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Comprehensive Pharmacognostical and Phytochemical investigation of *Leucomeris spectabilis* leaves using GC–MS analysis

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ABSTRACT

The leaves of Leucomeris spectabilis are used in folk medicine as a crude drug in the treatment of diabetes. This present work deals with Pharmacognostical studies such as Qualitative, quantitative, powder microscopy of Leaf, physicochemical studies, phytochemical studies, thin layer chromatography and GC-MS analysis of *Leucomeris spectabilis* leaves for future prospect. Pharmacognostical, phytochemical, and GC-MS analysis are used to screen, identify, extract, and isolate phyto-constituents in order to assess the therapeutic potential of the plant and to define phytochemical standards for medicinal plant materials for quality control purposes.

Keywords: *Leucomeris spectabilis, Pharmacognostical & phytochemical studies, GC-MS analysis.*

1. INTRODUCTION

Several traditional medical systems have long used medicinal plants because of their efficacy, affordability & accessibility traditional medicinal herbs are still utilized for primary healthcare in many cultures worldwide, despite recent advancements in modern medications[1].Unfortunately, because there are no criteria pertaining to the authenticity of medications, crude drugs derived from natural sources are vulnerable to adulteration and substitution. This will therefore have an impact on the medications' strength, calibre, and purity. A pharmacognostical investigation must be carried out to guarantee the validity of herbal medicine. The goal of the current study is to establish specific quality standards for the leaf of *L. spectabilis* because there is a dearth of pharmacological research on this plant's leaf. *Leucomeris spectabilis* showy white weed is a shrub with white flowers. Flowers are borne in rounded stalks corymbs, 10-20 cm in diameter. Flower-cluster-stalks are densely woolly and having bracteoles. The literature survey on journal, library and other of *Leucomeris spectabilis* plant has not more detail found.

Fig. 1: Leucomeris spectabilis plant

2. MATERIALS AND METHODS

The fresh leaves of *Leucomeris spectabilis* were collected in month of August from Herbal Garden IFTM University, Moradabad, Uttar Pradesh 244102. India. Plant was authenticated by the botanist at (Botany Department C.C.S. University Meerut. Following verification, large quantities of fresh leaves were gathered, washed to get rid of dirt, shade dried, and ground into powder using a machine. To create coarse powder, the dried leaf powder was sieved through 40 mesh and kept in a tight container utility was needed again. The Qualitative, quantitative & powder microscopy of Leaf were studied [2,6]. The physicochemical constants were determined by pharmacopeial methods[3]. The successive extraction of the leaves powder was done by continuous hot extraction method using Soxhlet apparatus. The various solvents used such as Petroleum ether, chloroform, ethanol and water4. The preliminary phytochemical studies of different extracts were performed[5,6]

Gas chromatography-mass spectroscopic analysis of *Leucomeris spectabilis*

GC-MS analysis of the Ethanolic extract of *Leucomeris spectabilis* leaves was performed using the equipment GCMS-QP2010 is a single quadrupole Gas Chromatograph-Mass Spectrometer. The equipment has a DB 35 – MS Capillary Standard non-polar column with dimensions of 30 mm × 0.25 mm ID × 0.25 µm films. The carrier gas used is Helium with at low of 1.0 ml/min. The injector was operated at 250 °C and the oven temperature was programmed as follows: 60 °C for 15 min, then gradually increased to 280 °C at 3 min. The identification of components was based on NIST14.L libraries as well as comparison of their retention indices. The constituents were identified after comparison with those available in the computer library (NIST14.L) attached to the GC-MS instrument and the results obtained have been tabulated[13,14]

3. RESULT & DISCUSSION

1. Macroscopic Characters

Fig. 2: Macroscopic View of Upper and Lower Surface of Leaf

Table 1: Macroscopic Characters of *Leucomeris spectabilis*

Leaves		
S. No	**Macroscopic characters**	***Leucomeris spectabilis***
1.	Size	10 -25cm length, 3.5 - 9 cm breadth and 1 mm thickness.
2.	Shape	Ovate
3.	Taste	Bitter
4.	Colour	Dark green

