Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

J P P Journal of Pharmacognosy and Phytochemistry

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2015; 3(6): 193-196
Received: 01-02-2015
Accepted: 28-03-2015

V. Nanadagopalan
PG & Research Department of Botany National College (Autonomous) Tiruchirappalli – 620 001, India

M. Johnson Gritto
PG & Research Department of Botany National College (Autonomous) Tiruchirappalli – 620 001, India

A. Doss
PG & Research Department of Botany National College (Autonomous) Tiruchirappalli – 620 001, India

Correspondence:
V. Nanadagopalan
Associate Professor, PG & Research Department of Botany, National College, Tiruchirappalli- 620 001, Tamil Nadu, South India.

GC-MS analysis of biomolecules on the leaves extract of *Sterculia urens* Roxb

V. Nanadagopalan, M. Johnson Gritto, A. Doss

Abstract
The present study of phytochemical analysis in the leaf powder extract with methanol, the phytochemical compound screened by GC-MS method. In this GC-MS analysis, 27 bioactive phytochemical compounds were identified in leaf powder of *Sterculia urens*. These different active phytochemicals have been found to possess a wide range of activities, which may help in the protection against incurable diseases.

Keywords: GC-MS, Medicinal Plants, Phytol, Phytochemicals, *Sterculia urens*

1. Introduction
The chemical compound 3, 7, 11, 15-Tetramethyl-2-hexadecen-1-ol also known as phytol was the highest chemical constituent analysed. It had a peak area of 37.78%. It is an acyclic diterpene alcohol that can be used as a precursor for the manufacture of synthetic forms of vitamin E and vitamin K1 [1, 2]. Phytol is used in the fragrance industry and in cosmetics, shampoos, toilet soaps, household cleaners and detergents [3, 4]. Phytol uses may also include increasing energy and fighting infection and are natural alternatives to use for hypertension and cancer [1, 2, 3]. Phytol has been reported to have anti-mycobacterial activity against mycobacterium tuberculosis [2, 5]. The high quantity of phytol in the leaf of *S. urens* suggests that the plant might be used in the treatment of tuberculosis. The medicinal plants appear to be rich in phytoconstituents, widely used in conventional medicine to combat and cure various diseases. The anti-inflammatory, anti-diabetic, antibacterial, anticancer, antioxidant, antispasmodic, analgesic and diuretic can be attributed to their high level of Phytoconstituents.
Sterculiaceae is a botanical name for a group of flowering plants at the rank of family and, as is true for any botanical name, the circumscription, status and placement of the taxon varies with taxonomic point of view. The family name is based on genus Sterculia. As traditionally circumscribed the Sterculiaceae, Malvaceae, Bombacaceae and Tiliaceae comprise the "core Malvales" of the Cronquist system and the close relationship among these families is generally recognized [6]. *Sterculia urens* is a moderate sized tree belonging to the family Sterculiaceae. It is commonly known as 'gum karaya tree' and it is valued for its gum known as 'Indian tragacanth'. In India, *S.urens* is used to treat fistula, rhagades, with the indigenous use which is known as sandal. It is used as an ingredient in the preparation of emulsions, lotions, denture fixative powders and bulk laxatives [7].
It has a wide application in food, baking and dairy industries. The gum is a complex polysaccharide. The gum is in great demand both within and outside India. Considerable part of the gum produced in India is exported. Tapping of the gum requires stripping of the bark. As the tree is easily injured, indiscriminate tapping of young tree impairs their viability. Unscientific tapping methods, poor seed viability and meager distribution of this tree are limitations for the availability of the gum. In spite of the rich commercial importance, it grows only as a wild forest plant and is enlisted as an endangered plant species. The aim of the present study is to identify the active biomolecules of this plant and subjecting the methanol extract of the plant leaves to Gas chromatography – Mass Spectrum analysis.

2. Materials and Methods
2.1. Collection of plant material
The leaves of *Sterculia urens* were collected from the Pachamalai, Eastern Ghats of Tamilnadu, South India. The hill is situated 2000 to 3000 feet above mean sea level and lies between 78.31' East and 11.28'North latitude. They were identified and authenticated by the Rabinat Herbarium (Ref No. SJCBOT 2086), St. Joseph's College, Tiruchirappalli, Tamilnadu, India.

