APORPHINE ALKALOIDS

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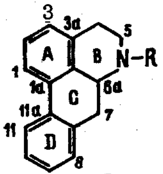
The review gives information on aporphine alkaloids and their oxo and dehydro derivatives and discusses the characteristic features of the chemical and spectral properties of these alkaloids.

The aporphine alkaloids make up a large group including at the present time about 250 alkaloids isolated from plants of 20 families. Plants of the families *Annonaceae* and *Lauraceae* are the richest in these alkaloids. All aporphine alkaloids are based on the skeleton I [1] and consist of di-, tri-, tetra-, penta-, and hexasubstituted derivatives, the substituents being hydroxy, methoxy, or methylenedioxy groups, sugar residues, etc. The aporphine alkaloids may also be component parts of biomolecular alkaloids [2] (these are not considered in the present review). The substitutents in the aporphine alkaloids may be located in all four rings, with the exception of the methylenedioxy group, which is found only in rings A and D. In the case of all the disubstituted aporphines isolated, the substituents are present in positions 1 and 2 in ring A.



R=H; CH_3, $COCH_3$

I

The most widespread in nature are the 1,2,9,10- and 1,2,10,11-tetrasubstituted bases, but pentasubstituted aporphines in which functional groups occupy positions at various carbon atoms are found fairly frequently.

Leucoxylonine and ocoxylonine are representatives of hexasubstituted aporphine alkaloids with substituents in rings A and D [3]. The nitrogen atom in the aporphines may be secondary (I, R = H), tertiary (I, R = CH_3, $COCH_3$), or quaternary.

The first compounds with an aporphine skeleton were apomorphine and morphothebaine, obtained from morphine [4, 5]. Dehydroaporphines (Δ^6, Δ^{6a}, Δ^4) and oxoaporphine (C=O at C_4, C_5, C_7), which can be regarded as products of the oxidation of aporphine alkaloids, have also been isolated from plants. Dehydrobases with the double bond between C_{6a} and C_7 are found most frequently and those with the double bond between C_6 and C_{6a} (dehydronorglaucine) and those with double bonds at C_4-C_5, and C_{6a}-C_7 (didehydroocoteine, didehydroremerine) more rarely [6].

The most widely distributed oxoaporphine alkaloids are those having a completely dehydrogenated system with a conjugated ketone group at C_7. Representatives of this group are colored, high-melting, optically inactive bases poorly soluble in organic solvents. Nonphenolic oxaporphines of this type are yellow or red. Phenolic oxoaporphines with hydroxy groups at C_1 or C_{11} have a green color [7]. Their reduction with zinc or zinc amalgam in sulfuric acid leads to the corresponding noraporphine bases [8]. In their turn, the oxoaporphine alkaloids are formed from nonphenolic aporphines by oxidation with lead tetraacetate or chromium trioxide in pyridine [8, 9], and also by the oxidation of the noraporphines with iodine in alcoholic solution. The oxidation of aporphines with iodine in aqueous alcoholic solutions leads to the formation of the dimeric compounds II [11]. Oxidation with potassium permanganate also forms oxoaporphines [13]. The oxidation of aporphines with iodine in dioxane in the

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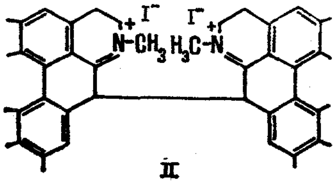
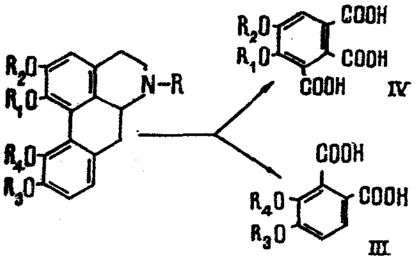
presence of sodium acetate, with potassium permanganate in acetone, or by dehydrogenation with 10% Pd/C in acetonitrile gives Δ^{6a}-dehydroaporphine alkaloids [10, 12].

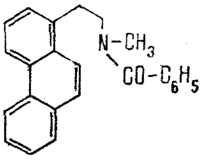


II

The structures of the aporphine alkaloids have been established by the usual methods, such as Hofmann degradation, oxidation, reduction, synthesis. With two repetitions of the Hofmann degradation, aporphine derivatives give substituted derivatives of 8-vinylphenanthrene. Subsequent oxidation leads to the corresponding phenanthrenecarboxylic acid the decarboxylation of which forms a substituted phenanthrene [4]. The formation of the latter gives an idea of the positions of the substituting groups in the initial alkaloid. Aporphine alkaloids having substitutents in rings A and D, when oxidized with potassium permanganate, form benzenedicarboxylic (III) and tricarboxylic (IV) acids.



The action on aporphines of acid anhydrides or chlorides leads to a phenanthrene derivative of the type of (V) which is optically inactive and nonbasic in nature.



V

In 1948, S. Yu. Yunusov demonstrated a number of general features of the aporphine alkaloids [14]:

1. Alkaloids containing substituting groups in positions 1, 2, and 9 and positions 1, 2, 9, and 10 have specific rotations several times less (40-100°) than bases with substituents in positions 1, 2, and 11 and positions 1, 2, 10, and 11 (200-300°).

2. The oxidation of optically inactive des-bases with strong nitric acid leads to mellophanic (benzene-1,2,3,4-tetracarboxylic) acid. When there are no substituting groups in rings A and D, depending on the position of the substituents, in place of mellophanic acid, an unsubstituted benzenedicarboxylic (from ring D) or benzenetricarboxylic (from ring A) acid is formed.

3. In the case of phenolic alkaloids, oxidation begins with that nucleus in which the hydroxy group is present.

4. In the aporphine alkaloids, a methylenedioxy group is most frequently found in the 1,2 positions.

5. Aporphine alkaloids having a hydroxy group at C_1 possess weak phenolic properties [15].

Aporphines containing a methoxy group in position C_1 or C_{11} lose it on hydrogenolysis with sodium in liquid ammonia [16, 17]. Under these conditions, a methylenedioxy group is converted into a monohydroxy function [18].

In the last 20 years, spectroscopic methods have been widely used, giving a large amount of information on the structure of aporphine alkaloids.

According to the nature of the substitution in the aporphine skeleton, the UV spectra are divided into three groups:

1. The spectra of unsubstituted alkaloids or those monosubstituted in ring D have a single maximum at 270-280 nm (log $\varepsilon \sim 4.3$) and a weak shoulder at 310-320 nm (log $\varepsilon \sim 3.3$) [19].

2. In the spectra of 1,2,9,10-substituted alkaloids absorption maxima are observed at 280-284 and 303-310 nm which are characterized by approximately equal intensities (log $\varepsilon \sim 4.20$).

3. The spectra of alkaloids substituted in positions 1, 2, 10, and 11 each have a maximum at 268-272 nm (log $\varepsilon \sim 4.20$) with a maximum of lower intensity at 303-310 nm (log $\varepsilon \sim 3.80$) [19, 20].

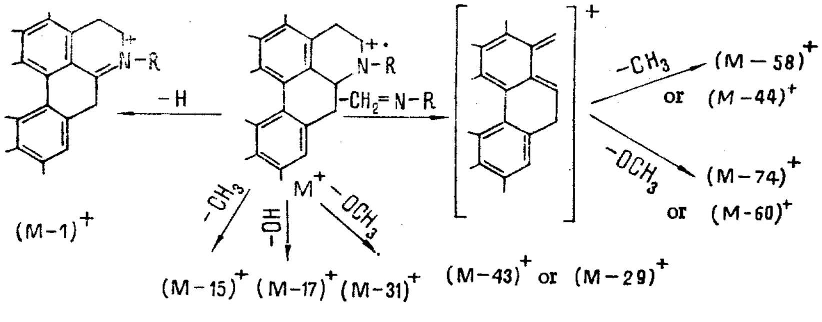
In the UV spectra of the 9-hydroxyaporphines taken in alkaline solutions a bathochromic shift is observed which is accompanied by a strong hyperchromic effect between 315 and 330 nm. Where there is no hydroxy group at C_9, this phenomenon is not observed [21]. In the UV spectra of the Δ^{6a}-dehydroaporphine alkaloids having no substituent at C_{11}, absorption bands of a highly conjugated system are observed at 220-222, 262-264, 293-302, and 335-341 nm (log ε 4.37-4.56, 4.66-4.97, 3.85-3.87, and 4.02-4.50) [6].

In the spectra of 1,2,10,11-tetrasubstituted dehydroaporphines absorption maxima are observed at 220, 310, and 340 nm (log ε 4.33, 4.27, 4.10) [22].

A feature of these alkaloids which is shown in their IR spectra is the presence in the aporphine nucleus of a biphenyl system, giving rise to three bands at about 1500, 1580, and 1600 cm^{-1}. A difference in the type of substitution of the aromatic rings is demonstrated by a scatter of the frequencies of the maximum of each band. It has been shown that alkaloids with a trisubstituted benzene ring (isothebaine, pukateine, and O-methylpukateine) absorb at somewhat lower frequencies [23]. Measurement of the total integral intensity permits alkaloids of the glaucine type to be distinguished from alkaloids of the corydine type. The total integral intensity of the alkaloids of the second type has low values and depends on the nature of the intramolecular hydrogen bond between the substituents at C_1 and C_{11}. The total integral intensity of the first type depends on the nature of the substituents in ring D [24].

The dehydroaporphine alkaloids have absorption bands in their IR spectra in the 1570-1610 cm^{-1} region. In the IR spectrum of the oxoaporphine alkaloids the absorption band of the carbonyl group is observed in the form of a sharp peak in the 1640-1675 cm^{-1} region [6].

The mass spectra of the aporphine alkaloids show characteristic peaks of the ions M^+, $(M-1)^+$, $(M-29)^+$, or $(M-43)^+$. The presence of methoxy and hydroxy groups in the molecule is responsible for the appearance in the spectrum of peaks of the ions $M-CH_3$, $M-OH$, and $M-OCH_3$, and also for the subsequent ejection of these fragments from the $M-CH_3{-}N{=}CH_2$ ion [25, 26].



The nature of the fragmentation of the aporphine alkaloids depends on the type of their substitution. The ion $(M-1)^+$ is the main peak in the spectra of the 1,2,9,10-tetrasubstituted aporphines, while for the 1,2,10,11-tetrasubstituted bases the main peak is that of the molecular ion and, as a rule, the $(M-1)^+$ ion does not exceed 50%. When there is a methoxy group at C_{11}, the peak of the $(M-31)^+$ ion amounts to 70-90%, and when it is substituted by a hydroxy group this ion amounts to 5-15% while the peak of the $(M - 17)^+$ amounts to ∿50%. The intensity of the peak of the $(M - 15)^+$ ion in the spectra of the alkaloids of the first type may reach 40%, and then those of the second type 100% [26].