5.	Odour	Characteristic

2. Quantitative Microscopy of Leaf Constants of *Leucomeris spectabilis*

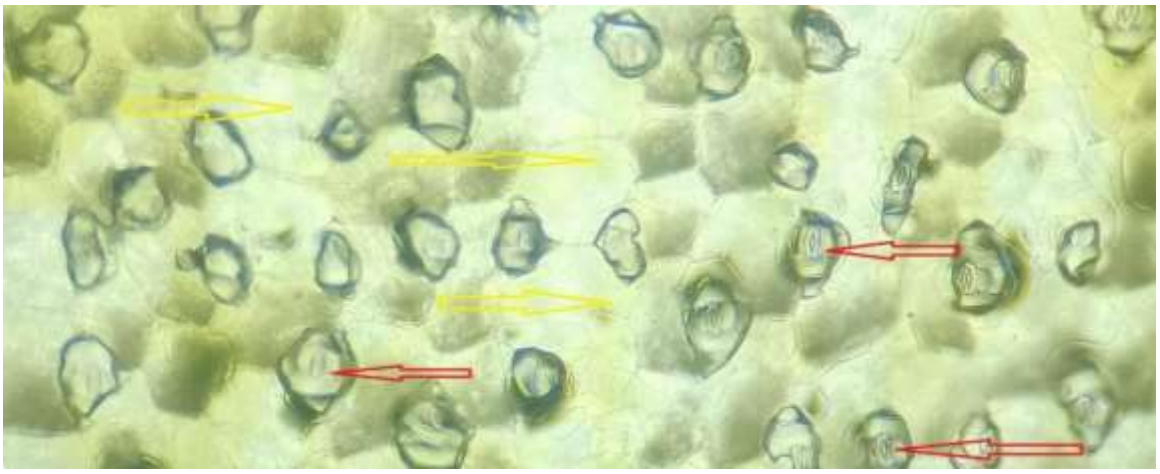


Fig. 3: Stomata and epidermal cells of LS leaf (Upper side) Yellow color arrow represent the epidermal cells & Red color arrow represents the Stomata

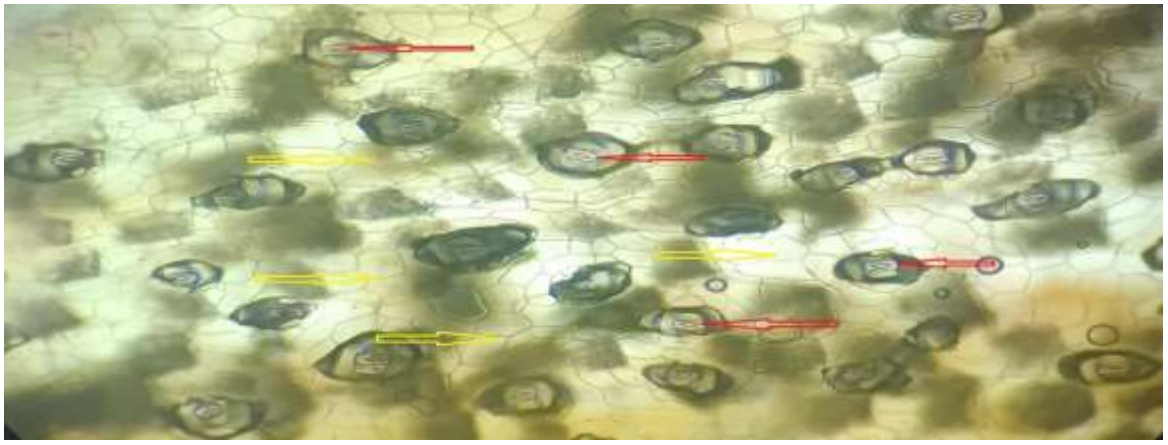


Fig. 4: Stomata and epidermal cells of LS leaf (Lower side) Yellow color arrow represents the epidermal cells & Red color arrow represents the Stomata

Table 2: Stomatal Number and Stomatal Index

Value	Stomatal number	Stomatal index	Vein islet Number	Vein termination number
Per sq. mm	45.25	18.12	25.35	19.40

