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GC-MS Studies on Methanolic Extracts of *Aerva lanata* L.

Yamunadevi Mariswamy¹, Wesely Edward Gnanaraj², Johnson Marimuthu Antonisamy^{3*}, Anto Arockiaraj Adaikalam⁴, Vinnarasi Jamesraj⁴

¹Research & Development Department, Bharathiyar University, Coimbatore – 641 046, Tamil Nadu, India

²Department of Botany, Arignar Anna Government Arts College, Namakkal – 637 002, Tamil Nadu, India

³Centre for Plant Biotechnology, Department Botany,

St. Xavier's College (Autonomous), Palayamkottai, Tamil Nadu, India – 627 002

⁴Department of Chemistry, St. Xavier's College (Autonomous), Palayamkottai, Tamil Nadu, India – 627 002

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ABSTRACT

The present was carried out to know the pharmacologically active chemical constituents present in *Aerva lanata* (L.) Juss. Ex. Schult leaves, stem, root and flower. 2 µL of the methanolic extract of roots, flowers, stems and leaves were employed for GC-MS analysis. Mass spectra were taken at 70 eV; a scan interval of 0.5 s and fragments from 45 to 450 Da. The MS detection was completed in 36 minutes. The compound biological activity prediction is based on Dr. Duke's Phytochemical and Ethnobotanical Databases by Dr. Jim Duke of the Agricultural Research Service/USDA and PASS. The *A. lanata* methanolic root, flower, stem and leaves extracts revealed the presence of 23, 25, 23 and 23 different compounds respectively. The *A. lanata* methanolic root, flower, stem and leaves extracts. The Dukes database and PASS prediction results showed that the major components displayed different biological activities such as antineurotoxic, anticarcinogenic, antialcoholic, antiviral, antiinflammatory, antiprotozoal, antiparasitic, antimutagenic, antineoplastic, antianemic, antiamyloidogenic, antimetastatic, antimycobacterial, antituberculosic, anticataract, cytoprotectant, fibrinolytic, immunomodulator, antileprosy, antianorexic, antirickettsial, CNS active muscle relaxant and psychostimulant. The present study results suggest that methanolic extract of *Aerva lanata* is a potent therapeutic agent. Further work is needed to isolate and identify these bioactive compounds.

Corresponding author

Yamunadevi Mariswamy

Research & Development Department, Bharathiyar University, Coimbatore – 641 046, Tamil Nadu, India.

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INTRODUCTION

Plants are a rich source of secondary metabolites with interesting biological activities. In general, these secondary metabolites are an important source with a variety of structural arrangements and properties [1]. Distinguished examples of these compounds include alkaloids, flavonoids, phenols, saponins, tannins, cyanogenic glycosides etc. [2]. Plant products and their modified derivatives have been rich sources for clinically useful drugs for thousands of years. Even today, about 80% of the world's population relies predominantly on plants and plant extracts for health care [3]. There is growing interest in correlating the phytochemical constituents of a medicinal plant with its pharmacological activity [4-6]. Screening active compounds from plants has led to the discovery of new medicinal drugs which have efficient protection and treatment roles against various diseases [7]. Natural products from microbial sources have been the primary source of antibiotics, but with the increasing recognition of herbal medicine as an alternative form of health care, the screening of medicinal plants for active compounds has become very significant because these may serve as talented sources of antibiotic prototypes [8]. It has been shown that *in vitro* screening methods could provide the needed preliminary observations necessary to select crude plant extracts with potentially useful properties for further chemical and pharmacological investigations. In the last few years gas chromatography mass spectrometry has become firmly established as a key technological platform for metabolite profiling in both plant and non plant species. Recently only a limited number of plant research laboratories had access to GC-MS instrumentation. However, such machines are increasingly becoming more commonplace [9, 10]. Analysis of small amounts of chemicals has become easier and more cost-effective owing to the development of hyphenated chromatographic techniques such as GC or LC/MS. GC/MS analysis can identify pure compounds present at less than 1 ng.

Aerva lanata (L.) Juss. Ex. Schult is a vital medicinal plant and become the subject of limitless pharmacological and chemical studies for the last 30 years. Various pharmacological studies have confirmed its versatile pharmacological activities. anthelmintic, demulcent, anti-inflammatory, diuretic, expectorant, hepatoprotective, nephroprotective [11], anti-diabetic activity, anti-hyperglycaemic activity in rats, anti-microbial, cytotoxic [12], urolithiatic, hypoglycemic, anti-hyperlipidaemic [13], anti-parasitic, anti-helmentic [14] and antioxidant activities [15-17]. In order to identify the bioactive compounds responsible for the above pharmacological activities, phytochemical studies have been carried out by several workers with the report of different kinds of bioactive compounds particularly alkaloids such as. Canthin-6-one and beta-carboline, aervine [10-hydroxycanthin-6-one], methylaervine [10-methoxycanthin-6-one], aervoside [10- β -Dglucopyranosyloxycanthin-6-one] and aervolanine [3-[6-methoxy- β -carbolin-1-yl] propionic acid] from leaves of *A. lanata*. Yamuna et al. revealed the HPTLC profile of *Aerva lanata* stem, leaves, root and flower. In addition, to know the functional compounds present in the leaves, stem, root and flower of *Aerva lanata*, the FTIR spectroscopic studies also performed and identified the functional compounds. With this background the

present study was aimed to explore the pharmacologically active chemical constituents of *Aerva lanata* (L.) Juss. Ex. Schult using GC-MS analysis.

MATERIALS AND METHODS

COLLECTION AND PROCESSING OF PLANT MATERIAL

Healthy, disease free *Aerva lanata* (L.) Juss. Ex Schultes was collected from natural habitats, Kadathur, Coimbatore District, Tamil Nadu, India. The plants were identified and authenticated by Dr. E.G. Wesely and the voucher specimens were deposited in the St. Xavier's College Herbarium, Palayamkottai, Tamil Nadu, India (XCH 28077) for further reference. The fresh leaves, stems, roots, flowers and seeds were shade dried and powdered using the electric homogenizer.

GC-MS analysis

10 g of each powdered sample is soaked with 30 mL methanol overnight and filtered through ashless filter paper with sodium sulphate (2 g). The extract is concentrated to 1 mL by bubbling nitrogen into the solution. The extract contained both polar and non-polar phytochemicals. 2 μ L of the methanolic extract of roots, flowers, stems and leaves were employed for GC-MS analysis [18]. The Clarus 500 GC used in the analysis employed a fused silica column packed with Elite-1 [100% dimethyl poly siloxane, 30 nm \times 0.25 mm ID \times 1 μ m df] and the components were separated using Helium as carrier gas at a constant flow of 1 ml/min. The 2 μ L sample extract injected into the instrument was detected by the Turbo gold mass detector (Perkin Elmer) with the aid of the Turbo mass 5.1 software. During the 36th minute GC extraction process, the oven was maintained at a temperature of 110^oC with 2 minutes holding. The injector temperature was set at 250^oC (mass analyser). The different parameters involved in the operation of the Clarus 500 MS, were also standardized (Inlet line temperature. 200^oC; Source temperature. 200^oC). Mass spectra were taken at 70 eV; a scan interval of 0.5 s and fragments from 45 to 450 Da. The MS detection was completed in 36 minutes.

Identification of components

The relative percentage amount of each component was calculated by comparing its average peak area to the total areas. The detection employed the NIST (National Institute of Standards and Technology) Ver.2.0-Year 2005 library. Interpretation of GC-MS was conducted using the database of NIST having more than 62,000 patterns. The spectrum of the unknown component was compared with the spectrum of the known components stored in the NIST library. The name, molecular weight and structure of the components of the test materials were ascertained. The compound biological activity prediction is based on Dr. Duke's Phytochemical and Ethnobotanical Databases by Dr. Jim Duke of the Agricultural Research Service/USDA and PASS. The biological activity spectrum of PASS is designed according to the algorithm specified below.

$$u_j = a_i \text{ArcSin}\{r_i(2p_{ij}-1)\}, u_{0j} = a_i \text{ArcSin}\{r_i(2p_j-1)\}$$

$$S_j = \text{Sin}(u_j/m), S_{0j} = \text{Sin}(u_{0j}/m)$$

$$P_{ij} = (1 + (s_j - s_{0j}) / (1 - s_j s_{0j})) / 2$$

For the compound under prediction structural descriptors are generated. For each activity the following values are calculated.

