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ORIGINAL ARTICLE **OPEN ACCESS**

Phyto-Chemical characterization of ethanol extract of *Acacia arabica* (Lam.) Willd root utilizing GC-MS

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ABSTRACT
Acacia arabica (Lam.) Willd. (Mimosaceae) is extensively distributed all through arid and semi-arid zones of the world. It can grow almost in all weather conditions. Various parts of this plant reported to have therapeutic effects like antimicrobial, astringent, anti-cancer, antioxidant, anti-asthmatic, antihypertensive, antiviral, antifungal, antidiabetic etc. Fat exhausted roots after extraction with ethanol have been used for GC-MS analysis. Forty-six compounds have been identified by GC-MS analysis of ethanol extract of roots from A. Arabica. The major constituents include carvone, cis-vaccinic acid; linoleic acid, palmitic acid etc. have many therapeutic effects which are responsible for the various actions of roots of this plant.
Keywords: *Acacia arabica, plant, roots, constituents, therapeutic effects, disorder.*

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INTRODUCTION

Acacia is a genus of shrubs and trees belonging to Fabaceae or Leguminosae. It was described in1773 by Del. syn. *Acacia arabica* (Lam.), Willd. (Mimosaceae), Linnaeus. *Acacia nilotica* (L.) is well known and called as babul, kikar or Indian gum. It is extensively distributed all through arid and semi-arid zones of the world. Arabic tree/multipurpose tree has extensive been used ethano-medicinally for the treatment of numerous diseases/disorders [1]. *A. Arabica* occurs in many parts of India can grow almost in all weather conditions. The plant requires no specific conditions of soil, weather and environment to grow. Various parts of this plant exhibit beneficial therapeutic effects. Literature reports that *A. Arabica* have antimicrobial activity against many disease-causing pathogens such as *E. coli, S. aureus* and *S. typhi* (bacteria); *C. albicans* and *A. niger* (Fungus) etc. The fresh parts of *A. arabica* are well known as astringent, demulcent, aphrodisiac, anthelmintic, antimicrobial, antidiarrheal, with good nutritional value in Indian traditional medicine system [2]. The roots of the plant are used in treatment of cancer (ear, eye and testicles), tuberculosis, disorders of liver and spleen [3]. Ethanol extract of leaves have antioxidant property [4]. The fruit of the plant have shown antiplatelet aggregator and antiasthmatic effect [5-6]. Methanol extract of pods possesses antihypertensive and antispasmodic activities [7]. Powdered seed of the plant have significant hypoglycaemic action [8]. The various types of extracts from the bark of the plants are effective as antibacterial, antiviral, antifungal, antidiabetic and antihypertensive [9].
GC-MS (gas chromatography-mass spectrum) have been performed for analysis of ethanol extract of *A. Arabica* roots. From the current research, the constituent responsible for various therapeutic effects of roots can be identified and roots can be explored further for its therapeutic actions [10].

MATERIAL AND METHODS

Collection of plant material

The roots of *A. Arabica* were acquired from local area of Guru Jambheshwar University, Hisar and the same verified/ identified by Dr. Anjula Pandey, NBPGR, New Delhi. Voucher specimens vide Letter no. NHCP/NBPGR/2015-31 has been deposited in the DOPS (Pharmacognosy Division), GJUS&T, Hisar, Haryana, India. The collected droots (500 g) were washed with water, dried under shade. The roots obtained after drying was powdered coarsely.

Preparation of Crude Extract

At 60°C-80°C powdered roots were defatted for seven days by using petroleum ether by renowned process cold maceration. Ethanol (95% v/v) was used as solvent for extraction of fat exhausted roots by soxhlation up to 72 h. The extract obtained after soxhlation extraction, was concentrated using rotary vacuum evaporator. 12.5 g extract was obtained after final step of extraction. The calculated yield of this extract was found to be 2.5% w/w approximately.

GC-MS analysis

The extract obtained in above procedure was additional diluted by using ethanol, filtered by using Whatman No. 42 resulted a particle-free extract of roots. This extract was unswervingly used for GC-MS analysis. GCMS-QP2010 Plus system was used while carrying out GC-MS analysis of extract. It was equipped with head space sampler (AOC-20s) and auto injector (AOC-20i). Detection of compounds have been done by mass selective detector which was having ion source temperature of 230°C, interface temperature of 260°C, a solvent cut time of 2.50 min. Rtx 5 MS capillary column, having dimensions30 m (length) × 0.25 mm (diameter) × 0.25 µm (film thickness), was used for separation of compounds. Ratio of 10:1 was taken for split mode. Initialization temperature of 250°C was used for injector, with a split injection mode. The set temperature was started at 100°C (3 min), which was further amplified to 280°C. Carrier gas (Helium) runs at a linear flow velocity of 40.9 cm/s. The deduction of carrier gas was predetermined to 16.3 mL/min, with a entire flow of 1. 21 mL/min. Sample volume (extract) for injection was 1.0 µL. Based upon comparison of retention indices (RI) qualified to homologous series of alkane and along with mass spectral fragmentation patterns i.e. data provided in WILEY8.LIB, NIST11.lib, components have been identified. Identification was presumed by eulogized the data of MS and RI was achieved.