3. Qualitative Microscopy of *Leucomeris spectabilis* leaves & stem

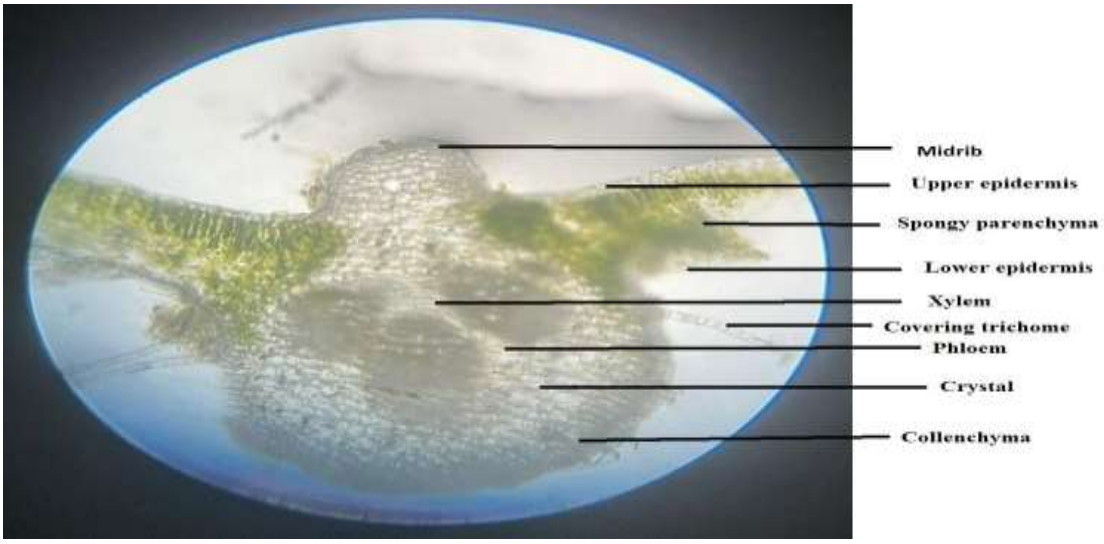


Fig. 5: T.S. of midrib leaf under 100X

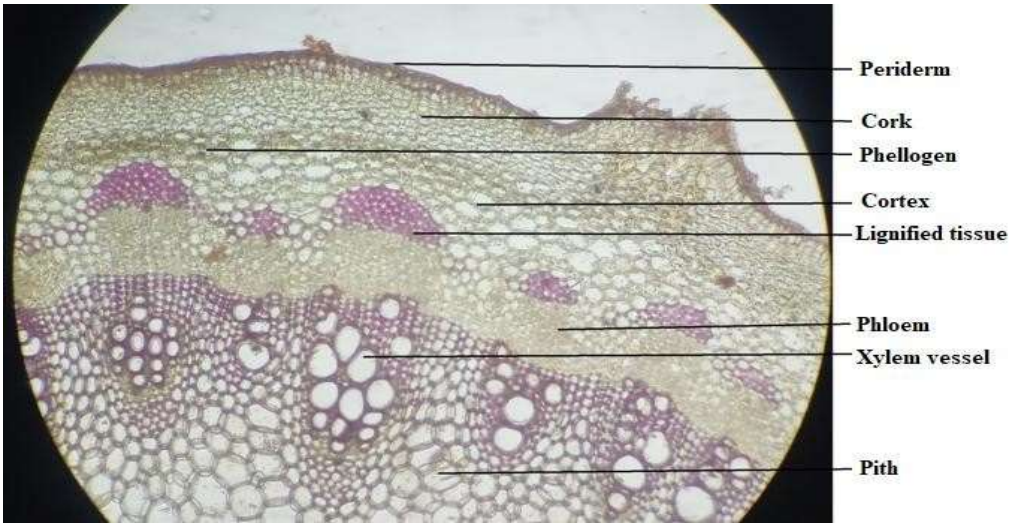
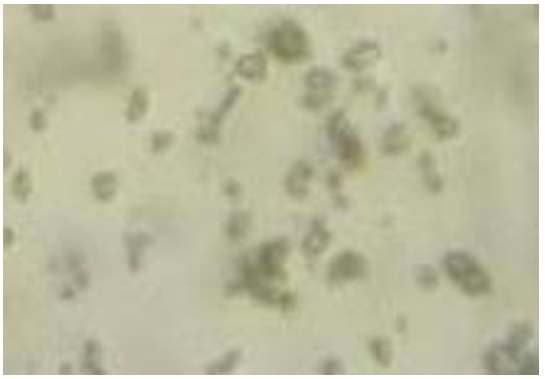


