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Research Article

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GC-MS analysis of stem bark extracts of *Senna alata* (L.)

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ABSTRACT

The aim of the study was to investigate the stem bark Extracts of Senna alata phytochemical compounds of ethanol extract. The phyto compounds were screened by qualitative and GC-MS method. Qualitatively the different extracts were analyzed the compounds were found to like alkaloids, saponins flavonoids, tannins, glycosides, whereas reducing sugar, quinines, and coumarins, totally absent in this plant. In the GC-MS analysis, 22 bioactive compounds were identified in the ethanol extract of stem bark of Senna alata.

Key words: *Senna alata*, Phytochemical, GC-MS.

INTRODUCTION

Cassia alata (Synonym; *Senna alata*) belonging to the family Leguminosae, commonly known as seven golden candlesticks, and ring worm Senna [1]. This plant is native to the West Indies, tropical America, found throughout India and Pakistan [2]. *C. alata* with golden blooms is a summer bloomer and a striking spring that last several weeks but prefer cooler month for flowering [3, 4]. This shrub may grow up to 3 meters tall with irregular, angled, glabrous branches. Flowers have bright yellow colour. It has long, membranous, dehiscent pods with 25 or more seeds per pod [5, 6].

Cassia alata is widely used as traditional medicine in India and Southeast Asia [7]. This plant is reported to possess insecticidal, anti-inflammatory, hydragogue, sudorific, diuretic, pesticidal properties. Fresh leaves juice is used for ring worm, snakebite, scorpion bite, skin diseases, impetigo, syphilis sores, itching, mycosis (washerman's itch), herbs and eczema. Roots, leaves and flowers of this plant possess many biological properties such as antibacterial, antifungal, anti-inflammatory, antitumor, expectorant and also useful in urinary tract problems [1], asthma, bronchitis and constipation [8]. The ethyl acetate extract of *C. alata* leaves possesss hypoglycaemic activity [3]. This plant also has hepatoproductive property. The present investigation was undertaken to study the phytochemicals present in the stem bark extracts of this plant by GC-MS method.

EXPERIMENTAL SECTION

Collection of plant material

The stem of *Senna alata* were collected from its natural habitat in and around Mannargudi, Thiruvarur district, Tamilnadu, India.

Preparation of plant extract
Fresh plant was shade dried at room temperature for 10 days and powdered coarsely using electric blender. The plant powder (10 gm) was taken and mixed with ethanol (150 ml).The mixture was boiled until and it was reduced to one third. The extract was filtered with a muslin cloth. The filtrate was transferred in to china dish and was allowed to evaporate using water bath. The obtained paste form of the extract was used for phytochemical and antioxidant activity.

Preliminary phytochemical screening
Phytochemical analysis of the extract was conducted following the procedure of Indian pharmacopeia, (1985).

Gas chromatography-Mass spectrometry Analysis:
For quantitation (area %), the GC analyses were carried out by using JEOL JMS-700 by the electron impact method where an electronic accelerating voltage of 75eV and an ion accelerating voltage of 8 - 10kV. The reservoir inlet systems were used. The capillary columns were: nonpolar column DB-5MS (J&W Scientific; 30 m x 0.25 mm, film thickness 0.25 μm) and polar column TC-Wax (60 m x 0.25 mm, film thickness 0.25 μm). The dynamic range for the peak intensities was 3 digits, and the accuracy of the mass number was 0.5. The oven temperature was programmed from 40°-240°C at a rate of 4°C/min and held at 240°C for 5 min. The injector and detector temperatures were 240°C and 280°C. The flow rates of the carrier gas (He) were 1.8mL/min. GLC data reported are given as area percentage. He at 49.9 KPa was used as carrier gas and the FID detector was maintained at 250°C. The oil constituents were identified on the basis of their retention data and by using GC/MS analytical conditions similar to that of GC/FID. The mass spectra were recorded on a mass spectrometer coupled to a JEOL JMS-700 gas chromatograph (EI mode 70 eV, source temperature 230°C, scanned mass ranged 35 – 350 amu). The characteristic fragmentation patterns have been analyzed and compared to those of Wiley 275.L database.

Identification of compounds
The identification of the compounds was based on comparison with the library spectra (NIST-I, NIST-2, Wiley 275 and Adams libraries) of their relative retention indices with literature values [9, 10]. The relative percentage amount of each component was calculated by comparing its average peak area to the total areas. The name, molecular weight, molecular formula and structure of the component of the test material were determined and the data are presented.

