Phytochemistry, 1972, Vol. 11, pp. 2527 to 2529. Pergamon Press. Printed in England.

SHORT COMMUNICATION

DISTRIBUTION OF LITTORINE AND OTHER ALKALOIDS IN THE ROOTS OF *DATURA* SPECIES

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(*Received* 7 *December* 1971, *in revised form* 10 *February* 1972)

Key Word Index—*Datura*; Solanaceae; tropane alkaloids; littorine; cuscohygrine.

Abstract—Littorine, various tropoyl and tigloyl esters and cuscohygrine are components of the roots of all nine *Datura* species studied. The genus exhibits a uniform alkaloid spectrum and its inclusion, with *Solandra*, in the tribe Datureae is supported on phytochemical grounds.

INTRODUCTION

LITTORINE, [(−)-3α-(2-hydroxy-3-phenylpropionyloxy)tropane], was isolated for the first time as a natural product from the aerial parts of *Anthocercis littorea* Labill.[1] and from both the aerial parts and roots of *Datura sanguinea* R. and P.[2] No evidence for its occurrence in other species has yet been reported. The root alkaloids of a number of species of *Datura* have already been extensively studied,[2–19] but in order to assess more fully the distribution of littorine and other alkaloids within the genus we have re-examined the roots of a number of species for alkaloids not previously recorded in them. Our results and their implications are reported here.

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TABLE 1. DISTRIBUTION OF TROPANE-

	D. stramonium L.	*D. ferox* L.	*D. innoxia* Mill.	*D. meteloides* DC. ex Dun.
Littorine	*	*	*	*
3,6-Ditigloyloxytropan-7-ol	†[3]	†[3]	†[4]	†[5]
3,6,-Ditigloyloxytropane	†[11]	†[4]	†[11]	†[5]
Hyoscyamine (or atropine) and hyoscine	†[13,14]	†[4,15]	†[4,15]	†[5]
Meteloidine	†[15]*	†[4,15]	†[4]	†[5]
Norhyoscine			†[4,16]	†[5]
Norhyoscyamine (or noratropine)				†[5]
Tigloidine			†[4]	
3α-Tigloyloxytropane		†[4]		*
Oscine				
3α-Acetoxytropane				
6-Isovaleryloxy-3-tigloyloxytropan-7-ol				
Apoatropine	†[14]		†[14]	
Tropine and ψ-Tropine	*	?†[4]	†[4]	†[5]
3,6-Dihydroxytropane				†[5]
Cuscohygrine	†[18]	†[18]	†[18]	*
Uncharacterised bases	*			

* Reported in this paper. † Previous report.

RESULTS AND DISCUSSION

The genus *Datura* comprises about twenty species arranged by Safford[20] into four sections. As indicated in Table 1, the results reported in this paper together with earlier results establish a marked uniformity in qualitative composition of the root alkaloid spectrum within the genus. Littorine and cuscohygrine, the latter formed biogenetically as an offshoot of the tropane pathway, are components of the roots of all the species studied. These two bases, together with tropoyl esters, the tigloyl esters of tropine and ψ-tropine, and free tropine and ψ-tropine have recently been reported[21] in five species of *Solandra*. These alkaloids therefore appear to characterize Wettstein's tribe Datureae[22] and support the inclusion of *Datura* and *Solandra* together in this tribe of the Solanaceae. Unlike those of *Solandra*, the roots of *Datura* species also contain meteloidine and the ditigloyl esters of 3α,6β-dihydroxytropane and 3α,6β,7β-trihydroxytropane but lack the 2-methylbutyryl ester of tropine found in *Solandra* roots. On current evidence, the complexity of the tropane alkaloid mixture of *Datura* is equalled in the Solanaceae only by that of certain woody members of the tribe Salpiglossideae such as *Duboisia*. Alkaloid studies on further species of *Datura* are in progress.

