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GC-MS ANALYSIS OF BIOACTIVE COMPOUNDS IN *BRYONOPSIS LACINIOSA* FRUIT EXTRACT

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ABSTRACT: The bioactive components of *Bryonopsis laciniosa* fruits have been evaluated using GC/MS. The chemical compositions of the methanolic extract of *Bryonopsis laciniosa* fruits were investigated using Perkin-Elmer Gas Chromatography –Mass Spectrometry, while the mass spectra of the compounds found in the extract was matched with the National Institute of Standards and Technology (NIST) library. The GC-MS analysis shows that the most prevailing compounds were identified as Oleic Acid, Hexanoic acid, 2-Ethylcyclohexanone, 2-Methyltetracosane, 2-Undecenal, 1,2-Benzenedicarboxylic acid, Ascorbic acid 2,6-dihexadecanoate, Octadecanoic acid, (2E)-2-Decenal.The compounds like Sulfurous acid, n-Nonaldehyde, 2-Hepten-3-ol, Decadienal, 3-Octenoic acid, 1-[2-(acetyloxy)ethyl]-3-oxooctyl acetate $$ acetic acid 3-acetoxy-5-oxo-decyl ester, 9-Octadecenoic acid, 2H-Pyran-2-one, Z,Z-4,15-Octadecadien-1-ol acetate were moderately present. The results confirm the presence of bioactive components which are known to exhibit medicinal value as well as pharmacological activities.

INTRODUCTION: Phytochemicals are natural bioactive compounds found in plant foods that work with dietary nutrients to protect our body against disease. Phytochemicals are non- nutritive plant chemicals, working together with nutrients found in leaves, fruits, vegetables and nuts, may help slow the aging process and reduce the risk of many diseases, including diabetes, anemia, ulcer, cancer, heart disease, stroke, high blood pressure, cataracts, osteoporosis, urinary tract infections etc.,[1]. Phytotherapy is the science of using remedies to treat sick.

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It therefore covers everything from medicinal plants with powerful actions, such as Digitalis and Belladonna, to those with very gentle action. Secondary metabolism in a plant plays a major role in the survival of the plant in its environment. In addition, these compounds may be responsible for the beneficial effects of fruits and vegetables on an array of health related measures [2]. Chemical principles from natural sources have become much simpler and have contributed significantly to the development of new drugs from medicinal plants [3]. The valuable medicinal properties of different plants are due to presence of several constituents i.e. saponins, tannins, alkaloids, alkenyl phenols, glycol-alkaloids, flavonoids, terpenes lactones, terpenoids and phorbol esters [4]. The rational design of novel drugs from traditional medicine obtained from plants offers new prospects in modern health care [5].

Bryonopsis lacinosa is a well known herb spread in throughout India from Himalayas to Ceylon, Mauritius, tropical Africa, Malaya, Phillippines, Australia and is one of the most versatile medicinal plants having a wide spectrum of biological activity. Stem is much branched, slender, grooved, glabrous. Tendrils are slender, scabrous above, smooth, beneath, margin denticulate, undulate or subcrenulate. Flowers monoeicious, often male and female clustered together. Fruits barriers, spherical yellowish-green or green-white, Seeds ovoid, with thickened, corrugated, margins. It is bitter and aperients, and is considered to have tonic properties [6]. Plant flowers and fruits during the period from August to December.

Bryonopsis laciniosa leaves and seeds are anti inflammatory and febrifuge. They are used to treat flatulence, fever and reduce inflammation. The seeds are used in Homeopathy and Ayurveda as a tonic Seeds are antibacterial and anti-fungal. In Homeopathy, a tincture made from the roots of the lollipop plant is prescribed for the treatment of inflammation. A juice made from the leaves can be applied for pains and joints. Whole plant is used to treat ailments such as asthma, cough and bronchitis. Fruits are used as aphrodisiac, tonic, sharp, cutting, lancinating or tearing pain ,serous inflammation; pain in serous cavities, with muscular tension.

