

Pyrone Glycosides from *Acosmium panamense* (Benth.) Yacovlev

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Besides caffeic acid three pyrones have been isolated from aqueous bark extracts from *Acosmium panamense* and their structures were determined using spectroscopical methods. Besides the already described desmethylyangonine its O^{4'}-mono as well as the di(1–6)glucoside are found the first time.

Key words: Desmethylyangonine, Desmethylyangonine- β -D-glucoside, Desmethylyangonine- β -D-di(1–6)glucoside

Introduction

Acosmium panamense (Benth.) Yacovlev (syn. *Sweetia panamensis* Benth.), Fabaceae, traditional names “Guayacán” and “Bálsamo amarillo” is a tree up to 40 m height growing in tropical rain forests. In the Mexican state Oaxaca it is traditionally used against fever and malaria and furthermore for the treatment of diseases of the respiratory tract. Leonti (2002) reported in the area of Soteapan (Veracruz) the usage as a hypoglycemic drug. The application of the drug is done by drinking an infusion of the bark one to two times per day.

Our ethnopharmacological studies according to our previous ones (Andrade-Cetto *et al.*, 2000; Andrade-Cetto and Wiedenfeld, 2001) in San Felipe Usila, Oaxaca, proved this report and showed that the plant is used traditionally for the treatment of diabetes type II.

Phytochemical studies of the plant showed the occurrence of quinolizidine as well as lupinane alkaloids (Balandrin and Kinghorn, 1982; Argueta, 1994; Veitch *et al.*, 1997; Nuzillard *et al.*, 1999). As the named compounds could be found in alcoholic extracts and the screening of an aqueous one showed the absence of alkaloids we investigated hydrophilic extracts of *A. panamense* bark to identify the main constituents. Besides caffeic acid we found three pyrones. The structures were determined by GC mass and by homo- as well as heteronuclear 2D NMR correlated spectroscopy. Besides the already known desmethylyangonine

(6[(*E*)-2-(4-hydroxyphenyl)vinyl]-4-methoxy-2*H*-pyron-2-one) we isolated as new compounds its β -D-O-glucoside and its β -D-O-di(1–6)glucoside.

The hydrophylic extracts of the plant show in Wistar rats a statistically significant reduction of the plasma glucose blood level.

Results and Discussion

The bark of *A. panamense* was extracted as previously described (Andrade-Cetto *et al.*, 2000; Wiedenfeld *et al.*, 2000). A final prep. HPLC (SP 250/10 Nucleosil 120–7 C₁₈) of the flash RP-CC fractions yielded the compounds **1–3** (Fig. 1).

The GC-MS spectrum of **1** shows the [M]⁺¹-peak at 245 indicating the formula C₁₄H₁₂O₄. The further MS fragmentation is in accordance as described earlier (Talapatra *et al.*, 1976).

The ¹H and ¹³C NMR-data of **1–3** are summarized in the Experimental part. The assignment was performed by interpretation of H, H- and C,H-correlated spectra. Important structural information is provided by the signals for two olefinic pairs: 88.3 and 100.3 ppm (¹³C); 5.59 and 6.21 ppm, D, *J* = 1.2 Hz (¹H) and 116.3 and 134.6 as well as 6.78 and 7.23 ppm, D, *J* = 16.1 Hz. In combination with the ¹³C-data for C-2 (159.1 ppm), C-4 (171.2 ppm) and C-6 (163 ppm) the vinyl-pyrone skeleton is demonstrated. The further data for the phenylic ring system is occurring in the expected range. Similar ¹H-signals were first described by Talapatra *et al.* (1976) who identified the structure

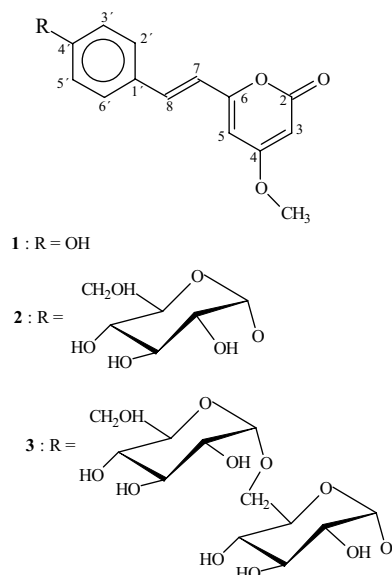


Fig. 1: Structures of the isolated pyrones (1–3).

