PHYTOCHEMICAL INVESTIGATION OF *LAURELIA NOVAE-ZELANDIAE*

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Laurelia novae-zelandiae A. Cunn. (Monimiaceae, subfamily Atherspermoideae), pukatea tree, is indigenous to New Zealand (1). This plant has previously been reported to contain the proaporphine alkaloid, stepharine (2); the aporphine alkaloids, pukateine (2, 3), pukateine *N*-oxide (3, 4), pukateine *O*-methyl ether (2, 3), laureline (4), isolaureline (3), laurolitsine (2), mecambroline (2), boldine (2), isoboldine (2), obovanine (5), and roemerine (2); the oxoaporphine alkaloids, liriodenine (6), oxolaureline (lauterine) (6), and oxoputerine (5); and the benzylisoquinoline alkaloid, (−)-romneine (5).

An investigation of the alkaloid fraction of the leaves and twigs of *L. novae-zelandiae* by column chromatography led to the isolation of the known alkaloids liriodenine, lauterine, pukateine, romneine, and corydine; and the lignans, pinoresinol dimethyl ether and lirioresinol B dimethyl ether in our laboratories. This represents the first reported occurrence of corydine in the Monimiaceae and the first occurrence of lignans in the subfamily Atherospermoideae.

EXPERIMENTAL

GENERAL EXPERIMENTAL PROCEDURES.—Melting points were determined using a Kofler hot-stage instrument and are uncorrected. Spectral data were obtained using the following instruments: uv, Beckman model DB-G grating spectrophotometer; ir, Beckman model IR-18A; nmr, 60 MHz, Varian T-60A with a Nicolet model TT-7 Fourier attachment and ^{13}C probe, ms, Hitachi Perkin-Elmer model RMU-6D spectrophotometer. Silica gel PF_{254} for column chromatography was obtained from E. Merck. Reference lauterine was available in our laboratories.

Full details on the isolation and identification of isolates are available on request.

PLANT MATERIAL.—Twigs and leaves of *L. novae-zelandiae* were collected in New Zealand in December of 1973 and identified by Dr. R.E. Perdue, Jr. A voucher specimen has been deposited in the Herbarium of the National Arboretum, Agricultural Research Service, U.S. Department of Agriculture, Washington, DC.

EXTRACTION AND ISOLATION.—Coarsely milled plant material (20 kg) was exhaustively extracted with MeOH (16 liters) by percolation and the percolate evaporated *in vacuo* to yield a syrupy residue (2.3 kg). The residue was dissolved in 2 N HCl (2 liters) and filtered. An equal volume of 2 N HCl was added to the acid-insoluble residue after dissolving it in MeOH (1.5 liters). MeOH was then removed *in vacuo*. This mixture was filtered, and the process was repeated three times. The combined acid extract was basified with NH_4OH (pH 9.5-10) and extracted ten times with equal volumes of $CHCl_3$ to obtain an alkaloid fraction. Chromatography of a 190-g portion of the alkaloid fraction on silica gel PF_{254} and subsequent work-up of fractions led to the isolation of the alkaloids, liriodenine (346 mg) (7), pukateine (176 mg) (2, 7), lauterine (9.6 mg) (8), corydine (796 mg) (7), and (−)-romneine (140 mg) (5, 9, 11), and the lignans, pinoresinol dimethyl ether (1.44 g) (10), and lirioresinol B dimethyl ether (1.98 g) (10).

Identification of the alkaloids and lignans was made on the basis of comparison of their physical and spectral data (mp, $[\alpha]_D$, tlc, uv, ir, pmr, cmr, and ms) with those reported in the literature, as well as with reference samples.

