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Research Article

PHYTOCHEMICAL INVESTIGATION OF *SUAEDA MARITIMA* (L.) DUMORT. STEM

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Abstract

In the present investigation the methanol extract of *Suaeda maritima* (L.) Dumort. stem was used for the isolation of phytoconstituents by using column chromatography. The identification of the isolated constituents was done by using spectroscopic analysis. Three new compounds namely are n-nonanyl-n-octadec-9-enoate, n-tetradecanyl dihydrocaffeate and n-hexadecanyl dihydrocaffeate were isolated and identified from the plant.

Keywords: *Suaeda maritima*, Chenopodiaceae, n-nonanyl-n-octadec-9enoate, n-tetradecanyl dihydrocaffeate and n-hexadecanyl dihydrocaffeate

INTRODUCTION

Today estimates that about 80 % of people in developing countries still relays on traditional systems of medicine for their primary health care. Plant extracts contain many chemical compounds which are biologically active within the human body[1]. Plant-derived substances have recently become of great interest owing to their versatile applications[2]. Scientific studies on a number of medicinal plants indicated that promising phytochemical compounds can be developed for many health problems[3]. Still most of the plants carry a large number of unidentified compounds which can be really useful for making new drugs and for the identification of lead compounds. The present study is aimed to isolate and characterize few phytoconstituents from the methanolic extract of *Suaeda maritima* (L.) Dumort. *Suaeda maritima* (L.) Dumort (Chenopodiaceae) is a salt marsh mangrove annual herb grows in very alkaline and saline moist soil[4]. The plant is distributed throughout the east west costs mangroves in India viz sunderbans in West Bengal, Mahnadhi and Bitharkanika in Orissa, Coringa, Krishna and Godavari in Andhra Pardesh, Karangadu and Pichavaram in Tamil Nadu, India. The raw or cooked young leave have a pleasant salty flavor and are often mixed with other vegetable to reduce their saltiness. The young shoots are pickled in vinegar and eaten on their own or used as relish. Traditionally the leaf from *Suaeda maritima* has been used as medicine for hepatitis[5] and is reported to have antiviral[6-7], antibacterial activity[8], hepatoprotective[4], antioxidant activity[5] etc.

MATERIALS AND METHODS

The stem of *Suaeda maritima* (L.) Dumort was collected from Hisar, Haryana, India in the month of October 2010 and authenticated by Dr. H.B. Singh, Head Raw Material Herbarium and Museum, New Delhi, India vide Ref. NISCAIR/RHMD/Consult-2010-11/1548/146. A voucher specimen has been retained in Department of Pharmaceutical Science, Guru Jambheshwar University of Science and Technology, Hisar, India. The plant material (1 kg) was air-dried at room temperature (30-40ºC).

Extraction of plant materials

The dried powdered stem of *Suaeda maritima* (3 kg) were subjected to hot continuous extraction with methanol using soxhlet apparatus for 72 hours. The liquid extract was concentrated by distillation followed by drying and kept in desiccators. The stem extract of *Suaeda maritima* (178.5 g, 5.95 %) of brown color sticky mass were obtained. The development and elution of the column was carried out with successive series of solvents in various combinations viz. petroleum ether, petroleum ether: chloroform, chloroform, chloroform: methanol and methanol.

RESULTS

Compounds isolated from *Suaeda maritima* (L.) Dumort. stem by column chromatography were

SMS-1

Elution of the column with chloroform: methanol (9:1) gave yellowish brown amorphous compound SMS-1 re crystallized from chloroform: methanol (1:1), 234 mg (0.067 %), R_f(0.74), m.p. 85-87ºC.

UV λmax (MeoH): 507 nm

IR νmax (KBr): 2947, 2842, 1723, 1647, 1396, 1260, 1188, 1103, 787 cm^{-1}

^{1}H-NMR ($CDCl_3$) : δ 5.31 (2H, m, H-9, H-10), 4.25 (2H, t, J = 6.8 Hz, H_2-1), 2.50 (2H, m, H_2-2), 2.44 (2H, m, H_2-8), 2.40 (2H, m, H_2-11), 1.22 (36 H, brs, 18 x CH_2), 0.88 (3 H, t, J = 6.5 Hz, Me-18), 0.83 (3 H, t, J = 6.3 Hz, Me-9).

