

A Sesquiterpene Ester from *Artemisia indica* Wild. of Nepali Origin

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Abstract

A sesquiterpene ester **1** has been isolated from the plant *Artemisia indica* for the first time. The structure of compound was deduced using mass spectrometry and 1D and 2D-NMR spectroscopy. Detail 2D-NMR of compound is described for the first time and this is the first report of the phytochemical work on *Artemisia indica* from Nepal.

Keywords: Sesquiterpene ester, *Artemisia indica*, Nepali origin

Introduction

Artemisia indica is a perennial wild plant belongs to genus *Artemisia* and growing in moderate places of the world. It is commonly found in the southern part of Himalaya and locally known as “Titepati”.¹ It has been used by local inhabitants to alleviate hepatobiliary ailment, heartburning, and persistent fever. The leaves of *A. indica* have the potential of antispasmodic, antiseptic, and antihelminthic activity.² The extract of the plant is drunk in Nepal for the treatment of abdominal pain dysentery and diarrhea. The flowers and leaves of *A. indica* in dried powder form are used to treat skin diseases.³ Antioxidant and antimicrobial activity of *A. indica* of Nepali origin has been reported.⁴

The major chemical constituent of *Artemisia indica* is essential oil. The essential oil of *A. indica* is very fascinating from food industry, cosmetic, and pharmaceutical points of view, as its antimicrobial, cytotoxic, and antioxidant behavior.³ The well known essential oils like artemisia ketone, linalool, germacrene, borneol, chrysanthenyl acetate, *p*-cymene, α -thujone and β -pinene were isolated from *A. indica*.³

Antimalarial compounds exiguaflavone A, exiguaflavone B, along with other compounds maackiain, and 2-(2,4-dihydroxyphenyl)-5,6-methylenedioxybenzofuran have been reported from *A. indica*.⁵ This is the first report of the phytochemical work on *A. indica* of Nepali origin.

Experimental Methods

General Experimental

Optical rotations were recorded on a JASCO digital polarimeter (model DIP-3600) in chloroform and methanol. Purity of compound was confirmed using pre-coated silica gel TLC (20 × 20, 0.5 mm thick, E.

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Merck, type 70-230 Mesh), were examined under UV light at 254 and 366 nm. Spots on TLC plates were further confirmed by spraying with cerriksulfate reagent. Jeol MS route JMS 600H attached with TSS 2000 was used to record EI-MS. The IR spectra were acquired from FTIR-8900 (Fourier Transform Infrared Spectrophotometer, Shimadzu, Japan) using KBr disc. UV/Visible spectra were acquired from Evolution UV-Visible spectrophotometer (Thermoscientific, United State) in λ_{max} (ϵ). Polarimeter P-2000 (JASCO, Japan) was used to measure optical rotations. All 1D- and 2D- NMR spectra were recorded on Avance 400 MHz instrument.

Plant material

The plant was collected from Kathmandu Nepal, during Sept, 2016. The plant material was identified by comparing with standard herbarium present at Central Department of Botany, Tribhuvan University, Kathumandu Nepal.

Extraction and isolation

2.15 Kg air dried plant material is grinded or cut into small pieces to make homogenous powder and macerated (ratio 1 g/10 ml) in methanol. Methanolic extract 206 g received after evaporation of solvent, was dissolved in distilled water and preceded for fractionation by different solvents. The dichloromethane (DCM) fraction was subjected to silica gel column chromatography using hexanes/ethylacetate as eluting solvent, which yielded a number of sub fractio. Sub-fraction DAI2, which obtained from 25% EtOAc/Hex, was further subjected to LH-20 sephadex column chromatography using methanol as mobile phase afforded compound **1** (15.0 mg).

IPUC Name: methyl 2-(1,5-dihydroxy-4a,8-dimethyl-1,2,3,4,4a,5,6,8a octahydronaphthalen-2-yl)acrylate.

Molecular Formula: $C_{16}H_{14}O_4$

Physical State: White crystalline

Yield: 15.0 mg

$[\alpha]_D^{26}$: + 97°

IR ν_{max} cm^{-1} : 3320 and 1710

EI-MS m/z (rel. int., %): 280 (M^+ , 1.2), 243.9 (100.0), 229.9 (38.8), 185.0 (31.7), 169.0 (31.4), 135.0 (31.0), 121.1(40.1), and 107.0 (62.8)

Results and Discussion

Compound **1** was isolated as a white amorphous solid by the column chromatography from DCM fraction of *Artemisia indica*. The EI-MS spectra of compound **1** depicted a [M^+] peak at 280 and a peak at m/z 262 after the loss of water molecule. The chemical formula of compound **1** was suggested $C_{16}H_{14}O_4$ with five degrees of unsaturation. The key fragment ions at m/z 262, 244 230, and 158 resulted from the cleavage of compound **1** (Fig.1).