RESULTS AND DISCUSSION

Forty-six compounds have been identified by GC-MS analysis of ethanol extract of rootsfrom *A. arabica* **(**Table **1,** Fig. **1)**. The major constituents identified were (i) Carvone, a terpenoid; (ii) Cis-vaccinic acid, a trans-fatty acid, which is an omega-7 fatty acid; (iii) Linoleic acid, a polyunsaturated omega-6 fatty acid (iv) Palmitic acid, a saturated fatty acid, most commonly found in animals; (v) Mome inositol, apolysaccharide; (vi) Ethyl linoleate, a long chain ethyl ester of linoleic acid (vii) Ricinoleic acid, a unsaturatedomega-9 fatty acid (vi) Some alkanes viz, , tetracontane, tetratriacontane accounts for almost 60% of total contents of ethanol extract of roots of *A. arabica*. The minor compounds present in extract were nonacosane, tetracosane, β-sitosterol, pyrogallol, hexatriacontane, ethyl palmitate, pentacosane, n-tetratetracontane, ethyl oleate, α-resorcinol, celidoniol, deoxy, n-hexatriacontane, 1,2-benzenediol, stigmasterol, 4-n-propylresorcinol while myristic acid, δ 5-ergostenol, eicosane, ar-tumerone, linoleyl alcohol, n-tetratriacontane, 2-monopalmitin, clindrol, 10,12-hexadecadien-1-olwere present in trace. The GC-MS analysis of the roots of the plant revealed the occurrence of a number of medicinally important constituents. These constituents have been reported for treatment of disorders like diabetes, spasm, hyper-lipidemia, bowl inflammation, cancer, delayed wound healing, alopecia, neuropathy in experimental animals. For example, carvone is reported to have antidiabetic, spasmolytic and antioxidant activity [11-13]. Cis-vaccinic acid is hypolipidemic, antioxidant and suppress bowl inflammation [14-16]. Palmitic acid possesses mild antioxidant properties [17]. Linoleic acid is reported as anticancer, antioxidant, it lowers body fat and promotes wound healing [18-21]. Mome-inositolis reported to have anti-alopecic, anti-cirrhotic, anti-neuropathic, cholesterolytic and lipotropic property [22]. Ricinoleic acid has anti-inflammatory and antimicrobial activities [23]. Tetracontane possess anti-inflammatory and antimicrobial activities [24, 25]. The minor constituents along withtrace constituents are also reported to have various therapeutic actions which aid to the effect of major constituents. Nonacosane is antibacterial constituent of plants [26]. Various plants having tetracosane as a major constituent have been reported to have cytotoxic activity and apoptotic effect [27]. β-sitosterol is responsible for anti-diabetic action in plants and it enhance insulin secretion [28]. Pyrogallol, a polyphenol compound possesses antibacterial effect [29]. Ethyl palmitate is shown to have anti-inflammatory action [30]. Various alkanes like pentacosane, heptacosane, nonacosane, tricosane, pentadecane exhibits antibacterial activity [31].

