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GC-MS Analysis of Luffa Cylindrica (L.) M.Roem. Vegetable Peel

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ABSTRACT

India is second major producer of fruits and vegetables in the world. Fruits and vegetables form the rich source of bioactive molecules.Due to the high consumption of vegetables and fruits, peel waste are generated in large quantities. Peel waste is a serious problem to processing industries and pollution monitoring agencies. Waste utilization is the one of the important and challengeable job around the world. The effect of resources depletion and environmental concerns have triggered new regulations and growing awareness throughout the world, thus promoting use of more and more fruit and vegetable waste to obtain by-products with health benefits.Thus, in present study an attempt was made to bring utilization of peel of Luffa cylindrica (L.) M.Roem.The aim of the study was to investigate the presence of different compounds from the methanolic extract of Luffa cylindrica (L.) M.Roem. peel by GC-MS method. 14 bioactive compounds were identified in the methanolic peel extract of Luffa cylindrica (L.) M.Roem. The identification of phytochemical compounds is based on the peak area, retention time molecular weight and molecular formula. Various bioactive compounds identified were found to possess biological and pharmacological activity such as antimicrobial, antifungal, anticancer, antioxidant properties. Recycling of fruit and vegetable waste is one of the most important means of utilizing it in a number of innovative ways yielding new products.

Keywords: Luffa cylindrica (L.) M.Roem. peel and GC-MS analysis

I. INTRODUCTION

"Let food be thy medicine and medicine be thy food" was the famous dictum proclaimed by Hippocrates about 2500 years ago. Recently many scientific studies supported the above fact. It appears that diet containing some phytochemicals also termed as bioactive molecules, can provide protection against various chronic diseases like cancer, atherosclerosis, thrombosis, etc and also impart other health benefits (Wildman, 2001). Food of plant origin is capable of contributing appreciable quantities of nutrients, including proteins needed by both children and adults (Okaka *et al.*, 2002). Fruits and vegetables form the rich source of bioactive molecules. Over 10,000 bioactive phytochemicals have been identified in different fruits and vegetables which are integral part of the human diet (Wise, 2001).

India is the second major producer of fruits and vegetables in the world. It contributes 10% of world fruit production. According to India Agricultural Research Data Book 2004, the total waste generated from fruits and vegetables comes to 50 million tons per annum (Uchakalwar *et al.*, 2014).

Due to the high consumption of vegetables and fruits, peel waste are generated in large quantities in big cities. Peel waste which are highly perishable and seasonal, is a problem to the processing industries and pollution monitoring agencies (Chacko *et al.*, 2014). These wastes if not disposed correctly are seen to cause serious environmental problems such as water pollution, unpleasant odors, explosions and combustion and greenhouse gas emissions (Roy *et al.*, 2014). Thus, in the present study an attempt has been made to bring about the utilization of the vegetable peel waste for mankind.

II. MATERIAL AND METHODS

Collection of sample

The vegetable of *Luffa cylindrica* (L.) M.Roem. used in the present study was collected from the local market of Kalyan. It was identified from the Department of Botany, Agharkar Institute, Pune. The peels were washed properly under running tap water to remove dust particles. The peels were then shade dried for 5 days and once the moisture was reduced the peels were then completely dried in an oven at 50°C.The dried peels were then powdered using grinder and stored in air tight bottles.

Preparation of sample for GC-MS study

About 5 grams of the peel powder of *Luffa cylindrica* (L.) M.Roem. was soaked in 50 ml methanol. Extraction was done in orbital shaker at 100 rpm (25°C) for 24 hours, followed by filtering of the extract using Whatman filter paper No.1. The residue was removed and supernatant was used for further analysis.

GC-MS analysis

The dried peel powder of *Luffa cylindrica* (L.) M.Roem. was analyzed using GC-MS (Shimadzu capillary GC-quadrupole MS system QP 5000). The sample was injected into the GC-MS on a 30 m glass capillary column with a film thickness of 0.25 μm (30 m × 0.25 mm) with helium as carrier gas at 1 ml/min constant flow mode. GC temperature programme was 50˚C - 300˚C at 10˚C/min. The mass spectra were recorded in electron ionization mode at 50 eV.

III. RESULT AND DISCUSSION

GC-MS analysis of methanolic extract of *Luffa cylindrica* (L.) M.Roem. peel

Gas Chromatography and Mass spectroscopy analysis results of methanolic peel extract of*Luffa cylindrica* (L.) M.Roem.are shown in Table-1. GC-MS analysis of methanolic peel extract of *Luffa cylindrica* (L.) M.Roem. revealed the presence of 14 bioactive compounds. The identification of phytochemical compounds is based on the peak area, retention time molecular weight and molecular formula.

