Asian Journal of Chemistry; Vol. 25, No. 6 (2013), 3533-3534

ASIAN JOURNAL OF CHEMISTRY

http://dx.doi.org/10.14233/ajchem.2013.13872

*NOTE*

# Isolation of Vomifoliol: A Megastigmane from Leaves of *Antidesma ghaesembilla*

S. MARIA[1], F. ISLAM[2,*], N. QAIS[1] and C.M. HASAN[2]

[1]Department of Clinical Pharmacy and Pharmacology, Faculty of Pharmacy, University of Dhaka, Dhaka-1000, Bangladesh
[2]Department of Pharmaceutical Chemistry, Faculty of Pharmacy, University of Dhaka, Dhaka-1000, Bangladesh

*Corresponding author: Tel: +880 1914937861; E-mail: farhana_p40@yahoo.com

(*Received*: 9 April 2012; *Accepted*: 29 December 2012) AJC-12641

The leaves of *Antidesma ghaesembilla* Gaertn (Phyllanthaceae) was subjected to phytochemical investigation. The powdered leaves were extracted with ethanol and then partitioned among petroleum ether, carbon tetrachloride and chloroform. Fractionation of the chloroform extracts affords the isolation and structural elucidation of vomifoliol. The separation of the chemical component was carried out by different chromatographic techniques and the structure was elucidated by nuclear magnetic resonance ($^1$H NMR) as well as by mass spectrometry.

**Key Words: *Antidesma ghaesembilla*, Phyllanthaceae, Vomifoliol, $^1$H NMR.**

*Antidesma* are part of the Phyllanthaceae family, comprising more than 120 species. *Antidesma* are widely distributed throughout south east Asia but also Australia, Africa and Pacific Island. There are 18 species and 5 varieties of *Antidesma* endemic to Thailand. *Antidesma* is a relatively homogeneous genus of dioeciously shrubs and trees in the Old World tropics[1]. *A. ghaesembilla* is widely distributed in Bangladesh, Bhutan, Cambodia, India (including Nicobar Islands), Indonesia, Laos, Malaysia, Myanmar, Nepal, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam and Australia. *Antidesma ghaesembilla* (local name-Khudijam) is a small to medium sized tree up to 20 m tall. The bark has been reported to be useful in astringent, tonic, dengue fever and wound healing. The wood or young stem with their barks are used as emmenagogue[2].

In this paper we report the isolation and characterization of Vomifoliol (**1**) from the chloroform extract of leaves of *Antidesma ghaesembilla*.

$^1$H NMR spectra were obtained on Bruker Avance (400 MHz for $^1$H) spectrophotometer using the residual solvents peak as internal standard, δH values are expressed in parts per million relative to the solvent ($CDCl_3$), mass spectra were obtained in JEOL JMS DX 303. Vacuum liquid chromatography (VLC) and gel permeation chromatography were conducted on silica gel (Kieselgel 60, mesh 70-230) and sephadex LH-20, respectively. TLC and preparative TLC were carried out using Merck silica gel 60 $PF_{254}$ on glass plates at a thickness of 0.5 mm and spots were visualized under UV light (254 nm) and spraying with 1 % vanillin- $H_2SO_4$ followed by heating at 110 ºC for 5-10 min.

The leaves of *Antidesma ghaesembilla* were collected from Gazipur, Bangladesh in October 2009 and a voucher specimen (Accession Number DACB - 34395) representing this collection has been deposited in Bangladesh National Herbarium, Mirpur, Dhaka for further reference.

The leaves after cutting into small pieces were dried under sun for several days. The plant materials were then oven dried for 24 h at considerably low temperature (40 ºC) for better grinding. The coarse powder was then stored in air tight container and kept in cool, dry and dark place for future use.

650 g of powdered leaf was soaked in 3.5 L of ethanol in a large conical flask for 7 days with occasional shaking and stirring. The whole mixture was then filtered off through a cotton plug followed by Whatman filter paper No. 1 and the filtrate thus obtained was concentrated at 40 ºC with a rotary evaporator. The weight of the dried residue was 10 g. Then 6 g of the concentrated methanol extract was fractioned by modified Kupchan partitioning[3] protocol which afforded petroleum ether (1 g), carbon tetrachloride (900 mg) and chloroform (2 g) and aqueous (1 g) soluble fractions.

