Vol. 3/1 (2003) 101 - 103

Short communication

JOURNAL OF NATURAL REMEDIES

Flavonoids of *Tephrosia procumbens* Buch-Ham

S. Ganapaty[1]*, P. Steve Thomas , P. Sudheer, K.V. Ramana, Peter G. Waterman[2]

1. Pharmacognosy and Phytochemistry Division, Department of Pharmaceutical Sciences, Andhra University, Visakhapatnam – 530003.
2. Centre for Phytochemistry, Southern Cross University, Lismore, NSW 2480, Australia.

Received 31 August 2002 ; Revised and accepted 20 November 2002

Abstract

Objective : The genus *Tephrosia* is a rich source for unusual flavonoids. The present work is aimed to isolate new molecules of biological interest. Materials and methods : The root powder of *T. procumbens* was extracted with chloroform and concentrated. The residue was subjected to column chromatography and fractional crystallization by organic solvents and their mixtures of increasing polarity which afforded crystalline compounds and were identified by spectroscopic methods. Results and conclusions : Among the isolates, two candidates calopogonium isoflavone B and 2′ ,7′ 8-trimethoxy-4′ , 5′ -methylenedioxy isoflavone are reported for the first time from this species.

Key words: *Tephrosia procumbens*, Flavonoids.

1. Introduction

The genus *Tephrosia* Buch-Ham. (Leguminosae) consists of about three hundred species, which are small annual or short-lived perennial herbs, distributed throughout the world, among which twenty species are found in the semi arid and dry regions of the plains of India. The genus *Tephrosia* is well known for its varied structures of flavonoids. The *Tephrosia's* are considered to possess insect repellant, larvicidal, pisicidal and antibacterial properties. [1-3] We now report the isolates of the roots of this species.

2. Materials and methods

The air-dried roots of *T. procumbens* (1kg) were collected near the Khailasa hills, Visakhapatnam in July 2001 and authenticated by Dr. M. Venkayya, taxonomist, Andhra University. A voucher specimen TPR-19 has been deposited at the herbarium (Department of Pharmaceutical Sciences, Andhra University).

The roots were separated, air dried and powdered in a Wiley mill. The root powder (1kg) was extracted with chloroform. Concentration of the chloroform extract yielded a reddish brown

Corresponding author
E- Mail: ganapatyseru@yahoo.co.in

syrup (25 g). A portion of the chloroform extract (20 g) was chromatographed over silica gel (Acme, 60-120 mesh) and successively eluted with hexane, hexane-chloroform, chloroform and chloroform- methanol mixtures. Rotenone was obtained as a white crystalline compound on elution with hexane-chloroform (1:1) and the hexane-chloroform (1:3) eluates afforded the flavanone (obovatin). The rotenoid (sumatrol) was obtained as white needles on elution with hexane-chloroform (1:3).

Further elution of the column with pure chloroform afforded a β-diketone (praecansone B) as yellow oil and its isomeric methyl ether (praecansone A) was obtained in chloroform-methanol (99:1) also as a yellow oil. Isocalycosin was obtained as a white crystalline compound on elution with 2% methanol in chloroform and fisetin 7-ethyl ether was obtained as a yellow powder on elution with 4% methanol in chloroform.

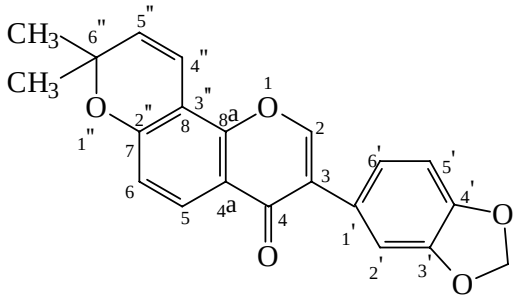
All the above flavonoids were found to be similar in their n.m.r mass and i.r spectral data with that of the literature [4].

Further elution of the column chromatogram using 5% methanol in chloroform afforded two new isoflavones, Calopogonium isoflavone B as colourless needles (1) [5] (yield: 0.02%) and 2′, 7,8-trimethoxy-4′, 5′-methylenedioxy isoflavone also as colourless needles (2) [6] (yield: 0.01%).

