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Research Article

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GC-MS studies and phytochemical screening of *Sesbania grandiflora* L.

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ABSTRACT

The present study is performed to investigate the phytochemical studies selected medicinal plants such as Sesbania grandiflora. L. Soxhlet apparatus was used for the organic solvent extraction. Water and methanol are used as solvents. Qualitative analysis of plant is carried out using standard chemical methods. The results reveal that the presence of alkaloids, carbohydrates, phenolic compound, tannin, flavonoids and saponins were found in plant extracts. The investigation was carried out to determine the possible chemical compound of Sesbania grandiflora. L by GC-MS analysis.

Key words: Qualitative analysis, GC-MS analysis of *Sesbania grandiflora. L*

INTRODUCTION

Medicinal plants are of great importance to the health of individuals and communities. Many of these indigenous medicinal plants are used as spices and food plants. They are sometimes added to foods meant for pregnant and nursing mothers for medicinal purposes [1]. Plants are the richest resource of drugs of traditional systems of medicine, modern medicines, nutraceuticals, food supplements, folk medicines, pharmaceutical intermediates and chemical entities for synthetic drugs [2].

Medicinal plants are generally used in traditional medicine for the treatment of many ailments. Medicinal plants contain some organic compounds which produce definite physiological action on the human body and these bioactive substances [3]. Plants are found to be sources of many chemical compounds, most of which account for their various uses by man. The most important of these compounds are alkaloids, terpenoid, steroid, phenolic compound, glycosides and tannin [4]. The whole plant does not used as food, but the juice is traditional used to ulcer, headache, and cough, anti asthma, and pesticides and Neurons protective. The quantitative estimation of phytoconstituents and trace elements of the plant study establishes the resources of proteins, carbohydrates, vitamins [3]. Today natural products derived from plants are being tested for presence of new drugs with new modes of pharmacological action [9].

Hence the present investigation is carried out to determine the possible chemical constituents of *Sesbania grandiflora. L* by GC -MS analysis.

EXPERIMENTAL SECTION

Collection of plant materials

Fresh parts of plant *Sesbania grandiflora*. *L* leaves are collected from Nallamanayakanpatty, Manapparai, Trichy, Tamilnadu. The plant materials were identified by botanically. The plant materials were shade dried until all the water molecules evaporated and plants became well dried for grinding after drying, the plant materials were ground well using mechanical blender into fine powder and transferred into airtight containers with proper labeling for future use.

Preparation of plants extracts

Solvent extraction

Crude plant extract were prepared by Soxhlet extraction method. About 150 g of powdered plant materials were uniformly packed into a thimble and extracted with 500 ml of different solvents separately, methanol was used as solvent. The process of extraction continues for 24 hours or till the solvent in siphon tube of an extractor become colorless. After that the extract was taken in a beaker and kept on hot plate and heated at 30-40 ºC till all the solvent got evaporated. Dried extract was kept in refrigerator at 4 ºC for phytochemical analysis.

Instruments and chromatographic condition

GC – MS analysis was carried out on a GC clarus 500 Perkin Elmer system comprising a AOC – 20i auto sampler and gas chromatograph interfaced to a mass spectrometer (GC - MS) instrument employing the following conditions: column Elite-1 fused silica capillary column (30 x 0.25 mm ID x 1EM df, composed of 100% 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 0.5 EI was employed (split ratio of 10:1) injector temperature 250^{o}C; ion-source temperature 280^{o}C. The oven temperature was programmed from 110^{o}C (isothermal for 2 min), with an increase of 10^{o}C/min, 200^{o}C/min, then 5 ^{o}C/min to 280 ^{o}C/min, ending with a 9 min isotherman at 280 ^{o}C. Mass spectra were taken at 70 eV; a scan interval of 0.5 s and fragments from 40 to 550 Da.

Identification of components

Interpretation on mass spectrum of GC – MS was done using the database of National Institute Standard and Technology (NIST) having more than 62,000 patterns. The mass spectrum of the unknown component was compared with the spectrum of the known compounds stored in the NIST library. The name, molecular weight and structure of the components of the test materials were ascertained [7].

RESULTS AND DISCUSSION

The plant *Sesbania grandiflora*. *L* is selected for the present study. The plant extracts are subjected to phytochemical, bacteriological and heavy metal analysis. The obtained results are discussed in this chapter.