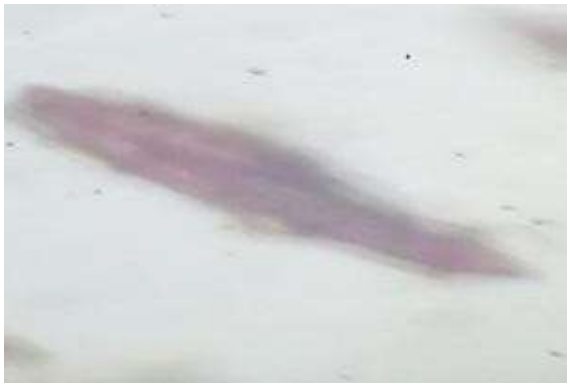
Fig. 6: T.S. of stem under 100X

4. Powder Microscopy of *Leucomeris spectabilis* leaves

(A) Unicellular Covering Trichome



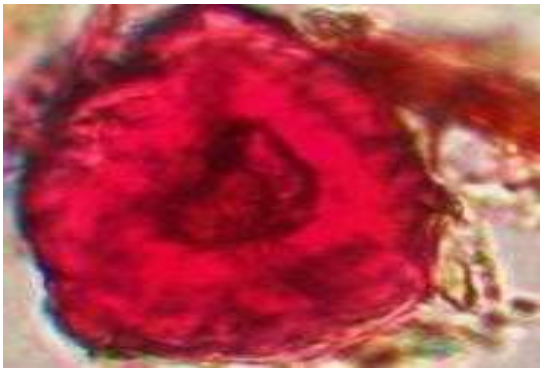
(B) Starch grain



(C) Lignified Fiber

(D) Calcium oxalate

(E) Xylem Vessel (Bordered Pitted)



(F) Sclereids (Stone Cell)

Fig. 7: Microscopy of powder under 100X

5. Physico-chemical studies

Table 3: Physico-chemical Characteristics of of *Leucomeris spectabilis* (Leaves)

S. No.	Parameters	Results
1.	Foreign organic content	1.10%
2.	Moisture content	0.73%
3.	Swelling Factor	1.2 ml.
4.	Foaming Index	Less than 100
5.	Ash Values Total Ash Acid Insoluble Ash Water Soluble Ash Sulphated ash	 4.72% w/w 1.10% w/w 1.55% w/w 2.03% w/w
6.	Alcohol soluble extractive value	12.55% w/w
7.	Water soluble extractive value	15.85% w/w

6. Successive Extraction with Different Solvents of *Leucomeris spectabilis* leaves

Fig. 8: Extract with Different Solvents

Table 4: Yield of Successive Extraction with Different Solvents

S. No.	Solvents	Appearance	Yield (%w/w)
1.	Pet. ether	Light yellow	3.25
2.	Chloroform	Light Green	4.06
3.	Ethanol	Dark green	7.78
4.	Aqueous	Light Red	5.76

