International Journal of PharmTech Research
CODEN (USA): IJPRIF ISSN : 0974-4304
Vol.6, No.7, pp 2043-2050, November 2014

# Gc-Ms Analysis of Whole Plant of *Leptadenia Reticulata*

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**Abstract :** The aim of the present study was to evaluate the phyto components present in the ethanolic extract of whole plant of *Leptadenia reticulata* by using GC-MS method. The chemical compounds were investigated using Perkin-Elmer Gas chromatography- Mass spectrometry. GC-MS analysis of ethanol extract of *Leptadenia reticulata* revealed the existence of thirty one compounds.
**Key Words**: Phyto components, *Leptadenia reticulata*, Perkin-Elmer Gas chromatography- Mass spectrometry.

## Introduction

During the twentieth century, when exploring the natural environment, man has made great discoveries that have enabled him to use a considerable number of natural resources.[1] Plants are like natural laboratories where a great number of chemicals are biosynthesized and in fact they may be considered the most important source of chemical compounds. Phyto therapy, the use of plants to medical purposes, is one of the oldest practices in the world. The traditional practice, based on empirical data, is considered as folk medicine and the approach based on scientific studies aims to extract and study active components from plants. Medicinal plants or their derived material, have been widely employed in all cultures, throughout history, for the prevention and treatement of diseases. The significant increase in the use of herbal medicines in recent decades may be attributed to popular wisdom, the costs of synthetic drugs and the resurgence of interest in the development of new drugs and the re-establishment of old ones from plant sources.[2] In many urbanized countries well-liked use of Complementary and Alternative Medicine (CAM) is fuelled by concern about the undesirable effects of synthetic drugs. In budding countries, broad use of Traditional Medicine (TM) is often attributable to its ease of access and availability. For the last few years, there has been a global trend for the regeneration of awareness in the traditional system of treatments. Simultaneously investigation of medicinal plants using indigenous medical systems has become ever more important for speed up better and effective treatment.[3] Herbal medicines are safer than synthetic medicines because the phytochemicals in the plant extract target the biochemical pathway. Traditional systems of medicines are prepared from a single plant or combinations of number of plants. The efficacy depends on the use of proper plant part and its biological potency which in turn depends upon the presence of required quantity and nature of secondary metabolite in a raw drug.[4-5] Screening of active components from plants has unswerving to the development of new medicinal drugs which have well-organized fortification and treatment role against various diseases.[6] Leptadenia reticulata (jivanti) is distributed in tropical and sub-tropical parts of Asia and Africa . In India, it is found in Gujarat, sub - Himalayan tracts from Punjab to Sikkim a nd Khasi hills and throughout peninsular India, ascending up to a altitude of 900 metres. Jivanti is jeevana to nicth at boosts energy level of the body as per according to ayurveda. It is beneficial for the patient for the persons from weak debility or a lack of energy. It also increases longevity, memory enhancement ,immune modulation and adoption.[7] The whole plant ameliorates 'tridoshas' (Vatta, Pitta and Kapha), and is of great value in general debility, involuntary seminal discharge, as a stimulant and snake bite[8-9], abortifacient, tonic, restorative, bactericidal, antifabrifuge, prostitutes, wound healer and in mouth ulcer. [10]

## Materials and Methods

### Collection and Identification of Plant Materials

Fresh leaves of the selected plant *Leptadenia reticulata* were collected from Thirunelveli district, Tamil Nadu, India. The plant materials were taxonomically identified and authenticated by Dr. V. Chelladurai, Research officer - Botany (scientist C), Central council for research in Ayurveda and Siddha, Govt. of India; Thirunelveli. Whole plant were cleaned, shade dried and pulverized to powder in a mechanical grinder. The powdered materials were stored in air tight polythene bags till use.

### Preparation of Extracts

The dried parts were extracted with ethanol using soxhlet extractor.[11] The extract which is obtained is concentrated with rotary evaporator till dry powder was obtained. The final concentrated extract is analysed by using GC-MS.

### Gas Chromatography-Mass Spectrometry (Gc-Ms) Analysis

GC–MS analysis was carried out on a GC Clarus 500 Perkin Elmer system and gas chromatograph interfaced to a mass spectrometer (GC-MS) instrument employing the following conditions: column Elite-MS fused silica capillary column (30m x 250 µm), composed of (5% Phenyl 95%Dimethyl poly siloxane), operating in electron impact mode at 70 eV; helium (99.999%) was used as carrier gas at a constant flow of 1ml/min and an injection volume of 2.0µl was employed (split ratio of 1:10) injector temperature 280°C; ion source temperature 150°C. The oven temperature was programmed at 50°C at 8°C/min to 220°C for 5 mins with an increase of 7°C/min, to 280°C for 15 min .Mass spectra were taken at 70 eV; Mass range is from 40-600 amu is maintained.

