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DETERMINATION OF BIOACTIVE COMPOUNDS FROM *Bacopa monneria* Linn. BY USING GC-MS ANALYSIS

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ABSTRACT

Memory is a process of retaining, storing and recalling experiences, and it is closely associated with learning. Though learning knowledge is acquired and through memory this knowledge is made available. Memory is the ability of an individual to record sensory stimuli, information retain them over short or long periods of time and recall the same at later date when needed. Poor Memory, lower retention and slow recall and are common problems in today's stressful and competitive world. Age stress, emotions are conditions that may lead to memory loss, amnesia, anxiety, high blood pressure, dementia, to more ominous threat like schizophrenia and Alzheimer's diseases. The nature provides a new opportunity to regain one's full mental capacity. A number of herbs traditionally employed in the Indian System of Medicine. Bacopa monneria has been used to promote memory enhancing activity, treatment psychoneurological disorders and as a rejuvenator. The most important bioactive constituents of this plant is alkaloids, tannins, flavonoids and phenolic compound. The plant Bacopa monneria is one of the most useful traditional medicinal plants in India. The plant is commonly used for the role of memory enhancement due to the presence of bioactive components. In the Present study the GC-MS analysis of Bacopa monneria was carried out to detect the active principle present in the plant.

Key words: *Bacopa monneria, Bioactive compounds, Phytomedicine, GC-MS*

I.INTRODUCTION

Bacopa monneria is a creaping herb belongs to the family Scophulariaceae [1]. It is a native to the wetlands of southern India, Australia, Europe, Africa, Asia, North and South America. Bacopa is a medicinal herb used in Ayurveda, where it is also known as "Brahmi," after Brahma, the creator God of the Hindu pantheon [2]. *Bacopa monneria* is an Indian herb commonly given to infants where it is observed to boost memory power intelligence, and mental health [3,4]. *Bacopa monneria* for memory enhancement goes back 3000 years or more in India, when it was cited for its medicinal properties, especially the memory-enhancing capacity, in the Vedic texts "Athar-Ved Samhita" (3:1) of 800 B.C and in Ayurveda [5,6]. Bacosides is the major phytochemical constituents in *Bacopa monneria*, help to repair damaged neurons by enhancing proteins involved in the regeneration of neural-cell synapses [7,]. Thus *Bacopa monneria* can be viewed as a neural nourished, restoring depleted synaptic activity and leading to enhance memory function [8].

The leaves of this plant are succulent, oblong and 4–6 mm (0.16–0.24 in) thick. Leaves are oblanceolate and are arranged oppositely on the stem. The flowers are small and white, with four or five petals. Its ability to grow in water makes it a popular aquarium plant. It can even grow in slightly brackish conditions. Propagation is often achieved through cuttings. It is commonly grown throughout India, Nepal, Srilanka, China, Pakistan, Taiwan and Vietnam. It is also found in Florida, Hawaii and other southern states of the United States where it can be grown in damp conditions by a pond or bog garden [9]. The whole parts of the plant is used to treat various human ailments. It is a cardiac and nervine tonic, leaves and stalks are diuretic and aperients[10, 11]. The crude Alcoholic extract of the plant showed a sedative effect, it also exerted cardiotonic, vaso constrictor, and neuromuscular blocking action. It has been used in traditional Ayurvedic treatment for epilepsy and asthma [12]**.** It is also used for ulcers**,** tumors**,** ascites**,** enlarged spleen**,** indigestion**,** inflammations**,** leprosy**,** anemia**,** and biliousness. *Bacopa monneria* have antioxidant properties which support cardiovascular diseases [13, 14]. In order to ascertain the active principle present in the plant, GC-MS study was carried out and documented in the present study.

II.MATERIALS AND METHODS

Collection of plant material

The plant material was collected from the damp and marshy areas of River basin of Paraliyaru, Thiruvattar, Kanyakumari District, Tamilnadu, India.