Fig 9: Preliminary Phytochemical Screening

7. Phytochemical Screening

Table 5: Qualitative chemical examination of *Leucomeris spectabilis* extract

S. No.	Phytoconstituents	Test	Pet. ether extract	Chloroform extract	Ethanolic extract	Aqueous extract
1.	Alkaloids	Mayer's test	—	—	+ +	+
		Hager's test	—	+	+ +	+
		Wagner's test	—	—	—	+
		Dragendroff's test	—	++	+ +	+
2.	Carbohydrates	Molisch's test	—	+	+ +	+
		Benedict's	—	—	+ +	+
		Fehling's test	—	+	+ +	+
3.	Glycosides	Borntrager's test	—	—	++	+
		Legal test	—	+	+	+
		Kellar -Killiani test	—	+	++	+
4.	Steroids	Salkowski's test	—	—	—	—
		Sulfur powder test	—	—	—	+
		Liebermann Burchard test	—	+	—	—
5.	Proteins	Millon's test	—	—	—	—
		Biuret test	—	—	—	—
		Ninhydrin test	—	—	—	—
6.	Resins	Acetone-Water test	—	—	—	—
7.	Fats and Oils	Filter paper test	+	—	+	—
8.	Flavonoids	Shinoda test	—	+	++	—
		Sulphuric acid test	—	+	++	—
9.	Tannin	Ferric chloride test	—	—	++	+
		Matchstic test	—	—	++	+
10.	Phenols	Lead acetate test	—	—	+	+
		Gelatin test	—	—	++	+
11.	Mucilage	Rhuthenium red test	—	—	+	+