### Identification of Components

Interpretation of mass spectrum GC-MS was conducted using the database of National Institute Standard and Technology (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.

## Results

GC–MS chromatogram of the ethanol extract of whole plant of Leptadenia reticulata (Fig. 1) clearly showed thirty one peaks indicating the presence of thirty two phytochemical compounds. The mass spectra of identified compounds were matched with those found in the NIST/NBS spectral database are given in table. 1. The identification of the phytochemical compounds was confirmed based on the peak area, retention time and molecular formula. The medicinal properties of the analyzed phytochemical constituents were listed in table. 2. The individual fragmentation patterns of necessary components were illustrated in Figures A-V.

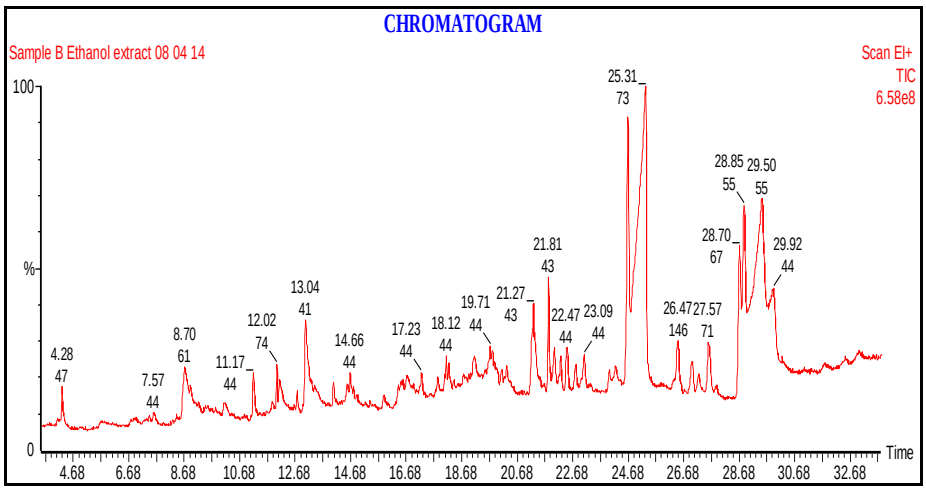


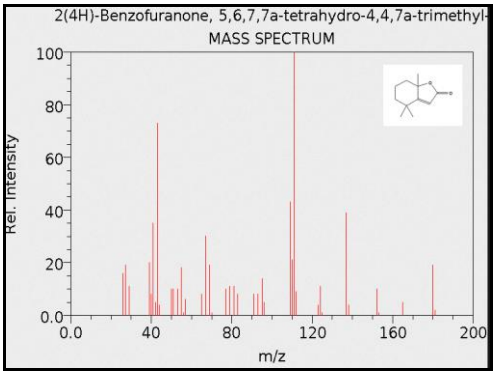

**Fig. 1: The GC - MS Chromatogram of ethanol extracts of whole plant of *Leptadenia reticula***

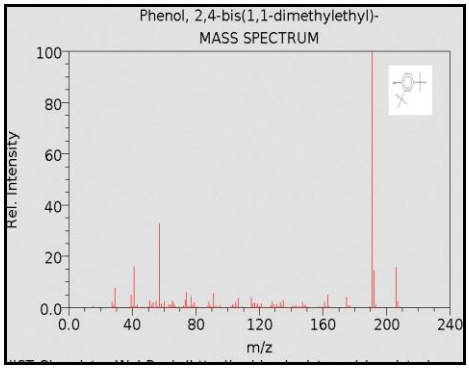
**Table 1: List of Compounds**

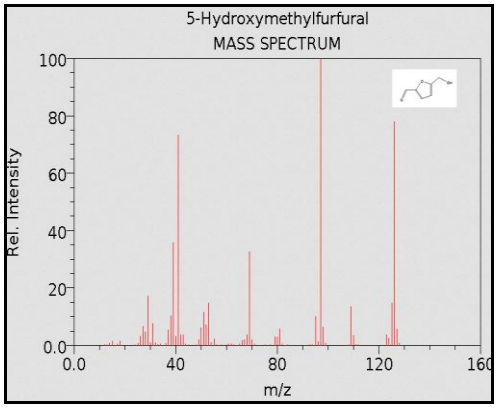
| S.No. | Peak Name | Molecular Formula | Molecular Weight | Retention Time | % Peak area |
|---|---|---|---|---|---|
| 1. | 2-Propanone, 1-(ethylthio)- | $C_5H_{10}OS$ | 118 | 4.28 | 0.9849 |
| 2. | Glycerin | $C_3H_8O_3$ | 92 | 8.70 | 2.4203 |
| 3. | 1-Penten-4-one, 2-acetyl-1-dimethylamino- ((Z)- or (E)-) | $C_9H_{15}NO_2$ | 169 | 10.11 | 0.8084 |
| 4. | 4H-Pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6-methyl- | $C_6H_8O_4$ | 144 | 11.17 | 1.8528 |
| 5. | Ethyl hydrogen succinate | $C_6H_{10}O_4$ | 146 | 11.84 | 0.4658 |
| 6. | á-d-Allopyranoside, methyl 6-deoxy-2-O-methyl- | $C_8H_{16}O_5$ | 192 | 12.02 | 0.9721 |
| 7. | Benzene carboxylic acid | $C_7H_6O_2$ | 122 | 12.11 | 1.1104 |
| 8. | 2-Furancarboxaldehyde, 5-(hydroxymethyl)- | $C_6H_6O_3$ | 126 | 13.04 | 3.6765 |