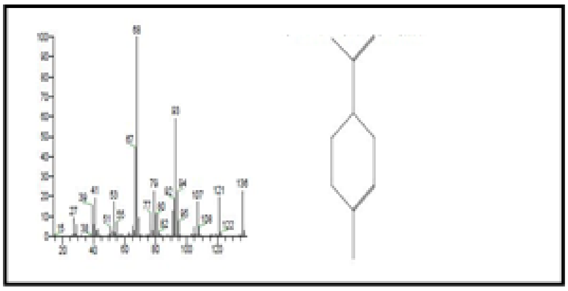
In the present investigation a variety of compounds have been detected including D-Limonene (8.81), 1-Hexadecanol (3.38), Stearic acid (0.48), 1-Monolinoleoylglycerol trimethylsilyl ether (1.12), Spirost-8-en-11-one (1.97), Glucopyranoside (1.24), 7-methyl-z-teradecen-1-ol acetate (0.59), 9,10-Secocholestra-5,7,10 (19)-triene-1,3-diol (1.75), Ethyl iso-allocholate (0.28), Cis-11-Eicosenoic acid (1.04), Estra-1,3,5 (10)- trien-17-ol (0.38), Pentadecanoic acid (8.43), Oleic acid (0.64) and Heptadecanoic acid (2.69) with retention time 6.47, 7.22, 7.48, 9.19, 9.87, 10.25, 10.99, 11.25, 11.98, 12.57, 12.70, 14.32, 15.39 and 15.64 respectively. Irrespective of the amount or concentration (high or low) in which these compounds were found to be present, almost all these compounds have been reported to possess some pharmacological or the other biological activity.

Table 1. GC MS analysis of methanolic extract of Luffa cylindrica (L.) M.Roem. vegetable peel

Sr. No.	Name of Compound	RT (min)	Area (%)	Formula	Molecular weight
1.	D-Limonene	6.47	8.81	$C_{10}H_{16}$	136
2.	1-Hexadecanol	7.22	3.38	$C_{17}H_{36}O$	256
3.	Stearic acid, 2-hydroxy-1-methylpropyl ester, 2-Hydroxy-1-methylpropyl stearate	7.48	0.48	$C_{22}H_{44}0_3$	356

4.	1-Monolinoleoylglycerol trimethylsilyl ether	9.19	1.12	$C_{27}H_{54}O_4Si_2$	498
5.	Spirost-8-en-11-one	9.87	1.97	$C_{27}H_{40}O_4$	428
6.	Glucopyranoside	10.25	1.24	$C_{18}H_{32}O_{16}$	504
7.	7-methyl-z-teradecen-1-ol acetate	10.99	0.59	$C_{17}H_{32}O_2$	268
8.	9,10-Secocholestra-5,7,10 (19)-triene-1,3-diol	11.25	1.75	$C_{30}H_{52}O_3Si$	488
9.	Ethyl iso-allocholate	11.98	0.28	$C_{26}H_{44}O_5$	436
10.	Cis-11-Eicosenoic acid	12.57	1.04	$C_{20}H_{38}O_2$	310
11.	Estra-1,3,5 (10)- trien-17-ol	12.70	0.38	$C_{18}H_{24}O$	256
12.	Pentadecanoic acid	14.32	8.43	$C_{17}H_{34}O_2$	270
13.	Oleic acid	15.39	0.64	$C_{39}H_{76}O_3$	592
14.	Heptadecanoic acid	15.64	2.69	$C_{19}H_{38}O_2$	298

Figure 1. Mass spectrum of different compounds identified in methanolic extract of Luffa cylindrica (L.) M.Roem. vegetable peel by GC-MS analysis



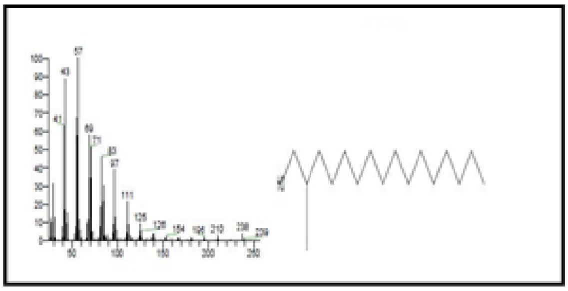
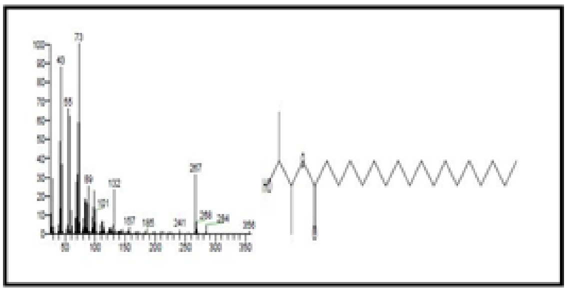


