Research Article

Preliminary GC-MS Anlaysis and Antioxidant Study of One Ayurvedic Medicine "Manasa Mitra Vatakam"

Sivakumaran G[1], Mudiganti Ram Krishna Rao[*2], Prabhu K[3], Kalaiselvi VS[4], Sumathi Jones[5], Johnson WM[6], J Antony[7]
[1]Research Scholar, Bharath University, Assistant Professor - Dept of Anatomy, Karpa Vinayaka Medical College, Kanchipuram, India.
[2]Professor, Department of Industrial Biotechnology, Bharath University, Chennai, India.
[3]Associate Professor, Department of Anatomy, Sree Balaji Medical College and Hospital, Chennai, India.
[4]Professor, Dept of Biochemistry, Sree Balaji Medical College, Chennai, India.
[5]Professor of Pharmacology, Asan Dental College, Kanchipuram, India.
[6]Professor, HOD of Anatomy, Sree Balaji Medical College, Chennai, India.
[7]Professor, Department of Anatomy, Sree Balaji Medical College and Hospital, Bharath University, Chennai, India.
***Corresponding author's E-mail:** mrkrao1455@gmail.com

Accepted on: 04-02-2016; **Finalized on:** 29-02-2016.

ABSTRACT

The authenticity of the medicinal efficacy of Ayurvedic and Siddha medicines is of great importance in the present day surge in the use of complimentary and alternative medicines. The present study is a step in this direction. Manasamitra vatakam is an Ayurvedic medicine used for the treatment of mental disorders, anxiety etc. This medicince is made of many components which are of plant, animal and mineral origin. The GC MS analysis revealed the presence of some important biomolecuels like 13-Docosenamide,(Z)-, n-Hexadecanoic acid, Oleic Acid, Borneol, Octadecanoic acid, 9-Octadecenoic acid, (E)-, Isoamyl cinnamate, 1-Heptadecanamine Disilane, 9-Octadecenamide, (Z)-, (diphenylmethyl)pentaphenyl-, Undecanoic acid, 11-amino-, Erucic acid, Tetradecanamide, Squalene among other minor components. These biomolecules have reflections on the role of this medicine. The antioxidant study also indicated that this medicine has strong properties as antioxidant. Further study however is warranted to prove the medicinal efficacy of this medicine.

Keywords: Manasamitra vatakam, Anxiety, Borneol, Octadecanoic acid, GC-MS, Antioxidant.

INTRODUCTION

Ayurvedic formulations are being subjected to various scientific documentations to prove their efficacy since not much knowledge is available on the molecular, pharmacological and other yardsticks to prove them as safe and effective. Some reports in this direction are available and the results are encouraging.[1] Manasamitra vatakam is a herbomineral ayurvedic formulation used for the treatment of mental disorders like anxiety, neurotoxicity etc. which is prepared by a number of plant, mineral and animal products.[2] There are reports of the protective role of Manasamitra vatakam against aluminum induced neurotoxicity and nephrotoxicity in rats.[3,4] It is good antioxidant and antimicrobial medicine.[5] Manasamitra Vatakam consist of the following ingredients:

10 g of each of Bala – Country mallow (root) – *Sida cordifolia* Nagabala – *Grewia populifolia* Bilva – Bael (root) – *Aegle marmelos* Prishniparni – *Uraria picta* Pravala pishti – Coral Shankhapushpi – *Clitorea ternatea*

Tamrachuda Padika- The salt of Copper Swarna Bhasma – Bhasma made of Gold Pushkaramoola – *Inula racemosa* Mrigashringa Bhasma – Bhasma made of Deer horn

Vacha – *Acorus calamus* Tapya – Makshika Bhasma – Bhasma of Copper-Iron Pyrite Chandana – Sandalwood – *Santalum album* Raktachandana – *Pterocarpus santalinus*

Mukta Pishti – Paste prepared from Pearl

Yashti – Licorice – *Glycyrrhiza glabra* Loha Bhasma – Bhasma prepared from Iron Twak – Cinnamon – *Cinnamomum zeylanicum* Magadhi – Long pepper fruit – *Piper longum*

Ghanasara – Karpoora – Camphor – *Cinnamomum camphora* Aileya – *Prunus cerasus* Vishala – *Citrullus cholocynthis* Arkaraga Nirgundi – *Vitex negundo* Plava – *Nyctanthes arbor-tristis* Rasna – *Pluchea lanceolata*

Vanda roxburghi Rajata Bhasma – Bhasma of silver Shilajatu – Asphaltum Gojihva – *Onosma bracteatum*

Padmakeshara – Lotus – *Nelumbium speciosum* Jivaka – *Malaxis acuminate* Rishabhaka – *Manilkara hexandra* (Roxb.) Dubard/*Mimusoops hexandra* Roxb. Kakoli – *Fritillaria roylei* Kshira Kakoli – *Roscoea purpurea* Brihati – Indian Nightshade (root) – *Solanum indicum* Kantakari – Yellow berried nightshade (whole plant) – *Solanum xanthcarpum* Shravani, Mahashravani – *Sphaeranthus indicus* Bhunimba – The Creat (whole plant) – *Andrographis paniculata* Kritamala – *Cassia fistula* Parushaka – *Grewia asiatica* Haritaki – Chebulic Myrobalan fruit rind – *Terminalia chebula* Vibhitaki – Belliric Myrobalan fruit rind – *Terminalia bellirica* Amalaki – Indian gooseberry fruit – *Emblica officinalis Gaertn*. Amruta – Indian Tinospora (stem) – *Tinospora cordifolia* Shweta and Krishnasariva – Indian Sarsaparila – *Hemidesmus indicus* Jivanti – *Leptadenia reticulate* Somavalli – *Sarcostemma acidum* Ashwagandha – Winter cherry/Indian Ginseng (root) – *Withania somnifera* (L.)

Dunal. Nisha – Turmeric (Rhizome) – *Curcuma longa* Usheera – Khus Khus – *Vetiveria zizanioides* Draksha – Raisin – *Vitis vinifera* Yashti – Licorice – *Glycyrrhiza glabra* Riddhi – *Vigna cylindrical* Durva – Bermuda grass – *Cynodon dactylon* Hamsapadi – *Adiantum philippense* Linn./*lunulatum* Lavanga – Clove – *Syzigium aromaticum* Tulasi – Holy Basil – *Ocimum sanctum* Kasturi – Musk Kumkuma – Saffron – *Crocus sativus*

Quantity Sufficient of each of: Juice extract of Trayamana – *Gentiana kurroo* Water decoction of Shankhapushpi – *Clitorea ternatea* Vacha – *Acorus calamus* Sariva – Indian Sarsaparila – *Hemidesmus indicus* Lakshmana – *Ipomoea sepiaria*/*Biophytum sensitivum* Bilva – Bael (root) – *Aegle marmelos* Bala – Country mallow (root) – *Sida cordifolia* Goksheera – Cow milk Jiraka – Cumin – *Cuminum cyminum* Somavalli – *Sarcostemma acidum* Stanya – breast milk.