| 9. | 2-Methoxy-4-vinylphenol | $C_9H_{10}O_2$ | 150 | 14.05 | 0.8089 |
| 10. | Phenol, 2,6-dimethoxy- | $C_8H_{10}O_3$ | 154 | 14.66 | 0.5354 |
| 11. | Benzaldehyde, 3-hydroxy-4-methoxy- | $C_8H_8O_3$ | 152 | 15.88 | 0.8500 |
| 12. | Phenol, 2,4-bis(1,1-dimethylethyl)- | $C_{14}H_{22}O$ | 206 | 17.23 | 0.4185 |
| 13. | 2(4H)-Benzofuranone, 5,6,7,7a-tetrahydro-4,4,7a-trimethyl- | $C_{11}H_{16}O_2$ | 180 | 17.82 | 0.6981 |
| 14. | Dodecanoic acid | $C_{12}H_{24}O_2$ | 200 | 18.12 | 1.2661 |
| 15. | 3',5'-Dimethoxyacetophenone | $C_{10}H_{12}O_3$ | 180 | 18.22 | 0.9888 |
| 16. | 3-Hydroxy-4-methoxybenzoic acid | $C_8H_8O_4$ | 168 | 19.15 | .3717 |
| 17. | Phenol, 2,6-dimethoxy-4-(2-propenyl)- | $C_{11}H_{14}O_3$ | 194 | 20.31 | 0.4260 |
| 18. | Tetradecanoic acid | $C_{14}H_{28}O_2$ | 228 | 21.27 | 0.9418 |
| 19. | 7,11,15-Tetramethyl-2-hexadecen-1-ol | $C_{20}H_{40}O$ | 296 | 21.81 | 2.8479 |
| 20. | 2,6,8-Trimethylbicyclo[4.2.0]oct-2-ene-1,8-diol | $C_{11}H_{18}O_2$ | 182 | 22.02 | 0.1151 |
| 21. | 2H-Pyran, 6-heptyltetrahydro-2,2-dimethoxy- | $C_{14}H_{28}O_3$ | 244 | 22.24 | 1.1455 |
| 22. | Pentadecanoic acid | $C_{15}H_{30}O_2$ | 242 | 22.80 | 0.9175 |
| 23. | 2,6-Di-O-methyl-d-galactopyranose | $C_8H_{16}O_6$ | 208 | 24.01 | 0.8619 |
| 24. | Hexadecanoic acid, ethyl ester | $C_{18}H_{36}O_2$ | 284 | 24.67 | 8.9910 |
| 25. | n-Hexadecanoic acid | $C_{16}H_{32}O_2$ | 256 | 25.31 | 36.5259 |
| 26. | 4-Oxazolecarboxylic acid, 4,5-dihydro-2-phenyl-, 1-methylethyl ester | $C_{13}H_{15}NO_3$ | 233 | 26.47 | 2.0761 |
| 27. | Phytol | $C_{20}H_{40}$ | 296 | 27.57 | 2.9637 |
| 28. | 9,12-Octadecadienoic acid, ethyl ester | $C_{20}H_{36}O_2$ | 308 | 28.70 | 5.3488 |
| 29. | 9-Octadecenoic acid, ethyl ester | $C_{20}H_{38}O_2$ | 310 | 28.85 | 6.4691 |
| 30. | 6-Octadecenoic acid, (Z)- | $C_{18}H_{34}O_2$ | 282 | 29.50 | 9.6053 |
| 31. | Z-2-Octadecen-1-ol | $C_{18}H_{36}O$ | 268 | 34.63 | 1.0956 |

