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BENZYLISOQUINOLINE ALKALOIDS AND FLAVONOLS FROM *OCOTEA VELLOSIANA*

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Key Word Index—*Ocotea vellosiana*; Lauraceae; benzylisoquinoline alkaloids; flavonol glycosides; acylated flavonol glycosides; thalictoside; asparagine.

Abstract—Unripe fruits of *Ocotea vellosiana* were found to contain 13 benzylisoquinoline alkaloids, four flavonol glycosides, thalictoside, *p*-hydroxybenzoyl-rutinoside and asparagine, besides three novel *p*-coumaroyl derivatives of afzelin.

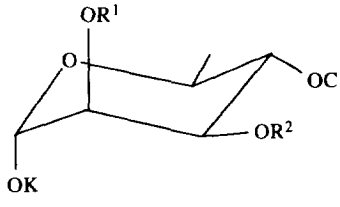
INTRODUCTION

Species of *Ocotea* are found throughout tropical America. Chemically they appear to fall into two groups characterized by the predominance either of neolignans [2] or of benzylisoquinoline alkaloids [1]. *Ocotea vellosiana* (Meissn.) Mez, collected near Campo Grande, Mato Grosso do Sul, belongs to the latter group.

RESULTS AND DISCUSSION

(+)-Dicentrine (**1**) [3, D-00796] was found in wood, fruit and leaves. nor-Dicentrine (**2**) [3, D-00796], predicentrine (**3**) [3, P-01740], ocoteine (**4**) [3, O-00081], *O*-methylcassifoline (**5**) [3, C-00527], leucoxylonine (**6**) [3, L-00499], ocotominarine (**7**) [3, O-00082], and the benzylisoquinoline alkaloid (±)-reticuline (**8**) [3, R-00142] were additionally isolated from wood. In contrast, fruits were shown to contain in addition to dicentrine, glaucine (**9**) [3, G-00398], corydine (**10**) [3, C-01881], and (+)-isocorydine (**11**) [3, I-00368], whereas in leaves ocopodine (**12**) [3, L-00497] and ocominarine (**13**) [3, O-00078] were additionally located. While all these compounds are known and were identified by detailed spectroscopic evidence, their distribution in the plant organs is of interest. Only 1,2,9,10-tetraoxygenated benzylisoquinoline alkaloids (represented by **1**–**3** and **9**) seem to be widely distributed in the plant. However, 1,2,10,11-tetraoxygenated derivatives (**10**, **11**) are limited to fruit; 1,2,8,9,10-pentaoxygenated derivatives (**12**, **13**) are limited to leaves; and 1,2,3,9,10-pentaoxygenated as well as 1,2,3,8,9,10-hexaoxygenated derivatives (respectively **4**, **5** and **6**, **7**) are limited to wood.

In addition to alkaloids, the amino acid asparagine (**14**) [3, A-02880] was isolated from fruit and the flavonol glycosides afzelin (**15**) [3, A-00540], astragalin (Kaempferol 3-glucoside) (**16**) [3, G-00470], quercitrin (quercetin 3-rhamnoside) (**17**) [3, Q-00019] and hirsutrin (myricetin 3-glucoside) (**18**) [3, H-00908] were isolated from leaves. Three further heterosides (**19**–**21**), upon methanolysis, yielded afzelin (kaempferol-3-α-L-rhamnoside) and the methyl ester of *p*-coumaric acid [3, H-02875]. The locations of the *p*-coumaroyl moieties were established by ^{1}H NMR spectral comparisons (Table 1). The rhamnose proton signals were easily assigned by their characteristic multiplicities. The H-4″ triplets ($J = ca$ 10 Hz) in the spectra of **19**–**21** appeared at relatively low field with respect to the corresponding signals of **15**. Hence all three compounds are esterified at this position.



K = 3-kaempferyl, C = *p*-coumaroyl

19 $R^1 = R^2 = H$
20 $R^1 = H$, $R^2 = C$
21 $R^2 = H$, $R^1 = C$

Part 105 in the series 'The Chemistry of Brazilian Lauraceae'. For Part 104 see ref. [1]. Based on the Doctorate thesis presented by W.S.G. to Universidade de São Paulo (1991).

