

# Isolation and 2D NMR Studies of Alkaloids from *Comptonella sessilifoliola*<sup>1</sup>

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<sup>1</sup> Plants of New Caledonia; Part 132. For Part 131, see: Skaltsounis, A.-L., Sbahi, S., Demetzos, C., Pusset, J. (1990) Ann. Pharm. Fr., in press.

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Received: May 16, 1990

## Abstract

Six known furanoquinoline alkaloids have been isolated from the wood and trunk bark of *Comptonella sessilifoliola* (Guillaumin) Hartley (Rutaceae). 2D NMR experiments gave the assignment of all the signals for both <sup>1</sup>H- and <sup>13</sup>C-NMR spectra. Pteleine and kokusaginine were used as models. The two-dimensional carbon-proton correlation experiments, performed for the first time on furanoquinoline alkaloids, led us to correct <sup>13</sup>C-NMR assignments previously described in the literature.

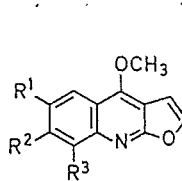
## Key words

— *RUTACEAE*

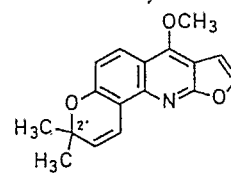
— *Comptonella sessilifoliola*, furanoquinoline alkaloids, 2D NMR, dictamnine, pteleine, evolitrine, kokusaginine, dutadrupine, *R*-(+)-platydesmine.

## Introduction

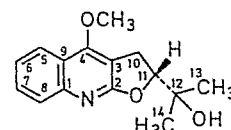
*Comptonella sessilifoliola* (Guill.) Hartley (Rutaceae) is a tree that grows to 8 m high with opposite trifoliolated leaves and four-lobed fruits. Phytochemical studies on different parts of the plant (trunk bark and wood) led to the isolation of six alkaloids. Their spectroscopic data (IR, <sup>1</sup>H-NMR, UV, mass) showed that they all belong to the group of furanoquinoline alkaloids. They have been found



	R <sup>1</sup>	R <sup>2</sup>	R <sup>3</sup>
1	H	H	H
2	H <sub>3</sub> CO	H	H
3	H	H <sub>3</sub> CO	H
4	H <sub>3</sub> CO	H <sub>3</sub> CO	H
7	H	H <sub>3</sub> CO	H <sub>3</sub> CO



5



6

unambiguously all the signals of both carbon and proton spectra for the six alkaloids (Tables 1 and 2).

For pteleine (2; Fig. 1), each of the signals of the proton spectrum can be identified as all the signals of aromatic protons show different coupling constants. The assignment of <sup>13</sup>C-NMR signals is clearly resolved by examination of the 2D spectra. For example, in the heteronuclear long-range H/C correlation spectrum, the signals at 155.4 ppm and 156.0 ppm in the carbon spectrum are respectively correlated to methoxy signals at 4.30 ppm and 3.88 ppm in the proton spectrum; furthermore, the latter <sup>13</sup>C signal is also correlated with H-8, which led us to assign the signal at 156.0 ppm to C-6 and hence the former (at

Chemical shifts								
PROTONS	H-8	H-11	H-5	H-7	H-10	OMe-4	OMe-6	
multiplicity	7.87	7.50	7.36	7.31	6.90	4.30	3.88	
CARBONS	d(9.0)	d(2.8)	d(2.9)	dd(9.0,2.9)	d(2.8)	s	s	Assignment
55.4	CH <sub>3</sub>						*	MeO-6
58.8	CH <sub>3</sub>					*		MeO-4
100.2	CH		*	◇				5
103.6	C	◇			◇			3
104.4	CH	◇			*			10
119.0	C	◇						9
122.2	CH		◇	*				7
129.0	CH	*						8
141.3	C			◇				1
143.3	CH		*		◇			11
155.4	C					◇		4
156.0	C	◇					◇	6
162.5	C	◇			◇			2

