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PHYTOCHEMICAL ANALYSIS OF ETHANOLIC EXTRACT OF *PROSOPIS CINERARIA* PODS BY GC-MS

Garima Sharma, Devki, Ruchi Vyas and Rashmi Sisodia *

Radiation Biology Laboratory, Department of Zoology, Centre for Advanced Studies, University of Rajasthan - 302004, Jaipur, India.

Keywords:

P. cineraria, Gas chromatography-mass spectrometry analysis, Phytochemical

Correspondence to Author:
Dr. Rashmi Sisodia

Professor,
Radiation Biology Laboratory, Department of Zoology, Centre for Advanced Studies, University of Rajasthan - 302004, Jaipur, India.

E-mail: rashsisodia@yahoo.co.in

ABSTRACT: This study was aimed to identify the possible bioactive chemical constituents of the state tree of Rajasthan, *i.e., Prosopis cineraria* L. (locally called Khejri) by GC-MS analysis using the GC-MS equipment (Shimadzu GCMSQP2010). For this purpose, the ethanolic extract of *P. cineraria* pods were used. Experimental conditions of the GC-MS system were as follows: Rtx-5MS capillary standard non-polar column, dimension: 30m, ID: 0.25 mm, Film: 0.25 µm was used, and flow rate of mobile phase (carrier gas: He) was set at 1.0 ml/min. Crude samples that were dissolved in methanol were run fully at a range of 40-550 m/z, and the results were compared by using NIST Library. GC-MS analysis of an ethanolic extract of pods led to the identification of 32 compounds *viz.* Bicyclo[3.1.1]hept-3-ene, 4, 6, 6-trimethyl-2-vi (30.47%), 5-Isopropyl-2methylbicyclo [3.1.0] hexan-2-ol(19.38%), (-)-.beta. –Bourbonene (10.62%), 3-O-Methyl- d-glucose (5.04%), Kessane (4.01%), Thunbergol (3.65%), alfa.-Copaene (2.23%). There is not much information available on the phytochemical constituents of *P. cineraria* pods. This is the first attempt to investigate the GC-MS analysis of the ethanolic extract of this plant.

INTRODUCTION: The *P. cineraria* (L) Druce belonging to the family Leguminosae is an important tree (Khejri- a local name in Rajasthan) of the Thar Desert with hard climatic adaptation and is considered as one of the lifelines in desert habitat as mentioned in ancient literature. This is a species representing all five F *viz.*, Forest, Fiber, Fuel, Fodder, and Food. Pods of Khejri are eaten by cattle, sheep, horses, mules, donkeys, goats, camels, and other wildlife in the desert, especially blackbuck and chinkara in the western Rajasthan have survived by eating pods and leaves of this tree. This tree is also of mythological importance in local communities.

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The high value of this species has led it to be recognized as a State symbol (the state tree of Rajasthan). *P. cineraria* (L.) tree is endemic to the hot deserts of India. Pods of the tree are locally called "Sangri" and are considered as dry fruit of desert. It is one of the main ingredients of the quintessential Rajasthani dish ''The Panchkuta' [1].

Pods contain various phytoconstituents like tannins (gallic acid), steroids (campestral, stigmasterol, sitosterol, *etc.*), flavone derivatives (prosogerin A, B, C, D, and E), alkaloids (prosophylline, spicigerine) etc. which have been isolated from the sangria pod [2]. The fresh ripe pods contain 7-10% preformed water, and on a dry matter basis contain 9-17% crude protein, 1.2-4.3% ether extractives, 47-61% nitrogen-free extracts ,16-34% crude fibre, 28% acid detergent fibre, 8% acid detergent lignin, 4-5% ash, 0.14-0.29% silica, 0.3-0.5% calcium and 0.40-0.44% phosphorus. The qualitative chemical analysis of extracts of *Prosopis* pods was found positive for alkaloids, proteins, carbohydrates,

flavonoids, glycosides, saponins, and tannins in alcohol and aqueous solvent extracts. Also, 11 amino acids have been isolated from leaves and pods *viz*; aspartic acid, glutamic acid, serine, glycine, histidine, threonine, arginine, alanine, proline, valine, tyrosine, methionine, cysteine, isoleucine, leucine, phenylalanine, and lysine [3].

Prosopis has been found to contain 5-hydroxy-tryptamine, apigenin, isorhamnetin-3-diglucoside, l- arabinose, quercetin, tannin, and tryptamine. The isolation of a flavone glycoside Patulitrin 3, 5, 6, 3, 4- pentamethoxy-7-hydroxy flavone from flowers of *P. cineraria* has been reported. The fruits of *P. juliflora* D.C. (leguminosae) were found to contain the same compound [4]. Many researchers found that patulitrin showed significant activity against the Lewis lung carcinoma *in-vivo* [5].

P. cineraria pods contain protein, iron, vitamins A and C, and other micro minerals. Unripe pods are also nutritious and are used to prepare curries and pickles. *P. cineraria* (L) Druce is also a highly valued plant in the indigenous system of medicine. Its bark is said to be a potent drug for several ailments such as leprosy, dysentery, bronchitis, asthma [6], leucoderma, piles, muscular tremors, asthma, rheumatism and inflammations. Pharmacological activities like analgesic, antipyretic, anti-hyperglycemic, anti-oxidant, antihypercholesterolemic, anti-tumor, nootropic, anthelmintic, anti-bacterial, anti-fungal, anti-viral, and anticancer activities have also been reported from different plant extracts [3, 7-14]. The inhibitory activities of enzymes lipid peroxidase, cyclooxygenase -1 and-2 in sangri pods was also reported [15].

The chloroform fraction of stem bark of *P. cineraria* shows anti-diabetic activity in Stepto-zotocin induced diabetes in rats. The possible mechanisms of its anti-diabetic action include inhibition of carbohydrate hydrolytic enzymes, enhancement of glycogen regulatory enzymes expression in the liver and glucose uptake by tissues and adipocytes as well as stimulation of pancreatic insulin release [16]. Thus, *P. cineraria* have potential *in-vitro* and *in-vivo* anti-diabetic activity, and this effect could be due to multi-target mode of action that includes anti-hyperglycemic, post-prandial hypoglycemic, hypolipidemic, and insulin secretory actions [17].

Phytoconstituents of an ethanolic pod extract of *P. cineraria* triggers the inhibition of HMG-CoA reductase, which is the main enzyme for cholesterol biosynthesis and the regression of atherosclerotic plaque in hyperchole-sterolemic rabbits [18]. *P. cineraria* pod extract components can be significantly considered in neuropharmacology as it showed inhibition against DPP-4, AChE, and BuChE target enzymes [19].

After the GC-MS analysis of the methanolic extract of roots of *P. cineraria* showed the presence of significant phytoconstituents belonging to the type acids, esters, alcohols, ethers, *etc*. Significant anticancer activity was also reported. Squalene, which was present in *P. cineraria* may be responsible for anticancer activity [20].

GC-MS analysis is a breakthrough in the analysis of phytoconstituents and structure elucidation of these compounds as they have a sensitivity of detecting compounds as low as 1 mg [21]. Therefore, we have done a GC-MS analysis for the identification of significant compounds in *P. cineraria* pods in the present study.

MATERIALS AND METHODS:

Collection of Pods: The fruits of *P. cineraria* were collected from the Dausa district of Rajasthan, India, in the month of March 2017. The plant material was identified and authenticated by the Department of Botany, University of Rajasthan, Jaipur (RUBL 211667).

Preparation of Plant Extract: 25 gm of *P. cineraria* pods were air-dried in the shade at room temperature, and then dried pods were coarsely powdered. Plant material was extracted with 100ml ethanol by using a Soxhlet apparatus.

GC-MS Analysis: Five grams of sample was extracted successively with ethanol in Soxhlet extractor for 8 h. Brown colored residues were obtained after concentrating the extract under reduced pressure using a rotary evaporator.

The obtained extracts were stored in desiccators for further analysis. The dried sample was reconstituted in methanol to obtain 10 μgml^{-1} concentrations. Methanol was used as a solvent. Finally, 2 ml of supernatant was taken and filtered through Axiva 0.2 μm nylon syringe filter and

transferred to GC vial for analysis. The analysis was carried out on a Shimadzu GCMSQP2010 Ultra system.

GC-MS Conditions: The injector temperature was 280 °C.The samples were injected in the split mode with a split ratio of 1/60. The injection volume was 1 µL. A capillary column Rtx-5MS (5% Diphenyl-95% Dimethyl Polysiloxane), 30 m × 0.25 mm × 0.25 mm, was used. The carrier gas was helium with a constant flow of 1.00 mL/min. The oven temperature was as follows: initial temperature of 60 °C, held for 2 min, increased to 10 °C/min up to 260 °C and held for 10 min. The MS ionization potential was 70 eV, and the temperatures were as follows: interface 260 °C, Ion source 280 °C. Mass scan range 40-550 m/z. GC-MS analysis of *P. cineraria* pods extracts led to the identification of 32 compounds **Table 1**.

TABLE 1: PHYTOCOMPONENTS IDENTIFIED IN THE ETHANOLIC EXTRACT OF *P. CINERARIA* PODS

S. no.	Retention Time	Frequency Time	Area	Area%	Compound name
1	6.673	6.715	186598	0.31	1,3,5-Cycloheptatriene,3,7,7-trimethyl-
2	7.227	7.275	242759	0.40	3-Carene
3	7.857	7.915	711648	1.18	cis-4-methoxy thujane
4	8.224	8.295	1607340	2.67	(1R,4R,5S)-1-Isopropyl-4-methoxy-4-methylbicyclo[3.1.0] hexane
5	8.571	8.655	326871	0.54	Butanedioic acid, mono(3-phenyl-2-propenyl) ester
6	8.910	8.950	207457	0.35	p-Mentha-1,5-dien-8-ol
7	9.016	9.055	351798	0.59	Bicyclo[3.1.0]hexan-3-ol,4-methylene-1-(1-methylethyl)-acetate
8	9.210	9.330	11650413	19.38	5-Isopropyl-2-methylbicyclo[3.1.0]hexan-2-ol
9	9.436	9.520	18312557	30.47	Bicyclo[3.1.1]hept-3-ene, 4,6,6-trimethyl-2-vinyloxy
10	10.238	10.285	441547	0.73	trans-Verbenol
11	10.449	10.510	399397	0.66	(1,2,3-Trimethyl-cyclopent-2-enyl)-methanol
12	10.604	10.660	609895	1.01	2,4-Pentadienoicacid,3,4-dimethyl-,isopropyl ester
13	10.904	10.975	362245	0.60	Carvacrol
14	11.582	11.625	361594	0.60	(1R,3S,4R,5S)-1-Isopropyl-4-methylbicyclo[3.1.0] hexan-3-yl acetate -rel
15	11.982	12.025	457781	0.76	alpha.-ylangene
16	12.067	12.110	1340176	2.23	alfa.-Copaene
17	12.193	12.330	6380761	10.62	(-)-.beta.-Bourbonene
18	12.450	12.515	361482	0.60	beta.-Longipinene
19	12.785	12.860	829377	1.38	cis-.alpha.-Bergamotene
20	12.991	13.035	432706	0.72	Germacrene D
21	13.355	13.390	1066554	1.77	alfa.-Copaene
22	13.499	13.560	729162	1.21	beta.-Longipinene
23	13.889	13.935	1103282	1.84	Isoledene
24	14.100	14.180	2408796	4.01	Kessane
25	14.643	14.740	1709613	2.84	Diethyl Phthalate
26	15.623	15.745	3030384	5.04	3-O-Methyl-d-glucose
27	17.113	17.215	691809	1.15	alpha.-Phellandrene, dimer
28	18.801	18.890	538651	0.90	(R,1E,5E,9E)-1,5,9-Trimethyl-12-(prop-1-en-2-yl)cyclotetradeca-1,5,9-triene.
29	19.069	19.155	344766	0.57	Isocembrol
30	19.566	19.625	305835	0.51	1,3,6,10-Cyclotetradecatetraene,3,7,11-trimethyl-14-(1-methylethyl)
31	20.556	20.620	409145	0.68	(R,1E,5E,9E)-1,5,9-Trimethyl-12-(prop-1-en-2-yl) cyclotetradeca-1,5,9-triene
32	20.678	20.760	2190909	3.65	Thunbergol
			60103308	100.00	

