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Phytochemical Investigation of the Tender Shoot of *Bambusa bamboos* (Linn.) Voss

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Phytochemical investigation of the ethyl alcohol extract of the tender shoot of *Bambusa bamboos* (Linn.) Voss yielded p- hydroxybenzaldehyde, p- hydroxybenzoic acid, p- hydroxyphenylacetic acid, β-sitosterol and β-sitosterol-β-D-glucopyranoside. All the compounds are reported for the first time from the tender shoot of *Bambusa bamboos*

Keyword: Mullumumgil, Vansha, *Bambusa Bamboos*

1. Introduction

Mullumumgil/ Mulgil/ Mangal is botanically equated to *Bambusa bamboos* (Linn.) Voss (Fam. Poaceae) syn. *Bambusa arundinaceae* (Retz.) Willd., *B. orientalis* Nees. and is known as Vansha in Sanskrit. A spinous bamboo, distributed throughout the moist parts of India, particularly near river banks, also cultivated in the plains of North-West India, and on the hills of Andhra Pradesh. Young shoot made into poultice is an efficacious application for dislodgement of worms from ulcers[1,2]. Young shoot is used for permanent sterilization[3,4]. Alcoholic extract of the tender shoot exhibited oestrogenic activity in ovariectomised rats [5]. Ethanolic extract of tender shoot caused a reduction in fertility of male rats. Ethanolic extract decreased male fertility index in rats[6,7]. Aqueous extract exhibited abortifacient activity in female rats. Further, the extract was reported to cause teratogenic effect in rats[8,9]. The raw, boiled and cooked shoots possess antithyroid activity as evidenced by *in vitro* inhibition of thyroid peroxidase activity (TPA). Further, a reduction of TPA, T_4 and T_3 levels and an increase in weight of rats following chronic feeding of shoot was also reported[10]. Earlier workers have reported the following chemical constituents from the stem of *Bambusa bamboos*; 2,6-dimethoxybenzoquinone, allantoin, *trans-p*-hydroxycinnamic acid, *p*-hydroxybenzaldehyde, fucosterol and 1,8-dihydroxy-3-methoxy-6-methylanthraquinone[11]. The seeds, tender shoot and fruits were reported to contain calcium, phosphorous, iron, carotene, thiamine, riboflavin, niacin. The mineral and trace elements were reported as magnesium, sodium, copper and chlorine[12,13]. The present study reports the isolation and identification of *p*-hydroxybenzaldehyde, *β*-sitosterol, *p*-hydroxybenzoic acid, p-hydroxyphenylacetic acid, *β*-sitosterol-*β-D*-glucopyranoside from the tender shoot of *B.bamboos*. *p*-hydroxybenzaldehyde were reported previously in the stem but so far no report on tender shoot.

All the compounds are reported for the first time from the tender shoot of *B. bamboos*. The structures of the compounds were determined by comparison of the physical and spectroscopic data with those reported in literature. Further the identity was confirmed by direct comparison with the authentic sample (m.p., m.m.p, co-TLC and superimposable IR).

2. Materials and Methods

2.1 Plant Collection

Tender shoot of *B. bamboos* was collected from Tirunelveli district and authenticated by Dr. V. Chelladurai Ex. Research Officer (Botany) of Survey of Medicinal Plants Unit of Central Council for Research in Ayurvedic Sciences at Palayamkottai, Tamil Nadu. A voucher specimen (no. 157B) was deposited in the Pharmacognosy department of the institute.

2.2 Instrumentation

IR spectra were recorded in KBr disc using FT-IR spectrophotometer. ^{1}H and ^{13}C NMR were recorded on Bruker instrument at 400 and 100.62 MHz respectively.

2.3 Material and reagents

AR grade *n*-hexane, chloroform, ethyl acetate, methanol and toluene were obtained from E. Merck, India.

2.4 Isolation and identification

Coarsely powdered tender shoot (2.3 kg) was extracted with ethyl alcohol by cold percolation method for 72 hours. The extraction was repeated and filtered. The combined extract was concentrated by distilling over a boiling water bath. The last traces of the solvent were removed under vacuum. Extract (16 gm.) was column chromatographed using silica gel (acme 100-200 mesh; 1:22) as the stationary phase and eluted with solvents of increasing polarity in the order *n*-hexane, chloroform, ethyl acetate and methanol and their mixtures. Earlier fractions gave waxy material. *n*-hexane- chloroform (2:1) eluates on concentration and crystallization yielded *β*-sitosterol (**1**) (m.p.131°C). It showed a single spot at R_f 0.42 in the mobile phase of Toluene: Ethyl acetate (9:1). The identity was confirmed by direct comparison with the authentic samples (m.p., m.m.p, co-TLC and superimposable IR).