**Vacuum liquid chromatography (VLC)[4]:** An aliquot of the chloroform soluble partitionate (2 g) was fractioned by vacuum liquid chromatography (VLC). The column was packed with silica gel (Kieselgel 60, mesh 70-230) under vacuum and washed with petroleum ether. Chloroform fraction was adsorbed onto silica gel, allowed to dry and applied on

top of the adsorbent layer. Then the column was eluted with pet ether, ethyl acetate and methanol mixtures of increasing polarities to provide 23 fractions (each 120 mL). All the fractions were screened by TLC under UV-light and vanillin $H_2SO_4$ reagent followed by heating. Depending on the TLC behaviour, fractions present in beaker 13-23 were mixed and subjected to gel permeation chromatography for further fractionation.

**Gel permeation chromatography[5]:** Vacuum liquid chromatography fractions 13-23 were passed through sephadex (LH-20) column using different solvent system (Table-1).

TABLE-1
DIFFERENT SOLVENT SYSTEM FOR GEL PERMEATION CHROMATOGRAPHY ANALYSIS

| Solvent system | Proportions | Fractions No. | Amount collected (mL) |
|---|---|---|---|
| Hexane:DCM[a]:ME[b] | 2:5:1 | 1-26 | 150 |
| ME:DCM | 9:1 | 27-42 | 50 |
| ME:DCM | 1:1 | 43-44 | 50 |
| ME | 100 | 45-47 | 100 |

a = dichloromethane; b = methanol

A total of 47 fractions were collected and screened by TLC under UV light and vanillin $H_2SO_4$ reagent followed by heating. Column fractions 30-33 were found to give identical spots. Preperative thin layer chromatography[6] (PTLC) of column fractions 30-33 eluted with 40 % ethyl acetate in pet ether over silica gel using tolune-ethyl acetate (70:30) afforded compound **1** (3 mg).

**Detection method:** Vomifoliol (Fig. 1): (3 mg); white needles; brick red colour spot was visualized under UV light (254 nm) on TLC plate upon spraying with 1 % vanillin $H_2SO_4$ followed by heating at 110 ºC for 5-10 min. EIMS for $C_{13}H_{20}O_3$ m/z (rel. int.): 224 ($M^+$); $^1$H NMR ($CDCl_3$, 400 MHz): δ 5.90 (1H, br.s, H-5), 5.84 (1H, dd, *J* = 14, 5 Hz, H-8), 5.81 (1H, d, *J* = 14, H-7), 4.34 (1H, m, H-9), 2.38 (1H, d, *J* = 17.08 Hz, Hb-3), 2.18 (1H, d, *J* = 17.02 Hz, Ha-3), 1.82 (3H, t, H-13), 1.23 (3H, d, *J* = 6.4 Hz, H-10), 1.02 (3H, s, H-11) and 0.93 (3H, s, H-12).

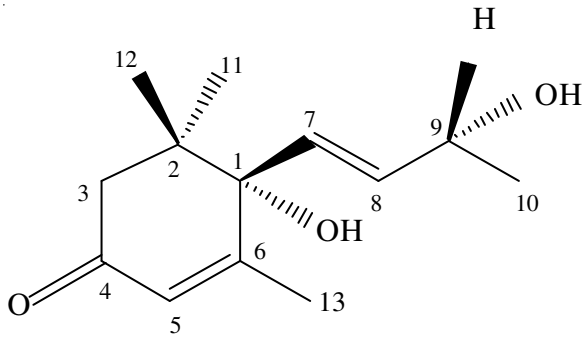


Fig. 1. Structure of vomifoliol (**1**)

One compound was isolated from the chloroform extract of the leaves of *Antidesma ghaesembilla* by repeated chromatographic separation and purification over silica gel. The structure of **1** was solved by $^1$H NMR and EIMS and determined to be vomifoliol (**1**) by comparing the spectral data with those reported for this compound[7-9].

