

Original

**Comparison of the Chemical Composition of *Ambrosia maritima*
Collected from Two Different Locations in Ed-Damer region, River Nile
State, North Sudan Based on GC/MS Analysis**

Khalid Elshafie Osman Elshafie*¹, Ibrahim Saeed Yousef², Hatil Hashim EL-Kamali^{3*}

¹ Faculty of Medicine, Sudan University for Science and Technology, Sudan.

²Department of Biology, Faculty of Education, Holy Quran and Islamic Sciences
University, Omdurman, Sudan.

³Department of Botany, Faculty of Science and Technology, Omdurman Islamic
University, Sudan.

***Corresponding author:** Hatil El- kamali, Department of Botany, Faculty of Science
and Technology, Omdurman Islamic University, Sudan.

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Abstract

In this study, Gas Chromatography-Mass Spectrometry (GC-MS) was used to compare the chemical compositions of *Ambrosia maritima* aerial parts collected from two different locations in Ed-Damer region, River Nile State, Northern Sudan. The results showed that 14 compounds of the two plant samples contained the same chemical composition, which was 2-methoxy-4-vinyl phenol, Decanoic acid ethyl ether, 1-cyclohexene 1-ol, 2,6-dimethyl acetate, 2-acetoxy 1,1,10 trimethyl 6,9-epidioxydecalin, 6,8-nonadien-2-one, 6-methyl-5-(1-methylethylidene-, Ethyl alpha-d-glucopyranoside, Hexadecanoic acid, methyl ester, n-Hexadecanoic acid, Hexadecanoic acid, ethyl ester, Phytol, Androstan-17-one, 3-ethyl-3-hydroxy (5-alpha), 17-beta-hydroxy-6-oxo-4,5-secoandrosta-, 5-alpha-17-alpha pregnan-12 one and Cyclohexanamine, N-(hexa-hydro-3 methylene 2(3H) –

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benzofuranyledene)-but the percentage content was different. The main components of the ethanolic extracts of the two samples were different. N,N-dimethylglycine (2.16%) , Norethindrone (19.76%), alpha-amyrin (0.66%) and others were only detected in *Ambrosia maritima* (sample Am1), Nitroacetamine (16.07%) , linoleic acid, ethyl ester (9.83%), gamma-sitosterol (5.59%), and others were only detected in *Ambrosia maritima* (sample Am2).

Keywords: *Ambrosia maritima*, Chemical composition, Ed-Damer region, River Nile State, Northern Sudan

Introduction

Ambrosia maritima L., traditionally known as “Damsissa” in Sudan is widely used in North and Central Sudan in folk medicine to treat respiratory problems, diabetes and hypertension [1]. This plant are used in North African folk medicine to treat infections, inflammatory diseases, gastrointestinal and urinary tract disturbances, rheumatic pain, diabetes and cancer [2].

The antidiabetic, hypolipidemic and antioxidant effects of the aqueous extract of *Ambrosia maritima* on the alloxan-induced diabetic male albino rats were investigated [3]. The hepatoprotective activity of the aqueous-methanolic extract of *Ambrosia maritima* was investigated against acetaminophen (paracetamol, 4-hydroxy acetanilide) induced hepatic damage. These data suggest that the plant *A. maritima* L. may act as a hepatoprotective and antioxidant agent [4]. Two known cytotoxic pseudoguaianolide sesquiterpene lactones; neoambrosin and damsins that were identified [5].

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Phytochemical and chromatographic study of the *Ambrosia maritima* extracts revealed the presence of terpenoids, flavonoids, coumarins, sesquiterpene lactone ambrosin, damsins, β -sitosterol, and stigmasterol, in addition to the identification of the volatile constituents of petroleum ether, methylene chloride and ethyl acetate fractions by GC/MS analysis. *Ambrosia maritima* showed high presence of alkaloids, steroids and triterpenes, moderate presence of flavonoids and tannins, and trace presence of saponins and cumarins. The antimicrobial activity of petroleum ether and butanol fractions indicated their broad effect [6-8].

Experimental

Plant material

The plant under investigation (Samples from two different locations in Ed-Damar region, River Nile State, Northern Sudan - *Ambrosia maritima*) were authenticated at the Department of Botany by one author, Prof. Hatil, Hashim ELKamali, Omdurman Islamic University.

