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THE EMETINE ALKALOIDS[1]

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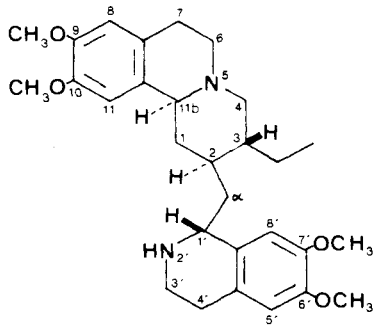
The present listing includes emetine and emetine analogs, all of which incorporate as part of their structures a top isoquinoline portion originating from tyrosine and a lower portion of monoterpenoidal origin. Tubulosine and related bases are also included; these consist of a top isoquinoline portion, a middle portion of monoterpenoidal origin, and a lower pendant indole system originating from tryptophan.

The last alkaloid to be mentioned is the recently characterized bharatamine (**30**), which occupies an anomalous position. Biogenetically, it is related to emetine (**1**) because its upper moiety emanates from tyrosine and its lower half is very probably of terpenoidal derivation. From a purely structural aspect, however, this compound may be considered a protoberberine, even though it lacks the two oxygenated substituents always present in ring D of the protoberberines. Because of this ambiguity, bharatamine is included in this listing and will also be mentioned in a forthcoming review of the protoberberines.

Emetine and emetine analogs occur with certainty in only three plant families: Alangiaceae, Icacinaceae, and Rubiaceae. *Psychotria ipecacuanha* Stokes (Rubiaceae) is one of the main sources for emetine and its analogs. The name of this plant is synonymous with *Cephaelis ipecacuanha* Rich. and also with *Uragoga ipecacuanha* Baill. Similarly, *Psychotria granadensis* Benth. ex Oerst is synonymous with *Uragoga granadensis*.

Uv data are in nm, and log ϵ values are quoted between parentheses. Ir frequencies are in cm^{-1}. Nmr spectra are at low resolution in $CDCl_3$, unless stated otherwise. Chemical shifts are in δ units. Whenever two or more references are cited, it is usually the first reference that is actually quoted in the tables.

The numbering system for emetine (**1**) is as given below. Several reviews or listings of the emetine alkaloids have appeared in the literature (1a-o).



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[1]This paper is dedicated to Prof. Jack L. Beal in appreciation of his many years of unstinting service as editor of this journal.

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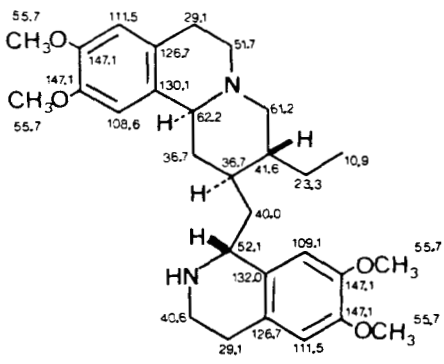
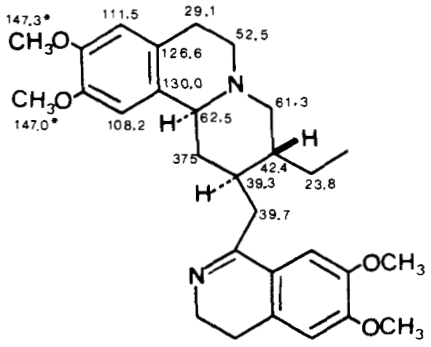
1. EMETINE



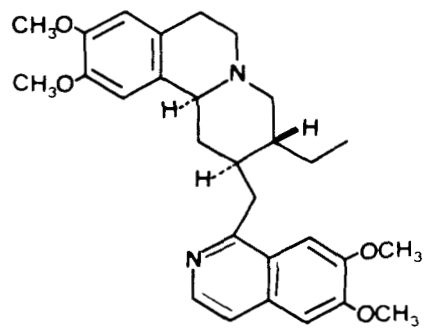
$C_{29}H_{40}N_2O_4$: 480.2988
MP: 74° (1e), 104-105° (1a)
[α]D: −46.55° ($CHCl_3$) (2)
−22° (EtOH) (1a)
−50° ($CHCl_3$) (1a)
−26° ($CHCl_3$) (1b)
ORD: (HBr) (3, no data)
CD: (EtOH; 0.1 N HCl) (4, figures)
UV: ($CHCl_3$) 285, 290 sh (5)
(HCl) 230 (4.23), 283 (3.87) (1g)
(1o, spectrum No. 330)
IR: (film) 3310, 1610 (6)
(Oxalate) (7, figure)
(1o, spectrum No. 330)
MS: 480 (M^+), 288, 272, 258, 246, 206, 192 (8, 9, 10, 1b)
CMR: (11, 1f)
SOURCES:
ALANGIACEAE: *Alangium lamarckii* Thwaites (1b, 1g, 1i, 9)
RUBIACEAE: *Cephaelis acuminata* Karsten (biosynthesis) (15), *Psychotria granadensis* Benth. ex Oerst and *P. ipecacuanha* Stokes (1a, 1b, 1e, 1i, 12, 13, 14, 6)