Fractions eluted with chloroform-ethylacetate (19:1) gave a colourless solid which on crystallization from methanol yielded compound (**2**) (m.p.119°C). It showed a single spot at R_f 0.61 in the mobile phase of Toluene: Ethyl acetate (4:1), answered ferric reaction for phenol. IR ν_{max} (KBr) cm-^{1}: 3448 (hydroxyl), 2933, 1675 (aldehyde carbonyl), 1597, 1447, 1285, 1217, 1159, 833. ^{1}H NMR, δ_{ppm} $CDCl_3$ (400 MHz): 7.0 (2H, d, J= 8.4 Hz, H-3 & H-5), 7.81 (2H, d, J=8.4 Hz, H-2 & H-6), 9.84 (^{1}H, s, CHO). ^{13}C NMR δ_{ppm} $CDCl_3$ (100.62 MHz): 116.12 (C-3 & C-5), 129.48 (C-1), 132.65 (C-2 & C-6), 162.25 (C-4), 191.59 (-CHO).

Elution of the column with chloroform-ethylacetate (9:1) gave a colourless solid which on crystallization from ethanol yielded a compound (**3**) (m.p. 212-214°C). It showed a single spot at R_f 0.38 in the mobile phase of Toluene: Ethyl acetate (1:1), and gave positive reaction for phenol. It was soluble in sodium hydroxide and gave effervescence with sodium carbonate. IR ν_{max} (KBr) cm-^{1}: 3393 (hydroxyl), 2980, 2667, 2550, 1685 (*α*, *β*-unsaturated carboxylic acid), 1609, 1596, 1424, 1364, 1381, 1291, 1170. ^{1}H NMR, δ_{ppm} $CDCl_3$ (400 MHz): 6.86 (2H, ddd, J=6.8, 2.0, 2.4 Hz, H-3 & H-5), 7.92 (2H, ddd, J= 6.8, 2.0, 2.4 Hz, H-2 & H-6), 9.79 (^{1}H, brs, -OH). ^{13}C NMR δ_{ppm} $CDCl_3$ (100.62 MHz): 115.25 (C-3 & C-5), 121.64 (C-1), 132.01 (C-2 & C-6), 161.71 (C-4), 169.04 (-COOH).

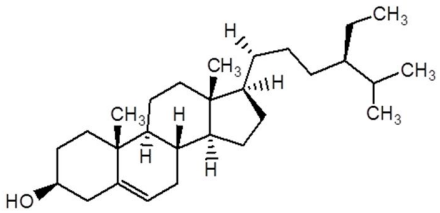
Elution of the column with chloroform-ethyl acetate (4:1) gave a colourless solid which on crystallization from methanol yielded a compound (**4**) (m.p.149-150°C). It showed a single spot at R_f 0.27 in the mobile phase of Toluene: Ethyl acetate (1:1). It was soluble in sodium hydroxide and gave effervescence with sodium carbonate. IR ν_{max} (KBr) cm-^{1}: 3264 (hydroxyl), 1708 (acid carbonyl), 1611, 1609. ^{1}HNMR, δ_{ppm} $CDCl_3$ (400 MHz): 6.8 (2H, d, J=8 Hz, H-3 & H-5), 7.1 (2H, d, J=8 Hz, H-2 &

H-6). ^{13}C NMR δ_{ppm} $CDCl_3$ (100.62 MHz): 40.43 (CH_2-), 115.51 (C-3 & C-5), 125.22 (C-1), 130.29 (C-2 & C-6), 156 (C-4), 174.18 (-COOH).

Further elution of the column with ethyl acetate led to the isolation of *β*-sitosterol-*β*-*D*-glucopyranoside (**5**) (m.p.284°C). It showed a single spot at R_f 0.38 in the mobile phase of chloroform: methanol (9:1). The identity was confirmed by direct comparison with the authentic samples (m.p., m.m.p, co-TLC and superimposable IR). The physical and spectroscopic data were comparable with those reported in literature.

2. Results and Discussion

The molecular formula of compound (**2**) is $C_7H_6O_2$, m.p. 119°C. IR spectrum showed the presence of hydroxyl (3448), acid carbonyl (2933, 1675), aromatic (1597, 1447) cm^{-1}. In ^1H NMR there were doublets corresponding to two protons each at δ 7.81 (H-2 & H-6) and 8.0 (H-3 & H-5) with J=8.4 Hz respectively. The aldehyde proton appeared as a singlet corresponding to one proton at δ 9.84. The ^{13}C NMR data were also in confirmative with the reported data. These data suggested the compound as *p*-hydroxybenzaldehyde (**2**). The physical and spectroscopic data were comparable with those reported in the literature[14,15].



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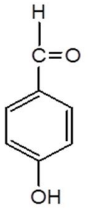

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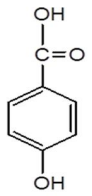

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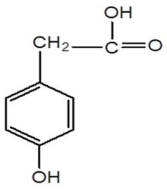

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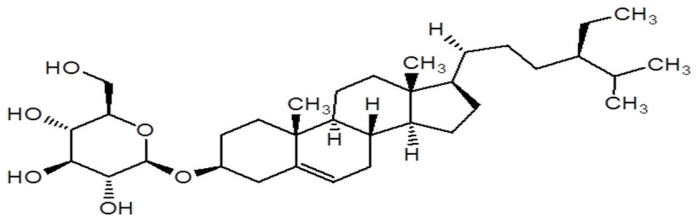

(5)

The molecular formula of compound (**3**) is C7H6O3, m.p. 212-214°C. IR spectrum showed the presence of hydroxyl (3393), α, β-unsaturated carboxylic acid (1685), aromatic (1596, 1424) cm-1. In ^1H NMR there were doublet of double doublet (ddd) corresponding to two protons each at δ 7.92 (H-2 & H-6) and 6.86 (H-3 & H-5) with J=6.8, 2.0, 2.4 Hz respectively. The ^{13}C NMR

data were also in confirmative with the reported data. These data suggested the compound as p-hydroxybenzoic acid (**3**). The physical and spectroscopic data were comparable with those reported in the literature[16,17].