Where: (+ +) Strongly Present; (+) Mild Present; (—) Absent

Chemical constituents

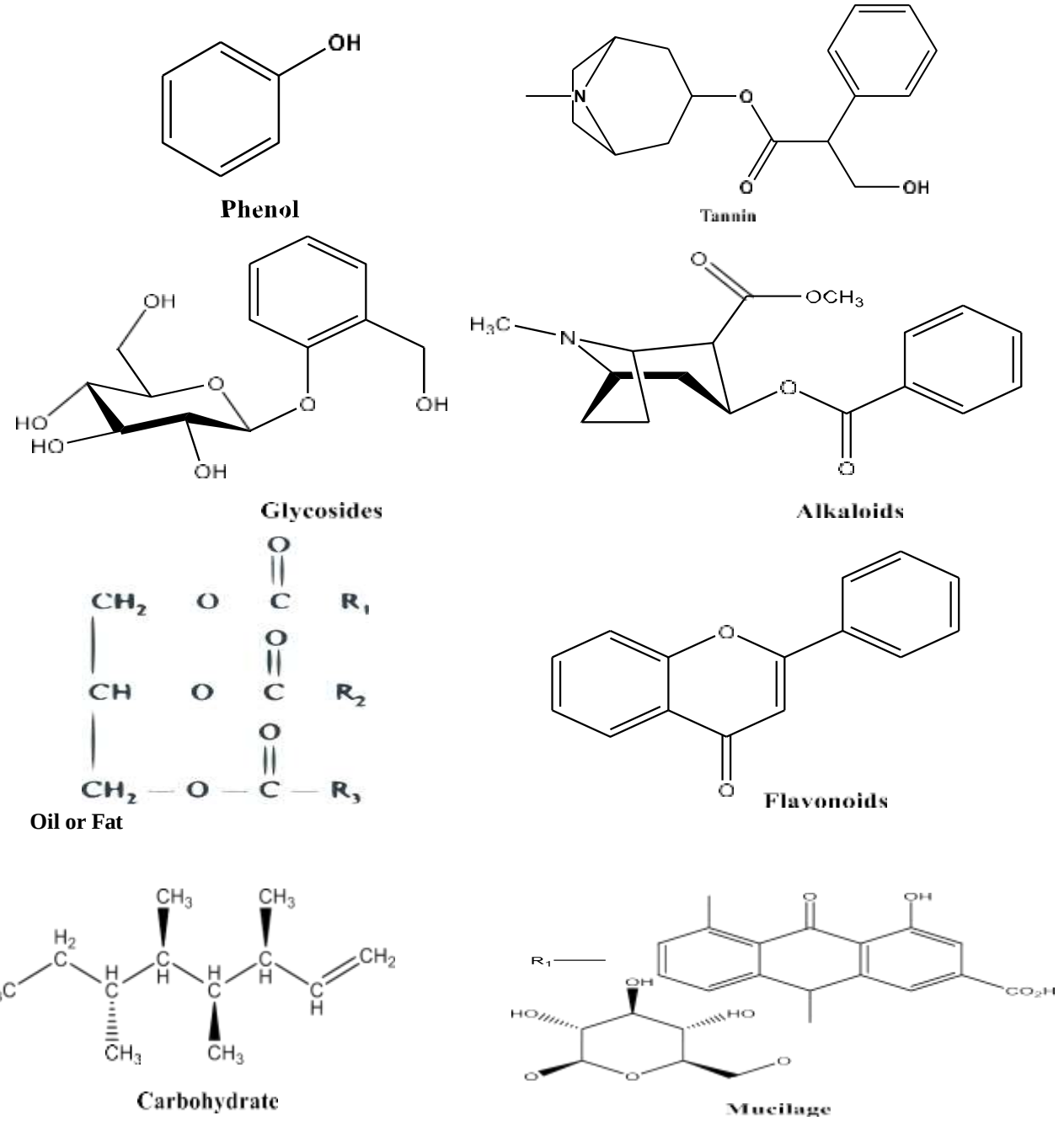


Fig. 10: Phytoconstituents present in plant

8. Thin Layer Chromatography of ethanolic leaves extract *Leucomeris spectabilis*

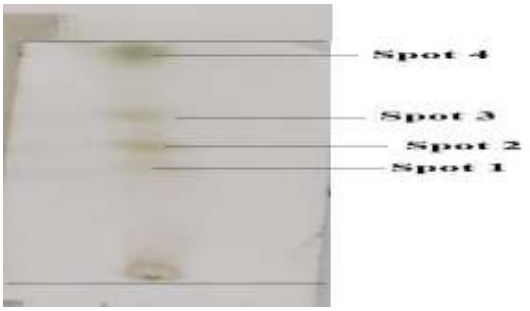


Fig. 11: TLC of ethanolic extract

Table 6: TLC of ethanolic extract

Extract	Mobile Phase	No. of Spot	Rf Value
Ethanolic Extract	Ethyl acetate: Methanol: water (Ratio- 10:1.35:1)	Spot 1 Spot 2 Spot 3 Spot 4	0.41 0.53 0.69 0.89

Identification of Phytocomponent by GC-MS of Ethanolic extract of Leucomeris spectabilis leaf

This study was to determine the phytochemical compounds present in ethanolic leaf extracts of Leucomeris spectabilis. The plant species is found in the genus Leucomeris and family Asteraceae. Phytochemical screening was conducted to determine the nature of secondary metabolites while Gas Chromatography-Mass Spectrometry, (GC-MS) was conducted to determine the specific Phyto-compounds present in the ethanolic leaf extracts. Phytochemicals were ascertained based on molecular weights (m/z) acquired from GC-MS chromatograms. Phytocompounds were established through interpretation of spectral peaks and comparing data with stored databases from the National Institute Standard and Technique (NIST) library. Phytochemical screening Alkaloids, flavonoids, Glycosides, steroids, tannins, saponins and phenolic compounds.

This study reports the ethanolic extract of Leucomeris spectabilis leaves has many phytochemical compounds that first time from this genus and species. Evidently, the reported pharmacological properties of these phytochemicals support the ethnomedical use of Leucomeris spectabilis for the traditional health care exclusively in the treatment of diseases such as fungal, bacterial, inflammatory, cancer diseases, antidiabetics etc.