The mass spectra of the dehydroaporphine alkaloids lack the peaks of the $(M - 1)^+$ and $(M - 43)^+$ ions that are characteristic for the aporphine bases. The strongest peak in each case is that of the molecular ion, and the peak of the $(M - 15)^+$ ion is fairly strong [6].

In the spectra of the oxoaporphine alkaloids, the main peak in each case is that of the molecular ion, and in addition to this there are the peaks of the ions $(M - 15)^+$, $(M - 28)^+$, $(M - 30)^+$, and M^{++} [6, 27].

The nuclear magnetic resonance method gives a large amount of information on the mutual positions of the substituting groups in the aporphine alkaloids. Methoxy groups at C_1 and C_{11} give signals in a stronger field (3.40-3.75 ppm) than methoxyls at C_2, C_3, C_9, and C_{10} (3.70-3.90 ppm) [28-32]. The signals of a $N-CH_3$ group appear at 2.35-2.55 ppm. The protons of a methylenedioxy group in the $C_{1,2}$ position give a quartet, and in other positions they frequently appear in the form of a singlet [38, 39]. When there is an oxygen-containing substituent at C_1 or C_{11}, the signals of the aromatic proton at C_{11} or C_1, respectively, shift downfield in the NMR spectrum (7.80-8.21 ppm) [40, 41].

When there is no oxygen-containing substituent at C_1 and C_{11}, the signals of the aromatic protons appear in the usual region [42]. If the C_1 and C_2 positions are occupied by a methylenedioxy group, the C_{11} proton has a chemical shift between 7.47 and 8.00 ppm, while in the case of a hydroxy or a methoxy group the signal of the C_{11} proton shifts downfield. The proton at C_8 has chemical shifts in the 6.60-7.20 ppm region, and one at C_3 gives a signal in a stronger field (6.42-6.70 ppm) than the other aromatic protons of the aporphine system [6].

The signals of the other aromatic protons appear in the 6.36-7.21 ppm region. Methylene and methine protons appear in the form of a complex multiplet in the 3.0-4.0 ppm region. In the 4-hydroxyaporphines where the hydroxy group has the α-orientation, the geminal proton gives a signal in the form of a poorly resolved triplet at ∿4.50 ppm with a peak half-width of 5 Hz. If the hydroxy group has the β-orientation, the signal is observed in the form of a quartet at 4.93-5.00 ppm with $J_1 = 10$ Hz and $J_2 = 5.5$ Hz [43-45]. In the 7-hydroxyaporphines, the geminal proton is shown in the form of a doublet at 4.50-4.90 ppm with J = 2.5 Hz in the case of α-OH and with J = 12 Hz in the case of β-OH.

A large amount of information on the structures of the phenolic aporphine alkaloids is given by NMR spectra taken in alkaline solutions. The spectra of the phenoxide ions show considerable shifts in the signals of the aromatic protons relative to the spectrum of the undissociated phenols [46, 47]. The anionic shift is a function of the relative position of the phenolic hydroxy group and of an aromatic proton, which is clearly expressed in the ortho and para positions. The spectra of the anions of alkaloids with hydroxy groups at C_1 or C_{11} show considerable downfield shifts (∿9.0 ppm) of the signals of the protons at C_{11} or C_1, respectively [48].

If an aporphine contains two hydroxy groups present in different aromatic rings, the hydroxyl in ring D is ionized first. This can be seen from the pronounced shift of the signals of the protons of ring D on the continuous addition of alkali. In this process, the signals of the protons of ring A shift to a far smaller degree. After the chemical shifts of the protons of ring D have assumed constant values (after the addition of 1 mole of alkali), the dissociation of the hydroxy group in ring A begins, which causes a further shift of the signals of the protons of the same ring. This phenomenon confirms the opinion expressed previously [14] that in the isoquinoline part of the aporphine molecule the hydroxy groups possess weakened phenolic properties.

The position of a hydroxy group in an aporphine molecule can also be determined by a comparative study of the NMR spectra of the base itself and of its acetyl derivative. The O-acetylation of 1,2,9,10-tetrasubstituted phenolic aporphines with the hydroxy group at C_1 causes a considerable diamagnetic shift of the signal of the proton at C_{11} (∿0.45-0.57 ppm) [49, 50].

The NMR spectra of the Δ^{6a}-dehydroaporphine alkaloids differ somewhat from the spectra of the aporphines. Thus, the signal of the N-methyl group is shifted downfield (2.98-3.10 ppm), and the protons of a methylenedioxy group at C_1, C_2 are shown in the form of a two-proton singlet at 5.90-6.20 ppm [6, 51]. This is explained by the more coplanar structure of the molecule of a dehydroaporphine as compared with the amorphine molecule. The signals of the aromatic protons at C_3 and C_8 appear in approximately the same region as in the aporphines. The signal of the C_7 proton appears in the 6.43-7.10 ppm, and the proton at C_{11} gives a signal in a weaker field, at 8.12-9.06 ppm [6].

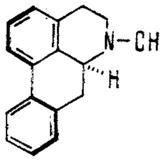
The pattern of the NMR spectra of the oxoaporphines depends on the solvent in which the particular spectrum is recorded. For example, the signal of the C_{11} proton does not always appear in the weak-field region as compared with the signals of the other aromatic protons. In the spectrum of oxolaureline taken in CF_3COOH, the signals of the C_5 and C_8 protons are observed in a weaker field (8.77 and 8.64 ppm) than the signal of the C_{11} proton (8.41 ppm). When the spectrum is taken in $CDCl_3$, the same pattern is observed (8.89, 8.58, and 8.14 ppm, respectively) [52, 53].

In the spectra of the quaternary oxoaporphines, the signals from the N-methyl group appear in a weaker field (3.50-5.36 ppm) than in the spectra of the aporphines themselves [6].

More than 20 alkaloids have been studied by ^{13}C NMR spectroscopy [54, 249]. It has been established that the replacement of a methoxyl by a hydroxyl at C_1 causes a downfield shift of the signals of the carbon atoms at 1a (9-10 ppm), 2 (6 ppm), and 3a (4.5-5.0 ppm), and the same substitution at C_{11} causes a downfield shift of the carbon atoms at 11a (3.5-4.5 ppm) and 10 (2.5-3.0) [54]. It has been shown that in alkaloids with a hydroxy group at C_9, there is a downfield shift of the signals of the ortho carbon atoms by 3-4 ppm, while the signals of the para carbon atoms do not change. The replacement of two methoxy groups by a methylenedioxy group in ring A at C_1 and C_2 causes an upfield shift of the signals of the carbon atoms C_{1a} ($\sim$11 ppm), and C_2 (5.5-6.0 ppm), and C_{3a} (2.0-3.0 ppm) while the same substitution in ring D at C_9 and C_{10} causes upfield shifts of the carbon atoms C_{7a} (3.0-3.5 ppm), C_8 (2.0-2.5 ppm), and C_{11} ($\sim$4.0 ppm) [54].

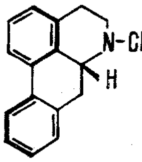
In the quaternary alkaloids, as compared with the tertiary alkaloids, paramagnetic shifts of the C_5 and C_{6a} signals by 7.0-8.0 ppm are observed, while the C_4 and C_7 signals undergo diamagnetic shifts of 5.0-6.0 and $\sim$4.0 ppm, respectively [54].

All the aporphine alkaloids have a twisted biphenyl structure and an asymmetric center adjacent to the nitrogen atom. It has been shown that the sign of the specific rotation depends on the absolute configuration [20, 55-57]. If the alkaloid is dextrorotatory, the absolute configuration of the asymmetric center is S, and if levorotatory it is R.



A

S- configuration



B

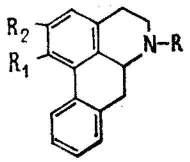
R- configuration

It has been established that 1,2,9,10-tetrasubstituted aporphine alkaloids with the S-configuration have a negative Cotton effect in the ORD spectra at about 320 nm, while the 1,2,10,11-tetrasubstituted aporphines with the configuration show a positive Cotton effect. It was later found [58] that the sign of the intense Cotton effect in the 235-245 nm region does not depend on the nature of the substitution and for the alkaloids of the S-series it is characterized by a positive Cotton effect and for the R-series by a negative one.

So far as concerns the confirmation of the aporphine alkaloids, in the opinion of a number of authors [20, 59] the biphenyl system can exist in two possible conformations: A and B. However, a study of aporphine alkaloids permitted Shamma to conclude that diastereoisomerism is impossible in the aporphine series [56] and the S-series always corresponds to conformation A and the R-series to B.

The effect of the anomalous scattering of x-rays by halogen or oxygen atoms has also been used to establish the absolute configurations of molecules. The absolute configurations of some aporphine alkaloids have been determined by this method [60-66].

TABLE 1

Alkaloid	Structure	Source of isolation		Literature
		Family	Number of genera	
				
1. (Caaverine, mp 208°C (decomp.), [α]D −89°(methanol) +95 (methanol)	R=H R_1=OH R_2=OCH_3	Annonaceae, Lauraceae, Magnoliaceae, Symplocaceae	4	6, 67, 68, 175, 180
2. Lirinidine, mp 214—215°	R=CH_3 R_1=OH R_2=OCH_3	Lauraceae, Magnoliaceae, Papaveraceae	3	6, 68, 180
3. Asimilobine, mp 177−179° [α]D —213° (chloroform)	R=H R_1=OCH_3 R_2=OH	Annonaceae, Aristolochiaceae, Lauraceae, Magnoliaceae, Nympheaceae, Rhamnaceae	10	6, 68—70, 110, 181
4. N-Methylasimilobine, mp 195—196°, [α]D —220° (chloroform)	R=CH_3 R_1=OCH_3 R_2=OH	Annonaceae, Nympheaceae, Papaveraceae, Rhamnaceae	4	6, 71, 91, 183.
5. Nornuciferine, mp 128—129°, [α]D —145°(ethanol) +140° (ethanol)	R=H R_1=R_2=OCH_3	Annonaceae, Magnoliaceae, Nympheaceae, Rhamnaceae.	9	6, 67, 71, 81, 110, 180. 181—184
6. N-Acetylnornuciferine, mp 229—230°, [α]D —406° (chloroform)	R=COCH_3 R_1=R_2=OCH_3	Magnoliaceae	1	6, 70, 77
7. Nuciferine, mp 165°, [α]D —164° (ethanol)	R=CH_3 R_1=R_2=OCH_3	Araceae, Berberidaceae, Lauraceae, Magnoliaceae, Menispermaceae, Nympheaceae, Papaveraceae, Rhamnaceae	10	6, 71, 110, 183
8. Anonaine, mp 122°, [α]D —68° (ethanol)	R=H $R_{1,2}$=CH_2O_2	Annonaceae, Lauraceae, Magnoliaceae, Monimiaceae, Nympheaceae, Papaveraceae, Rhamnaceae	13	6, 67. 71—74, 181, 183—185
9. Remerine, mp 100—103°, [α]D −97° (ethanol); +68° (ethanol)	R=CH_3 $R_{1,2}$=CH_2O_2	Annonaceae, Lauraceae, Magnoliaceae, Menispermaceae, Monimiaceae, Nympheaceae, Papaveraceae, Rhamnaceae	13	6, 67, 71, 74, 75, 181, 183, 185
10. Isoremerine, mp 87—88°, [α]D −71° (ethanol); +69,9° (ethanol)	R=CH_3 $R_{1,2}$=CH_2O_2	Magnoliaceae, Papaveraceae	3	78, 79
11. Remrefidine, mp 223—224°	R=$(CH_3)_2$ $R_{1,2}$=CH_2O_2	Papaveraceae	2	6, 76
12. N-Acetylasimilobine, mp 280—282°, [α]D —405° (pyridine)	R=COCH_3 R_1=OCH_3 R_2=OH	Magnoliaceae	1	6, 77

