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Isolation of Phytoconstituents from the leaves of *Chenopodium album* Linn

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ABSTRACT

Fractionation of crude petroleum ether extract of the leaves of *Chenopodium album* Linn lead to the isolation of β-sitosterol (1), lupeol (2) and 3 hydroxy nonadecyl henicosanoate (3). Their structures were elucidated by spectroscopic methods such as UV, IR, NMR and LCMS. Compound 2 and 3 were isolated for the first time from this plant.

Keywords: *Chenopodium album* Linn; Isolation; β-sitosterol; lupeol; 3 hydroxy nonadecyl henicosanoate; spectroscopic method.

INTRODUCTION

Chenopodium album Linn (Chenopodiaceae) found wild up to an altitude of 4700 m and cultivated throughout India particularly Western Rajasthan, Kulu valley and Shimla. It is commonly known as Lamb's quarte, wild spinach, white goosefoot in English (Wealth of India, 2001; Warrier PK et al., 2006). In Tradition System of Medicine, it is used as an anthelmintic, antiphlogistic, antirheumatic, contraceptive, odontalgic, laxative, cardiotonic, antiscorbutic, blood purifier, hepatic disorder, spleen enlargement, biliousness, intestinal ulcers, digestive, carminative, aphrodisiac, dyspepsia, flatulence, strangury, seminal weakness, pharyngopathy, splenopathy, hemorrhoids, ophthalamopathy, cardiac disorder and general debility (Khare, 2007; Agarwal et al., 2005; Pramila et al., 2006; Panda, 2005).The phytoconstituents isolated so far from the plant are ascorbic acid, β-carotene, catechin, gallocatechin, caffeic acid, p-coumaric acid, ferulic acid, β-sitosterol, campesterol, xanthotoxin, stigmasterol, n-triacontanol, imperatorin, ecdysteroid (Rastogi et al., 1998), cinnamic acid amide alkaloid (Della Greca et al., 2005), phenol, saponin, apocartenoids (Della Greca et al., 2004), crytomeridiol (Cutilla et al., 2004), n-trans-feruloyl-4-O-methyl dopamine and syringaresinol (Cutilla et al., 2006). In the present work, we have isolated β-sitosterol (1), lupeol (2) and 3 hydroxy nonadecyl henicosanoate (3) from the petroleum ether extract of dried leaves of *Chenopodium album.* Compound 2 and 3 were isolated for the first time from this plant.

MATERIAL and METHODS

Plant material

Fresh leaves of *Chenopodium album* were collected, shade dried and authenticated by Dr. Shiddamallayya. N, Central Council for Research in Ayurveda and Siddha, Bangalore. A voucher specimen (RRCBI/MCW/7) of the plant was deposited in the Department of Pharmacognosy, The Oxford College of Pharmacy, Bangalore.

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General instrument details

UV: Shimadzu UV VIS-1700; IR: JASCO FTIR 5300; LCMS: Agilent 1100 LC-MSD APCI; ^{1}H-NMR (500 MHz) and ^{13}C-NMR (125MHz): Bruker Avance 500.

Extraction and isolation procedure

Coarsely powdered leaves (750 gm) were extracted with petroleum ether followed by chloroform by the process of continuous extraction (soxhlation). The crude extract was evaporated to dryness in a in a rotary flash evaporator, with the percentage yield being 2.20 % and 0.60 % w/w in term of dry plant material. Crude petroleum ether extract was subjected to column chromatography over silica gel (60-120 mesh) using petroleum ether: chloroform (different ratio), chloroform (100 %) and chloroform: methanol (different ratio), taking 250 ml fraction each time. From petroleum ether: chloroform: 1:0.1, fractions 63-69 (CA-1); petroleum ether: chloroform: 1:0.5, fractions 104-110(CA-2) and petroleum ether: chloroform: 1:1, fractions 130-138 (CA-3) on further purification by fractional crystallization yielded compound 1(20 mg), compound 2 (07 mg) and compound 3 (10 mg) respectively.

RESULTS and DISCUSSION

The structures of compound isolated were elucidated on the basis of spectral data.

Compound 1 was isolated as white amorphous powder, m.p.: 139-142^{0}C. Positive test for Liebermann Burchardt test indicated the presence of tetracyclic triterpenoid compound. Its IR spectrum exhibited characteristic bands at 3288 cm^{-1} for hydroxyl group. The ^{1}H-NMR as well as ^{13}C-NMR data were found to be identical with the spectrum of those already reported earlier for β-sitosterol (Sethi et al., 1978). It was further confirmed by TLC and CO-TLC method with the reference standard of ß-sitosterol.

Compound 2 was isolated as colorless powder. Positive test for Liebermann Burchardt test indicated the presence of tetracyclic

triterpenoid compound.

Its IR spectrum exhibited characteristic bands at 3288 cm^{-1} for hydroxyl group. The ^{1}H-NMR as well as ^{13}C-NMR data were found to be identical with the spectrum of those already reported earlier for lupeol (Lakshmi et al., 1975). It was further confirmed by TLC and CO-TLC method with the reference standard of lupeol.

Compound 3 was isolated as colorless compound. Its molecular formula was determined as $C_{40}H_{80}O_3$ on the basis of mass spectrum by exhibiting a quassi molecular ion at m/z 609 (M +) and molecular weight was established as 608. Its IR spectrum exhibited characteristic band at 1736 cm^{-1} for carbonyl group and a broad band at 3400 cm^{-1} for hydroxyl group. The ^{1}H-NMR spectrum showed a triplet signal at δ 0.71 for methyl group and a strong signal at δ 1.29 for long chain methylene protons. The triplet signal at d 3.92 and at d 3.10 is due to the methylene group attached to oxygen atom of the ester moiety and triplet at δ 2.50 is due to methylene group attached to the carbonyl carbon. The signal at d 3.92 and at d 3.10 is attributed to a hydroxy methane group. With the above data and mass spectrum, the compound is identified as 3-hydroxy nonadecyl henicosanoate. Compound 2 and 3 were isolated for the first time from this plant.

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