TOF MS m/z (rel. int): 408 [M] + (C_{27} H_{52} O_2) (9.8).

SMS-2

Elution of the column with chloroform: methanol (1:1) furnished light reddish brown crystal of compound SMS-2 re crystallized from chloroform: methanol (1:1), 244 mg (0.069 %), R_f(0.74), m.p. 101-103ºC.

UV λmax (MeoH): 207 and 276 nm

IR νmax (KBr): 3364, 3240, 2925, 2850, 1720, 1643, 1427, 1260, 1219, 1188, 1103, 1041, 725 cm^{-1}

^{1}H-NMR (DMSO-d_6) : δ 7.36 (1H, d, J = 3.0 Hz, H-2), 7.16 (1H, m, H-5), 6.59 (1H, m, H-6), 4.21 (2H, t, J = 7.3 Hz, H_2-1), 2.60 (2H, t, J = 7.2 Hz, H_2-7), 2.42 (2H, t, J = 7.5 Hz, H_2-8), 1.20 (24 H, brs, 12 x CH_2), 0.87 (3 H, t, J = 6.5 Hz, Me-14).

TOF MS m/z (rel. int): 378 [M] + (C_{23} H_{38} O_4) (19.3).

SMS-3

Elution of the column with chloroform: methanol (1:3) gave brown amorphous resinous compound SMS-3 re crystallized from chloroform: methanol (1:1), 238 mg (0.068 %), R_f (0.67), m.p. 110-112ºC.

UV λmax (MeoH): 206 and 276 nm

IR νmax (KBr): 3394, 3286, 2947, 2851, 1723, 1645, 1566, 1396, 1188, 1103, 1041, 887 cm^{-1}

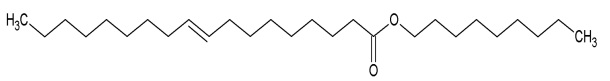
^{1}H-NMR (DMSO-d_6) : δ 7.36 (1H, d, J = 3.0 Hz, H-2), 7.16 (1H, m, H-5), 6.62 (1H, m, H-6), 4.23 (2H, t, J = 7.5 Hz, H_2-1), 2.70 (2H, t, J = 7.1 Hz, H_2-7), 2.50 (2H, t, J = 7.2 Hz, H2-8), 1.22 (28 H, brs, 14 x CH_3), 0.83 (3 H, t, J = 6.3 Hz, Me-16).

TOF MS m/z (rel. int): 406 [M] + (C_{25} H_{42} O_4) (3.5).

DISCUSSION

SMS-1

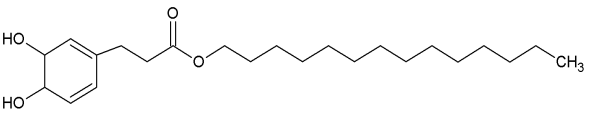
Compound SMS-1 named n-nonanyl-n-octadec-9-enoate, was obtained as yellowish brown amorphous mass from chloroform: methanol (9:1) eluant. It had IR absorption bands for stretching for ester function (1723 cm^{-1}), un saturation (1647cm^{-1}), and long aliphatic chain (787 cm^{-1}) on the basis of mass spectra, the molecular ion peak of compound SMS-1 was determined at m/z 408 constituent to the molecular formula of a ester ($C_{27}H_{52}O_2$). The ^{1}H-NMR spectra of compound SMS-1 showed that H-9, H-10, appears as multiplet at δ 5.31. Two proton triplet at δ 4.25 (J= 6.8 HZ) was appears at H-1. The two proton multiplet at δ 2.50, δ 2.44 and δ 2.40 appears at H_2-2, H_2-8, H_2-11. The broad peaks of methylene group (18 x CH_2) were found at δ 1.22. The terminal methyl group showed three proton triplet at δ 0.83 (J = 6.5 HZ) and δ 0.83 (J = 6.3 HZ) was ascribed to Me-9 and Me-18 respectively. On the basis of these evidences, the structure of compound SMS-1 has been characterized as n-nonanyl-n-octadec-9-enoate.