RESULTS AND DISCUSSION

Preliminary phytochemical analysis
Preliminary phytochemical analysis of ethanol extract of the stem of *Senna alata* revealed the presence of alkaloids, flavonoids,phenols, saponins, tannins and glycosides (Table 1**).** Several investigation have been attributed to study the phytochemical compounds in *Senna alata* and it was found that the results of the result of the phytochemical analysis conducted in this study are in accordance to those previous reports on the plant [11,12]

Gas Chromatography Mass Spectrophotometry Analysis (GC-MS)
GC-MS is one of the best techniques to identify the constituents of volatile matter, long chain, branched chain hydrocarbons, alcohols acids and esters etc.

The GC-MS analysis of *Senna alata* stem revealed the presence of twenty two compounds (phytochemical constituents) that could contribute the medicinal quality of the plant **(**Table 2 and Figure 1**).** The identification of the phytochemical compounds was confirmed based on the peak area, retention time and molecular formula. The results revealed that glycerin (36.90%), n-Hexadecanoic acid (11.11%), 4H-Pyran-4-one, 2,3-dohydro-3,5-dihydroxy-6-metyl (10.95%), 1,3;2,5-Dimethylene-l-rhamnitol (9.05%), 2-Furancarboxaldehyde,5-(hydroxymetyl) (8.52%), 6-Octadecenoic acid,(Z) (8.87%), were found as the major components in the ethanol extract and the other minor components such as Propanoic acid, 2-oxo-,metyl ester (1.09%), Furfural (0.44%), 2-Furanmethanol (0.66%), 2-Cyclopentene-1,4-dione (0.34%), Butanoic acid, 4-hydroxy- (0.37%), 1,2-Cyclopentanedione (0.97%), 2-Furancarboxaldehyde, 5-methyl- (0.60%), 2,4-Dihyroxy-2,5-dimethyl-3(2H)-furan-3-one (0.51%), 2,4(1H,3H)-Pyrimidinedione, dihydro-1,3-dimethyl-(0.27%),2-Methoxy-4-vinylphenol,1,6;3,4-Dianhydro-2-O-acetyl-α-d allopyranose (2.20%), Phenol,2,6-dimethoxy- (0.38%), D-Allose (0.46%), 3-O-Methyl-d-glucose (0.79%), α-D-Glucopyranoside, α-D-glucopyranosyl (0.87%), Myo-Inositol,2-C-methyl- (3.67 %).

The GC-MS chromatogram of chloroform fraction of *H.benghalensis* was revealed the presence of 55 active phytocomponents. Phytochemical compounds are known to play an important role in identify the bioactivity of medicinal plants. The phytocomponents reported from the GC-MS study on the leaf fraction of the plant has been first of its kind and all the biological activities related to the plant may be due to its major constituents namely phenol, 2, 4-bis (1,1- methylethyl) (5.9645%) which is reported to possess antioxidant property [13], E-15-Heptadecenal (3.6761%) and a – Cedrene, a sesquiterpene by nature (0.1123%) are reported to possess anticancer, antioxidant and antimicrobial activity [14]. while Tetradecanoicacid (1.2249%), Octadecene (6.7182%), hexadecanoic acid etyl ester (3.7915%) and Eicosane (1.5175%) have also been reported with antioxidant and antimicrobial activities.

Table 1: Preliminary phytochemical screening of ethanolic extract of *Senna alata*

S.No	Constituents	Results
1	Alkaloids	+
2	Flavonoids	+
3	Saponins	+
4	Quinones	-
5	Tannins	+
6	Steroids/Teiterpenoids	-
7	Phenols	+
8	Coumarins	-
9	Glycosides	+
10	Phlobtannins	-
11	Reducing sugar	-

+ are indicate presence – are indicate absence

Table: 2 Phytocomponents identified in the ethanol extracts of *Senna alata* by GC-MS