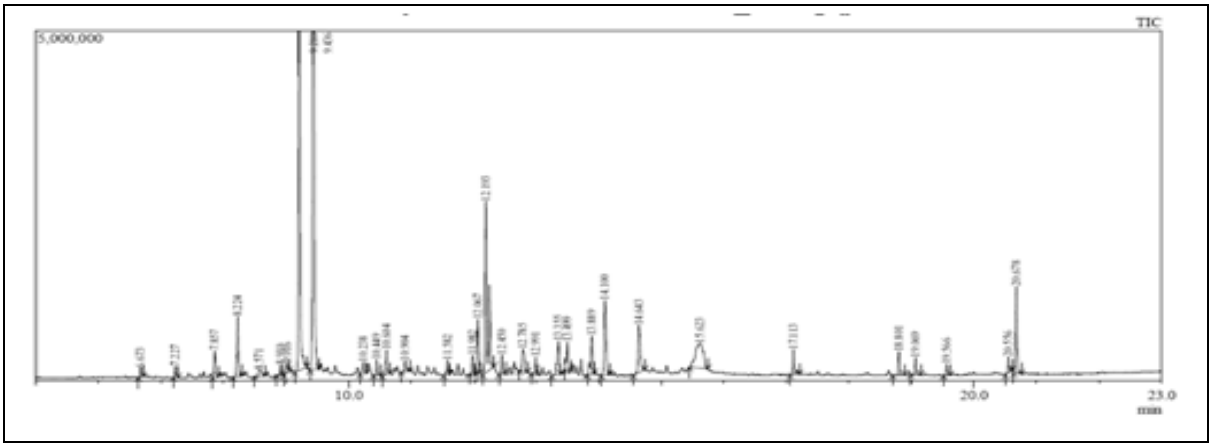
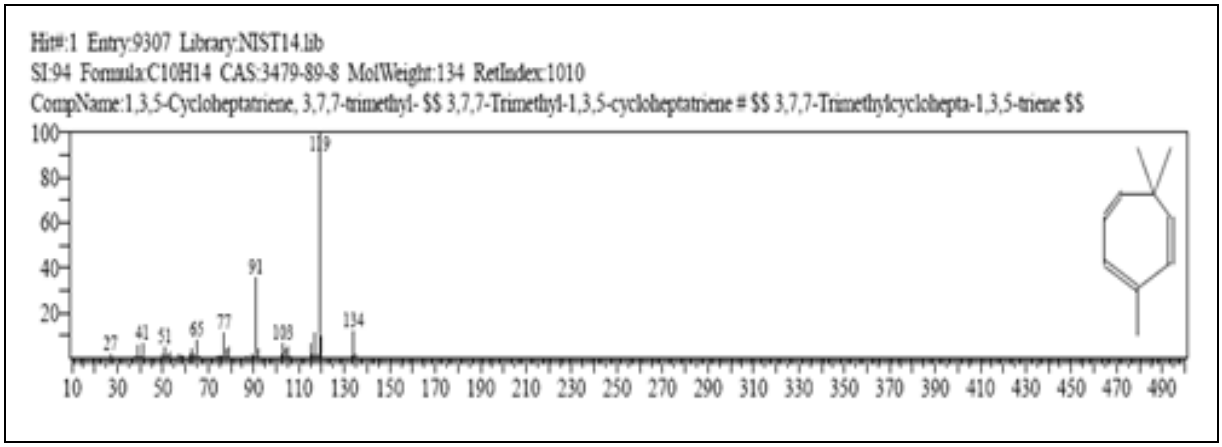
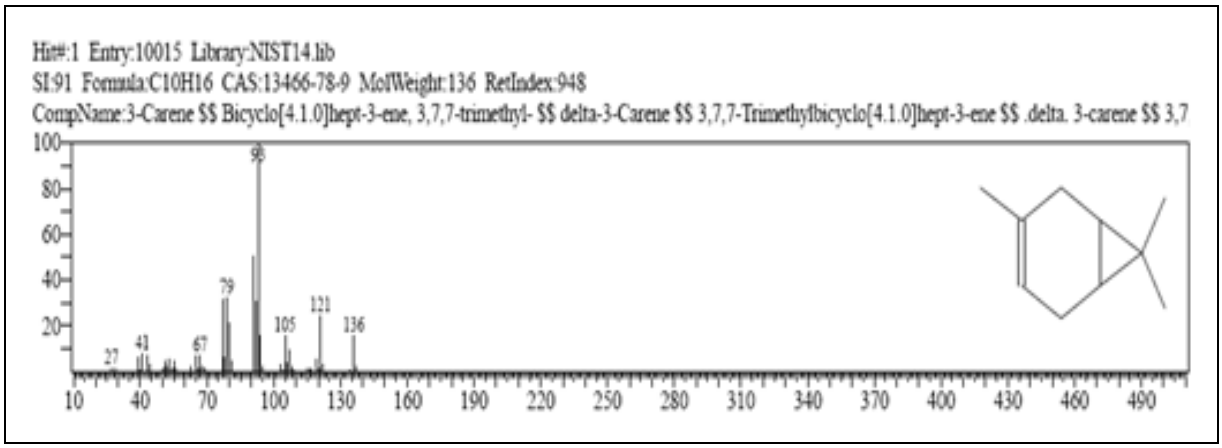
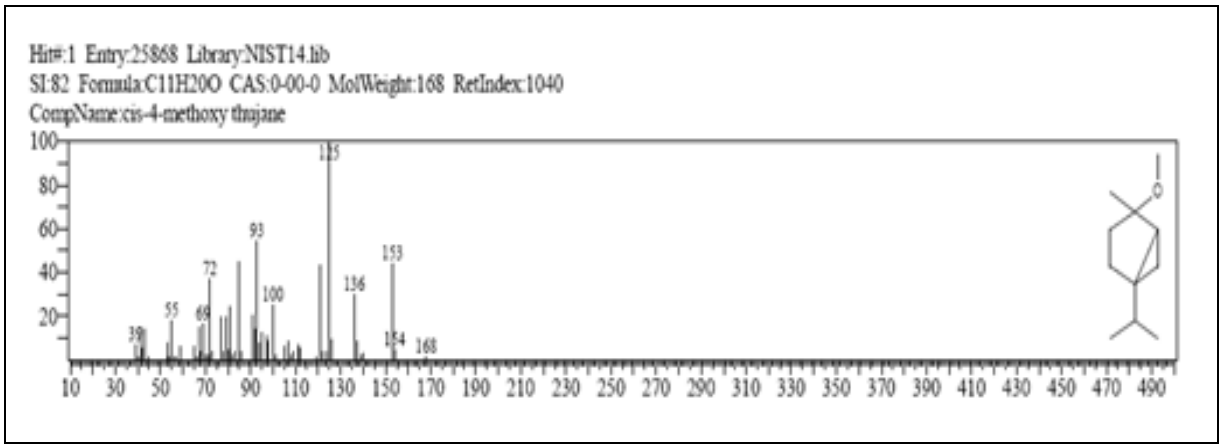
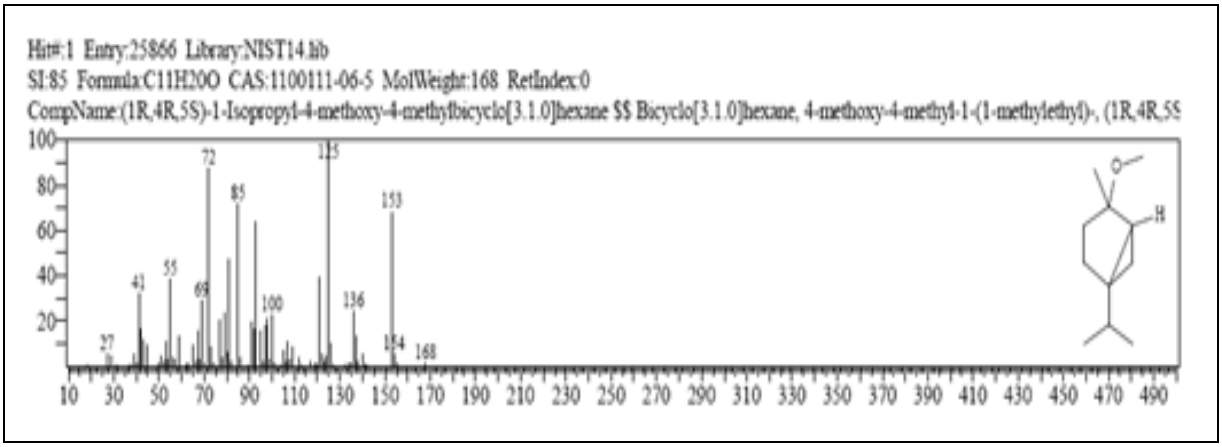


