m/z$  242 (18%) resulting from loss of

Malatyamine ethyl ester (2),  $\text{C}_{17}\text{H}_{21}\text{NO}_3$ , is an optically inactive base whose 200 MHz nmr spectrum ( $\text{CDCl}_3$ ) is presented around expression

ethoxyl. A series of small intensity ions,  $m/z$  214 (4%), 200 (4%), 186 (9%), and 172 (0.5%), represented cleavage of the side chain with loss of  $\text{COOCH}_2\text{CH}_3$ ,

$\text{CH}_2\text{COOCH}_2\text{CH}_3$ ,  $\text{CH}_2\text{CH}_2\text{COOCH}_2\text{CH}_3$ ,  $\text{CH}_2\text{CH}_2\text{CH}_2\text{COOCH}_2\text{CH}_3$ , and  $\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{COOCH}_2\text{CH}_3$ , respectively, from the molecular ion. The base peak,  $m/z$  159, was then due to the remaining cation **3** (4).



Ethyl esters are relatively rare among alkaloids or natural products in general, and it is thus probable that the true alkaloid is the corresponding carboxylic acid **1**, especially since EtOH was utilized in the early stages of the alkaloid extraction process. Given that the alkaloid hapovine (**4**) has been found in *Haplophyllum popovii* (5), there is a possibility that malatyamine (**1**) may be formed in vivo through oxidation of **4** or one of its close analogs. The ethyl ester **2** would then be generated during the isolation process.

Mustafa A. Önür at the northwestern end of old Malatya on July 6, 1982. The identity of the plant was confirmed by Prof. Asuman Baytop of the Faculty of Pharmacy, Istanbul University. A voucher specimen, No. 642, was deposited in the herbarium of the Department of Pharmacognosy, Ege University.

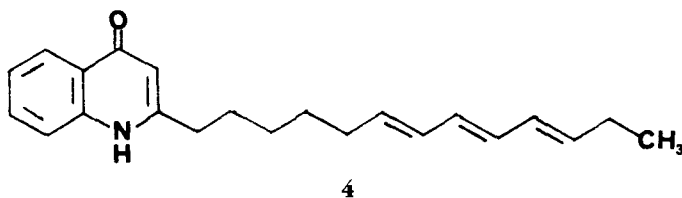
**EXTRACTION AND ISOLATION.**—The powdered, whole plant was extracted with cold EtOH. The residue following evaporation of the solvent was extracted with 5% HCl. The acidic solution was basified with  $\text{NH}_4\text{OH}$  and extracted with  $\text{CHCl}_3$ . The basic  $\text{CHCl}_3$  extracts were chromatographed on silica gel using  $\text{CHCl}_3$  and increasing percentages of MeOH. Final purification was by tlc on silica gel using the system  $\text{C}_6\text{H}_6$ -EtOAc-MeOH (2:2:1). In this fashion, 17 mg of amorphous malatyamine were obtained.

#### ACKNOWLEDGMENTS

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#### LITERATURE CITED

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#### EXPERIMENTAL

**PLANT COLLECTION.**—*H. cappadocicum* (6.9 kg, dry) was gathered with the assistance of Mr.

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