The fine powder of herbal mix is triturated with the liquids and a paste is prepared, which is made into tablet form, dried and preserved. The medicine is prepared as per Sahasrayoga prakarana 68. AFI Vol.1 of Ayurved Litereature and manufactured by Kottakkal Arya Vaidya Sala, Kerala.

A brief description of the medicinal values of each constituent of Manasamitra vatakam is mentioned in the following paragraphs.

Bala – (Bhadra) - Country mallow (root) – *Sida cordifolia*

This plant has CNS depressant, antioxidant, hepatoprotective, anti-inflammatory, anti-cancer and antibacterial activities.[6]

Naga Bala (Grewia subinaequalis)

Grewia subinaequalis plant possess antioxidant, antidiabetic, antihyperglycaemic, radioprotective, antimicrobial, hepatoprotective, antifertility, antifungal, analgesic, antipyeretic and antiviral activities.[7]

Bilva (Aegle marmelos)

Extensive experimental and clinical studies prove that *Bilva* has antidiarrhoeal, antimicrobial, antiviral, radioprotective, anticancer, chemopreventive, antipyretic, ulcer healing, antigenotoxic, diuretic, antifertility and anti-inflammatory properties.[8]

Prishniparni *(Uraria picta)*

Uraria picta exhibit a range of biological activities like antiinflammatory, antianxiety, anti depressant properties.[9]

Pravala pisti (The paste of Coral)

Pravala pisti is made of Coral and used for the treatment of problems related to menopause.[10]

Shankhapushpi **(***Clitoria ternate)*

Clitoria ternate plant can act as cognition boosting, anticancer and as antihistaminic.[11]

Bhasmas

They are the specialized preparations made of metals which are commonly used in Ayurvedic and Sidhha preparations. In Manasamitra Vatakam, Swarna Bhasma (Gold), Mrigasringa bhasma (Prepared by the antlers of Deer), tapya-Makshika Bhasma (Copper and Iron pyrite), Loha bashma (Iron) and rajata bhasma (Silver) are present. It is claimed that by processing elaborately the toxic effects pertaining to the heavy metals like gold, silver etc. are neutralised and thus could be used as medicines to cure a number of diseases. Some recent authors have claimed that these metals are present at nanolevels and are thus safe.[12]

Pushkaramoola *(Inula racemosa)*

Inula racemosa is reported to have antispasmodic, anti asthmatic, cardiotonic, antimutgenic, antiapoptotic and antioxidant properties.[13,14]

Vacha *(Acorus calamus)*

The medicinal properties of *A. calamus* were reported by Kumar and Vandana, 2012.[15] This plant has activities like antiulcer and cytoprotective, analgesic, antispasmodic, anti-inflammatory, anticonvulsant and antibacterial.

Chandana (*Santalum album*)

Santalum album Sandal is an age old medicinal plant and it is used for many diseases. It has curative roles such as antihyperglycemic and antihyperlipidemic, cardioprotective (Khan), as a brain tonic and antiulcerogenic (Ahmed).[16,17]

(Rakta chandana) *Pterocarpus santalinus*

This plant is one of the oldest medicinal having properties like hepatoprotective, gastroprotective, anticancer, antioxidant, antidiabetic and apoptotic.[18]

Mukta Pishti – Paste prepared from Pearl

The paste prepared from pearl is used to treat TB, asthma, cough and other diseases in Ayurveda. Wavare have reported that this paste as a safe nanomedicine.[19]

Yashti – Licorice – *Glycrrhiza glabra*

Glycrrhiza glabra is known for its medicinal properties such as anti-tussive & expectorant, antioxidant and antibacterial, anti-inflammatory, antiviral, memory enhancer, antifungal, antibacterial, antihyperglycemic, immunostimulatory, hepatoprotective, anticancer and anticoagulant.[20] (Damle, 2014)

Twak – Cinnamon – *Cinnamomum zeylanicum*

Almost every part of the cinnamon tree has some medicinal or culinary use. Ranasinghe and Jayaprakasha have reviewed the medicinal properties of Cinnamon.[21,22]

Magadhi – Long pepper fruit – *Piper longum*

Kumar have reviewed the various health benefits of *Piper longum*. with many important medicinal values such as

anticancer, antioxidant, hepatoprotective, anti-inflammatory, immunomodulatory, antimicrobial, antihyperlipidemic, analgesic, antidepressant, antiamoebic, vasodialtory, bioavailability enhancer due the presence of piperine in it, antiobesity activity, radioprotective, cardioprotective and antifungal.[23]

Carpooram (*Cinnamomum camphora*)

Camphor has medicinal values such as topical analgesic, antiseptic, antispasmodic, anti inflammatory, expectorant and as cold suppressant.[24]

Aileya (*Prunus cerasus)*

Known as sour cherry, this fruit contains polyphenols which are sources of nutrition and antioxidants.[25]

Vishala *(Citrullus cholocynthis)*

Bitter apple has many pharmacological roles such as antioxidant, anti-inflammatory, antimicrobial, antidiabetic, anti cancer and as local anesthetic.[26]

Arkaraga Nirgundi (*Vitex negundo*)

The entire plant has a spectrum of medicinal potential for common cold to cancer.[27]

Plava *(Nyctanthes arbor-tristis)*

It has significant medicinal roles such as hepatoprotective, antileishmaniasis, antiviral, antifungal, antipyretic, antihistaminic, antimalarial, antibacterial, anti-inflammatory and antioxidant.[28]

Rasna *(Pluchea lanceolata)*

This plant is used as antirhematic, antiarthritic and as anti inflammatory.[29]

Vanda roxburghi

The root of this plant has a folkloric reputation to treat inflammations, fever, dyspepsia, bronchitis, hiccough, piles, snake bites and diseases of the nervous system.[30]

Shilajit (*Asphaltum*)

Shilajit is used as a medicine separately or in combination with other medicines for the treatment of a number of diseases like cognitive disorders, genitourinary disorders, jaundice, digestive disorders and Obesity etc.[31]

Gojihva *(Onosma bracteatum)*

This plant is reported to have medicinal role such as immunomodulatory, anti stress, laxative, anthelmintic and for alexipharmic effects. The plant is also used to treat eye diseases, blood diseases, bronchitis, abdominal pain, stangury, thirst, itch, lecoderma, fever, wounds, burns, piles and urinary calculi.[32]

Padmakeshara *(Nelumbium speciosum)*

This plant has notable pharmacological activities like anti-ischemic, antioxidant, anticancer, antiviral, antiobesity, lipolytic, hypocholesterimic, antipyretic, hepatoprotective, hypoglycaemic, antidiarrhoeal, antifungal, antibacterial, antiinflammatory and diuretic activities.[33]

Jivaka *(Malaxis acuminate)*

It is used for treating diseases like impotency, dysenteric, internal and external bleeding, and emaciation, burning sensation, rheumatism and lung diseases.[34]