2. *O*-METHYLPSYCHOTRINE



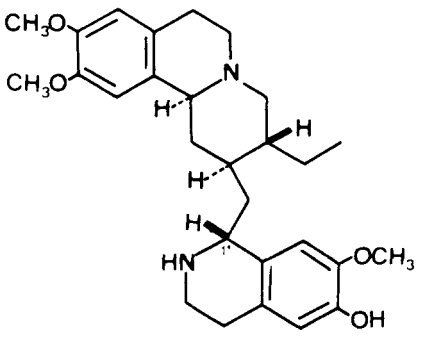
$C_{29}H_{38}N_2O_4$: 478.2831
MP: 123-124° (1e, 6, 12)
(Oxalate) 161° (dec.) (16, 17)
[α]D: 43.2° (EtOH) (1e)
ORD: (Oxalate) (c 2, H_2O)
$[\alpha]^{20}D$ +37.3°, $[\alpha]^{20}_{578}$ +39.7°, $[\alpha]^{20}_{546}$+47.6°, $[\alpha]^{20}_{436}$+130.1°, $[\alpha]^{20}_{365}$+130.1° (17)
UV: (0.1 N HCl) 241.5 (4.26), 288.5 (3.86), 305 (3.92), 354 (3.91) (18), (EtOH) (19)
(1o, spectrum No. 178)
IR: (Nujol) 1618, 1610, 1576 (6)
(1o, spectrum No. 178)
MS: 478 (M^+), 463, 449, 286, 274, 273, 272, 258, 244 (base), 239, 230, 206, 205, 192, 191, 190 (9, 10, 1g)
PMR: 0.98 (C-Me), 3.75, 3.82, 3.89, 3.92 (O-Me), 6.49, 6.54, 6.73, 7.03 (arom. H) (18)
CMR: (18)
SOURCES:
RUBIACEAE: *Psychotria granadensis* Benth. ex Oerst (1g, 6), *P. ipecacuanha* Stokes (1a)

3. EMETAMINE



$C_{29}H_{36}N_2O_4$: 476.2675
MP: 155-156° (1a)
(Oxalate) 170-171° (dec.) (6)
[α]D: 13.6° (EtOh) (1e)
(Oxalate) −5.5° (H_2O) (6)
UV: (EtOH) 236 (4.85), 283 (3.86) (1g)
MS: 476 (M^+), 461, 447, 286, 274, 273, 272 (base), 258, 244, 242, 238, 228, 204, 203, 192, 191, 190 (9)
SOURCES:
RUBIACEAE: *Psychotria granadensis* Benth. ex Oerst and *P. ipecacuanha* Stokes (1a, 1g, 6, 20)

4. CEPHAELINE

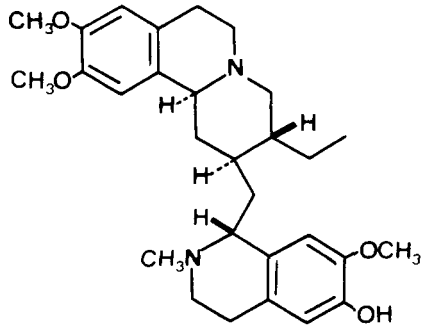


$C_{28}H_{38}N_2O_4$: 466.2831
MP: 115-116° (1e)
104-107° (1b, 2)
(HCl) 254-257° (22)
$[\alpha]^{25}D$: −43.4° ($CHCl_3$) (1e, 21)
UV: (19, figure)
MS: 466 (M^+), 451, 437, 288, 274, 273, 272, 246, 244, 206, 205, 192, 178 (base) (9, 1b)
SOURCES:
ALANGIACEAE: *Alangium lamarckii* Thwaites (9, 21, 22, 1b), *A. salviifolium* (23, 24)
RUBIACEAE: *Cephaelis acuminata* Karsten (biosynthesis) (15), *Psychotria granadensis* Benth. ex Oerst and P. ipecacuanha Stokes (1a, 1e, 13, 14)

5. ISOCEPHAELINE
Epimeric with cephaeline at C-1′

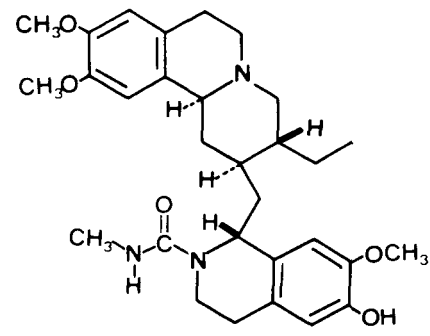
$C_{28}H_{38}N_2O_4$: 466.2831
MP: 108-116° (Et_2O) (25)
$[\alpha]^{20}D$: −69.8° ($CHCl_3$) (25)
UV: (EtOH) 228 sh, 286 (25)
MS: (25)
SOURCE:
ALANGIACEAE: *Alangium lamarckii* Thwaites (25)