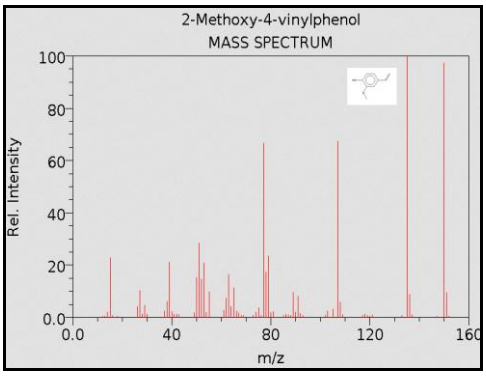
**Table 2: Biological Activities of Phytochemical Compounds Identified in Ethanol Extract of Whole Plant *Leptadenia Reticulata***

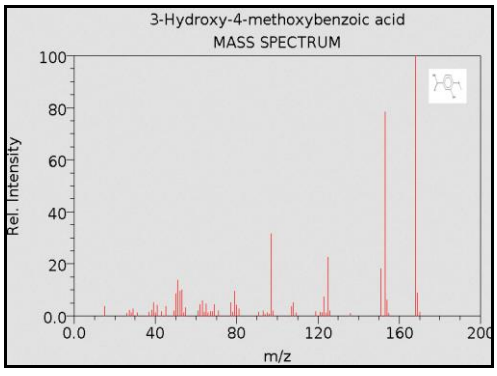
| No. | Name of the compound | **Biological Activity |
|---|---|---|
| 1. | 2-Propanone, 1-(ethylthio)- | No Activity reported |
| 2. | Glycerin | Flavor [12] |
| 3. | 1-Penten-4-one, 2-acetyl-1-dimethylamino-((Z)- or (E)-) | No Activity reported |
| 4. | 4H-Pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6-methyl- | Antimicrobial, Anti-inflammatory, Antiproliferative Antioxidant, Automatic nerve activity [13] |
| 5. | Ethyl hydrogen succinate | No Activity reported |
| 6. | á-d-Allopyranoside, methyl 6-deoxy-2-O-methyl- | No Activity reported |
| 7. | Benzenecarboxylic acid | Antifungal agents, Food preservatives[14] |
| 8. | 2-Furancarboxaldehyde, 5-(hydroxymethyl)- | Antimicrobial , Preservative [12] |
| 9. | 2-Methoxy-4-vinylphenol | Antioxidant, Antimicrobial, Anti inflammatory [12] |
| 10. | Phenol, 2,6-dimethoxy- | No Activity reported |
| 11. | Benzaldehyde, 3-hydroxy-4-methoxy- | No Activity reported |
| 12. | Phenol, 2,4-bis(1,1-dimethylethyl)- | Antioxidant [15] |
| 13. | 2(4H)-Benzofuranone, 5,6,7,7a-tetrahydro-4,4,7a-trimethyl | No Activity reported |
| 14. | Dodecanoic acid | Antibacterial [12] |
| 15. | 3',5'-Dimethoxyacetophenone | No Activity reported |
| 16. | 3-Hydroxy-4-methoxybenzoic acid | No Activity reported |
| 17. | Phenol, 2,6-dimethoxy-4-(2-propenyl)- | No Activity reported |
| 18. | Tetradecanoic acid | Antioxidant, Cancer preventive, Nematicide, Lubricant Hypocholesterolemic [12] |
| 19. | 3,7,11,15-Tetramethyl-2-hexadecen-1-ol | No Activity reported |
| 20. | 2,6,8-Trimethylbicyclo[4.2.0]oct-2-ene-1,8-diol | No Activity reported |
| 21. | 2H-Pyran, 6-heptyltetrahydro-2,2-dimethoxy- | No Activity reported |
| 22. | Pentadecanoic acid | No Activity reported |
| 23. | 2,6-Di-O-methyl-d-galactopyranose | No Activity reported |
| 24. | Hexadecanoic acid, ethyl ester | Lubricant, antiandrogenic, antioxidant, 5-alpha-reductase inhibitor.[12] |
| 25. | n-Hexadecanoic acid | Antifungal, Antioxidant, hypocholesterolemic, nematicide, anti-androgenic flavour, haemolytic, 5-Alpha reductase inhibitor, potent antimicrobial agent, antimalarial and antifungal.[16,17] |
| 26. | 4-Oxazolecarboxylic acid, 4,5-dihydro-2-phenyl-, 1-methylethyl ester | No Activity reported |
| 27. | Phytol | Anti-microbial, anti-cancer, anti-Inflammatory.[12] |
| 28 | 9,12-Octadecadienoic acid, ethyl ester | No Activity reported |
| 29. | 9-Octadecenoic acid, ethyl ester | Nematicide, hepatoprotective, antihistaminic, anticoronary.[12] |
| 30. | 6-Octadecenoic acid, (Z)- | No Activity reported |
| 31. | Z-2-Octadecen-1-ol | No Activity reported |