Rishabhaka – *Manilkara hexandra* (Roxb.) Dubard

Manilkara hexandra (Roxb.) Dubard leaf is commonly known as Rayan, traditionally used as antioxidant, antimicrobial, immune stimulant, anti ulcer, anti bacterial and antidiabetic.[35]

Kakoli *(Fritillaria roylei)*

This plant has been shown to have antiproloferative and antioxidant activities by Wajahat.[36]

Kshira Kakoli (*Roscoea purpurea)*

Leaves, roots and flowers are used traditionally for treatment of diabetes, fever, hypertension and inflammations. This plant is reported to have immunomodulatory, antioxidant and nutritional qualities.[37]

Brihati *(Solanum indicum)*

The fruits are edible and traditionally used to treat various diseases like loss of appetite and anorexia, blood disorders, rhinitis, cough, asthma, sore throat and hiccup, sexual disorders, abdominal pain and worm infestation, pain and fever, inflammation, insomnia, urinary complications, cardiac weakness etc.[38]

Kantakari *(Solanum xanthocarpum)*

Various studies indicated that *Solanum xanthocarpum* possesses antiasthmatic, hypoglycemic, hepatoprotective, antibacterial, apoptotic, anti arthritic activities.[39]

Sravani *(Sphaeranthus indicus* Linn.)

It is known as hepatoprotective, antitussive, neuroleptic, Immunomodulatory, analgesic, antidiabetic, antihyperlipidimic, anxiolytic, central nervous system depressant and anticonvulsant activities, anti-inflammatory, anti-proliferative activity among other medicinal activities.[40,41]

Bhoonimba ***(****Andrographis paniculata)*

Extract and pure compounds of the plant have been reported for their anti-microbial, cytotoxicity, anti-protozoan, anti-inflammatory, antioxidant, immunostimulant, anti-diabetic, anti-infective, anti-angiogenic, hepato-renal protective, sex hormone/sexual function modulation, liver enzymes modulation, insecticidal and toxicity activities.[42]

Kritamala *(Cassia fistula)*

C. fistula is known as rich source of tannins, flavonoids and glycosides. Pharmacological activities include antibacterial, antidiabetic, antifertility, anti-inflammatory,

antioxidant, hypatoprotective, antitumor and as antifungal.[43]

Parushaka *(Grewia asiatica)*

Grewia asiatica is reported to have antimicrobial, anti inflammatory, antihyperglycemic activities.[44,45]

Haritaki – Chebulic Myrobalan fruit rind – *Terminalia chebula*

One of the constituent of the common Triphala choornam, *T. chebula* bark, rind, galls etc. have been found to have activities like antioxidant, antimicrobial, antidiabetic, hepato protective, anti-inflammatory and anti arthritic, anti mutagenic, anti proliferative, radio protective, cardio protective, hypo lipidemic, antispasmodic, Immuno-modulatory and antiviral activities.[46]

Vibhitaki – Belliric Myrobalan fruit rind – *Terminalia bellirica*

A review of the medicinal values of this plant is reported by Saraswathi.[47] The plant has medicinal properties such as antibacterial, antioxidant, hypoglycemic, hepatoprotective, antidiorrhial, antihypertensive, antispasmodic, analgesic, antisecretory, antinociceptive and bronchodialatory.

Amalaki – Indian gooseberry fruit – *Emblica officinalis* Gaertn.

Amla has multifarious medicinal properties such as antipyretic, analgesic, as skin care lotion, antioxidant and also used to treat Gonorrhoea, nausea, vomiting, indigestion, nose bleeding etc.[48,49]

Amruta (Guduchi) - Indian Tinospora (stem) – *Tinospora cordifolia*

This plant medicinal properties like anti-diabetic, anti-periodic, anti-spasmodic, antiinflammatory, anti-arthritic, antioxidant, anti-allergic, anti-stress, anti-leprotic, anti-malarial, hepatoprotective, immunomodulatory and anti-neoplastic activities.[50]

Shweta and Krishnasariva – Indian Sarsaparila – *Hemidesmus indicus*

This plant is a very rich medicinal resource having activities like antiarthritic, anticancerous, antimicrobial, antidiarrhial, anti-inflammatory, antioxidant, hepatoprotective, nootropic and antileprotic.[51]

Jivanti *(Leptadenia reticulate)*

There are reports of this plant having medicinal activities such as immunomodulatory, hepatoprotective, diuretic, antiulcer, antioxidant, anti-lipoxygenase and cytotoxic, antifungal activity, antidepressant, antiasthmatic, anticancerous etc.[52,53]

Somavalli *(Sarcostemma acidum)*

This plant possess antimicrobial, CNS depressant, antipsychotic and anxiolytic activities.[54]

Ashwagandha – Winter cherry/ Indian Ginseng (root) – *Withania somnifera* (L.) Dunal.

Another wonder drug plant having activities like antitumor, anti-inflammatory, antistress, antioxidant, sleep inducing, effective in memory related conditions, insomania, immunomodulatory, hemopoetic effect on CNS and cardiopulmonary systems.[55]

Nisha – Turmeric (Rhizome) – *Curcuma longa*

Turmeric has wide applications in food, medicine and preservation. Turmeric is anti-inflammatory, antimicrobial, preservative, antifungal, anticancer, cardio protective, hyperglycemic and anti-diabetic.[56,57]

Usheera – Khus Khus – *Vetiveria zizanioides*

Vetiver oil is supposed be have a nerve relaxant causing reduced mental stress. Chemical components of *Vetiveria* roots have very high fungicidal, bactericidal and insecticidal properties (Bhushan).[58] This oil is reported to be carminative in flatulence, colic and obstinate vomiting. It is regarded as a stimulant, diaphoric, refrigerant, astringent and antimicrobial.

Draksha – Raisin – *Vitis vinifera*

The cardio-protective role of grapes was reported by Dohadwala and Vita, 2009.[59] The antioxidant properties of the polyphenols such as resveratrol, phenolic acids, anthocyanins and flavonoids present in grapes are attributed to secondarily help to avoid atherosclerosis, platelet aggregation and stenosis. These compounds also possess a range of additional cardio protective and vaso-protective properties including anti-atherosclerotic, anti-arrhythmic and vaso-relaxation actions.