FIG. 1: GC-MS CHROMATOGRAM OF CONSTITUENTS OF ETHANOLIC EXTRACT OF *PROSOPIS CINERARIA* PODS





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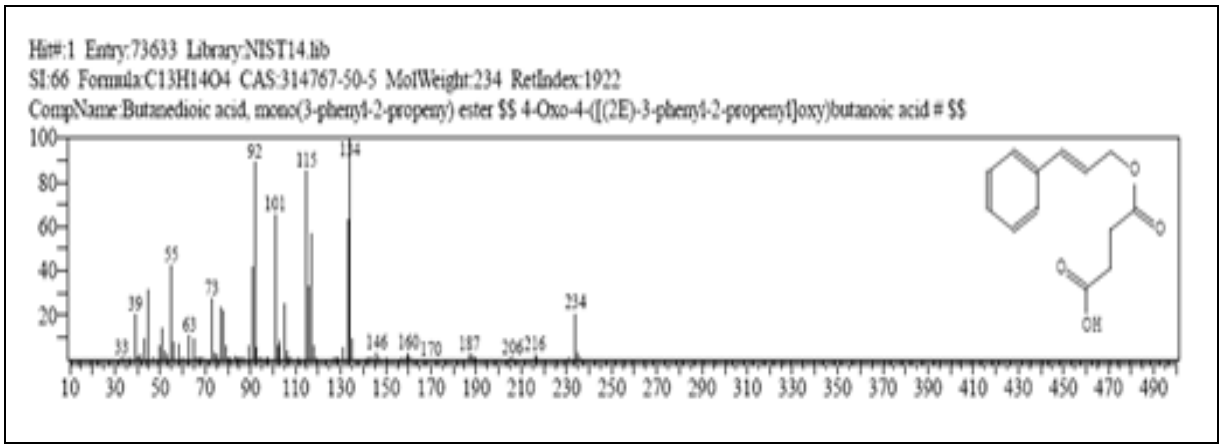
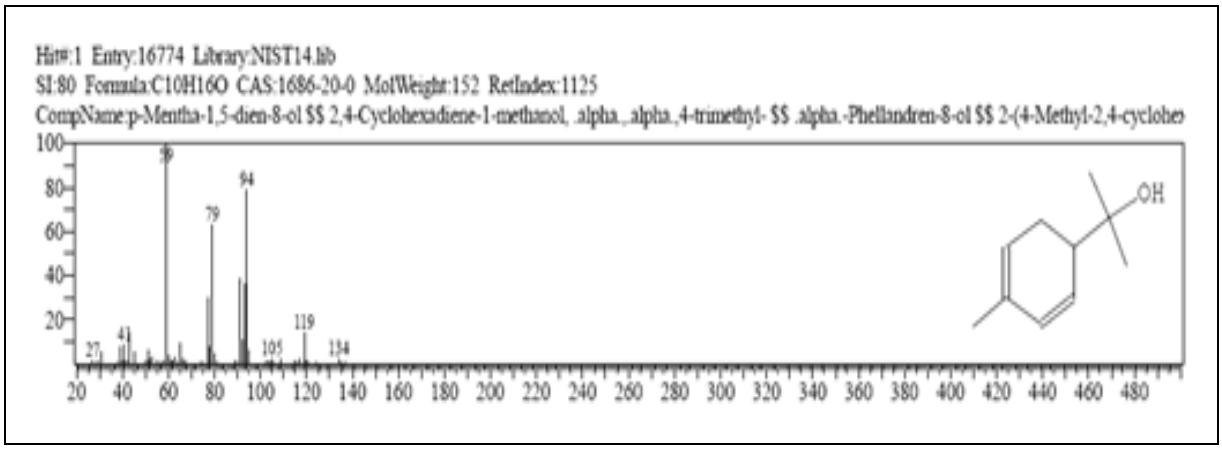
SI:85 Formula:C11H20O CAS:1100111-06-5 MolWeight:168 RetIndex:0
CompName:(1R,4R,5S)-1-Isopropyl-4-methoxy-4-methylbicyclo[3.1.0]hexane $$ Bicyclo[3.1.0]hexane, 4-methoxy-4-methyl-1-(1-methylethyl)-, (1R,4R,5S


Hit#:1 Entry:73633 Library:NIST14.lib
SI:66 Formula:C13H14O4 CAS:314767-50-5 MolWeight:234 RetIndex:1922
CompName:Butanedioic acid, mono(3-phenyl-2-propenyl) ester $$ 4-Oxo-4-[[(2E)-3-phenyl-2-propenyl]oxy]butanoic acid # $$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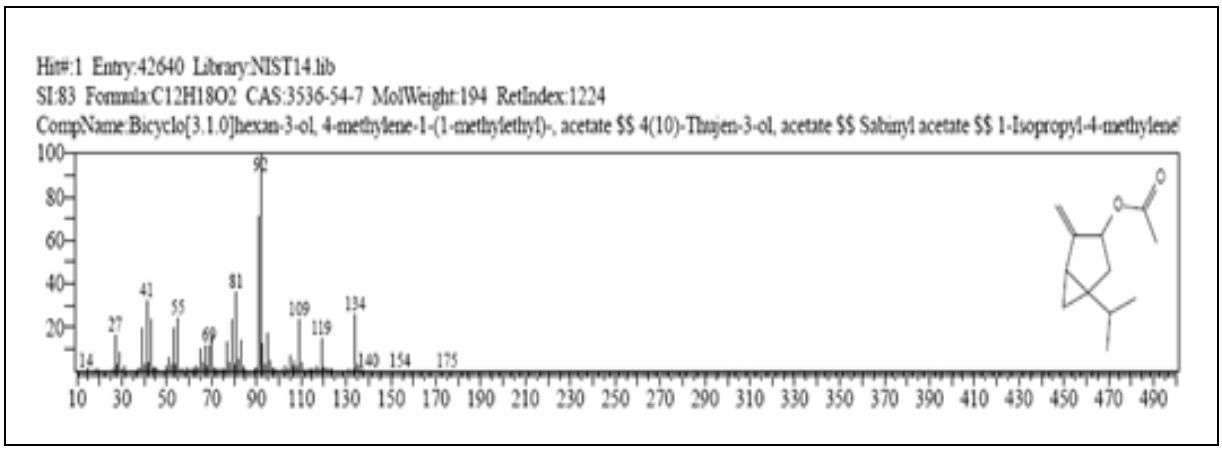
SI:80 Formula:C10H16O CAS:1686-20-0 MolWeight:152 RetIndex:1125
CompName:p-Mentha-1,5-dien-8-ol $$ 2,4-Cyclohexadiene-1-methanol, .alpha.,.alpha.,4-trimethyl- $$ .alpha.-Phellandren-8-ol $$ 2-(4-Methyl-2,4-cyclohex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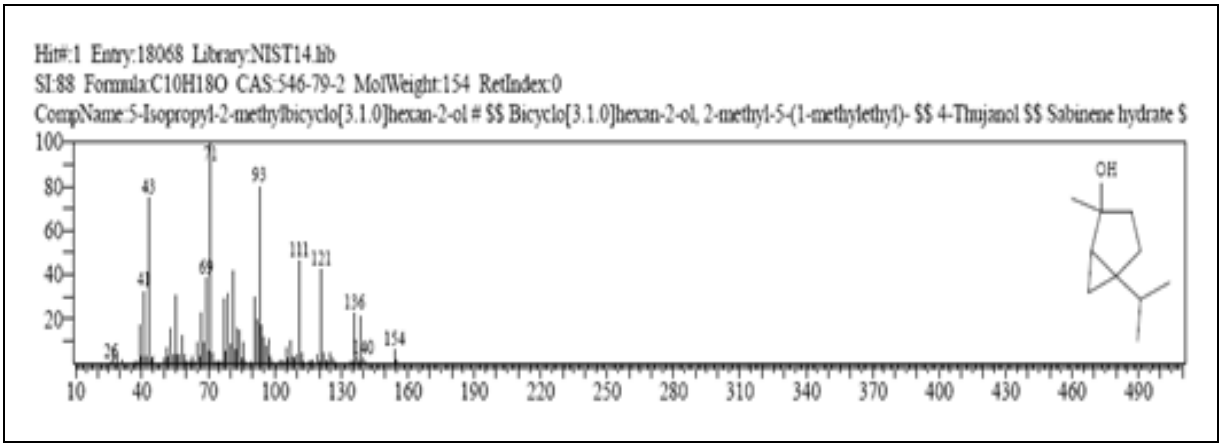
SI:83 Formula:C12H18O2 CAS:3536-54-7 MolWeight:194 RetIndex:1224
CompName:Bicyclo[3.1.0]hexan-3-ol, 4-methylene-1-(1-methylethyl)-, acetate $$ 4(10)-Thujen-3-ol, acetate $$ Sabinyl acetate $$ 1-Isopropyl-4-methylene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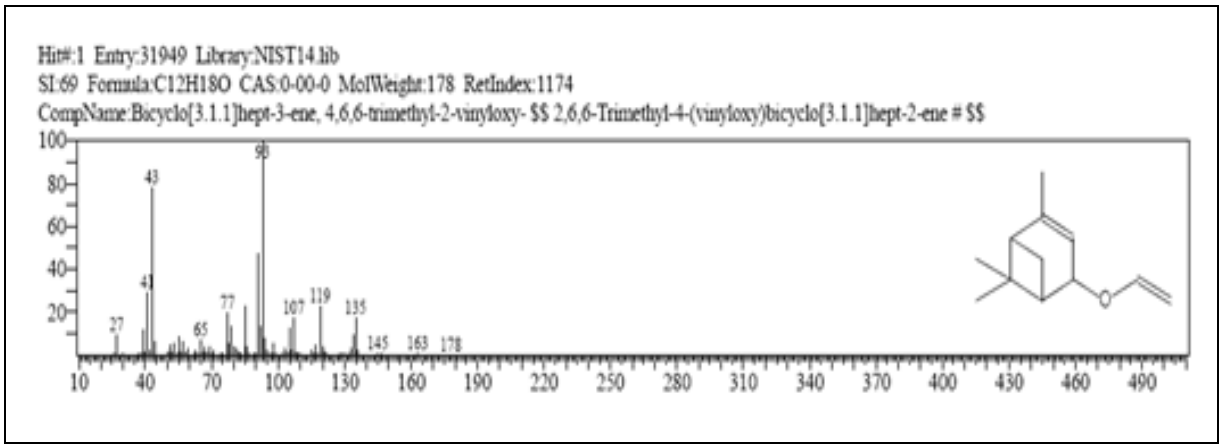
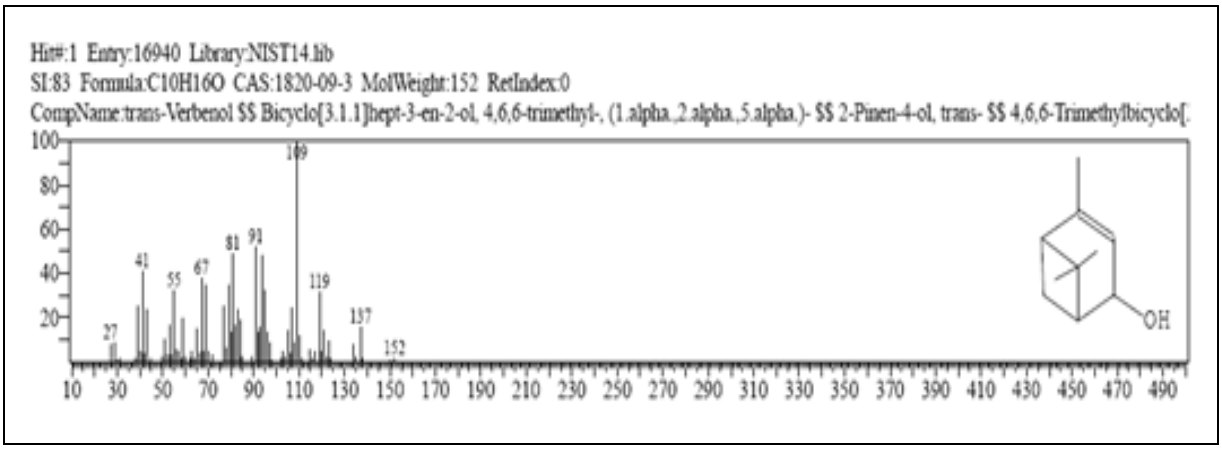
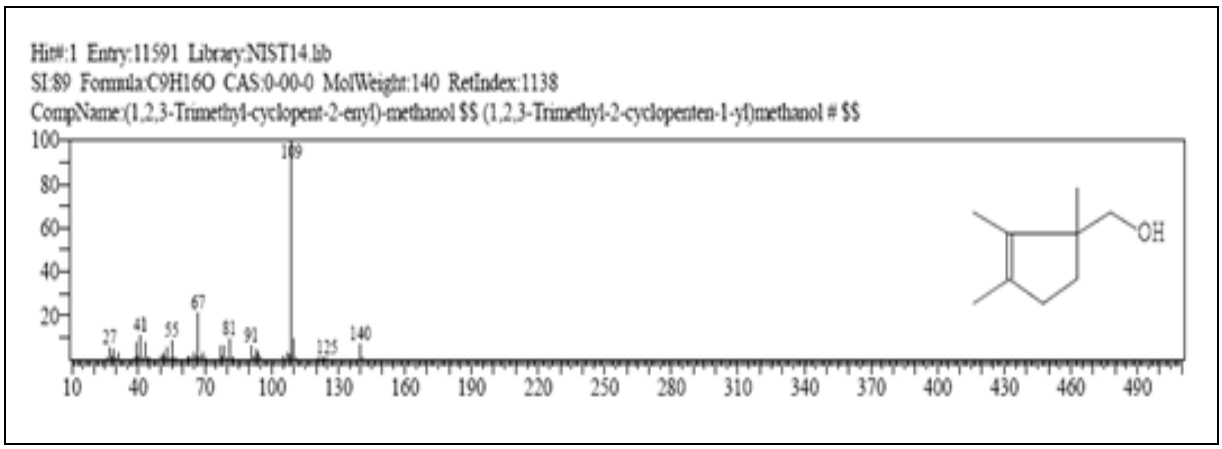
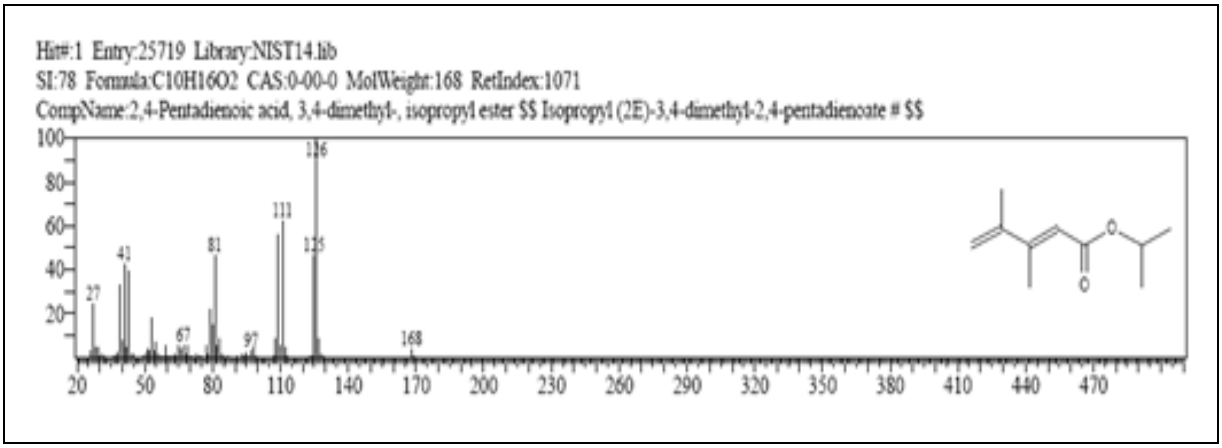
SI:88 Formula:C10H18O CAS:546-79-2 MolWeight:154 RetIndex:0
CompName:5-Isopropyl-2-methylbicyclo[3.1.0]hexan-2-ol # $$ Bicyclo[3.1.0]hexan-2-ol, 2-methyl-5-(1-methylethyl)- $$ 4-Thujanol $$ Sabinene hydrate $
OH