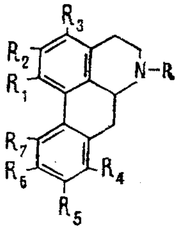
Alkaloid	Structure	Source of isolation		Literature
		Family	Number of genera	
13. N-Acetylanonaine, mp 229—230°, $[\alpha]_D$ —356° (chloroform)	$R=COCH_3$ $R_{1,2}=CH_2O_2$ 	Magnoliaceae	1	77, 202
14. Stephalagine, mp 128—130°, $[\alpha]_D$ —30° (chloroform)	$R=CH_3$ $R_{1,2}=CH_2O_2$ $R_4=R_5=R_6=R_7=H$ $R_3=OCH_3$	Menispermaceae	1	6
15. Norstephalagine	$R_{1,2}=CH_2O_2$ $R_3=OCH_3$ $R=R_4=R_5=R_6=R_7=H$	Annonaceae	1	245
16. Liridinine, mp 142—144°, $[\alpha]_D$ —38° (chloroform)	$R=CH_3$ $R_1=R_3=OCH_3$ $R_2=OH$ $R_4=R_5=R_6=R_7=H$	Magnoliaceae	1	80
17. O-Methyl-N-norlirinine	$R_1=P_2=P_3=OCH_3$ $R=R_4=R_5=R_6=R_7=H$	Magnoliaceae	1	81
18. Isopiline, mp 153°, $[\alpha]_D$ —55° (methanol)	$R_1=OH$ $R_2=R_3=OCH_3$ $R=R_4=R_5=R_6=R_7=H$	Annonaceae	1	67
19. N-methylisopiline, mp 220—222° $[\alpha]_D$ —56° (methanol)	$R=CH_3$ $R_1=OH$ $R_2=R_3=OCH_3$ $R_4=R_5=R_6=R_7=H$	Annonaceae	1	67
20. Lirinine, mp 152—154°, $[\alpha]_D$ —55° (chloroform)	$R=CH_3$ $R_1=P_2=OCH_3$ $R_3=OH$ $R_4=R_5=R_6=R_7=H$	Magnoliaceae	1	6, 80, 81, 154
21. Lirinine N-oxide, mp 162—164° (decomp.) $[\alpha]_D$ —49.9° (methanol)		Magnoliaceae	1	6, 80, 81, 154
22. O-Methylirinine, $[\alpha]_D$ —52.9° (chloroform)	$R=CH_3$ $R_1=R_2=R_3=OCH_3$ $R_4=R_5=R_6=R_7=H$	Magnoliaceae	1	6, 81, 147
23. Tuliferoline, mp 145—146°, $[\alpha]_D$ —330° (chloroform)	$R=COCH_3$ $R_1=R_2=R_3=OCH_3$ $R_4=R_5=R_6=R_7=H$	Magnoliaceae	1	77, 202
24. Stephanine, mp 155—157°, $[\alpha]_D$ —92.5° (chloroform)	$R=CH_3$ $R_{1,2}=CH_2O_2$ $R_4=OCH_3$ $R_3=R_5=R_6=R_7=H$	Magnoliaceae, Menispermaceae	2	6
25. Anolobine, mp 242—244° (decomp.) $[\alpha]_D$ —19° (chloroform — methanol)	$R_{1,2}=CH_2O_2$ $R_5=OH$ $R=R_3=R_4=R_6=R_7=H$	Annonaceae, Magnoliaceae	3	6, 181
26. Remeroline, mp 228—231°	$R=CH_3$ $R_{1,2}=CH_2O_2$ $R_5=OH$ $R_3=R_4=R_6=R_7=H$	Papaveraceae	1	6
27. Xylopine, mp 124—125°, $[\alpha]_D$ —23.4° (methanol)	$R_{1,2}=CH_2O_2$ $R_5=OCH_3$ $R=R_3=R_4=R_6=R_7=H$	Annonaceae	1	6, 185, 186

TABLE 1 (Continued)

Alkaloid	Structure	Source of isolation		Literature
		Family	Number of genera	
28. Isolaureline, mp 108—110°, $[\alpha]_D$ —36° (ethanol)	$R=CH_3$ $R_{1,2}=CH_2O_2$ $R_5=OCH_3$ $R_3=R_4=R_6=R_7=H$	Annonaceae, Magnoliaceae, Monimiaceae	4	6
29. Norlaureline, mp . 208—209°, $[\alpha]_D$ —336° (methanol)	$R_{1,2}=CH_2O_2$ $R_6=OCH_3$ $R=R_3=R_4=R_5=R_7=H$	Annonaceae	1	82, 246
30. Sparsiflorine, mp 228°, $[\alpha]_D$ + 43° (H_2O+HCl)	$R_1=R_6=OH$ $R_2=OCH_3$ $R=R_3=R_4=R_5=R_7=H$	Annonaceae, Euphorbiaceae	2	6, 187
31. Apoglasiovine, mp 149° (decomp.) $[\alpha]_D$ —35° (chloroform)	$R=CH_3$ $R_1=R_6=OH$ $R_2=OCH_3$ $R_3=R_4=R_5=R_7=H$	Euphorbiaceae, Lauraceae	2	6, 68
32. Apocrotonosine	$R_1=OCH_3$ $R_2=R_6=OH$ $R=R_3=R_4=R_5=R_7=H$	Euphorbiaceae	1	6
33. Base 2, mp 198—200°, $[\alpha]_D$ +160° (chloroform)	$R=CH_3$ $R_2=OH$ $R_1=R_6=OCH_3$ $R_3-R_4=R_5=R_7=H$	Lauraceae	1	6
34. Tuduranine, mp 125°, $[\alpha]_D$ —131° (methanol+HCl)	$R_1=R_2=OCH_3$ $R_6=OH$ $R=R_3=R_4=R_5=R_7=H$	Menispermaceae	2	6
35. Nuciferoline, mp . 212 -214°, $[\alpha]_D$ −154° (ethanol)	$R=CH_3$ $R_1=R_2=OCH_3$ $R_6=OH$ $R_3=R_4=R_5=R_7=H$	Papaveraceae	1	6
36. Mecambroline, mp 252°, $[\alpha]_D$ — 76,5° (chloroform)	$R=CH_3$ $R_{1,2}=CH_2O_2$ $R_6=OH$ $R_3=R_4=R_5=R_7=H$	Lauraceae, Monimiaceae, Papaveraceae	4	6
37. Michepressine, mp 235—236° (iodide) $[\alpha]_D$ —131° (ethanol)	$R=(CH_3)_2$ $R_{1,2}=CH_2O_2$ $R_6=OH$ $R_3=R_4=R_5=R_7=H$	Magnoliaceae	1	6
38. O-Methylmichepressine, mp 220-222° (decomp., iodide) $[\alpha]_D$ +116.9° (methanol)	$R=(CH_3)_2$ $R_{1,2}=CH_2O_2$ $R_6=OCH_3$ $R_3=R_4=R_5=R_7=H$	Magnoliaceae	1	6
39. Laureline, mp 97°, $[\alpha]_D$ —98,5° (ethanol)	$R=CH_3$ $R_{1,2}=CH_2O_2$ $R_6=OCH_3$ $R_3=R_4=R_5=R_7=H$	Monimiaceae	1	6
40. Zenkerine	$R_1=OH$ $R_2=R_6=OCH_3$ $R=R_3=R_4=R_5=R_7=H$	Annonaceae	1	67
41 N-Methylzenkerine (pulchine)	$R=CH_3$ $R_1=OH$ $R_2=R_6=OCH_3$ $R_3=R_4=R_5=R_7=H$	Lauraceae	1	245
42. Isothebaine, mp 164—166°, $[\alpha]_D$ + 281° (chloroform)	$R=CH_3$ $R_1=OH$ $R_2=R_7=OCH_3$ $R_3=R_4=R_5=R_6=H$	Papaveraceae	1	6, 83, 91, 188
43. Base, mp 260—262° (decomp., hydrochloride), $[\alpha]_D$ — 164° (methanol)	$R_{1,2}=CH_2O_2$ $R_7=OH$ $R=R_3=R_4=R_5=R_6=H$	Magnoliaceae	1	6
44. Pukateine, mp 213—215°, $[\alpha]_D$ — 261° (ethanol)	$R=CH_3$ $R_{1,2}=CH_2O_2$ $R_7=OH$ $R_3=R_4=R_5=R_6=H$	Monimiaceae	1	6

TABLE 1 (Continued)