Preparation Leaf Powder

Fresh leaves of the plant *Bacopa monneria* were collected and washed thoroughly under running tap water to be freed fully from foreign particles. Then the leaves were cut into small pieces and shade dried. The dried leaves were then pulverized to powder using a mechanical grinder and the powdered leaves were preserved in an airtight container to avoid the effect of humidity and then stored at room temperature until for further use**.**

GC-MS ANALYSIS

Sample preparation for GC-MS analysis

The powdered leaves of the plant were used for GC-MS analysis. For the Identification of bioactive components in plants, the extract was subjected to GC-MS analysis. The GC-MS is capable of injecting various kinds of samples such as microliter volumes of liquids, vapor from a headspace vial, or chemicals adsorbed on a Solid Phase Micro Extraction (SPME) fiber but only headspace analysis will be discussed since all other methods will not be used during this analytical class. There are a few guidelines on how a sample should be prepared for headspace GC-MS. All compounds must be volatile enough to pass through the chromatographic column when heated to 300°C. Non-polar compounds with up to 500 g/mol molecular weight and polar compounds with up to 300 g/mol molecular weight should make it through.

RESULT

Gas chromatography and mass spectroscopy analysis of compounds was carried out in leaf extract of *Bacopa monneria*. The GC-MS graph of the plant *Bacopa monneria* is shown in Figures1. It showed the presence of 11 major components corresponding to the peaks were determined in the figure (1.a – 1.k).

.The results pertaining to GC-MS analysis of the leaf powder of *Bacopa monneria* lead to the identified number of bioactive compounds. On comparison of the mass spectra of the constituents with the NIST library the 11 phytochemical constituents were characterized and identified Table1.

Fig 1: GC-MS graph of the leaf powder of *Bacopa monneria*

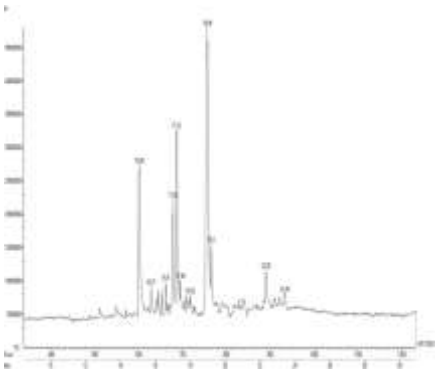

Fig 1.a: Structure of Hexadecanoic acid, methyl ester present in the leaf powder of *Bacopa monneria* by using GC-MS analysis.

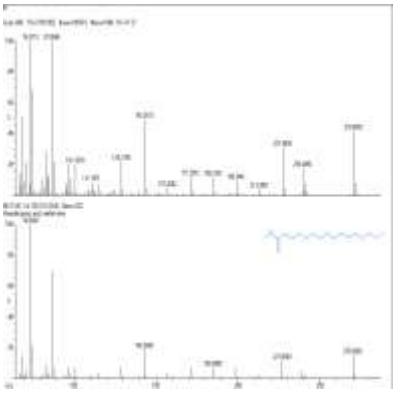

Fig 1.b: Structure of Z, E-2-methyl-3, 13-octadecadien-1-ol present in the leaf powder of *Bacopa monneria* by using GC-MS analysis.

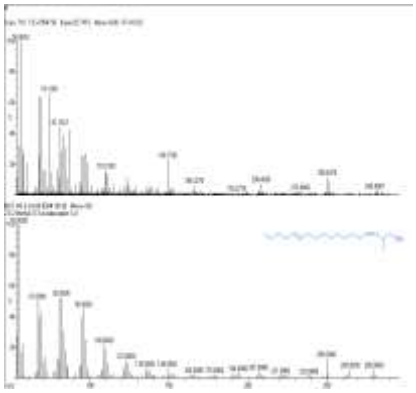

Fig 1.c: Structure of Heneicosanoic acid present in the leaf powder of *Bacopa monneria* by using GC-MS analysis.