Riddhi – *Vigna cylindrical*

The seeds and leaves of this plant are used to treat neuritis, insomnia, memory loss, dyspepsia, indigestion, needles in limbs and sensation of pins, periodic palpitation, congestive cardiac failure, stomatitis, corneal ulcers, coleic diseases, Kwasiorkar and Marasmus.[60]

Durva – Bermuda grass – *Cynodon dactylon*

This grass has diverse medicinal values such as wound healing, antidiabetic, antioxidant, immunomodulatory activity, antidiuretic activity, anticancer, anti-inflammatory and antibacterial.[61-63]

Hamsapadi – *Adiantum philippense* Linn./lunulatum

The fern *Adiantum philippense* L. is well known for its antioxidant and antibacterial potential and has been ethnomedicinally used in treatment of paralysis, blood diseases, epileptic fits, rabies, dysentery, elephantiasis, pimples, and wounds.[64]

Lavanga – Clove – *Syzigium aromaticum*

Cloves are rich source of phenolic compounds like eugenol and gallic acid, which have medicinal properties

such as antioxidant, antimicrobial, antiviral and cytotoxic.[65]

Tulsi - *Ocimum sanctum*

Tulsi is recommended as a treatment for a range of conditions including anxiety, cough, asthma, diarrhea, fever, dysentery, arthritis, eye diseases, otalgia, indigestion, hiccups, vomiting, gastric, cardiac and genitourinary disorders, back pain, skin diseases, ringworm, insect, snake and scorpion bites and malaria.[66]

Kasturi – Musk is characteristic scent producing gland which is obtained from the recatal regional of Deers. It is used for the scent which is very long lasting.

Kumkuma – Saffron – *Crocus sativus*

This petals and stigmas of this plant have medicinal properties such as controlling blood pressure, treatment of ischemic retinopathy, as antioxidant, anti tumor and as neuroprotective.[67]

Lakshmana *(Ipomea sepiaria)*

This plant is reported to be antidiabetic, hypolipidemic, tonic, aphrodisiac, antidiuretic, antibacterial and hyperdipsia.[68]

MATERIALS AND METHODS

The medicine, Manasamitra vatakam was procured from standard Ayurvedic shop at Chennai.

Antioxidant study of Manasamitra vatakam was carried out by three standard methods, i.e. DPPH assay, FRAP Assay and Hydroden peroxide scavenging assay.

DPPH Assay (Blios MS. 1958)[69]

The samples were dissolved in 3 different polar solvents (Ethanol, Methanol and Water) in 1mg/ml concentration and it was used as stock. From the stock, various concentrations (100, 200, 300, 400mg) had been taken for further analysis.

Respective solvents were taken as negative control.

Conc = Concentration of the sample

OD = OD of the sample

Neg Control = The solvent

Activity = Neg Control – OD / Neg Control

% of Activity = Activity/100

IC50 = 50 – c value / m value

IC50/ml = IC50/3 (We have taken 3 ml of DPPH for the assay. To find the activity in 1 ml, the value had been divided by 3)

FRAP Assay (Pulido)[70]

Sample was dissolved in Ethanol.

Note: Triplicates had been put for all the Processes.

Conc = Concentration of the sample

OD = OD of the sample

Linearity (y) = mx + c

M = Slope

C = The point x crosses y axis

X = OD – c value / m value

mM Fe/mg = X value / concentration x 1000

Mean = Average of mM Fe/mg

STDEV = Standard Deviation for mM Fe/mg

Hydrogen Peroxide Scavenging Activity (Ruch)[71]

Sample was dissolved in Ethanol and Water.

Note: Triplicates had been put for all the Processes.

Conc = Concentration of the sample

OD = OD of the sample

Neg control = The solvent

Activity = Negative control – OD / Negative control

% of activity = Activity / 100

Mean = Average of % of Activity

STDEV = Standard Deviation of % of Activity

Graph = (For Mean of % of Inhibition vs samples) Drawn using 2D clustered column

GC MS Analysis of the Manasamitra vatakam

The medicine which is available in liquid form was subjected to GC MS analysis after necessary procedure.

The metabolites in the samples were identified using a P2010 gas chromatography with thermal desorption system TD20 coupled with mass spectroscopy (Shimadzu). The ionization voltage 70ev and GC was conducted in the temperature programming mode with a Restek column (0.25mm, 60m, XTI-5). The temperature in the initial column was 80°C for 1 min, and then increased linearly to 70°C to 220°C held for 3 min followed by linear increased temperature 100° C up to 290°C and held for 10min. The injection port temperature was 290° C and the GC/MS interface was maintained at 29°C, the samples were introduced via an all glass injector working in the split mode with helium carrier gas low rate with 1.2 ml per minute.

The identification of metabolites was accomplished by comparison of retention time and fragmentation pattern with mass spectra in the NIST spectral library stored in the computer software (version 1.10 beta, Shimadzu) of the GC-MS. The relative percentage of each extract constituent was expressed with peak area normalization.

RESULTS AND DISCUSSION

The results of the DDPH assay of Manasamitra vatakam is represented in Table No 1.

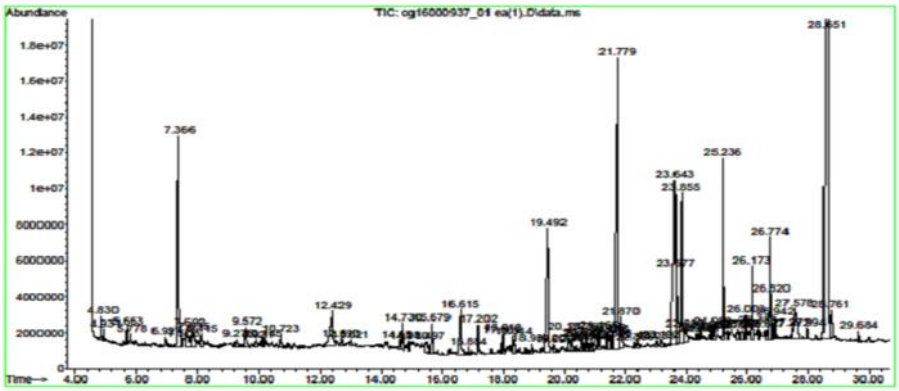

Figure 1: The GC MS chromatogram of Manasamitra vatakam.

Table 1: Indicates the results of DDPH assay with ethanol, methanol and water solutions of Manasamitra vatakam.

S. No	Solution	Conc.	OD	Neg.Control	% Activity	m value	C value	IC50	IC50/ml
1	Ethanol	100	1.213	1.295	6.332	0.044	0.864	1002.776	334.2585
2		200	1.152	1.295	11.042				
3		300	1.073	1.295	17.143				
4		400	1.044	1.295	19.382				
5	Methanol	100	0.892	1.295	31.119	0.098	10.13	406.837	135.6122
6		200	0.870	1.295	32.818				
7		300	0.763	1.295	41.811				
8		400	0.720	1.295	44.401				
9	Water	100	0.93	1.295	28.1853	0.098	9.122	417.2245	139.0748
10		200	0.857	1.295	33.8223				
11		300	0.807	1.295	37.6833				
12		400	0.717	1.295	44.6332				
13				1.295					

From the results it shows that IC50/ml was lowest value (135.6112) indicating highest activity in Methanol solution as compared to ethanol and water solutions.

FRAP antioxidant test Results are mentioned in Table No.2

Table 2: Indicates the FRAP assay patterns of Manasamitra Vatakam in Ethanol solution.