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TYPE ALKALOIDS IN *Datura* ROOTS

D. metel L. var. *fastuosa* (Bernh.) Danert	*D. leichhardtii* Muell. ex Benth.	*D. cornigera* Hook.	*D. candida* (Persoon) Safford	*D. sanguinea* R. & P.
*	*	*	*	†[2]
†[6]	†[7]	†[8]	†[9]	†[10]
†[6]	†[12]	†[8]		†[10]
†[6]	*	†[8]	†[9]	†[10]
	†[7]		†[9]	†[2]
			†[9]	
†[17]		†[8]	†[9]	
*	†[7]*	*	*	
	†[7]		†[9]	†[2]
			†[9]	†[2]
				†[2]
				†[2]
†[6]			†[9]	†[10]
		†[8]		
†[18]	*	*	*	*
†[19]	†[7]	†[8]	†[9]	†[2]

EXPERIMENTAL

In those instances where alkaloids were isolated as derivatives, the powdered roots (20–100 g) were extracted and the alkaloids fractionated by methods previously described.[2–11] The littorine–meteloidine–hyoscyamine–atropine mixture so obtained in the $CHCl_3$ eluate from partition chromatography was further resolved on alumina (isolation of meteloidine) followed by rechromatography at pH 6·8 (separation of littorine and hyoscyamine–atropine). In cases where the alkaloids were characterized by chromatographic evidence alone, the root (400 mg) was extracted with EtOH–$CHCl_3$ (1:1) and the evaporated extract, after purification by acid–base partition, submitted to PC and TLC using at least one system which gives a clear characterization of the alkaloid concerned. Littorine was identified by co-chromatography on SiO_2 ($CHCl_3$–$NHEt_2$, 9:1) with iodoplatinate as spray reagent.

D. stramonium root-Meteloidine: m.p., m.m.p. and IR of picrate, TLC (2 systems); previously indicated[15] by PC. Littorine: co-chromatography. Tropine and ψ-tropine: TLC (2 systems), PC (1 system).

D. ferox root-Littorine: m.p., m.m.p. and IR of picrate, co-chromatography. *D. innoxia* root-Littorine: m.p., m.m.p. and IR of picrate, co-chromatography; previously indicated[23] by dilution analysis. *D. meteloides* root-Littorine: m.p., m.m.p. and IR of picrate, co-chromatography. 3α-Tigloyloxytropane: m.p., m.m.p. and IR of picrate, TLC (2 systems). Cuscohygrine: m.p., m.m.p. and IR of picrate, TLC (2 systems), PC (1 system). *D. metel* root-Littorine: present in similar proportion to hyoscyamine–atropine, co-chromatography. Tigloidine: TLC (2 systems). *D. leichhardtii* root-Littorine: very low proportion compared with hyoscyamine–atropine content, co-chromatography. Tigloidine: TLC (2 systems), confirming previous tentative identification.[7] Cuscohygrine: TLC (2 systems), PC (1 system). Hyoscyamine: TLC (2 systems), PC (1 system). Hyoscine: TLC (3 systems), PC (1 system). *D. cornigera* root-Littorine: co-chromatography. Tigloidine: TLC (2 systems). Cuscohygrine: TLC (2 systems) and PC (1 system); a re-examination of the picrate having some characters of cuscohygrine, reported earlier by Evans and Than,[8] showed it to be a mixture of cuscohygrine and norhyoscyamine. *D. candida* root-Littorine: trace quantities only, co-chromatography. Tigloidine: trace quantity, TLC (2 systems). Cuscohygrine: TLC (2 systems), PC (1 system). *D. sanguinea* root-Cuscohygrine: m.p., m.m.p. and IR of picrate, TLC (2 systems), PC (1 system). Roots of the yellow-flowered variety of this plant[10] possessed a similar alkaloid spectrum: m.p., m.m.p. and IR of picrates for major alkaloids, TLC (3 systems), PC (1 system).

Acknowledgements—We acknowledge financial assistance to one of us (A.G.) from the British Council and the Wellcome Trust.

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