6. ALAMARCKINE
(*N*-Methylcephaeline)



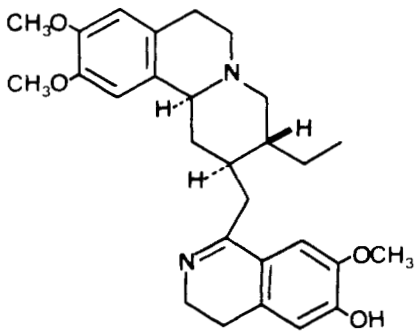
$C_{29}H_{40}N_2O_4$: 480.2988
MP: 191-192° (9)
[α]D: −50.5° (c 1.14, MeOH) (9)
MS: 480 (M^+), 455, 451, 288, 274, 273, 272, 246, 244, 206, 205, 192 (base), 191, 190, 177 (9)
SOURCES:
Semisynthetic; from N-methylation of the crude alkaloids of *Alangium lamarckii* Thwaites (Alangiaceae), or from N-methylation of cephaeline (9, 2)

7. ALANGAMIDE



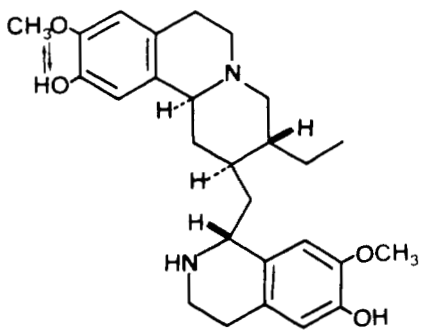
$C_{30}H_{41}N_3O_5$: 523.3046
MP: 213° (EtOH-H_2O) (26)
[α]D: −45±2° (c 0.82, $CHCl_3$) (26)
UV: (EtOH or 0.1 N EtOH-HCl) 211 (4.66), 227 sh (4.13), 286 (3.85) (26)
(0.1 N EtOH-NaOH) 222 (4.74), 230 sh (4.19), 289 (3.93), 302 sh (3.82) (26)
IR: ($CHCl_3$) 3500, 3200, 1631 (26)
MS: 523 (M^+), 522, 508, 494, 466, 274, 273, 246, 244, 192 (26)
PMR: 2.80, 2.88 (urea N-Me), 3.82, 3.86, 3.94 (three O-Me), 5.83 (N-H), 6.57 (two arom. H), 6.62, 6.92 (arom. H) (26)
SOURCE:
ALANGIACEAE: *Alangium lamarckii* Thwaites (26)

8. PSYCHOTRINE



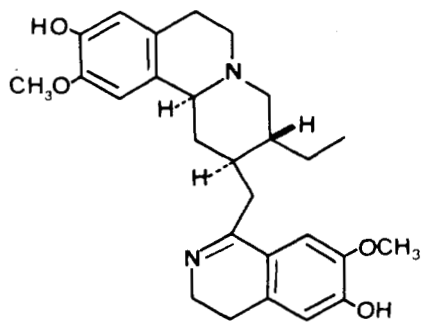
$C_{28}H_{36}N_2O_4$: 464.2674
MP: 138° (1a)
130-133° (Me_2CO-H_2O) (2)
117-120° (Me_2CO-H_2O) (16, 17, 22)
108-112° (1b)
$[\alpha]_D$: +69° (EtOH) (1a)
+75.5° (MeOH) (16)
+80.2° (MeOH) (22)
+48° ($CHCl_3$) (1b)
ORD: (c 1.0, EtOH) $[\alpha]^{20}_D$ +68.4°, $[\alpha]^{20}_{578}$ +73.8°, $[\alpha]^{20}_{546}$ +90.3°, $[\alpha]^{20}_{436}$ +91.4° (erratic measurement), $[\alpha]^{20}_{365}$ 0° (17)
CD: (EtOH) Φ^{26} (nm) 0(460), +3520(402), +100(347), +1560(315), 0(285), −590(279), 0(275), +780(269), +200(264), +3320(244), 0(239), −11700(231), 0(224) (27)
UV: (0.1 N HCl) 240 (4.14), 288 (3.76), 306 (3.80), 356 (3.83) (17, 1g)
IR: ($CHCl_3$) 3530, 1300, 1260 (17)
MS: 464 (M^+), 274, 273, 272, 258, 244 (base), 192, 191, 190 (9, 17)
PMR: 3.62, 3.68, 3.77 (three O-CH_3), 6.45, 6.58, 7.02 (arom. H) (17)
SOURCES:
ALANGIACEAE: *Alangium lamarckii* Thwaites (1b, 1g, 9, 16), *A. salviifolium* (23, 24)
RHUBIACEAE: *Psychotria ipecacuanha* Stokes (1a, 1g, 12, 13)