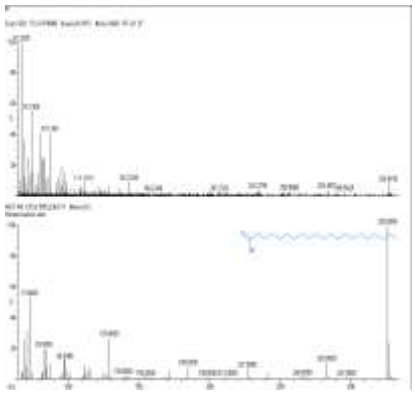

Fig1.d: Structure of methyl tetradecanoate present in the leaf powder of Bacopa monniera by using GC-MS analysis

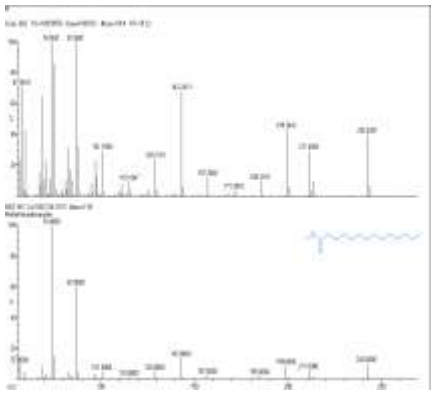

Fig 1.e Structure of 9-hexadecenoic acid, methyl ester [Z] - present in the leaf powder of *Bacopa monneria* by using GC-MS analysis.

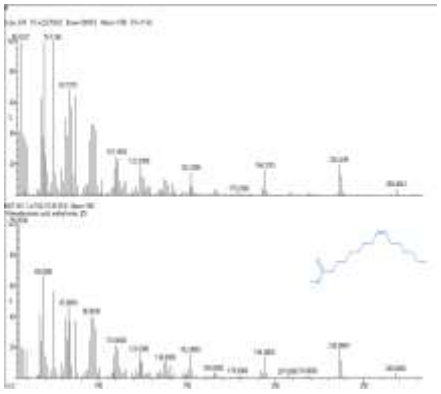

Fig 1.f: Structure of Methyleicosa-5, 8, 11, 14, 17-pentaenoate present in the leaf powder of *Bacopa monneria* by using GC-MS analysis.

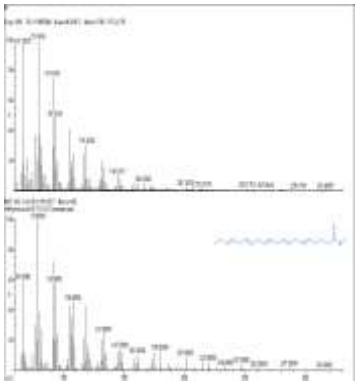

Fig 1.g: Structure of Benzene propanoic acid, 3, 5-bis [1, 1-dimethylethyl]-4-hydroxy-, methyl ester present in the leaf powder of *Bacopa monneria* by using GC-MS analysis.

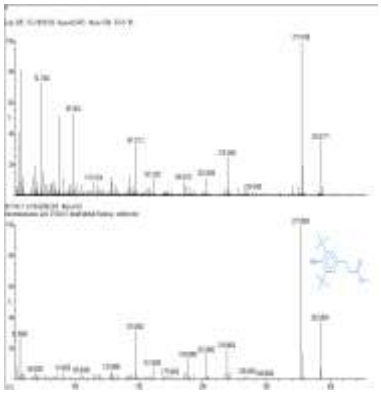

Fig 1.h: Structure of Pentadecanoic acid, methyl ester present in the leaf powder of *Bacopa monneria* by using GC-MS analysis.

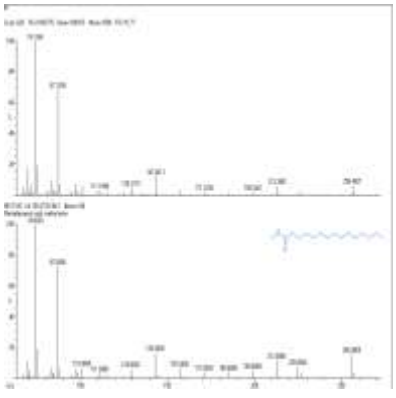

Fig 1.i: Structure of Mass Spectrum of 10-Octadecenoic acid, methyl ester present in the leaf powder of *Bacopa monneria* by using GC-MS analysis.

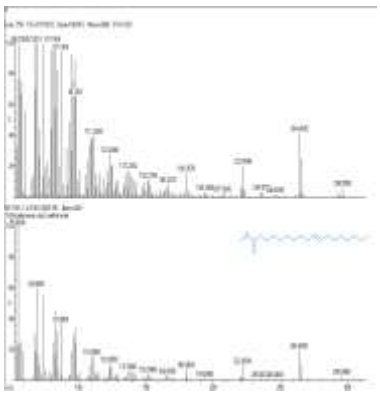

Fig 1.j: Structure of Heptadecanoic acid, 16-methyl-, methyl ester present in the leaf powder of *Bacopa monneria* by using GC-MS analysis.

