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AN ISOFLAVONE FROM *PELTOPHORUM PTEROCARPUM*

Dilip Gorai*

Department of Chemistry, Bolpur College, Bolpur, West Bengal, India, 731204.

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***Corresponding Author**
Dr. Dilip Gorai
Department of Chemistry,
Bolpur College, Bolpur,
West Bengal, India, 731204.

ABSTRACT

The chemical investigation of methanol extract of the aerial parts of P. pterocarpum belonging to the family Leguminosae led to the isolation of an isoflavone, mexitin. The isolated compound was characterized using various spectroscopic data as well as chemical studies.

KEYWORDS: *Peltophorum pterocarpum*, Leguminosae/Papaveraceae, Aerial parts, Isoflavone, Mexitin.

INTRODUCTION

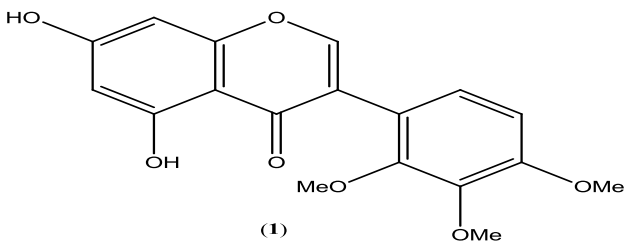
Peltophorum pterocarpum (known as Radhachura in Bengali; Synonyms: *Peltophorum inermis* and *Peltophorum ferrugineum*) is a family of Leguminosae native to tropical southeastern Asia and a popularly ornamental tree grown around the world. Trees begin to flower after about four years.[1-2] It is a deciduous tree having length 15–25 m, with a trunk diameter of upto 1 m. The leaves are bipinnate having 30-60 cm long. The flowers are yellow in colour with 2.5-4 cm diameter and the fruit is a pod having 5-10 cm length and 2.5 cm broad containing one to four seeds. The plant is also available in Sri Lanka, Thailand, Vietnam, Indonesia, Malaysia, Papua New Guinea, Philippines and the islands of the coast of Northern Territory, Australia and different regions of India including Birbhum District, West Bengal.[1,3] The wood of the plant is wide variety of uses like cabinet-making[4] and a fodder crop.[1]

P. pterocarpum is a deciduous tree commonly used for ornamental purpose and also as an avenue tree. Different parts of this tree are used to treat many diseases like ringworm, constipation, stomatitis, insomnia, skin troubles and sleep inducer.[5-7] Leaves are used as decoction for treating skin disorders and bark is used for the treatment for dysentery, as eye lotion, embrocation for pains and sores. Stem infusion of the plant is also used in dysentery, for gargles, tooth powder as well as for muscular pain.[8] Flowers are used as an astringent to

cure or relieve intestinal disorders.[9] Crude organic extracts of different parts of this plant are found to have promising antimicrobial activities.[5,8,10-15] The aim of the present study is to isolate and characterize the phytochemicals from the methanol extract of aerial parts of *P. pterocarpum*.

RESULTS AND DISCUSSION

Isoflavone **1** was obtained as light yellow powder, $C_{17}H_{13}O_6$ ($[M]^+$ at 344). It gave positive Shinoda test for the presence of flavonoid. It was recognized to be a isoflavone by UV absorption maxima appearing at 261 and 327 nm as well as a characterized proton singlet at δ 8.25 (H-2) in its ^{1}H-NMR spectrum. IR spectrum showed bands at 3442 cm^{-1} for bonded hydroxyl and at 1639 cm^{-1} for conjugated carbonyl groups. The *retro-Diels Alder* fragmented ion peaks appearing at *m/z* 152 and 192 in its mass spectrum indicates that two hydroxyl groups are present in ring-A and three methoxyl functions are present in ring-B. A significant ion peak appeared at *m/z* 313 locates one of the methoxyl function at 2'-position. ^{1}H-NMR spectrum showed two *meta* coupled protons at δ 6.18 and 6.36 as doublet, and two *ortho* coupled proton doublets at δ 6.78 and 6.80. It also indicates the presence of a methoxy group at 3-position due to appearance of a broad singlet peak at δ 3.57 and two hydroxyl functions (δ 9.72 & 12.92). The UV spectrum with anhydrous $AlCl_3$ and NaOAc exhibited bathochromic shift of 42 and 12 nm, respectively indicating the presence of free hydroxyl functions at C-5 and C-7 positions. The aforesaid discussions led us to formulate the compound as mexitin[16] (5,7-dihydroxy, 2',3',4'-trimethoxyisoflavone; **Figure 1**).[13] C-NMR data are also in well-conformity with the structure **1** and the previously reported spectral data.[16]