9. DEMETHYLCEPHAELINE



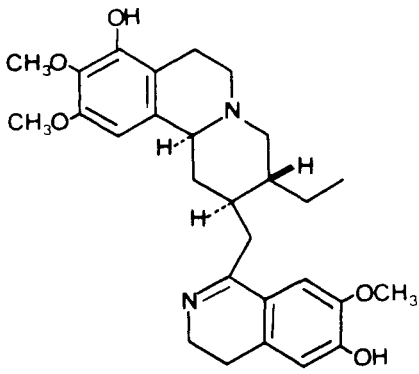
$C_{27}H_{36}N_2O_4$: 452.2675
MP: 147-149° (22, 28)
$[\alpha]_D$: −53.5° ($CHCl_3$) (22, 28)
UV: (EtOH) 211 (4.28), 225 sh (3.91), 286 (3.69) (22)
(0.1 N EtOH-NaOH) 213 (3.48), 227 (3.96), 247 (4.05), 301 (3.81) (22)
IR: (Nujol) 1010-1030 cm^{-1} (22)
MS: 452 (M^+), 274, 272, 260, 259, 258, 232, 230, 192, 191, 178 (base) (22)
SOURCE:
ALANGIACEAE: *Alangium lamarckii* Thwaites (22, 28)
The synthesis of (−)-9- and of (−)-10-demethylcephaeline has been reported, but a comparison with the natural product could not be carried out (28)

10. DEMETHYLPSYCHOTRINE
(9-Demethylpsychotrine) (29)



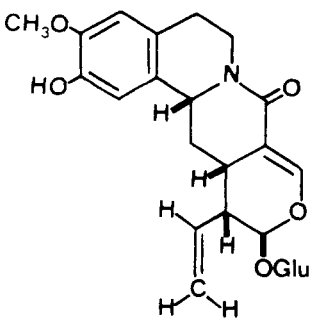
$C_{27}H_{34}N_2O_4$: 450.2518
MP: 166-168° (EtOH) (16)
$[\alpha]_D$: 67.9° (MeOH) (16)
72.3° (MeOH) (22)
UV: (EtOH) 223 (3.95), 277 (3.83), 310 (3.34), 410 (3.96) (16)
(0.1 N NaOH) 243 (4.41), 307 (4.28), 326 (4.32) (16)
IR: ($CHCl_3$) 3509 (16)
MS: 435, 421, 272, 260, 259, 258, 256, 244, 230 (base), 228, 225 (M^{++}), 216, 192, 191, 190, 178, 177, 176 (16)
SOURCE:
ALANGIACEAE: *Alangium lamarckii* Thwaites (1g, 16, 22)

11. ALANGICINE



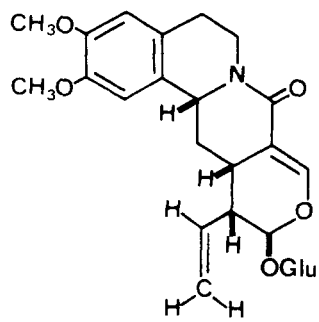
$C_{28}H_{36}N_2O_5$: 480.2624
MP: 147-148° (EtOH) (16, 27)
$[\alpha]_D$: 64.1° (c 0.26, MeOH) (16, 27)
CD: (EtOH) Φ^{26} (nm) 0(448), +3010(402), +100(349), +1500(315), 0(285), −2000(275), +1000(269), −1670(265), 0(255), +1340(246), 0(241), −8850(233), 0(225) (27)
UV: (EtOH) 275 (3.84), 312 (3.42), 408 (4.09) (16) (0.1 N NaOH) 238 (4.17), 292 (3.82), 328 (4.07) (16)
MS: 465, 451, 302, 290, 289, 288, 274, 260 (base), 258, 240 (M^{++}), 216, 207, 206, 192, 191, 190, 178 (16)
SOURCE:
ALANGIACEAE: *Alangium lamarckii* Thwaites (1g, 16, 27)

12. ALANGISIDE



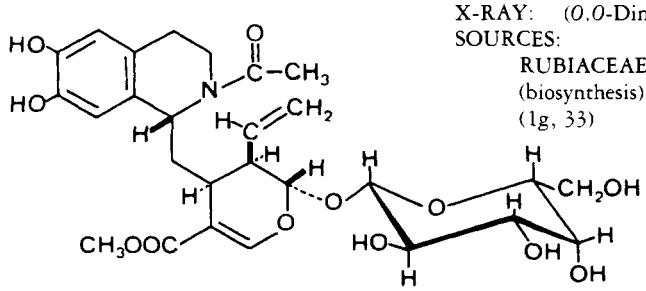
$C_{25}H_{31}NO_{10}$: 505.1948
MP: 187° (30)
$[\alpha]_{26D}$: −105° (c 1.0, MeOH) (30, 31)
UV: (MeOH) 237 (4.27), 285 (3.68) (30)
IR: (KBr) 3350, 1650, 1585, 1510, 1450, 1440, 1020, 910 (30, 31)
MS: 505 (M^+), 343, 274 (base), 272, 178, 177, 176 (30)
PMR: (DMSO-d_6) 3.79 (O-Me), 5.4 (3H, olefinic), 6.75 (arom. H), 7.39 (vinylic enol ether) (30, 31)
SOURCE:
ALANGIACEAE: *Alangium lamarckii* Thwaites (1g, 30)