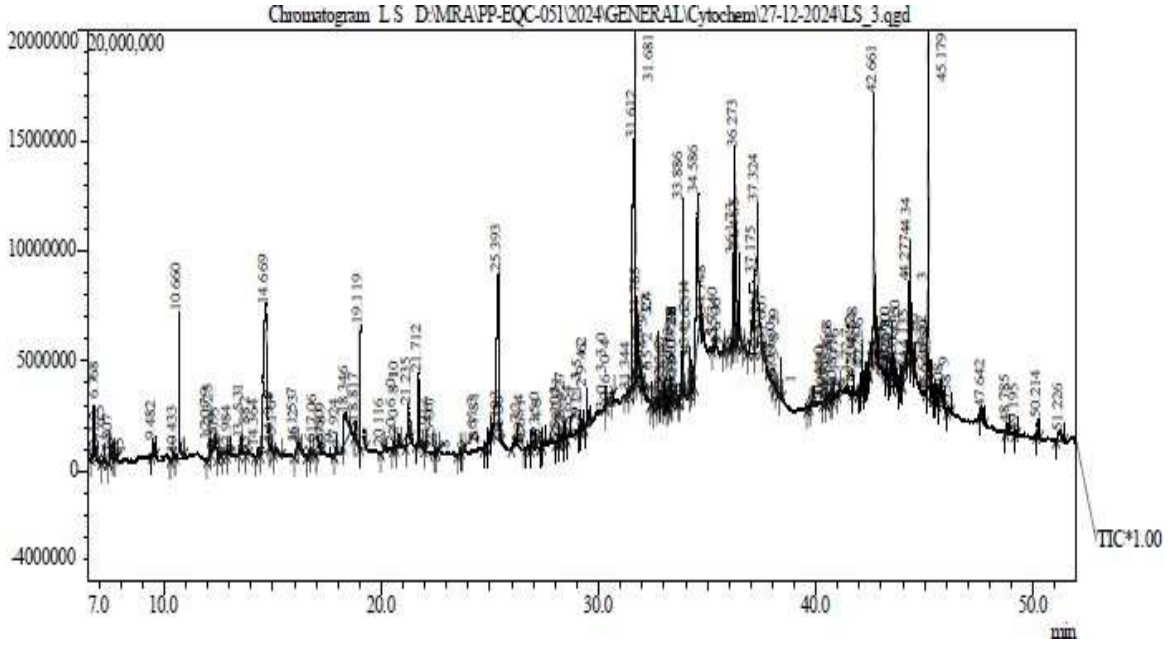
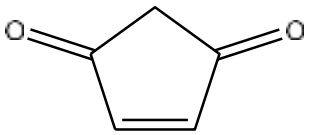
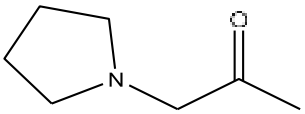
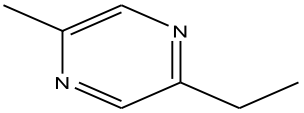
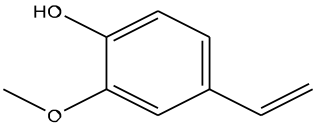
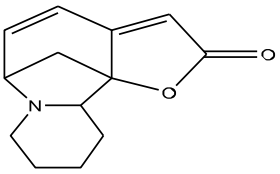
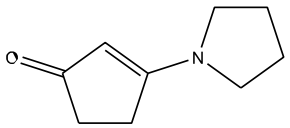
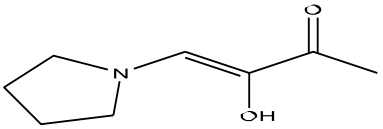
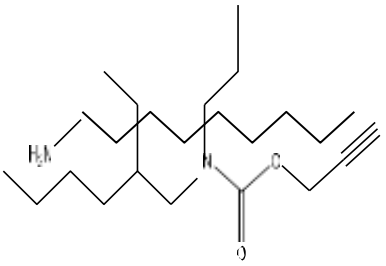
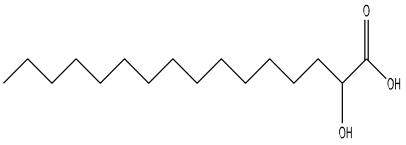
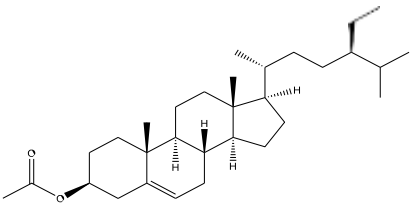


Fig. 12: Gas Chromatography

Table 7: GC-MS spectral analysis of ethanolic extract of *Leucomeris spectabilis leaves*

