ALKALOIDS OF ANNONACEAE. XXXV. ALKALOIDS OF DESMOS TIEBAGHIENSIS[1]

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ABSTRACT.—Thirteen isoquinoline-type alkaloids belonging to five different skeletons have been isolated from *Desmos tiebaghiensis*. They were identified as the tetrahydroprotoberberines (−)-discretamine (**1a**) and (−)-stepholidine (**1b**); the proaporphine (−)-glaziovine (**2**); the aporphines (−)-laurotetanine (**3a**), (+)-*N*-methyllaurotetanine (**3b**), (+)-boldine (**3c**), (+)-isoboldine (**3d**), (−)-anonaine (**4a**), (−)-asimilobine (**4b**) and the 7-hydroxy aporphine (−)-norushinsunine (**5**); the morphinandienone (−)-pallidine (**6a**) and the benzyltetrahydroisoquinolines (+)-reticuline (**7a**) and (+)-*N*-methylcoclaurine (**7b**). This is the first report of a morphinandienone alkaloid in an Annonaceous plant; the biogenetic significance is discussed briefly.

The genus *Desmos* (Annonaceae, subfamily Annonoideae, tribe of *Unoneae*) incorporates about thirty species native to Indomalaya, Australia and the western Pacific. Two species are indigenous to New-Caledonia, *Desmos tiebaghiensis* (Däniker) R. E. Fr. and *D. lecardii* (Guillaum.) R.E. Fr., formerly known, respectively, as *Unona tiebaghiensis* Däniker and *U. lecardii* Guillaum. (1).

Phytochemical examination of the genus *Desmos* has received so far very little attention (2). Several C-methyl C-formyl flavonoids and dibenzoylmethanes were isolated from *Desmos lawii* (ex *Unona lawii*) (3,4). Although alkaloids have been found to occur in many genera of the family Annonaceae (2), only a positive Mayer's test was reported for *Desmos elegans* (5).

Within the framework of a continuing study of the alkaloids of the Annonaceae, we have now investigated those of the New Caledonian *Desmos tiebaghiensis*, a shrubby tree with alternate fragrant (when crumpled) leaves, caulinary flowers and fruits. The species is rather rare and grows on peridotitic soils. Nothing is known about any use in folk medicine.

RESULTS AND DISCUSSION

The aerial parts of *Desmos tiebaghiensis* were extensively extracted for their total alkaloid content (0.12%) by the usual procedure. The following alkaloids were isolated:

a). Tetrahydroprotoberberines: (−)-discretamine (**1a**) (15% of the crude alkaloids) and (−)-stepholidine (**1b**) (18%).

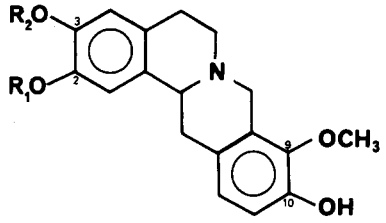
b). Proaporphine: (−)-glaziovine (**2**) (0.5%).

c). Aporphines: (−)-laurotetanine (**3a**) (4%), (+)-*N*-methyl laurotetanine (**3b**) (9%), (+)-boldine (**3c**) (2%), (+)-isoboldine (**3d**) (5%), (−)-anonaine (**4a**) (1.5%), (−)-asimilobine (**4b**) (26%) and (−)-norushinsunine (=michelalbine) (**5**) (1%).

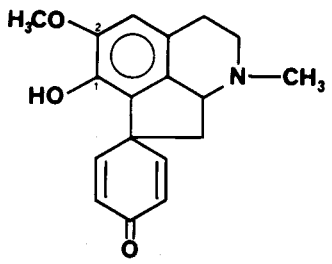
d). Morphinandienone: (−)-pallidine (**6a**) (0.6%).

e). Benzyltetrahydroisoquinolines: (+)-reticuline (**7a**) (9%) and (+)-*N*-methylcoclaurine (**7b**) (3%).