13. *O*-METHYLALANGISIDE



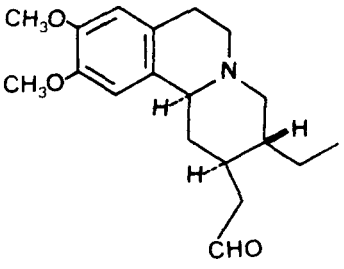
$C_{26}H_{33}NO_{10}$: 519.2104
MP: 236° (EtOAc) (30)
IR: (KBr) 3375, 1655 (30)
MS: 519 (m^+), 505, 358, 357, 356, 340, 288 (base), 274, 272, 270, 258, 257, 256, 192, 191, 178, 177, 176, 149, 145 (30)
PMR: 3.86, 3.90 (O-Me), 5.4 (olefinic H), 6.65, 6.8 (arom. H), 7.58 (O-CH=) (30)
O-Methylalangiside tetraacetate at 270 MHz (32, 33)
CMR: O-Methylalangiside tetraacetate (33)
SOURCE:
Semi-synthetic from alangiside (30, 33)

14. IPECOSIDE



$C_{29}H_{35}NO_{12}$: 565.2159
MP: 176-178° (33)
CD: (Hexaacetate) (32)
UV: (EtOH) 227 (4.14), 287 (3.58) (33)
IR: 1690, 1630 (34)
MS: 220, 206, 178, 164, 43 (34)
PMR: (Trimethylsilyl ether) (34)
(Hexaacetate) (33)
X-RAY: (*O.O*-Dimethylipecoside) (35)
SOURCES:
RUBIACEAE: *Cephaelis acuminata* Karsten (biosynthesis) (15), *Psychotria ipecacuanha* Stokes (1g, 33)

15. PROTOEMETINE

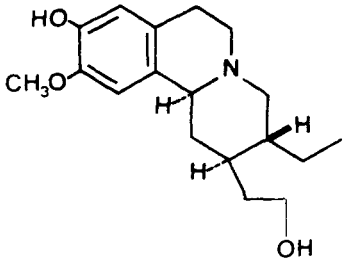


$C_{19}H_{27}NO_3$: 317.1990
MP: (Perchlorate) 193-195° (MeOH) (1a, 1b)
$[\alpha]_D$: (Perchlorate) −11° (EtOH) (1a, 1b)
UV: (Perchlorate) (EtOH) 232 (3.92), 283 (3.61) (6, 1g)
IR: ($CHCl_3$) 1725 (36, 6)
MS: 317 (M^+) (36)
PMR: 0.8-1.16 (CH_2CH_3), 3.91 (O-Me), 6.70 (arom. H), 6.77 (arom. H), 10.0 (CHO) (36)
SOURCE:
RUBIACEAE: *Psychotria ipecacuanha* Stokes (1a, 1g, 6)

16. PROTOEMETINOL
(Dihydroprotoemetine)
Aldehyde function of protoemetine (**15**) reduced to alcohol

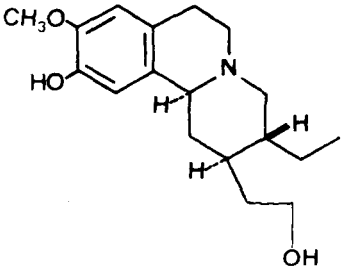
$C_{19}H_{29}NO_3$: 319.2147
MP: (Perchlorate) 199-200° (EtOH-H_2O) (6)
IR: (Nujol) 3550 (6)
MS: 319 (M^+), 288, 272, 246, 205, 191, 190, 178 (21, 37)
SOURCE:
ALANGIACEAE: *Alangium lamarckii* Thwaites (1b, 21)
Also from reduction of protoemetine (1g, 6)

17. 9-DEMETHYLPROTOEMETINOL



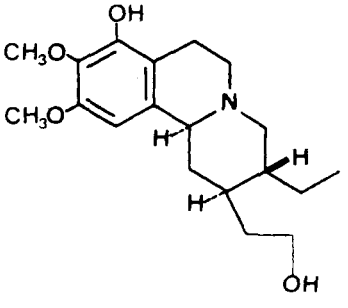
$C_{18}H_{27}NO_3$: 305.1991
MP: 157-158.5° (38)
$[\alpha]^{25}_D$: −61° (c 0.5, EtOH) (38)
SOURCE:
ALANGIACEAE: *Alangium lamarckii* Thwaites (39)

18. 10-DEMETHYLPROTOEMETINOL



$C_{18}H_{27}NO_3$: 305.1991
MP: Glass (38, 39)
$[\alpha]^{17}_D$: −35.2° (c 0.5, EtOH) (38)
$[\alpha]_D$: −11.9 ($CHCl_3$) (39)
UV: (EtOH) 227 (4.01), 286 (3.77) (39)
IR: (Diacetate) (39)
MS: 305 (M^+, 51), 304 (80), 260 (28), 258 (17), 232 (base), 191 (93), 177 (98) (39)
PMR: (Diacetate) (39)
SOURCE:
ALANGIACEAE: *Alangium lamarckii* Thwaites (39)

