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Anthraquinones Isolated from *Senna macranthera* (Collad.) Irwin et Barn

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Abstract
Chemical investigation of dichloromethane extract from roots of *Senna macrantherana* led the isolation of two anthraquinone and confirms this genus as a rich source of phenolic derivatives.

Keywords: *Senna macranthera*, Fabaceae, Anthraquinones, Emodin, Phision.

Senna macranthera (Collad.) Irwin et Barn, a native plant from Brazil that belongs to the family Fabaceae is frequently found in the woods and is used as ornamental tree in the flowering season, from April to June , when it becomes covered with large bright-yellow flowers (Corrêa,1984). This tree is popularly known as “manduirana”, “pau fava”, “alleluia”, “mamangá”, “Cássia”, “Cássia-do-nordeste”, “Cássia-macranta”, “Cássia-macrantera”, “Fedegoso”, “Fedegoso do Rio”, “Macrantera”, “Habú, Mwenu”, “Mhomba and pau fava”. The genus Senna (Fabaceae) is widely distributed in tropical and subtropical regions throughout the world, and it has been extensively chemically and pharmacologically investigated (Viegas et al.,2006). Local population has been using this genus as a remedy for various diseases, mainly as antimicrobial for infectious diseases (Matos, 2000). They are known to be a rich source of phenolic derivatives like anthraquinone compounds which have been isolated from heartwood, seeds, roots and leaves. As part of an ongoing research for the genus *Senna* we describe in this work, - for the first time in this specie-, the isolation of two anthraquinones.

Materials and Methods

Materials and equipments

^{1}H and ^{13}C NMR spectra were recorded on a Mercury at 300 MHz and 75.4 MHz, respectively. FTIR spectra were determined in KBr disk on a FTIR Perkin Elmer Spectrum 200 spectrometer. Uncorrected melting points were determined by using Thermopan (C. Reichest Optische Wercke A G). GC/MS-analyses were recorded on a QP5050A, Shimadzu equipment. Chromatographic purification was carried out on silica gel (70-230 Mesh) and thin layer chromatography (TLC) was performed on silica GF_{254} Merck. TLC visualization was achieved by spraying with 7% ethanolic phosphomolybdic acid and heating.

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Plant Material

The root was collected in January 2005 in Cascavel, Paraná Brazil. An authenticated voucher, n° 1237 and 1238 was deposited in the herbarium of the University (UNOP).

Plant Material Extraction

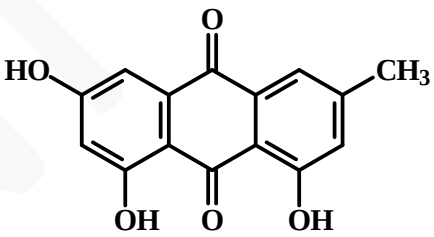
Dried roots (700g) of *S. macranthera* were successively extracted with petrol, (30 ± 60 °C), CH_2Cl_2 and EtOH for 60 h in a Soxhlet apparatus. After solvent evaporation, the petrol extract was a viscous brown oil (5.0g), whereas the dichloromethane extract (3.0g) and the methanol extract (8.0g) were brown gums. These extracts were used for in vitro antibacterial activity. Since dichloromethane extract was the most active against Gram-negative and Gram-positive bacteria, a portion of this extract (100 g) was subjected to silica gel chromatography, firstly eluted with petrol. The eluent polarity was then gradually increased by the addition of EtOAc to furnish 100 fractions (10mL each) which were reduced to 13 fractions following TLC analysis. The fraction one was further submitted to TLC preparative, eluted with petrol-EtOAc 8:2 v/v permitting the isolation of **1** (5 mg) and, **2** (3 mg).

Results and Discussion

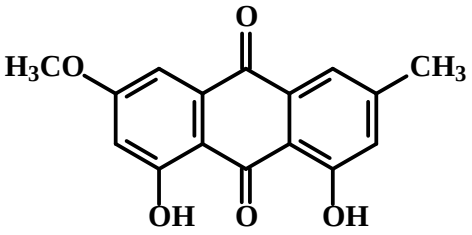
The dichloromethane extract was purified by using chromatography leading to the isolation of emodin and physcion anthraquinones (Figure 1) These anthraquinones were previously isolated from other sources (Barbosa et al., 2004; Santos and Silva, 2008; Kim et al.,2004) and their structure was confirmed by IR, NMR and Massas data. These compounds were identified on the basis of the following evidence. Compound **1**: Orange amorphous powder from $CHCl_3$ mp 261 - 264 °C, its molecular weight though mass spectrometry was 270 and elemental analysis gave the formula C_{15} H_{10} O_5. The IR spectrum showed the presence of hydroxyl group (3382 cm^{-1}) and carbonilic groups (1677 and 1627 cm^{-1}, respectively). The compound EI mass spectrum displayed a molecular ion $[M]^+$ at *m/z* 270 (100%), in agreement to the formula C_{15} H_{10} O_5. Other major fragments were at *m/z* 269, and 241. ^{1}H-NMR (300 MHz $CDCl_3$ δ) 2.42 (3H, s), 6.55 (1H, d, J= 1.0, H-2), 7.08 (1H, d, J= 1.0, H-4), 7,17 (1H, d, H-7), 7.55 (1H, d, J= 2.4, H-5), 12.08 (1H, s,), 12.28 (1H, s); ^{13}C-NMR (75 MHz $CDCl_3$ δ) 21,2 (CH_3), 106,7 (C-5, CH), 108,9 (C-7, CH), 162,2 (C-1, C), 167,3 (C-6, C), 184,3 (C-10, C), 192.3 (C-9, C).

Compound **2**: Orange amorphous powder from $CDCl_3$ mp 206-209 °C, its molecular weight through mass spectrometry was 284 and elemental analysis gave the formula C_{16} H_{12} O_5. The IR spectrum showed the presence of hydroxyl group (3340 cm^{-1}) and carbonilic groups (1656 and 1619 cm^{-1}, respectively). The compound EI mass spectrum displayed a molecular ion $[M]^+$ at *m/z* 284 (100%), in agreement to the formula C_{16} H_{12} O_5. Other major fragments were at *m/z* 269 and 240. ^{1}H-NMR (300 MHz $CDCl_3$ δ) 2.42 (3H, s, CH_3), 3.93 (3H, s, O-CH_3), 6.48 (1H, s, H-2), 6.58 (1H, s, H-7), 6.92 (1H, s, H-4), 7.12 (1H, s, H-5), 12.08 (1H, s), 12.28 (1H, s); ^{13}C-NMR (75 MHz $CDCl_3$ δ) 21.2 (CH_3), 55.7 (OCH_3), 106.7 (C-5, CH), 108.9 (C-7, CH), 162.2 (C-1, C), 167.3 (C-6, C), 184.3 (C-10, C), 190.8 (C-9, C).

The results of the present study showed the presence of emodin and physcion anthraquinones in dichloromethane extract of the roots of *S. macranthera*. These results are in accordance to genus *Senna* a rich source of anthraquinone compounds.



(1)



(2)

Figure 1: Emodin and Physcion isolated isolated from roots of *Senna macranthera*

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