[1]For part XXXIV in this series, see: R. Hocquemiller, S. Rasamizafy et A. Cavé, *Tetrahedron*, **38**, 911 (1982). This paper is also part LXXX in the series "Plants of New Caledonia"; for part LXXIX, see: M. J. Jacquier, J. Vercauteren, G. Massiot, L. Le Men-Olivier, T. Sévenet et J. Pusset, *Phytochemistry*, in press.



1a: $R_1=CH_3$; $R_2=H$
1b: $R_1=H$; $R_2=CH_3$



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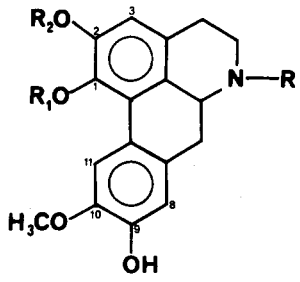
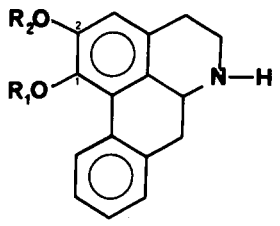
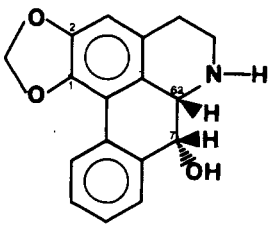


3a: $R_1=R_2=CH_3$; R=H
3b: $R=R_1=R_2=CH_3$
3c: $R=R_1=CH_3$; $R_2=H$
3d: $R=R_2=CH_3$; $R_1=H$



4a: $R_1-R_2=-CH_2-$
4b: $R_1=CH_3$; $R_2=H$



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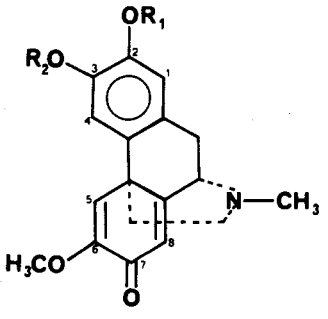
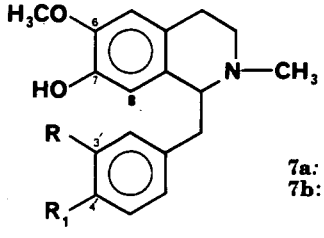


6a: $R_1=H$; $R_2=CH_3$
6b: $R_1=CH_3$; $R_2=H$



7a: R=OH; $R_1=OCH_3$
7b: R=H; $R_1=OH$

The tetrahydroprotoberberine alkaloids discretamine (**1a**) and stepholidine (**1b**) were readily identified by their spectral data and by co-chromatography with reference samples. The basic skeleton for each of the two compounds was determined by the characteristic uv spectra and confirmed by the ^{1}Hnmr and ms data (6,7). The nmr spectra showed that the two compounds are tetrasubstituted and two of these substituents are OCH_3 groups. The presence of a bathochromic

shift in the uv spectra on addition of alkali suggested that the other two substituents are phenolic OH groups. This result was confirmed by the mass spectra of the two compounds which indicated that one pair of OH and OCH_3 substituents is positioned at each of rings A and D (8). The presence in the nmr spectra of the two compounds of half AB quartet at 4.21–4.25 ppm proved that the substitution pattern of ring D is at position 9 and 10 (8).

The actual distribution of the OH and OCH_3 substituents over the two sites in ring D was determined by making use of the fact that 9-methoxy-tetrahydroprotoberberines exhibit pronounced $(M-OCH_3)^+$ ions in their mass spectra (>10% of molecular ion) compared to those carrying methoxyl substituents at C–10 (<3% of the molecular ion) (9). The two products were found to exhibit relatively intense $(M-OCH_3)^+$ ions (11.8 and 12.9% respectively of the molecular ion), thus proving that the oxygenation pattern of ring D for the two products is 9-methoxy-10-hydroxy. On the basis of the different behaviour of the two products on tlc and the small difference in the chemical shifts of their nmr spectra, it was thought that they should have different substitution pattern at ring A. Comparison of the spectral data of the two products with those found in the literature (10) and direct comparison with authentic samples confirmed that the first product (**1a**) is discretamine (3,10-dihydroxy-2,9-dimethoxy tetrahydroprotoberberine) and the second (**1b**) is stepholidine (2,10-dihydroxy-3,9-dimethoxy tetrahydroprotoberberine).