Results

The results pertaining to GC-MS analysis leads to the identification of number of metabolites / chemical constituents from the GC fractions of the various parts (root, flower, stem and leaves) of *A. lanata* methanolic extract. The *A. lanata* methanolic root extracts revealed the presence of 23 different compounds and were illustrated in Table 1 (Figure 1). The major components were Pyridine (21.74%) and 1,2-Benzenedicarboxylic acid dioctyl ester (7.83%), Hydroquinone monobenzyl ether (5.71%), 6-Trifluoroacetyl-7,11-methano-1,2,3,4,5-pentahydroazuleno[2,1-g]cycloundecene (4.39%), (5S,8S,9S)-1-Benzyl-10-methyl 8,9-bis(benzoyloxy)-4,7-dioxo-5-methyl-3,6-diazadecane dicarboxylate (4.33%), N(2)-Cumyl-5-(2,6-di-p-tolylphenyl)tetrazole (4.27%) and Pent-4-enal (4.13%). The Dukes database and PASS prediction results showed that the major compounds possess the following biological activities viz., antibacterial, antineoplastic, antiviral, anticarcinogenic, antiurolithic, anti-inflammatory, antiseptic, antitoxic, antihelminthic, antiprotozoal, antimutagenic, immunomodulator, cytoprotectant, nticataract, immunostimulant, hepatoprotectant, antidiabetic, antimetastatic, antialcoholic, antihypercholesterolemic, antiperistaltic and may be used to treat atherosclerosis treatment, alzheimer's disease, gaucher disease treatment, cystic fibrosis treatment, sickle-cell anemia treatment and may be act as Ophthalmic drug.

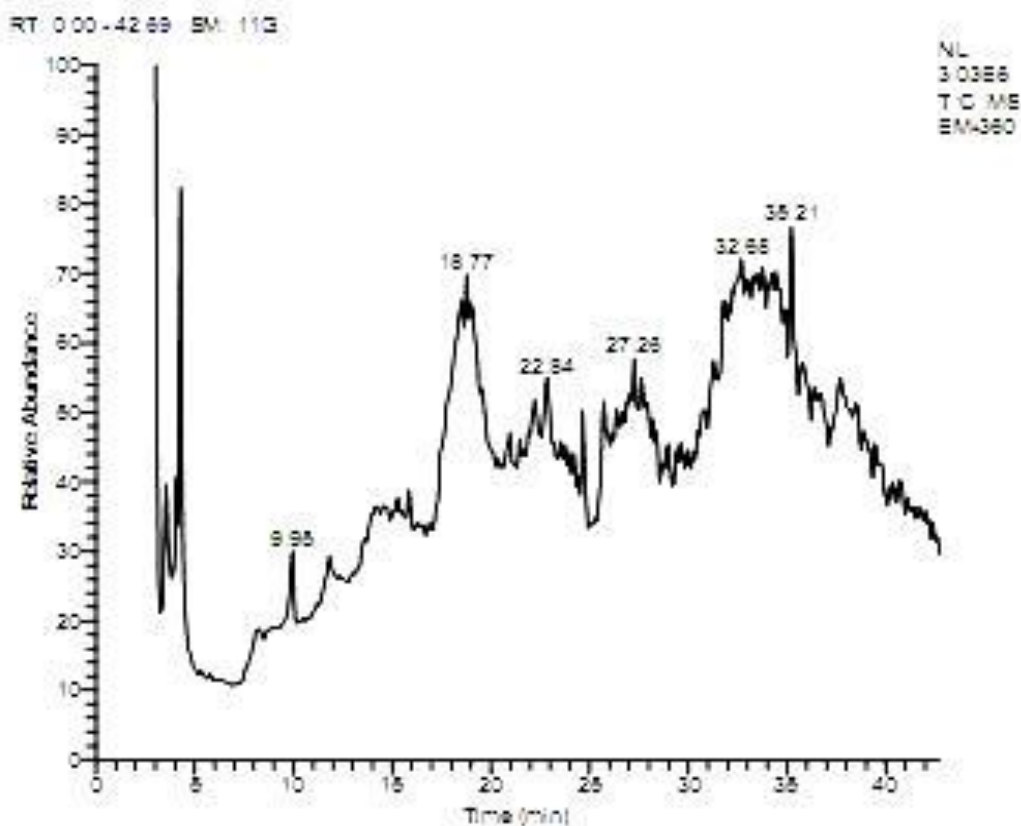


Figure 1: GC-MS chromatogram of the methanolic extracts of *Aerva lanata* root**Table 1: Chemical composition of Methanolic root extract of *Aerva lanata***

Name of the compound	Molecular Formula	MW	Peak Area %	Uses
Hydroquinone monobenzyl ether #	C ₁₃ H ₁₂ O ₂	200	5.71	Antibacterial; Antimalarial; Antioxidant; Antitumor; Carcinogenic; Cytotoxic; Hypertensive; Antitrypanosomic;
Pyridine (CAS) #	C ₅ H ₅ N	79	21.74	CNS-Depressant; Flavor; Irritant; Antianemic, Antineurotoxic, Antiasthmatic,
1-(2-Hydroxyethoxy)tridecane*	C ₁₅ H ₃₂ O ₂	244	3.54	Antiinflammatory, Antiallergic, Alzheimer's disease, Antihelminthic, Anticarcinogenic, Antiviral, Antiprotozoal, Anti-diabetic, Immunostimulant
Butanimidamide, N-(1-chloro-2-methyl-1-butenyl)-2-methyl-, monohydrochloride (CAS)*	C ₁₀ H ₂₀ Cl ₂ N ₂	238	1.83	Antibacterial, Antineoplastic, Antiviral, Anticarcinogenic, Alzheimer's disease, Antiuro lithic, Anti-inflammatory, Antiprotozoal
10,11-dichlorotricyclo [4.3.2.0(1,6)]undec-3-en-7-one C ₁₁ H ₁₂ Cl ₂ O 230 3.57*				Antiseptic, Gaucher disease treatment, Antiviral, Antitoxic, Antihelminthic, Ophthalmic drug, Antiprotozoal, Immunomodulator
Allyl 1-Benzyl-5-Iodo-1H-[1,2,3]triazole-4-carboxylate	C ₁₃ H ₁₂ IN ₃ O ₂	369	1.93	Cytoprotectant, Atherosclerosis treatment, Antiinflammatory, Antihypercholesterolemic, Antiviral, Cystic fibrosis treatment, Anticataract, Immunostimulant, Hepatoprotectant, Antiinflammatory, Antidiabetic, Antimetastatic, Sickle-cell anemia treatment, Antialcoholic, Antineoplastic ,
6-Trifluoroacetyl-7,11-methano-1,2,3,4,5-pentahydroazuleno[2,1-g]cycloundecene	C ₂₂ H ₁₉ F ₃ O	356	4.39	Antimutagenic, Antiperistaltic Antineurotoxic, Antineoplastic, Antiinflammatory, ophthalmic, Antinociceptive, Anticarcinogenic, Antiprotozoal, Cystic fibrosis treatment, Atherosclerosis treatment, Antiperistaltic, Chemopreventive, Antimetastatic, Antiulcerative, Antihypertensive
Heptadecanoic acid, methyl ester (CAS) #*	C ₁₈ H ₃₆ O ₂	284	4.10	Antioxidant, Anti-microbial, Antihelminthic, Immunostimulant

N(2)-Cumyl-5-(2,6-di-p-tolylphenyl)tetrazole	$C_{30}H_{28}N_4$	444	4.27	Antiasthmatic, Antiallergic, Antihypertensive, Antineurotoxic, Antiulcerative, Anticarcinogenic, Antiinflammatory, Antiprotozoal, Antithrombocytopenic Anticarcinogenic, Antiinfective, Antiprotozoal, Chemopreventive, Antimutagenic, Immunostimulant, Hepatic disorders treatment, Multiple sclerosis treatment, Anticataract, Antihelminthic, Antimyopathies, Chemoprotective, Antiamyloidogenic, Antimetastatic, Antimetabolite, Antioxidant
Pent-4-enal	C_5H_8O	84	4.13	Antineoplastic, Antiprotozoal, Antianemic, Antineurotoxic, Autoimmune disorders treatment, Anticarcinogenic, Antihelminthic Antiinflammatory,, Anticholelithogenic, Antimetastatic, Hepatotoxic, Antinociceptive, Antimyopathies Antiparasitic, Antiinfertility, Antimitotic
2-Methylene-3-(2-methylpropyl)cyclopentanone	$C_{10}H_{16}O$	152	2.88	Hematotoxic, Antineoplastic, Antinociceptive, Antiamyloidogenic, Antiprotozoal, Antiseborrheic, Antiparasitic, Cytoprotectant, Antiinflammatory, Antileukemic, Antiuremic, Antiprotozoal, Antimetastatic, Antitreponemal, Antispirochetal, Antiperistaltic Hepatoprotectant, Antiinflammatory, Antiinfertility, Antiallergic, Hepatic disorders treatment, HIV-1 integrase inhibitor, Antifungal, Antidiabetic, Antiosteoporotic, Antimycobacterial, Antiviral (Herpes), Antiuremic, Antiamyloidogenic, Antihemorrhagic, Anticarcinogenic, Immunomodulator, Antischistosomal, Antibacterial
3-Deoxy-3-[(benzoyloxy)methyl]-1,2-isopropylidene- β -ribofuranose	$C_{16}H_{20}O_6$	308	3.24	Cardioprotectant, Immunomodulator, Autoimmune disorders treatment, Multiple sclerosis treatment, Antidiarrheal, Transplant rejection treatment, Hepatoprotectant, Hepatic disorders treatment, Antiarthritic, Cystic fibrosis treatment, Antianemic, Immunostimulant Antihypertensive, Osteoarthritis treatment, Antihyperlipoproteinemic,
9-Acetyl-6,11-dihydroxyxantho[2,3-g]-and-[3,2-g]tetralin	$C_{19}H_{16}O_5$	324	3.52	
(5S,8S,9S)-1-Benzyl-10-methyl-8,9-bis(benzoyloxy)-4,7-dioxo-5-methyl-3,6-diazadecanedicarboxylate	$C_{31}H_{30}N_2O_{10}$	590	4.33	