Hit#:1 Entry:31949 Library:NIST14.lib
SI:69 Formula:C12H18O CAS:0-00-0 MolWeight:178 RetIndex:1174
CompName:Bicyclo[3.1.1]hept-3-ene, 4,6,6-trimethyl-2-vinyloxy- $$ 2,6,6-Trimethyl-4-(vinyloxy)bicyclo[3.1.1]hept-2-ene # $$


Hit#:1 Entry:16940 Library:NIST14.lib
SI:83 Formula:C10H16O CAS:1820-09-3 MolWeight:152 RetIndex:0
CompName:trans-Verbenol $$ Bicyclo[3.1.1]hept-3-en-2-ol, 4,6,6-trimethyl-, (1.alpha.,2.alpha.,5.alpha.)- $$ 2-Pinen-4-ol, trans- $$ 4,6,6-Trimethylbicyclo[.
OH


Hit#:1 Entry:11591 Library:NIST14.lib
SI:89 Formula:C9H16O CAS:0-00-0 MolWeight:140 RetIndex:1138
CompName:(1,2,3-Trimethyl-cyclopent-2-enyl)-methanol $$ (1,2,3-Trimethyl-2-cyclopenten-1-yl)methanol # $$
OH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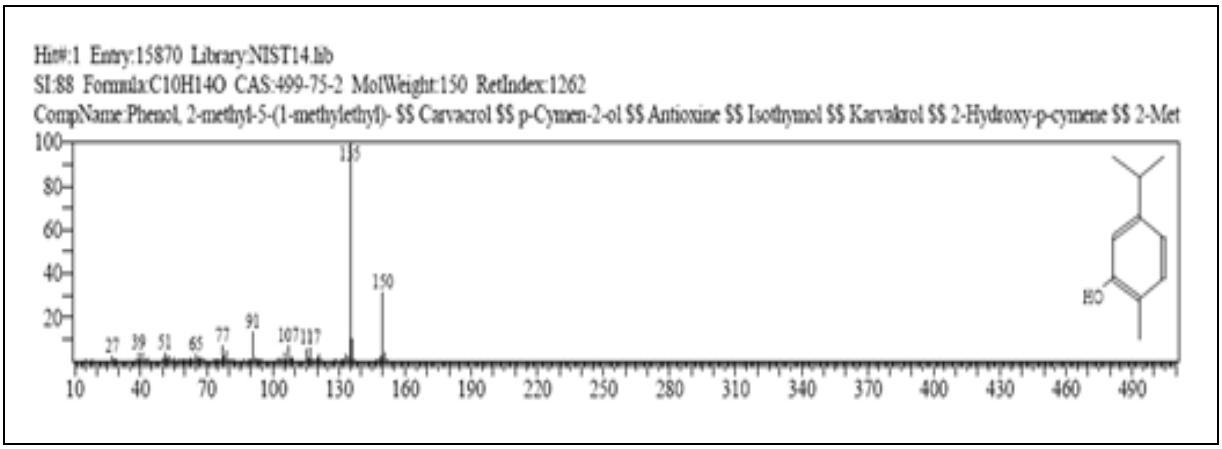
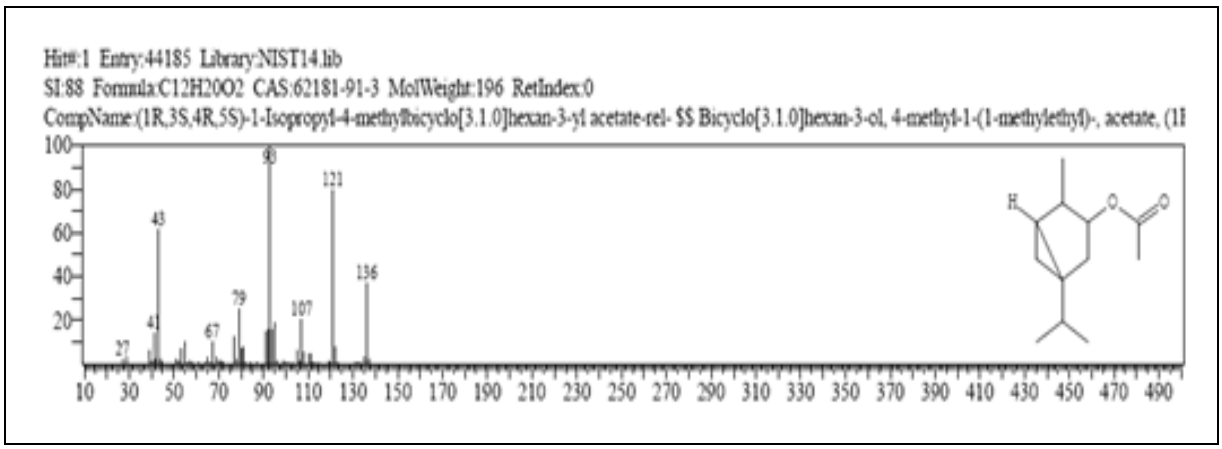
SI:78 Formula:C10H16O2 CAS:0-00-0 MolWeight:168 RetIndex:1071
CompName:2,4-Pentadienoic acid, 3,4-dimethyl-, isopropyl ester $$ Isopropyl (2E)-3,4-dimethyl-2,4-pentadienoate # $$