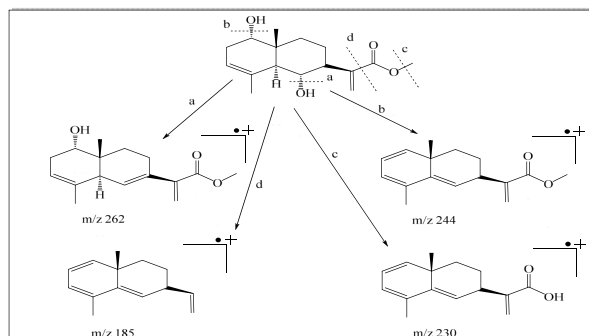


Figure 1: Key fragments of compound **1**.

The $^1\text{H-NMR}$ spectrum (Table-1) showed resonances for two methyls and one methoxy at δ 0.84 s, 1.87 s, and 3.73 s, which were allocated to protons of C-14, C-15, and C-16 methyl groups respectively. Signals resonated at δ 5.69 and 6.22 were assigned to protons of methylene group at C-13. Two downfield signals resonated at δ 3.91 t ($J_{1,2} = 10.4$ Hz) and 3.27 d ($J_{6,7} = 4.4$ Hz) were assigned to protons of C-1 and C-6 respectively bearing hydroxyl group.

The $^{13}\text{C-NMR}$ spectra broad band DEPT (Table-1) revealed resonances for sixteen carbons, including three methyls, four methylenes, five methines, and four quaternary carbons. Resonances of downfield at δ 121.0, 136.6, 144.8, and 126.2 indicate two double bonds. Furthermore, signal at δ 168.8 verified a carbonyl carbon in compound. The deduction of key structural fragments and their combination to obtain the finishing structure of compound **1** was carried out with the help of COSY, HSQC and HMBC spectra (Fig. 2). Stereochemistry of the compound was confirmed with the help of coupling constant values and NOESY correlation. Compound **1** was previously reported from the plant *Tanacetum praeteritum*.⁶

Table-1: $^{13}\text{C-}$ and $^1\text{H-NMR}$ chemical shift values of **1** (CD_3OD , ppm, 100 and 400 MHz).

Carbon No.	δ_{C}	δ_{H} (J, Hz)
1	72.2	3.27 d (4.4)
2	35.0	1.11 dd (8.8, 2.4), 1.89 ovp
3	121.0	5.24 br s (2.4)
4	136.6	-
5	46.5	2.25 d (10.8)
6	74.8	3.91 t (10.4)
7	53.0	2.44 m
8	27.8	1.58 m, 1.89 ovp
9	33.8	1.98 dd (18.8, 1.6), 2.41 ovp
10	40.3	-
11	144.8	-
12	168.8	-
13a	126.2	6.22 br s
13b	126.2	5.69 s
14	17.6	0.84 s
15	25.5	1.87 s
16 OMe	49.4	3.73 s

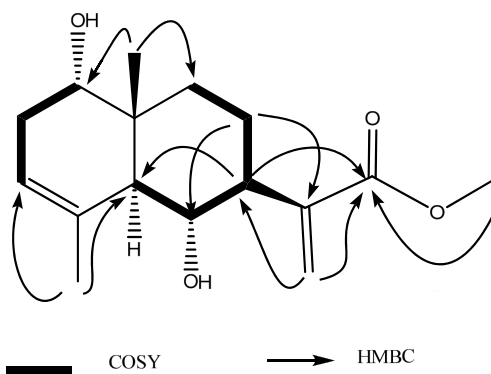


Figure 2: Key COSY and HMBC correlations of compound 1.

Conclusion

Phytochemical work on *Artemisia indica* from Nepal has been done for the first time and a sesquiterpene ester has isolated for the first time from the *Artemisia indica*.

Acknowledgement

We would like to thank Mr. R. C. Kandel for helping to collect plant material and Prof. Dr. Krishna Kumar Shrestha for identifying the plant material.

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