				Liver fibrosis treatment, Antinephritic, Antiprotozoal
2,3-Bis(hydroxymethyl)-1-(2-bromo-4-pyridyl)naphthalene [#]	$C_{17}H_{14}BrNO_2$	343	1.59	Alzheimer's disease treatment, Antiviral (Poxvirus), Antiarthritic, ophthalmic, Antiinflammatory, Antiviral, Anticarcinogenic
1,2-Benzenedicarboxylic acid, dioctyl ester (CAS)	$C_{24}H_{38}O_4$	390	7.83	Antihypoxic, Antinephritic, Antimutagenic, Hepatoprotectant, Antinociceptive, Antiinflammatory, Antiperistaltic, Anticarcinogenic, Antiamyloidogenic, Immunostimulant, Antiinfertility, Antiuremic, Antimyopathies, Antimetastatic, Anticataract, Antiallergic, Antiuro lithic, Cardiodepressant, Antileprosy, Antineurotic, Antituberculosic, Antiprotozoal
1-(1-Phenylsulphinyl cyclohexyl)ethanol [#]	$C_{14}H_{20}O_2S$	252	2.46	Anhydrotic; Antiatherosclerotic; Antibacterial; Antipruritic; Antiseptic; CNS-Depressant; Expectorant; Hepatotoxic; Hypertensive; Hypnotic; Neurolytic;
racemic 1,3-Dimethyl-2-oxabicyclo[2.2.2]oct-3-yl methanol [#]	$C_{10}H_{18}O_2$	170	2.05	Anti HIV, antidote
(cis,trans)-1,3,5-Triisopropyl-1,3,5-tri-ortho-tolylcyclotrisiloxane	$C_{30}H_{42}O_3Si_3$	534	2.01	Antineurotoxic, Anticarcinogenic, Antihypoxic, Antinociceptive, Chemopreventive, Antianemic, Antiprotozoal, Antiperistaltic, Antimetastatic, Antileprosy Anticataract, Antihypercholesterolemic, Antiparasitic, Antineurogenic, Antihemorrhagic, Antihelmintic Antiprotozoal, Anticarcinogenic, Antiviral, Antileukemic, Antimetastatic, Antiprotozoal, Antihelmintic, Antineurotoxic, Antibacterial, Antineoplastic, Antirickettsial,
(2R,6R)-2(tert-Butyl)-6-methyl-1,3-dioxane-4-one	$C_9H_{16}O_3$	172	2.10	Antimyopathies, Antidiabetic, Antiparasitic, Antimitotic, Antihypoxic, Anticataract, Antinociceptive, Antihemorrhagic, Hepatoprotectant, Antispirochetal

Methanolic flower extract of *A. lanata* showed the presence of 25 different compounds and were demonstrated in Table 2 (Figure 2). Among them, the major phytoconstituents were Docosane (26.82%), Dotriacontane (18.64%), Bis-(3,5,5-trimethylhexyl) ether (6.69%) and Bicyclo [3.2.0]hepta-2,6-diene (6.27%), 1-cyclohexyl-5-(diazomethyl)-1H- tetrazole (4.14%) and 6H-Dibenzo[b,d]thiopyran (4.02%). The Dukes database and PASS prediction results showed that these components displayed different activities such as antiseborrheic, antineurotoxic, anticarcinogenic, antialcoholic, antiviral, antinociceptive, antiinflammatory, antihypoxic, antiprotozoal, antiparasitic, antimutagenic, antineoplastic, antianemic, anti amyloidogenic, anticholelithogenic, antimyopathies, antimetastatic, antisecretoric, antimycobacterial, antiosteoporotic, antituberculosic, anticataract, antinephritic, cytoprotectant, fibrinolytic, immunomodulator, antileprosy, antianorexic, antirickettsial, CNS active muscle relaxant and psychostimulant.

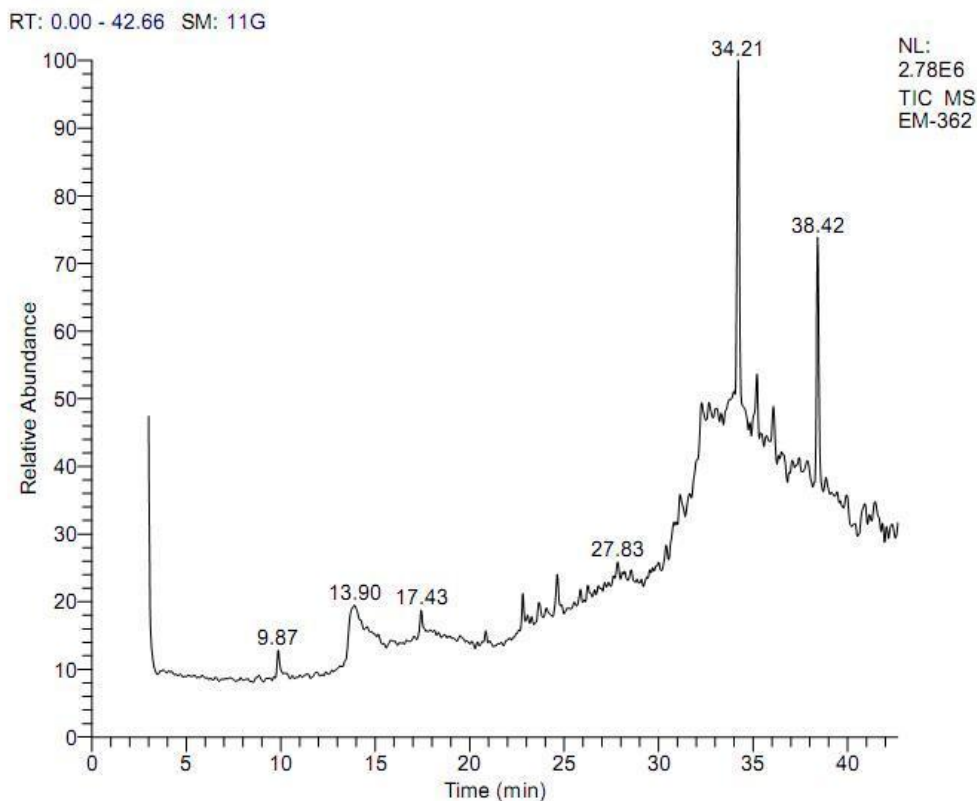


Figure 2: GC-MS chromatogram of the methanolic extracts of *Aerva lanata* flower

The methanolic stem extract of *A. lanata* illustrated (Figure 3) the presence of 23 different compounds (Table 3) and the major compounds depicted were anti-5-(1-hydroxyundecyl)-3-(3-methylbutyl)oxazolidin-2-one (9.31%), (R,Z)-12-Hydroxy-9-octadecenoic acid (8.25%) and Isopropyl (Z)-3-Anilino-3-phenyl-2-propenoate (7.47%), 3-t-Butyl-5-methyl-4-hexen-2-ol (5.35%) and (1S*,6R*)-4-Bromo-3-methoxy-2,7-dioxabicyclo [5,4,0] undecane isomer (5.20%). The following biological activities of *A. lanata* stem methanolic extract were predicted through DUKE database and PASS prediction, antiviral, antithrombotic, antimutagenic, immunosuppressant, antihelminthic, antiinfertility, anticataract, antialcoholic, Cardioprotectant, antifibrinolytic, Microtubule

