currently with the quantitative analysis of the behavioral somato-motor and viscero-motor manifestations, can provide a complete picture of the interacting waking and sleep processes, in animals and man. This concept of an integral waking-sleep function and the use of highly elaborated techniques will allow a functional understanding of wakefulness and of the corresponding complementary sleep function.

All co-authors of this survey deserve full credit and gratitude for having summarized the chief aspects of sleep and expressed their personal conception.

SPECIALIA

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Structure of effusol: A new phenolic constituent from *Juncus effusus*

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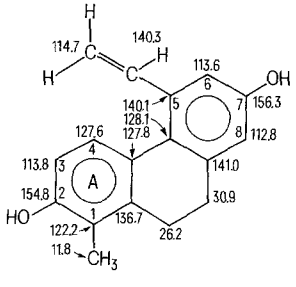
Summary. Effusol, a relatively rare alkylated phenolic 9,10-dihydrophenanthrene has been isolated from *Juncus effusus*. Its structure has been established mainly on the basis of ^1H and ^{13}C-NMR spectra.

Juncus effusus (NO Juncaceae), popularly known as 'common rush', grows abundantly in moist depressions, edges of ponds and lakes and fresh water marshes in Southeastern United States. Our interest in the chemistry of Juncaceae[2,3] led us to investigate this fresh water rush. The $CHCl_3$ soluble part of the 95% EtOH extract of the aerial parts of *J. effusus*, upon column chromatography, PTLC, and crystallization yielded, inter alia, effusol, $C_{17}H_{16}O_2$ (M+252), m.p. 177–178 °C and juncusol[3]. In this communication, we wish to report the structure of effusol as **1**, based on chemical and spectral (^1H and ^{13}C-NMR) evidence. Effusol is the first example of a phenolic 9,10-dihydrophenanthrene isolated from a fresh water *Juncus* having both alkyl and vinyl groups in the skeleton. The alkylated 9,10-dihydrophenanthrenes which are present in both *J. effusus*, a fresh water species and *J. roemerianus*, a salt water species[3], seem to be characteristic of the genus.

Effusol, upon acetylation with Ac^2O and Py afforded a diacetate, $C_{21}H_{24}O_4$(M+336) suggesting that both the O atmos are present as OH functions in the parent compound. The IR-spectrum of effusol in nujol showed bands at 3380 (OH), 1600 (Ar) and 910 (monosubstituted vinyl) cm^{-1}. A 4H singlet at 2.66 ppm in the 60 MHz ^1H-NMR spectrum of effusol in $(CD_3)_2CO$ is typical of 9,10-dihydrophenanthrenes[5]. The ^1H-NMR spectrum also showed a peak at 2.23 (*s*, 3H, Ar–CH_3), typical ABX type of signals for a vinyl group at 5.20 (1H, J_{BX}= 11Hz; J_{AB}=2Hz), 5.63 (1H, J_{AX}= 17Hz; J_{AB}=2Hz) and 6.95 (1H, J_{AX}=17Hz; J_{BX}=11Hz; J_{AB}=2Hz) ortho aromatic proton doublets at 6.73 (1H, J=8Hz) and 7.23 (1H, J=8Hz) and 2 meta aromatic proton doublets at 6.76 (1H, J=1.5Hz) and 6.93 (1H, J=1.5Hz) ppm. The lowfield ortho coupled proton at 7.23 ppm indicates that the C-3 and C-4 in effusol are unsubstituted. The ^1H-NMR chemical shifts strongly suggests that ring A of effusol (**1**) is identically substituted as the corresponding ring in juncusol (**2**). The presence of only 1 aromatic proton at a field lower than 7.00 ppm indicates that C-5 in effusol is substituted[2]. Therefore, in view of the presence of 2 meta related protons in the ^1H-NMR spectrum, C-7 in effusol must also be substituted. Effusol gives a negative Gibbs test[5] showing that the positions para to OH groups are substituted. Therefore, 1 of the OH groups must be placed at C-7 and consequently, the vinyl group is present at C-5. The co-ocurrence of effusol and juncusol indicates structure **1** for the former which is supported by the ^{13}C-NMR spectrum.

The ^{13}C-NMR spectrum of effusol showed 17 signals corresponding to 17 carbons in the molecule. The chemical shifts in ppm, indicated in **1**, were assigned on the basis of the direct analysis of the non-protonated centers, partially and completely decoupled spectra and by comparison with the spectrum of juncusol[6]. The ^{13}C-NMR spectrum of effusol is very similar to that of juncusol with the following significant difference: In place of a singlet at 120.6 ppm (C-3) and a quartet at 13.2 ppm (C-3-CH_3) in the spectrum of juncusol, as indicated in **2**, there is an additional doublet at 113.6 ppm (C-6) in the spectrum of effusol.

Therefore, effusol should be represented by **1**.



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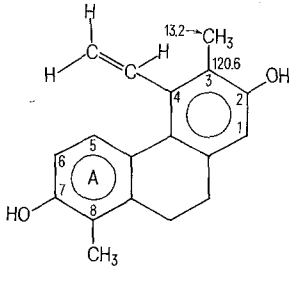

2

1 The author thanks Dr H. P. Benecke, for the ^1H-NMR, Dr R. H. Bailey for the MS and Miss Patricia Cofer for the collection of the plant material. Thanks are also due to Prof. R. A. Abramovitch, for a generous supply of chemicals and his interest. The use of the facilities of this Department is also gratefully acknowledged.

