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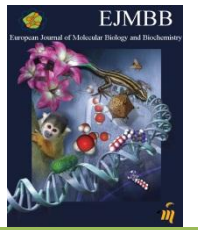

PHYTOCHEMICAL AND GC-MS ANALYSIS OF BIOACTIVE COMPOUNDS FROM *Borassus flabellifer* Linn ROOT

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ABSTRACT

Medicinal plants play a pivotal role in the health care of ancient and modern cultures .The plant *Borassus flabellifer* Linn., is one of the medicinally important plants belonging to the family Arecaceae. The present study was under taken to explore the potential bioactive compounds present in *Borrassus flaberllifer* root which have been evaluated using Phytochemical analysis and Gas Chromatography- Mass spectrometry analysis. The GC-MS analysis revealed the presence of 28 compounds which are namely Resorcinol, Phenol, Pentanoic acid, Glycerin, 10-undecenyl ester, Octadecanoic acid and n-Hexadecanoic acid. Many of these compounds are used for various applications like antioxidant, anti-inflammatory, antimicrobial, and anti-cancer activities. The results of this study offer a platform of using *Borassus flabellifer* root as herbal alternative source for various diseases.

INTRODUCTION

Medicinal plants are the richest bio-resources of folk medicines and traditional systems of medicine which are act as a food supplements, nutraceuticals and chemical entities for synthetic drugs [1]. Modern medicine has evolved from folk medicine and traditional system only after through chemical and pharmaceutical screening [2]. India is the birth place of renewed system of indigenous medicine such as Siddha, Ayurvedha and Unani. Traditional systems of medicines are prepared from a single plant or combinations of number of plants. The efficacy depends on the use of proper plant part and its biological potency which in turn depends upon the presence of required quantity and nature of secondary metabolite in a raw drug [3-4]. There is growing awareness in correlating the phytochemical constituents of a medicinal plant with its pharmacological activity [5]. Screening active compounds from plants has lead to the invention of new medicinal drugs which have efficient protection and treatment roles against various diseases, including cancer [6] and Alzhemir's diseases [7]. Phytochemicals are responsible for medicinal activity of plants .The Phytochemicals are naturally occurring in the medicinal plants that have defense mechanism and protect from various diseases. These phytochemical are very important in medicine and constitute most of the valuable drugs [8]. These biochemicals are often referred to as Secondary metabolites which is useful to traditional medicine system and these biochemicals are identify by using GC-MS technique.In recent years Gas chromatography – Mass Spectrum (GC-MS) studies have been increasingly applied for the analysis of medicinal plants as this technique has proved to be a valuable method for the analysis of essential oil,alcohols, acids, esters, alkaloids, steroids, amino and nitro compounds [9].

Palmyra palm botanically known as *Borasus flbellifer L*., belongs to the family *Arecaceae.* In India it is called the tree with 800 uses5. The coconut like fruit is three-sided when young, becoming rounded or more or less oval, 12-15 cm wide, and capped at the base with overlapping sepals [10]. The plant has been used traditionally as a stimulant, anti-laprotic, diuretic, antiphlogistic. The leaves are used to make baskets, hats and many other useful items. The fruits are stomachic,

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sedative, laxative and aphrodisiac in nature useful in hyperdipsia, dyspepsia, flatulence, skin diseases, hemorrhages, fever and general debility. The toddy, inflorescence and juice of the plant are useful in bleeding, oedema and inflammatory reactions[11] .The fresh sap is reportedly a good source of vitamin B-complex .The Palmyra fruit pulp has good water and fat absorption properties. The different parts of the plant is used for the various ailments like secondary syphilis, antiperiodic, heart burns, liver and spleen enlargement etc. Other than these pharmacological uses the juice of the plant is used in preparation of health drinks, jellies etc.So the whole plant used to cure many diseases and disorders [12]. Hence the present study focused on GC-MS analysis of bioactive compounds from *Borassus flabellifer* Linn root and their application in pharmaceutical industry.

MATERIALS AND METHODS

Collection of Roots

B. flabellifer roots were collected from Thanjavur District, Tamil Nadu. It was peeled and washed with water. The root was shadow dried and powdered. The powdered materials were packed in aluminum pouch and stored in atmospheric condition.