Hit#:1 Entry:15870 Library:NIST14.lib
SI:88 Formula:C10H14O CAS:499-75-2 MolWeight:150 RetIndex:1262
CompName:Phenol, 2-methyl-5-(1-methylethyl)- $$ Carvacrol $$ p-Cymen-2-ol $$ Antioxine $$ Isothymol $$ Karvakrol $$ 2-Hydroxy-p-cymene $$ 2-Met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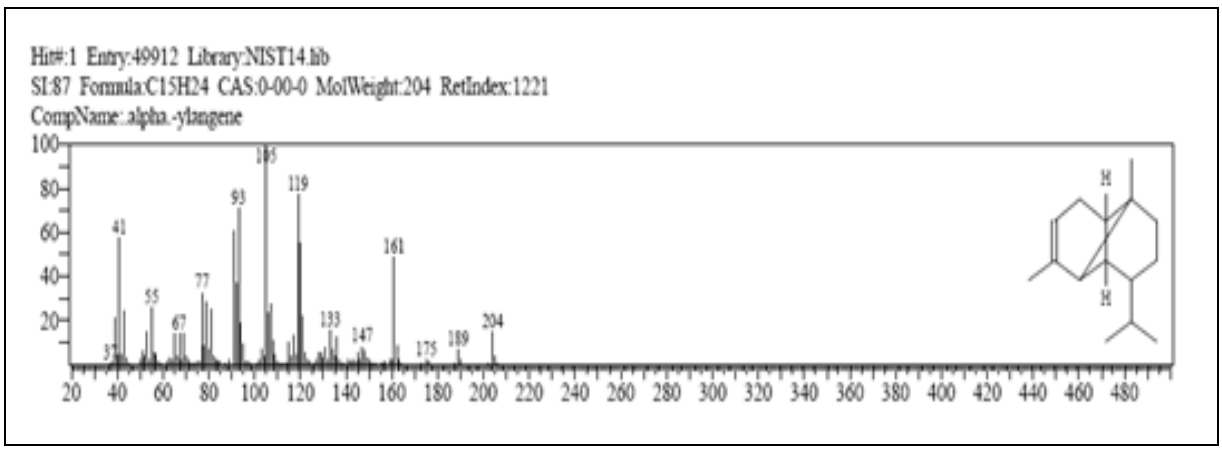
CompName:(1R,3S,4R,5S)-1-Isopropyl-4-methylbicyclo[3.1.0]hexan-3-yl acetate-rel- $$ Bicyclo[3.1.0]hexan-3-ol, 4-methyl-1-(1-methylethyl)-, acetate, (1I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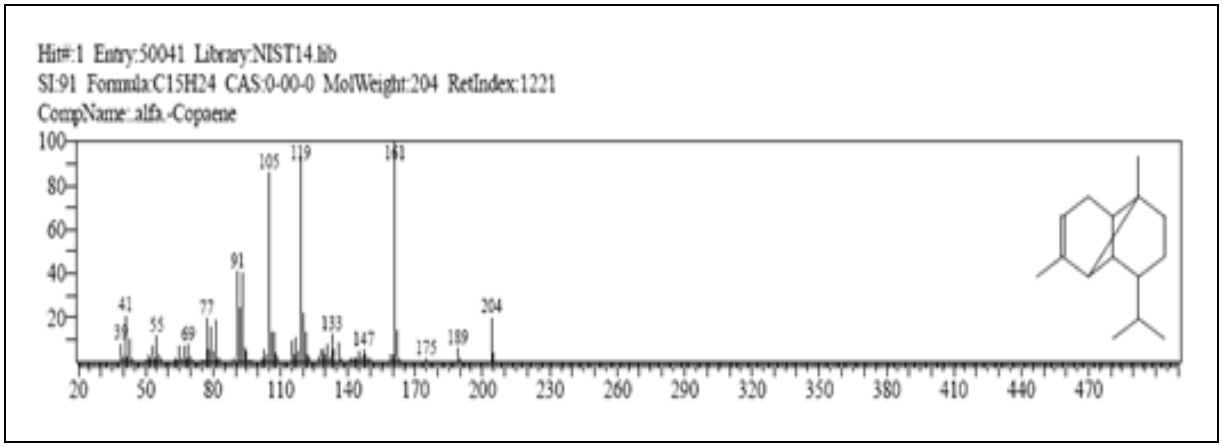
SI:87 Formula:C15H24 CAS:0-00-0 MolWeight:204 RetIndex:1221
CompName:.alpha.-ylangene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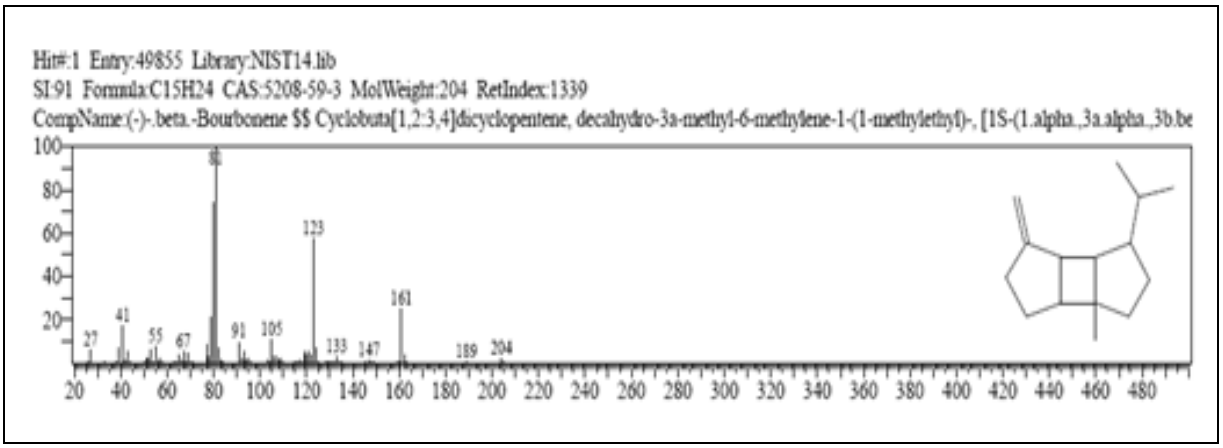
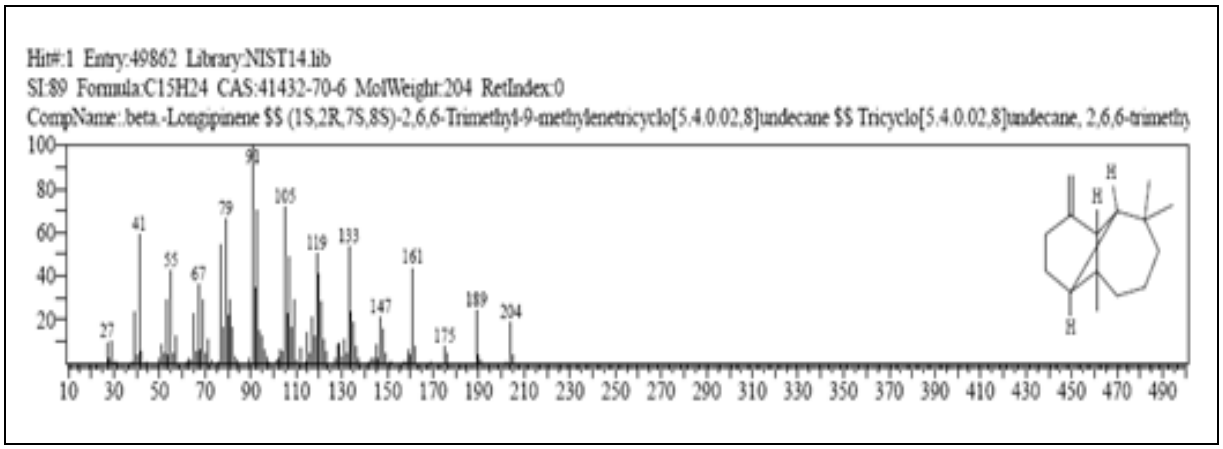
CompName:.alfa.-Copaene


Hit#:1 Entry:49855 Library:NIST14.lib
SI:91 Formula:C15H24 CAS:5208-59-3 MolWeight:204 RetIndex:1339
CompName:(-)-.beta.-Bourbonene $$ Cyclobuta[1,2:3,4]dicyclopentene, decahydro-3a-methyl-6-methylene-1-(1-methylethyl)-, [1S-(1.alpha.,3a.alpha.,3b.be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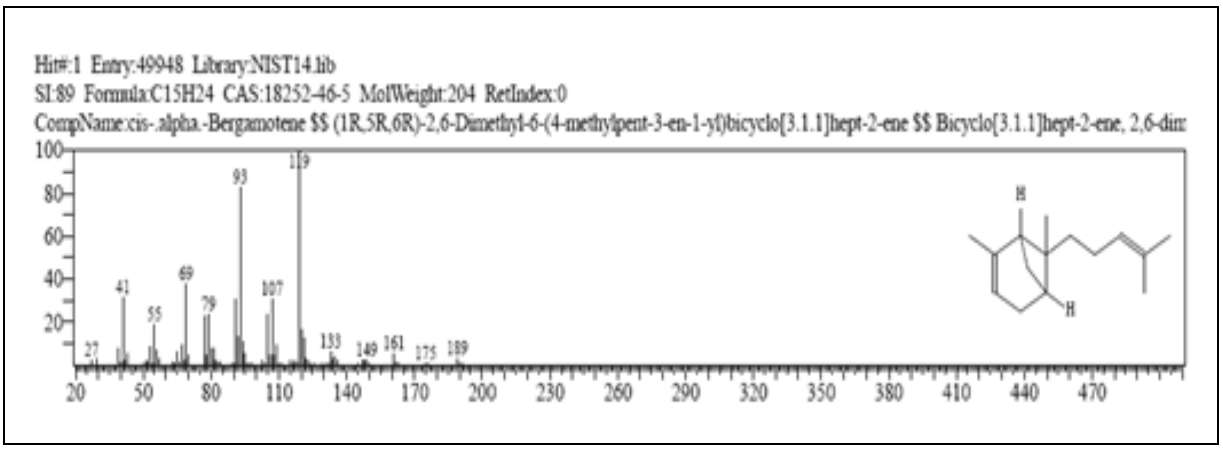
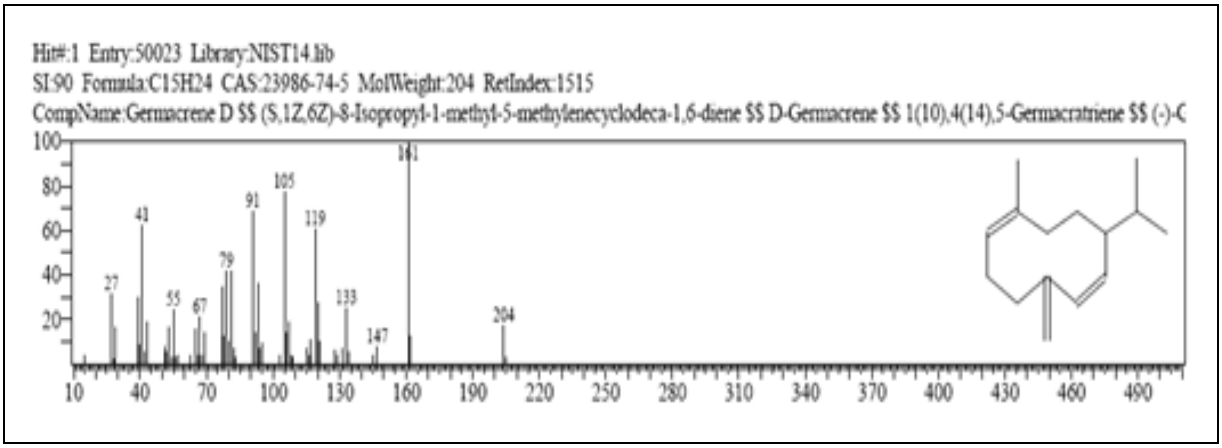
SI:89 Formula:C15H24 CAS:41432-70-6 MolWeight:204 RetIndex:0
CompName:.beta.-Longipinene $$ (1S,2R,7S,8S)-2,6,6-Trimethyl-9-methylenetricyclo[5.4.0.02,8]undecane $$ Tricyclo[5.4.0.02,8]undecane, 2,6,6-trimethy