Figure 1.1. GC MS Spectrum of D-Limonene **Figure 1.2.** GC MS Spectrum of 1-Hexadecanol



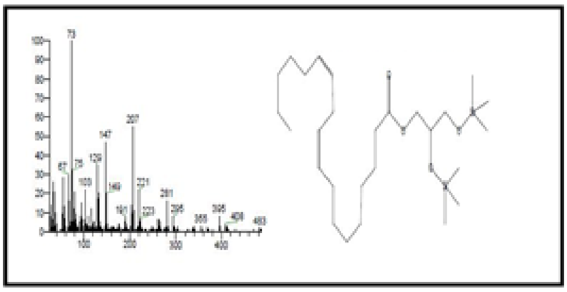
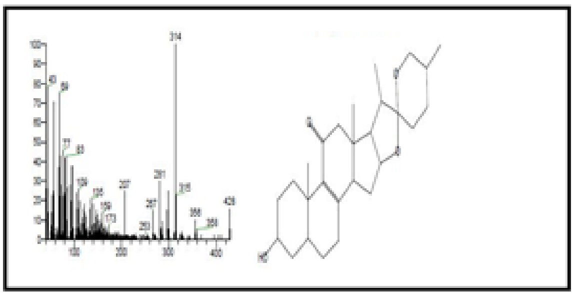


Figure 1.3. GC MS Spectrum of Stearic acid **Figure 1.4.** GC MS Spectrum of 1-Monolinoleoylglycerol trimethylsilyl ether



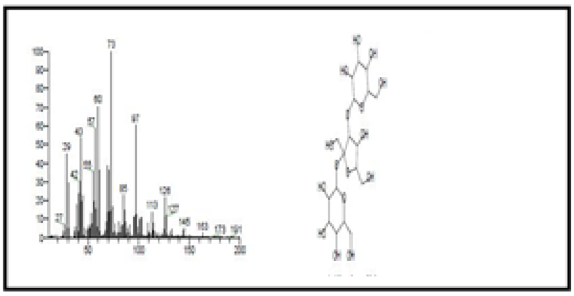
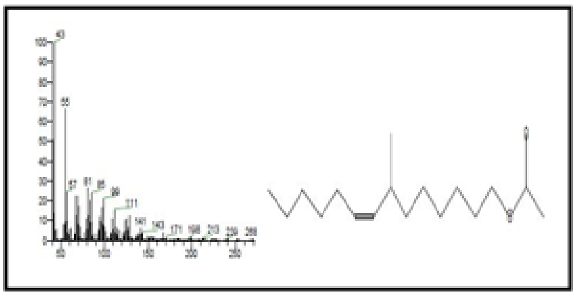


Figure 1.5. GC MS Spectrum of Spirost-8-en-11-one **Figure 1.6.** GC MS Spectrum of Glucopyranoside



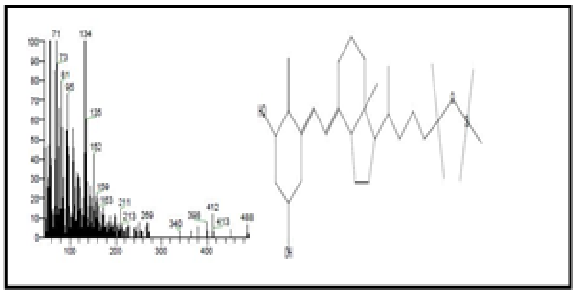
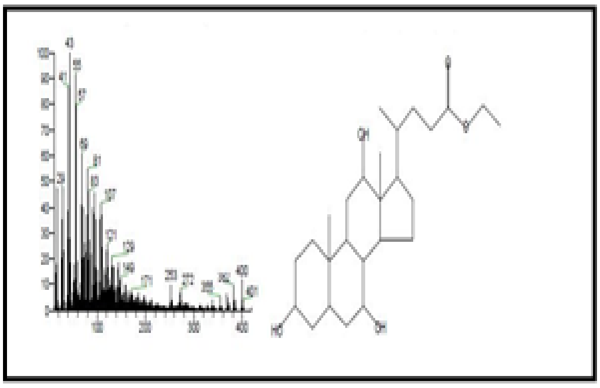


Figure 1.7.GC MS Spectrum of 7-methyl-z-teradecen-1-ol acetate **Figure 1.8.** GC MS Spectrum of 9,10-Secocholestra-5,7,10 (19)-triene-1,3-diol