The proaporphine alkaloid glaziovine (**2**) was isolated in a very small amount and in an impure form. The proaporphine skeleton was suggested by its ir (1665 cm^{-1}) and uv (λ max 230 and 277 nm) spectra (6). The structure was supported by the information derived from its nmr and mass spectra. In addition to the *N*-methyl, *O*-methyl and the single aromatic proton of the isoquinoline moiety, the nmr spectrum showed two groups of signals attributed to the olefinic protons of the dienone moiety, between 6.15–6.52 ppm (α and α') and 6.88–7.21 ppm (β and β'). The fragmentations recorded in the mass spectrum of (**2**) ($M^{+\cdot}$ 297 and *m/z* at M–1, M–29, M–43, M–58, M–74, M–86) were also in full agreement with those found in the literature for glaziovine (6,10). The identification was confirmed by comparative tlc with reference glaziovine.

The seven aporphine alkaloids were mainly identified by their characteristic uv spectra, ms fragmentation pattern, ^1H nmr spectra and by comparison of their spectral data with those found in the literature (11) and also by co-chromatography with authentic samples. The presence of one or more phenolic groups was detected by a bathochromic shift in the uv spectrum with alkali. Uv maxima near 220, 282, 303–310 in the spectra of laurotetanine (**3a**), *N*-methyllaurotetanine (**3b**), boldine (**3c**) and isoboldine (**3d**), indicated that these bases are 1,2,9,10-substituted aporphines (6). A pronounced bathochromic and hyperchromic effect between 315–330 nm in the uv spectra of two of the above four aporphines (**3a**, **3b**) suggested that they are monophenolic aporphines with the OH group at position 9 (12). The substitution pattern was also confirmed by the relative intensities of the ms peaks, especially those of $M^{+\cdot}$ and the base peak (M–1). The nmr spectra of these aporphine alkaloids were also informative (6,11). For the first four compounds (**3a**, **3b**, **3c**, **3d**), a low field one proton signal at position 11 of the aporphine system is present at δ 7.83–8.06. A three protons signal for a shielded methoxy group at position 1 appears at δ 3.60–3.70 in the spectra of (**3a**, **3b**, **3c**), while a six protons signal for two relatively deshielded methoxy groups at positions 2 and 10 is present at δ 3.88–3.91 in the spectra of (**3a**, **3b**, **3d**).

The other three aporphine alkaloids, anonaine (**4a**), which was identified in its *N*-acetyl form, asimilobine (**4b**), and michelalbine (or norushinsunine) (**5**), show an unsubstituted ring D and no *N*-methyl group on their nmr spectra. The characteristic AB quartet of a methylenedioxy group at C–1,2 was observed at δ 5.83–6.10 ($J=2$ Hz) in the spectra of (**4a**) and (**5**). Furthermore, the nmr

spectrum of michelalbine (**5**) presented, in addition to the usual signals for an aporphinic structure, two doublets (one proton each) at δ 3.90 and 4.51 ($J=3$ Hz) assigned respectively to the proton at 6a and that at position 7 where there is also an alcoholic OH group. The lower value of the coupling constant indicates that the two protons are in a cis relationship to one another. The presence of a bathochromic shift upon addition of alkali in the uv spectrum of asimilobine (**4b**), and the presence in its nmr spectrum of one methoxyl group as a singlet at δ 3.58 was indicative of a 1,2-dioxygenated pattern with the phenolic group and the methoxyl, respectively, at positions 2 and 1 (6,11).

The morphinandienone alkaloid pallidine (**6a**) was isolated in a very small amount. The ms fragmentation pattern showed ion $M^{+\cdot}$ at 327 and fragments corresponding to M–1, M–15, M–28, M–43 and M–59, which were in full agreement with a morphinandienone type structure (13). The uv spectrum exhibited a bathochromic shift upon addition of alkali, indicating that (**6a**) is a phenolic compound. The presence in the ir spectrum of absorptions at 1666, 1643 and 1622 cm^{-1} denotes the presence of a conjugated enone system which was also consistent with a morphinandienone type structure. The nmr spectrum showed the presence of two methoxyl groups, an *N*-methyl and four single aromatic protons; therefore, positions 1 and 4 are unsubstituted (14,15). The above spectral data were consistent with the alkaloid being either pallidine (**6a**) or flavinantine (**6b**). Comparison of our spectral data with those found in the literature for **6a** and **6b** (14,16,17,18) showed that our product was more closely related to pallidine, although there is no distinct difference between those of pallidine and flavinantine. Direct comparison by co-chromatography with flavinantine and pallidine confirmed that the *Desmos* alkaloid is pallidine.