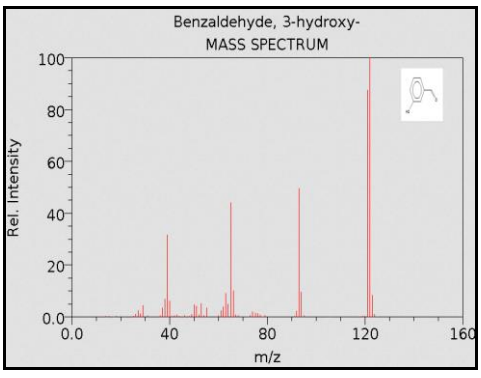

2(4H)-Benzofuranone, 5,6,7,7a-tetrahydro-4,4,7a-trimethyl-
MASS SPECTRUM
Rel. Intensity
m/z

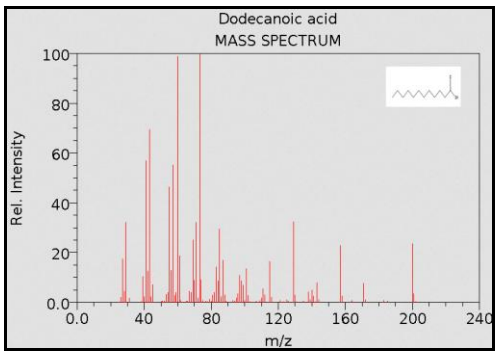

Phenol, 2,4-bis(1,1-dimethylethyl)-
MASS SPECTRUM
Rel. Intensity
m/z

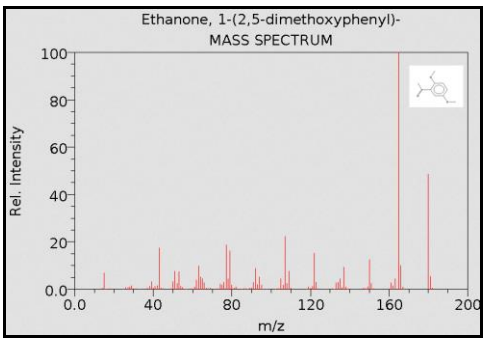

5-Hydroxymethylfurfural
MASS SPECTRUM
Rel. Intensity
m/z

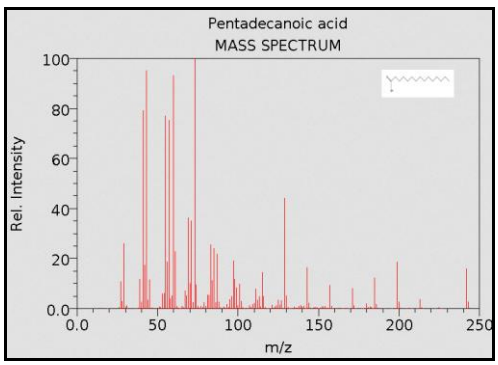

2-Methoxy-4-vinylphenol
MASS SPECTRUM
Rel. Intensity
m/z

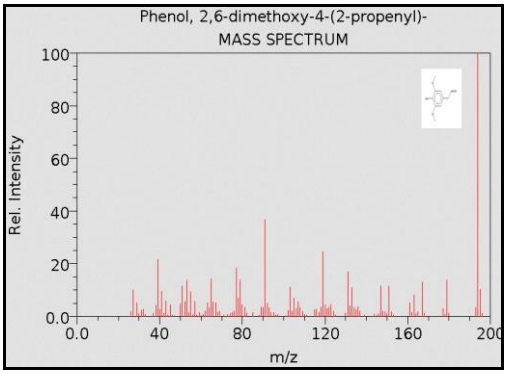

3-Hydroxy-4-methoxybenzoic acid
MASS SPECTRUM
Rel. Intensity
m/z

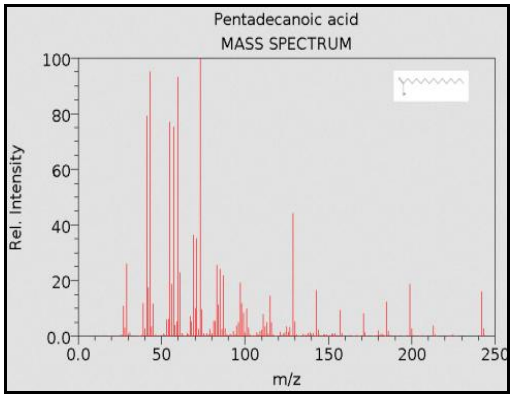

Benzaldehyde, 3-hydroxy-
MASS SPECTRUM
Rel. Intensity
m/z

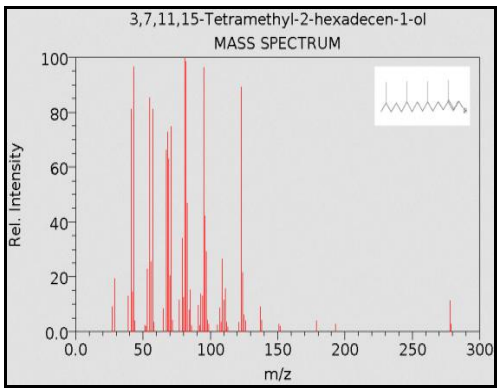

Dodecanoic acid