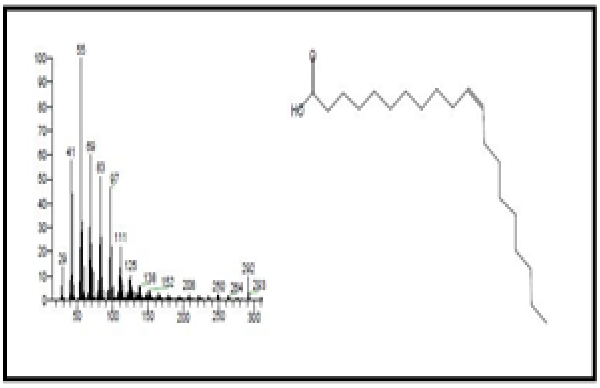
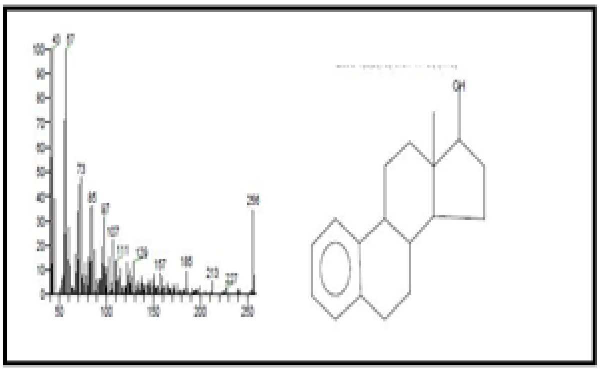


Figure 1.9. GC MS Spectrum of Ethyl iso-allocholate **Figure 1.10.** GC MS Spectrum of Cis-11-Eicosenoic acid



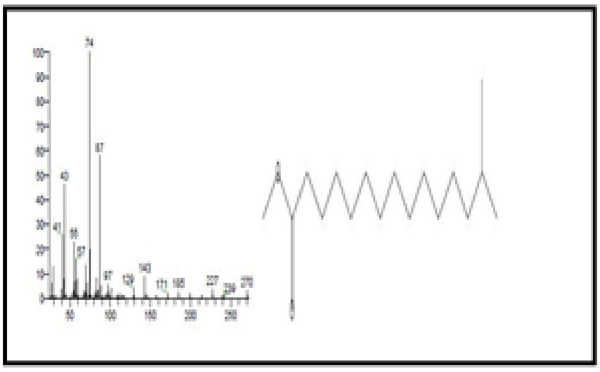
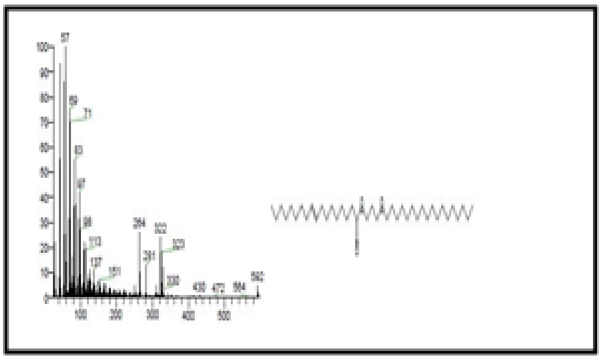


Figure 1.11. GC MS Spectrum of Estra-1,3,5 (10)- trien-17-ol **Figure 1.12.**GC MS Spectrum of Pentadecanoic acid



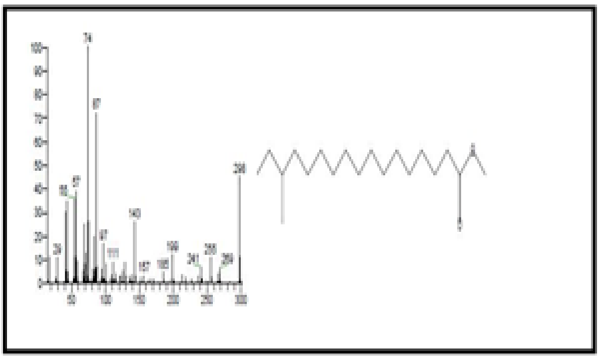


Figure 1.13. GC MS Spectrum of Oleic acid **Figure 1.14.** GC MS Spectrum of Heptadecanoic acid

IV. CONCLUSION

Recycling of fruit and vegetable waste is one of the most important means of utilizing it in a number of innovative ways yielding new products. The secondary metabolites (phytochemicals) and other chemical constituents of medicinal plants account for their medicinal value. Thus, the GC-MS analysis of methanolic extract of *Luffacylindrica*(L.) M.Roem. peel showed a highly complex profile, containing 14 bioactive constituents. This study further may be useful to explore the pharmacological and biosynthetic activity of the peel.

V. ACKNOWLEDGMENT

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