Within a decade, there was a number of dramatic advances in analytical techniques including TLC, UV, NMR and GC-MS that were powerful tools for separation, identification and structure determination of phytochemicals [7]. The aim of this study is to determine the organic compounds present in the *Bryonopsis laciniosa(Linn)*fruit (Family : Cucurbitaeceae) extract with the aid of GC-MS technique, which may provide an insight in its use in traditional medicine.

MATERIALS AND METHODS:

Collection of *Bryonopsis laciniosa* fruit:

Bryonopsis laciniosa (Linn) fruits were collected from Ramanathapuram District, Tamil Nadu. The collected fruits were identified and authenticated by Botanist, Dr. V. Ramachandran. Associate professor, Department of Botany, Bharathiyar University, Coimbatore. A Voucher specimen (Number:BU/Dept BOT/Bl/16.06.2014) has been deposited at the Herbarium, Bharathiyar University, Coimbatore, Tamil Nadu, India.

GC-MS method:

GC-MS analysis was carried out on using a Perkin-Elmer GC Clarus 500 system and Gas Chromatograph interfaced to a Mass Spectrometer**,** (GC-MS) equipped with a Elite-I, fused silica capillary column (30 mm x 0.25 mm 1 D x 1 µMdf, composed of 100% Dimethyl poly siloxane). For GC-MS detection, an electron ionization system with ionizing energy of 70 eV was used. Helium gas (99.999%) was used as the carrier gas at constant flow rate 1mL/min and an injection volume of 2 µL 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, to 200^{o}C, then 5^{o}C/min to 280^{o}C, ending with a 9 min isothermal at 280^{o}C. Mass spectra were taken at 70 eV; a scan interval of 0.5 seconds and fragments from 45 to 450 Da. Total GC running time was 36 minutes. The relative % amount of each component was calculated by comparing its average peak area to the total areas. Software adopted to handle mass spectra and chromatograms was a Turbo mass [8].

Identification of components:

Interpretation on mass spectrum GC-MS was conducted using the database of National Institute Standard and Technology (NIST) having more than 62,000 patterns. The 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.

RESULTS AND DISCUSSION:

Thirty compounds were identified in *Bryonopsis laciniosa* fruit by GC-MS analysis. The active principles with their retention time (RT), molecular formula, molecular weight (MW) and concentration (%) are presented in (Table 1 and Fig 1). The most prevailing compounds were identified as Oleic Acid, Hexanoic acid, 2-Ethylcyclohexanone, 22-Methyltetracosane, 2-Undecenal, 1,2-Benzenedicarboxylic acid, Ascorbic acid 2,6-

dihexadecanoate, Octadecanoic acid, (2E)-2-Decenal.The compounds like Sulfurous acid, n-Nonaldehyde, 2-Hepten-3-ol, Decadienal, 3-Octenoic acid, 1-[2-(acetyloxy)ethyl]-3-oxooctyl acetate $$ acetic acid 3-acetoxy-5-oxo-decyl ester, 9-octadecenoic acid, 2H-Pyran-2-one, Z,Z-4,15-Octadecadien-1-ol acetate were moderately present. The biological activities listed (Table 2) are based on Dr. Duke's Phytochemical and Ethnobotanical Databases by Dr. Jim Duke of the Agricultural Research Service/USDA [9]. The results confirm the presence of constituents which are known to exhibit medicinal value as well as pharmacological activities.

Table 2 depicts that among the 30 compounds identified by GC-MS study 16 were already found to be biologically active. 2(3H)-Furanone, Octadecanoic acid, n-Non aldehyde and Nonanoic acid has found to posses antioxidant activity and 2-methyltetracosane is found to be a Free radical Scavenger. Ascorbic acid, Oleicacid, Octadecanoic acid detected in *Bryonopsis laciniosa* fruit posses anticancer, antioxidant and anti-inflammatory activity. Hexanoic acid, Acetic acid, 3-methylhept-3-yl ester are potent anticancer compounds. Most of the biologically active compounds present in **Table 2** have been reported to posses antimicrobial activity.

