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ORIGINAL ARTICLE

GC-MS AND FT-IR ANALYSIS OF THE SPICE AJWAIN (*Trachyspermum ammi*)

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ABSTRACT

The bioactive compounds of Ajwain **(***Trachyspermum ammi*) spice have been evaluated using GC-MS and FT-IR. The chemical compositions of ethanol extract of Ajwain **(***Trachyspermum ammi*) were investigated using Perkin- Elmer Gas Chromatography- Mass Spectrometry. While the mass spectra of the compounds found in the extract was matched by the National Institute of Standards and Technology (NIST) library. GC-MS analysis of extract of spice Ajwain **(***Trachyspermum ammi*) revealed the exsistance of 54 compounds. The result of FTIR analysis confirmed the presence of alcohol, alkanes, aromatic carboxylic acid, halogen compound, alkyl halide. The result of this study offers a platform of using Ajwain (*Trachyspermum ammi*) spice as herbal alternative for various diseases.

Keywords: Ajwain, *Trachyspermum ammi*, GC-MS, FT-IR, NIST

1.INTRODUCTION

Herbs and spices grown in various regions of the world have been used for several purposes since ancient times. Several uses of these plants are for culinary purposes (Oz Can, 2004). Spices and herbs belong to condiments, substances which do not contain nutritive components. Although a few dosen different spice plants are of global importance, many more are used as condiments locally, in the regions of their natural occurrence. Some of these are traded in small quantities and used in ethnic restaurants. Spices have been recognized to have some medical properties due to antioxidant and antimicrobial action (Hinne Bur et *al*., 2006; Samo Tyja *et al*., 2005). Many spices have been documented to possess antidiabetic, anti-inflammatory, and antihypertensive potential (Duraka et *al*., 2004; Srini Vasan, 2005)

Ajwain **(***Trachyspermum ammi*) used as a spice is a traditional herb widely used for curing various diseases in both humans and animals. Most utilizing part of Ajwain is its caraway like fruit, which is popular in cooking recipes, snacks, savory pastries and as spice. Aroma chemicals present in Ajwain; inhibit other undesirable changes in food affecting its nutritional quality, texture and flavor. Decoction of Ajwain seeds is used for treatments of abdominal discomfort, diarrhea, cough and stomach troubles (Anikumar *et al*., 2009) Fruit of Ajwain is reported to have antiseptic, antifungal/ antibacterial and antithelminitic effects (Morsi, 2000). In Ajwain, the major phenolic compound Thymol is present and has been reported to be an antispasmodic, germicide and antifungal agent (Nagalakshmi *et al*., 2000). In the essential oil of *Trachyspermum ammi*, the principle active constituents of the oil are phenols, mainly thymol (35 to 60%) and some carvacrol (Tsimidou and Boskou, 1994). Both the phenols Thymol and carvacrol are responsible for the antiseptic, antitussive and expectorant properties (Treas and Evans, 2002). Thymol also has antiseptic activity and carvacrol possesses antifungal properties (Menphini *et al*., 1995).The present study was carried out the bioactive compounds present in the Ajwain **(***Trachyspermum ammi*) Spice in methanol extract with the aid of GC-MS and FT-IR techniques, which may provide an insight in its use of traditional medicine.

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2.MATERIALS AND METHODS

Sample Preparation:

The Ajwain **(***Trachyspermum ammi*) spices were used in this study and they were obtained from a local Supermarket. The spice were taken and ground into fine powder and preserved in air tight polythene covers and stored at 5 degree centigrade until used.

Phytochemical Screening

The extraction of Phyto components and analysis is followed as per the standard methods. (Poongothai *et al*., 2011).). A qualitative phytochemical test is performed to detect the presence of Phytosterols, Terpenoids, Flavonoids, Tannins, Saponin, Alkaloids, Carbohydrate and Cardiac Glycosides using standard procedures

Identification of Secondary Metabolites by Gas Chromatography Mass Spectrometry

Sample preparation

The ethanol was found to be suitable for polar and non polar compounds. Ten gram sample was extracted with 30ml ethanol over night and filtered and concentrated to 1ml through nitrogen flushing. 2 µl of prepared sample was injected into the GC-MS instrument.