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Table 1. ^{1}H NMR data [δ, mult. (J in Hz)] for rhamnose units of heterosides (Me_2CO-d_6, 200 MHz)

H	15	19	20	21
1″	5.47	5.64	5.74	5.82
	d(1.4)	*br s*	*br s*	*br s*
2″	4.21	4.28	4.53	5.62
	m	*m*	*br s*	*br s*
3″		3.92	5.42	4.20
		dd (3.4, 9.7)	*br d* (10.5)	*m*
4″	3.2–3.8	4.97	5.33 *t*	5.00
		t (9.7)	*t* (10.5)	*t* (9.7)
5″		3.2–3.6	3.51	3.96
		m	*m*	*m*
6″	0.86	0.79	0.88	0.87
	d (6.0)	*d* (6.2)	*d* (6.0)	*d* (6.0)

Table 2. ^{13}C data (δ), for glucose (Glc) and rhamnose (Rha) units of *p*-hydroxybenzoyl-β-D-rutinoside (**23**) and kaempferol-3-rutinoside (**24**)

Glc	C	**23***	**24**[4]†	Rha	C	**23***	**24**[4]†
	1	101.4	100.6		2	74.5	74.2
	2	70.8	70.3		3	76.8	76.5
	3	71.2	70.7		4	70.0	70.1
	4	72.6	72.0		5	75.6	75.8
	5	68.9	68.1		6	67.6	66.9
	6	17.4	17.4				

*Me_2CO-d_6-D_2O, 50 MHz.
†DMSO-d_6, 20 MHz.

Compounds **20** and **21** showed additional low field signals for H-3″ (*br s*, J = 10.5 Hz) and H-2″ (*br s*), respectively. Thus **19**, **20** and **21** are 4″-*p*-coumaroyl, 3″,4″-di-*p*-coumaroyl and 2″,4″-di-*p*-coumaroyl afzelins, three seemingly new compounds.

Finally, leaves afforded two further heterosides, thalictoside (**22**) [3, N-00491] and the novel *p*-hydroxybenzoyl-β-D-rutinoside (**23**). Methanolysis of **23** gave the methyl ester of *p*-hydroxybenzoic acid [3, H-01256] and rutinose [3, R-00495]. The ^{13}C NMR spectra of **23** and kaempferol-3-rutinoside [4] were practically superimposable with respect to the glycosidic signals of the molecules (Table 2). Hence the aglycones of both compounds must be located at the same carbon, i.e. C-1 of the glucose moieties.

EXPERIMENTAL

Unripe fruit (without calyxes), leaves and wood (from a branch measuring 10 cm in diameter) were collected from a tree (height *ca* 6 m) growing on sandy soil in a deforested region near Campo Grande, MS, Brasil. The fruits were crushed and percolated with EtOH. The extracts were washed with hexane and partitioned between $CHCl_3$ and EtOH–H_2O. The latter solution, after addition of Me_2CO and cooling, pptd crystalline **14**. The former solution, after conc and cooling, pptd crystalline **11**. After filtration it was extracted with dilute (2%) HOAc. Separation of alkaloids from the aqueous phase by the usual process and fractionation of the crude mixture (CC, alumina, hexane–AcOEt gradient) gave **11**, **1**, **9** and **10**.

Wood, treated in the same way, gave **4**, **1**, **2**, **6**, **7**, **3**, **5** and **8**.

Leaves were percolated with EtOH. An EtOH–H_2O solution of the extract was washed successively with hexane, $CHCl_3$ and EtOAc. The $CHCl_3$ soln was evapd. Fractionation of the residue (CC, silica, CH_2Cl_2–EtOH, 19:1 and 9:1) gave two fractions. The first one (by CC, alumina, C_6H_6–EtOAc, 9:1) gave **12**, **13** and **1**. The second fraction (by CC and TLC, silica H, MeOH–H_2O–HCO_2H gradient) gave **19**, **20**, **21**, **15**, **16** and **1**. The EtOAc soln was evapd. Fractionation of the residue (CC, Sephadex LH-20, MeOH) gave **22** and **23** besides a mixture. This was separated (CC and TLC, silica, EtOAc–H_2O–MeOH gradient) into **15**–**18**.

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