n-nonanyl-n-octadec-9-enoate

SMS-2

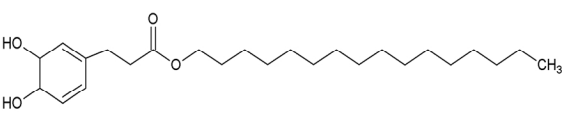
Compound SMS-2 named n-tetradecanyl dihydrocaffeate, was obtained as light reddish brown crystalline mass from chloroform: methanol (1:1) eluant. It had IR absorption bands for stretching for phenol group (3364 cm^{-1}), Carboxylic group (3240 cm^{-1}) ester function (1720 cm^{-1}), aromaticity (1643, 1427 cm^{-1}) and long aliphatic chain (725 cm^{-1}) on the basis of mass spectra, the molecular ion peak of compound SMS-2 was determined at m/z 378 constituent to the molecular formula of a ester ($C_{23}H_{38}O_4$). The ^{1}H-NMR spectra of compound SMS-2 showed one-proton doublets at δ 7.36 (J = 3.0 Hz) and one proton multiplet at 7.16 and one proton multiplet at 6.59 (assigned to aromatic H-2, H-5 and H-6 respectively. A two proton triplets at δ 4.21 was ascribed to the OCH_2 protons. A two- proton triplet at δ 2.60 (J = 7.2 HZ) was due to benzylic carbon at H_2-7' protons. The methyline group (-CH_2) at position H_2-8 protons showed two proton triplet at δ 2.42 (J = 7.5 HZ). The broad peaks of methylene group (12 x CH_2) were found at δ 1.20. The terminal methyl group showed three proton triplet at δ 0.83 (J = 6.5 HZ). On the basis of these evidences, the structure of compound SMS-2 has been characterized as n-tetradecanyl dihydrocaffeate



. n-tetradecanyl dihydrocaffeate.

SMS-3

Compound SMS-3 named n-hexadecanyl dihydrocaffeate, was obtained as brown amorphous resinous mass from chloroform: methanol (1:3) eluant. It had IR absorption bands for stretching for phenol group (3394 cm^{-1}), Carboxylic group (3286 cm^{-1}) ester function (1723 cm^{-1}), aromaticity (1645, 1396 and 1041 cm^{-1}) and long aliphatic chain (887 cm^{-1}) on the basis of mass spectra, the molecular ion peak of compound SMS-3 was determined at m/z 406 constituent to the molecular formula of a ester ($C_{25}H_{42}O_4$). The ^{1}H-NMR spectra of compound SMS-3 showed one-proton doublets at δ 7.36 (J = 3.0 HZ) and one proton singlet at 7.16 and one proton singlets at 6.62 assigned to aromatic H-2, H-5 and H-6 respectively. A two proton triplets at δ 4.23 (J = 7.5 HZ) was ascribed to the OCH_2 protons. A two- proton triplet at δ 2.70 (J = 7.1 HZ) as due to benzylic carbon at H_2-7' protons. The methyline group (-CH_2) at position H_2-8 protons showed two proton triplet at δ 2.42 (J = 7.2 HZ). The broad peaks of methylene group (14 x CH_3) were found at δ 1.20. The terminal methyl group showed three proton triplet at δ 0.83 (J = 6.3 HZ). On the basis of these evidences, the structure of compound SMS-3 has been characterized as n-hexadecanyl dihydrocaffeate.



n-hexadecanyl dihydrocaffeate.

Table 1: Physical constants and nomenclature of the phytoconstituents isolated from *Suaeda maritima* L. Dumort. Stem

Code No.	Name	Molecular formula/M. wt.	Column Fraction; R_f value	% Yield	Melting point (°C)
SMS-1	n-nonanyl-n-octadec-9-enoate	$C_{27}H_{52}O_2$	9:1 (C:M); 0.74	234 mg (0.067)	85-87
SMS-2	n-tetradecanyl dihydrocaffeate,	$C_{23}H_{38}O_4$	1:1 (C:M); 0.74	244 mg (0.069)	101-103
SMS-3	n-hexadecanyl dihydrocaffeate	$C_{25}H_{42}O_4$	1:3 (C:M); 0.67	238 mg (0.068)	110-112

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