Preparation of crude plant extracts

The plant material was air dried and ground into coarse powder using mortar and pestle. One hundred and fifty grams from the powder were soaked in ethanol (95%) for three days and then filtered using Whatman No. 3 filter paper. The filtrates evaporated to dryness using a rotatory evaporator then weighed and stored.

GC/MS analysis [9]

The qualitative and quantitative analysis of the sample was carried out by using GC/MS technique model (GC/MSQP2010-Ultra) from Japan's Shimadzu Company, with serial number 020525101565SA and capillary column (Rtx-5ms-30mX0.25 mmX0.25um). The sample was injected by using split mode, helium as the carrier gas passed with flow rate 1.61 ml/min, the temperature program was started from 60c with rate 10c/min to 300c as final temperature degree with 5 minutes hold time, the injection port temperature was 300c, the

ion source temperature was 200 °C and the interface temperature was 250°C. The sample was analyzed by using scan mode in the range of m/z 40-500 charges to ratio. Identification of the sample components was achieved by computer searches in commercial library, the National Institute of Standards and Technology (NIST).

Results and Discussion**GC/MS analysis of *Ambrosia maritima* ethanolic extract (sample Am1):**

GC/MS chromatogram of the ethanolic extract (sample Am1) showed 41 peaks in *Ambrosia Maritima*. The extract components along with their retention time and percentage area obtained from the GC/MS are tabulated in Table 1 and Figure 1. 5.alpha,17.alpha-Pregnan-12-one (38.3%); Norethindrone (19.76%); 4,4,6a,8a,11,11,14b-Octamethyl-1,4,4a (8.29%); 9,12,15-Octadecatrienoic acid (3.84%) and n-Hexadecanoic acid (3.65%) were the major constituents.

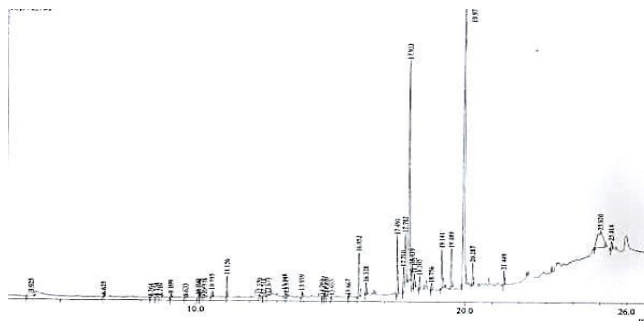


Figure 1. Chromatogram of *Ambrosia Maritima* aerial parts (sample Am1) ethanolic extract:

Table 1. Chemical constituents of *Ambrosia maritima* aerial parts sample Am1) by GC/MS

Peak	R. time	Area %	Compounds
1.	3.925	2.16	N,N'-Dimethylglycine
2.	6.625	0.12	2,7-Dimethyl-2,7-octanediol
3.	8.364	0.04	Thymol
4.	8.554	0.12	1,2-Dimethyl-6-oxa-bicyclo[3.1.0]hexane
5.	8.709	0.09	2-Methoxy-4-vinylphenol
6.	9.099	0.30	4-Hepten-2-one,5-ethyl-3,3,4-trimethyl
7.	9.633	0.08	Decanoic acid, ethyl ester
8.	10.090	0.15	1-Cyclohexen-1-ol,2,6-dimethyl-,acetate
9.	10.144	0.16	2-Acetoxy-1,1,10-trimethyl-6,9-epidioxyd
10.	10.227	0.07	6,8-Nonadien-2-one,6-methyl-5-(1-methyl)
11.	10.338	0.35	1,3-Dithiolane-2-propanol,2-methyl
12.	10.595	0.55	1,4-Methanocycloocta[d]pyridazine,1,4,4
13.	11.156	1.13	.beta.-Bisabolene