Plant sample Extraction

The *B. flabellifer* roots were collected and they were shadow dried at room temperature. The dried roots were subjected to size reduction to a coarse powder by using dry grinder and passed through sieve. 100 g of crushed roots were continuously extracted with ethanol using soxhlet up to 48 h. The extract was filtered and concentrated in rotatory evaporator at 35-40ºC under reduced pressure to obtain a semisolid material, which was then lyophilized to get a powder (28.5%, w/v).

GC-MS spectra

The GC-MS analysis was carried out using a Clarus 500 Perkin- Elmer Gas Chromatograph equipped and coupled to a mass detector Turbo mass ver5.2.0 – Perking Elmer Turbomas 5.2 spectrometer with an Elite-(5%Phenyl 95% dimethylpolysiloxane), 30 m, 250 µm capillary column. The oven temperature was raised upto 280°C, Injection port temperature was ensured as 280°C and Helium flow rate as 1 ml/min. The ionization voltage was 70 eV. The samples were injected in split mode as 1:10. Mass Spectral scan range was set at 40-450 (mhz).
Transfer line and source temperature: 200ºC, 160ºC, Library: NIST 2005, Sample injected: 1.0µL

Identification of Compounds

The identity of the components in the extract was assigned by the comparison of their retention indices and mass spectra fragmentation patterns with those stored on the computer library and also with published literatures. National Institute of Standards and Technology library sources were also used for matching the identified components from the plant material.

RESULTS AND DISCUSSION

Plants are a tremendous source for the discovery of new products of drug development. Today several distinct chemicals derived from plants are important drugs that are currently used in more countries in the world [13]. Medicinal plants are potential source of therapeutic aids and also significant role in health system all over the world for both humans and animals. Plant based drugs remain an important source of therapeutic agents because of the availability, relatively cheaper cost and non-toxic nature when compared to modern medicine [14]. The preliminary phytochemical screening tests may be useful in the detection of the bioactive principles and subsequently leads to the drug discovery and development **(Table-1.)** GC-MS is one of the best techniques to identify the constituents of volatile matter, long chain, branched chain hydrocarbons, alcohols acids, esters etc [9]. The present study carried out GC-MS chromatogram of the ethanolic extract of *Borassus flabellifer* showed 28 major peaks **(Table-2.)** and have been identified after comparison of the mass spectra with NIST library (Table-1,2), indicating the presence of various phytocomponents. From the results, it was observed that presence of 2-Furanmethanol, Propane, 1-(1-methylethoxy), 2-Cyclopenten-1-one, 2-hydroxy-, 2,4-Dihydroxy-2,5-dimethyl-3(2H)-furan-3-one, Glycerin, 1,3-Propanediamine, 1,2-Propanediol 2-acetate, Butane, 1-(ethenyloxy)-3-methyl-, Propane, 1,1-diethoxy-,1H-Imidazole-4-carboxamide, 5-amino-, 4H-Pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6-methyl-, Resorcinol, Phenol, 2,6-dimethoxy-,6H-Purin-6-one, 2-amino-1,7-dihydro-,6H-Purin-6-one, 2-amino-1,7-dihydro-, 1,4-Benzenediol, 2-methoxy-, Phenol, 3,4-dimethoxy-, Benzene, 1-(1,5-dimethyl-4-hexenyl)-4-methyl-, Phenol, 4-[2-(dimethylamino)ethyl]-, 1-Butanol, 2-amino-, 3-Hydroxy-4-methoxybenzoic acid, Phenol, 3,4,5-trimethoxy-,; Phenol, 5-(1,5-dimethyl-4-hexenyl)-2-methyl-, (R)-, 7H-Furo[3,2-g][1]benzopyran-7-one, n-Hexadecanoic acid, Pentanoic acid, 10-undecenyl ester, Octadecanoic acid.

Stearic acid, also known as n-octadecanoic acid (C18H36O2), is a saturated, wax-like, fatty acid commonly used in the production of pharmaceutical tablets and capsules. It has antiviral and anti-inflammatory activities. In epidemiologic and clinical studies, stearic acid was found to be associated with lowered LDLcholesterol in comparison with other saturated fatty acids [15]. Hexadecanoicacid is used to Antioxidant, Hypocholesterolemic, Lubricant, Nematicide, Pesticide, Anti-androgenic, Flavor, Hemolytic,5-Alpha reductase inhibitor, Resorcinol is used as anti-inflamatory and antiulcer agent. Resorcinol widely used in medications for acne and in antibacterial and keratolytic formulations. In vitro and in vivo studies have shown that resorcinol can inhibit peroxidases in the thyroid and thus block the synthesis of thyroid hormones and cause goiter [16].