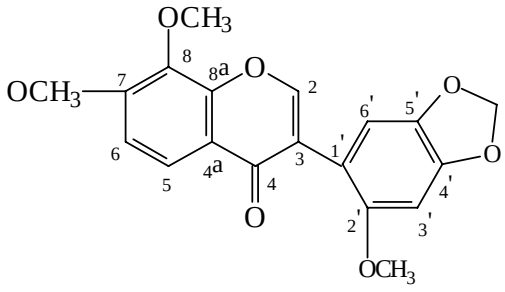
3. Results and discussion

Our results interestingly reveal the meticulous isolation and spectral characterization of nine flavonoids, among which two new isoflavones possessing methylenedioxyl groups and the absence of 5-OH group in the "C" ring of the isoflavone nucleus, is quite apparent. This marks a distinction between the flavonoids previously reported [4].

Calopogonium isoflavone B (1). $C_{21}H_{16}O_5$, colourless needles, mp 213°C; ^{1}H- NMR (400 MHz, $CDCl_3$): δ1.5(6H,*s*,$(Me)_2$, H-6′′,6′′), 5.99(2H,s,CH_2,H-3′,4′), 5.72(1H,*d*, H-5′′, *J* 1.0 Hz), 6.86 (1H, *d*, H-4′′, *J* 3.1Hz), 6.87 (2H, *d*, H-2′, 6′, *J* 1.0Hz), 6.88 (1H, *d*, H-5, *J* 1.0Hz), 6.96 (1H, *s*, H-6), 7.93 (1H, s, H-2), 8.05 (1H, *d*, H-5′, *J* 1.0Hz). ^{13}C- NMR (100 MHz, $CDCl_3$): 28.36 (C- 6,″6,″$(Me)_2$), 77.55(C-6″), 101.37(O-CH_2-O), 108.59 (C- 2′, 6′), 109.40 (C-5), 110.02 (C-6), 115.14(C-1′), 115.47 (C-3′′, C-8), 118.51(C-5′), 122.61 (C-4′′), 125.07(C-4a), 125.92 (C-3), 126.96 (C-5′′), 130.53 (C-2), 147.86 (C-3′, 4′), 152.10 (C-2′′,C-7), 157.56(C-8a), 175.96 (C=O).



Calopogonium isoflavone B (1)



2′, 7, 8 - trimethoxy- 4′, 5′ -methylenedioxy isoflavone (2)

2′ , 7, 8-trimethoxy-4′ , 5′ -methylenedioxy isoflavone(2).$C_{19}H_{16}O_7$,colourless needles, mp.204-206°C;^{1}H-NMR (400MHz, $CDCl_3$): δ 3.72 (3H, *s*, (OMe), H-2′), 3.99 (6H, *s* $(OMe)_2$, H-7, H-8), 5.94 (2H, *s*, o-CH_2-o), 6.61 (1H, *s*, H-3'), 6.82 (1H, s, H-6′),7.05 (1H, *d*, H-6, J= 9Hz), 7.87 (1H, s, H-2), 7.99 (1H, *d*, H-5, J=9Hz). ^{13}C- NMR (100 MHz, $CDCl_3$): 55.96(C-2′ ,OMe), 57.01(C-8,OMe), 61.75(C-7,OMe), 95.60(C-3′), 101.55(O-CH_2-O), 111.34(C-6), 112.80(C-1′), 119.46(C-4a), 121.91(C-3), 127.93(C-5), 136.78(C-8), 141.35(C-5′), 148.61(C-4′), 150.80(C-8a), 153.14(C-2'), 154.26(C-2), 154.26(C-6′), 156.39(C-7), 175.95(C=O).

4. Acknowledgements

One of the authors (S.G) is grateful to the University Grants Commission (UGC) New Delhi for Financial assistance (UGC-Major research project. Grant No. F- 7-23/ (Sr-I)/ 2001).

References

1. Willis JC A. (1973) *Dictionary of the flowering plants and ferns.* (revised by H.K. Airy-shaw) 8th edn. Cambridge University Press: Cambridge; 423.

2. Gillent JB, Polhill RM, Verdcourt B. (1971) *Flora of Tropical East-Africa.* Part 1, Crown agents: London; 326.

3. Chopra RN, Nayar SL, Chopra IC. (1956) *Glossary of Indian Medicinal Plants.* CSIR: New Delhi, India; 240.

4. Venkataratnam G, Venkata Rao E, Vilain C. (1987) *J. Chem. Soc.* Perkin Trans. 1: 2723.

5. Vilain C, Joseph J. (1976) *Bull. Soc. R. Sci. Liege.* 45: 468.

6. Galina E, Gottlieb OR. (1974) *Phytochemistry* 13: 2593.