Table 2: Chemical Constituents of Methanol icflower extracts of *Aerva lanata*

Name of the compound	Molecular Formula	MW	Peak Area %	Uses
1-Butanol, 4-butoxy- (CAS)	C ₈ H ₁₈ O ₂	146	1.72	Antiseborrheic, Antihypoxic, Cytoprotectant, Fibrinolytic, Antineurotoxic, Antimutagenic, Antiprotozoal, Hepatoprotectant, Antiinflammatory, Antisecretoric, Antiglaucomic, Cardioprotectant, Antiparasitic, Chemoprotective, Antithrombotic, Antimetastatic, Anticataract, Antimyopathies, Antiperistaltic, Antirickettsial, Antioxidant, Antileprosy, Antineurogenic, Antipyretic, Antiseborrheic, Antineurotoxic, Anticarcinogenic, Antialcoholic, Antiviral, Antinociceptive, Antiinflammatory, Antihypoxic, Antiprotozoal, Antiparasitic, Antimutagenic, Antineoplastic, Antianemic, Antiamyloidogenic, Anticholelithogenic, Antimyopathies, Antimetastatic, Antisecretoric, Antimycobacterial, Antileprosy, Antiosteoporotic, Antituberculosic, Anticataract, Antinephritic, Antiseborrheic, Hematotoxic, Antiinflammatory, Antinephritic, Cardioprotectant, Fibrinolytic, Antihypoxic, Antihelminthic, Hepatoprotectant, Immunomodulator, Antimutagenic, Anticarcinogenic, Antiulcerative, Antiglaucomic, Antineurogenic, Antipsoriatic, Anticataract, Antiviral (Herpes), Antiepileptic, Antileprosy, Antiamyloidogenic, Antimyopathies, Antiuremic, Antiemphysemic, Antiallergic, Antiperistaltic, Antiasthmatic, Antifibrinolytic, Antimutagenic,
Bicyclo[3.2.0]hepta-2,6-diene (CAS)	C ₇ H ₈	92	6.27	Antiamyloidogenic, Anticholelithogenic, Antimyopathies, Antimetastatic, Antisecretoric, Antimycobacterial, Antileprosy, Antiosteoporotic, Antituberculosic, Anticataract, Antinephritic, Antiseborrheic, Hematotoxic, Antiinflammatory, Antinephritic, Cardioprotectant, Fibrinolytic, Antihypoxic, Antihelminthic, Hepatoprotectant, Immunomodulator, Antimutagenic, Anticarcinogenic, Antiulcerative, Antiglaucomic, Antineurogenic, Antipsoriatic, Anticataract, Antiviral (Herpes), Antiepileptic, Antileprosy, Antiamyloidogenic, Antimyopathies, Antiuremic, Antiemphysemic, Antiallergic, Antiperistaltic, Antiasthmatic, Antifibrinolytic, Antimutagenic,
Heptadecanoic acid, methyl ester (CAS)	C ₁₈ H ₃₆ O ₂	284	1.86	Antiepileptic, Antileprosy, Antiamyloidogenic, Antimyopathies, Antiuremic, Antiemphysemic, Antiallergic, Antiperistaltic, Antiasthmatic, Antifibrinolytic, Antimutagenic,
1,10-Decanediol	C ₁₀ H ₂₂ O ₂	174	2.07	Antimutagenic,

(CAS)					Anticarcinogenic, Antipsoriatic Antiglaucomic, Antiosteoporotic Antiinflammatory Psychostimulant CNS active muscle relaxant Antiviral (Poxvirus) Chemopreventive Antiamyloidogenic Antimyopathies Antiinflammatory Cytoprotectant, Antinociceptive, Antineurotoxic, Antianemic Antiamyloidogenic Antimutagenic, Antialcoholic Antimyopathies Antituberculosic, Antimycobacterial Antiviral, Antimetastatic Astringent, Antileprosy Antiprotozoal Anticataract Fibrinolytic, Antiprotozoal (Amoeba), Antiperistaltic Antibacterial Anticoagulant, Antithrombotic Insulin promoter, Antineurotoxic, Antineoplastic Cytoprotectant, Antiseborrheic
Propanal, oxime	C ₃ H ₇ NO	73	1.38		Antiprotozoal , Leukopoiesis Antimetastatic, Antileprosy Antiparkinsonian Adenylate cyclase stimulant Antiprotozoal (Coccidial) Antirickettsial, Antifibrinolytic Inflammatory Bowel disease, Antiinflammatory, Antiallergic Ophthalmic drug, Antiasthmatic, Antineurotoxic Antiviral (Arbovirus), Antiglaucomic, Antidiabetic Antiseborrheic, Antileukemic Anticholelithogenic Antihyperlipoproteinemic Antirickettsial, Antimyopathies Antiviral, ophthalmic Abortion inducer, Antimetastatic, Antiinflammatory, Antianemic Antimutagenic Antiadrenalinic; Anticirrhotic; Insulin-Sparing
1-Cyclopropyl-2-fluoroethane	C ₅ H ₉ F	88	3.01		Antineurotoxic, Antineoplastic Antiprotozoal , Leukopoiesis Antimetastatic, Antileprosy Antiparkinsonian Adenylate cyclase stimulant Antiprotozoal (Coccidial) Antirickettsial, Antifibrinolytic Inflammatory Bowel disease, Antiinflammatory, Antiallergic Ophthalmic drug, Antiasthmatic, Antineurotoxic Antiviral (Arbovirus), Antiglaucomic, Antidiabetic Antiseborrheic, Antileukemic Anticholelithogenic Antihyperlipoproteinemic Antirickettsial, Antimyopathies Antiviral, ophthalmic Abortion inducer, Antimetastatic, Antiinflammatory, Antianemic Antimutagenic Antiadrenalinic; Anticirrhotic; Insulin-Sparing
1,3-Dioxane-2-propanol (CAS)	C ₇ H ₁₄ O ₃	146	1.00		Antineurotoxic, Antineoplastic Antiprotozoal , Leukopoiesis Antimetastatic, Antileprosy Antiparkinsonian Adenylate cyclase stimulant Antiprotozoal (Coccidial) Antirickettsial, Antifibrinolytic Inflammatory Bowel disease, Antiinflammatory, Antiallergic Ophthalmic drug, Antiasthmatic, Antineurotoxic Antiviral (Arbovirus), Antiglaucomic, Antidiabetic Antiseborrheic, Antileukemic Anticholelithogenic Antihyperlipoproteinemic Antirickettsial, Antimyopathies Antiviral, ophthalmic Abortion inducer, Antimetastatic, Antiinflammatory, Antianemic Antimutagenic Antiadrenalinic; Anticirrhotic; Insulin-Sparing
[ü(3)-allyl][ü(5)-pentaphenylcyclopentadienyl] nickel	C ₃₈ H ₃₀ Ni	544	1.00		Antineurotoxic, Antineoplastic Antiprotozoal , Leukopoiesis Antimetastatic, Antileprosy Antiparkinsonian Adenylate cyclase stimulant Antiprotozoal (Coccidial) Antirickettsial, Antifibrinolytic Inflammatory Bowel disease, Antiinflammatory, Antiallergic Ophthalmic drug, Antiasthmatic, Antineurotoxic Antiviral (Arbovirus), Antiglaucomic, Antidiabetic Antiseborrheic, Antileukemic Anticholelithogenic Antihyperlipoproteinemic Antirickettsial, Antimyopathies Antiviral, ophthalmic Abortion inducer, Antimetastatic, Antiinflammatory, Antianemic Antimutagenic Antiadrenalinic; Anticirrhotic; Insulin-Sparing
5-t-Butyl-2-(5H)-	C ₈ H ₁₂ O ₂	140	1.22		Antineurotoxic, Leukopoiesis

furanone					Antiprotozoal , Antipsoriatic Antiviral (Influenza), Chemoprotective, Immunosuppressant, Antimetastatic, Hepatoprotectant, Fibrinolytic, Antiuremic Antirickettsial, Antimycoplasmal Antineoplastic Antimutagenic Antimycobacterial Cytoprotectant, Antiprotozoal, Immunostimulant, Antihypertensive, Antinociceptive, Erythropoietin, Antimetastatic, Antiinflammatory, Anticataract, Autoimmune Antimyopathies, Antianemic Antimycoplasmal, Antidiabetic Antineoplastic , Antiparasitic Antirickettsial, Antianorexic, Antiperistaltic Cardioprotectant Antipsoriatic, Antineurotic Antinociceptive, Antiprotozoal Antineurotoxic, Cytoprotectant Antiprotozoal , Antiviral Antineoplastic (breast cancer) Antimetastatic, Antianemic Antineoplastic , Antiobesity Hepatoprotectant, Antianorexic, Antirickettsial Anticarcinogenic
Oxirane, hexyl- (CAS)	$C_8H_{16}O$	128	2.36		Antineurotoxic, Antitoxic Chemoprotective Antianemic, Fibrinolytic HIV-1 integrase inhibitor Antiasthmatic, Antinociceptive Antimigraine, Antiviral (HIV), Transplant rejection treatment Antiviral, ophthalmic Venom exonuclease inhibitor Uric acid excretion stimulant Antiinfertility, Antihypoxic Antioxidant, Antiglaucomic Immunomodulator
(1RS,2SR,1'SR)-2- (1- Methoxyethyl)cycl obutanecarboxalde hyde	$C_8H_{14}O_2$	142	2.22		Antisecretoric, Antimutagenic Antihelminthic, Immunostimulant Anticataract, Antifungal Antiprotozoal, Antineurogenic
1-cyclohexyl-5- (diazomethyl)-1H- tetrazole	$C_8H_{12}N_6$	192	4.14		
Pentadecane, 2,6,10-trimethyl-	$C_{18}H_{38}$	254	1.00		