Solvent	Conc.	OD	m Value	c Value	X	mM Fe(II)/mg	Mean	STDEV
Ethanol	100	0.167	0.0274	0.1086	2.131387	21.31386861		
	100	0.184	0.0274	0.1086	2.751825	27.51624818		
	100	0.167	0.0274	0.1086	2.131387	21.31386861	23.38	3.58

From the Table no. 2, it is clear that methanol solution Manasamitra Vatakam indicated antioxidant activity (3.58).

Hydrogen peroxide scavenging assay results of Manasamitra vatakam is shown in Table No.3

Table 3: Indicates the Hydrogen Peroxide Assay results of Manasamitra vatakam.

Solvent	Conc.	OD	Neg. Control	% Activity	Mean	STDEV
Ethanol	100	0.314	0.748	0.580214	58.29	1.75
	100	0.298	0.748	0.601604		
	100	0.324	0.748	0.566850		
Water	100	0.547	0.748	26.87166	24.60	3.94
	100	0.598	0.748	20.05348		
	100	0.547	0.748	26.87166		

From the results it is clear that the Ethanolic solution of Manasamitra Vatakam indicated more antioxidant activity (4.48) when compared with that of water solution (2.39).

Table 4: GC MS analysis report with the retention time, % area of the peaks and Library/Id of each compound.

S. No.	Retention Time(Min)	% Area	Libraray /ID Compound
1	7.367	6.17	Borneol
2	7.690	0.92	N,N'-Diacetylethylenediamine 2-Ethylbutylamine
3	7.837	0.93	Diethyl disulfide Propanedinitrile Mercaptamine
4	9.575	0.63	2H-Pyran, 2-(3-butynyloxy)tetrahydro-
5	12.428	2.34	1-Heptadecanamine
6	14.730	0.76	2(3H)-Furanone, 5-butyldihydro-
7	15.499	0.59	Adenosine, 2-methyl-
8	15.681	0.83	Benzoic acid, 4-ethoxy-, ethyl ester
9	16.614	1.82	Undecanoic acid, 11-amino-
10	17.202	0.53	Asarone
11	18.346	0.52	N-Glycylglycine
12	20.137	0.68	1-Heptadecanamine
13	21.781	12.91	n-Hexadecanoic acid
14	23.642	6.76	Oleic Acid
15	23.678	2.27	9-Octadecenoic acid, (E)-
16	23.854	3.90	Octadecanoic acid
17	23.989	0.62	Oleylamine
18.	25.233	2.53	Isoamyl cinnamate
19	26.173	1.36	Erucic acid
20	26.772	1.93	9-Octadecenamide, (Z)-
21	26.819	1.03	Tetradecanamide
22	27.576	2.15	Disilane, (diphenylmethyl)pentaphenyl-
23	28.651	26.77	13-Docosenamide, (Z)-
23	28.762	1.00	C(14a)-Homo-27-nor-14.beta.-gammaceran-3.alpha.-ol Squalene

Some of the compounds which are present in high quantities (as represented by the % peak areas) are 13-Docosenamide,(Z)-, n-Hexadecanoic acid, Oleic Acid, Borneol, Octadecanoic acid, 9-Octadecenoic acid, (E)-, Isoamyl cinnamate, 1-Heptadecanamine, Disilane, 9-Octadecenamide, (Z)-, (diphenylmethyl)pentaphenyl-, Undecanoic acid, 11-amino-, Erucic acid, Tetradecanamide, Squalene etc.

The known biological activities of some of the biomolecules are mentioned below.

1. Borneol: Isoborneol, a derivative of Borneol is reported to have antiviral properties on herpes simplex virus 1 (HSV-1).[72]

2. Diethyl disulfide his organosulouhur has anticancer property.[73]

3. 2H-Pyran, 2-(3-butynyloxy) tetrahydro- This type of compounds have been found to have anticancer activity.[74]

4. 1-Heptadecanamine This compound has antimicrobial role.[75]

5. 2(3H)-Furanone, 5-butyldihydro- This enhances flavor of foods.

6. Benzoic acid, 4-ethoxy-, ethyl ester is an antifungal.[76]

7. Squalene. Antibacterial, Antioxidant, Pesticide, Antitumor, Cancer preventive, Immunostimulant, Chemo preventive, Lipoxygenase-inhibitor.[77]

8. Oleic acid: Antiinflamatory, Antiandrogenic, cancer preventive, hypercholesterolemic, 5-alpha reductase inhibitor.[78]

9. β-Asarone is a known antifungal.[79]

10. - Hexadecanoic acid is reported to have activities like antioxidant, hypocholesterolemic, nematicide, antiandrogenic, as flavoring agents, hemolytic, antibacterial and cytotoxic and as 5-alpha reductase inhibitor.[80-82]

11. Octadecanoic acid esters are reported to be antiviral, antibacterial and antioxidant activities.[83]

12. Isoamyl Cinnamate. It has a host of biological activities like antioxidant, hepatoprotective, anxiolytic, insect repellent, antidiabetic and anticholesterolemic etc. Different substitutions on basic moiety lead to various pharmacological activities e.g. m- hydroxy or p- methoxy residue on cinnamic acid (CA) is significantly important functional groups as an effective insulin releasing agent while 3, 4-Dihydroxycinnamic acid (Caffeic acid, CAF) shows hepatoprotective activity.[84]

13. Erucic acid is a monounsaturated omega-9 fatty acid which can cause toxicity if consumed in large quantities.

14.-Docosenamide, (Z)-is an antimicrobial compound.[85]

The biological activities some of the compounds like N,N'-Diacetylethylenediamine,2-Ethylbutylamine, Propanedinitrile, Mercaptamine, Adenosine, 2-methyl-, Undecanoic acid, 11-amino-, Oleylamine, 9-Octadecenamide, (Z)-, Tetradecanamide, Disilane, (diphenylmethyl) pentaphenyl-, 13-Docosenamide, (Z)-, C(14a)-Homo-27-nor-14.beta.-gammaceran-3.alpha.-ol, which are shown In the GC MS analysis report are not clearly known.

Among the various plants used for the preparation of Manasamitra vatakam the plants, namely, *Sida cordifolia, Uraria picta, Clitoria ternate, Acorus calamus, Santalum album, Glycyrrhiza glabra, Sphaeranthus indicus, Leptadenia reticulate. Sarcostemma acidum, Withania somnifera, Vetiveria zizanioides, Adiantum philippense* and *Saffron* are proven for their activities on central nervous system. Other plants have different other biological activities like antioxidant, tonic etc. which might give a synergy to his medicine. The biomolecules as found in the GC MS analysis are very important for the homoeostasis of the body which may be attributed to the neuroprotective and neurostimulatory role of manasamitra vatakam. Since this medicine is made of very huge number of components which include plant parts, animal parts and minerals, it requires much deeper analysis to prove the efficacy by subjecting this drug to various other methods. Further probe is all the more essential as the minerals present in the formulation could have formed some metlloproteins and other conjugate compounds the details of which is not reflected in the GC MS analysis. The present report is a preliminary evaluation and further analysis is in warranted.