\* one bond correlations; ◇ long-range correlations

Chemical shifts								
PROTONS	H-11	H-5	H-8	H-10	OMe-4	OMe-7	OMe-6	
multiplicity	7.32	7.41	7.31	6.97	4.37	4.02	4.00	
CARBONS	d(2.7)	s	s	d(2.7)	s	s	s	Assignment
56.0 <sup>a</sup>	CH <sub>3</sub>					*		MeO-6, MeO-7
58.8	CH <sub>3</sub>					*		MeO-4
100.4	CH		*					5
102.3	C	◇			◇			3
104.5	CH				*			10
106.7	CH			*				8
113.1	C		◇					9
142.4	CH	*			◇			11
142.7	C		◇					1
147.9	C			◇			◇	6
152.8	C		◇				◇	7
155.6	C		◇			◇		4
163.1	C	◇			◇			2

<sup>a</sup> double intensity; \* one bond correlations; ◇ long-range correlations

Fig. 1 Heteronuclear correlations C-H for one bond and long-range

Fig. 2 Heteronuclear correlations C-H for one bond and long-range

mianine (7), the signals at 101.8 ppm and 114.8 ppm were assigned (8) to C-9 and C-3, but we have shown in this work that it was the opposite. Similar assignments have been made for evoxine (6), perfamine (9), (2-isopentenyl-oxy)-4,7-dimethoxyfurano[2,3-*b*]quinoline (10) and have to be corrected.

## Materials and Methods

### General

Melting points were taken on a Kofler apparatus, optical rotations were measured on a Perkin-Elmer 241 instrument and UV spectra ( $C_2H_5OH$ ,  $\lambda_{max}$ , nm) on a Perkin-Elmer Lambda 5 spectrometer. IR spectra ( $\nu$ ,  $cm^{-1}$ ,  $CHCl_3$ ) were recorded on a Perkin-Elmer 297 spectrometer.  $^1H$ -NMR,  $^{13}C$ -NMR spectra at 50.3 MHz and 2-D experiments have been recorded on a Bruker WP 200 SY spectrometer in  $CDCl_3$ . The  $\delta$  values are given in ppm with TMS as internal reference and coupling constants in Hz. Mass spectra were measured on an MS 50 instrument. Flash chromatography was performed on silica gel 60 (Merck) column and TLC on silica gel F 254 (Merck).

### Material

The plant was collected on Mount Koniambo in New-Caledonia around 800 m on October 21, 1982. A voucher is kept in the Herbarium of ORSTOM Center in Noumea under the reference Puset-Chauviere 453.

### Extractions and purifications

The sawdust (8.7 kg), wet with  $NH_4OH$ , was extracted with methylene chloride during 24 h yielding the crude alkaloids (2.4 g, 0.027% from starting material). Chromatography on silica gel H60 Merck (with  $CH_2Cl_2$ -MeOH, 99:1) led to compounds 1 (22 mg, 3%), 2 (30 mg, 4.25%), 3 (38 mg, 5.4%), and 6 (600 mg, 25%).

The trunk bark (6.4 kg), wet with  $NH_4OH$ , was extracted with methylene chloride during 48 h yielding the crude alkaloids (16 g, 0.25% from starting material). Chromatography on silica gel H60 Merck (with  $CH_2Cl_2$ -MeOH, 99:1) led to compounds 2 (1.74 g, 10.8%), 3 (1.5 g, 9.3%), 4 (4.23 g, 26%), and 5 (1.72 g, 10.7%).

**Dictamnine (1):** m.p. 128–130°C; IR: 3144, 2960, 1627, 1583, 1470; UV (neutral): 330, 315, 241, 237; MS:  $m/z$  = 199 ( $M^+$ ), 184, 156, 128, 101.