10-(1,3-Benzodioxol-5-yl)-4,10-dihydro-1H,3H-furo[3,4-c][1,5]benzothiazepin-1-one	$C_{18}H_{13}NO_4$ S	339	1.13	Hepatoprotectant, Antimyopathies, Antiparasitic Antispirochetal, Antileprosy Antimetastatic, Antiemphysemic, Antirickettsial, Antipsoriatic Antinephritic, Antihypertensive Antituberculosic, Antineoplastic (brain cancer) Cardioprotectant, Antiasthmatic, Antiulcerative, Cytoprotectant, Cardiodepressant, Hepatic disorders treatment, Antiosteoporotic, Irritable Bowel syndrome treatment, Hepatoprotectant, Antiadrenergic, Antiparasitic Anticarcinogenic, Antiviral, Alopecia treatment, Antinociceptive, Spermicide, Antiprotozoal, Antianemic, Antiperistaltic, Antiseborrheic, Antimyopathies, Antihelmintic, Antimutagenic, Antiprotozoal, Chemoprotective, antiepileptic, Antimetastatic
2-(Azidomethyl)-1,3-butadiene	$C_5H_7N_3$	109	1.84	Antiseborrheic, Antineurotoxic Antimutagenic, Cytoprotectant Fibrinolytic, Anticarcinogenic Antinephritic, Antiprotozoal Immunomodulator,
Docosane (CAS)	$C_{22}H_{46}$	310	26.82	Antiinfective, Antimyopathies Antiprotozoal (Coccidial) Antineurotic, Antimetastatic Antituberculosic, Antileprosy Antimycobacterial, Antianorexic, Antirickettsial Antiseborrheic, Cytoprotectant Antipsoriatic, Antihypoxic Fibrinolytic, Antihelmintic Anticarcinogenic,
Bis-(3,5,5-trimethylhexyl) ether	$C_{18}H_{38}O$	270	6.69	Antimyopathies, Antisecretoric CNS active muscle relaxant Psychostimulant, Antiglaucomic, Antineoplastic Anticataract, Antimetastatic, Antiosteoporotic, Antirickettsial, Antileprosy Antineurogenic, Antinephritic Antihistaminic, Antidepressant Antiseborrheic, Leukopoiesis, Antiparkinsonian, Antiarthritic Antinociceptive, Myocardial ischemia treatment, Prostate cancer treatment,
6H-Dibenzo[b,d]thiopyran	$C_{13}H_{10}S$	198	4.02	

5-(2-Thienyl)-3-[3-(4-methylphenyl)sydnon-4-yl]-1H-[1,2,4]triazole	$C_{15}H_{11}N_5O_2S$	325	1.70	Antipsychotic, Antipyretic Antimutagenic, Anticonvulsant Antiadrenergic, Antiosteoporotic, Antipsoriatic Antismoking, Antiischemic Immunomodulator, Antimetastatic, Anticholelithogenic Contraceptive, Antiperistaltic Antimyopathies, Antimigraine Antiamyloidogenic Rheumatoid arthritis treatment Mucomembranous protector Antiulcerative, Anticarcinogenic Neurotrophic factor enhancer Antiseborrheic, Antiviral Platelet aggregation stimulant Antioxidant, Hypertensive, Antinociceptive, Fibrinolytic Antihypoxic, Antixerophthalmic Antimutagenic, Antiperistaltic Antirickettsial, Antibiotic Antihemorrhagic, Antiinfertility, Antiuremic, Antiseborrheic, hypertension Sickle-cell anemia treatment Antineurotoxic, Psychosexual dysfunction treatment, Antimutagenic, Cytoprotectant Antihypoxic, Aspergillopepsin II inhibitor, Antinociceptive, Cardioprotectant, Antinephritic
Dotriacontane (CAS)	$C_{32}H_{66}$	450	18.64	Astringent, Antiepileptic Antiinflammatory, Atherosclerosis treatment, Anticholelithogenic, Antithrombotic, Antiviral Antipsoriatic, Antiglaucomic Antiamyloidogenic, Anticataract, Antianorexic Cocain dependency treatment Antirickettsial Gaucher disease treatment Mucomembranous protector Antiseborrheic, Transplant rejection treatment, Aspergillus nuclease S1 inhibitor, Menopausal disorders treatment, Antiviral , Gynecological disorders treatment, Platelet aggregation stimulant, Antihypercholesterolemic
9- Octadecenoic acid (Z)- (CAS)	$C_{18}H_{34}O_2$	282	1.18	

2-Oxetanone (CAS)	C ₃ H ₄ O ₂	72	2.25	Antipruritic, Immunosuppressant, Alzheimer's disease treatment Antipruritic, Antiprotozoal , Antineurogenic , Antiinflammatory, Antineoplastic, Anticarcinogenic, Cytoprotectant , Chemoprotective, Antinociceptive, Antialcoholic, Antihelmintic, Hepatoprotectant, Antipsoriatic, Antiprotozoal Antiinflammatory, Antimetastatic, Anticholelithogenic, Osteoarthritis treatment, Antiparasitic, Antiperistaltic, Antimycoplasmal, Anticataract, Antileprosy
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Formation stimulant, antileprosy, antitreponemal, Mucomembranous protector, anticarcinogenic, antimicrobial, anti-inflammatory, antiparasitic, and antirickettsial. The prediction results suggest that the methanolic extracts may be used in the atherosclerosis treatment, multiple sclerosis treatment, alopecia treatment, sickle-cell anemia treatment, autoimmune disorders treatment, menopausal disorders treatment, gynecological disorders treatment, hepatic disorders treatment, pancreatic disorders treatment, skin diseases treatment and transplant rejection treatment. It may be acted as bone formation stimulant, abortion inducer and HIV-1 protease inhibitor.

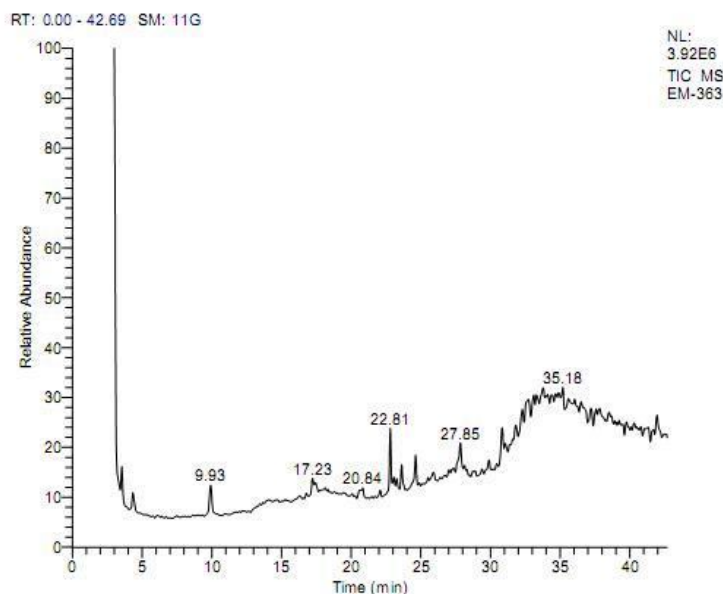


Figure 3: GC-MS chromatogram of the methanolic extracts of *Aerva lanata* stem

Table 3: Chemical constituents of Methanolic stem extract of *Aerva lanata*

Name of the compound	Molecular Formula	MW	Peak Area %	Uses
4,6,10,12-Tetramethoxy-6,12-bis(methylthiomethyl)tricyclo[6.4.0.0(1,8)]trideca-3,9-diene-5,11-dione	C ₂₀ H ₂₈ O ₆ S ₂	428	2.38	Myocardial ischemia treatment, Antinephritic, Cytoprotectant, Immunosuppressant, Male reproductive dysfunction treatment, Gynecological disorders treatment, Hepatic disorders treatment, Antiparasitic, Anticholelithogenic, Microtubule formation stimulant, Postmenopausal disorders treatment, Cystic fibrosis treatment, Antibacterial, Antiprotozoal, Alopecia treatment, Immunomodulator, Antimetastatic, Antibiotic
Benzyl 2-[N-(trifluoromethanesulfonyl)amido]-2-phenylethanoate	C ₁₆ H ₁₄ F ₃ NO ₄ S	373	4.12	Antiasthmatic, Anticoagulant, Antiallergic, Antiinflammatory, Antineoplastic, Fibrinolytic, Antiuro lithic, Rheumatoid arthritis treatment, Antiprotozoal (Toxoplasma), Antihypertensive, Anticataract, Sickle-cell anemia treatment, Antiobesity, Irritable Bowel syndrome treatment
(1S,2S)-N-Methyl-1-methoxy-1-phenylprop-2-ylamine	C ₁₁ H ₁₇ NO	179	2.55	Irritant
3-t-Butyl-5-methyl-4-hexen-2-ol	C ₁₁ H ₂₂ O	170	5.35	Antiviral, Mucomembranous protector, Anticarcinogenic,