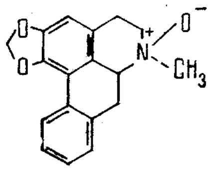
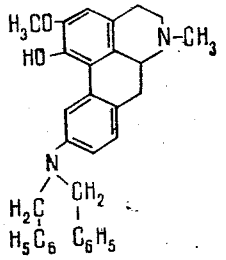
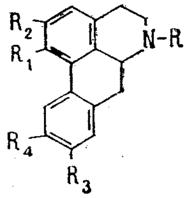
Alkaloid	Structure	Source of isolation		Literature
		Family	Number of genera	
45. O-Methylpukateine mp 136—138°, $[\alpha]_D$ −283° (chloroform)	$R=CH_3$ $R_{1,2}=CH_2O_2$ $R_7=OCH_3$ $R_3=R_4=R_5=R_6=H$	Monimiaceae	1	6
46. Puterine, mp 179—182°, $[\alpha]_D$ — 352° (methanol)	$R_{1,2}=CH_2O_2$ $R_7=OCH_3$ $R=R_3=R_4=R_5=R_6=H$	Annonaceae	1	82
47. Isothebaidine, mp 236—237° (decomp.)$[\alpha]_D$ +321° (methanol)	$R_1=R_7=OH$ $R_2=OCH_3$ $R=R_3=R_4=R_5=R_6=H$	Papaveraceae	1	83
48. Zanthoxyphylline	$R=(CH_3)_2$ $R_1=R_2=R_7=OCH_3$ $R_3=R_4=R_5=R_6=H$	Rutaceae	1	52
49. Buxifoline	$R_{1,2}=CH_2O_2$ $R_3=R_5=OCH_3$ $R=R_4=R_6=R_7=H$	Annonaceae	1	245
50. Elmerrilicine, mp 201-203° (N-acetyl derivative)	$R_{1.2}=CH_2O_2$ $R_3=OCH_3$ $R_7=OH$ $R=R_4=R_5=R_6=H$	Magnoliaceae	1	178
51. Crebanine, mp 115-118° $[\alpha]_D$ — 61° (chloroform)	$R=CH_3$ $R_{1,2}=CH_2O_2$ $R_4=R_5=OCH_3$ $R_3=R_6=R_7=H$	Menispermaceae	1	6
52. Laurepukine		Monimiaceae	1	6
53. Variabiline, mp 116—117°		Lauraceae	1	6
				
54. Laurelliptine, mp 190—192°, $[\alpha]_D$ +47°(ethanol)	$R=H$ $R_1=R_3=OH$ $R_2=R_4=OCH_3$	Lauraceae, Rhamnaceae	4	6, 69, 84
55. Isoboldine, mp 122—123°, $[\alpha]_D$ + 54° (ethanol)	$R=CH_3$ $R_1=R_3=OH$ $R_2=R_4=OCH_3$	Annonaceae, Berberidaceae, Lauraceae, Leguminosae, Menispermaceae, Monimiaceae, Papaveraceae, Ranunculaceae, Rhamnaceae, Symplocaceae	21	6, 22, 68, 69, 84—90, 129, 181, 184, 189—192

TABLE 1 (Continued)

Alkaloid	Structure	Source of isolation		Literature
		Family	Number of genera	
56. Laurifoline, mp 253° (decomp., hydrochloride)$[\alpha]_D$ +14°	$R=(CH_3)_2$ $R_1=R_3=OH$ $R_2=R_4=OCH_3$	Menispermaceae, Rutaceae	4	6, 193, 194
57. Bracteoline, mp 218–220°, $[\alpha]_D$ + 35° (chloroform)	$R=CH_3$ $R_1=R_4=OH$ $R_2=R_3=OCH_3$	Papaveraceae	2	6, 83, 88, 91, 190
58. Wilsonirine, mp 211–213° (decomp.) $[\alpha]_D$ +47° (methanol)	$R=H$ $R_1=OH$ $R_2=R_3=R_4=OCH_3$	Annonaceae, Euphorbiaceae, Papaveraceae	3	6
59. Thalicmidine (thaliporphine), mp 170–172°, $[\alpha]_D$ +44 (ethanol)	$R=CH_3$ $R_1=OH$ $R_2=R_3=R_4=OCH_3$	Berberidaceae, Lauraceae, Magnoliaceae, Papaveraceae, Fanunculaceae, Rutaceae	6	6, 83, 110, 195, 196
60. Thalicmidine N-oxide, mp 192-193°		Ranunculaceae	1	6
61. Base F, mp 218° (picrate) $[\alpha]_D$ +30° (water)	$R=(CH_3)_2$ $R_1=OH$ $R_2=R_3=R_4=OCH_3$	Rutaceae	1	6, 197, 198
62. Nordomesticine, mp 252–254°, $[\alpha]_D$ +31° (chloroform)	$R=H$ $R_1=OH$ $R_2=OCH_3$ $R_{3,4}=CH_2O_2$	Lauraceae	1	6
63. Domesticine, mp 114–115°, $[\alpha]_D$ + 44,4° (chloroform)	$R=CH_3$ $R_1=OH$ $R_2=OCH_3$ $R_{3,4}=CH_2O_2$	Berberidaceae, Lauraceae, Papaveraceae	4	6, 86, 89, 92, 190
64. Norboldine, mp 113–115°, $[\alpha]_D$ + 101° (ethanol)	$R=H$ $R_1=R_4=OCH_3$ $R_2=R_3=OH$	Annonaceae, Hernandiaceae, Lauraceae, Monimiaceae	10	6, 93, 94, 189
65. Boldine, mp 161°, $[\alpha]_D$ +111° (ethanol)	$R=CH_3$ $R_1=R_4=OCH_3$ $R_2=R_3=OH$	Lauraceae. Magnoliaceae, Monimiaceae	6	6,95
66. Norpredicentrine, mp 133°C (N-acetyl-derivative), $[\alpha]_D$ +97° (chloroform)	$R=H$ $R_2=OH$ $R_1=R_3=R_4=OCH_3$	Lauraceae	1	6,96
67. Predicentrine, mp mp 200-205° (hydrobromide), $[\alpha]_D$ +97° (ethanol)	$R=CH_3$ $R_2=OH$ $R_1=R_3=R_4=OCH_3$	Lauraceae, Magnoliaceae, Papaveraceae	5	6, 89, 97, 110, 175
68. Isodomesticine, mp 180–183°	$R=CH_3$ $R_1=OCH_3$ $R_2=OH$ $R_{3,4}=CH_2O_2$	Berberidaceae	1	6, 245
69. Norisodomesticine	$R=H$ $R_1=OCH_3$ $R_2=OH$ $R_{3,4}=CH_2O_2$	Annonaceae	1	245
70. Laurotetanine, mp 125°, $[\alpha]_D$ +95° (ethanol)	$R=H$ $R_3=OH$ $R_1=R_2=R_4=OCH_3$	Hernandiaceae, Lauraceae, Monimiaceae	12	6
71. N-Methyllaurotetanine, mp 237-238° (hydrobromide) $[\alpha]_D$ +88° (chloroform)	$R=CH_3$ $R_3=OH$ $R_1=R_2=R_4=OCH_3$	Annonaceae, Hernandiaceae, Lauraceae, Magnoliaceae, Monimiaceae, Papaveraceae, Ranunculaceae, Rhamnaceae	16	6, 85, 88, 98, 110, 184, 199
72. Xanthoplanine, mp 218–220° (decomp.) (hydrochloride)	$R=(CH_3)_2$ $R_3=OH$ $R_1=R_2=R_4=OCH_3$	Hernandiaceae, Rutaceae	2	6
73. Coxarmine, mp 205–207° (methiodide), $[\alpha]_D$ +27,9° (ethanol)	$R=(CH_3)_2$ $R_1=R_2=R_3=OCH_3$ $R_4=OH$	Menispermaceae	1	6

TABLE 1 (Continued)

Alkaloid	Structure	Source of isolation		Literature
		Family	Number of genera	
74. Norglaucine, mp 248—250° (hydrobromide) $[\alpha]_D$ +102° (methanol)	$R=H$ $R_1=R_2=R_3=R_4=OCH_3$	Annonaceae, Magnoliaceae, Rhamnaceae	7	6, 99, 100, 110, 183
75. Glaucine, mp 120—121°, $[\alpha]_D$ + 116° (methanol); —114,5° (chloroform)	$R=CH_3$ $R_1=R_2=R_3=R_4=OCH_3$	Annonaceae, Berberidaceae, Lauraceae, Magnoliaceae, Papaveraceae, Ranunculaceae, Rhamnaceae	16	6, 70, 90, 97, 99, 101—105, 110, 175, 183, 192, 195, 196, 201
76. N-Methylglaucine, mp 216—219° (methiodide), $[\alpha]_D$ —72,4°	$R=(CH_3)_2$ $R_1=R_2=R_3=R_4=OCH_3$	Papaveraceae	1	6
77. Nornantenine, mp 163—164° $[\alpha]_D$ +85° (chloroform)	$R=H$ $R_1=R_2=OCH_3$ $R_{3,4}=CH_2O_2$	Berberidaceae, Lauraceae	2	6, 106
78. Nantenine, mp 139—141°, $[\alpha]_D$ + 93° (chloroform)	$R=CH_3$ $R_1=R_2=OCH_3$ $R_{3,4}=CH_2O_2$	Berberidaceae, Lauraceae	3	6, 200
79. N-Methylnantenine, mp 213—214°, $[\alpha]_D$ +39° (ethanol)	$R=(CH_3)_2$ $R_1=R_2=OCH_3$ $R_{3,4}=CH_2O_2$	Ranunculaceae	1	247
80. N-Acetylnornantenine, mp 283—284°, $[\alpha]_D$ + 340° (chloroform)	$R=COCH_3$ $R_1=R_2=OCH_3$ $R_{3,4}=CH_2O_2$	Magnoliaceae	1	6, 201. 202
81. Actinodaphnine, mp 203-205° $[\alpha]_D$ +39° (chloroform)	$R=H \quad R_3=OH$ $R_{1,2}=CH_2O_2$ $R_4=OCH_3$	Hernandiaceae, Lauraceae	6	6, 107, 111, 133
82. N-Methylactinodaphine, mp 210—212°, $[\alpha]_D$ + 62° (chloroform)	$R=CH_3 \quad R_3=OH$ $R_{1,2}=CH_2O_2$ $R_4=OCH_3$	Annonaceae, Lauraceae	5	6
83. Phanostenine, mp 126—128°, $[\alpha]_D$ — 39° (chloroform)	$R=CH_3 \quad R_4=OH$ $R_{1,2}=CH_2O_2$ $R_3=OCH_3$	Menispermaceae	1	6
84. Nordicentrine, mp 254—255° (decomp.)$[\alpha]_D$ +31° (methanol)	$R=H$ $R_{1,2}=CH_2O_2$ $R_3=R_4=OCH_3$	Lauraceae	1	245
85. Dicentrine, mp 162—163°, $[\alpha]_D$ — 53° (chloroform); +57° (ethanol)	$R=CH_3$ $R_{1,2}=CH_2O_2$ $R_3=R_4=OCH_3$	Annonaceae, Lauraceae, Menispermaceae. Papaveraceae	11	6, 101, 105, 108, 133, 203—205
86. Cryptodorine, mp 219-221° (decomp., sulfate), $[\alpha]_D$ +61° (chloroform)	$R=H$ $R_{1,2}=R_{3,4}=CH_2O_3$	Lauraceae	2	6, 109
87. Neolitsine, mp 149—150°, $[\alpha]_D$ + 56,5° (chloroform)	$R=CH_3$ $R_{1,2}=R_{3,4}=CH_2O_2$	Lauraceae	2	6
88. Liriofenne, mp 173-174° $[\alpha]_D$ +128,6° (chloroform)	$R=CH_3 \quad R_4=OH$ $R_1=R_2=R_3=OCH_3$	Magnoliaceae	1	110
89. Liriotulipiferine, mp 184-186°, $[\alpha]_D$ + 174,4° (CCl_4)	$R=CH_3$ $R_1=R_3=OCH_3$ $R_2=R_4=OH$	Magnoliaceae	1	110