The molecular formula of compound (**4**) is C8H8O3, m.p.149-150°C. IR spectrum showed the presence of hydroxyl (3264), acid carbonyl (1708), aromatic (1611, 1609) cm-1. In ^{1}H NMR there were two doublets corresponding to two protons each at δ 6.8 (H-3 & H-5) and 7.1 (H-2 & H-6) with J=8.0 Hz respectively. The ^{13}C NMR data were similar to compound (**2**) excepting a triplet at δ 40.43 showing the presence of CH2 carbon. These data suggested the compound as p-hydroxypheny lacetic acid. The physical and spectroscopic data were comparable with those reported in the literature [18].

4. Acknowledgment

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5. Conflict of Interest

The authors have no conflict of interest.

6. References:

1. Chopra RN, Nayar SL, Chopra IC. Glossary of Indian Medicinal plants, Drug Research Laboratory, Jammu Kashmir, Sri Nagar, 1956: 33.
2. Anonymous. The Wealth of India, A Dictionary of Indian Raw materials and Industrial Products. Vol.1, Publication and Information Directorate, Council of Scientific and Industrial Research, New Delhi, 1948: 145-154.
3. Tewari, K.C., Majunder, R., Bhattacharjee, S. Folkfore information from Assam for family planning and birth control. *International Journal of Crude Drug Research*, 1982; 20, 133-137.
4. Vedavathy S, Mrudula V, Sudhakar A. Herbal medicines for birth control ante- and post-partum treatments from Chittoor district. Fitoterapia 1995; 66: 192-195.
5. Menachery MD, Chandran K. Oestrogenic activity of bamboo (*Bambusa arundinacea*) buds. Kerala Journal of Veterinary Science 1984; 15, 38-44.
6. Vanithakumari G, Manonayagi S, Padma S, Malini T. Antifertility effect of *Bambusa arundinacea* shoot extracts in male rats. Journal of Ethnopharmacology 1989; 25:173-180.
7. Manonayagi S, Vanithakumari G, Padma S, Malini T. Effects of bamboo buds: Structural and functional changes in the epidisymis of rats. Journal of Ethnopharmacology 1989; 25: 201-212.
8. Sethi N, Nath D, Singh RK. Teratological evaluation of some commonly used indigenous antifertility plants in rats. International Journal of Crude Drug Research 1989; 27: 118-120.
9. Nath D, Sethi N, Singh RK, Jain AK. Commonly used Indian abortifacient plants with special reference to their teratologic effects in rats. Journal of Ethnopharmacology 1992; 36: 147-154.
10. Chandra AK, Ghosh D, Mukhopadhyay S, Tripathy S. Effect of bamboo shoot, *Bambusa arundinacea* (Retz.) willd. on thyroid status under conditions of varying iodine intake in rats. Indian Journal of Experimental Biology 2004; 42: 781-786.
11. Ju CK, Hong LB, Li CT, Ching CF. Constituents of the stem extract from green bamboo. T'ai wank k'O Hsuesh 1989; 42: 21.
12. Rao PS, Jacob CM, Ramasastri BV. The nutritive value of Bamboo seeds. Journal of Nutrition and Dietetics 1969; 6:192-195.
13. Gopalan C, Rama Sastri BV, Balasubramanian SC. Nutritive value of Indian foods 1989: 74, 77-79, 85, 91.
14. Magano J, Chen MH, Clark JD, Nussbaumer T. 2-(Diethyamino) ethanethiol, a new reagent for the odorless deprotection of aromatic methyl ethers. Journal of Organic Chemistry 2006; 71:7103-7105.
15. Khazaei A, Zolfigol MA, Abedian N. A novel synthesis and characterization of poly [4-imino (N-4-ethylbenzoate) benzene p-styrenesulphonate] and the investigation on polymer ability for drug release. Iranian Polymer journal 2001; 10: 59-65.
16. Scott KN. Carbon-13 nuclear magnetic resonance of biologically important aromatic acids. I. chemical shifts of benzoic acid and derivatives. Journal of American chemical Society 1972; 94: 8564-8568.
17. Scott KN. NMR parameters of biologically important aromatic aids. I. Benzoic acids and derivatives. Journal of Magnetic resonance 1970; 2:361-376.

18. Shapiro BL, Mohrmann LE. NMR spectral data: A compilation of aromatic chemical shifts in mono- and di- substituted benzenes. Journal of Physical and Chemical Reference Data1977; 6: 919-991.