N-(4-Chlorophenyl) carbamoylquinoline	$C_{16}H_{11}ClN_2O$	282	3.14	<p>Skin diseases treatment, Immunomodulator, Antimicrobial, Antiinflammatory, Autoimmune disorders treatment, Antineoplastic, Antihypercholesterolemic, Antimycoplasmal, Atherosclerosis treatment, Abortion inducer, Antiparasitic, Antineoplastic, Gynecological disorders treatment, Chemopreventive, HIV-1 protease inhibitor, Hepatic disorders treatment, Transplant rejection treatment, Antirickettsial</p> <p>Antimalarial, Transplant rejection treatment, Antiasthmatic, Pancreatic disorders treatment, Alzheimer's disease treatment, Antiurolithic, Corneal wound healing stimulator, Antismoking Liver fibrosis treatment, HIV-1 reverse transcriptase inhibitor, Renal disease treatment, Rheumatoid arthritis treatment, Antituberculosic, Antiobesity Sleep disorders treatment, CNS active muscle relaxant, Autoimmune disorders treatment, Antileprosy HIV-1 integrase inhibitor, Antineoplastic, Hair growth stimulant, Antidiabetic Bone formation stimulant Antithrombotic, Antimutagenic, Multiple sclerosis treatment,</p>
(R,Z)-12-Hydroxy-9-octadecenoic acid	$C_{18}H_{34}O_3$	298	8.25	

5-exo-methyl-5-endo-nitrobicyclo[2.2.1]heptan-2-one	$C_8H_{11}NO_3$	169	3.77	<p>Alopecia treatment, Immunosuppressant, Sickle-cell anemia treatment, Autoimmune disorders treatment, Antihelminthic, Menopausal disorders treatment, Gynecological disorders treatment, Bone formation stimulant, Hepatic disorders treatment, Antiinfertility, Anticataract, Antialcoholic, Pancreatic disorders treatment, Cardioprotectant, Antifibrinolytic, Antirickettsial, Microtubule formation stimulant, Antitreponemal, Antileprosy</p> <p>Antineoplastic (brain cancer) Male reproductive dysfunction treatment, Alzheimer's disease treatment Antineurotoxic, Antirickettsial, Menopausal disorders treatment, Sickle-cell anemia treatment, Anticarcinogenic, Chemopreventive, Hepatoprotectant, Antiviral, Metabolic disease treatment, Cytoprotectant, Antimetastatic, Antiprotozoal Immunomodulator Antinephritic, Cardioprotectant, Antithrombotic, Antihelminthic (Nematodes) Hepatoprotectant, Vascular disease treatment, Antineurotoxic, Hepatic disorders treatment, Antiulcerative,</p>
Nonanoic acid, methyl ester (CAS)	$C_{10}H_{20}O_2$	172	4.33	<p>Hepatoprotectant, Vascular disease treatment, Antineurotoxic, Hepatic disorders treatment, Antiulcerative,</p>

				Septic shock treatment, Menopausal disorders treatment, Respiratory distress syndrome treatment, Anticataract, Psychosexual dysfunction treatment, Antineoplastic (multiple myeloma), Antiepileptic, Cystic fibrosis treatment, Abortion inducer, Antileprosy, Antirickettsial Transplant rejection treatment, Pancreatic disorders treatment, CNS active muscle relaxant, Liver fibrosis treatment, Antineoplastic enhancer, Antispirochetal Vascular disease treatment Sickle-cell anemia treatment Multiple sclerosis treatment Anticataract, Antidiarrheal Pancreatic disorders, treatment, Antileprosy, Antihyperlipoproteinemic, Anticarcinogenic, Antirickettsial, Antiviral, Autoimmune disorders treatment, Septic shock treatment, Antibacterial, Chemopreventive, Antiseptic Antispirochetal Psychosexual dysfunction treatment, Antineoplastic, Male reproductive dysfunction treatment, Antiinflammatory, Antineurotic, Antihypertensive, Irritable Bowel syndrome treatment, Cognition disorders treatment
Dethiobiotin	$C_{10}H_{18}N_2O_3$	214	6.76	
Methyl 3-(1á- hydroxyethyl)- 1,2,3,4,6,7,12,12b - octahydroindolo[2,3-a]quinolizi ne-1à-carboxylate	$C_{19}H_{24}N_2O_3$	328	2.25	

(1S*,6R*)-4-Bromo-3-methoxy-2,7-dioxabicyclo[5,4,0]undecane isomer	$C_{10}H_{17}BrO_3$	264	5.20	Rhinitis treatment, Antidiarrheal, Antimycoplasmal, Antidepressant Antineoplastic, Antibacterial Antineurotoxic, Cytoprotectant, Immunosuppressant, Antibiotic, Antimetastatic, Insecticide, Antihelminthic, Antimycoplasmal, Skin diseases treatment, Antiprotozoal, Antihelminthic, Antineoplastic Capillary fragility treatment Skin diseases treatment, Antihypercholesterolemic, Rheumatoid arthritis treatment, Multiple sclerosis treatment, Antialcoholic, Antimutagenic, Hepatoprotectant, Antiperistaltic, Anticholelithogenic, Alopecia treatment, Antioxidant, Antinociceptive, Antiinflammatory, Hepatic disorders treatment, HIV-1 reverse transcriptase inhibitor, Abortion inducer, Antirickettsial, Liver fibrosis treatment, Antispirochetal, Antimycoplasmal Antineoplastic, Menopausal disorders treatment, Anticarcinogenic, Anticholelithogenic, Osteoarthritis treatment, Alzheimer's disease treatment
2-Propenoic acid, butyl ester (CAS)	$C_7H_{12}O_2$	128	2.58	Antianemic, Capillary fragility treatment, Antirickettsial, Rheumatoid arthritis treatment, Abortion inducer,
1-(2,3-Epoxypropionyl) cyclohexanol	$C_9H_{14}O_3$	170	3.45	Antianemic, Capillary fragility treatment, Antirickettsial, Rheumatoid arthritis treatment, Abortion inducer,

Isopropyl (Z)-3-Anilino-3-phenyl-2-propenoate	$C_{18}H_{19}NO_2$	281	7.47	Hepatoprotectant, Myelodysplastic syndrome treatment, Antiperistaltic, Hair growth stimulant, Antiparasitic Skin diseases treatment, Gaucher disease treatment, Pulmonary hypertension treatment, HIV-1 integrase inhibitor, Multiple sclerosis treatment, Antimycoplasmal, Hepatic disorders treatment, Microtubule formation stimulant, Anticholelithogenic, Antirickettsial, Antiviral Antifungal, Anticataract
3-(8-tert-Butyldimethylsilyloxyoctyl)-3-hydroxytricyclo[5.2.1.0(2,6)]dec-8-en-5-one	$C_{24}H_{42}O_3Si$	406	2.70	Antineoplastic, Multiple sclerosis treatment, Contraceptive female, Antifungal, Bone diseases treatment, Menopausal disorders treatment, Prostate disorders treatment, Antiviral (HIV), Autoimmune disorders treatment, Vitamin, Antiinflammatory Multiple sclerosis treatment, Transplant rejection treatment, Prostate cancer treatment, Skin diseases treatment, Antineoplastic, Gynecological disorders treatment, Antidepressant
anti-5-(1-hydroxyundecyl)-3-(3-methylbutyl)oxazolidin-2-one	$C_{19}H_{37}NO_3$	327	9.31	Transplant rejection treatment, Antineoplastic (brain cancer), Menopausal disorders treatment, Alzheimer's disease treatment Antiinflammatory,
Methyl 2-Cyanohept-6-ynoate	$C_9H_{11}NO_2$	165	3.19	

5-(Trifluoromethyl) nonan-6-one	$C_{12}H_{21}F_3O$	238	3.79	<p>Ovulation inhibitor, Antiuro lithic, Pulmonary hypertension treatment, Hair growth stimulant, Capillary fragility treatment, Immunostimulant, Antihelminthic, Cognition disorders treatment</p> <p>Mucomembranous protector, Multiple sclerosis treatment, Respiratory distress syndrome treatment, Fibrinolytic, Autoimmune disorders treatment, Alzheimer's disease treatment, Menopausal disorders treatment, Gynecological disorders treatment, Platelet aggregation stimulant Transplant rejection treatment, Vascular disease treatment, Antinociceptive, Antineurotic, Muscular dystrophy treatment, Membrane permeability enhancer, Hair growth stimulant, Abortion inducer, Antiinfertility, Antihyperlipoproteinemic, Atherosclerosis treatment Urologic disorders treatment, Pulmonary hypertension treatment, Antianemic, Myocardial ischemia treatment, Antidiarrheal, Microtubule formation stimulant, Alzheimer's disease treatment, Antineurotoxic,</p>
Phenyl 2-butenolate	$C_{10}H_{10}O_2$	162	4.05	<p>Antineurotoxic,</p>