Preliminary phytochemical analysis

Phytochemical screening of Methanol extracts *Sesbania grandiflora*. *L* have been analysed. Phytochemical analysis conducted on the plant extracts which revealed at the presence of constituents which are known to exhibit medicinal active compounds as well as physiological activities. Analysis of the plant extracts shown the presence of phytochemicals such as alkaloids, carbohydrates, saponin, tannin, chlorogenic acid, flavonoid, saponin, anthocyanin, glycosides, steroidal glycosides and phenolic compounds. They are shown in the table.1

ANALYSIS OF HEAVY METALS

The leaf extract was subjected to heavy metal analysis. The metals are sodium, potassium, phosphorus, manganese, iron, calcium, zinc, lead, mercury, copper, nickel and magnesium are found in the plant extracts. In the present study, the heavy metals like potassium are found to be 20.8 ppm in the *Sesbania grandiflora* leaf extracts. Similarly Sodium, phosphorus, manganese, iron, calcium, zinc, copper, nickel, magnesium have 2.86 ppm, 8.4 ppm, 0.006 ppm, 2.80 ppm, 21 ppm, 0.051 ppm, 0.038 ppm, 0.025 ppm, 3.05 ppm respectively. Lead and mercury is not detected in the extracts table – 2.

Table : 1 Preliminary phytochemical analysis of Sesbania grandiflora. L extract

Sl. No.	Name of the Test	Phytochemical consitituents	Methanolic Extract	Aqueous Extract
1	Mayer's test Dragondraff test Wagner Test	Alkaloids	+ ++ +	- + -
2	Molish Test Fehling Test Benedicts Test	Carbohydrates	++ - +	+ - +
3	Foam Test	Saponins	+	-
4	Lead Acetate Test	Tannins	+	+
5	Ferric Chloride Test	Pseudo tannins	Condensed Tannin	-
6	Ammonia Test	Chlorogenic Acid	+	+
7	Salkowaski Test	Steroidal Glycosides	+	-
8	H_2SO_4 Test	Anthocyanin	+	-
9	Liebermann's Burchard Test	Steroidal Glycosides	-	-
10	$H_2SO_{4\ Test}$	Saponins Glycosides	++	-
11	Ammonia Test	Flavonoids	+++	++
12	Shinoda's Test	Flavones	-	-
13	Ferric Chloride Test	Phenols	++	++
14	Sodium Chloride Test	Coumarin	+	+
15	Borntrager's Test	Anthracene Glycoside	-	+

+ = Present ++ = Moderate +++ = High - = Absent

Table: 2 GC-MS Analysis of phytochemicals identified from *Sesbania grandiflora. L* extract

S. No.	RT	*Name of the compound*	*Molecular Formula*	*Molecular Weight*	*Peak Area (%)*
1	3.02	3,4,5-Trimethoxyphenol	$C_9H_{12}O_4$	184.18	2.5
2	4.96	Erucic acid	$C_{22}H_{42}O_2$	338	2.8
3	5.71	Phytofluene	$C_{40}H_{62}$	542	1.05
4	6.55	2-Furancarboxaldehyde	$C_5H_4O_2$	96.08	2.8
5	7.05	Nonanoic acid, methyl ester	$C_{10}H_{20}O_2$	172	1.36
6	8.35	Acrylonitrile	C_3H_3N	53.06	0.033
7	9.02	4-methyloxazole	$C_4H_5N\ O$	83.09	0.056
8	10.54	1-Propanol, 2-methyl-	$C_4H_{10}O$	74.12	0.664
9	14.23	3-Hexen-2-one, 3,4-dimethyl-	$C_8H_{14}O$	126.19	0.042
10	17.28	Benzoic acid, 4-ethoxy-,ethyl ester	$C_{11}H_{14}O_3$	194.23	1.12
11	18.12	6-Octadecenoic acid, methyl ester	$C_{19}H_{36}O_2$	296.49	1.25
12	20.5	3,5-di-t-butyl phenol	$C_{14}H_{22}O$	206	1.2
13	22.76	Urea	CH_4N_2O	60.06	0.064
14	26.1	Palmticacid (Hexadecanoicacid)	$C_{16}H_{32}O_2$	256	11.8
15	27.3	9-hexadecenol	$C_{16}H_{32}O$	238	9.0
16	28.8	Dioctyl ester	$C_{24}H_{38}O_4$	390	10.1
17	29.84	Vitamin E acetate	$C_{31}H_{52}O_3$	472	3.13
18	30.662	Malonic acid, ethyl 3-hexyl ester	$C_{11}H_{20}O_4$	216.27	1.44