The two benzyltetrahydroisoquinoline alkaloids were identified mainly by their characteristic ms fragmentation pattern (6), nmr spectra (19) and by co-chromatography with reference alkaloids. The first benzyltetrahydroisoquinoline, reticuline (**7a**), was readily identified by comparison of its spectral data with those found in the literature (10). Its behaviour on tlc with an authentic sample confirmed its identity. The other alkaloid, *N*-methylcoclaurine (**7b**), was characterized by its nmr spectrum (A_2 B_2 system for H–2', 3', 5', 6'; and singlet signals for H–5 and H–8) and mass spectrum (base peak at m/z 192 indicating the loss of a hydroxybenzyl fragment from the molecular ion) as a 1-benzyl-1,2,3,4-tetrahydroisoquinoline having a hydroxy group at the 4' position and a methoxyl and a hydroxyl groups at positions 6 and 7. The determination of the substitution pattern in the aromatic ring of the isoquinoline moiety for both reticuline and *N*-methylcoclaurine was made by use of the observations of Tomita et al. (19): for our two products, the chemical shift of the proton at C–8 was deshielded while those of the *N*-methyl were shielded, which proved that the substitution pattern for the two compounds at ring A is 6-methoxy-7-hydroxy. The identification of compound **7b** as *N*-methylcoclaurine was confirmed by co-chromatography with reference alkaloid.

In summary, the isolation of the above thirteen alkaloids from *Desmos tiebaghiensis* constitutes the first report of any identified alkaloid from this genus. Moreover, the occurrence of the morphinandienone pallidine is of interest. Morphinandienone alkaloids are widely distributed in plants of the Lauraceae, Menispermaceae and Papaveraceae families, but they had not been reported earlier in the Annonaceae. In fact, at about the same time in our laboratory, three Annonaceous plants were found to contain morphinandienones; in addition to pallidine in *Desmos tiebaghiensis*, sebiferine was isolated from *Duguetia obovata* (20) and from *Polyalthia beccarii* (21). Pallidine and sebiferine are, therefore, the only two examples of morphinandienones isolated so far from the Annonaceae.

The fact that the thirteen alkaloids from *Desmos tiebaghiensis* belong to five different isoquinoline-type skeletons (i.e. benzylisoquinoline, tetrahydroproto-

berberine, morphinandienone, proaporphine, aporphine) has also to be noted, since these groups are biogenetically closely related. Particularly, the morphinandienones, which are biosynthesized from benzylisoquinolines, could play a role as *in vivo* precursors of aporphine alkaloids (7, 17). Since morphinandienones are biosynthetic intermediates in the formation of morphinanes, the question arises whether morphinanes may also occur in Annonaceous plants. Examination of the alkaloidal content of this Annonaceae outlines the perfect homogeneity within the Magnoliales order.

EXPERIMENTAL[2]

PLANT MATERIAL.—The aerial parts of *Desmos tiebaghiensis* (Däniker) R.E. Fr. (Annonaceae) were collected by one of the authors (J.P.) in New Caledonia (col de Mô, Basse Tontouta), during October, 1979, when the plant began flowering. Voucher specimens are under reference Sévenet-Pusset 1569 (Herbarium ORSTOM, Nouméa).

EXTRACTION AND ISOLATION OF THE ALKALOIDS.—The aerial parts (twigs and leaves) were air dried and milled to a coarse powder. The ground plant material (13.0 kg) was moistened with a 20% Na_2CO_3 solution and extracted exhaustively for its alkaloid content by percolation with chloroform. The percolate was concentrated and then extracted with 1 N H_2SO_4. The aqueous layer was basified to pH 9.5 by a saturated solution of sodium carbonate and extrated by chloroform until a negative Mayer reaction was obtained. The chloroform extracts, when pooled, washed with water until neutral, dried (Na_2SO_4), filtered, and evaporated *in vacuo*, yielded the total bases (15.5 g).