Octadecanoic acid is used to Hypocholesterolemic, antiarthritic, nematicide, 5-alpha reductase inhibitor, antiacne, and hepatoprotective activity [17]. Glycerin used on every part of the epidermis, including mucous membranes. Glycerin is one of the most widely used ingredients in medical prescriptions. Medically glycerin serves as an emollient and demulcent in preparations used on the skin and as an osmotic diuretic to manage cerebral edema, reduce cerebrospinal pressure, and lower intraocular pressure [19]. These essential bioactive compounds were present in *B. flabellifer* root extract which is very effective therapeutic agent *B. flabellifer* is used in folk medicine for multiple purposes, such as a stimulant, anti-laprotic, diuretic, antiphlogistic. The fruits are stomachic, sedative, laxative and aphrodisiac in nature useful in hyperdipsia, dyspepsia, flatulence, skin diseases, hemorrhages, fever and general debility. The roots and juice of the plant are useful in inflammatory reactions. The ash obtained by burning the inflorescence is a good antacid antipatriotic, and is useful in heart burn, splenomegaly and in bilious fever [20]. Due to the presence of above mentioned compounds in the ethanol extract of *B. flabellifer* root, it can be used in various pharmaceutical and industrial applications.

Table 1. **Phytochemical analysis of *Borassus flabellifer* L**

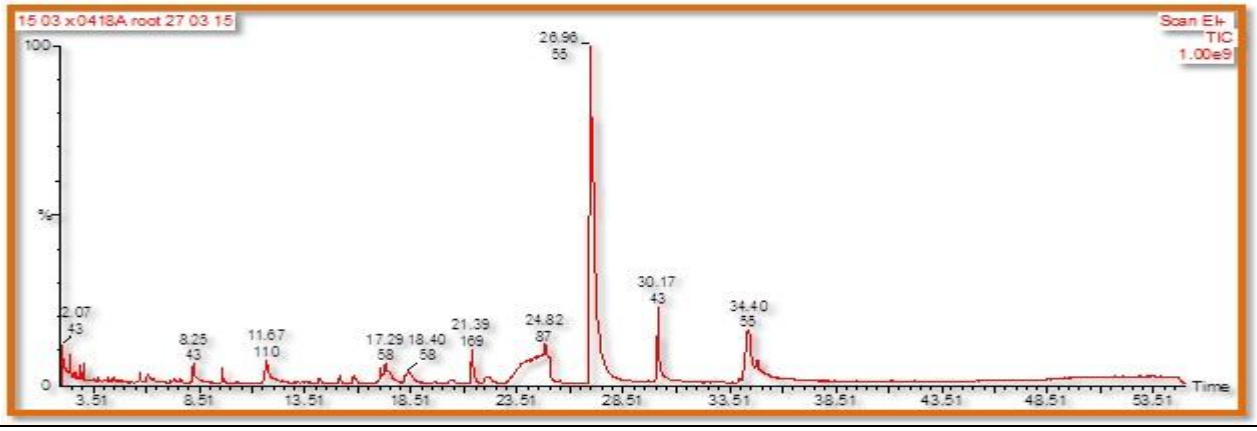
S No	Chemical Tests	Result
1	Alkaloids	+
2	Flavonoids	+
3	Tannins	+
4	Proteins	+
5	Carbohydrates	+
6	Mucilage	+
7	Saponins	-