Equipment:

GC Clarus 500 Perkin Elmer, Carrier gas: 1ml per min, Split: 10:1, Detector: Mass detector Turbo mass gold-Perkin Elmer, Software: Turbomass 5.2, Sample injected: 2µl, Column: Elite-5MS (5% Diphenyl / 95% Dimethyl poly siloxane), 30m x 0.25mm x 0.25µm df , Oven temperature Progmme: 110° C with 2 min hold ,Up to 200° C at the rate of 10 ° C/min without hold, Up to 280 ° C at the rate of 5° C / min with 9 min hold, Injector temperature 250° C, Total GC running time 36 min, Inlet line temperature 200°C, Source temperature 200°C Electron energy:70 eV, Mass scan (m/z): 45-450,Solvent Delay: 0-2 min, Total MS running time: 36 min (Srinivasan *et al* .,2014).

Interpretation of mass spectrum GC-MS

In the MS Programme, NIST Version 2.0 library database of National Institute Standard and Technology (NIST) having more than 62,000 patterns was used for identifying the chemical components. 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.

FTIR Spectroscopic Analysis

Structural determination of different functional groups present in spices has been carried out using FT-IR analysis. It is used for determining the presence of certain functional groups such as carbon-carbon multiple bonds, aromatic rings, carbonyl groups or hydroxyl groups in a molecule.

Fourier transformed infrared (FT–IR) spectrometer (Perkin Elmer spectrum Two, FT–IR spectrometer; Perkin Elmer). The FT–IR spectra of samples were recorded in the range 4000–400 cm–1 to study the molecular structure of the samples prepared. To improve the signal to noise ratio for each spectrum, 100 interferograms with a spectral resolution of ± 4cm–1 were averaged. Background spectra collected under identical conditions were subtracted from the sample spectra. The present study directly relates the intensities of the absorption bands to the concentration of the corresponding functional groups. Collection and analysis of IR images were done using Spectrum V6.0 software. The sample spectra of the extracts were comparable with that of standard and reported.

3.RESULT AND DISCUSSION

Phytochemical analysis

In the present study, the investigation of phytochemical screening was done by Methanol extract of Ajwain **(***Trachyspermum ammi*). The result revealed that the methanolic extract of Ajwain **(***Trachyspermum ammi*) recorded the presence of Alkaloid, Cardiac Glycosides, Flavonoid, Phytosterols, Saponins, Tannins and Terpenoids whereas the Carbohydrates were absent in the extract (Table 1).

Table 1: Phytochemical screening of Ajwain (*Trachyspermum ammi*)

Phytochemical	*Trachyspermum ammi* (Ajwain)
Alkaloids	+
Carbohydrate	-
Cardiac Glycosides	+
Flavonoids,	+
Phytosterols	+
Saponins	+
Tannins	+
Terpenoids,	+

+ **Present** **-Absent**

The secondary metabolites are found in about 20 % of plant species and they classified as true alkaloids, A wide range of biological activities of alkaloids have been reported: emetic, anti-cholinergic, antitumor, diuretic, sympathomimetic, antiviral, antihypertensive, hypnoanalgesic, antidepressant, miorelaxant, antitussigen, antimicrobial and anti-inflammatory (Esenwah and Ikenebomeh.,2008).

The glycosides are useful in lowering blood pressure. They are also used in the treatment of congestive heart failure and cardiac arrhythmia. (Nyarko *et al*., 1990) which can play important role in synthesis of novel drugs to treat several diseases.

Nandave et *al*., (2005) reviewed cardio protective property of flavonoids that possess wide spectrum of biological activities in cardiovascular and cancer, which include free radical scavenging, antioxidant, anti-thrombic, antiapoptic, anti-ischemic, anti- arrhythmic, anti-hypertensive and anti-inflammatory activities.