A portion of the crude alkaloid mixture (9.7 g) was subjected to flash chromatography (22) over silica gel 60; chloroform-methanol (95:5, then 90:10) and, finally, pure methanol were used. The 209 fractions (25 ml each) were collected and grouped into 8 fractions after monitoring by tlc. The first fraction (1.2 g) was found devoid of alkaloids and discarded. The other fractions were treated separately to isolate and purify their alkaloid content by extensive column chromatography and preparative tlc.

It has to be noted that during the separation of the hereunder 13 alkaloids, they gave characteristic tlc colors when they were run in alkaline plates and revealed with iodine vapor; this was of help in their identification. The different colors obtained are listed below:

Alkaloid	Color
Discretamine (**1a**)	violet
Stepholidine (**1b**)	brownish yellow
Glaziovine (**2**)	brown
Laurotetanine (**3a**)	pale brown
N-methyllaurotetanine (**3b**)	dark brown
Boldine (**3c**)	dark violet
Isoboldine (**3d**)	brick red
Anonaine (**4a**)	green
N-acetylanonaine	yellow
Asimilobine (**4b**)	dark brown
Norushinsunine (**5**)	yellow
Pallidine (**6a**)	yellowish brown
Reticuline (**7a**)	pale brown
N-methylcoclaurine (**7b**)	brownish green

DISCRETAMINE (**1a**).—Discretamine represented 15% of the crude bases. It was isolated as white crystals from chloroform; $C_{19}H_{21}NO_4$; mp 209–211°; $[\alpha]_D$ −313° (EtOH, c=0,5); uv λmax: 222 (log ε 4.26) and 286 (3.80); after addition of NaOH, λmax 238, 260 and 310 nm; ^{1}H nmr: 3.81 and 3.88 (3 H each, s, 2 OCH_3), 6.68 (1 H, s, ArH); 6.73 (1 H, s, ArH) and 6.80 (2 H, s, 2 ArH); ms, *m/z* (%): 327 (94), 326 (44), 296 (11), 178 (100), 176 (29), 150 (30), 149 (15), 135 (28).

STEPHOLIDINE (**1b**).—Stepholidine was 18% of the crude bases. It was isolated as white crystals from chloroform; $C_{19}H_{21}NO_4$; mp 165–167°; $[\alpha]_D$ −267° (EtOH, c=0.5); uv λmax: 222 (log ε 3.96) and 286 (3.47); after addition of NaOH, λmax 250 and 303 nm; ^{1}H nmr: 3.80 and 3.85

[2]Melting points were taken on a Buchi-Tottoli apparatus and are uncorrected. The optical rotations were measured with a Schmidt-Haensch polarimeter, type Polartronic I. The uv spectra were obtained in EtOH or MeOH on a Unicam SP 1800; KBr pellets were used in determining the ir spectra on a Perkin-Elmer 257 spectrophotometer. The nmr spectra were recorded in deuterated chloroform on a Varian T 60 spectrometer, with tetramethylsilane as internal standard; chemical shifts are reported in δ (ppm) units. The mass spectra were run on a VG Micromass 70 spectrometer. Kieselgel 60 G Merck with NaOH 5% solution was used for tlc, with solvent system chloroform-methanol (95:5 or 92:8).

(3 H each, s, 2 OCH_3), 6.53 (1 H, s, ArH), 6.71 (3 H, s, 3 ArH); ms, *m/z* (%): 327 (67), 326 (40), 296 (9), 178 (100), 176 (22), 150 (26), 149 (13), 135 (24).

