which were further confirmed by superimposable IR with the respective authentic samples. Based on the above spectral characteristics and reactions structure **1a** may be assigned to marsupol.

In the mass spectrum of marsupol, the prominent ions m/z 123 (100%) and m/z 137 (30%), may be considered to have been formed by the symmetrical cleavage (shown by the dotted lines in structure **1a**) of the molecule. EIMS (probe) 70 eV m/z (rel. int.); 260 $[M]^+$ (85), 242 $[M-H_2O]^+$ (5), 137 $[M-123]^+$ (30), 123 $[M-137]^+$ (100), 119 $[M-123-H_2O]^+$ (30), 91 $[M-123-H_2O-CO]^+$ (50). The position (δ 2.6) and the broadening of the methyl signal in the NMR spectrum of marsupol may be attributed to the deshielding [6] and the varying eclipsing [4] effects, respectively, caused by the β-OH group.

The structure of marsupol has been confirmed by the synthesis of its dimethyl ether (**1b**) as follows. The required α-methylstilbene (**3**), mp 123° (lit. [7] mp 124°), was prepared by the Grignard reaction between p-methoxybenzyl magnesium chloride and p-methoxacetophenone; and the subsequent dehydration of the resulting alcohol (**2**), mp 60° (lit. [7] mp 62°), using ethanolic HCl. **3** on reaction with aq. potassium permanganate under phase transfer catalysis conditions [8] using triethylbenzylammonium chloride (TEBAC) as a catalyst, yielded a racemic glycol which was found to be identical with the dimethyl ether of marsupol (**1b**) (mp, and superimposable IR).

The structure of marsupol may be considered as closely related to angolensin [9], an isoflavonoid isolated from *Pterocarpus angolensis*.

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FURTHER FUROQUINOLONE ALKALOIDS FROM *RUTA CHALEPENSIS*[*]

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Key Word Index—*Ruta chalepensis*; Rutaceae; furoquinolone alkaloids; chalepin.

Abstract—Two new alkaloids, 9-ethyl-8-methoxy-furo[2,3]quinol-4-one and 9-ethyl-7,8-dimethoxy-furo-[2,3]quinol-4-one, and the known furocoumarin chalepin were isolated from *Ruta chalepensis*.

In a recent publication [1], we described the isolation and structure elucidation of taifine (**1**), the first representative of a N-ethylfuroquinolone alkaloid. We wish now to report on two further members of this class, viz. isotaifine (**2**) and 8-methoxytaifine (**3**) also isolated from *Ruta chalepensis* L.

As shown by exact mass measurements, **2** has an elemental composition of $C_{14}H_{13}NO_3$ and is, therefore, an isomer of **1**. Its mass and UV spectra are very similar to those of **1**. The NMR spectrum (see Table 1) differs from that of **1**; the pattern is typical

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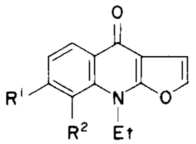
[*] Part 14 in the series "Constituents of Local Plants". For Part 13, see ref. [1].

Table 1. NMR spectra of **1**–**3** (δ ppm, J Hz, multiplicity). The integrals correspond to the number of protons in the structural elements (solvent $CDCl_3$)

Position	1	2	3
C-2/C-3	7.00; 7.65	7.02; 7.67	6.98; 7.60
	3,*d*	3,*d*	3,*d*
C-5	8.00	7.93	8.10
	9,*d*	8 and 2, *dd*	10,*d*
C-6	7.38	7.40	7.27
	9 and 3, *dd*	8 and 8, *t*	10,*d*
C-7	—	7,09	—
		8 and 2, *dd*	
C-8	7.60	—	—
	3,*d*		
OCH_3	3.97,*s*	4.10,*s*	4.03 and 4,13,*s*
$N\underline{CH_2}CH_3$	4.77	4.75	4.75
	7,*q*	7,*q*	7,*q*
$NCH_2\underline{CH_3}$	1.63	1.60	1.57
	7,*t*	7,*t*	7,*t*

for three neighbouring aromatic protons, one of which (C-5), as in the case of **1**, is shifted downfield due to the deshielding effect of the carbonyl group at C-4. As observed for **1** upon addition of CF_3COOH, the ethyl-CH_2 signal is shifted downfield by $\delta 0.25$, because of the protonation of the nitrogen, while the CH_3-signal remains unchanged. Hence, the ethyl group has to be bound to the nitrogen.



1 R¹=OMe, R²=H
2 R¹=H, R²=OMe
3 R¹=R²=OMe

Compound **3** has an elemental composition of $C_{15}H_{15}NO_4$. The UV spectrum resembles those of **1** and **2** while in the mass spectrum the fragments in the upper mass region are shifted by 30 μm which suggests the presence of a further methoxyl group in **3**. This is confirmed (see Table 1) by the presence of two 3H-singlets the positions of which correspond to those in **1** and **2**, and the change of the pattern of the hydrogens in the benzene ring which now corresponds to two adjacent protons, one of them at C-5 (*vide supra*).

From the non-alkaloid fraction, a furocoumarin was isolated which, by comparison with the published[2] data, is identical with chalepin.

EXPERIMENTAL

Plant material. The plant was identified by Prof. L. Boulos, National Research Centre, Cairo, and a voucher is deposited in the Herbarium of King Abdulaziz University, Jeddah.

Isolation. From the chromatography on neutral alumina as described in ref. [2] following the elution of taifine (**1**) further fractions were obtained: (4) C_6H_6; 5 mg of a compound mp 102° which could not yet be identified. (5) C_6H_6 with 0.5% CH_3OH; 30 mg **2**; and subsequently 10 mg **3**. From the aq. residue obtained after treatment of the crude extract with KOH and extraction with ether[1] after acidification with HCl and extraction with $CHCl_3$, chalepin was obtained (mp 117–120°, MW: 314, 1536; calcd 314, 1518 for $C_{19}H_{22}O_4$; other data as in ref. [2]).

Isotaifine (**2**). Needles, mp (from petrol ether) 123–125°. IR (KBr): 1620, 1580, 1550, 1515, 1415, 1375, 1355, 1330, 1305, 1270, 1160, 1100, 1025, 995, 750 cm^{-1}. UV (CH_3OH): 243 (4,26), 257 (sh), 267 (sh), 300 (sh), 310 (3,32), 324 (3,31), 338 (3,26) nm (log ϵ). The compound shows violet fluorescence. NMR: see Table 1. MW (mass spectroscopically) 243.0892 (calcd 243.0895 for $C_{14}H_{13}NO_3$).

8-*Methoxytaifine* (**3**). Needles, mp (from petrol ether) 122–123°. IR (KBr): 1620, 1580, 1555, 1500, 1490, 1420, 1380, 1355, 1295, 1270, 1245, 1115, 1095, 1060, 1020, 990, 740 cm^{-1}. UV (CH_3OH): 248 (4,25), 318 (3,36), 325 (sh), 340 (sh). The compound shows blue fluorescence. NMR: see Table 1. MW (mass spectroscopically) 273.0987 (calc 273.1001 for $C_{15}H_{15}NO_4$).

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