S.No.	R. Time	Name	Mol. formula	Mol. weight	Area %	Structure	Category
1	6.768	4-Cyclopentene-1,3-dione	$C_5H_4O_2$	96	1.11		Cyclic diketone
2	10.660	1-(1'-Pyrrolidinyl)-2-propanone	$C_7H_{13}NO$	127	2.74		Alkaloid
3	18.346	Pyrazine, 2-ethyl-5-methyl	$C_7H_{10}N_2$	122	1.72		Alkaloid
4	19.119	2-Methoxy-4-vinylphenol	$C_9H_{10}O_2$	150	2.54		Isoflavonoids

5	21.235	Securinine	$C_{13}H_{15}NO_2$	217	1.13		Alkaloid
6	21.712	3-(Pyrrolidin-1-yl) cyclopent-2-en-1-one	$C_9H_{13}NO$	151	1.35		Alkaloid
7	25.393	2-Hydroxy-1-(1'-pyrrolidiyl)-1-buten-3-one	$C_8H_{13}NO_2$	155	7.11		Alkaloid
8	31.612	Nonyl amine	$C_{15}H_{29}N$	223	7.12		amine
9	31.681	Carbonic acid, monoamide, N-propyl-N-(2-ethylhexyl)-propargyl ester	$C_{15}H_{27}NO_2$	253	7.13		Pseudo alkaloid
10	31.785	Tetradecanoic acid	$C_{14}H_{28}O_2$	228	1.60		Fatty acid
11	33.886	Hexadecanoic acid, methyl ester	$C_{17}H_{34}O_2$	270	1.69		Fatty acid
12	34.586	n-Hexadecanoic acid	$C_{16}H_{32}O_2$	256	6.71		Fatty acid
13	36.173	9,12 Octadecadienoica cid (Z,Z)-, methyl este	$C_{19}H_{34}O_2$	294	1.11		Fatty acid
14	36.273	9,12,15-Octadecatrienoic acid, methyl ester	$C_{19}H_{32}O_2$	292	2.57		Fatty acid
15	36.465	Phytol	$C_{20}H_{40}O$	296	1.38		Terpenoid

16	37.324	9,12,15-Octadecatrienoic acid, (Z,Z,Z)-	$C_{18}H_{30}O_2$	278	6.89		Fatty acid
17	42.661	Hexadecanoic acid, 2-hydroxy-1	$C_{19}H_{38}O_4$	330	3.84		Fatty acid
18	44.277	n-Propyl 9,12-octadecadienoate	$C_{21}H_{38}O_2$	322	1.66		Fatty acid
19	44.343	Methyl 5,11,14,17-eicosatetraenoate	$C_{21}H_{34}O_2$	318	2.71		Fatty acid
20	45.179	13-Docosenamide	$C_{22}H_{43}NO$	337	5.05		Fatty amides
21	45.738	beta-Sitosterol acetate	$C_{31}H_{52}O_2$	456	1.11		Triterpenoid

4. DISCUSSION

The existing research on *Leucomeris spectabilis* leaves are 10 -25cm length, 3.5 - 9 cm breadth and 1 mm thickness, shape Ovate, taste Bitter odor characteristic and leaf apex is acute. show casing a range of pharmacological benefits. Investigations into this plant have revealed the presence of essential phytoconstituents such as flavonoids, alkaloids, glycosides, tannins and others. These compounds have been identified as responsible for a variety of therapeutic properties, including its effectiveness in managing diabetes, displaying antimicrobial activity, reducing inflammation, acting as an antioxidant, offering neuroprotection, and lowering lipid levels. Further research is essential to develop deeper into the medicinal properties and various phytoconstituents responsible for these pharmacological effects, aiming to develop more reliable and safer treatments for the well-being of humanity in the future.

5. CONCLUSION

It can be concluded that Pharmacognostical, physicochemical values, phytochemical study, thin layer chromatography and GC-MS analysis are useful in authentication of *Leucomeris spectabilis.*

6. DECLARATION

Ethics approval and consent to participate- Not applicable

Consent for publication - Not applicable

Availability of data and materials – All data and material are available upon request.

Competing Interests- The author has declared that no conflicts of interest exist.

Funding- No financial support

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