Hit#:1 Entry:49948 Library:NIST14.lib
SI:89 Formula:C15H24 CAS:18252-46-5 MolWeight:204 RetIndex:0
CompName:cis-.alpha.-Bergamotene $$ (1R,5R,6R)-2,6-Dimethyl-6-(4-methylpent-3-en-1-yl)bicyclo[3.1.1]hept-2-ene $$ Bicyclo[3.1.1]hept-2-ene, 2,6-dim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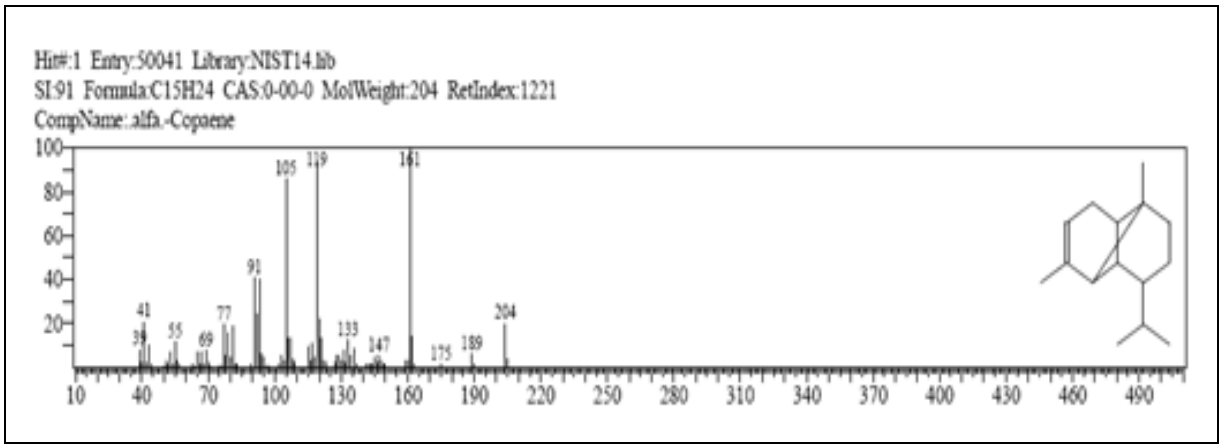
SI:90 Formula:C15H24 CAS:23986-74-5 MolWeight:204 RetIndex:1515
CompName:Germacrene D $$ (S,1Z,6Z)-8-Isopropyl-1-methyl-5-methylenecyclodeca-1,6-diene $$ D-Germacrene $$ 1(10),4(14),5-Germacratriene $$ (-)-C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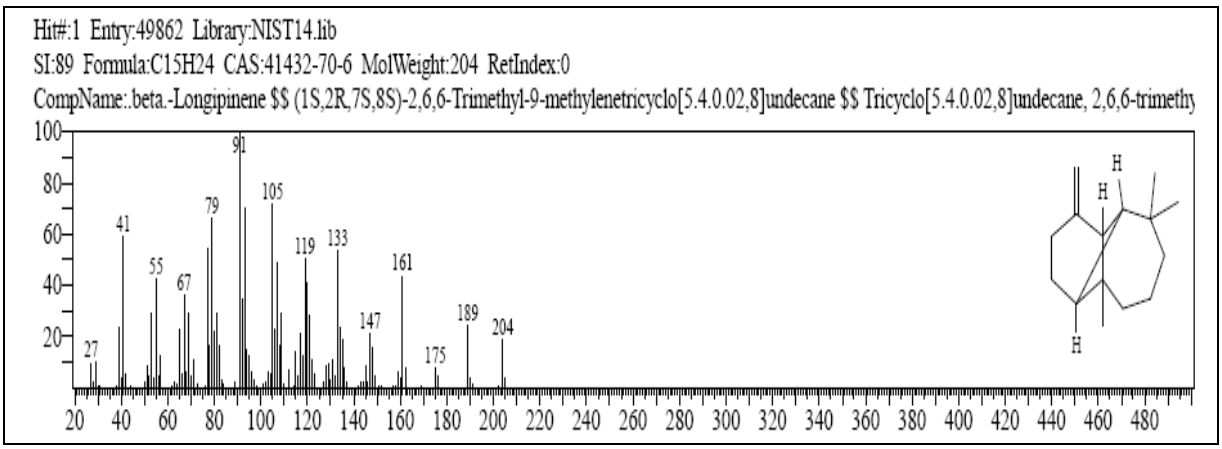
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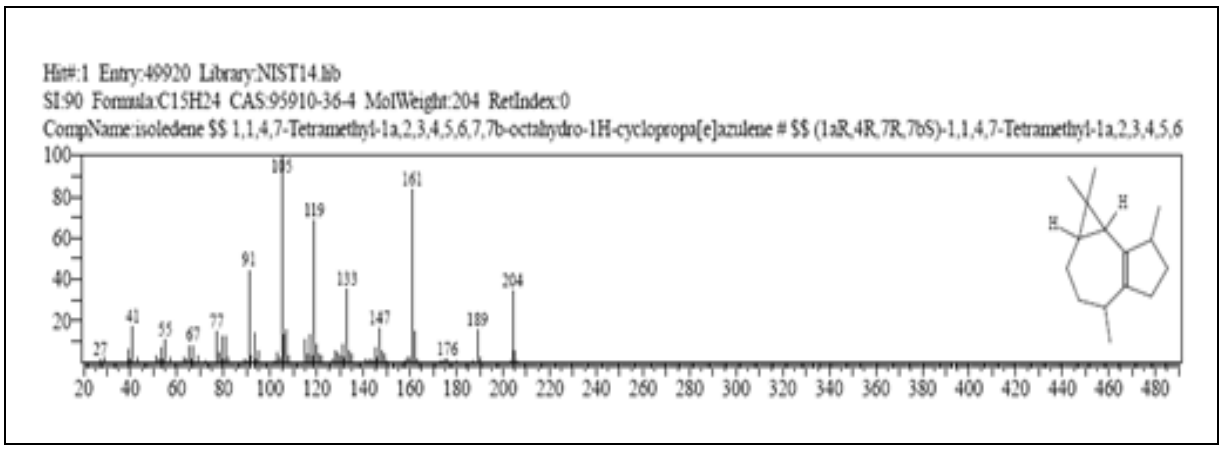
SI:89 Formula:C15H24 CAS:41432-70-6 MolWeight:204 RetIndex:0
CompName:.beta.-Longipinene $$ (1S,2R,7S,8S)-2,6,6-Trimethyl-9-methylenetricyclo[5.4.0.02,8]undecane $$ Tricyclo[5.4.0.02,8]undecane, 2,6,6-trimethy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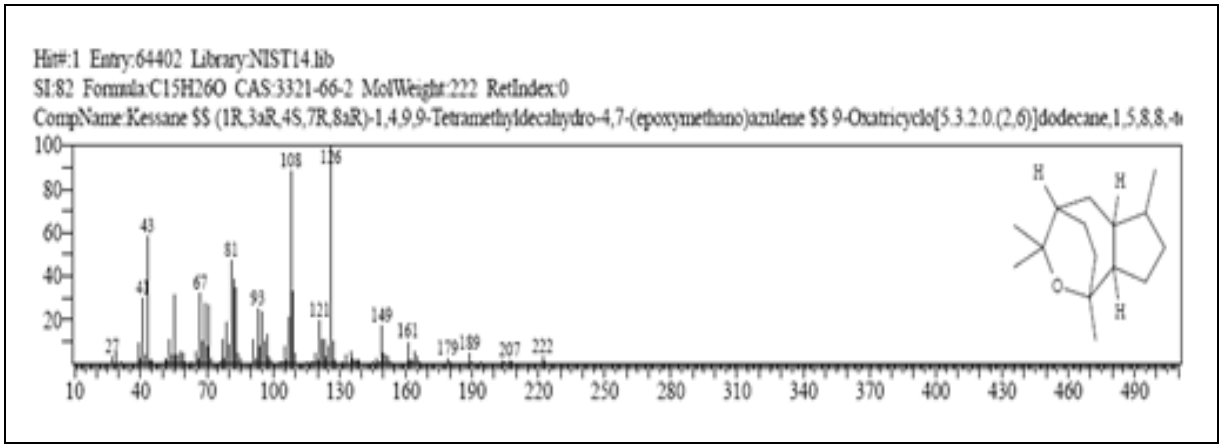
SI:90 Formula:C15H24 CAS:95910-36-4 MolWeight:204 RetIndex:0
CompName:isoledene $$ 1,1,4,7-Tetramethyl-1a,2,3,4,5,6,7,7b-octahydro-1H-cyclopropa[e]azulene # $$ (1aR,4R,7R,7bS)-1,1,4,7-Tetramethyl-1a,2,3,4,5,6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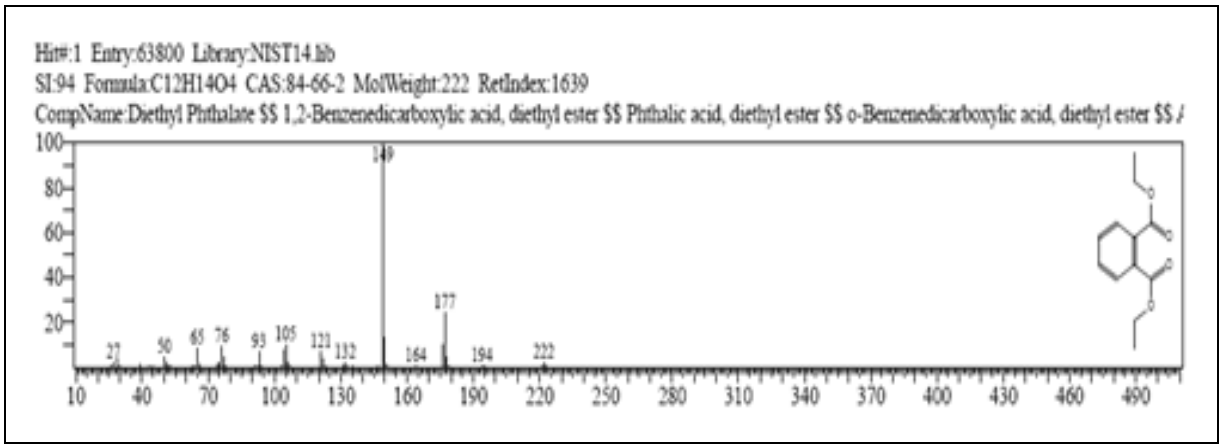
SI:82 Formula:C15H26O CAS:3321-66-2 MolWeight:222 RetIndex:0
CompName:Kessane $$ (1R,3aR,4S,7R,8aR)-1,4,9,9-Tetramethyldecahydro-4,7-(epoxymethano)azulene $$ 9-Oxatricyclo[5.3.2.0.(2,6)]dodecane,1,5,8,8,-t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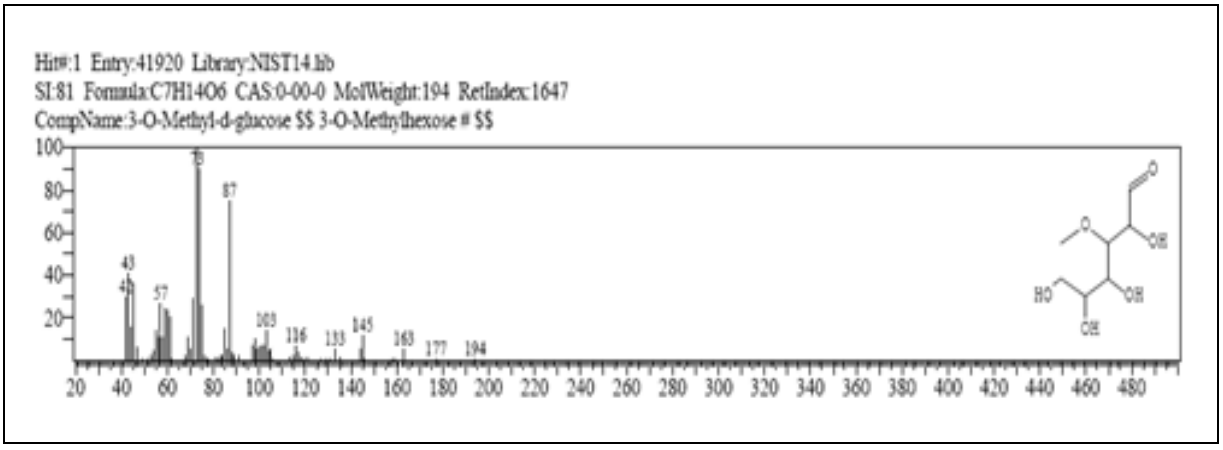
