

# (+)-*N*-2'-NORADIANTIFOLINE: A NEW APORPHINE-BENZYLISOQUINOLINE ALKALOID

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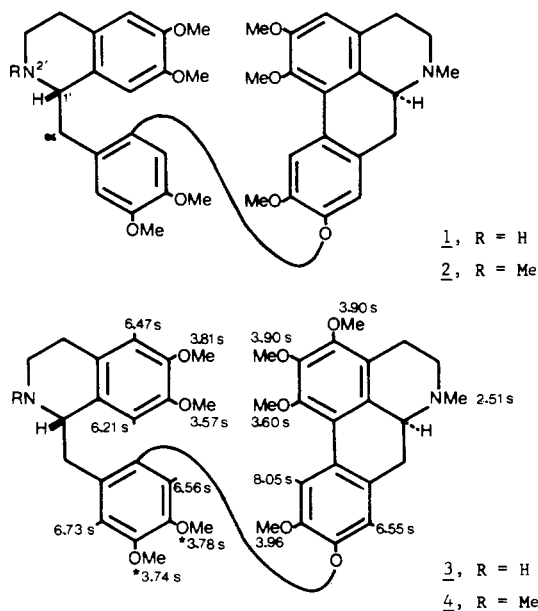
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In 1963, Kupchan reported the isolation of (+)-thalicarpine (2), the first known aporphine-benzylisoquinoline dimer, from *Thalictrum dasycarpum* Fisch. and Lall (Ranunculaceae) (1). Since that time, a sufficient number of other naturally occurring aporphine-benzylisoquinolines have been isolated and characterized to allow for their classification as derivatives of either (+)-reticuline or (±)-*N*-methylcoclaurine (2). Thus, (+)-thalicarpine (2) is formed from two reticuline units, while (+)-pakistanine is derived from two *N*-methylcoclau-

rines. It is also worth noting that both classes of aporphine-benzylisoquinolines dimers, i.e. those of the (+)-thalicarpine and those of the (+)-pakistanine type, are generally obtained as tertiary amines in which each of the two nitrogen atoms bears a methyl substituent. The lone exception has been (+)-northalicarpine (1) found in *T. revolutum* DC. (3).

Presently, we have found that *T. minus* L. var. *microphyllum* Boiss., collected in June 1979 in the village of Mahmudiye, near Eskişehir, Turkey, produces another nor dimer, (+)-2'-



NMR chemical shift values are for compound 3

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noradiantifoline (3), C<sub>41</sub>H<sub>48</sub>O<sub>9</sub>N<sub>2</sub>, obtained as 5 mg of amorphous material from 4 kg of the powdered roots and rhizomes of the plant. The spectral profile for (+)-*N*-2'-noradiantifoline

(3) bears a significant resemblance to that for the known (+)-adiantifoline (4), (4) provision being made for the presence of only one *N*-methyl group in 3.

The 200 MHz (FT) nmr spectrum of (+)-*N*-2'-noradiantifoline in deuteriochloroform has been summarized in expression 3. This spectrum includes eight methoxy singlets, two of them superimposed at  $\delta$  3.90, only one *N*-methyl singlet, and six aromatic protons, all as singlets. Analysis of this spectrum immediately suggested that we had on hand an aporphine-benzylisoquinoline dimer of the (+)-thalicarpine type, in which H-11 appears characteristically downfield at  $\delta$  8.05.

That the *N*-methyl group was present on the aporphine rather than the tetrahydrobenzylisoquinoline residue was indicated by the mass spectrum (table 1) which shows base peak *m/z* 192 due to the dihydroisoquinolinium cation formed from cleavage of the C-1' to C- $\alpha$  bond.

The uv spectrum of 3 (table 1), with maxima at 280, 302 sh, and 314 nm, is markedly similar to that reported for adiantifoline (4). (4) Additionally, the absolute configuration of (+)-*N*-2'-noradiantifoline is indicated by the general similarity of its circular dichroism (CD) curve with that of 4 (table 1). (4) Both alkaloids are dextrorotatory, with 3 exhibiting  $[\alpha]^{25D} + 39^\circ$  (*c* 0.082 MeOH).

A common feature of (+)-northali-

TABLE 1. Spectral and chromatographic data for (+)-*N*-2'-noradiantifoline.

UV:	$\lambda$ max (MeOH) 208, 220 sh, 280, 296 sh, 302 sh and 314 nm ( $\log \epsilon$ 4.77, 4.69, 4.31, 4.24, 4.17 and 4.10).
MS:	712 ( $M^+$ , 0.3), 710 (0.8), 681 (0.6), 520 (6), 519 (7), 490 (3), 369 (1), 192 (100) and 177 (8).
CD:	MeOH $\Delta\epsilon$ (nm) -5.3(304), -4.0(287), -5.9(272), +38(246) and -16(213).
Column Chromatography:	On silica gel, using the system chloroform-methanol-ammonium hydroxide (90:10:1).
TLC $R_f$ :	0.15 in acetonitrile-benzene-ethyl acetate-methanol-ammonium hydroxide (40:30:20:5:5) on Merck Silica Gel 60 glass plates.

carpine (1) and (+)-2'-*N*-noradiantifoline (3) is that their secondary nitrogen atom is part of the tetrahydrobenzylisoquinoline rather than the aporphine segment.

#### ACKNOWLEDGMENTS

This research was supported by grant CA-11450 from the National Cancer Institute, National Institutes of Health, USDHHS. H.G. is the recipient of a NATO fellowship.

Received 14 January 1982

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