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Milanjilactones A and B, two novel cytotoxic norditerpene dilactones from *Podocarpus milanjianus* Rendle[1]

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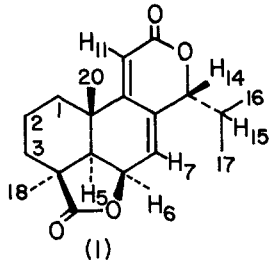
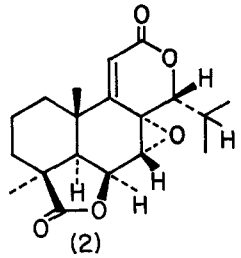
Summary. Two new cytotoxic norditerpene dilactones, milanjilactones A (**3**) and B (**4**) have been isolated from the stem bark of *Podocarpus milanjianus* Rendle and characterized, on the basis of spectroscopic evidence, as 1,2-dehydro derivatives of nagilactones F (**1**) and G (**2**).

The genus *Podocarpus* (Taxaceae) is a rich source of terpenic substances from which a number of norditerpene dilactones have been isolated[2]. Earlier we reported that the stem bark of *Podocarpus milanjianus* Rendle, from Kenya, contained 2 norditerpene dilactones (nagilactones F and G, **1** and **2**) which were cytotoxic to 9 KB nasopharynx carcinoma cells[3,4]. Similar activity directed fractionation has now led to the isolation of 2 additional cytotoxic components, milanjilactones A (**3**) ($ED_{50} = 4 \times 10^{\circ}$ μg/ml) and B (**4**) ($ED_{50} = 1 \times 10^{-1}$ μg/ml). The active mixture of **3** and **4** ($ED_{50} = 1 \times 10^{-2}$ μg/ml) was separated from extracts[3] containing **1** and **2** by C-18 reversed-phase silica gel column chromatography. Multiple development preparative-layer chromatography on silica gel then resolved **3** and **4**.

Milanjilactone A (**3**), m.p. 237–238 °C, $C_{19}H_{22}O_5$ (M^+ m/e 330.144), showed UV absorption which supported the


(1)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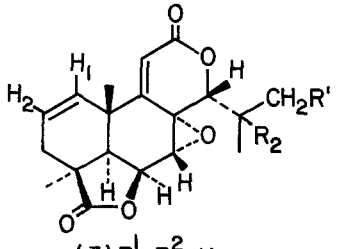
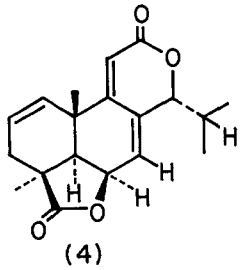

(3) $R^1 = R^2 = H$
(6) $R^1 = SOCH_3$, $R_2 = OH$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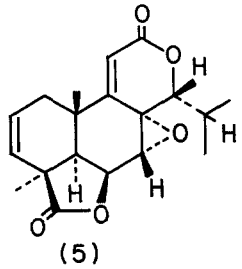
(5)

The PMR-spectra[a] of nagilactone F (**1**), nagilactone G (**2**), milanjilactone A (**3**), milanjilactone B (**4**), podolide[b] (**5**) and podolactone D[c] (**6**)

Compound	H-1	H-2	H-3	H-5	H-6	H-7	H-11	H-14	H-16	H-17	H-18	H-20
1	–	–	–	1.59d (4.7)	5.08td (4.7, 4.7, 1.7)	6.19dt (4.7, 1.7, 1.7)	5.76d (1.7)	4.88q (1.7, 1.7, 1.7)	0.98d[d] (6.8)	1.20d[d] (6.8)	1.34s	1.16s
2	–	–	–	1.85d (4.4)	4.94dd (5.5, 1.5)	3.95d (1.5)	5.96s	4.43d (3.7)	1.10d[d] (8.0)	1.08d[d] (8.0)	1.29s	1.16s
3	(5.80–5.92)		–	2.01d (5)	4.95dd (5, 1.4)	3.96d (1.4)	5.97s	4.34d (3.8)	1.08d[d] (6.7)	1.10d[d] (6.7)	1.35s	1.24s
4[e]	(5.80–6.05m)		–	2.10d (4.7)	5.06td (4.7, 4.7, 1.7)	6.19dt (4.7, 1.7, 1.7)	5.75d (1.7)	4.88q (1.7, 1.7, 1.7)	0.98d[d] (6.8)	1.20d[d] (6.8)	1.38s	1.24s
5	–	(5.80–6.03)		1.85d (5.5)	4.94dd (5.5, 1.5)	3.90d (1.5)	5.97s	4.40d (3.7)	1.06d[d] (7.0)	0.92d[d] (7.0)	1.20s	1.03s
6	5.88d (10.5)	5.75m (10.5, 3.5, < 1)	–	2.05d (5.0)	5.06dd (5.0, 1.3)	5.25d (1.3)	6.19s	4.89s	–	–	1.29s	1.15s

[a] PMR-spectra for compounds **1–5** were obtained in $CDCl_3$ on a Varian FT-80 Spectrometer. Shifts are reported in ppm (δ); J = Hz; d = doublet of doublets, dt = doublet of triplets, td = triplet of doublets, q = quartet, m = multiplet. [b] Authentic sample. [c] Reported[5] in pyridine-d_5. [d] May be reversed. [e] Chemical shifts in pyridine-d_5: H-16 and H-17, 1.01d (6.7), 1.15d (6.7); H-18, 1.38s; H-20, 1.17s.