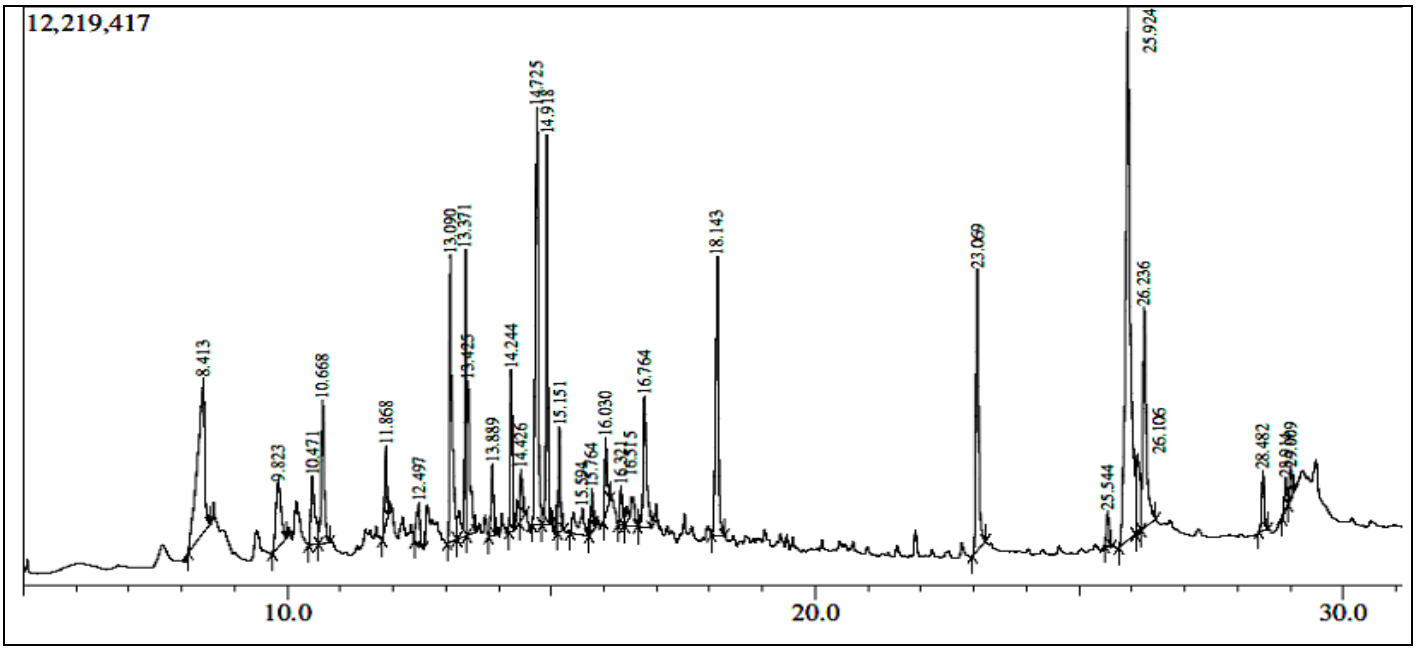

FIG. 1: GC MS ANALYSIS OF *BRYONOPSIS LACINIOSA* FRUIT EXTRACT

TABLE 1: GC MS ANALYSIS OF *BRYONOPSIS LACINIOSA* FRUIT EXTRACT

Sl.no	RT	Name of the Compound	Mol. Formula	Mol.Wt	Area %
1.	8.413	Hexanoic acid $$ Caproic acid	C6H12O2	116	8.17
2.	9.823	Sulfurous acid, hexyl heptyl ester	C13H28O3S	264	2.39
3	10.471	2-Hepten-3-ol, 4,5-dimethyl	C9H18O	142	1.96
4	10.668	Nonanal $$ n-Nonaldehyde	C9H18O	142	3.35
5	11.868	Octanoic acid $$ ammonium caprylate	C8H16O2	144	1.21
6	12.497	2-Octenoic acid $$ Oct-2-enoic acid $$	C8H14O2	142	1.05
7	13.090	Cyclohexanone, 2-ethyl- $$ 2-Ethylcyclohexanone	C8H14O	126	5.65
8	13.371	2-decenal, (e)- $$ (2e)-2-decenal	C10H18O	154	4.69
9	13.425	Nonanoic acid $$ calcium pelargonate	C9H18O2	158	3.00
10	13.889	2,4-decadienal, (e,e)- $$ (2e,4e)-2,4-decadienal	C10H16O	152	1.22
11	14.244	Decadienal	C10H16O	152	2.19
12	14.426	2-undecenal, e- $$ (2e)-2-undecenal	C11H20O	168	0.88
13	14.725	2-methyltetracosane	C25H52	352	8.65
14	14.918	2-Undecenal $$ Undec-2-enal $$ 2-Undecen-1-	C11H20O	168	5.14
15	15.151	trans-4,5-Epoxy-(E)-2-decenal	C10H16O2	168	1.41
16	15.594	3-Octenoic acid	C8H14O2	142	1.38