14.	12.370	0.16	Lanceol, cis
15.	12.511	0.26	Caryophyllene oxide
16.	12.675	0.24	Ethyl. alpha.-d-glucopyranoside
17.	13.298	0.38	Cyclopentanol,2-cyclopentylidene
18.	13.375	0.23	Andrographolide
19.	13.939	0.49	5,6-Azulenedicarboxaldehyde. 1.2.3.3a,8.8
20.	14.702	0.08	6,10-Dodecadien-1-yn-3ol, 3,7,11-trimethyl
21.	14.777	0.24	Phytol, acetate
22.	14.860	0.20	2-Pentadecanone,6,10,14-trimethyl
23.	15.035	0.10	3,7,11,15-Tetramethyl-2-hexadecen-1-ol
24.	15.667	0.07	Hexadecanoic acid, methyl ester
25.	16.052	3.65	n-Hexadecanoic acid
26.	16.328	0.65	Hexadecanoic acid, ethyl ester
27.	17.491	3.60	Phytol
28.	17.710	2.06	1-Oxaspiro[2.5]octane,5,5-dimethyl-4
29.	17.782	3.84	9,12,15-Octadecatrienoic acid, (Z,Z,Z)
30.	17.933	19.76	Norethindrone
31.	18.039	1.39	Cyclodeca [b] furan-2(3H)-one, 3a,4,5,8,9
32.	18.122	0.77	(1S,2E,4S,5R,7E,11E)-Cembra-2,7,11-triethyl
33.	18.305	0.76	Acetic acid, 1-[2-(2,2,6-trimethyl-bicyclo
34.	18.756	0.47	1,1-Bis(cyclooct-2-en-4-one)
35.	19.141	2.96	Androstan-17-one,3-ethyl-3-hydroxy
36.	19.489	2.84	17, Beta,-hydroxy-6-oxo-4,5-secoandrosta
37.	19.973	38.3	5.alpha,17.alpha-Pregnan-12-one
38.	20.287	1.29	Cyclohexanamine. N-(hexahydro-3-methyl
39.	21.449	0.95	9,19-Cycloanostan-3-ol,acetate. (3.beta.)
40.	25.020	8.29	4,4a,8a,11,11,14b-Octamethyl-1,4,4a
41.	25.414	0.66	.alpha.-Amyrin

Ethanollic extract of *Ambrosia maritima* (sample Am1) was analyzed by GC/MS and the results of chemical classes are presented in Table 2. A total of 41 compounds were identified with nine

compounds (63.71%) belonging to ketones followed by five compounds (8.94%) as fatty acids, and six compounds (5.9%) as terpenes.

Table 2. Statistics of chemical classes of ethanolic extract of *Ambrosia maritima* (sample Am1)

Chemical class	# of Compounds	Concentration (%)
Ketones	9	63.71
Fatty acids	5	8.94
Alcohols	7	1.34
Terpenes	6	5.9
Phenols	1	0.09
Amines	1	1.29
Lipids	1	0.16
Alkaloids	1	0.55

Amino acid derivatives	1	2.16
Sugar derivatives	1	0.24
Organic acids	1	0.76
Aldehydes	1	0.49
Alkanes	2	2.18
Others	4	12.85

The fatty acid, n-Hexadecanoic acid (Palmitic acid) (3.63%) is used as an antioxidant and hypocholesterol agent, in addition for used in industry in soap and lubricant. The diterpene, phytol is used as cancer preventive. Sugar derivative, Ethyl-alpha-d-glucopyranoside is used as skin moisturizing agent. Andrographolide exhibits a wide range of biological activities including promising antidiabetic potential, antibacterial, antiviral and neurotoxin properties [10-11].

GC/S Analysis of *Ambrosia maritima* (sample Am2):

GC/MS chromatogram of ethanol extract of *Ambrosia maritima* (sample Am2) Table 3 and Figure 2 shows the presence of 29 compounds. 5.alpha.-pregnan-12-one, 20.beta.-hydroxy (22.55), Nitroacetamide (16.07), n-Hexadecanoic acid (11.28), Linoleic acid ethyl ester (9.83), Androstan-17-one,3-ethyl-1-3-hydroxy(7.19) and .gamma.-Sitosterol (5.59) were as the major phytochemical constituents.

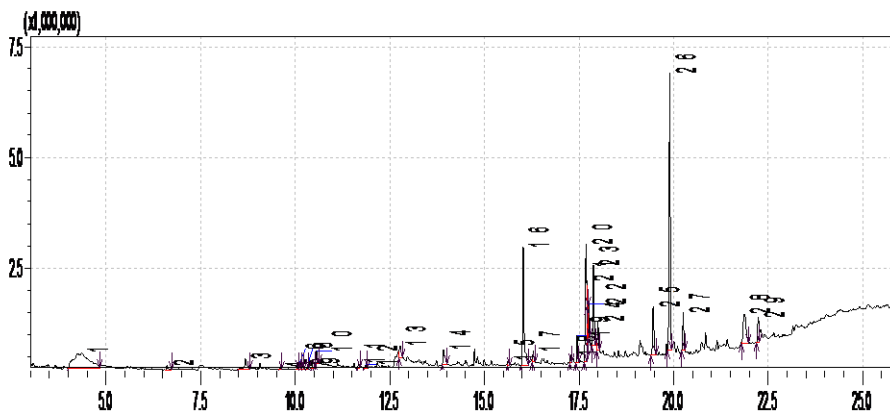


Figure 2. The GC/MS chromatogram of the ethanol extract of *Ambrosia maritima* (sample Am2).