as the Kawa pyrone desmethylyangonine (6[(*E*)-2-(4-hydroxyphenyl)vinyl]-4-methoxy-2*H*-pyron-2-one) isolated from the Asteraceae *Anaphalis adenata*. Worth mentioning is furthermore that this pyrone occurs as a typical compound in roots of *Helichrysum* species (Bohlmann and Suwita, 1979). Besides this it is of importance that **1** has already been identified in *Acosmium subelegans* from Brazil (Paulino *et al.*, 1977).

2 and **3** only differ from **1** in the data for additional glucose moieties. Especially the ^{12}C NMR data show that **2** has to be the C-4'- β -D-O-glucoside (C-1'': 100.9; C-2'': 73.4; C-3'': 77.3; C-4'': 69.8; C-5'': 76.7; C-6'': 60.8 ppm) and **3** the C-4'- β -D-O-diglucoside. Besides the doubling of the signals for the sugar-C-1 to C-5 the C-6'' undergoes a downfield-shift to 68.5 and C-6''' occurs at 61.2 ppm. These data are in accordance with the structure of a di(1–6)glucoside which is further proven by a spectra simulation (ACD/ChemSketch, V. 5.11).

These two glucosides of desmethylyangonine are reported the first time.

Experimental

General

NMR spectra (Bruker AC 400) were measured in $\text{CDCl}_3/\text{D}_6\text{-DMSO}$ at 400 and 100 MHz, respec-

tively. GC-MS: GC: 150 °C (5 min) – 250 °C, 10 °/min; HP-1, 25 m \times 0.32 mm; inj.: 250 °C, det.: 280 °C; R_t (**1**): 20.3 min; MS: 220 °C; interface: 250 °C; 2000 emV.

Plant material

With the help of traditional healers and diabetic people, samples of *A. panamense* have been collected in San Felipe Usila (Oaxaca), Mexico, in 2001. Their identity was confirmed and voucher specimens were deposited at the IMSS Herbarium in Mexico City.

Extraction and isolation

Plant extracts were prepared from bark samples (300 g) as already described (Andrade-Cetto *et al.*, 2000), resulting in 36 g of aqueous extract (WE) and 3.12 g of butanolic extract (BE). The latter was used for the phytochemical identification of the main components. The BE was applied on a 100 cm \times 2 cm Polygoprep 60–30 C_{18} (Macherey & Nagel, Düren, Germany) flash-column and eluted with $\text{H}_2\text{O}/\text{MeOH}/\text{AcCN}$ 80:10:10, 4 ml/min (10 ml fractions; monitored by UV detection and controlled by HPLC).

Desmethylyangonine (**1**)

GC-MS: m/z (%) = 245 (100) $[\text{M}]^+ + 1$ $\text{C}_{14}\text{H}_{12}\text{O}_4$, 229 (9.5) $\text{C}_{14}\text{H}_{12}\text{O}_3$, 217 (16.5) $\text{C}_{13}\text{H}_{12}\text{O}_3$, 201 (10.2) $\text{C}_{13}\text{H}_{12}\text{O}_2$, 137 (50.6) $\text{C}_7\text{H}_5\text{O}_3$, 125 (43.3) $\text{C}_6\text{H}_5\text{O}_3$, 102 (23.2) C_8H_6 . ^1H NMR: δ (ppm) = 7.47 (d, $J_{2',3'/6',5'} = 8.2$ Hz, 2H, H-2'/6'), 7.23 (d, $J_{8,7} = 16.1$ Hz, 1H, H-8), 6.81 (d, $J_{3',2'/5',6'} = 8.2$ Hz, 2H, H-3'/5'), 6.78 (d, $J_{7,8} = 16.1$ Hz, 1H, H-7), 6.3 (OH), 6.21 (d, $J_{5,3} = 1.2$ Hz, 1H, H-5), 5.59 (d, $J_{3,5} = 1.2$ Hz, 1H, H-3), 3.81 (s, 3H, $\text{H}_3\text{-O}$). – ^{13}C NMR: δ (ppm) = 171.2 (C-4), 163.0 (C-6), 159.1 (C-2), 158.2 (C-4'), 134.8 (C-8), 129.5 (C-2'/6'), 126.4 (C-1'), 116.3 (C-7), 116.0 (C-3'/5'), 100.3 (C-5), 88.3 (C-3), 56.5 (O- CH_3).