CompName:Diethyl Phthalate $$ 1,2-Benzenedicarboxylic acid, diethyl ester $$ Phthalic acid, diethyl ester $$ o-Benzenedicarboxylic acid, diethyl ester $$ /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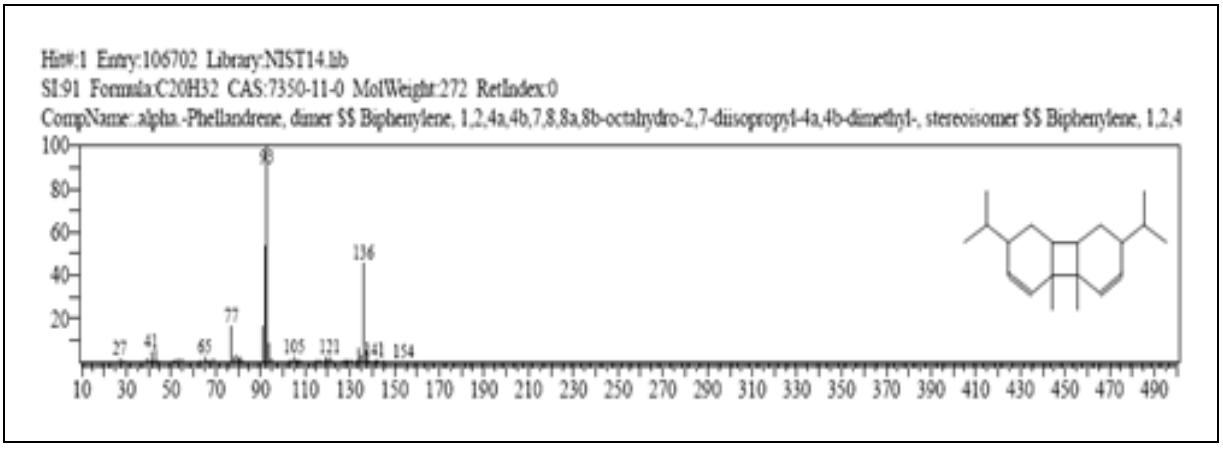
CompName:3-O-Methyl-d-glucose $$ 3-O-Methylhexose # $$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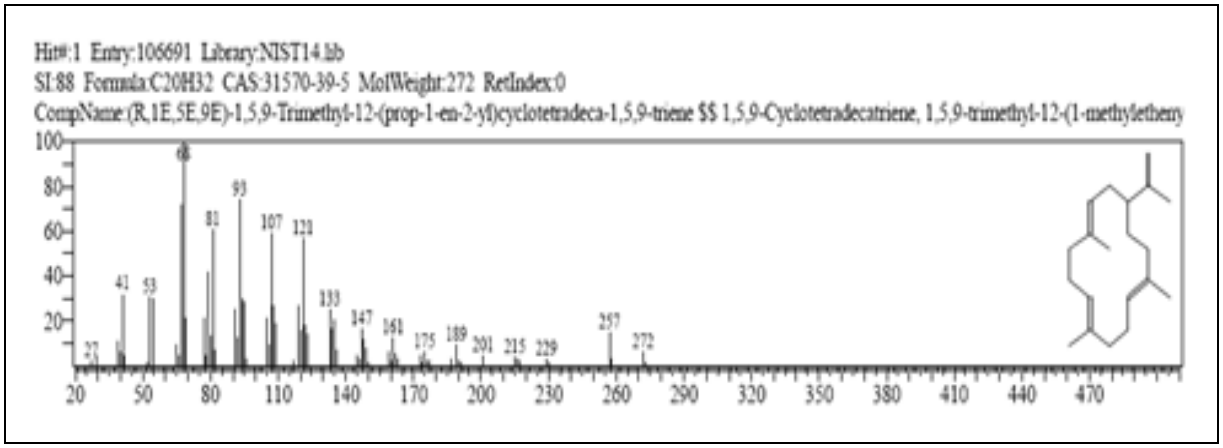
SI:91 Formula:C20H32 CAS:7350-11-0 MolWeight:272 RetIndex:0
CompName:.alpha.-Phellandrene, dimer $$ Biphenylene, 1,2,4a,4b,7,8,8a,8b-octahydro-2,7-diisopropyl-4a,4b-dimethyl-, stereoisomer $$ Biphenylene, 1,2,4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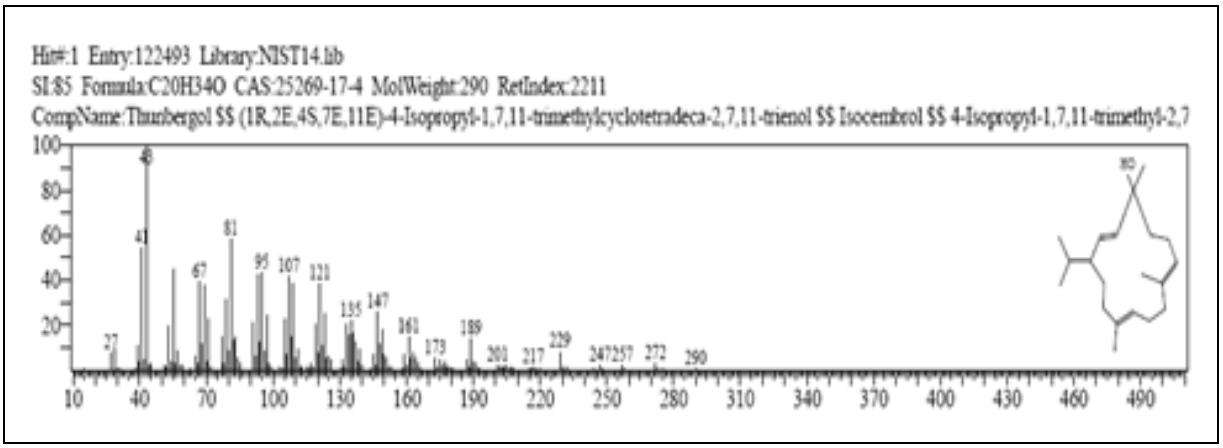
CompName:(R,1E,5E,9E)-1,5,9-Trimethyl-12-(prop-1-en-2-yl)cyclotetradeca-1,5,9-triene $$ 1,5,9-Cyclotetradecatriene, 1,5,9-trimethyl-12-(1-methylethenyl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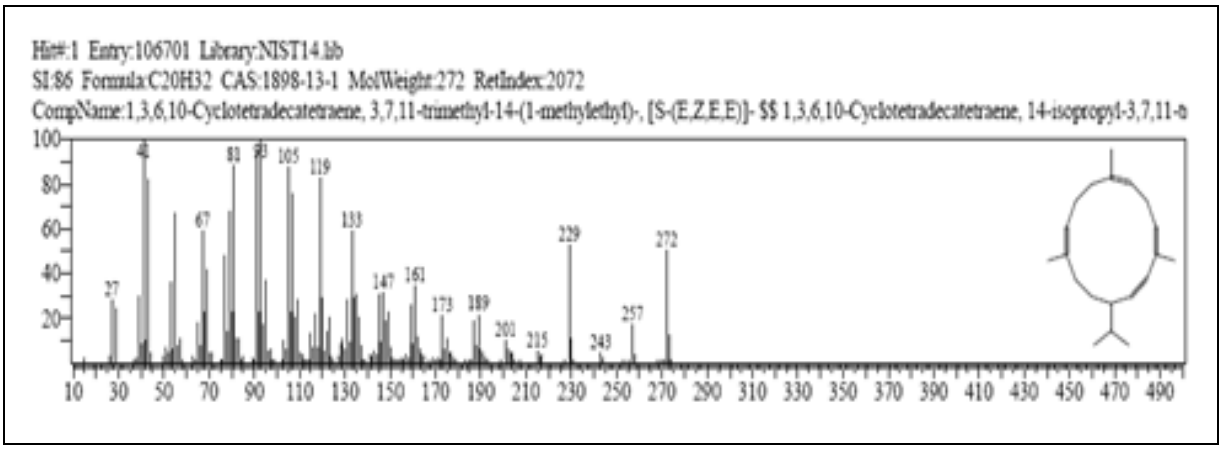
CompName:Thunbergol $$ (1R,2E,4S,7E,11E)-4-Isopropyl-1,7,11-trimethylcyclotetradeca-2,7,11-trienol $$ Isocembrol $$ 4-Isopropyl-1,7,11-trimethyl-2,7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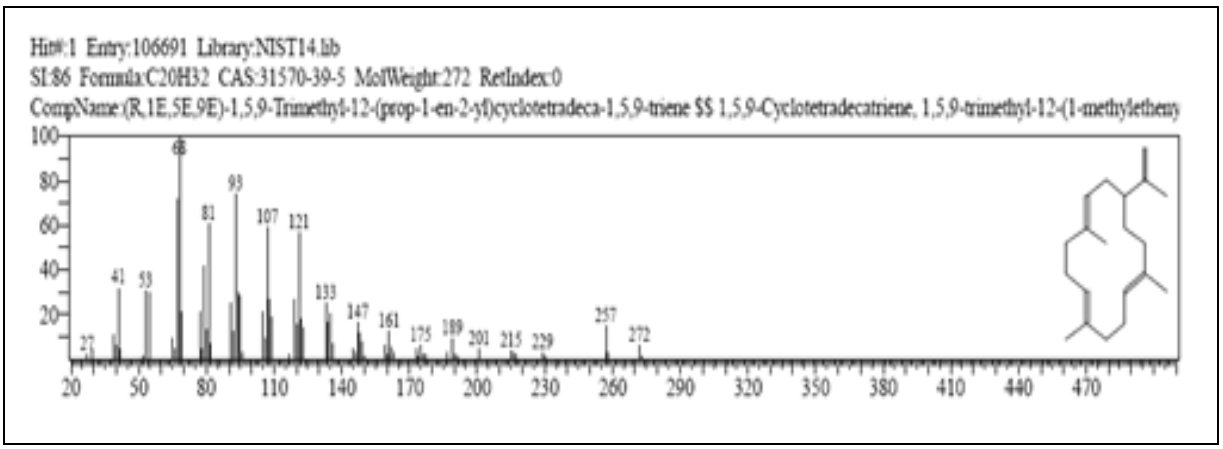
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SI:86 Formula:C20H32 CAS:31570-39-5 MolWeight:272 RetIndex:0
CompName:(R,1E,5E,9E)-1,5,9-Trimethyl-12-(prop-1-en-2-yl)cyclotetradeca-1,5,9-triene $$ 1,5,9-Cyclotetradecatriene, 1,5,9-trimethyl-12-(1-methylethenyl