S.No	Peak name	Molecular weight	Molecular formula	Retention time	%Peak area
1.	Propanoic acid, 2-oxo-,methyl ester	102	$C_4H_6O_3$	3.06	1.0955
2.	Furfural	96	$C_5H_4O_2$	3.61	0.4481
3.	2-Furanmethanol	98	$C_5H_6O_2$	4.03	0.6635
4.	2-Cyclopentene-1,4-dione	96	$C_5H_4O_2$	4.38	0.3410
5.	Butanoic acid, 4-hydroxy	104	$C_4H_8O_3$	4.90	0.3762
6.	1,2-Cyclopentanedione	98	$C_5H_6O_2$	5.24	0.9705
7.	2- Furancarboxaldehyde, 5-methyl-	110	$C_7H_7O_2$	5.75	0.6045
8.	2,4-Dihydroxy -2,5-dimethyl-3(2H)-furan-3-one	144	$C_6H_8O_4$	6.02	0.5197
9.	Glycerine	92	$C_3H_8O_3$	8.36	36.9034
10.	4H-Pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6-methyl-	144	$C_6H_8O_4$	10.33	10.9593
	2,4(1H,3H)-Pyrimidinedione,dihydro-1,3-dimethyl-	142	$C_6H_{10}N_2O_2$	11.53	0.2778
11.	2-Furancarboxaldehyde,5-(hydroxymetyl)-	12.63	$C_6H_6O_3$	12.63	8.5265
12.	2-Methoxy-4-vinylphenol	150	$C_9H_{10}O_2$	14.07	0.8777
13.	1,6;3,4-Dianhydro-2-O-acetyl-α-d-allopyranose	186	$C_8H_{10}O_5$	14.52	2.2051
14.	Phenol,2,6-dimethoxy-	154	$C_8H_{10}O_3$	14.82	0.3812
15.	1,3;2,5-Dimethylene-I-rhamnitol	190	$C_8H_{14}O_5$	19.08	9.0587
16.	D-Allose	180	$C_6H_{12}O_6$	20.15	0.4652
17.	3-O-Methyl-d-glucose	194	$C_7H_{14}O_6$	28.94	0.7900
18.	n-Hexadecanoic acid	256	$C_{16}H_{32}O_2$	31.44	11.1139
19.	6-Octadecenoic acid,(Z)	282	$C_{18}H_{34}O_2$	35.62	8.8736
20.	α-D-Glucopyranoside, α-D-glucopyranosyl	342	$C_{12}H_{22}O_{11}$	40.20	0.8711
21.	Myo-Inositol,2-C-metyl-	194	$C_7H_{14}O_6$	45.91	3.6776

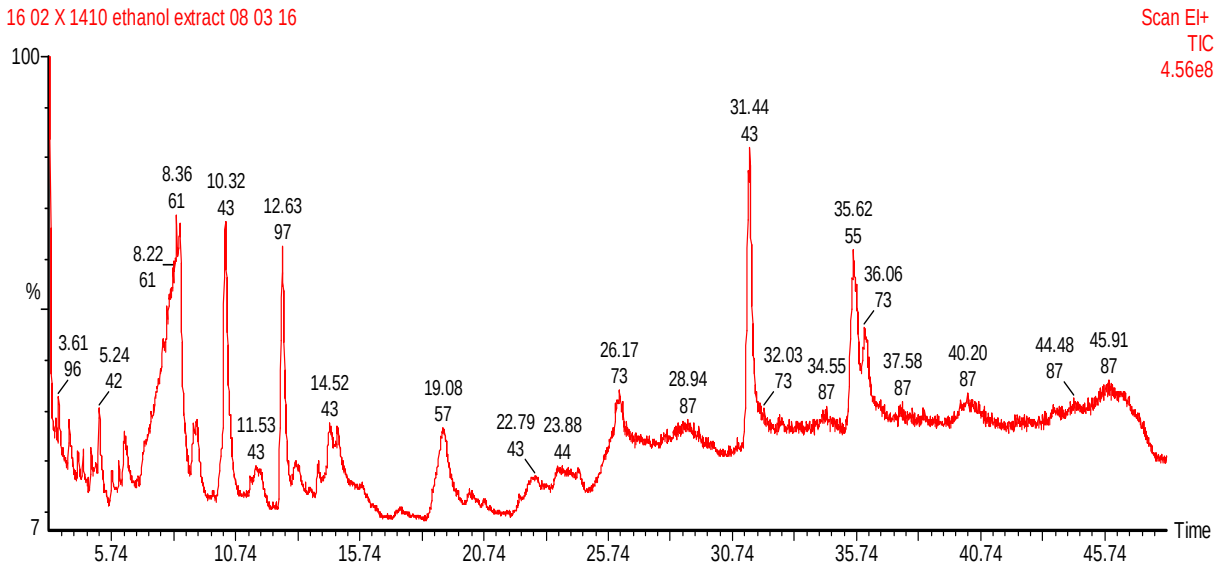

Figure 1: GC-MS Chromatogram of ethanolic extract of *Senna alata*

CONCLUSION

Traditional knowledge with its holistic and systematic approach supported by experimental base can serve as an innovative and powerful discovery engine for newer, safer and affordable medicines. The various bioactive compounds reported from the GC-MS analysis and subsequent literature evidences of their medicinal activities provide ample proof to the therapeutic and pharmacological potential of *Senna alata* which needs to be further explored and validated so as to use it as a potential force in the field of health care against many diseases.

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