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ISOLATION AND STRUCTURAL STUDIES ON THE ALKALOIDS IN FLOWERS OF *CATHARANTHUS ROSEUS*

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The flowers of *Catharanthus roseus* (L.) G.Don enjoy the reputation in the folklore of possessing hypoglycemic properties and are, therefore, administered to diabetic patients. While a large amount of work has been carried out on the alkaloidal contents of the leaves of *C. roseus* (1-6), little work has been done on the flowers of this plant. We report here the isolation of ten alkaloids from its flowers: vinblastine, coronaridine, 11-methoxytabersonine, tetrahydroalstonine, ajmalicine, catharanthine, mitraphylline, vindorosine, vindoline, and a new alkaloid that appears to be isomeric to vincristine.

EXPERIMENTAL

GENERAL EXPERIMENTAL PROCEDURES.—Spectra were recorded on Jasco-IRA-1, ir spectrophotometer, Shimadzu uv-240, uv spectrophotometer, Finnigan MAT 312, mass spectrometer and Brücker WP-100 SY nmr spectrometer.

Leaves and other plant tissues were carefully removed from the flowers of *C. roseus*. The flowers (73 kg) were then extracted with EtOH, the extracts concentrated to a dark brown gum, and the material partitioned between 5% HOAc and $CHCl_3$. The acid-soluble portion was basified with NH_3 and extracted into $CHCl_3$ to afford the crude alkaloids (34 g). These were redissolved in 5% HCl solution and extracted into $CHCl_3$ at various pH values.

The alkaloids obtained at pH 4 were loaded on a flash chromatography column (neutral alumina) and eluted with increasing polarities of petroleum ether (40-60°)-C_6H_6 (F_1), C_6H_6 (F_2), C_6H_6-$CHCl_3$ (1:1) (F_3), $CHCl_3$ (F_4), $CHCl_3$-EtOAc (1:1) (F_5), EtOAc (F_6), and MeOH (F_7).

THE FRACTIONS.—Fraction (F_3) (9 g) was again loaded on a silica column and eluted with 80% $CHCl_3$-20% petroleum ether (40-60°). The eluates were concentrated and subjected to preparative tlc on silica plates in 80% petroleum ether-20% Me_2CO to afford a compound identified as coronaridine (8 mg) by comparison of its spectral data with those reported in the literature (7). Further elution of the same column with $CHCl_3$-EtOAc (1:1) afforded another fraction that was subjected to preparative tlc on silica plates in 72% petroleum ether-28% Me_2CO to afford 11-methoxytabersonine (5 mg) which was identified by comparison of its ir, uv, nmr ($CDCl_3$) and mass spectra with those reported in the literature (8).

Fraction (F_4) (11 g) was chromatographed on an alumina column and eluted with petroleum ether and then with $CHCl_3$. The $CHCl_3$ eluates afforded a mixture of alkaloids that were purified by preparative tlc on silica plates in 70% petroleum ether-30% Me_2CO. The faster-moving alkaloid was identified as tetrahydroalstonine (10 mg) by comparing its spectral data with those reported in the literature (9). The slower-moving alkaloid was identified as ajmalicine (20 mg) by direct tlc comparison with an authentic sample and by comparison of spectral data (10). Further elution of the same column with EtOAc gave another fraction containing an alkaloid that was further purified by preparative tlc on silica plates in 68% petroleum ether-32% Me_2CO. The alkaloid was identified as vindorosine (15 mg) by comparison of spectral data (11) (ir, uv, nmr, ms).

Fraction (F_5) (8 g) was loaded on a silica column and eluted with EtOAc-EtOH (1:1) to give a fraction containing two alkaloids that were separated by preparative tlc on silica plates in 55% petroleum ether-45% Me_2CO. The faster-moving alkaloid was identified as catharanthine (13 mg) by direct chromatographic comparison with an authentic sample isolated by us from the leaves of *C. roseus* as well as by comparison of spectral data (12). The slower-moving alkaloid was similarly identified as mitraphylline (13) (5 mg).

Another fraction obtained on elution of the column with the same solvent system was found to contain one major compound that was separated and purified by preparative tlc on silica plates in 50% Me_2CO-