The molecular formula of **1** was determined to be $C_{13}H_{20}O_3$ based on molecular ion peak at m/z 224 ($M^+$) in its EIMS. The $^1$H NMR spectrum of **1** showed signals assignable to three olefinic proton at δ 5.90, 5.84 and 5.81 at H-5, H-8 and H-7, respectively, an oxygenated methine at δ 4.34 ( H-9), an isolated methylene at δ 2.38 ( H 3b) and 2.18 (H 3a). In addition the spectrum also revealed a vinyl methyl at δ 1.23 (Me-10), a secondary methyl at δ 1.82 (Me-13) and two tertiary methyl resonating at δ 1.02 (Me-11) and 0.93 (Me-12). This is the first report of its occurrence from *Antidesma ghaesembilla* and to the best of our knowledge it is the fourth report from the plant sources.

## Conclusion

The isolation and identification of vomifoliol (**1**) from the leaves of *Antidesma ghaesembilla* was reported from this plant. The work was carried out by means of various physical (solvent extraction, chromatography), spectral techniques and the structure was established on the basis of $^1$H NMR and mass spectroscopy. Vomifoliol is biologically active[10] and is a megastigmane derivative. Naturally occurring megastigmane derivatives were previously found to have antiproliferative[11-16], anticancer[17] and cytotoxic effects[18]. So the isolated compound vomifoliol (**1**) can be used for determining anticancer, cytotoxic, antiproliferative and other biological activities.

## ACKNOWLEDGEMENTS

The authors thank Bangladesh Council for Scientific and Industrial Research (BCSIR) for assisting with the NMR studies.

## REFERENCES

1. F. Pax and P. Hoffmann, In ed.: A. Engler, Euphorbiaceae-Phyllanthoideae-Phyllanthae, in Das Pflanzenreich 81, Wilhelm Engelmann, Leipzig, Vol. 1 (1922).
2. J.F. Caius, The Medicinal and Poisonous Plants of India, Scientific Publishers, Jodhpur, India, p. 528 (1986).
3. B.C. Vanwagenen, R. Larsen, J.H. Cardellina II, D. Randazzo, Z.C. Lidert and C. Swithenbank, *J. Org. Chem*., **58**, 335 (1993).
4. J.C. Coll and B.F. Bowden, *J. Nat. Prod*., **49**, 934 (1986).
5. R.G. Reid and S.D. Sarker, *Nat. Prod. Isolation*, **4**, 111 (1998).
6. Q.T. Liu and J.L. Kinderlerer, *J. Chromatogr*., **855**, 617 (1999).
7. K.L. Stuart and R.B.W. Ming, *Phytochem. Reports*, **14**, 594 (1975).
8. S. Hammami, H.B. Jannet, A. Bergaoui, L. Ciavatta, G. Cimino and Z. Mighri, *Molecules*, **9**, 602 (2004).
9. S. Oksuz, A. Ulubellen and A. Barla, *Turk. J. Chem*., **26**, 457 (2002).
10. K.L. Stuart and L.B. Coke, *Planta*, **122**, 307 (1975).
11. J.M. Zhou, G.Y. Geng, G. Batist and J.H. Wu, *Bioorg. Med. Chem. Lett*., **19**, 1183 (2009).
12. J.R. Liu, B.F. Yang, B.Q. Chen, Y.M. Yang, H.W. Dong and Y.Q. Song, *World J. Gastroenterol*., **10**, 167 (2004).
13. W.L. Chen, Q.F. Liu, J. Wang, J.P. Zuo, Z.X. Zhu and W.M. Zhao, *Planta Med*., **72**, 143 (2006).
14. J.R. Liu, B.F. Yang, B.Q. Chen, H.W. Dong, Y.Q. Song, C.H. Sun, Q. Wang and G. Song, *World J. Gastroenterol*., **10**, 348 (2004).
15. J.R. Liu, X.R. Sun, H.W. Dong, C.H. Sun, W. G. Sun, B.Q. Chen, Y.Q. Song and B.F. Yang, *Int. J. Cancer*, **122**, 268 (2008).
16. S.G. Yu, P.J. Anderson and C.E. Elson, *J. Agric. Food Chem*., **43**, 2144 (1995).
17. H. Ito, E. Kobayashi, S.H. Li, T. Hatano, D. Sugita, N. Kubo, S. Shimura, Y. Ito, H. Tokuda and H. Nishino, *J. Agric. Food Chem*., **50**, 2400 (2002).
18. I. Kubo and Y. Morimitsu, *J. Agric. Food Chem*., **43**, 1626 (1995).