17	15.764	Butyl 3-hydroxy-2-methylene-butanoate $$ Isobutylester	C9H16O3	172	0.67
18	16.030	1-[2-(acetyloxy)ethyl]-3-oxooctyl acetate $$ acetic acid 3-acetoxy-5-	C14H24O5	272	1.30

		oxo-decyl ester			
19	16.321	Dimethyl phthalate $$ 1,2-Benzenedicarboxylicacid,	C10H10O4	194	0.67
20	16.515	9-octadecenoic acid (z)- $$ octadec-9-enoic acid $$ (9e)-9-octadecenoic acid	C18H34O2	282	1.30
21	16.764	Acetic acid, 3-methylhept-3-yl ester	C10H20O2	172	3.18
22	18.143	Diethyl Phthalate $$ 1,2-Benzenedicarboxylic acid, diethyl ester $$	C12H14O4	222	5.49
23	23.069	l-(+)-Ascorbic acid 2,6-dihexadecanoate	C38H68O8	652	5.79
24	25.544	2(3H)-Furanone, 5-dodecyldihydro- $$ Hexadecanoic acid,	C16H30O2	254	0.68
25	25.924	Oleic Acid $$ 9-Octadecenoic acid (Z)- $$ .DELTA	C18H34O2	282	18.27
26	26.106	2H-Pyran-2-one, tetrahydro-6-tridecyl- $$ Octadecanoic acid	C18H34O2	282	2.26
27	26.236	Octadecanoic acid $$ Stearic acid $$ n-Octadecanoic acid	C18H36O2	284	5.77
28	28.482	Z,Z-4,15-Octadecadien-1-ol acetate $$ (4Z,15Z)-4,15-Octadecadienyl acetate	C20H36O2	308	1.14
29	28.914	2(3H)-Furanone, dihydro-5-tetradecyl- $$ .gamma	C18H34O2	282	0.63
30	29.009	Z,Z-4,15-Octadecadien-1-ol acetate $$ (4Z,15Z)-4,15-Octadecadienyl acetate	C20H36O2	308	0.53