Table 3. Chemical constituents of *Ambrosia maritima* aerial parts sample Am2) by GC/MS

Peak#	Name	Ret.Time	Area%
1.	Nitroacetamide	4.351	16.07
2.	2-(1-Hydroxy-1-methylethyl)cyclohexanol	6.604	0.47
3.	2-Methoxy-4-vinylphenol	8.679	1.99
4.	Decanoic acid, ethyl ester	9.593	0.12

5.	1-Cyclohexen-1-ol, 2,6-dimethyl-, acetate	10.057	0.37
6.	2-Acetoxy-1,1,10-trimethyl-6,9-epidioxydecalin	10.111	0.38
7.	6,8-Nonadien-2-one, 6-methyl-5-(1-methylethylidene)-	10.194	0.14
8.	Ether, 3-hydroxy-2-butyl 1-(p-tolyl)ethyl	10.304	0.11
9.	1,3-Propanediol, 2-(hydroxymethyl)-2-nitro-	10.485	0.80
10.	2H-2,4a-Ethanopentaleno[1,2-b]oxirene, hexahydro-, (1a.alpha.,1b.alpha.,2.beta.,4a.beta.,5a.alpha.)-	10.557	1.22
11.	Benzene, 1,2,3-trimethoxy-5-(2-propenyl)-	11.671	0.39
12.	Butyric acid, 4-amino-3-(4-methoxyphenyl)-	11.865	0.28
13.	Ethyl .alpha.-d-glucopyranoside	12.766	1.33
14.	4-((1E)-3-Hydroxy-1-propenyl)-2-methoxyphenol	13.921	1.72
15.	Hexadecanoic acid, methyl ester	15.630	0.39
16.	n-Hexadecanoic acid	16.027	11.28
17.	Hexadecanoic acid, ethyl ester	16.290	0.78
18.	9,12-Octadecadienoic acid (Z,Z)-, methyl ester	17.282	0.49
19.	Phytol	17.452	1.66
20.	Linoleic acid ethyl ester	17.685	9.83
21.	9-Octadecen-1-ol, (Z)-	17.716	1.13
22.	(Z)6,(Z)9-Pentadecadien-1-ol	17.750	1.71
23.	Androstan-17-one, 3-ethyl-3-hydroxy-, (5.alpha.)-	17.879	7.19

24.	Patchouli alcohol	18.002	2.13
25.	17.beta.-Hydroxy-6-oxo-4,5-secoandrostan-4-oic acid methyl ester	19.462	4.59
26.	5.alpha.-Pregnan-12-one, 20.beta.-hydroxy-	19.900	22.57
27.	Cyclohexanamine, N-(hexahydro-3-methylene-2(3H)-benzofuranylidene)-, (2Z,3a.alpha.,7a.alpha.)-	20.255	2.89
28.	.gamma.-Sitosterol	21.866	5.59
29.	9,12-Octadecadienoic acid (Z,Z)-, 2,3-dihydroxypropyl ester	22.237	2.38

Table 4. shows the Statistics of chemical classes of ethanolic extract of *Ambrosia maritima* (sample Am2) with three compounds (29.9% belonging to ketones

followed by eight compounds (29.86%) as fatty acids, and one compound (16.07%) as amides).

Table 4. Statistics of chemical classes of ethanolic extract of *Ambrosia maritima*:

Compounds	# of Compounds	Concentration %
Amide	2	18.96
Alcohols	5	5.81
Fatty acids	8	29.86
Ketone	1	0.14

Organic acids	1	0.28
Sugars	1	1.33
Terpenes	1	1.66
Phenol	2	3.71
Benzene derivatives	1	0.39
Sterols	3	35.35
Others	3	1.71

The fatty acid, linoleic acid (9.83%) is used as an antiarrhythmic, antihistaminic and anti-inflammatory agents. The phytosterol, gamma-sitosterol (5.59%) is used for diabetes. Androstan-17-one,3-ethyl-1-3-hydroxy(7.19%) is steroid and steroids are type of medicine with strong anti-inflammatory effects [10, 12].

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