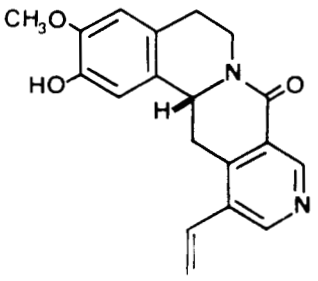
19. ANKORINE



$C_{19}H_{29}NO_4$: 335.2096
MP: 174-176° (40, 37)
$[\alpha]^{20}_D$: −53.11° ($CHCl_3$) (40, 42)
$[\alpha]_D$: −62° ($CHCl_3$ (37)
UV: (EtOH) 272 (2.96) (37, 41, 42), (1o, spectrum No. 805)
IR: 3518, 3250 (37, 40, 42)
($CHCl_3$) 3630, 3530, 2800, 2750 (41), (1o, spectrum No. 805)
MS: 335 (M^+), 334 (base), 320, 318, 262, 221, 207, 192 (37, 41, 42)
PMR: 0.88 (CH_2CH_3), 3.67 (CH_2OH), 3.76 (O-Me), 3.78 (O-Me), 6.24 (arom. H) (37, 41, 42)

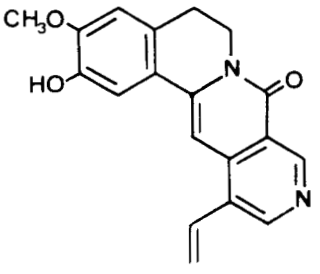
SOURCE:
ALANGIACEAE: *Alangium lamarckii* Thwaites (1b, 1f, 40, 37)
A. salviifolium (Linn.) Wangerin (24)

20. ALANGIMARIDINE



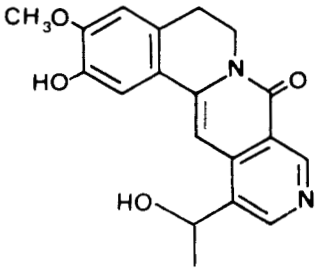
$C_{19}H_{18}N_2O_3$: 322.1317
MP: 278° (43)
$[\alpha]_D$: 429° (c 0.35, $CHCl_3$) (?) (43)
UV: (EtOH) 220 (4.53), 255 (4.00), 284 (3.84) (43)
MS: 322 (M^+), 177, 175, 145, 117 (43)
PMR: (Acetate) (43)
SOURCE:
ALANGIACEAE: *Alangium lamarckii* Thwaites (43)

21. ALANGIMARINE



$C_{19}H_{16}N_2O_3$: 320.1161
MP: 247° (43)
UV: (EtOH) 220 (4.37), 261 (4.11), 290 sh (3.83), 365 (4.42) (43)
IR: (Nujol) 1650 (43)
MS: 305 ($M^+ - 15$) (43)
PMR: (Acetate) (43)
SOURCE:
ALANGIACEAE: *Alangium lamarckii* Thwaites (43)

22. ALAMARINE



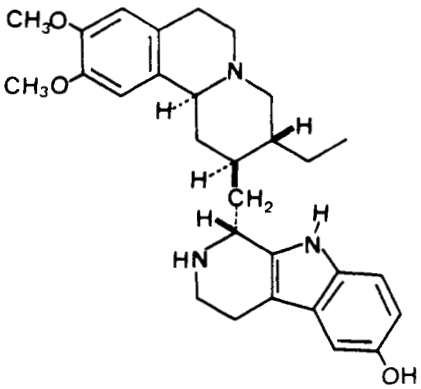
$C_{19}H_{18}N_2O_4$: 338.1266
MP: 288° (EtOH) (43)
$[\alpha]_D$: 0° (43)
UV: (EtOH) 220 (4.37), 253 (4.20), 363 (4.44) (43)
MS: 338 (M^+) (43)
PMR: (Diaceate) (43)
SOURCE:
ALANGIACEAE: *Alangium lamarckii* Thwaites (43)

23. ISOALAMARINE

As in alamarine (**22**), but with positions of phenolic and methoxyl functions probably reversed.

$C_{19}H_{18}N_2O_4$: 338.1266
SOURCE:
ALANGIACEAE: *Alangium lamarckii* Thwaites (43)

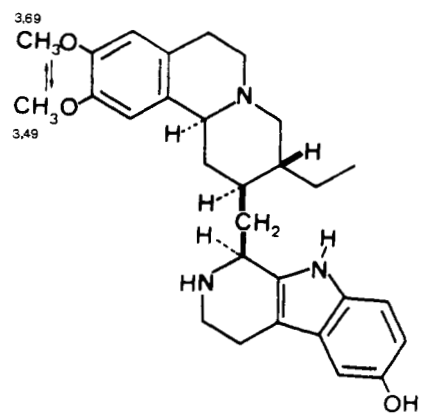
24. TUBULOSINE
(Marckine) (44)



The position of the phenolic function has been settled conclusively (47).