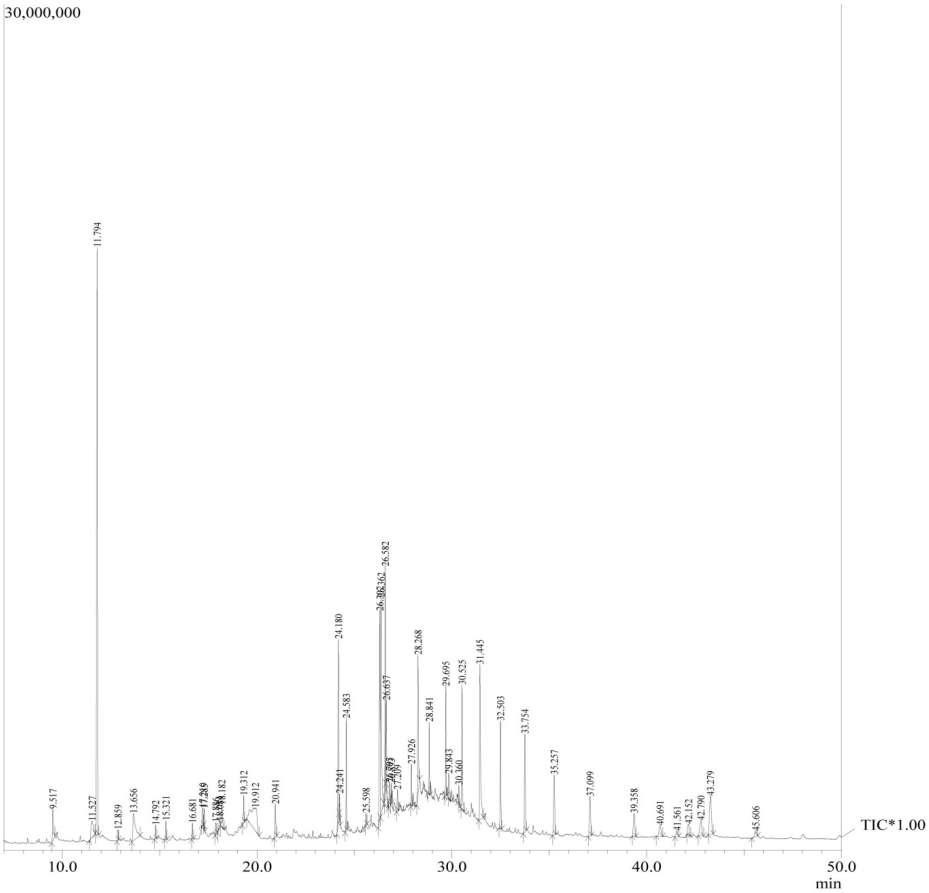

Fig. 1: GC-MS chromatogram of ethanol extract of roots of *Acacia arabica.*

Table 1: Composition of ethanol extract of *Acacia arabica* roots.

Peak	Retention Time(min)	Retention indices	Area %	Name
1	9.517	1207	1.21	1,2-Benzenediol
2	11.527	1295	1.41	α-Resorcinol
3	11.794	1308	18.06	Carvone
4	12.859	1356	0.24	Phenol, 2,6-dimethoxy
5	13.656	1393	2.66	Pyrogallol
6	14.792	1446	0.36	Ethyl 5-oxo-2-pyrrolidinecarboxylate
7	15.321	1471	0.44	2-(3-Methoxyphenyl)-2-propanol
8	16.681	1538	0.36	Nerolidol
9	17.210	1565	0.50	Clindrol
10	17.285	1569	0.40	trans-Nerolidol
11	17.886	1598	0.34	Caryophyllene, epoxide
12	18.084	1609	0.34	4-O-.beta.-D-Galactopyranosyl-.beta.-D-glucopyranose
13	18.182	1615	1.00	4-n-Propylresorcinol
14	19.312	1674	0.70	ar-tumerone
15	19.912	1706	5.40	Mome inositol
16	20.941	1763	0.99	Myristic acid
17	24.180	1967	5.19	Palmitic acid
18	24.241	1971	0.39	Elaol
19	24.583	1996	2.26	Ethyl palmitate
20	25.598	2078	0.28	13-Hexyloxacyclotridec-10-en-2-one
21	26.302	2145	6.53	Linoleic acid
22	26.362	2147	7.85	cis-Vaccenic acid
23	26.582	2167	4.52	Ethyl linoleate
24	26.637	2147	1.60	Ethyl oleate
25	26.793	2167	0.68	Linoleyl alcohol

26	26.893	2196	0.36	Ethyl stearate
27	27.209	2167	0.57	10,12-hexadecadien-1-ol
28	27.926	2252	0.81	Eicosane
29	28.268	2270	3.56	Ricinoleic acid
30	28.841	2300	1.41	Celidoniol, deoxy
31	29.695	2600	2.08	Pentacosane
32	29.843	2617	0.67	2-Monopalmitin
33	30.360	2680	0.36	Capsaicin
34	30.525	2700	2.93	Tetracosane
35	31.445	2746	5.57	Tetratetracontane
36	32.503	2800	2.97	Nonacosane
37	33.754	2900	3.20	Tetratriacontane
38	35.257	2998	2.33	Hexatriacontane
39	37.099	3098	1.88	n-Tetratetracontane
40	39.358	3197	1.28	n-Hexatriacontane
41	40.691	3246	0.81	δ 5-Ergostenol
42	41.561	3276	0.38	Stigmasta-5,22-dien-3-ol
43	42.152	3297	0.68	n-Tetratriacontane
44	42.790	3337	1.14	Stigmasterol
45	43.279	3337	2.87	β-Sitosterol
46	45.606	3421	0.43	Hexatriacontane

CONCLUSION

This study suggests that the various constituents from roots can treat many diseases as simple as inflammation and as typical as cancer. Moreover, literature survey shows that *A. Arabica* is a plant that can be grown in excess in any weather conditions therefore; the roots of the plant can be further explored as economical source for the medicinally important phyto-constituents.

ABBREVIATIONS USED

GC-MS = Gas chromatography–Mass spectrometry
g = gram
^{o}C = Celsius
V = Volume
h = hours
W = weight
Min. = minute

CONSENT FOR PUBLICATION

All the authors of the manuscript entitled "Phyto-Chemical characterization of ethanol extract of *Acacia arabica* (Lam.) Wild root utilizing GC-MS" give their consent for publication in Current Bioactive compounds and this manuscript has not been published elsewhere nor submitted simultaneously for publication elsewhere.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Not applicable**.**

HUMAN AND ANIMAL RIGHTS

No Animals/Humans were used for studies that are base of this research.

CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

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