Table 2: Activity of Components identified in the sample of Ajwain (*Trachyspermum ammi*) **by GC MS**

S.No	Identified Compound Details	Activity**
1	**Bicyclo[3.1.1]heptane, 6,6-dimethyl-2-methylene-, (1S)- ((-)-á-Pinene),(RT-2.07) Molecular Formula- $C_{10}H_{16}$, MW - 136, Peak Area % -0.65, Compound Nature- Monoterpene**	Anti-inflammatory, Sedative, Anticancer, Antitumor, Antibacterial, Antiflu, Nematicide, Insecticide, Pesticide, Herbicide, Flavor, Immunomodulator, Fungistat, Antiobesity, Detoxicant, Chemo preventive, Expectorant, Photo sensitizer
2	1,3,5-Cycloheptatriene, 3,7,7-trimethyl-),(RT-2.26) **Molecular Formula-** $C_{10}H_{14}$, **MW** - 134, **Peak Area %** -0.95, **Compound Nature-** Unsaturated compound	No activity reported
3	Benzene, 1-methyl-2-(1-methylethyl)-,(RT-2.32) **Molecular Formula-** $C_{10}H_{14}$, **MW** - 134, **Peak Area %** -10.17, **Compound Nature-** Aromatic compound	No activity reported
4	à-Pinene)-,(RT-2.48) **Molecular Formula-** $C_{10}H_{16}$, **MW** - 135, **Peak Area %** -1.03, **Compound Nature-** Monoterpene	Anti-inflammatory, Sedative, Anticancer, Antitumor, Antibacterial, Antiflu, Nematicide, Insecticide, Pesticide, Herbicide, Flavor, Immunomodulator, Fungistat, Antiobesity, Detoxicant, Chemo preventive, Expectorant, Photo sensitizer
5	1,4-Cyclohexadiene, 1-methyl-4-(1-methylethyl)-(RT-2.53) **Molecular Formula-** $C_{10}H_{16}$, **MW** - 136, **Peak Area %** -10.19, **Compound Nature-** Monoterpene	Anti-inflammatory, Sedative, Anticancer Antitumor, Antibacterial, Antiflu, Nematicide, Insecticide, Pesticide, Herbicide, Flavor, Immunomodulator, Fungistat, Antiobesity, Detoxicant, Chemo preventive, Expectorant ,Photo sensitizer
6	Bicyclo[3.1.0]hexan-2-ol, 2-methyl-5-(1-methylethyl)-, (1à,2á,5à)-)-(RT-2.67) **Molecular Formula-** $C_{10}H_{18}O$, **MW** - 154, **Peak Area %** -0.03, **Compound Nature-** Mono Terpene alcohol e	Anti-inflammatory, Sedative, Anticancer Antitumor, Antibacterial, Antiflu, Nematicide Insecticide, Pesticide, Herbicide, Flavor Immunomodulator, Fungistat, Antiobesity Detoxicant, Chemo preventive, Expectorant ,Photo sensitizer
7	1,6-Octadien-3-ol, 3,7-dimethyl-) (RT-2.85) **Molecular Formula-** $C_{10}H_{18}O$, **MW** - 154, **Peak Area %** -0.01, **Compound Nature-** Mono Terpene alcohol	Anti-inflammatory, Sedative, Anticancer Antitumor, Antibacterial ,Antiflu Nematicide, Insecticide, Pesticide, Herbicide Flavor, Immunomodulator Fungistat, Antiobesity, Detoxicant, Chemo preventive, Expectorant, Photo sensitizer
8	5-Caranol, trans,trans-(+) (RT-3.33) **Molecular Formula-** $C_{10}H_{18}O$, **MW** - 154, **Peak Area %** -0.03, **Compound Nature-** Mono Terpene alcohol	Anti-inflammatory, Sedative, Anticancer Antitumor, Antibacterial, Antiflu, Nematicide Insecticide, Pesticide, Herbicide Flavor ,Immunomodulator Fungistat, Antiobesity, Detoxicant Chemo preventive, Expectorant Photo sensitizer