MASS SPECTRUM
Rel. Intensity
m/z

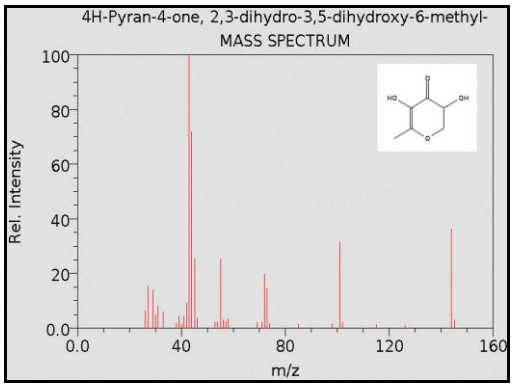

Ethanone, 1-(2,5-dimethoxyphenyl)-
MASS SPECTRUM
Rel. Intensity
m/z

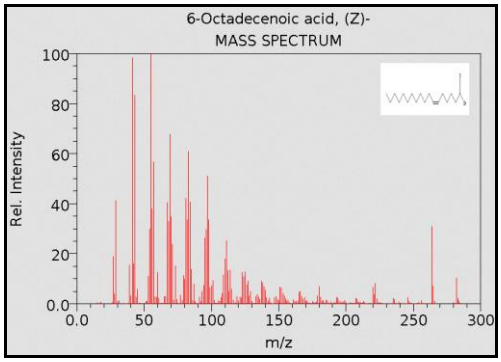

Pentadecanoic acid
MASS SPECTRUM
Rel. Intensity
m/z

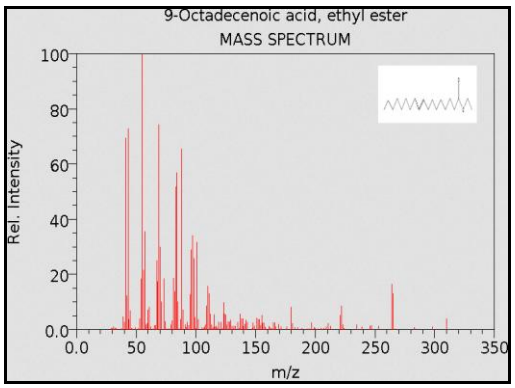

Phenol, 2,6-dimethoxy-4-(2-propenyl)-
MASS SPECTRUM
Rel. Intensity
m/z

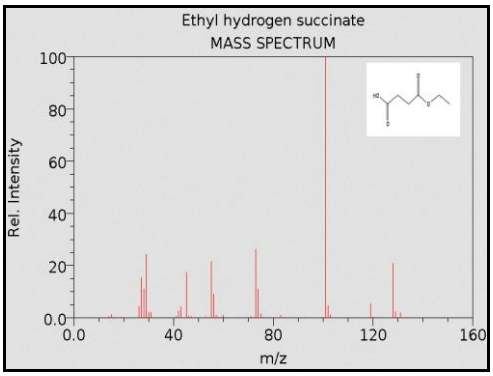

Pentadecanoic acid
MASS SPECTRUM
Rel. Intensity
m/z

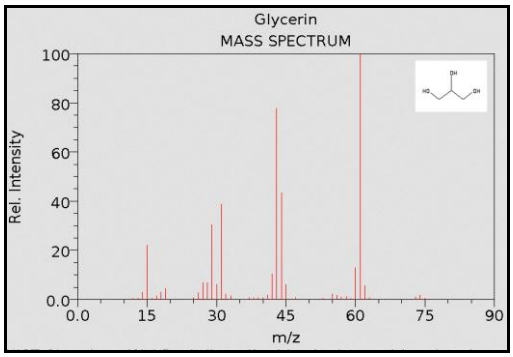

3,7,11,15-Tetramethyl-2-hexadecen-1-ol
MASS SPECTRUM
Rel. Intensity
m/z

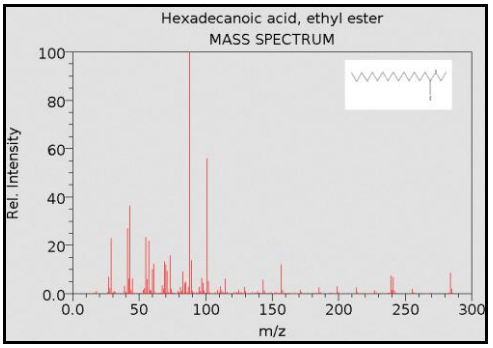

4H-Pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6-methyl-
MASS SPECTRUM
Rel. Intensity
m/z