TABLE 1 (Continued)

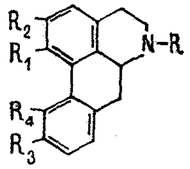
Alkaloid	Structure	Source of isolation		Literature
		Family	Number of genera	
90. Leitanine, mp 226—228°	R=H $R_1=R_3=OCH_3$ $R_2=R_4=OH$	Lauraceae	1	112
91. Litseferine, mp 258°	R=H $R_4=OH$ $R_{1,2}=CH_2O_2$ $R_3=OCH_3$	Lauraceae	1	111
				
92. Corytuberine, mp 240°, $[\alpha]_D$ + 286° (ethanol)	$R=CH_3$ $R_1=R_4=OH$ $R_2=R_3=OCH_3$	Papaveraceae	6	6, 86, 87, 113—115
93. Isocorytuberine, $[\alpha]_D$ +181° (methanol)	$R=CH_3$ $R_1=R_3=OH$ $R_2=R_4=OCH_3$	Papaveraceae	1	6, 22
94. Magnoflorine, mp 248° (decomp., iodide), $[\alpha]_D$ +193° (ethanol, iodide)	$R=(CH_3)_2$ $R_1=R_4=OH$ $R_2=R_3=OCH_3$	Annonaceae, Aristochiaceae, Berberidaceae, Euphorbiaceae, Magnoliaceae, Menispermaceae, Papaveraceae, Ranunculaceae, Rhamnaceae, Rutaceae	29	6, 113, 116—121, 183, 184, 192, 193, 195, 196, 207, 208, 211, 213—225, 209, 210
95. Norcorydine, $[\alpha]_D$ +156° (methanol)	R=H $R_1=OH$ $R_2=R_3=R_4=OCH_3$	Annonaceae, Menispermaceae, Papaveraceae	3	6, 22, 185
96. Corydine, mp 148°, $[\alpha]_D$ +204° (ethanol)	$R=CH_3$ $R_1=OH$ $R_2=R_3=R_4=OCH_3$	Annonaceae, Lauraceae, Liliaceae, Menispermaceae, Papaveraceae, Ranunculaceae, Rutaceae	10	6, 22, 86, 98, 105, 113, 114, 122, 123. 190, 192, 226
97. Corydine N-oxide $[\alpha]_D$ +154° (methanol)		Papaveraceae	1	22
98. N-Methylcorydine, mp 190—200° (iodide), $[\alpha]_D$ +154° (H_2O; iodide)	$R=(CH_3)_2$ $R_1=OH$ $R_2=R_3=R_4=OCH_3$	Annonaceae, Rutaceae	3	6, 73, 224
99. Hernovine, mp 234—235°, $[\alpha]_D$ + 142° (pyridine)	R=H $R_1=R_4=OCH_3$ $R_2=R_3=OH$	Euphorbiaceae, Hernandiaceae	2	6
100. N-Methylhernovine, mp 244—245° (hydrochloride); $[\alpha]_D$ +209° (ethanol; hydrochloride)	$R=CH_3$ $R_1=R_4=OCH_3$ $R_2=R_3=OH$	Euphorbiaceae, Hernandiaceae	2	6
101. 10-O-Methylhernovine, mp 157-158°, $[\alpha]_D$ +188° (ethanol)	R=H $R_2=OH$ $R_1=R_3=R_4=OCH_3$	Euphorbiaceae	1	6
102. N,O-Dimethylhernovine, mp 218—219° (HCl), $[\alpha]_D$ +139° (methanol)	$R=CH_3$ $R_2=OH$ $R_1=R_3=R_4=OCH_3$	Euphorbiaceae	1	6
103. Lindcarpine, mp 195° (decomp.) $[\alpha]_D$ +166° (ethanol)	R=H $R_1=R_3=OCH_3$ $R_2=R_4=OH$	Lauraceae	1	6

TABLE 1 (Continued)

Alkaloid	Structure	Source of isolation		Literature
		Family	Number of genera	
104. N-Methyllindcarpine, mp 198-200° (decomp.) $[\alpha]_D$ + 160° (chloroform)	$R=CH_3$ $R_1=R_3=OCH_3$ $R_2=R_4=OH$	Lauraceae, Magnoliaceae, Papaveraceae	5	6, 22, 105, 124
105. N-Dimethyllindcarpine, mp 249-251° (decomp., iodide) $[\alpha]_D$ +213° (ethanol; iodide)	$R=(CH_3)_2$ $R_1=R_3=OCH_3$ $R_2=R_4=OH$	Magnoliaceae, Menispermaceae, Ranunculaceae	3	6, 227
106. Suaveoline, mp 232°, $[\alpha]_D$ +164° (chloroform)	$R=CH_3$ $R_1=R_2=OCH_3$ $R_3=R_4=OH$	Annonaceae	1	6
107. Norisocorydine, mp 203—205° (decomp., hydrobromide) $[\alpha]_D$ +158° (ethanol; hydrobromide)	$R=H$ $R_4=OH$ $R_1=R_2=R_3=OCH_3$	Annonaceae, Hernandiaceae, Monimiaceae, Papaveraceae	6	6, 22
108. Isocorydine, mp 185°, $[\alpha]_D$ + 210° (chloroform)	$R=CH_3$ $R_4=OH$ $R_1=R_2=R_3=OCH_3$	Annonaceae, Berberidaceae, Hernandiaceae, Lauraceae, Menispermaceae, Monimiaceae, Papaveraceae, Ranunculaceae, Rhamnaceae	24	6, 22, 75, 86, 105, 113, 122, 125—128, 184, 190—192, 195, 212
109. Isocorydine N-oxide, mp 228—229° (hydrochloride)		Berberidaceae, Monimiaceae	2	129, 149
110. Menisperine (N-methylisocorydine), mp 219°C (decomp.) $[\alpha]_D$ +168,6° (H_2O; chloride)	$R=(CH_3)_2$ $R_4=OH$ $R_1=R_2=R_3=OCH_3$	Annonaceae, Aristochiaceae, Berberidaceae, Lauraceae, Menispermaceae, Papaveraceae, Rutaceae	11	6, 113, 184, 221
111. Catalpifoline, mp 174-175°C, $[\alpha]_D$ +220°(ethanol)	$R=H$ $R_1=R_2=R_3=R_4=OCH_3$	Hernandiaceae	1	6
112. O,O-Dimethylcorytuberine, mp 226—227° (decomp. tetrate) $[\alpha]_D$ +147° (H_2O)	$R=CH_3$ $R_1=R_2=R_3=R_4=OCH_3$	Hernandiaceae	1	6
113. Glaufine, $[\alpha]_D$ +183° (methanol)	$R=CH_3$ $R_1=OCH_3$ $R_2=R_3=R_4=OH$	Papaveraceae	1	124
114. Nandigerine, mp 176—177°, $[\alpha]_D$ +248°(ethanol)	$R=H$ $R_3=OH$ $R_{1,2}=CH_2O_2$ $R_4=OCH_3$	Hernandiaceae	1	6
115. N-Methylhernangerine, mp 169—170°, $[\alpha]_D$ +300° (chloroform)	$R=CH_3$ $R_3=OH$ $R_{1,2}=CH_2O_2$ $R_4=OCH_3$	Hernandiaceae, Lauraceae	2	6
116. Launobine, mp 214—215°, $[\alpha]_D$ + 192° (chloroform)	$R=H$ $R_3=OCH_3$ $R_{1,2}=CH_2O_2$ $R_4=OH$	Hernandiaceae, Lauraceae	4	6, 130
117. Bulbocapnine, mp 201—203°, $[\alpha]_D$ +232°(chloroform); N-methylbulbocapnine, iodide, mp 268—269°, $[\alpha]_D$ +163° (methanol)	$R=CH_3$ $R_4=OH$ $R_{1,2}=CH_2O_2$ $R_3=OCH_3$	Lauraceae, Papaveraceae	6	6, 89, 105, 108, 115, 131, 132, 204, 228, 229, 250

TABLE 1 (Continued)

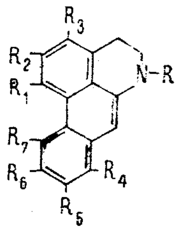
Alkaloid	Structure	Source of isolation		Literature
		Family	Number of genera	
118. O-Methylbulbocapnine, mp 129–130° $[\alpha]_D$ + 248° (chloroform)	$R=CH_3$ $R_{1,2}=CH_2O_2$ $R_3=R_4=OCH_3$	Lauraceae	1	6
119. Ovigerine, mp 300° (hydrochloride) $[\alpha]_D$ +177° (H_2O; hydrochloride)	$R=H$ $R_{1,2}=R_{3,4}=CH_2O_2$	Hernandiaceae	1	6
120. N-Methylovigerine, mp 243–245° (hydrobromide) $[\alpha]_D$ +214° (chloroform)	$R=CH_3$ $R_{1,2}=R_{3,4}=CH_2O_2$	Hernandiaceae, Lauraceae	2	6
121. Litsedine, mp 182–183°	$R=H$ $R_{1,2}=CH_2O_2$ $R_3=R_4=OCH_3$	Lauraceae	1	133
				