CONCLUSION

The GC MS analysis and antioxidant study of Manasamitra vatakam has indicated some very important biomolecules which augur well with its medicinal use as anti anxiety and brain tonic properties. Further study is required to prove the efficacy of this medicine at molecular levels.

REFERENCES

1. Rao MRK, Aparna Ravi, Narayanan S, Prabhu K, Kalaiselvi VS, Shruthi Dinakar, Guru Rajan, Kotteeswaran N. Antioxidant study and GC MS analysis of an ayurvedic medicine 'Talisapatradi choornam'. Int J Pharm Sci Rev Res, 36(1), 2016, 158-166.
2. Tubaki BR, Chandrashekar CR, Sudhakar D, Prabha TN, Lavekar GS, Kutty BM. Clinical efficacy of Manasamitra Vataka (an Ayurveda medication) on generalized anxiety disorder with comorbid generalized social phobia: a randomized controlled study. J Alt Complement Med, 18(6), 2012, 612-621.
3. Thirunavukkarasu SV, Jayanthi M, Raja S, Venkataraman S. Effect of Manasamitra vatakam against Aluminium induced learning and memory impairment if Apoptosis in rat's hippocampus and cortex. J Drug Metab Toxicol, 4, 2013, 154. Doi: 4172/2157-7609.1000154.
4. Thirunavukkarasu SV, Upadhyay L, Venkataraman S. Effect of Manasamitra vatakam, an Ayurvedic formulation, on Aluminium induced nephrotoxicity. Tropi J of Pharma Res, 11(1), 2012, 75-83.
5. Thirunavukkarasu SV, Venkataraman S, Upadhyay L. *In vitro* antioxidant and antimicrobial activity of Polyherbal Manasamitra vatakam (MMV) drug. J Pharmacy Res, 3(8), 2010, 2042-2047.
6. Mohammad Abdul Motalib Momin, Sm Faysal Bellah, Sarder Mohammad Raussel Rahman, Ahmed Ayedur Rahman, Gazi Mohammad Monjur Murshid, Talha Bin Emran. Phytopharmacological evaluation of ethanol extracts of *Sida cordifolia* L. roots. Asian Pac J Trop Biomed, 4(1), 2014, 18–24.
7. Sinha J, Purwar S, Chuhan SK, Rai G. Nutritional and medicinal potential of *Grewia subinaequalis* DC. (Syn. G. *asiatica*.) (Phalsa). Journal of Medicinal Plants Research, 9(19), 2015, 594-612.
8. Shahedur Rahman, Rashida Parvin. Therapeutic potential of *Aegle marmelos* (L.)-An overview. Asian Pac J Trop Dis, 4(1), 2014, 71–77.
9. Garg N, Garg M, Maan AS, Sandhu BS, Mittal S, Goyal S. Phytochemical studies and anti anxiety activity of *Uraria picta* leaves. Journal of Pharmaceutical Research and Opinion, 2, 5, 2012, 39-40.
10. Modi MB, Donga SP, Dei L. Clinical evaluation of *Ashokarishta, Ashwagandha Churna* and *Praval Pishti* in the management of menopausal syndrome. Ayu. 33(4), 2012, 511–516.
11. Swain SS, Rout KK, Chand PK. Production of Triterpenoid Anti-cancer Compound Taraxerol in Agrobacterium-Transformed Root Cultures of Butterfly Pea (*Clitoria ternatea* L.). Appl Biochem Biotechnol, 168(3), 2012, 487-503.
12. Dikshit M, Saxena GK. A review on bhasma kalpana & standardization of tamra bhasma. 4(3), 2015, 744-750.
13. Arumugam P, Murugan M. Antimutagenic and Antiapoptotic Effects of Aqueous Root Extract of *Inula racemosa* Hook. f. on 4-NQO-Induced Genetic Damage in Mice. ISRN Pharmacol, 2013, 2013, 768359.
14. Sharma AK. Medicinal value of *Inula racemes* Hook. f. (Pushkarmoola). Unique Journal of Ayurveda and Herbal Medicine, 2(2), 2014, 11-13.
15. Kumar A, Vandana. Medicinal properties of *Acorus calamus*. Journal of Drug Delivery & Therapeutics, 3(3), 2013, 143-144.
16. Khan MS, Singh M, Khan MA, Sayeed Ahmad. Protective effect of *Santalum album* on doxorubicin induced cardiotoxicity in rats. World Journal of Pharmaceutical Research, 3(2), 2014, 2760-2771.
17. Ahmad N, Khan MSA, Jais AMM, Mohtaruddin N, Ranjbar M, Amjad SM, Nagaraju B, Pathan M. Anti-ulcer Activity of Sandalwood (*Santalum album* L.) Stem Hydroalcoholic Extract in Three Gastric-Ulceration Models of Wistar Rats. Bol Latinoam Caribe Plant Med Aromat, 12(1), 2013, 81-91.