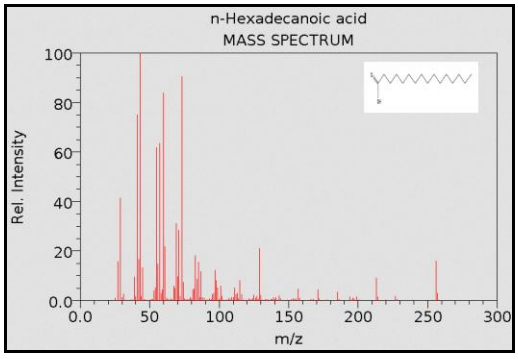

6-Octadecenoic acid, (Z)-
MASS SPECTRUM
Rel. Intensity
m/z

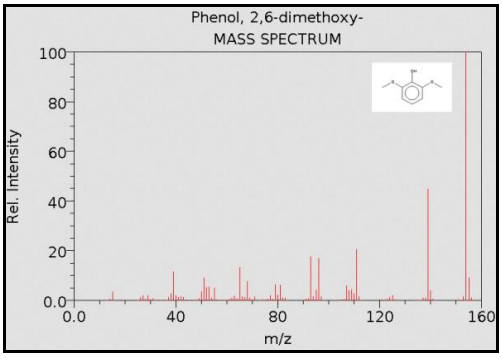

9-Octadecenoic acid, ethyl ester
MASS SPECTRUM
Rel. Intensity
m/z

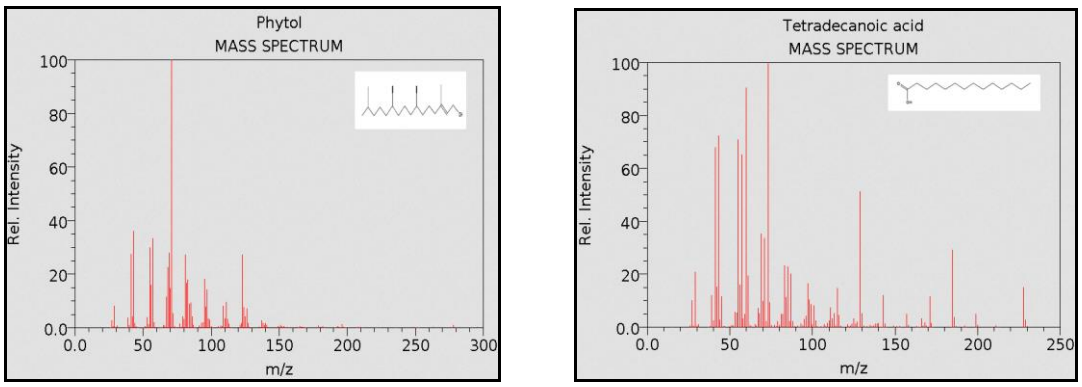

Ethyl hydrogen succinate
MASS SPECTRUM
Rel. Intensity
m/z


Glycerin
MASS SPECTRUM
Rel. Intensity
m/z


Hexadecanoic acid, ethyl ester
MASS SPECTRUM
Rel. Intensity
m/z


n-Hexadecanoic acid
MASS SPECTRUM
Rel. Intensity
m/z


Phenol, 2,6-dimethoxy-
MASS SPECTRUM
Rel. Intensity
m/z




**(Fig A-V: The individual fragmentation pattern of the important compounds)**

## Discussion

GC–MS chromatogram of the ethanol extract of whole plant of *Leptadenia reticulata* (Fig1) clearly showed thirty two peaks indicating the presence of thirty two phyto chemical compounds. The identification of the phyto chemical compounds was confirmed based on the peak area, retention time and molecular formula. The active principles with their retention time (RT), molecular formula (MF), molecular weight (MW) and peak area in percentage (%) were tabulated in Table 1. The components corresponding to the peaks were determined as follows

2-Propanone, 1-(ethylthio)- (0.98%), Glycerin (2.42%), 1-Penten-4-one, 2-acetyl-1-dimethylamino-((Z)- or (E)-) (0.80%) , Ethyl hydrogen succinate (0.46%), á-d-Allopyranoside, methyl 6-deoxy-2-O-methyl- (0.97%), Benzenecarboxylic acid (1.1%), 2-Furancarboxaldehyde, 5-(hydroxymethyl)- (3.67%),2-Methoxy-4-vinylphenol (0.80%), Phenol, 2,6-dimethoxy- (0.53%), Benzaldehyde, 3-hydroxy-4-methoxy- (0.85%), Phenol, 2,4-bis(1,1-dimethylethyl)- (0.41%), 2(4H)-Benzofuranone, 5,6,7,7a-tetrahydro-4,4,7a-trimethyl- (0.69%), Dodecanoic acid (1.26%), 3',5'-Dimethoxyacetophenone (0.98%), 3-Hydroxy-4-methoxybenzoic acid (1.37%), Phenol, 