**Pteleine (2):** m.p. 136–138°C; IR: 3130, 1623, 1593, 1542, 1383, 1158; UV (neutral) 349, 307, 296, 249; MS:  $m/z$  = 229 ( $M^+$ ), 214, 186, 158, 156, 63.

**Evolitrine (3):** m.p. 114°C; IR: 3122, 2940, 1626, 1590, 1465, 1158; UV (neutral) 333, 320, 308, 247; MS:  $m/z$  = 229 ( $M^+$ ), 214, 186.

**Kokusaginine (4):** m.p. 168–169°C; IR: 3130, 1623, 1592, 1552, 1423; UV (neutral) 336, 322, 296, 251; MS:  $m/z$  = 259 ( $M^+$ ), 244, 216, 201, 186, 173.

**Dutadrupine (5):** all data are identical with those published in the literature (5).

**R-(+)-Platydesmine (6):**  $[\alpha]_D^{25} = +51^\circ$  (c 1, EtOH); m.p. 136–138°C; IR: 3040, 1636, 1590, 1470, 1370; UV (neutral) 321, 307, 283, 263, 237; MS:  $m/z$  = 259 ( $M^+$ ), 200, 59.

### 2-D NMR experiments

**Heteronuclear  $^1H$ - $^{13}C$  (200/50.3 MHz) correlation:** The four experiments have been performed with the XHDEPT pulse sequence from the Bruker DISNMR 87 library program. For the two one bond correlations 128 FIDs of 1200 scans each, with 1 sec recycle delay and incrementing  $t_1$  from 5  $\mu$ sec to 640 msec, were acquired on a 0.5 M solution at 32°C. Polarization transfer was tuned for a value of  $^1J_{C,H} = 135$  Hz. After sine-bell multiplication of the FID in both domains with one degree of zero-filling in  $F_1$ , a matrix of 256/1024 data points with digital resolution (DR) = 7.2 Hz/pt in  $F_2$  and 7.8 Hz/pt in  $F_1$  was obtained. The long-range  $^1H$ - $^{13}C$  correlation was performed in similar manner with  $^1J_{C,H} = 8$  Hz and 2400 scans per FID.

### Acknowledgements

J. L. L. thanks La Caja de Ahorros de Salamanca for financial support.

### References

- Robertson, A. V. (1963) Aust. J. Chem. 16, 451.
- Werny, F., Scheuer, P. J. (1963) Tetrahedron 19, 1293.
- a) De Silva, L. B., De Silva, U. L. L., Mahendran, M., Jennings, R. (1979) Phytochemistry 18, 1255; b) Fauvel, M. Th., Gleye, J., Moulis, C., Blasco, F., Stanislas, E. (1981) Phytochemistry 20, 2059.
- a) Briggs, L. H., Colebrook, L. D. (1960) J. Chem. Soc., 2458; b) Lalhey, F. N., Lauder, I., MacCamish, M. (1969) Aust. J. Chem. 22, 431.
- Baudouin, G., Tillequin, F., Kock, M., Puset, J., Sevenet, T. (1981) J. Nat. Prod. 44, 546.
- Brown, N. M. D., Grundon, M. F., Harrison, D. M., Surgenor, S. A. (1980) Tetrahedron 36, 3579.
- Marshall, J. L. (1983) in: Carbon-Carbon and Carbon-Proton NMR Couplings, (Marchand, A. P., ed.), p. 44, Verlag Chem. Int., Deerfield Beach.
- Ahond, A., Picot, F., Potier, P., Poupat, C., Sevenet, T. (1978) Phytochemistry 17, 166.
- Rozsa, Zs., Rabik, M., Szendrei, K., Kalman, A., Argay, Gy., Pelczer, I., Aynechi, M., Mester, I., Reisch, I., (1986) Phytochemistry 25, 2005.
- Grina, J. A., Ratcliff, M. R., Stermitz, F. R. (1982) J. Org. Chem. 47, 2648.