9	Thujol (RT-3.51) **Molecular Formula-** $C_{10}H_{16}O$, **MW** - 152, **Peak Area %** -0.04, **Compound Nature-** Monoterpene oxide	Anti-inflammatory, Sedative, Anticancer Antitumor, Antibacterial, Antiflu, Nematicide Insecticide, Pesticide, Herbicide Flavor, Immunomodulator, Fungistat Antiobesity, Detoxicant, Chemo preventive Expectorant, Photo sensitizer
10	2,6-Dimethyl-3,5,7-octatriene-2-ol, Z,Z (RT-3.56) **Molecular Formula-** $C_{10}H_{16}O$, **MW** - 152, **Peak Area %** -0.03, **Compound Nature-** Monoterpene oxide	Anti-inflammatory, Sedative, Anticancer Antitumor, Antibacterial, Antiflu Nematicide, Insecticide, Pesticide, Herbicide, Flavor, Immunomodulator, Fungistat, Antiobesity, Detoxicant, Chemo preventive, Expectorant Photo sensitizer
11	3-Cyclohexen-1-ol, 4-methyl-1-(1-methylethyl) (RT-3.73) **Molecular Formula-** $C_{10}H_{18}O$, **MW** - 154, **Peak Area %** -0.07, **Compound Nature-** Mono Terpene alcohol	Anti-inflammatory, Sedative, Anticancer Antitumor, Antibacterial, Antiflu, Nematicide, Insecticide, Pesticide, Herbicide, Flavor Immunomodulator, Fungistat, Antiobesity, Detoxicant, Chemo preventive Expectorant Photo sensitizer
12	p-menth-1-en-8-ol ,(RT-3.90) **Molecular Formula-** $C_{10}H_{18}O$, **MW** - 154, **Peak Area %** -0.08, **Compound Nature-** Mono Terpene alcohol	Anti-inflammatory, Sedative, Anticancer Antitumor, Antibacterial, Antiflu Nematicide, Insecticide, Pesticide Herbicide, Flavor, Immunomodulator, Fungistat, Antiobesity, Detoxicant, Chemo preventive, Expectorant, Photo sensitizer
13	Bicyclo[4.1.0]heptan-3-ol, 4,7,7-trimethyl-, (1à,3à,4à,6à)- ,(RT-4.61) **Molecular Formula-** $C_{10}H_{18}O$, **MW** - 154, **Peak Area %** -0.01, **Compound Nature-** Mono Terpene alcohol	Anti-inflammatory, Sedative, Anticancer Antitumor, Antibacterial, Antiflu Nematicide, Insecticide, Pesticide, Herbicide Flavor, Immunomodulator, Fungistat, Antiobesity, Detoxicant, Chemo preventive, Expectorant, Photo sensitizer
14	Phenol, 2-methyl-5-(1-methylethyl)- (Carvacrol) ,(RT-5.17) **Molecular Formula-** $C_{10}H_{14}O$, **MW** - 150, **Peak Area %** - 71.33, **Compound Nature-** Phenolic compound	Antimicrobial, Anti-inflammatory, Sedative Antioxidant
15	2,3-Butanediol, 1,4-dimethoxy-,(RT-5.54) **Molecular Formula-** $C_6H_{14}O_4$, **MW** - 150, **Peak Area %** -0.44, **Compound Nature-** Alcoholic compound	Antimicrobial
16	3,5-Heptadienal, 2-ethylidene-6-methyl--,(RT-5.74) **Molecular Formula-** $C_{10}H_{14}O$, **MW** - 150, **Peak Area %** -0.14, **Compound Nature-** Unsaturated compound	No activity reported
17	D-Galactose, diethyl mercaptal, pentaacetate--,(RT-6.02) **Molecular Formula-** $C_{20}H_{32}O_{10}S_2$, **MW** - 496, **Peak Area %** -	Antimicrobial