(-)-(1R,2R)-2-(2-Benzenesulfonylthyl)-1-(tert-butyl)dimethylsilyloxy)cyclopropane	$C_{17}H_{28}O_3SSi$	340	2.13	Antiparasitic, Sickle-cell anemia treatment, Antineoplastic enhancer, Transplant rejection treatment, Uric acid excretion stimulant, Protein synthesis stimulant, Antithrombotic, Antituberculosic, Capillary fragility treatment, Osteoarthritis treatment, Antirickettsial, Antimycobacterial, HIV-1 integrase, Antileprosy Multiple sclerosis treatment, Bone diseases treatment, Autoimmune disorders treatment, Prostate disorders treatment, Antiparasitic, Contraceptive female, Antiviral (HIV), Antiprotozoal (Toxoplasma) Antiviral, Antihelminthic, Antiuremic, Anti-inflammatory
Ethyl (2,6-dibromo-4'-pyren-1-ylbiphenyl)-4-carboxylate	$C_{31}H_{20}Br_2O_2$	582	3.01	Myocardial ischemia treatment, Amyotrophic lateral sclerosis treatment, Alzheimer's disease treatment, Antiinflammatory, Skin diseases treatment, Vascular disease treatment, Gout treatment, Atherosclerosis treatment, Antinephritic, Skeletal muscle relaxant, Antiinfertility, Hair growth stimulant, Lipoprotein disorders treatment, Rheumatoid arthritis treatment, HIV-1 reverse transcriptase inhibitor

Methanolic leaves extract of *A. lanata* revealed the presence of 23 different compounds and were shown in Table 4 (Figure 4). The major phytoconstituents were 2-Isopropyl-2,5-dihydrofuran (20.60%), 1,6-(E)-Octadiene (11.76%) and 4,6-Dimethyl-2-(prop-1-enyl)-1,3-dioxane isomer (9.61%), 2,3,11-trioxabicyclo[6.2.1]undecane (5.80%), Tetradecanoic acid methyl ester (5.32%) and 2-Hydroxyethyl cycloheptane carboxylate (5.07%). The prediction results suggest that it may be are used as antifibrinolytic, antiinflammatory, antialcoholic, antipsoriatic, antianemic, antirickettsial, antileprosy, antiinfertility, antiulcerative, antispirochetal, antiperistaltic, antioxidant, antiparasitic, immunomodulator, anti-cataract, anti-tuberculosic, agents in the near future. In addition, the methanolic extracts may be used in skin diseases treatment, menopausal disorders treatment, gynecological disorders treatment, rheumatoid arthritis treatment, atherosclerosis treatment, CNS active muscle relaxant, autoimmune disorders treatment, alzheimer's disease treatment, liver fibrosis treatment. It may act as cancer procoagulant inhibitor, abortion inducer and hair growth stimulant.

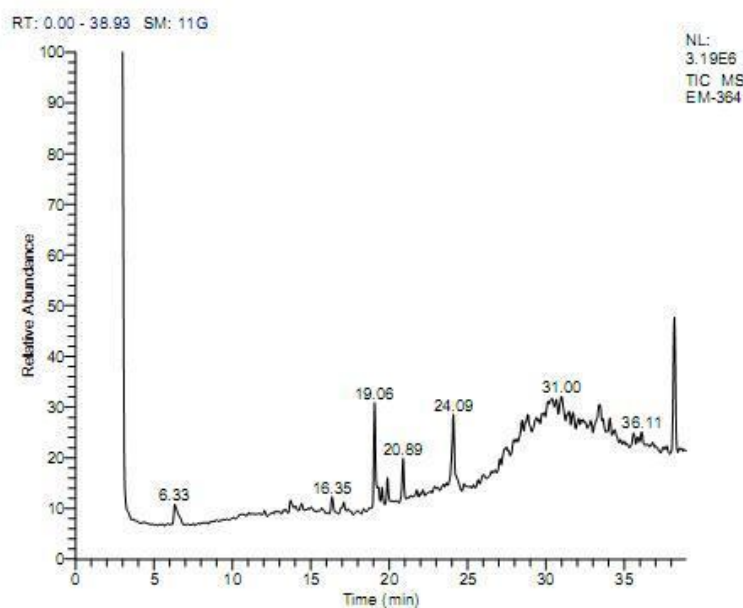


Figure 4: GC-MS chromatogram of the methanolic extracts of *Aerva lanata* leaves

Table 4: Chemical constituents of Methanolic leaves extract of *Aerva lanata*

Name of the compound	Molecular Formula	MW	Peak Area %	Uses
(E)-17á[3-[(2-Aminoethoxy)imin o]propyl]-5á-androstane-3á,14á-diol	C ₂₄ H ₄₂ N ₂ O ₃	406	2.42	Menopausal disorders treatment, Antidiarrheal, Antiinfertility, Prostate cancer treatment, Contraceptive, Erythropoietin, Protein synthesis stimulant, Immunosuppressant, Hepatic disorders treatment, Antineoplastic , Antihypertensive, Antineurotic, Antifungal.
Methane, chloromethoxy-	C ₂ H ₅ ClO	80	2.24	Antiinflammatory, Antineurotoxic,

(CAS)				Antineoplastic , Skin diseases treatment, Alzheimer's disease treatment, Pulmonary hypertension treatment, Antirickettsial, Antimutagenic, Anthelmintic, CNS active muscle relaxant, Rheumatoid arthritis treatment, Antileprosy, Hair growth stimulant, Abortion inducer Cardioprotectant, Anticarcinogenic, Alzheimer's disease treatment, Venom exonuclease inhibitor, Immunomodulator, Antituberculosic, Antimycobacterial, Antiprotozoal, Antirickettsial, Hair growth stimulant, Cancer procoagulant inhibitor, Pancreatic disorders treatment, Rheumatoid arthritis treatment, HIV-1 integrase inhibitor. Skin diseases treatment. Autoimmune disorders treatment, Antispirochetal, Menopausal disorders treatment, Antiperistaltic, Antioxidant, Antiparasitic, Cancer procoagulant inhibitor
Ethane, 1,1-dinitro- (CAS)	$C_2H_4N_2O_4$	120	1.92	Antituberculosic, Alzheimer's disease treatment, Abortion inducer, Liver fibrosis treatment, Immunomodulator, Antiinflammatory, Anticataract, Hair growth stimulant. Anticarcinogenic, Immunosuppressant, Antihyperlipoproteinemic, Rheumatoid arthritis treatment, Autoimmune disorders treatment,
1,6-(E)-Octadiene	C_8H_{14}	110	11.76	Cytoprotectant, Antiglaucomic, Cystic fibrosis treatment, Antirickettsial, Abortion inducer, Antiuremic, Chemopreventive,
3-Methyl-3-butenyl acetate	$C_7H_{12}O_2$	128	1.72	

1,1'-Bicyclopentyl (CAS)	$C_{10}H_{18}$	138	2.94	Multiple sclerosis treatment, Antineoplastic , Antithrombotic, Antimutagenic. Cardioprotectant, Menopausal disorders treatment, Antithrombotic, Anticarcinogenic, Skin diseases treatment, Sickle-cell anemia treatment, Antismoking, Alzheimer's disease treatment, Osteoarthritis treatment, CNS active muscle relaxant, Antirickettsial, Antiinfective, Pancreatic disorders treatment, Antileprosy, HIV-1 integrase inhibitor, Antituberculosic, HIV-1 protease inhibitor, Multiple sclerosis treatment, Autoimmune disorders treatment. Skin diseases treatment, Multiple sclerosis treatment, Autoimmune disorders treatment, Alzheimer's disease treatment, Anticarcinogenic, Rheumatoid arthritis treatment, Hepatic disorders treatment, Menopausal disorders treatment, Cystic fibrosis treatment, Protein synthesis stimulant, Abortion inducer, Bone formation stimulant, Antineoplastic , Antileprosy, Antirickettsial, CNS active muscle relaxant, Antidiabetic, Myocardial ischemia treatment, Antispirochetal. Sickle-cell anemia treatment, Skin diseases treatment, Alzheimer's disease treatment, Urinary incontinence treatment, Male reproductive dysfunction treatment, Multiple sclerosis treatment, Antianginal, Antiamyloidogenic, Antileprosy, Cocain dependency treatment,
Tetradecanoic acid, methyl ester (CAS)	$C_{15}H_{30}O_2$	242	5.32	
2-Butanamine, 2- methyl-	$C_5H_{13}N$	87	3.09	