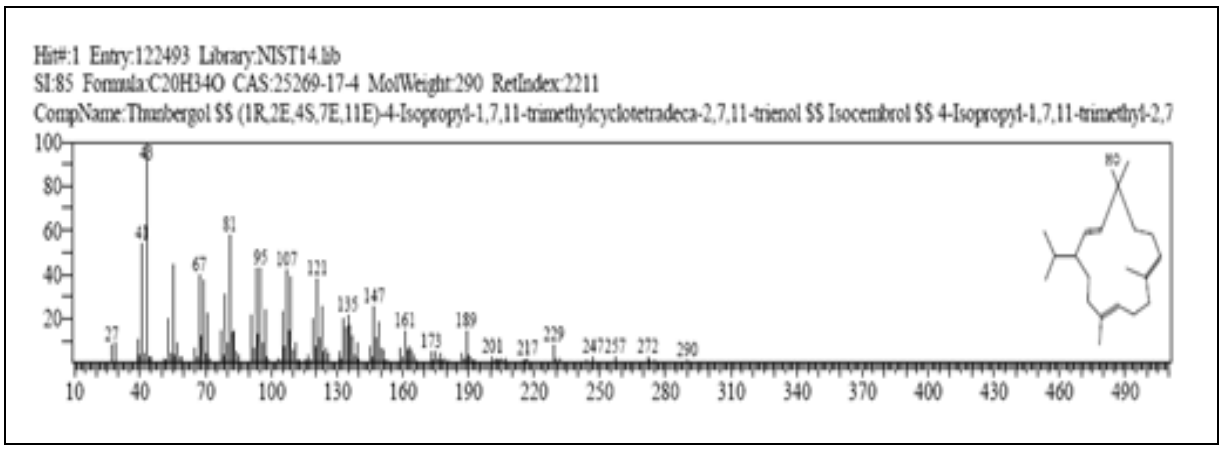

FIG. 2: LIST OF IDENTIFIED COMPOUNDS FROM *P. CINERARIA* PODS ARE ASCERTAINED WITH NIST14 LIBRARY

RESULTS AND DISCUSSION: The results pertaining to GC-MS analysis led to the identification of a number of compounds from the GC fractions of ethanolic extract of *P. cineraria*. These compounds were identified through mass spectrometry attached with GC. The results of the GC-MS was interpreted by using a database of the National Institute of Standards and Technology (NIST) library having more than 2,00,000 patterns. The GC-MS spectrum of the unknown constituent was then compared with the known components stored in NIST-14 library. The results of present study are tabulated in **Table 1**.

***P. cineraria* Pods Extract:** GC-MS analysis of ethanolic extract of P.cineraria pods revealed the presence of 32 different phytocompounds namely1, 3, 5-Cycloheptatriene, 3, 7, 7-trimethyl (0.31%), 3-Carene (0.40%), cis-4-methoxy thujane (1.18%), (1R, 4R, 5S) -1-Isopropyl-4- methoxy-4-methylb (2.67%), Butanedioic acid, mono (3-phenyl-2-propeny) (0.54%),p-Mentha-1,5-dien-8-ol (0.35%), Bicyclo [3.1.0] hexan-3-ol, 4-methylene-1- (1-methylethyl) -acetate(0.59%), 5-Isopropyl-2-methyl-bicyclo [3.1.0] hexan-2-ol (19.38%), Bicyclo [3.1.1] hept-3-ene, 4, 6, 6-trimethyl-2-vi (30.47%), trans-Verbenol (0.73%), (1,2,3-Tri-methyl- cyclo-pent-2-enyl)- methanol (0.66%), 2, 4-Pentadienoic acid, 3, 4-dimethyl-, isopropy (1.01%), Carvacrol (0.60%), (1R, 3S, 4R, 5S)-1-Isopropyl-4- methyl-bicyclo [3.1.0] hexan- 3-yl acetate -rel (0.60%), alpha.-ylangene (0.76 %), .alfa.- Copaene (2.23%), (-)-. beta.- Bourbonene (10.62%), beta.- Longipinene (0.60%), cis-.alpha.-Bergamotene (1.38%), Germacrene D (0.72%), alfa.- Copaene (1.77%),. beta.- Longipinene (1.21%), Isoledene (1.84 %), Kessane (4.01%), Diethyl Phthalate (2.84%), 3-O-Methyl-d-glucose (5.04%),. alpha.- Phellandrene, dimer (1.15%), (R, 1E, 5E, 9E)-1, 5, 9-Trimethyl-12-(prop-1-en-2-yl)cyclotetradeca-1, 5, 9-triene (0.90%), Isocembrol (0.57%), 1, 3, 6, 10-Cyclotetra-deca-tetraene, 3, 7, 11-trimet (0.51%), (R, 1E, 5E, 9E)-1, 5, 9-Trimethyl-12- (prop-1-en-2-yl) cyclo-tetradeca-1, 5, 9-triene (0.68%), Thunbergol (3.65%).

TABLE 2: PHARMACEUTICAL / THERAPEUTIC POTENTIAL OF THE PHYTOCOMPONENTS IDENTIFIED IN THE ETHANOLIC EXTRACT OF *P. CINERARIA* PODS

Phytoconstituents identified in *P. cineraria* pods	Properties
3-Carene	Anti-inflammatory properties [22,23]
	Anti-oxidant, anti-stress [24] and antifungal activity [25]
Diethyl phthalate, Carvacrol, Thymol	antimicrobial activity [26]
trans-Verbenol	Anti-bacterial activity [27]
alpha.-ylangene	Anti-oxidant activity [28]
alfa-Copaene	analgesic and anti-inflammatory[29]
beta.-Bourbonene	Anti-tumour, Anti-inflammation and anti-fungal effects [30]
beta.-Longipinene	anticancer properties [31]
cis- alpha-Bergamotene	herbivore-induced plant volatile[32]
Germacrene-D, Isoledene	cytotoxic nature [33,34,35]
Kessane	Anti-oxidant properties [36]
alpha.-Phellandrene	Hydroxyl radical scavenger [37]
Isocembrol	Anti-oxidant activity [38]
	neuro-protective and anti-cancer activity [39]
Thunbergol	Anti-microbial and Larvicidal properties[40]

The GC-MS spectrum confirmed that the presence of 32 major components with the retention time

6.673, 7.227, 7.857, 8.224, 8.571, 8.910, 9.016, 9.210, 9.436, 10.238,10.449, 10.604, 10.904, 11,582, 11.982, 12.067, 12.193, 12.450, 12.785, 12.991, 13.355, 13.499, 13.889, 14.100, 14.643, 15.623, 17.113, 18.801, 19.069, 19.566 respectively **Fig. 1**. The name, molecular weight, molecular formula and structure of the component of the test materials were ascertained. The relative percentage amount of each component was calculated by comparing its average peak area to the total areas. The identified phytoconstituents from pods of *P. cineraria* possess the following properties **Table 2**.

CONCLUSION: In the present study, the GC-MS analysis of an ethanolic extract of pods of *P. cineraria* revealed the presence of thirty-two compounds. Such pods are consumed as the dietary agent and may be further explored for their medicinal potential as the phytoconstituents identified has potent anticancer and antioxidant activities which can be used to reduce the damages caused by free radicals in the body and therefore contribute to the prevention of diseases related to the oxidative stress and also for the management of diabetes, inflammation and microbial infections.

Thus, this type of GC-MS analysis is the first step towards understanding the nature of active principle bioconstituents in this medicinal plant. The identification of phytoconstituents would be helpful for further detailed studies.

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CONFLICTS OF INTEREST: The authors declare that this article content has no conflict of interest.

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