122. Preocoteine	$R=CH_3$ $R_1=OH$ $R_2=R_3=R_5=R_6=OCH_3$ $R_4=R_7=H$	Panunculaceae	1	6, 217
123. Preocoteine N-oxide, mp 199–200° (decomp.)		Ranunculaceae	1	6
124. O-Demethylpurpureine	$R=CH_3$ $R_1=R_5=R_6=OCH_3$ $R_2+R_3=OH+OCH_3$	Annonaceae	1	6
125. Norpurpureine, mp 115–117°	$R_1=R_2=R_3=R_5=$ $R_6=OCH_3$ $R=R_4=R_7=H$	Annonaceae	1	6
126. Purpureine (thalicsimidine), mp 131–132°, $[\alpha]_D$ + 66,9° (ethanol)	$R=CH_3$ $R_4=R_7=H$ $R_1=R_2=R_3=R_5=$ $R_6=OCH_3$	Annonaceae, Ranunculaceae	2	6, 196, 217
127. 3-Methoxy-N-acetylnomantenine	$R=COCH_3$ $R_1=R_2=R_3=OCH_3$ $R_{5,6}=CH_2O_2$ $R_4=R_7=H$	Magnoliaceae	1	6, 134, 201, 202
128. Cassythine, mp 217–219°, $[\alpha]_D$ + 24° (chloroform)	$R_{1,2}=CH_2O_2$ $R_3=R_6=OCH_3$ $R_5=OH$ $R=R_4=R_7=H$	Lauraceae	1	6
129. N-Methylcassythine, mp 210–211°, $[\alpha]_D$ +24,6° (chloroform)	$R=CH_3$ $R_5=OH$ $R_{1,2}=CH_2O_2$ $R_3=R_6=OCH_3$ $R_4=R_7=H$	Lauraceae	1	6
130. O-Methylcassyfiline, mp 150–152°, $[\alpha]_D$ + 16,4° (chloroform)	$R_{1,2}=CH_2O_2$ $R_3=R_5=R_6=OCH_3$ $R=R_4=R_7=H$	Lauraceae, Ranunculaceae	2	6
131. Thalicmine, mp 140–142°, $[\alpha]_D$ + 36,2° (ethanol)	$R=CH_3$ $R_{1,2}=CH_2O_2$ $R_3=P_5=P_6=OCH_3$ $R_4=R_7=H$	Lauraceae, Ranunculaceae	5	6, 135
132. Cassythidine, mp 206–207°, $[\alpha]_D$ +15° (chloroform)	$R_{1,2}=P_{5,6}=CH_2O_2$ $R_3=OCH_3$ $R=R_4=R_7=H$	Lauraceae	1	6

TABLE 1 (Continued)

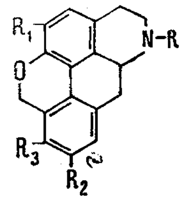
Alkaloid	Structure	Source of isolation		Literature
		family	No. of genera	
133. Thalisopynine, $[\alpha]_D$ +45° (methanol)	$R=CH_3$ $R_5=OH$ $R_1=R_2=R_3=R_6=OCH_3$ $R_4=R_7=H$	Ranunculaceae	1	136
134. Delporphine mp 116–117°, $[\alpha]_D$ +68° (ethanol)	$R=CH_3$ $R_1=R_2=R_6=OCH_3$ $R_3=R_5=OH$ $R_4=R_7=H$	Ranunculaceae	1	85
135. Noroconovine	$R=R_4=R_5=H$ $R_1=R_2=R_3=R_6=OCH_3$ $R_7=OH$	Annonaceae	1	245
136. Oconovine, $[\alpha]_D$ +156° (chloroform)	$R=CH_3$ $R_7=OH$ $R_1=R_2=R_3=R_6=OCH_3$ $R_4=R_5=H$	Lauraceae, Ranunculaceae	2	6, 128
137. O-Methyloconovine	$R=CH_3$ $R_1=R_2=R_3=R_6=$ $R_7=OCH_3$ $R_4=R_5=H$	Lauraceae	1	6
138. Ocokryptine, mp . 160-161°, $[\alpha]_D$ +164° (chloroform)	$R=CH_3$ $R_7=OH$ $R_1=R_6=OCH_3$ $R_{2,3}=CH_2O_2$ $R_4=R_5=H$	Lauraceae	1	6
139. O-Methylocokryptine, mp 170–171°, $[\alpha]_D$ + 156° (chloroform)	$R=CH_3$ $R_4=R_5=H$ $R_1=R_6=R_7=OCH_3$ $R_{2,3}=CH_2O_2$	Lauraceae	1	6
140. Hernandine, mp 240–241°, $[\alpha]_D$ + 347°	$R_{1,2}=CH_2O_2$ $R_3=R_7=OCH_3$ $R_6=OH$ $R=R_4=R_5=H$	Hernandiaceae	1	6
141. Polygospermine	$R_1=R_2=R_3=OCH_3$ $R_{6,7}=CH_2O_2$ $R=R_4=R_5=H$	Annonaceae	1	245
142. N-Methylpolygospermine	$R=CH_3$ $R_1=R_2=R_3=OCH_3$ $R_{6,7}=CH_2O_2$ $R_4=R_5=H$	Annonaceae	1	245
143. Leucoxine, mp 213–217° (decomp.), $[\alpha]_D$ +81° (ethanol)	$R=CH_3$ $R_4=OH$ $R_{1,2}=CH_2O_2$ $R_5=R_6=OCH_3$ $R_3=R_7=H$	Lauraceae	1	138
144. Ocopodine, mp 116°, $[\alpha]_D$ +87° (ethanol)	$R=CH_3$ $R_{1,2}=CH_2O_2$ $R_4=R_5=R_6=OCH_3$ $R_3=R_7=H$	Lauraceae	1	6
145. Leucoxylonine, $[\alpha]_D$ +54° (methanol)	$R=CH_3$ $R_7=H$ $R_{1,2}=CH_2O_2$ $R_3=R_4=R_5=R_6=OCH_3$	Lauraceae	1	3
146. Ocoxylonine, mp 161–162°, $[\alpha]_D$ +45° (chloroform)	$R=CH_3$ $R_7=H$ $R_{1,2}=CH_2O_2$ $R_3=R_5=R_6=OCH_3$ $R_4=OH$	Lauraceae	1	3
				
147. Bisnorthalphenine, mp 124–125°, $[\alpha]_D$ +81° (methanol)	$R=H$ $R_1=OCH_3$ $R_{2,3}=CH_2O_2$	Ranunculaceae	1	6
148. N-Demethylthaphenine, mp 179.5–180.5°, $[\alpha]_D$ +104° (methanol)	$R=CH_3$ $R_1=OCH_3$ $R_{2,3}=CH_2O_2$	Ranunculaceae	1	182

TABLE 1 (Continued)

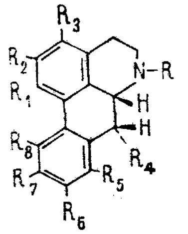
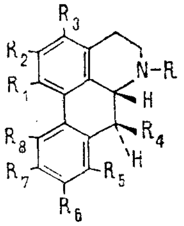
Alkaloid	Structure	Source of isolation		Literature
		Family	Number of genera	
149. Thalphenine, mp 185—186°, $[\alpha]_D$ + 69° (ethanol; chloride)	$R=(CH_3)_2$ $R_1=OCH_3$ $R_{2,3}=CH_2O_2$ 	Ranunculaceae, Rutaceae,	2	6, 137, 220, 221, 230
150. Pachyconfine, mp 198° (hydrochloride), $[\alpha]_D$ —150° (chloroform)	$R=CH_3$ $R_1=OCH_3$ $R_2=R_4=OH$ $R_3=R_5=R_6=R_7=R_8=H$	Annonaceae	1	167
151 Norushinsunine, mp 206—207°, $[\alpha]_D$ —103° (chloroform)	$R_{1,2}=CH_2O_2$ $R_4=OH$ $R=R_3=R_5=R_6=R_7=R_8=H$	Annonaceae, Magnoliaceae, Menispermaceae	8	6, 70, 110, 178, 181
152. Ushinsunine, mp 122—123°, $[\alpha]_D$ — 122° (methanol)	$R=CH_3$ $R_4=OH$ $R_{1,2}=CH_2O_2$ $R_3=R_5=R_6=R_7=R_8=H$	Annonaceae, Lauraceae, Magnoliaceae, Menispermaceae	5	6, 74
153. N-Methylushinsunine, mp 235—237°, $[\alpha]_D$ —118° (chloroform)	$R=(CH_3)_2$ $R_4=OH$ $R_{1,2}=CH_2O_2$ $R_3=R_5=R_6=R_7=R_8=H$	Magnoliaceae	1	178
154. Michelanugine, mp 275° (decomp. hydrochloride), $[\alpha]_D$ 105° (ethanol)	$R_{1,2}=CH_2O_2$ $R_4=OH$ $R_6=OCH_3$ $R=R_3=R_5=R_7=R_8=H$ 	Magnoliaceae	1	6, 142
155. Pachypodanthine, mp 128°, $[\alpha]_D$ + 38° (ethanol)	$R_{1,2}=CH_2O_2$ $R_4=OCH_3$ $R=R_3=R_5=R_6=R_7=R_8=H$	Annonaceae	2	73, 164, 165
156. N-methylpachypodanthine, mp 250° (decomp., hydrochloride), $[\alpha]_D$ +24° (ethanol)	$R=CH_3$ $R_4=OCH_3$ $R_{1,2}=CH_2O_2$ $R_3=R_5=R_6=R_7=R_8=H$	Annonaceae	1	245
157. N-Methylpachypodanthine N-oxide		Annonaceae	1	73
158. Oliveroline, mp 152°, $[\alpha]_D$ — 64° (chloroform)	$R=CH_3$ $R_4=OH$ $R_{1,2}=CH_2O_2$ $R_3=R_5=R_6=R_7=R_8=H$	Annonaceae	2	73, 164, 167
159. Oliveroline N-oxide, mp 138°, $[\alpha]_D$ —154° (ethanol)		Annonaceae	1	73
160. Guatterine, mp 146—148°, $[\alpha]_D$ — 57° (chloroform)	$R=CH_3$ $R_4=OH$ $R_{1,2}=CH_2O_2$ $R_3=OCH_3$ $R_5=R_6=R_7=R_8=H$	Annonaceae	3	6, 145, 164, 167

TABLE 1 (Continued)