2.2. Preparation of powder and extract

Leaves of *Sterculia urens* (5 g) was shade dried, powdered and extracted with methanol for 24 hours using cold maceration methods (Advantages: 1. The drug is extracted as many times as there are receivers – in this case, three. If more extraction stages are required, it is only necessary to have more receivers. 2. The last treatment of the drug before it is discharged is with fresh solvent, giving maximum extraction. 3. The solution is in contact with fresh drug before removal for evaporation, giving the highest possible concentration). The extract was then filtered through Whatman filter paper No. 1 along with 2 g sodium sulfate to remove the sediments and traces of water in the filtrate. Before filtering, the filter paper along with sodium sulphate is wetted with absolute alcohol. The filtrate is then concentrated by bubbling nitrogen gas into the solution and reduce the volume to 1ml.The extract contains both polar and non-polar phyto components.

2.3. GC-MS Analysis

The GC-MS analysis of *Sterculia urens* powder leaves extract with in methanol, was performed using a Clarus 500 Perkin Elmer gas chromatography equipped with a Elite-5 capillary column (5% phenyl 95% dimethyl polysiloxane) (30 nm X 0.25 mm ID X 0.25 µmdf) and mass detector turbomass gold of the company which was operated in EI mode. Helium was the carriers gas at a flow rate of 1ml/min. and the injector was operated at 290 ºC and the oven temperature was programmed as follows; 50 ºC at 8 ºC/min to 200 ºC (5 min) at 7 ºC/min to 290 ºC (10 min).

2.4. 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 components stored in the (NIST), library. The name, molecular weight and structure of the components of the test materials were ascertained [8, 9].

3. Results and Discussion

The GC-MS analysis of *S. urens* leaves revealed the presence of twenty seven compounds (phytochemical constituents) that could contribute the medicinal quality of the plant. The identification of the phytochemical compounds was confirmed based on the peak area, retention time and molecular formula. The active principles with their Retention time (RT), Molecular formula, Molecular weight (MW) and peak area in percentage are presented in Figure 1. The major compounds present in the leaves were 3, 7, 11, 15-Tetramethyl-2-hexadecen-1-ol (21.34%), sucrose (11.49%), 2, 4-Dihydroxy-2, 5-dimethyl-3(2H)-furan-3-one (8.10%), 5(2H)-Oxazolone, 4-(phenylmethyl)- (6.97%), 4H-Pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6-methyl- (6.78%), Megastigmatrienone (5.93%) and 2-Methoxy-4-vinylphenol (5.27%) etc., other major and minor compounds were also present (Table 1).

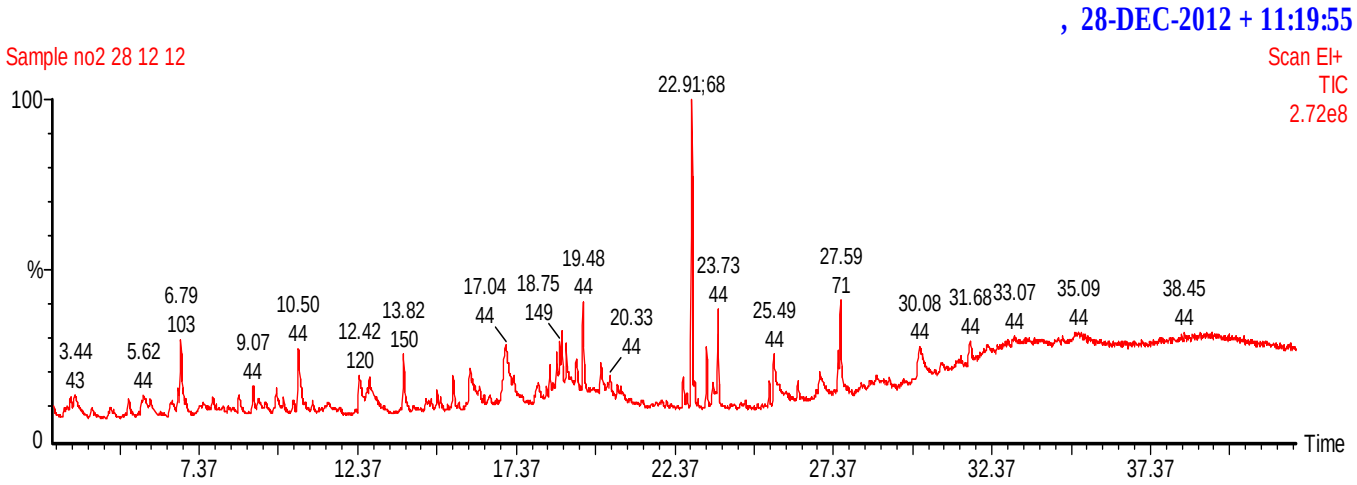

Fig 1: GC-MS profiles of leaves of *Sterculia urens*

Table 1: Compounds present in the leaves extract of *Sterculia urens* using GC-MS analysis