18. Azamthulla M, Balasubramanian R, Kavimani S. A review on *Pterocarpus santalinus* linn. World Journal of Pharmaceutical Research. 4(2), 2015, 282-292.
19. Wavare RC, Kadam VV, Sheth SM, Sawant RM. A pharmaceutical approach or pearl as a biosafe nanomedicine. Int Res J of Pharmacy, 5(1), 2014, 83-87.
20. Monica Damle. *Glycyrrhiza glabra* (Liquorice)- a potent medicinal herb. International Journal of Herbal Medicine, 2(2), 2014, 132-136.
21. Ranasinghe P, Pigera S, Sirimal GA, Galappaththy PP, Constantine GR, Prasad K. Medicinal properties of 'true' cinnamon (*Cinnamomum zeylanicum*): a systematic review. BMC Complementary and Alternative Medicine, 13, 2013, 275.
22. Jayaprakasha GK, Rao LJ. Chemistry, biogenesis, and biological activities of *Cinnamomum zeylanicum*. Crit Rev Food Sci Nutr, 51, 2011, 547–562.
23. Kumar S, Kamboj J, Suman, Sharma S. Overview for various aspects of the health benefits of *Piper longum* Linn. fruit. J of Acupuncture and Meridian studies. 4(2), 2011, 134-140.
24. R Hamidpour, S Hamidpour, M Hamidpour, M Shahlari. Camphor (*Cinnamomum camphora*), a traditional remedy with the history of treating several diseases. Int J of Case Reports and Images, 4(2), 2013, 86-89.
25. Wojdylo A, Nowicka P, Laskowski P, Oszmianski J. Evaluation of sour cherry (*Prunus cerasus* L.,) fruits for polyphenol content, antioxidant properties and nutritional components. J of Agric. Food Chem, 62(51), 2014, 12332-12345.
26. Gurudeeban S, Satyavani K, Ramanathan T. Bitter apple, *Citrullus cholocynthis*. An overview of chemical composition and Biomedical potential. Asian J of Plant Sciences, 9(7), 2010, 394-401.
27. Rana S, Rana KK. Review on Medicinal Usefulness of Vitex negundo Linn. Open Access Library Journal, 1, 2014, 1-13.
28. Sah AK, Verma VK. Phytochemicals and Pharmacological Potential of Nyctanthes arbortristis: A Comprehensive Review. International Journal of Research in Pharmaceutical and Biomedical Sciences, 3(1), 2012, 420-427.
29. Bhagwat DP, Kharya MD, Bani S, Kaul A, Kaur K, Chauhan PS, Suri KA, Satti NK. Immunosuppressive properties of *Pluchea lanceolata* leaves. Ind J of Pharmacology, 42(1), 2010, 21-26.
30. Md. Josim Uddin, Md. Masudur Rahman, Md. Abdullah-Al-Mamun, Golam Sadik. *Vanda roxburghi*: An experimental evaluation of antinociceptive properties of a traditional epiphytic medicinal orchid in animal models. BMC Complementary and Alternative Medicine, 15, 2015, 305.
31. Firke AC, Pargunde S. Shuddha Shilajatu - Rasayana with its pharmacological actions. Punarnav, 2(3), 2014, 1-9.
32. Kumar N, Kumar R, Kishore K. Onosma L.: A Review of phytochemistry and ethnopharmacology. Pharmacogn Rev, 7(14), 2013, 140–151.
33. Mehta NR, P Patel EP, Patani PV, Shah B. *Nelumbo Nucifera* (Lotus): A Review on Ethanobotany, Phytochemistry and Pharmacology. Indian J Pharm Biol Res, 1(4), 2013, 152-167.
34. Sharma P, Mahajan N, Garg P, Singh G, Dadhwal S, Sharma S. *Malaxis acuminate*: A review. Int J of Res in Ayurveda and Pharmacy, 2(2), 2011, 422-425.
35. Patel ED, Patel NJ, Vegad KL, Jadav DN. Pharmacognostic and Phytochemical Evaluation of Leaves of *Manilkara hexandra* (Roxb.) Dubard. Int J Current Trends in Pharma Res, 3(4), 2015, 984–988.
36. Shah WA, Mir TA, Ahmed A. Antiproloferative and antioxidant potentials of different extracts of *Fritillaria roylei*. World J of Phar Sci, 2(4), 2014, 386-389.
37. Misra A, Srivastava S, Verma S, Rawat AK. Nutritional evaluation, antioxidant studies and quantification of poly phenolics, in *Roscoea purpurea* tubers. BMS Res Notes, 8, 2015, 324.
38. Deb PK, Ghosh R, Chakraverty R, Debnath R, Das L, Bhakta T. Phytochemical and Pharmacological Evaluation of Fruits of *Solanum indicum* Linn. Int J Pharm Sci Rev Res, 25(2), 2014, 28-32.
39. Reddy NM, Reddy RN. *Solanum xanthocarpum* Chemical Constituents and Medicinal Properties: A Review. Scholars Academic Journal of Pharmacy, 3(2), 2014, 146-149.
40. Ramachandran S. Review on *Sphaeranthus indicus*. Pharmacogn Rev, 7(14), 2013, 157-269.
41. Sundari K, Govindaraju G. Protective effects of aqueous extract of *Sphaeranthus indicus* L. on paracetamol induced hepatic damage in rats. Res J Pharm Biol Chem Sci, 3, 2012, 62–69.
42. Agbonlahor Okhuarobo, Joyce Ehizogie Falodun, Osayemwenre Erharuyi, Vincent Imieje, Abiodun Falodun, Peter Langer. Harnessing the medicinal properties of *Andrographis paniculata* for diseases and beyond: a review of its phytochemistry and pharmacology. Asian Pac J Trop Dis. 4(3), 2014, 213–222.
43. Bhalerao SA, Kelkar TS. Traditional Medicinal Uses, Phytochemical Profile and Pharmacological Activities of *Cassia fistula* Linn. International Research Journal of Biological Sciences, 1(5), 2012, 79-84.
44. Khattab HAH, Shitany NAE, Abdallah IZA, Yousef FM, Huda M. Alkreathy. Antihyperglycemic Potential of Grewia asiatica Fruit Extract against Streptozotocin-Induced Hyperglycemia in Rats: Anti-Inflammatory and Antioxidant Mechanisms. Oxidative Medicine and Cellular Longevity, Volume 2015 (2015), Article ID 549743, 7 pages.
45. Sinha J, Purwar S, Chuhan SK, Rai G. Nutritional and medicinal potential of *Grewia subinaequalis* DC. (Syn. G. *asiatica*.) (Phalsa). Journal of Medicinal Plants Research, 9(19), 2015, 594-612.
46. Bag A, Bhattacharya SK, Chattopadhyay RR. The development of *Terminalia chebula* Retz. (Combretaceae) in clinical research. Asian Paci J Tropical Biomed, 3(3), 2013, 244.
47. Saraswathi NM, Karthikeyan M, Kannan M, Rajasekar S. *Terminalia belerica* .Roxb-A Phytopharmacological Review. International Journal of Research in Pharmaceutical and Biomedical Science, 3(1), 2012, 96.
48. Bhide MM, Nitave SA. Roles of *Embelica officinalis* (Amla) in medicine. World Journal of Pharmacy and Pharmaceutical Sciences, 3(6), 2014, 604-615.
49. Dasaroju S, Gottumukkala KM. Current Trends in the Research of *Emblica officinalis* (Amla): A Pharmacological Perspective. Int J Pharm Sci Rev Res, 24(2), 2014, 150.
50. Upadhyay AK, Kumar K, Kumar A, Mishra HS. *Tinospora cordifolia* (Willd.) Hook. f. and Thomas. (Guduchi) - validation of the Ayurvedic pharmacology through experimental and clinical studies. Int J Ayurveda Res, 1, 2010, 112–121.
51. Chatterjee S, Banerjee A, Chandra I. *Hemidesmus indicus*: A Rich Source of Herbal Medicine. Med Aromat Plants, 3, 2014, 4.
52. Godara P, Dulara B, Barwar N, Rao DV. Multidimensional approach of endangered ayurvedic plant *Leptadenia reticulata*: A review. Int. Journal of Applied Sciences and Engineering Research, 4(4), 2015, 531-543.
53. Kirtikar KR, Basu BD. Indian Medicinal Plants. Vol.3 Dehradun. International Book Distributors, 2005, 1863–1865.
54. Ittiyavirah SP, Rahees T. Evaluation of psychopharmacological activity of ethyl acetate extract of *Sarcostemma acidum* (Roxb).Voigt. The Journal of Phytopharmacology, 2(5), 2013, 1-7.

55. Uddin Q, Samiulla L, Singh VK, Jamil SS. Phytochemical and pharmacological profile of *Withania somnifera* Dunal: A review. J of Applied Pharmaceutical Sciences, 2(1), 2012, 170-175.

56. Sikha A, Harini A, Hegde PL. 2015. Pharmacological activities of wild turmeric (*Curcuma aromatica* Salisb): a review. Journal of Pharmacognosy and Phytochemistry, 3(5), 2015, 1-4.