	0.14, **Compound Nature-** Sulfur compound	
18	1-[3-(1-Adamantyl)-1-methylpropylidene]thiosemicarbazide--,(RT-6.52) **Molecular Formula-** $C_{15}H_{25}N_3S$, **MW -** 279, **Peak Area %-**0.02, **Compound Nature-** Sulfur compound	Antimicrobial
19	2,7-Dimethyloctadiyne-3,5-diol-2,7- ,(RT-7.17) **Molecular Formula-** $C_{10}H_{14}O_2$, **MW -** 166, **Peak Area %-** 0.08, **Compound Nature-** Unsaturated compound	No activity reported
20	Phenol, 2-methoxy-4-(2-propenyl)-, acetate,(RT-7.74) **Molecular Formula-** $C_{12}H_{14}O_3$, **MW -** 206, **Peak Area %-**0.04, **Compound Nature-** Phenolic compound	Antimicrobial, Anti-inflammatory, Sedative Antioxidant
21	à-D-Glucopyranoside, O-à-D-glucopyranosyl-(1.fwdarw.3)-á-D-fructofuranosyl,(RT-8.21) **Molecular Formula-** $C_{18}H_{32}O_{16}$, **MW -** 504, **Peak Area %-**0.18, **Compound Nature-** Sugar moiety	Preservative
22	7,7a-Dimethyl-3a,4,5,7a-tetrahydro-3H-benzofuran-2-one,(RT-8.66) **Molecular Formula-** $C_{10}H_{14}O_2$, **MW -** 166, **Peak Area %-**0.56, **Compound Nature-** Ketone compound	No activity reported
23	4,6-Octadienoic acid, 2-acetyl-2-methyl-, ethyl ester,(RT-11.09) **Molecular Formula-** $C_{13}H_{20}O_3$, **MW -** 224, **Peak Area %-** 0.05, **Compound Nature-** Ester compound	No activity reported
24	Cyclohexane, 1-methyl-2,4-bis(1-methylethenyl)-,(RT-11.57) **Molecular Formula-** $C_{13}H_{22}$, **MW -** 178, **Peak Area %-**0.12, **Compound Nature-** Hydrocarbon	No activity reported
25	Bicyclo[6.1.0]nonane, 9-(1-methylethylidene) ,(RT-11.73) **Molecular Formula-** $C_{12}H_{20}$, **MW -** 164, **Peak Area %-**0.04, **Compound Nature-** Alkene compound	No activity reported
26	2,2-Dimethyl-6-methylene-1-[3,5-dihydroxy-1-pentenyl]cyclohexan-1-perhydrol, (RT-12.89) **Molecular Formula-** $C_{12}H_{20}$, **MW -** 256, **Peak Area %-**0.03, **Compound Nature-** Hydroxy compound	No activity reported
27	13,16-Octadecadienoic acid, methyl ester ,(RT-14.11) **Molecular Formula-** $C_{19}H_{34}O_2$, **MW -** 294, **Peak Area %-**0.04, **Compound Nature-** Unsaturated fatty acid	No activity reported
28	9,12-Octadecadienoic acid (Z,Z)- , (RT-14.93) **Molecular Formula-** $C_{18}H_{32}O_2$, **MW -** 280, **Peak Area %-** 0.06, **Compound Nature-** Linoleic acid	Hypocholesterolemic, Nematicide, Antiarthritic ,Hepatoprotective , Anti- androgenic, 5-Alpha reductase inhibitor Antihistaminic, Anticoronary ,Insectifuge Antieczemic , Antiacne