Desmethylyangonine-4'-glucoside (**2**)

^1H NMR: δ (ppm) = 7.60 (d, $J_{2',3'/6',5'} = 7.9$ Hz, 2H, H-2'/6'), 7.30 (d, $J_{8,7} = 16.3$ Hz, 1H, H-8), 7.05 (d, $J_{3',2'/5',6'} = 7.9$ Hz, 2H, H-3'/5'), 6.88 (d, $J_{7,8} = 16.3$ Hz, 1H, H-7), 6.26 (d, $J_{5,3} = 1.0$ Hz, 1H, H-5), 5.63 (d, $J_{3,5} = 1.0$ Hz, 1H, H-3), 4.92 (d, $J_{1'',2''} = 6.2$ Hz, 1H, H-1''), 4.6–4.8 (4 OH), 3.95 (m, 1H,

H-5''), 3.82 (s, 3H, H₃-O), 3.80 (m, 1H, H-3''), 3.72 (m, 1H, H-6_αb2), 3.51 (m, 1H, H-6_β''), 3.30 (m, 1H, H-4''), 3.20 (m, 1H, H-2''). – ¹³C NMR: δ (ppm) = 171.1 (C-4), 162.9 (C-6), 158.8 (C-2), 158.5 (C-4'), 134.0 (C-8), 129.1 (C-2'/6'), 129.0 (C-1'), 117.9 (C-7), 116.7 (C-3'/5'), 100.9 (C-1''), 100.2 (C-5), 88.6 (C-3), 77.3 (C-3''), 76.7 (C-5''), 73.4 (C-2''), 69.8 (C-4''), 60.8 (C-6''), 56.6 (O-CH₃).

Desmethylangonine-4'-diglucoside (3)

¹H NMR: δ (ppm) = 7.60 (d, $J_{2',3'/6',5'} = 8.3$ Hz, 2H, H-2'/6'), 7.29 (d, $J_{8,7} = 16.3$ Hz, 1H, H-8), 7.12 (d, $J_{3',2'/5',6'} = 8.3$ Hz, 2H, H-3'/5'), 6.87 (d, $J_{7,8} = 16.3$ Hz, 1H, H-7), 6.27 (d, $J_{5,3} = 1.6$ Hz, 1H, H-5),

5.62 (d, $J_{3,5} = 1.6$ Hz, 1H, H-3), 4.90 (d, $J_{1'',2''} = 6.1$ Hz, 1H, H-1''), 4.9–5.4 4.6–4.8 (7 OH), 4.22 (d, $J_{1'',2''} = 7.0$ Hz, 1H, H-1''), 4.19 (m, 2H, H-4''/H-4'''), 3.98 (m, 1H, H-6_α''), 3.95 (m, 1H, H-3'''), 3.88 (m, 1H, H-3''), 3.80 (m, 1H, H-6_α'''), 3.78 (s, 3H, H₃-O), 3.76 (m, 1H, H-5'''), 3.62 (m, 1H, H-5''), 3.39 (m, 1H, H-6_β''), 3.22 (m, 1H, H-6_β'''), 3.28 (m, 1H, H-2''), 3.11 (m, 1H, H-2'''). – ¹³C NMR: δ (ppm) = 171.1 (C-4), 162.9 (C-6), 158.8 (C-2), 158.5 (C-4'), 134.1 (C-8), 129.3 (C-1'), 129.0 (C-2'/6'), 117.8 (C-7), 116.9 (C-3'/5'), 103.4 (C-1'''), 100.9 (C-1''), 100.2 (C-5), 88.6 (C-3), 77.1 (C-3''), 76.9 (C-3'''), 76.7 (C-5'''), 76.3 (C-5''), 73.8 (C-2''), 73.4 (C-2'''), 70.2 (C-4''), 69.9 (C-4'''), 68.5 (C-6''), 61.2 (C-6'''), 56.2 (O-CH₃).

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