S. No.	Peak Name	Retention time	Peak area	%Peak area
1.	Name: 3-Amino-2-oxazolidinone Formula: C3H6N2O2 MW: 102	3.49	1087152	1.7363
2.	Name: 1,6;2,3-Dianhydro-4-O-acetyl-á-d-allopyranose Formula: C8H10O5 MW: 186	4.59	1111762	1.7756
3.	Name: 2-Cyclopenten-1-one, 2-hydroxy- Formula: C5H6O2 MW: 98	5.84	610367	0.9748
4.	Name: 2,4-Dihydroxy-2,5-dimethyl-3(2H)-furan-3-one Formula: C6H8O4 MW: 144	6.72	5075019	8.1055
5.	Name: 2,5-Dimethyl-4-hydroxy-3(2H)-furanone Formula: C6H8O3	8.61	1437816	2.2964

	MW: 128			
6.	Name: 3-Hexen-2-one, 3,4-dimethyl- Formula: C8H14O MW: 126	9.25	557997	0.8912
7.	Name: 4H-Pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6-methyl- Formula: C6H8O4 MW: 144	10.51	4247659	6.7841
8.	Name: Benzofuran, 2,3-dihydro- Formula: C8H8O MW: 120	12.42	1955631	3.1234
9.	Name: 2-Methoxy-4-vinylphenol Formula: C9H10O2 MW: 150	13.82	3303463	5.2761
10.	Name: Phenol, 2,6-dimethoxy- Formula: C8H10O3 MW: 154	14.54	328783	0.5251
11.	Name: à-D-Glucopyranosiduronamide, methyl 2,3-di-O-methyl- Formula: C9H17NO6 MW: 235	14.69	186645	0.2981
12.	Name: Benzene, 1-[(dimethoxymethyl)-1-ethyl]-4-methoxycarbonyl-1-ethyl- Formula: C15H22O4 MW: 266	14.88	1459869	2.3316
13.	Name: Sucrose Formula: C12H22O11 MW: 342	17.07	7196369	11.4936
14.	Name: 1,6-Anhydro-á-D-glucopyranose (levoglucosan) Formula: C6H10O5 MW: 162	18.07	2156719	3.4446
15.	Name: 3',5'-Dimethoxyacetophenone Formula: C10H12O3 MW: 180	18.42	911846	1.4563
16.	Name: Ethanol, 2-[4-(1,1-dimethylethyl)-2-methylphenoxy]- Formula: C13H20O2 MW: 208	18.52	10020	0.0160
17.	Name: Megastigmatrienone Formula: C13H18O MW: 190	19.47	3717073	5.9367
18.	Name: 4,4,5,8-Tetramethylchroman-2-ol Formula: C13H18O2 MW: 206	20.03	1745103	2.7872
19.	Name: 1-Cyclohexene-1-propanal, 2,6,6-trimethyl- Formula: C12H20O MW: 180	20.55	63089	0.1008
20.	Name: Benzene, 1-methoxy-2-[(4-methoxyphenyl)methyl]- Formula: C15H16O2 MW: 228	22.61	962456	1.5372
21.	Name: 3,7,11,15-Tetramethyl-2-hexadecen-1-ol Formula: C20H40O MW: 296	22.88	13363286	21.3430
22.	Name: Acetamide, N-(4-ethoxy-3-hydroxyphenyl)- Formula: C10H13NO3 MW: 195	23.55	615001	0.9822
23.	Name: n-Hexadecanoic acid Formula: C16H32O2 MW: 256	25.43	2116523	3.3804
24.	Name: Phytol Formula: C20H40O MW: 296	27.51	891830	1.4244
25.	Name: 5(2H)-Oxazolone, 4-(phenylmethyl)- Formula: C10H9NO2 MW: 175	29.91	4366027	6.9731
26.	Name: 1-Propanamine, 3-dibenz[b,e]oxepin-11(6H)-ylidene-N,N-dimethyl- Formula: C19H21NO MW: 279	34.68	2108569	3.3677
27.	Name: Squalene Formula: C30H50 MW: 410	36.84	1025973	1.6386

Phytol is one among the 27 compounds from the leaves of *S.urens*. Presence of Phytol in the leaves of *Kirganelia reticulata* aerial parts, which was also found to be effective in different stages of arthritis [9]. Abirami and Rajendran [11] reported that this compound present in *Vernonia cinerea* added medicinal properties to this species despite the presence of eight other chemical compounds. The other major compound reported in the study species, *Hildegardia populifolia*, 1-Benzazirene-1-carboxylic acid, 2, 2, 5atrimethyl-1a-[3-oxo-1-butenyl] erhydro-methyl ester is a fatty acid compound. Kale *et al*. [12] also identified major fatty acid compounds in Sterculiaceae member, *Sterculia foetida* through GC-MS analysis.