29	Aspidospermidin-17-ol, 1-acetyl-19,21-epoxy-15,16-dimethoxy-(RT-15.41) **Molecular Formula-** $C_{23}H_{30}N_2O_5$, **MW -** 414, **Peak Area %-**0.05, **Compound Nature-** Amino compound	Antimicrobial
30	8,11,14-Eicosatrienoic acid, (Z,Z,Z)- (RT-15.80) **Molecular Formula-** $C_{20}H_{34}O_2$, **MW -** 306, **Peak Area %-** 0.09, **Compound Nature-** Unsaturated fatty acid	Cardio protective ,Hypocholesterolemic
31	E,E-1,9,17-Docasatriene ,(RT-17.09) **Molecular Formula-** $C_{22}H_{40}$, **MW -** 304, **Peak Area %-**0.03, **Compound Nature-** Alkene compound	No activity reported
32	7-Methyl-Z-tetradecen-1-ol acetate, (RT-18.00) **Molecular Formula-** $C_{17}H_{32}O_2$, **MW -** 268, **Peak Area %-** 0.05, **Compound Nature-** Acetate compound	No activity reported
33	Undecanal, 2-methyl-(RT-18.85) **Molecular Formula-** $C_{12}H_{24}O$, **MW -** 184, **Peak Area %-**0.23, **Compound Nature** Aldehyde compound	Antimicrobial, Anti-inflammatory
34	10-Methyl-E-11-tridecen-1-ol propionate(RT-19.11) **Molecular Formula-** $C_{17}H_{32}O_2$, **MW -** 268, **Peak Area %-**0.01, **Compound Nature** Unsaturated compound	No activity reported
35	2-Piperidinone, N-[4-bromo-n-butyl]- -(RT-19.38) **Molecular Formula-** $C_9H_{16}BrNO$, **MW -** 233, **Peak Area %-**0.06, **Compound Nature** -Alkaloid	Antimicrobial Anti-inflammatory
36	6,11-Dimethyl-2,6,10-dodecatrien-1-ol-(RT-19.90) **Molecular Formula-** $C_{14}H_{24}O$, **MW -** 208, **Peak Area %-**0.02, **Compound Nature** - Unsaturated compound	No activity reported
37	Undecane, 1,2-dibromo-2-methyl- (RT-20.75) **Molecular Formula-** $C_{12}H_{24}Br_2$, **MW -** 326, **Peak Area %-** 0.07, **Compound Nature** - Bromo compound	Antimicrobial
38	7-Hexadecenal, (Z)- (RT-21.92) **Molecular Formula-** $C_{16}H_{30}O$, **MW -** 238, **Peak Area %-**0.01, **Compound Nature** - Aldehyde compound	Antimicrobial Anti-inflammatory
39	Methoxyacetic acid, 4-tetradecyl ester (RT-22.13) **Molecular Formula-** $C_{17}H_{34}O_3$, **MW -** 286, **Peak Area %-**0.14, **Compound Nature** - Acetic acid compound	Antimicrobial
40	13,16-Octadecadienoic acid, methyl ester,(RT-22.30) **Molecular Formula-** $C_{19}H_{34}O_2$, **MW -** 294, **Peak Area %-**0.09, **Compound Nature** Unsaturated fatty acid compound	No activity reported