57. Liu B, Gao YQ, Wang XM, Wang YC, Fu LQ. Germacrone inhibits the proliferation of glioma cells by promoting apoptosis and inducing cell cycle arrest. Mol Med Rep, 10(2), 2014, 1046-1050.

58. Bhushan B, Sharma SS, Singh T, Singh L, Arya H. *Vetiveria zizanoides* (L.) Nash: a pharmacological overview. Int Res J Pharma, 4(7), 2013, 18-20.

59. Dohadwala MM, Vita JA. Grapes and Cardiovascular Disease. J Nutr, 139(9), 2009, 1788S–1793S.

60. Khusniyati E, Sari AA, Yueniwati Y, Noorhamdani N, Nurseta T, Keman K. The effects of *Vigna unguiculata* on cardiac oxidative stress and aorta estrogen receptor-β expression of ovariectomized rats. Asian Pacific Journal of Reproduction, 3(4), 2014, 263-267.

61. Aruna D, Chakarvarthy K, Sarath BK. Evaluation of diuretic activity of *Cynodon dactylon* in rats with comparison of hydrochlorothiazide. Int J Res Pharmaceut Biomed Sci, 4(2), 2013, 471-474.

62. Kanimozhi D, Ratha BV. *In vitro* anticancer activity of ethanolic extract of *Cynodon dactylon* against HT-29 cell line. Int J Curr Sci, 5, 2013, 74-81.

63. Yogesh HS, Kidchadi SCK, Muchandi IS, Gopalakrishna B. Evaluation of Anti-Inflammatory activity of *Cynodon dactylon* Pers. on carrageenan induced paw edema in rats. Indian J Nat Prod Resour, 4(2), 2013, 151-154.

64. Ali MS, Amin MR, Kamal CMI, Hossain MA. In vitro antioxidant, cytotoxic, thrombolytic activities and phytochemical evaluation of methanol extract of the *A. philippense* L. leaves. Asian Pacific Journal of Tropical Biomedicine, 3(6), 2013, 464–469.

65. Gülçin I, Elmastas M, boul-Enein HY. Antioxidant activities of clove oil- A powerful antioxidant source. Arab J Chem, 5(4), 2012, 489–499.

66. Cohen MC. Tulsi - a herb for all reasons. J Ayurv Int Med. 5(4), 2014, 251-259.

67. Hosseinzadeh H, Younesi HM. Antinociceptive and anti-inflammatory effects of *Crocus sativus* L. stigma and petal extracts in mice. BMC Pharmacology, 2, 2002, 7.

68. Larbie C, Torkornoo D, Dadson J. Anti-diabetic and hypolipidaemic effect of botanicals: a review of medicinal weeds on KNUST campus, Kumasi. Journal of Applied Pharmaceutical Science, 4(10), 2014, 97-104.

69. Blois MS, 1958. Antioxidant determinations by the use of a stable free radical. Nature, 29, 1199-1200.

70. Pulido R, Bravo L, Sauro-Calixo F. Antioxidant activity of dietary polyphenols as determined by a modified ferric reducing/antioxidant power assay. J Agri Food Chem, 48, 2000, 3396-3402.

71. Ruch RJ, Cheng SJ, Klaunig JE. Prevention of cytotoxicity and inhibition of intracellular communication by antioxidant catechins isolated from Chinese green tea. Carcinogenesis, 10, 1989, 1003-1008.

72. Armaka M, Papanikolaou E, Sivropoulou A, Arsenakis M. Antiviral properties of isoborneol, a potent inhibitor of herpes simplex virus Type 1. Antiviral Research, 43(2), 1999, 79-92.

73. Georgia Schäfer, Catherine H. Kaschula. The Immunomodulation and Anti-Inflammatory Effects of Garlic Organosulfur Compounds in Cancer Chemoprevention. Anticancer Agents Med Chem, 14(2), 2014, 233–240.

74. Dong Y, Nakagawa-Goto K, Lai C, Susan L. Morris-Natschke, Kenneth F. Bastow K. Antitumor agents 287. Substituted 4-amino-2*H*-pyran-2-one (APO) analogs reveal a new scaffold from neo-tanshinlactone with *in vitro* anticancer activity. Bioorg Med Chem Lett, 21(8), 2011, 2341–2344.

75. Sukatar A, N. Ulku Karabay-Yavas, OgLu, Guven Ozdemir, Zerrin Horzum. Antimicrobial activity of volatile component and various extracts of Enteromorpha linza (Linnaeus) J. Agardh from the coast of Izmir, Turkey. Annals of Microbiology, 56(3), 2006, 275-279.

76. Hussain AZ, Kummaresan S. GC MS studies and phytochemical screening of *Sebania grandiflora* L. J of Chem Pharma Res, 6(9), 2014, 43-47.

77. Sermakkani M., Thangapandian V. GC-MS Analysis of *Cassia italica* leaf methanol extract. Asian Journal of Pharmaceutical and Clinical Research, 5(2), 2012, 90-94.

78. Gopalakrishna S. 2011. GC MS analysis of some bioactive constituents of *Mussaenda frondasa* Linn. Int J of Pharma and Bio Sciences, 2(1), 2011, 313-320.

79. Yun B, Hwang BK. Antifungal activity of β- Asarone from rhizomes of *Acorus gramineus*. J Agric Food Chem, 52(4), 2004, 776-78.

80. Lalitharani S, Mohan VR, Regini GS, Kalidass C. GC-MS analysis of ethanolic extract of *Pothos scandens* leaf. J Herb Medi Toxicology, 3, 2009, 159-160.

81. Dineshkumar G, Rajakumar R. GC-MS evaluation of bioactive molecules from the methanolic leaf extract of *Azadirachta indica* (A.JUSS). Asian J of Pharmaceutical Science & Tech, 5(2), 2015, 64.

82. Rajeswari G, Murugan M, Mohan VR. GC-MS analysis of bioactive components of *Hugonia mystax* L. bark (Linaceae). J Pharm Biomed Sci., 29, 2013, 818-824.

83. Sudharsan S, Saravanan, Shanmugam A, Vairamani S, Mohan Kumar R, Menaga S, Ramesh N. Isolation and Characterization of Octadecanoic Acid from the Ethyl Acetate Root Extract of *Trigonella foneum graecum* L. by Using Hydroponics Method. J Bioterr Biodef, 2, 2010, 105. doi: 10.4172/2157-2526.1000105.

84. Sharma P. Cinnamic acid derivatives: A new chapter of various pharmacological activities. J Chem Pharm Res, 3(2), 2011, 403-423.

85. Norliana Ghazali, Nurul Asma Abdullah, Asiah Abu Bakar, Noor Khairiena Mohamad. GC MS analysis of some bioactive components in the root extract of *Ixora coccinea* linn. Int J Pharm Bio Sci, 5(3), 2014, 197-203.

Source of Support: Nil, **Conflict of Interest:** None.