Table 2. GC-MS Analysis of *Borassus flabellifer* L

S.No.	Peak Name	Retention Time(min)	Peak Area	% Peak area
1.	Name: 2-Furanmethanol Formula: $C_5H_6O_2$ MW: 98	3.73	510451	0.3679
2.	Name: Propane, 1-(1-methylethoxy)- Formula: $C_6H_{14}O$ MW: 102	4.21	645017	0.4648
3.	Name: 2-Cyclopenten-1-one, 2-hydroxy- Formula: $C_5H_6O_2$ MW: 98	4.86	309198	0.2228
4.	Name: 2,4-Dihydroxy-2,5-dimethyl-3(2H)-furan-3-one Formula: $C_6H_8O_4$ MW: 144	5.72	1144031	0.8245
5.	Name: Glycerin Formula: $C_3H_8O_3$ MW: 92	6.10	2666349	1.9215
6.	Name: 1,3-PropanediamineFormula: $C_3H_{10}N_2$ MW: 74	6.31	245746	0.1771
7.	Name: 1,2-Propanediol, 2-acetate Formula: $C_5H_{10}O_3$ MW: 118	7.15	201468	0.1452
8.	Name: Butane, 1-(ethenyloxy)-3-methyl- Formula: $C_7H_{14}O$ MW: 114	7.34	1418134	1.0220
9.	Name: Propane, 1,1-diethoxy- Formula: $C_7H_{16}O_2$ MW: 132	7.64	490514	0.3535
10.	Name: 1H-Imidazole-4-carboxamide, 5-amino- Formula: $C_4H_6N_4O$ MW: 126	8.25	5981183	4.3104
11.	Name: 4H-Pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6-methyl- Formula: $C_6H_8O_4$ MW: 144 CAS	9.57	3526920	2.5417
12.	Name: Resorcinol Formula: $C_6H_6O_2$ MW: 110	11.67	11718171	8.4448
13.	Name: Phenol, 2,6-dimethoxy- Formula: $C_8H_{10}O_3$ MW: 154	14.21	829226	0.5976
14.	Name: 6H-Purin-6-one, 2-amino-1,7-dihydro- Formula: $C_5H_5N_5O$ MW: 151	15.37	45039	0.0325
15.	Name: 1,4-Benzenediol, 2-methoxy-	15.80	4257777	3.0684

	Formula: $C_7H_8O_3$ MW: 140			
16.	Name: Phenol, 3,4-dimethoxy- Formula: $C_8H_{10}O_3$ MW: 154	16.34	417122	0.3006
17.	Name: Benzene, 1-(1,5-dimethyl-4-hexenyl)-4-methyl- Formula: $C_{15}H_{22}$ MW: 202	17.05	1233943	0.8892
18.	Name: Phenol, 4-[2-(dimethylamino)ethyl]- Formula: $C_{10}H_{15}NO$ MW: 165	17.29	4114040	2.9648
19.	Name: 1-Butanol, 2-amino- Formula: $C_4H_{11}NO$ MW: 89	18.40	11728060	8.4519
20.	Name: 3-Hydroxy-4-methoxybenzoic acid Formula: $C_8H_8O_4$ MW: 168	20.46	2521867	1.8174
21.	Name: Phenol, 3,4,5-trimethoxy- Formula: $C_9H_{12}O_4$ MW: 184	21.38	13319789	9.5990
22.	Name: 1,3-Benzenediol, 4-propyl- Formula: $C_9H_{12}O_2$ MW: 152	22.10	6140963	4.4255
23.	Name: Phenol, 5-(1,5-dimethyl-4-hexenyl)-2-methyl-, (R)- Formula: $C_{15}H_{22}O$ MW: 218	24.82	3705363	2.6703
24.	Name: 3-O-Methyl-d-glucose Formula: $C_7H_{14}O_6$ MW: 194			
25.	Name: 7H-Furo[3,2-g][1]benzopyran-7-one Formula: $C_{11}H_6O_3$ MW: 186 Ficusin	25.51	2281568	1.6442
26.	Name: n-Hexadecanoic acid Formula: $C_{16}H_{32}O_2$ MW: 256	30.17	21408314	15.4280
27.	Name: Pentanoic acid, 10-undecenyl ester Formula: $C_{16}H_{30}O_2$ MW: 254	34.40	35690296	25.7204
28.	Name: Octadecanoic acid Formula: $C_{18}H_{36}O_2$ MW: 284	34.83	2212143	1.5942

Figure 1. GC-MS Chromatogram of *Borassus flabellifer* L.



CONCLUSION

In the present study, 28 chemical constituents have been identified from ethanol root extract of *Borassus flabellifer* by Gas Chromatogram-Mass spectrometry (GC-MS) analysis. The presence of various chemical constituents justifies the use of the whole plant for various ailments by traditional practitioners. It was concluded that ethanol extract of *B. flabellifer* root possess various potent bioactive compounds and antimicrobial, analgesic, antiseptic, diuretic, antioxidant, anti-inflammatory, antiulcer and anticancer properties it is recommended as drug formation to pharmaceutical industries. Further studies are needed to explore the potential bioactive compounds responsible for the biological activities of *B. flabellifer*.

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