41	Diethylene glycol monododecyl ether, (RT-23.47) **Molecular Formula-** $C_{16}H_{34}O_3$, **MW** - 274, **Peak Area %** - 0.05, **Compound Nature** -Ether compound	No activity reported
42	Squalene ,(RT-23.64) **Molecular Formula-** $C_{30}H_{50}$, **MW** - 410, **Peak Area %** -0.08, **Compound Nature** - Triterpene	**Antibacterial, Antioxidant, Antitumor Cancer preventive, Immunostimulant Chemo preventive, Lipoxygenase-inhibitor** Pesticide
43	1,2-15,16-Diepoxyhexadecane,(RT-24.04) **Molecular Formula-** $C_{16}H_{30}O_2$, **MW** - 254, **Peak Area %** -0.00, **Compound Nature** - Epoxy compound	**No activity reported**
44	7-Isopropyl-7-methyl-nona-3,5-diene-2,8-dione,(RT-24.44) **Molecular Formula-** $C_{13}H_{20}O_2$, **MW** - 208, **Peak Area %** - 0.14, **Compound Nature** - Ketone compound	**No activity reported**
45	1-Hexadecanol, 2-methyl-,(RT-24.80) **Molecular Formula-** $C_{17}H_{36}O$, **MW** - 256, **Peak Area %** -0.03, **Compound Nature** - Alcoholic compound	**Antimicrobial**
46	9,12,15-Octadecatrienoic acid, 2-(acetyloxy)-1-[(acetyloxy)methyl]ethyl ester, (Z,Z,Z)- -,(RT-26.10) **Molecular Formula-** $C_{17}H_{36}O$, **MW** - 256, **Peak Area %** -0.03, **Compound Nature** - Alcoholic compound	**No activity reported**
47	8-Dodecen-1-ol, acetate, (Z)- -,(RT-26.39) **Molecular Formula-** $C_{14}H_{26}O_2$, **MW** - 226, **Peak Area %** -0.01, **Compound Nature** - Acetate compound	**No activity reported**
48	1H-Benzocyclohepten-7-ol, 2,3,4,4a,5,6,7,8-octahydro-1,1,4a,7-tetramethyl-, cis--,(RT-26.90) **Molecular Formula-** $C_{15}H_{26}O$, **MW** - 222, **Peak Area %** -0.02, **Compound Nature** - Aromatic compound	**No activity reported**
49	[1,1'-Bicyclopropyl]-2-octanoic acid, 2'-hexyl-, methyl ester--,(RT-27.82) **Molecular Formula-** $C_{21}H_{38}O_2$, **MW** - 322, **Peak Area %** -0.07, **Compound Nature** - Ester compound	**No activity reported**
50	4-(2,2-Dimethyl-6-methylenecyclohexyl)butanal--,(RT- 28.00) **Molecular Formula-** $C_{13}H_{22}O$, **MW** - 194, **Peak Area %** -0.01, **Compound Nature** - Aldehyde compound	**No activity reported**
51	2(5H)-Furanone, 4-methyl-3,5-bis(2-methyl-2-propenyl)- --,(RT-28.46) **Molecular Formula-** $C_{13}H_{18}O_2$, **MW** - 206, **Peak Area %** -0.26, **Compound Nature** - Furan compound	**No activity reported**
52	2H-Pyran, 2-(7-heptadecynyloxy)tetrahydro---,(RT- 29.23) **Molecular Formula-** $C_{22}H_{40}O_2$, **MW** - 336, **Peak Area %** -0.03, **Compound Nature** - Pyran compound	**No activity reported**
53	Cholestan-3-ol, 2-methylene-, (3á,5à)- ---,(RT- 29.66) **Molecular Formula-** $C_{28}H_{48}O$, **MW** - 308, **Peak Area %** -0.25, **Compound Nature** - Steroid	Antiarthritic, Anticancer, Hepatoprotective Antimicrobial, Antiasthma, Diuretic
54	1-Naphthalenepropanol, à-ethenyldecahydro-2-hydroxy-à,2,5,5,8a-pentamethyl-, [1R-[1à(R*),2á,4aá,8aà]]- ---,(RT- 34.41) **Molecular Formula-** $C_{28}H_{48}O$, **MW** - 400, **Peak Area %** -0.34, **Compound Nature** - Poly aromatic compound	No activity reported