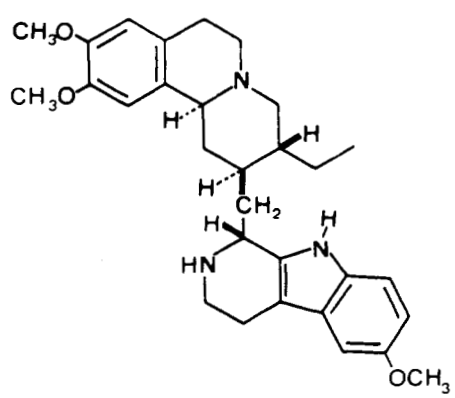
$C_{29}H_{37}N_3O_3$: 475.2835
MP: 257-260° (MeOH) (21, 45, 46)
$[\alpha]_D$: −72.0 (pyridine) (21, 45)
UV: (MeOH) 223 (4.60), 279 (4.16), 310 sh (3.67) (21, 45)
IR: (KBr) 3401, 1631, 1600 (21)
MS: 475 (M^+), 288, 275-272, 246, 244, 206, 205, 201, 192, 191, 187 (base) (45, 48, 21)
PMR: 0.95 (CH_2CH_3), 3.75 (O-Me), 4.15 (N-H), 6.5-7.3 (five arom. H), 8.4 (OH), 10.4 (indole N-H) (45, 21)
SOURCES:
ALANGIACEAE: *Alangium lamarckii* Thwaites (21, 46)
RUBIACEAE: *Pogonopus tubulosis* Schumann (45)

25. ISOTUBULOSINE



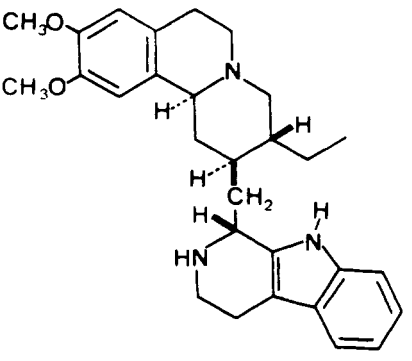
$C_{29}H_{37}N_3O_3$: 475.2835
MP: 177-178° (EtOH) (1b, 49)
$[\alpha]^{25}_D$: −84.0° (pyridine) (1b, 49)
UV: (MeOH) 279 (4.08) (49)
IR: (49)
MS: 288, 274, 273, 272, 244, 205, 201, 192, 191, 190, 187 (base), 160, 146 (49)
PMR: (DMSO-d_6) (49)
SOURCE:
ALANGIACEAE: *Alangium lamarckii* Thwaites (1b, 49)

26. *O*-METHYLTUBULOSINE



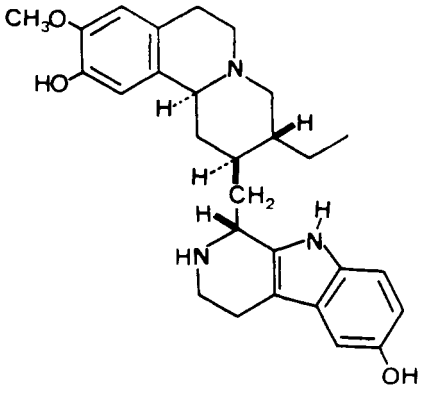
$C_{30}H_{39}N_3O_3$: 489.2991
MP: 183° ((+)-enantiomer) (48)
146-148° (MeOH) (racemate) (36)
$[\alpha]^{20}_D$: 15.4° (c 1.0, MeOH) (48)
IR: ($CHCl_3$) 3510 (36)
MS: 489 (M^+) (36)
PMR: 0.77-1.16 (CH_2CH_3), 3.86 (O-Me), 6.69-7.16 (arom. H), 7.81 (N-H) (36)
SOURCE:
Semisynthetic. (+)-Enantiomer from tubulosine (48). Racemate from racemic 4-oxoprotoemetine (36)

27. DEOXYTUBULOSINE



$C_{29}H_{37}N_3O_2$: 459.2886
MP: 230-232° (1b)
$[\alpha]_D$: −24° ($CHCl_3$) (50, 1b)
−17° ($CHCl_3$) (1b)
IR: ($CHCl_3$) 3530 (36, 50)
MS: 459 (M^+), 288, 286, 275-272, 246, 244, 185, 171 (50)
PMR: 6.58 (1H, arom. H), 6.70 (1H, arom. H), 7.0-7.4 (4H, arom. H) (50)
SOURCES:
ALANGIACEAE: *Alangium lamarckii* Thwaites (1b, 50, 51)
ICACINACEAE: *Cassinopsis ilicifolia* Kuntze (1b, 52)

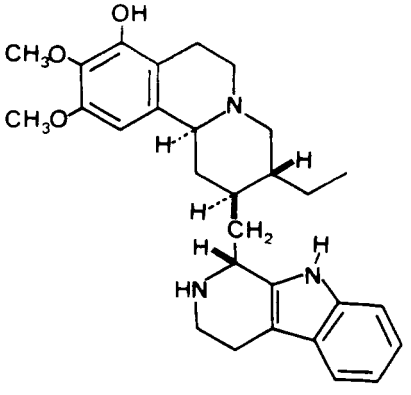
28. 10-DEMETHYLTUBULOSINE



$C_{28}H_{35}N_3O_3$: 461.2679
MP: 198-200° (MeOH-CH_2Cl_2) (1b, 48)
$[\alpha]^{23}_D$: −51.9 (c 1, pyridine) (1b, 48)
UV: (MeOH) 278 (4.10 (48)
IR: 3500 (48)
MS: 259, 258, 246, 230, 201, 191, 187, 178, 177, 176 (48)
PMR: (Pyridine-d_5) 3.76 (48)
SOURCE:
ALANGIACEAE: *Alangium lamarckii* Thwaites (1b, 48)

For the location of the phenolic function, see (53).