TABLE 2: BIOLOGICAL ACTIVITY OF COMPONENTS IN THE *BRYONOPSIS LACINIOSA* FRUIT EXTRACT

S. No	Name of the Compound	Biological Activity**
	Hexanoic acid $$ Caproic acid	Flavouring agents Antidiabetic activity, anticancer activity.
	Sulfurous acid, hexyl heptyl ester	Disinfectants
	Nonanal $$ n-Nonaldehyde	Anti-inflammatory, antioxidant, antiviral (HIV), antitoxic, free radical scavenging, cardioprotectant, hepatoprotectant, antitussive, antihemorrhagic
	Octanoic acid $$ ammonium caprylate	Antimicrobial activity
	Cyclohexanone, 2-ethyl- $$ 2-Ethylcyclohexanone	Antimicrobial activity
	2-decenal, (e)- $$ (2e)-2-decenal	Nematicidal activity
	Nonanoic acid $$ calcium pelargonate	Anti-oxidant and antimicrobial activity
	2-methyltetracosane	Free radical scavenging activity
	9-octadecenoic acid (z)- $$ octadec-9-enoic acid $$ (9e)-9-octadecenoic acid	Antipreventive, Flavour, Fungicide, pesticide, perfumery Anti inflammatory, hypocholesterolemic, Cancer preventive, hepatoprotective, nematicide, insectifuge, antihistaminic, anticoronary etc,
	Acetic acid, 3-methylhept-3-yl ester	Acidulant, Antibacterial , Antisalmonella Antivaginitic , Expectorant , Fungicide, Keratitigenic Mucolytic, Osteolytic, Perfumery, Pesticide , Protisticide, Spermicide, Ulcerogenic and Verrucolytic activity, Anticancer activity
	L-(+)-Ascorbic acid 2,6-dihexadecanoate	Antiallergic, Antianemic, Antianxiety, Antibacterial, Antibronchitic, Anticancer, Anticarcinogenic, Anticataract, Anticoagulant, Anticonvulsant, Antidiabetic, Antidiarrheic, Antifatigue, Antifertility, Antigastric, Anti-inflammatory, Antimalarial, Antioxidant, Antistress, Antiulcer, Antiatheroscelerotic, Anticold, Antiglaucomic, Antihepatic, Antihypertensive, Antiplague, Antiproliferant, Antiprotozoal, Antiseptic, Antistroke, Antituberculic, Antitumer, CNSStimulant, Chelator, Chemopreventive, CytochromeP450Inducer, Deodorant, Dermal, Detoxicant, Flavor, Hypolipidimic, Neuroprotective, Neurotransmitter, Termiticide and Antiviral activity
	2(3H)-Furanone, 5-dodecyldihydro- $$ Hexadecanoic acid,	Antioxidant and anti inflammatory activity
	Oleic Acid $$ 9-Octadecenoic acid (Z)- $$ .delta	Antimicrobial, Antifungal, anticonvulsive activity, Antiadhesive, Antiallergic, Antianalgesic, Antiatherosclerosis, Anesthetic, Antihelmenthic, Antianxiety, Antibacterial, Antiberiberi, Antibiotic, Anticancer, Anticonvulsant, Antidiabetic, Antidiarrheic, Antifertility, Antigastric, Anti-inflammatory, Antiobesity, Antioxidant, Antiulcer, Antitubercellosic, Anticold, Antihepatotoxic and Antiviral activity
	2H-Pyran-2-one, tetrahydro-6-tridecyl- $$ Octadecanoic acid	Antidiabetic activity, Gastro intestinal activity, antibacterial activity, antioxidant activity, mitogenic activity and anticancer activity
	Octadecanoic acid $$ Stearic acid $$ n-Octadecanoic acid	Lowering the plasma cholesterol level, Antianalgesic, Anesthetic, Antihelmenthic, AntiHIV, Antiaging, Antiamoebic, Antianaemic, Antianxiety, Antiasthmatic, Antibacterial, Antibiotic, Antibronchitic, Anticalculi, Anticancer, Anticarcinogenic, Anticataract, Anticoagulant, Anticonvulsant, Antidiabetic, Antidiarrheic, Antifatigue, Antifertility, Antigastric, Antihemorrhagic, Anti-inflammatory, Antimalarial, Antiobesity, Antioxidant, Antistress, Antiulcer and Antiviral activity
	2(3H)-Furanone, dihydro-5-tetradecyl- $$ .gamma	Antimicrobial activity and anticonvulsant activity.

**Source: Dr. Duke's phytochemical and ethnobotanical databases [9].

CONCLUSION: The results obtained in this study thus suggest that the identified phytochemical compounds are bioactive constituents. Therefore, the data generated from these experiment provide the chemical basis for the wide use of this plant as therapeutic agent for treating various ailments. This study offers a platform for using *Bryonopsis laciniosa* fruit as herbal alternative for various diseases including diabetes, cancer, microbial infections, inflammations etc.

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