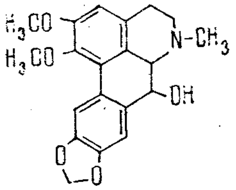
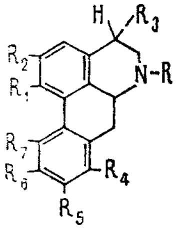
Alkaloid	Structure	Source of isolation		Literature
		Family	Number of genera	
161. Guatterine N-oxide, mp 196°, $[\alpha]_D$ −43° (chloroform)		Annonaceae	1	**167**
162. Oliveridine, mp 95-100°, $[\alpha]_D$ − 28° (chloroform)	$R=CH_3$ $R_4=OH$ $R_{1,2}=CH_2O_2$ $R_6=OCH_3$ $R_3=R_5=R_7=R_8=H$	Annonaceae	2	6, 73, 141, 164
163. Oliveridine N-oxide, mp 208-209°, $[\alpha]_D$ − 51° (ethanol)		Annonaceae	1	141
164. Noroliveridine	$R_{1,2}=CH_2O_2$ $R_4=OH$ $R_6=OCH_3$ $R=R_3=R_5=R_7=R_8=H$	Annonaceae	1	73
165. Oliverine, mp 250° (hydrochloride) $[\alpha]_D$ +73° (ethanol; hydrochloride)	$R=CH_3$ $R_{1,2}=CH_2O_2$ $R_4=R_6=OCH_3$ $R_3=R_5=R_7=R_8=H$	Annonaceae	2	6, 73, **141**, 164
166. Oliverine N-oxide, mp 134°, $[\alpha]_D$ +111° (ethanol)		Annonaceae	2	141
167. Noroliverine, mp 202°, $[\alpha]_D$ − 142° (chloroform)	$R_{1,2}=CH_2O_2$ $R_4=R_6=OCH_3$ $R=R_3=R_5=R_7=R_8=H$	Annonaceae	1	164
168. Polysuavine	$R=CH_3$ $R_{1,2}=CH_2O_2$ $R_4=OCH_3$ $R_6=OH$ $R_3=R_5=R_7=R_8=H$	Annonaceae	1	164
169. Polyalthine, mp 274° (decomp) $[\alpha]_D$ +11° (methanol)	$R=CH_3$ $R_4=OH$ $R_{1,2}=CH_2O_2$ $R_3=R_6=OCH_3$ $R_5=R_7=R_8=H$	Annonaceae	1	164
170. Duguetine, mp 149—150°, $[\alpha]_D$ − 41° (ethanol)	$R=CH_3$ $R_4=OH$ $R_{1,2}=CH_2O_2$ $R_6=R_7=OCH_3$ $R_3=R_5=R_8=H$	Annonaceae	1	6
171. 7-Hydroxynantenine		Berberidaceae	1	6
				
172. Steporphine, mp 177—179° $[\alpha]_D$ — 90,6° (methanol)	$R=CH_3$ $R_3=OH$ $R_{1,2}=CH_2O_2$ $R_4=R_5=R_6=R_7=H$	Menispermaceae, Monimiaceae	2	6, 243
173. Glaufidine, $[\alpha]_D$ +182° (methanol)	$R=CH_3$ $R_1=R_3=OH$ $R_2=R_6=R_7=OCH_3$ $R_4=R_5=H$	Papaveraceae	1	45

TABLE 1 (Continued)

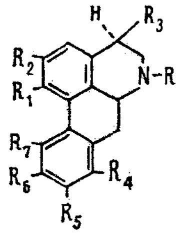
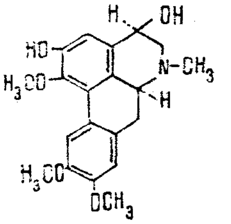
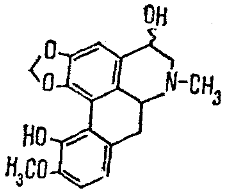
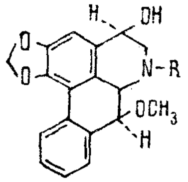
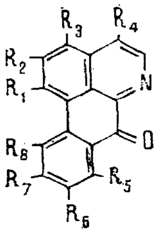
Alkaloid	Structure	Source of isolation		Literature
		Family	Number of genera	
				
174. Episteporphine, mp 198°, $[\alpha]_D$ −35° (chloroform)	$R=CH_3$ $R_3=OH$ $R_{1,2}=CH_2O_2$ $R_4=R_5=R_6=R_7=H$	Rhamnaceae	1	6, 183
175. Cataline, mp 183°, $[\alpha]_D$ +166° (chloroform)	$R=CH_3$ $R_3=OH$ $R_1=R_2=R_5=R_6=OCH_3$ $R_4=R_7=H$	Papaveraceae	1	6, 168–170
176. 4-Hydroxy-nornantenine	$R_1=R_2=OCH_3$ $R_3=OH$ $R_{5,6}=CH_2O_2$ $R=R_4=R_7=H$	Lauraceae	1	171
177. Srilankine, $[\alpha]_D$ +122° (methanol)		Lauraceae	1	172
178. 4-Hydroxylbulbocapnine, mp 231–233° $[\alpha]_D$ +100° (chloroform)		Papaveraceae	1	173
				
179. Norpachystaudine, mp 214–216°, $[\alpha]_D$ +5° (chloroform)	$R=H$	Annonaceae	1	245
180. Pachystaudine, mp 157°, $[\alpha]_D$ +34°	$R=CH_3$	Annonaceae	1	245
				

TABLE 1 (Continued)

Alkaloid	Structure	Source of isolation		Literature
		Family	Number of genera	
181. Lysicamine, mp 210–211° (decomp.)	$R_1=R_2=OCH_3$ $R_3=R_4=R_5=R_6=R_7=R_8=H$	Annonaceae, Araceae, Magnoliaceae, Menispermaceae, Rhamnaceae	6	6, 139, 140, 164, 183, 184
182. Liriodenine, mp 280–282° (decomp.)	$R_{1,2}=CH_2O_2$ $R_3=R_4=R_5=R_6=R_7=R_8=H$	Annonaceae, Araceae, Eupomatiaceae, Lauraceae, Magnoliaceae Menispermaceae, Monimiaceae, Nympheaceae, Papaveraceae, Rhamnaceae	32	6, 70, 73, 74, 80, 110, 140–142, 175 178, 180, 183–185, 216, 231–239, 248
183. Liriodendronine, mp 265-270° (decomp.)	$R_1=R_2=OH$ $R_3=R_4=R_5=R_6=R_7=R_8=H$	Magnoliaceae	1	143
184. Moschatoline, mp 190–200°, (O-acetyl derivative)	$R_1=R_3=OCH_3$ $R_2=OH$ $R_4=R_5=R_6=R_7=R_8=H$	Monimiaceae	1	6
185. O-Methylmoschatoline, mp 188° (decomp.)	$R_1=R_2=R_3=OCH_3$ $R_4=R_5=R_6=R_7=R_8=H$	Annonaceae, Magnoliaceae, Menispermaceae	6	6, 139, 145, 148, 184, 240
186. Atherospermidine mp 283–285° (decomp.)	$R_{1,2}=CH_2O_2$ $R_3=OCH_3$ $R_4=R_5=R_6=R_7=R_8=H$	Annonaceae, Monimiaceae	3	6, 184
187. Splendidine, mp 235°	$R_1=R_2=R_4=OCH_3$ $R_3=R_5=R_6=R_7=R_8=H$	Menispermaceae	1	144
188. Oxostephanine, mp 270–272°	$R_{1,2}=CH_2O_2$ $R_5=OCH_3$ $R_3=R_4=R_6=R_7=R_8=H$	Menispermaceae	1	146, 164
189. Lanuginosine, mp 319–321°	$R_{1,2}=CH_2O_2$ $R_6=OCH_3$ $R_3=R_4=R_5=R_7=R_8=H$	Annonaceae, Magnoliaceae, Menispermaceae	8	6, 53, 73, 80, 141, 142, 146, 234, 239, 241
190. 10-Methoxyliriodenine (oxolaurelline), mp 268°	$R_{1,2}=CH_2O_2$ $R_7=OCH_3$ $R_3=R_4=R_5=R_6=R_8=H$	Annonaceae, Magnoliaceae, Monimiaceae	3	6, 52, 53, 238
191. Oxopukateine, mp 255–257°	$R_{1,2}=CH_2O_2$ $R_8=OH$ $R_3=R_4=R_5=R_6=R_7=H$	Annonaceae	1	148
192. Oxoputerine, mp 241–242° (decomp.)	$R_{1,2}=CH_2O_2$ $R_8=OCH_3$ $R_3=R_4=R_5=R_6=R_7=H$	Annonaceae	2	53, 148
193. Subsessiline, mp 235° (decomp.)	$R_1=R_2=R_6=OCH_3$ $R_3=OH$ $R_4=R_5=R_7=R_8=H$	Annonaceae	1	6
194. 1,2-Methylenedioxy-8, 9-dimethoxyoxoaporphine	$R_{1,2}=CH_2O_2$ $R_5=R_6=OCH_3$ $R_3=R_4=R_7=R_8=H$	Hernandiaceae	1	245
195. Atheroline, mp 250–260°	$R_1=R_2=R_7=OCH_3$ $R_6=H$ $R_3=R_4=R_5=R_8=H$	Monimiaceae	3	6, 150, 151
196. O-Methylatheroline, mp 225–226° (decomp.)	$R_1=R_2=R_6=R_7=OCH_3$ $R_3=R_4=R_5=R_8=H$	Annonaceae, Magnoliaceae, Papaveraceae	4	6, 70, 76, 97 110, 180
197. Oxonantenine, mp 215–218° (decomp.)	$R_1=R_2=OCH_3$ $R_{6,7}=CH_2O_2$ $R_3=R_4=R_5=R_8=H$	Lauraceae	1	6
198. Dicentrinone, mp 300° (decomp.)	$R_{1,2}=CH_2O_2$ $R_6=R_7=OCH_3$ $R_3=R_4=R_5=R_8=H$	Hernandiaceae, Lauraceae, Papaveraceae	4	6, 101
199. Cassameridine, mp 300°	$R_{1,2}=R_{6,7}=CH_2O_2$ $R_3=R_4=R_5=R_8=H$	Lauraceae	1	6
200. Glaunine	$R_1=R_2=R_7=OCH_3$ $R_8=OH$ $R_3=R_4=R_5=R_6=H$	Papaveraceae	1	22, 152

TABLE 1 (Continued)