4-[1-Tributyltinstanyl-(E)-methylene]-7-methoxymethoxy-2,2-dimethyl-1-(3aR,5S,7S,7aS)-perhydrobenzo[d][1,3]-dioxol-5-ol	$C_{24}H_{46}O_5Sn$	534	1.58	Antimetastatic, Renal disease treatment, Antirickettsial, Uric acid excretion stimulant, Antituberculosic, Antimycobacterial. Antismoking, Antibacterial, Antineoplastic, Antimycoplasmal, Cytoprotectant, Immunosuppressant, Antitreponemal, Antiparasitic, Antibiotic, Microtubule formation stimulant. Transplant rejection treatment, Antithrombocytopenic, Antidiabetic, Antioxidant, Antiviral, Antithrombotic, Osteoarthritis treatment, Antitoxic, Capillary fragility treatment, Antiprotozoal, Cognition disorders treatment, Cytoprotectant. Skin diseases treatment, Anticarcinogenic, Antinociceptive, Ovulation inhibitor, Antiviral, Antinephritic, Antimutagenic, Prostate cancer treatment, Antineoplastic, Antirickettsial, Antineurotic, Menopausal disorders treatment, Rhinitis treatment, Cancer procoagulant inhibitor, HIV-1 integrase inhibitor
3,8-Dimethyl-2-ethyl-1(2H)-furo[2,3-h]isoquinolinone	$C_{15}H_{15}NO_2$	241	4.09	Skin diseases treatment, Anticarcinogenic, Antinociceptive, Ovulation inhibitor, Antiviral, Antinephritic, Antimutagenic, Prostate cancer treatment, Antineoplastic, Antirickettsial, Antineurotic, Menopausal disorders treatment, Rhinitis treatment, Cancer procoagulant inhibitor, HIV-1 integrase inhibitor
2-Benzyl-1,1,3,3-tetramethyl-2-indanselenol	$C_{20}H_{24}Se$	344	1.77	Skin diseases treatment, Antifibrinolytic, Menopausal disorders treatment, Gynecological disorders treatment, Rheumatoid arthritis treatment, Antialcoholic, Antipsoriatic, Antiinflammatory, Antianemic, Atherosclerosis treatment, Sickle-cell anemia treatment, Autoimmune disorders treatment, CNS active muscle relaxant, Antirickettsial, Antileprosy, Antiinfertility, Antiulcerative.
2-Hydroxyethyl cycloheptane carboxylate	$C_{10}H_{18}O_3$	186	5.07	Skin diseases treatment,
(5R,6R)-2,5-	$C_9H_{14}O_2$	154	2.39	Skin diseases treatment,

dimethyl-5,6-epoxy-3-heptyn-2-ol				Anticholelithogenic, Antiviral (HIV), Abortion inducer, Menopausal disorders treatment, Antiviral, Hepatoprotectant, Antirickettsial, Bone diseases treatment, Insecticide, Antiprotozoal , Neurotrophic factor enhancer, Antihelmintic, Antialcoholic, Chemoprotective, Mucomembranous protector, Antiinfertility, Hepatoprotectant, Antiprotozoal , Microtubule formation stimulant, Antimetastatic, Urologic disorders treatment, Antismoking, Antidiarrheal, Antimycobacterial, Prostate disorders treatment, CNS active muscle relaxant, Antituberculosic, Antiviral, ophthalmic, Skeletal muscle relaxant Antiinfective. Transplant rejection treatment, Alzheimer's disease treatment, Skin diseases treatment, Antihelmintic, Antiparasitic, Aspergillus nuclease S1 inhibitor, Rheumatoid arthritis treatment, Membrane permeability, enhancer, Antiperistaltic, Multiple sclerosis treatment, Antimetastatic, Antineoplastic , Abortion inducer, Antituberculosic, Antirickettsial, Antileprosy. Atherosclerosis treatment, Amyotrophic lateral sclerosis treatment, Transplant rejection, treatment, Inflammatory, Bowel disease treatment, Antinephritic, Pulmonary hypertension treatment, Bone formation stimulant, Rhinitis treatment, Sleep disorders treatment,
trans-1-(2-Methylcyclohexyl) ethanone	$C_9H_{16}O$	140	2.36	
Pentanedinitrile, 2-methyl-	$C_6H_8N_2$	108	1.61	
1,2-Bis(5'-t-butyl-3',4'-dimethoxyphenyl) ethane	$C_{26}H_{38}O_4$	414	1.82	

2,3,11-trioxabicyclo[6.2.1]undecane	$C_8H_{14}O_3$	158	5.80	Prostate cancer treatment, Male reproductive dysfunction treatment, Antimetastatic, Sickle-cell anemia treatment, Menopausal disorders treatment, Respiratory distress syndrome treatment, Antiviral, Skin diseases treatment, Antiparasitic, Restenosis treatment, Anticarcinogenic, Abortion inducer, Antibiotic, Antiinfective, Antimyopathies, Antineoplastic, Protein synthesis stimulant, Antirickettsial, Capillary fragility treatment, Gynecological disorders treatment, Ovulation inhibitor, Gaucher disease treatment, Metabolic disease treatment, Antifungal, Antiperistaltic, Antialcoholic, Antibacterial activity enhancer, Antineoplastic, Antiinflammatory, Antineurotoxic, Antiviral, Skin diseases treatment, Vascular disease treatment, Platelet aggregation stimulant, Antialcoholic, Antibiotic, Antihemorrhagic, Antiviral, Antirickettsial, Protein synthesis stimulant, Antiinfective, Antiprotozoal, Mucomembranous protector, Antianemic, Antiinflammatory, Skin diseases treatment, Antimycobacterial, Anticataract, Uric acid excretion stimulant, Gaucher disease treatment, Antileprosy, Male reproductive dysfunction treatment,
Hexanedioic acid, monomethyl ester	$C_7H_{12}O_4$	160	2.07	Antifungal, Antiperistaltic, Antialcoholic, Antibacterial activity enhancer, Antineoplastic, Antiinflammatory, Antineurotoxic, Antiviral, Skin diseases treatment, Vascular disease treatment, Platelet aggregation stimulant, Antialcoholic, Antibiotic, Antihemorrhagic, Antiviral, Antirickettsial, Protein synthesis stimulant, Antiinfective, Antiprotozoal, Mucomembranous protector, Antianemic, Antiinflammatory, Skin diseases treatment, Antimycobacterial, Anticataract, Uric acid excretion stimulant, Gaucher disease treatment, Antileprosy, Male reproductive dysfunction treatment,
1,6 - anhydro - beta - D - gluco - furanose	$C_6H_{10}O_5$	162	1.75	Antifungal, Antiperistaltic, Antialcoholic, Antibacterial activity enhancer, Antineoplastic, Antiinflammatory, Antineurotoxic, Antiviral, Skin diseases treatment, Vascular disease treatment, Platelet aggregation stimulant, Antialcoholic, Antibiotic, Antihemorrhagic, Antiviral, Antirickettsial, Protein synthesis stimulant, Antiinfective, Antiprotozoal, Mucomembranous protector, Antianemic, Antiinflammatory, Skin diseases treatment, Antimycobacterial, Anticataract, Uric acid excretion stimulant, Gaucher disease treatment, Antileprosy, Male reproductive dysfunction treatment,
2,5-Di-tert-butyl-2,3-dihydro-1,3,4-thiadiazol-1,1-dioxide	$C_{10}H_{20}N_2O_2S$	232	1.68	Antifungal, Antiperistaltic, Antialcoholic, Antibacterial activity enhancer, Antineoplastic, Antiinflammatory, Antineurotoxic, Antiviral, Skin diseases treatment, Vascular disease treatment, Platelet aggregation stimulant, Antialcoholic, Antibiotic, Antihemorrhagic, Antiviral, Antirickettsial, Protein synthesis stimulant, Antiinfective, Antiprotozoal, Mucomembranous protector, Antianemic, Antiinflammatory, Skin diseases treatment, Antimycobacterial, Anticataract, Uric acid excretion stimulant, Gaucher disease treatment, Antileprosy, Male reproductive dysfunction treatment,

N-Bis(trimethylsilyl)methyl-2-methyl-3-(tert-butoxycarbonylamino)-1-azacyclobutan-4-one	$C_{16}H_{34}N_2O_3$ Si_2	358	2.01	Rheumatoid arthritis treatment, Antituberculosic, Hepatic disorders treatment, Antiperistaltic, Antiurolithic, Antiprotozoal, Muscular dystrophy treatment, CNS active muscle relaxant, Microtubule formation stimulant, Cognition disorders treatment, Cystic fibrosis treatment, Antibacterial, Immunostimulant, Anticonvulsant, Antibiotic, Erythropoietin.
2-Isopropyl-2,5-dihydrofuran	$C_7H_{12}O$	112	20.60	

Discussion

The results of GC-MS analysis on methanolic extract of root, flower, stem and leaves showed the existence of various compounds with different chemical structures. The prediction of the biological activities was confirmed with the previous observations which supplemented the traditional usage of *A. lanata* [19-21]. Similar to our observation, Sahaya Sathish et al. [22] also analysed bioactive constituents present in leaf extracts of *Vitex altissima* L. They also identified 21 phytochemical compounds and predicted biological activities using Dr. Duke's Phytochemical and Ethnobotanical Databases. John De Britto et al. [23] predict the biological activity profile of known seven secondary metabolites viz., taxol, vinblastine, vincristine, topotecan, irinotecan, etoposide and teniposide using PASS. In the present study we applied the PASS prediction biological activity for GC-MS predicted unknown compounds. We observed boundless activity for the major constituents of the methanolic extracts of *Aerva lanata* stem, leaves, flower and root. The present study suggests that methanolic extract is a potent therapeutic agent. It paves the way for the development of several treatment regimens based on different extracts. Further work is needed to isolate and identify these bioactive compounds.

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Conflict of interest.

We declare that we have no conflict of interest.

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