GLAZIOVINE (**2**).—Glaziovine represented 0.5% of the crude bases. It was isolated in an impure form: uv λmax: 230 and 277 nm; ir: νmax 1665 cm^{-1}; ^1H nmr: 2.35 (3 H, s, NCH_3), 3.77 (3 H, s, OCH_3), 6.55 (1 H, s, H-3), 6.15–6.52 (2 H, m, vinyl protons at $\alpha\,\alpha'$ positions), 6.88–7.21 (2 H, m, vinyl protons at $\beta\,\beta'$ positions); ms: 297 ($M^{+\cdot}$), 296, 281, 280 (M–17), 268 (M–29), 254 (M–43), 239 (M–58), 223 (M–74), 211 (M–86), 195 (M–102).

LAUROTETANINE (**3a**).—Laurotetanine constituted 4% of the crude bases. It was obtained in an amorphous form; $C_{19}H_{21}NO_4$; uv λmax: 281 (4.03) and 302 (3.98); after addition of NaOH, bathochromic and hyperchromic shift at 338 nm; ^1H nmr: 3.70 (3 H, s, 1–OCH_3), 3.91 (6 H, s, 2- and 10–OCH_3), 6.58 (1 H, s, H-3), 6.75 (1 H, s, H-8), 8.05 (1 H, s, H-11); ms: *m/z* (%): 327 (72), 326 (100), 312 (21), 310 (7), 298 (6), 296 (16).

N-METHYLLAUROTETANINE (**3b**).—*N*-Methyllaurotetanine constituted 9% of the crude bases. It was isolated in an amorphous form; $C_{20}H_{23}NO_4$; uv λmax: 220 (4.53), 284 (4.13) and 305 (4.11); after addition of NaOH, bathochromic and hyperchromic shift at 330 nm; ^1H nmr: 2.53 (3 H, s, NCH_3), 3.65 (3 H, s, 1–OCH_3), 3.89 (6 H, s, 2- and 10–OCH_3), 6.57 (1 H, s, H-3), 6.80 (1 H, s, H-8), 8.06 (1 H, s, H-11); ms: *m/z* (%): 341 (80), 340 (100), 326 (40), 324 (13), 310 (22), 298 (21), 283 (16).

BOLDINE (**3c**).—Boldine was 2% of the crude bases. It crystallized from chloroform; $C_{19}H_{21}NO_4$; mp 162–164°; uv λmax: 217 (4.47), 283 (4.05), 304 (4.05), after addition of NaOH λmax at 320 nm; ^1H nmr: 2.55 (3 H, s, NCH_3), 3.60 (3 H, s, 1–OCH_3), 3.90 (3 H, s, 10–OCH_3), 6.56 (1 H, s, H-3), 6.76 (1 H, s, H-8), 7.83 (1 H, s, H-11); ms: *m/z* (%): 327 (93), 326 (100), 312 (64), 296 (28), 284 (21), 269 (24), 253 (10).

ISOBOLDINE (**3d**).—Isoboldine constituted 5% of the crude bases. It was isolated as reddish white crystals from chloroform; $C_{19}H_{21}NO_4$; mp 119–121°; $[\alpha]_D$+54° (MeOH), c=0.7; uv λmax: 220 (4.42), 272 (sh, 3.90), 280 (3.99); 305 (4.04), after addition of NaOH λmax at 350 nm; ^1H nmr: 2.55 (3 H, s, NCH_3), 3.88 (6 H, s, 2- and 10–OCH_3), 6.46 (1 H, s, H-3), 6.70 (1 H, s, H-8), 7.93 (1 H, s, H-11); ms: *m/z* (%): 327 (87), 326 (100), 312 (38), 284 (39), 253 (27).

ANONAINE (**4a**).—Anonaine represented 1.5% of the crude bases. It was isolated in an amorphous form. The *N*-acetyl derivative was prepared and crystallized from acetone, $C_{19}H_{17}NO_3$, mp 225–227°, $[\alpha]_D$−350° ($CHCl_3$, c=0.5). *N*-acetylanonaine showed the following spectral data: uv λmax: 215 (4.56), 230 (sh, 4.33), 274 (4.24), 290 (sh, 3.96), 316 (3.75); ^1H nmr: 2.17 (3 H, s, $NCOCH_3$), 5.98 and 6.10 (1 H each, 2d, *J*=1.5 Hz, OCH_2O), 6.60 (1 H, s, H-3), 7.20–7.40 (3 H, m, H-8, H-9, H-10), 8.13 (1 H, m, H-11); ms: *m/z* (%): 307 (48), 264 (12), 251 (23), 248 (20), 236 (43), 235 (100).