In the present study, GC-MS analysis of plant species has established the twenty seven bioactive components which may possess several pharmacological properties. Similar to this study, five major compounds were characterized through GC-MS analysis *in Polygonum chinense* [13] seventeen compounds were characterized from methanolic extract of *Cassia italica* leaf [14] seed fourteen compounds were identified from ethanolic extract of *Entada pursaetha* by GC-MS analysis [15] fourteen compounds were identified from *Caralluma fimbriata* through Phytochemical studies and GC-MS analysis [16].

The presence of various bioactive compounds in the *P. chinense* justifies the use of leaves for various ailments by traditional practitioners. However, isolation of individual phytochemical constituents and subjecting it to the biological activity will definitely give fruitful results. From the results, it could be concluded that *S. urens* contains various bioactive compounds. Therefore, it is recommended as a plant of phytopharmaceutical importance.

4. References

1. Daines AM. The synthesis of naturally occurring Vitamin K and Vitamin K analogues. Current Organic Chemistry 2003; 7:1625-1634.
2. Igwe OU. Chromatographic and spectrometric characterization of bioactive compounds from the leaves of *Hyptis lanceolata* Poir. International Journal of Chemical and Physical Sciences 2014; 2(1):547-553.
3. Mc Ginty D. Fragrance Material Review on Phytol. Food and Chemical Toxicology 2010; 48:559-563.
4. Igwe OU, Abii T. Characterization of bioactive sesquiterpenes, Organic acids and their derivatives from the leaves of *Psidium guajava* Linn. International Research Journal of Pure and Applied Chemistry 2014; 4(4):456-467.
5. Rajab MS. Antimycobacterial Activity of (E)-Phytol and Derivatives: A Preliminary Structure-activity Study. Planta Medica 1998; 64(1):2-4.
6. Watson L, Dallwitz MJ. Angiosperm Families-Sterculiaceae vent. Chemical Pharmaceutical Journal 1992; 38:23-28.
7. Hussain TM, Chandrasekhar T, Gopal GR. Micropropagation of *Sterculia urens* Roxb. an endangered tree species from intact seedlings. African Journal of Biotechnology 2008; 7(2):095-101.
8. Nezhadali A, Nabavi M, Akbarpour M. Chemical composition of ethanol/n-hexane extract of the leaf from *Tanacetum polycephalum* subsp. *duderanum* as a herbal plant in Iran. Der Pharmacia Sinica 2010; 1(3):147-150.
9. Sathyaprabha G, Kumaravel S, Panneerselvam A. Bioactive Compounds Identification of *Pleurotus platypus* and *Pleurotus eous* by GC-MS. Advances Applied Science Research 2011; 2:51.
10. Sudha T, Chidambaram Pillai S, Mohan VR. GC-MS Analysis of bioactive components of leaf and stem bark of *Kirganelia reticulata* Poir (Euphorbiaceae). Journal of Current Chemical and Pharmaceutical Sciences 2013; 3(2):113-122.
11. Abirami P, Rajendran A. GC-MS analysis of methanol extracts of *Vernonia cinerea.* European Journal of Experimental Biology 2012; 2(1):9-12.
12. Kale SS, Vijaya D, Thakur HA. Analysis of fixed oil from *Sterculia foetida* Linn. International Journal of Pharmaceutical Science and Research 2011; 2(11):2908-2911.
13. Bagavathi PE, Ramasamy N. GC–MS analysis of phytocomponents in the ethanol extract of *Polygonum Chinense* L. Pharmacognosy Research 2012; 4(1):11-14.
14. Sermakkani M, V. Thangapandian. GC-MS analysis of *Cassia Italica* leaf methanol extract. Asian Journal of Pharmaceutical and Clinical Research 2012, 5(2).
15. Kalpana DV, Shanmugasundaram R, Mohan VR. GC-MS. analysis of ethanol extract of *Entada pursaetha* seed. Bioscience Discovery 2012; 3(1):30-33.
16. Priya D, Rajaram K, Suresh KP. Phytochemical studies and GC-MS analysis of *Caralluma fimbriata* Wall. International Journal of Pharmaceutical Research and Development 2011; 3(10):105-110.