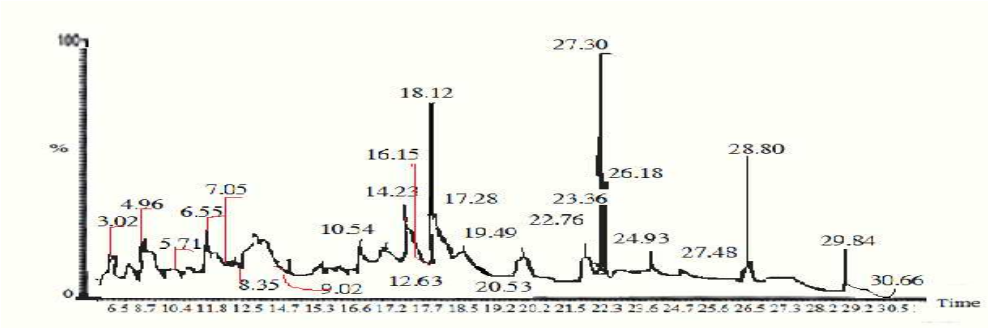
GC – MS studies

Eighteen compounds were identified in ***Sesbania grandiflora. L*** *by GC – MS analysis. The active principles with their retention time (RT), molecular formula (MF), molecular weight (MW) and concentration (%) are present in (Table-3 and figure- 1).* The GC – MS analysis revealed that the methanolic extract is mainly composed of oxygenated hydrocarbons and predominantly phenolic hydrocarbons. These phytochemicals are responsible for various pharmacological actions like antimicrobial activity. This study is only a preliminary study of the occurrence of certain properties of ***Sesbania grandiflora. L*** extract an in-depth study will provide a good concrete base for all the bio chemical and the phytochemical function mentioned above. 3,4,5-Trimethoxyphenol (2.5 %), Erucic acid (2.8 %), 2-Furancarboxaldehyde (2.8 %), Vitamin E acetate (3.13%), 4-methyloxazole (5 %), Palmticacid (11.8 %), 9-hexadecenol (9.0 %), Dioctyl ester (10.1 %) are major compounds.

Table: 3 Activity of phytochemicals identified from *Sesbania grandiflora. L extract by* GC-MS Analysis

S. No.	RT	*Name of the compound*	*Molecular Formula*	Nature	Activity
1	3.02	3,4,5-Trimethoxyphenol	$C_9H_{12}O_4$	Phenolic compound	Antibacterial and anti-fungal
2	4.96	Erucic acid	$C_{22}H_{42}O_2$	Acidic Compound	Antioxidants
3	5.71	Phytofluene	$C_{40}H_{62}$	carotenoid	antioxidants, anti-inflammatory
4	6.55	2-Furancarboxaldehyde	$C_5H_4O_2$	Aldehyde compound	Antimicrobial, Antifungal
5	7.05	Nonanoic acid, methyl ester	$C_{10}H_{20}O_2$	Acidic Compound	Antimicrobial
6	8.35	Acrylonitrile	C_3H_3N	Nitrile compound	Anti-Proliferative, Anti-tumour, activity
7	9.02	4-methyloxazole	C_4H_5NO	Oxazole derivative compound	Anti-bacterial, Anti-inflammatory
8	10.54	1-Propanol, 2-methyl-	$C_4H_{10}O$	Alcohol compound	Enzymatic activity
9	14.23	3-Hexen-2-one, 3,4-dimethyl-	$C_8H_{14}O$	Alkene compound	Antimicrobial
10	17.28	Benzoic acid, 4-ethoxy-,ethyl ester	$C_{11}H_{14}O_3$	Unknown	Antifungal
11	18.12	6-Octadecenoic acid, methyl ester	$C_{19}H_{36}O_2$	Unknown	Antimicrobial
12	20.5	3,5-di-t-butyl phenol	$C_{14}H_{22}O$	Phenolic compound	Antimicrobial
13	22.76	Urea	CH_4N_2O	Amide compound	Antibacterial
14	26.1	Hexadecanoic acid	$C_{16}H_{32}O_2$	Fatty acid	Antimicrobial
15	27.3	9-hexadecenol	$C_{16}H_{32}O$	Aldehyde	Antimicrobial
16	28.8	Dioctyl ester	$C_{24}H_{38}O_4$	Ester	Antimicrobial
17	29.84	Vitamin E acetate	$C_{31}H_{52}O_3$	vitamins	Biological activity
18	30.662	Malonic acid, ethyl 3-hexyl ester	$C_{11}H_{20}O_4$	Ester compound	Antimicrobial

Figure: 1 GC MS spectra of phytochemicals from *Sesbania grandiflora. L* extract



The methanol extracts of the *Sesbania grandiflora* many bioactive chemical compounds qualitative analysis. Alkaloids, glycosides, steroid, terpenoid and tannin are identified by the extract of *Sesbania grandiflora* spectral data from GC - MS studies presents that the major 18 compounds are identified in *Sesbania grandiflora.* The compounds are like that . 3,4,5-Trimethoxyphenol (2.5 %), Erucic acid (2.8 %), 2-Furancarboxaldehyde (2.8 %), Vitamin E acetate (3.13%), 4-methyloxazole (5 %), Palmticacid (11.8 %), 9-hexadecenol (9.0 %), Dioctyl ester (10.1 %) are major compounds by GC-MS analysis. The traditional and modern medicine practice is recommended strongly for this plant as well as it is suggested that further work should be carried out to separation of Phytochemical, purify and structural characterization of the active Phytochemical constituents responsible for the activity of these medicinal plants.

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