ASIMILOBINE (**4b**).—Asimilobine constituted 26% of the crude bases (main alkaloid). It crystallized easily from acetone; $C_{17}H_{17}NO_2$; mp 177–178°; $[\alpha]_D$−200° ($CHCl_3$, c=0.6); uv λmax: 226 (sh, 4.29), 272 (4.22), 308 (3.54); ^1H nmr: 3.58 (3 H, s, 1–OCH_3), 6.61 (1 H, s, H-3), 7.15–7.28 (3 H, m, H-8, H-9, H-10), 8.18 (1 H, m, H-11); ms: *m/z* (%): 267 (65), 266 (100), 252 (22), 236 (20), 207 (21).

MICHELALBINE (**5**).—Michelalbine was 1% of the crude bases. It was obtained as an amorphous product; $C_{17}H_{15}NO_3$; uv λmax 232 (sh, 3.97), 248 (3.90), 273 (4.13), 281 (sh, 4.01), 320 (3.43); ^1H nmr: 3.90 and 4.51 (1 H each, 2d, *J*=3 Hz, H-6a and H-7); 5.83 and 5.98 (1 H each, 2 d, *J*=1.5 Hz, OCH_2O), 7.15–7.31 (3 H, m, H-8, H-9, H-10), 8.01 (1 H, m, H-11); ms: *m/z* (%): 281 (100), 280 (93), 263 (22), 262 (27), 252 (38), 251 (30).

PALLIDINE (**6a**).—Pallidine constituted 0.6% of the crude bases. It was obtained as an amorphous product; $C_{19}H_{21}NO_4$; $[\alpha]_D$−38° (MeOH, c=0,6); ir: νmax 1664, 1643 and 1622 cm^{-1}; uv λmax 239 (3.91) and 286 (3.58), after addition of NaOH λmax at 250 and 293 nm; ^1H nmr: 2.46 (3 H, s, NCH_3), 3.81 and 3.91 (3 H each, 2 s, 2 OCH_3), 6.30 (1 H, s, H-8), 6.76 (1 H, s, H-5), 6.35 and 6.66 (1 H each, 2s, H-1 and H-4); ms: *m/z* (%): 327 (100), 312 (34), 299 (29), 284 (52), 268 (25), 242 (23).

RETICULINE (**7a**).—Reticuline represented 9% of the crude bases. It was isolated in an amorphous form; $C_{19}H_{23}NO_4$; $[\alpha]_D$+105° (MeOH, c=0.7); uv λmax 222 (sh, 4.16) and 284 (3.80), after addition of NaOH λmax 246 and 299 nm; ^1H nmr: 2.45 (3 H, s, NCH_3), 3.83 (6 H, s, 2 OCH_3), 6.33 (1 H, s, H-8), 6.50 (1 H, s, H-5), 6.63 (1 H, s, H-6'), 6.58–6.70 (2 H, m, H-2', H-3'); ms: *m/z* (%): 192 (100), 177 (20), 137 (9).

N-METHYLCOCLAURINE (**7b**).—*N*-Methylcoclaurine constituted 3% of the crude bases. It was obtained as an amorphous product; $C_{18}H_{21}NO_3$; uv λmax 227 (sh, 4.14) and 286 (3.68), after addition of NaOH λmax 252 and 308 nm; ^1H nmr: 2.43 (3H, s, NCH_3), 3.81 (3H, s, 6–OCH_3), 6.28 (1 H, s, H-8); 6.46 (1 H, s, H-5), 6.47 and 6.83 (2 H each, A_2 B_2 doublets, *J*=8.5 Hz, H-2', H-3', H-5', H-6'); ms: *m/z* (%): 192 (100), 178 (44), 177 (23), 107 (7), 91 (6).

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Note added in proof: Pallidine has just been isolated from the Annonaceous *Guatteria melosma* (D. J. Slatkin, private communication; J. Nat. Prod., in press).