(1)

MATERIALS AND METHODS

PHYTOCHEMICAL INVESTIGATION

General Experimental Procedure: Melting point was recorded on Model No. Chemiline-715 melting point apparatus and was uncorrected. IR measurements were carried out on Perkin-Elmer (FT-IR) infrared spectrophotometer. TMS has been used as internal standard in

recording ^{1}H-NMR spectra (Bruker DRX300; $CDCl_3$, 400 MHz), ^{13}C-NMR Spectrum was performed on 100 MHz instrument (Bruker DRX 300) and EIMS Spectrum was carried out on JEOL-JMS 600 (70 eV). TLC was carried out using Silica-gel 60/ UV254 using precoated plates wheras Silica-gel (60-120 mesh) was used for Column Chromatography.

Plant Material: The aerial parts of *P. pterocarpum* was collected from Santiniketan, Birbhum District, West Bengal, India during July, 2015. It was authenticated by Dr. H.R. Choudhury, Dept. of Botany, Visva-Bharati, Santiniketan, West Bengal, India. A voucher specimen of the plant has been deposited in the Dept. of Chemistry, Bolpur College.

Preparation of methanol extract

The aerial parts of *P. pterocarpum* were collected and dried in shade. The mass was then powdered (1kg) and exhaustively extracted by Soxhlet apparatus with methanol for 56h. The methanol layer was decanted off and the solvent of the extract was distilled off by using rotary evaporator when a brown syrupy material was obtained. It was allowed to evaporated to dryness and a brown mass (about 12.8 g) was obtained.

Isolation of Compound from methanol Soluble Fraction

The brown mass was stirred with 5% aqueous acetic acid repeated for three times and the acid undissolved part (gummy mass) left was dried on water bath and subjected to chromatographed over silica gel (60-120 mesh) column. The column was eluted with solvents of increasing polarity and collected eluents were monitored by TLC for their homogeneity. The eluents collected from $CHCl_3$: MeOH (7:1) were evaporated to dryness and crystallized from MeOH to afford mexitin (1, 88 mg).

Mexitin[16] (1)

Light yellow powder (88 mg); m.p. 219-221^{0}C; UV (MeOH) λ_{max} (loge); 261 (4.52), 327 (3.94) nm; λ_{max} (MeOH+Anhydrous $AlCl_3$+HCl); 261, 369 nm; λ_{max} (MeOH+NaOAc); 273, 327 nm; IR (KBr) ν_{max} 3442 (-OH), 1639 (C=O), 1599, 1521, 1441 and 1261 cm^{-1}; ^{1}H-NMR ($CDCl_3$): δ 3.57 (9H, *br* s, 3x-OMe), 6.18 (1H, d, *J*=2 Hz, H-8), 6.36 (1H, d, *J*=2 Hz, H-6), 6.79 (1H, d, *J*=8 Hz, H-5'), 7.33 (1H, d, *J*=8 Hz, H-6), 8.26 (1H, s, H-2), 9.72 (1H, *br* s, 5-OH) and 12.92 (1H, *br* s, 7-OH); ^{13}C-NMR ($CDCl_3$, 100 MHz): δ 154.12 (C-2), 121.43 (C-3), 180.42 (C-4), 162.17 (C-4a), 99.17 (C-5), 164.46 (C-6), 93.3 (C-7), 157.57 (C-8), 105.3 (C-8a), 111.48 (C-1'), 56.78 (-OMe), 54.78 (-OMe) & 54.55 (-OMe); EIMS: *m/z* (%, relative intensity): 344 (100), 316 (17), 313 (15), 192 (32), 152 (59), 124 (16), 122 (10) and 119 (11)

CONCLUSION

The phytochemical investigation of ethanolic extract of the aerial parts of *P. peltophorum* was carried out and an isoflavone, mexitin has been isolated. This natural product may be accounted for the biological activities exhibited by the crude methanol extract of the plant. I am sure that the pharmacologists/biologists will undertake further systematic research work on this important plant for its complete exploration. Therefore, the present work will boost the scientific communities to do more work on this important medicinal plant in near future.

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