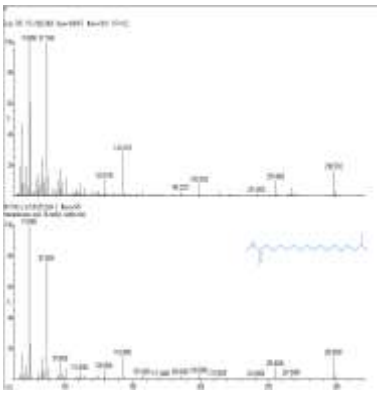

Fig 1.k: Structure of 2-Heptenoic acid, [6-[4-cyanophenyl] 2-naphthyl ester present in the leaf powder of *Bacopa monneria* by using GC-MS analysis.

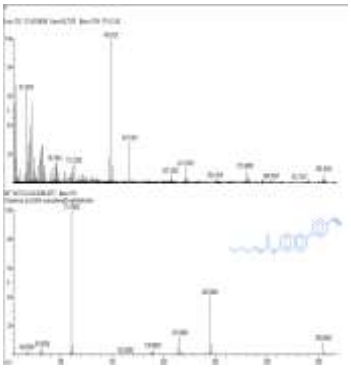

Table 1. Phytochemical constituents of *Bacopa monneria*

Sl no.	Name of the Compounds	Retention time
1.	Methyl tetradecanoate	15.12
2.	9-Hexadecenoic acid, methyl ester, [Z]	17.02
3.	Hexadecanoic acid, methyl ester	17.27
4.	10-Octadecenoic acid, methyl ester	19.03
5.	Methyl eicosa-5,8,11,14,17- Pentaenoate	22.35
6.	Pentadecanoic acid, methyl ester	15.77
7.	Benzenepropanoic acid,3,5-bis[1,1-dimethyl]-4-hydroxy- ,methyl ester	17.45
8.	Z,E-2-Methyl-3,13-Octadecadien-1-ol	18.02
9.	Heneicosanoic acid	21.07
10.	Heptadecanoic acid, 16-methyl, methyl ester	19.20
11.	2-Heptenoic acid,[6-[4-cyanophenyl]2-naphthyl] ester	23.43

III.DISCUSSION

The GC-MS spectrum confirmed the presence of various components with different retention times. The mass spectrometer analyses the compounds eluted at different times to identify the nature and structure of the compounds. The large no of compound fragments into small compounds giving rise to appearance of peaks at different m/z ratios. These mass spectra are fingerprint of that compound which can be identified from the data library. GC-MS is one of the best techniques to identify the constituents of volatile matter, long chain, branched chain hydrocarbons, alcohols, acids, esters etc. The GC-MS analysis of *Bacopa monneria* leaves revealed the presence of five bioactive compounds and *Bacopa monneria* has eleven compounds that could contribute the medicinal quality of the plant. The bioactive compounds may be responsible for their usefulness in the management and treatment of various diseases. In the present study, reported that the bioactive compounds in both the plant *Bacopa monneria* by using GC-MS analysis, which is mostly needed for memory enhancement activity.

IV.CONCLUSION

This study has revealed that the plant *Bacopa monneria* is found to have better level of memory enhancement activity *Bacopa monneria*. Further GC-MS analysis of this sample has established the presence of eleven bioactive components. The presence of various bioactive compounds justifies the use of Bacopa *monneria* for various human ailments by traditional practitioners. *Bacopa monneria* decreases blood pressure to reduce anxiety and stimulates production of neurotransmitter and *Bacopa monneria* generally increases mental function. And also it is a right step in the direction of searching for novel and more effective Gas chromatography and mass spectroscopy analysis which showed the existence of various compounds with variable chemical structures. However, the isolation of individual phytochemical constituents and subjecting it to biological activity will definitely give effective results. So it is recommended as a plant of phytopharmaceutical importance. However, further studies will need to be undertaken to ascertain fully its bioactivity, toxicity profile, effect on ecosystem and agriculture products.

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