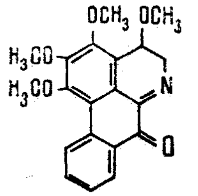
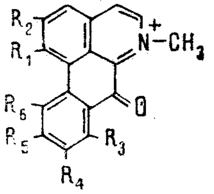
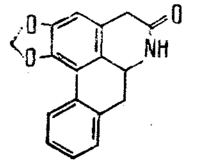
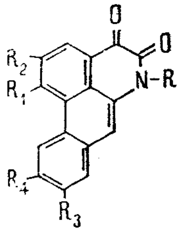
Alkaloid	Structure	Source of isolation		Literature
		Family	Number of genera	
201. Hernandonine, mp 298—300°	$R_{1,2}=R_{7,8}=CH_2O_2$ $R_3=R_4=R_5=R_6=H$	Hernandiaceae, Lauraceae	2	6
202. Oxopurpureine, mp 198—202°	$R_1=R_2=R_3=R_6=R_7=OCH_3$ $R_4=R_5=R_8=H$	Annonaceae	1	6
203. Thalicminine, mp 274—277°	$R_{1,2}=CH_2O_2$ $R_3=R_6=R_7=OCH_3$ $R_4=R_5=R_8=H$	Lauraceae, Ranunculaceae	2	6, 217, 242
204. Cassamedine, mp 248°	$R_{1,2}=R_{6,7}=CH_2O_2$ $R_3=OCH_3$ $R_4=R_5=R_8=H$	Lauraceae, Monimiaceae	2	6, 153, 231
205. Imenine, mp 206—207°	$R_1=R_2=R_3=R_4=OCH_3$ $R_5=R_6=R_7=R_8=H$	Menispermaceae	1	6, 145
206. Dihydroimenine, mp 205°		Menispermaceae	1	6
				
207. Corunnine (glauvine), mp 255—257°	$R_1=OH$ $R_2=R_4=R_5=OCH_3$ $R_3=R_6=H$	Magnoliaceae, Papaveraceae	2	6, 9, 110, 155—157
208. Nandazurine, mp 300°	$R_1=OH$ $R_2=OCH_3$ $R_{4,5}=CH_2O_2$ $R_3=R_6=H$	Berberidaceae	1	6, 156
209. Alkaloid PO$_3$	$R_1=OH$ $R_2=R_6=OCH_3$ $R_3=R_4=R_5=H$	Papaveraceae	1	6
210. Glaunidine, mp 230—232°	$R_1=OH$ $R_2=R_5=R_6=OCH_3$ $R_3=R_4=H$	Papaveraceae	1	22, 152
211. Fuseine, mp 280° (decomp.)		Annonaceae	1	231
				
212. Cepharadione A, mp 340-342°,	$R=CH_3$ $R_{1,2}=CH_2O_2$ $R_3=R_4=H$	Menispermaceae, Piperaceae	2	6, 158, 159

TABLE 1 (Continued)

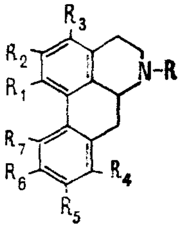
Alkaloid	Structure	Source of isolation		Literature
		Family	Number of genera	
213. Cepharadione B, mp 263—264°	$R=CH_3$ $R_1=R_2=OCH_3$ $R_3=R_4=H$	Menispermaceae, Piperaceae	2	6, 158—160
214. Norcepharadione B, mp 304—307° (decomp.)	$R_1=R_2=OCH_3$ $R=R_3=R_4=H$	Menispermaceae	1	140
215. Pontevedrine, mp 269—271°	$R=CH_3$ $R_1=R_2=R_3=R_4=OCH_3$	Papaveraceae	1	5, 161—163
				
216. Dehydronuciferine, mp 130-131°	$R=CH_3$ $R_1=R_2=OCH_3$ $R_3=R_4=R_5=R_6=R_7=H$	Nympheaceae, Rhamnaceae	2	6, 174, 183
217. Dehydroanonaine	$R_{1,2}=CH_2O_2$ $R=R_3=R_4=R_5=R_6=R_7=H$	Nympheaceae	1	6
218. Dehydroisolaureline, mp 143-145°C	$R=CH_3$ $R_5=OCH_3$ $R_{1,2}=CH_2O_2$ $R_3=R_4=R_6=R_7=H$	Magnoliaceae	1	175
219. Dehydroremerine, mp 88-89°C	$R=CH_3$ $R_{1,2}=CH_2O_2$ $R_3=R_4=R_5=R_6=R_7=H$	Magnoliaceae, Nympheaceae, Rhamnaceae	3	6, 175, 183
220. Dehydroisoboldine	$R=CH_3$ $R_1=R_5=OH$ $R_2=R_6=OCH_3$ $R_3=R_4=R_7=H$	Berberidaceae	1	6
221. Dehydroglaucine, mp 133-134°C	$R=CH_3$ $R_1=R_2=R_5=R_6=OCH_3$ $R_3=R_4=R_7=H$	Magnoliaceae, Papaveraceae	2	6, 70, 110, 201
222. Dehydronantenine	$R=CH_3$ $R_1=R_2=OCH_3$ $R_{5,6}=CH_2O_2$ $R_3=R_4=R_7=H$	Berberidaceae, Lauraceae	2	6, 176, 200
223. Dehydrodicentrine, mp 218°C	$R=CH_3$ $R_{1,2}=CH_2O_2$ $R_5=R_6=OCH_3$ $R_3=R_4=R_7=H$	Lauraceae, Menispermaceae, Papaveraceae	3	6, 101, 203
224. Dehydrothalicmine, mp 203-204°C	$R=CH_3$ $R_{1,2}=CH_2O_2$ $R_3=R_5=R_6=OCH_3$ $R_4=R_7=H$	Lauraceae, Ranunculaceae	3	6
225. Dehydrocorydine	$R=CH_3$ $R_1=OH$ $R_2=R_6=R_7=OCH_3$ $R_3=R_4=R_5=H$	Papaveraceae	1	22
226. Dehydrocopodine, mp, 113°C	$R=CH_3$ $R_{1,2}=CH_2O_2$ $R_4=R_5=R_6=OCH_3$ $R_3=R_7=H$	Hernandiaceae, Lauraceae	2	5

TABLE 1 (Continued)

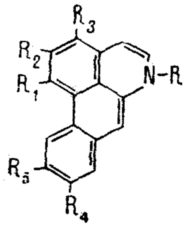
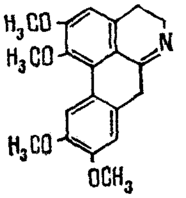
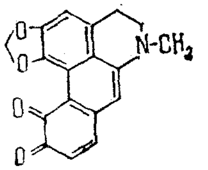
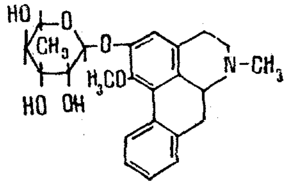
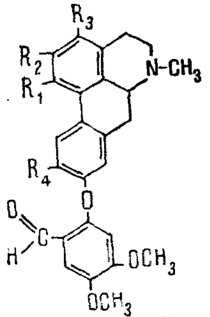
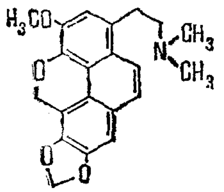
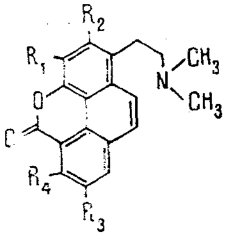
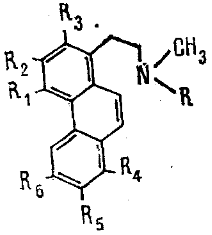
Alkaloid	Structure	Source of isolation: Family	Source of isolation: Number of genera	Literature
				
227. Didehydroremerine	$R=CH_3$ $R_{1,2}=CH_2O_2$ $R_3=R_4=R_5=H$	Papaveraceae	1	6
228. Didehydroocotiene	$R=CH_3$ $R_{1,2}=CH_2O_2$ $R_3=R_4=R_5=OCH_3$	Lauraceae	1	6
229. Dehydronorglaucine		Papaveraceae	1	6
230. 1,2-Methylenedioxy-6a,7-dehydroapoporphine-10,11-quinone; mp 218–220°C		Papaveraceae	1	89
231. Floripavidine, mp 241–242°, $[\alpha]_D$ −156° (methanol)		Papaveraceae	1	91, 177
				
232. Hernandaline, mp 170°, $[\alpha]_D$ + 35,6° (chloroform)	$R_1=R_2=R_4=OCH_3$ $R_3=H$	Hernandiaceae	1	6, 179
233. Thaliadine, mp 143–144°	$R_1=R_2=R_3=R_4=OCH_3$	Ranunculaceae	1	237
234. Thaliglucine, m 122°		Ranunculaceae	1	6

TABLE 1 (Continued)

Alkaloid	Structure	Source of isolation		Literature
		Family	Number of genera	
				
235. Thaliglucinone, mp 126–128°	$R_1=OCH_3$ $R_2=H$ $R_{3,4}=CH_2O_2$	Ranunculaceae	1	6, 121, 216, 218—220, 230, 244
236. Thalflavidine, mp 219—220°	$R_1=R_2=OCH_3$ $R_{3,4}=CH_2O_2$	Ranunculaceae	1	6
				
237. Argentinine, mp 176—177° (oxalate)	$R=CH_3$ $R_2=OH$ $R_1=OCH_3$ $R_3=R_4=R_5=R_6=H$	Annonaceae, Aristolochiaceae	3	6
238. Atherosperminine mp 161-162° (picrate)	$R=CH_3$ $R_1=R_2=OCH_3$ $R_3=R_4=R_5=R_6=H$	Annonaceae, Lauraceae, Monimiaceae	5	6
239. Noratherosperminine, mp 180°	$R_1=R_2=OCH_3$ $R=R_3=R_4=R_5=R_6=H$	Annonaceae	1	245
240. Methoxyatherosperminine, mp 161-162° (picrate)	$R=CH_3$ $R_1=R_2=R_3=OCH_3$ $R_4=R_5=P_6=H$	Annonaceae, Monimiaceae	2	6, 245, 166
241. Methoxyatherosperminine N-oxide, mp 189°C (picrate)		Annonaceae	1	245
242. Uvariopsine	$R=CH_3$ $R_5=OCH_3$ $R_{1,2}=CH_2O_2$ $R_3=R_4=R_6=H$	Annonaceaa	1	6
243. Noruvariopsamine, mp 224—225° (picrate)	$R_1=R_2=R_4=R_5=OCH_3$ $R=R_3=R_6=H$	Annonaceae	1	6
244. Uvariopsamine, mp 181-182° (picrate)	$R=CH_3$ $R_1=R_2=R_4=R_5=OCH_3$ $R_3=R_6=H$	Annonaceae	1	6
245. Uvariopsamine N-oxide, mp 184—185° (picrate)		Annonaceae	1	6
246. 8-Methoxyuvariopsine, mp 99—100°	$R=CH_3$ $R_{1,2}=CH_2O_2$ $R_4=R_5=OCH_3$ $R_3=R_6=H$	Annonaceae	1	6
247. Thalictuberine, mp 126-127°	$R=CH_3$ $R_1=R_2=OCH_3$ $R_{5,6}=CH_2O_2$ $R_3=R_4=H$	Ranunculaceae	1	6, 217

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