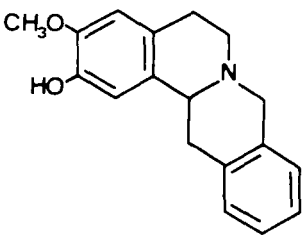
29. ALANGIMARCKINE



$C_{29}H_{37}N_3O_3$: 475.2835
MP: (Hydrate) 184-186° (37, 4)
$[\alpha]^{25}_D$: −67.7° (pyridine) (37, 4)
UV: (EtOH) 226 (4.28), 283 (4.18) (54)
IR: 3508, 3460 (37)
MS: 171 (base) (37)
PMR: 0.84, 1.94, 3.70, 3.76 (two O-Me), 4.16 (CH_2CH-Ar-NH), 6.27, 6.9-7.5 (arom. H) (37)
SOURCE:
ALANGIACEAE: *Alangium lamarckii* Thwaites (1b, 54)

The alkaloid AL 64 (54) may be alangimarckine.

30. BHARATAMINE



$C_{18}H_{19}NO_2$: 281.1416
MP: 182-183° (petroleum ether-$CHCl_3$) (55)
$[\alpha]_D$: 0° (55)
UV: (EtOH) 206 (5.08), 290 (2.77) (55)
(0.01 N NaOH) 208 (4.85), 295 (3.91), 310 (2.71) (55)
IR: (Nujol) 3160 (55)
MS: 281 (M^+), 280 (base), 176, 104 (55)
PMR: 2.48-4.12 (aliphatic H), 3.84 (O-Me), 6.60, 6.84, 7.74 (arom. H) (55)
SOURCE:
ALANGIACEAE: *Alangium lamarckii* Thwaites (55)

Occurrence of the Alkaloids by Plant Sources

Alangiaceae

Alangium lamarckii Thwaites
Emetine (**1**)
Emetamine (**3**)
Cephaeline (**4**)
Isocephaeline (**5**)
Alangamide (**7**)
Psychotrine (**8**)
Demethylcephaeline (**9**)
Demethylpsychotrine (**10**)
Alangicine (**11**)
Alangiside (**12**)
Protoemetinol (**16**)
9-Demethylprotoemetinol (**17**)
10-Demethylprotoemetinol (**18**)
Ankorine (**19**)
Alangimaridine (**20**)
Alangimarine (**21**)
Alamarine (**22**)
Isoalamarine (**23**)
Tubulosine (**24**)
Isotubulosine (**25**)
Deoxytubulosine (**27**)
10-Demethyltubulosine (**28**)
Alangimarckine (**29**)
Bharatamine (**30**)

Alangium salviifolium
Cephaeline (**4**)
Psychotrine (**8**)
Ankorine (**19**)

Icacinaceae

Cassinopsis ilicifolia Kuntze
Deoxytubulosine (**27**)

Rubiaceae

Cephaelis acuminata Karsten
Emetine (**1**)
Cephaeline (**4**)
Ipecoside (**14**)

Pogonopus tubulosis Schumann
Tubulosine (**24**)

Psychotria granadensis Benth. ex Oerst
Emetine (**1**)
O-Methylpsychotrine (**2**)
Emetamine (**3**)
Cephaeline (**4**)

Psychotria ipecacuanha Stokes
O-Methylpsychotrine (**2**)
Emetamine (**3**)
Cephaeline (**4**)
Psychotrine (**8**)
Ipecoside (**14**)
Protoemetine (**15**)

Unconfirmed Occurrence of Emetine-Type Alkaloids

Emetine has been reported to be present in *Borreria verticillata* (Rubiaceae) (56). Other Central or South American Rubiaceae containing emetine, cephaeline, and psychotrine are *Bothriospora corymboa, Capirona decorticans, Ferdinandusa elliptica, Tocoyena longiflora, Remija amazonica,* and *Hillia ilustria* (57). A rather doubtful source of emetine is the common ivy, *Hedera helix* (Araliaceae) (58).

Alphabetical Listing of the Alkaloids

Alamarckine (**6**)
Alamarine (**22**)
Alangamide (**7**)
Alangicine (**11**)
Alangimarckine (**29**)
Alangimaridine (**20**)
Alangimarine (**21**)
Alangiside (**12**)
Ankorine (**19**)
Bharatamine (**30**)
Cephaeline (**4**)
Demethylcephaeline (**9**)
9-Demethylprotoemetinol (**17**)
10-Demethylprotoemetinol (**18**)
Demethylpsychotrine (**10**)
Demethyltubulosine (**28**)
Deoxytubulosine (**27**)
Emetamine (**3**)
Emetine (**1**)
Ipecoside (**14**)
Isoalamarine (**23**)
Isocephaeline (**5**)
Isotubulosine (**25**)
Marckine (**24**)
O-Methylalangiside (**13**)
O-Methylpsychotrine (**2**)
O-Methyltubulosine (**26**)
Protoemetine (**15**)
Protoemetinol (**16**)
Psychotrine (**8**)
Tubulosine (**24**)

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