**Dr. Duke's Phytochemical and Ethnobotanical database

Table 3: FTIR Peak Values of Methanolic Extract of Ajwain (*Trachyspermum ammi*)

S.No	Peak values	Frequency ranges(cm^{-1})	Functional groups and Possible compounds
1	3286.97	3500–3200	O–H stretching vibration, presence of alcohols, phenols
2	2923.66	3000–2850	C–H stretching vibration, presence of alkenes
3	2854.34	3000–2850	C-H stretching vibration, presence of alkenes
4	1604.03	1680–1640	–C=C– stretching vibration, presence of alkenes
5	1413.75	1470–1450	C–H bend stretching vibration, presence of alkenes
6	1256.49	1320–1000	C–O stretching vibration, presence of alcohols, carboxylic acids, esters, ethers
7	1147.2	1300–1150	C–H wag (–CH2X) stretching Vibration, presence of alkyl halides
8	1027.62	1250–1020	C–N stretch stretching vibration, presence of aliphatic amines

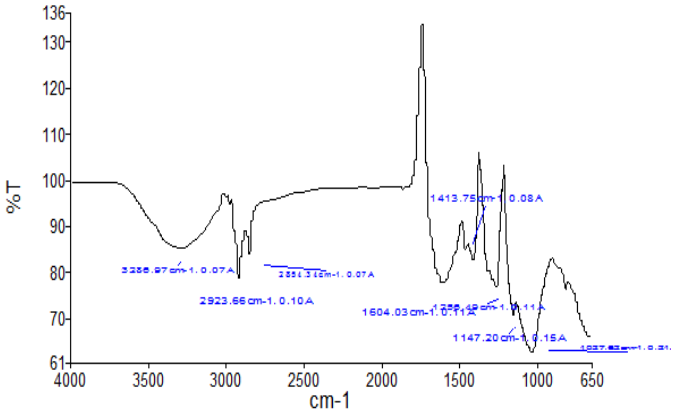

Figure 1: FTIR Analysis of Ajwain (*Trachyspermum ammi*)

Plant sterols (phytosterols), which chemically resemble cholesterol, have been shown to block the absorption of dietary and endogenously derived cholesterol from the gut. They are not synthesized by the human body and are minimally absorbed by the human intestine. The main function of Phytosterols and Phytosterols is to inhibit the uptake of dietary and endogenously produced cholesterol from the gut (Lagarda *et al*, 2008).

Tannins are present in Ajwain extracts. The growth of many fungi, yeast, bacteria and viruses was inhibited by tannins (Chung *et al*., 1998).Tannins acts as antioxidants (Han *et al*., 2005). The spices, herbs, plant extract and their phytoconstituents have been reported for anti-inflammatory, Antidiarrhoeal, antimicrobial, antioxidant and insecticidal activities (Chouhan and Singh, 2001).Terpenoids is also present in all the studied spices. Terpenoids are used in the treatment of cough, asthma and hay fever.

Saponins are present in Ajwain extracts. Traditionally saponin have been extensively used as detergents and pesticides, in addition to their industrial applications as foaming and surface active agents and also beneficial health effects (Shi *et al*., 2004). Akindahunsi and Salawu (2005) reported that, Saponins have potential of inhibiting tumor in animals and also used for traditional medicine preparation. Saponins protect against hypercholesterolemia and antibiotics properties (Amin *et al*., 2013). Consumption of spices has been implicated in the prevention of cardiovascular diseases, carcinogenesis, inflammation, atherosclerosis, etc. (Srinivasan, 2005; Hossain, *et al* ., 2008). Thus the preliminary screening test may be useful in the detection of the bioactive principles and subsequently may lead to the drug discovery and development.

GC MS Analysis

The studies on the active principles in the Ajwain **(***Trachyspermum ammi*) of Methanolic extract by GC MS analysis clearly showed the presence of fifty compounds. The active principles with their Retention Time (RT), Molecular Formula (MF), Molecular Weight (MW), and Concentration (peaks areas %) and Compound Nature are presented in (Table 2).

FTIR functional groups identification

The FT-IR spectrum was used to identify the functional groups of the active components present in extract based on the peaks values in the region of IR radiation. When the extract was passed into the FT-IR, the functional groups of the components were separated based on its peaks ratio. The results of FT-IR analysis confirmed the presence of alcohol, alkanes, aromatic carboxylic acid, and halogen compound, alkyl halide (Figure-1 and Table.3).

4.CONCLUSION

In conclusion, the presence of various bioactive compounds in the Ajwain **(***Trachyspermum ammi*) *(*Ajwain) spices necessarily indicates its potential in treating various infectious diseases. The presence of biologically active compounds also contributes to its nutritive value and thus proved to be potential sources of useful foods. Furthermore, isolation, purification and characterization of the phytochemicals will make interesting studies. The result of this study would lead to find out some compounds which are very useful for the manufacturing of new drugs.

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