2,6-dimethoxy-4-(2-propenyl)- (0.42%), Tetradecanoic acid (0.94%), 3,7,11,15-Tetramethyl-2-hexadecen-1-ol (2.84%), 2,6,8-Trimethylbicyclo[4.2.0]oct-2-ene-1,8-diol (0.11%), 2H-Pyran, 6-heptyltetra hydro-2,2-dimethoxy- (1.14%), Pentadecanoic acid (0.91%), 2,6-Di-O-methyl-d-galactopyranose (0.86%), Hexadecanoic acid, ethyl ester (8.99%), n-Hexadecanoic acid (36.5%), 4-Oxazolecarboxylic acid, 4,5-dihydro-2-phenyl-, 1-methylethyl ester (2.07%), Phytol(2.96%), 9,12-Octadecadienoic acid, ethyl ester (5.34%), 9-Octadecenoic acid, ethyl ester (6.46%), 6-Octadecenoic acid, (Z)- (9.60%), Z-2-Octadecen-1-ol (1.09%). The spectrum sketch out of GC-MS confirmed the presence of thirty one components with the retention time 4.28, 8.70, 10.11, 11.17, 11.84, 12.02, 12.11, 12.75, 13.04, 14.05, 14.66, 15.88, 17.23, 17.82,18.12, 18.22, 19.15, 20.31, 21.27, 21.27, 21.81, 22.02, 22.24, 22.80, 24.01, 24.67, 25.31, 26.47, 25.31, 26.47, 27.57, 28.70, 28.85, 29.50, 34.63 min respectively which is shown in Figure. 1. The individual fragmentation patterns of necessary components were illustrated in Figures A-V. The phytochemical compounds recognized through GC-MS analysis showed many biological activities are listed in Table 2.

## Conclusion

In the present study, thirty two phytochemical constituents have been identified from the ethanol extract of whole plant of *Leptadenia reticulata* by Gas Chromatogram - Mass Spectrometry (GC - MS) analysis. The presence of these phytochemical constituents proves the use of this plant for various diseases. Isolation of individual photochemical constituents and subjecting it to biological activities are being undertaken.

## Acknowledgement

The authors express their deep sense of gratitude to the UGC- MRP, New Delhi, for financial assistance.

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