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## Phytochemical and Biochemical Studies Of Medicinal Plant *Bacopa Monnieri*

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### ABSTRACT

Screening of phytochemicals is a precious stair in the detection of bioactive principles present in particular medicinal plant and may lead to novel drug discovery. In the present study, *Bacopa monnieri* root extracts are tested for phytochemical and biochemical studies. Ethanolic extract shown good number of compounds compared to methanolic, ethyl acetate, aqueous and chloroform extracts. Phytochemical analysis of ethanolic tuber extract of *Bacopa monnieri* has shown the biological compounds like carbohydrates, cholesterol, Amino acids, Steroids, Alkaloids, Flavonoids, Cardiac glycosides, Saponins, Tannins, Terpenoids, Phlobatinins, Fattyacids, Coumarins and Phenols. The result suggests that the phytochemicals present in *Bacopa monnieri* tuber extracts may show antimicrobial, anti-inflammatory and antioxidant properties.

**Keywords:** *Bacopa monnieri*, Phytochemical, Solvent extraction, Biochemical studies.

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## INTRODUCTION

Herbal traditional medicines have gained considerable momentum worldwide during the past decade and play paramount role in health care programs especially in developing countries<sup>1</sup>. The global market of medicine that worth about 1.1 trillion US dollars comprises of plant based medicines<sup>2</sup>. The world depends upon the herbal medicine for the largest sources of the plant biodiversity still about 70% to 80% of the world population which are being used since the ages as the traditional health care system<sup>3</sup>. The medicinal plants are useful for healing as well as for curing of human disease because of the presence of phytochemical constituents. Ancient Siddha literatures are well provided with references on the herbs with medicinal properties. Carvings of our siddhars are still an astonishing one. every country has its own system of medicine. Likewise in our country Siddha system of medicine is most popular<sup>4</sup>. Plants have designed the basis of classy traditional medicine practices that have been used for thousands of years by people in china, India and many other countries<sup>5</sup>.

*Bacopa monnieri* is a herb which is most popular as neurotonic<sup>6</sup>. It belongs to *Scrophulariaceae* family, which represents 220 genera with more than 4,500 species, and typically grows in the wetlands of southern India and Australia. *Bacopa monnieri* is a small, creeping herb with numerous branches, small oblong leaves, and light purple flowers<sup>7</sup>. Of all the Indian herbs, *Bacopa monnieri* is prescribed for a variety of therapeutic indications including antipyretic, anti-inflammatory, analgesic<sup>8,9</sup>, epilepsy, insanity, anticancer, antioxidant activities and memory enhancement<sup>10,11</sup>. It is used to treat asthma, hoarseness, snake bite, rheumatism, water retention, blood cleaning, eczema and ring worm<sup>12</sup>. Due to recent scientific research methods Siddha system of medicine is not fully accepted by other system of medicine and moreover not recognized by other countries<sup>13</sup>. The main objective our research work was to analyze the presence or absence of different phytochemicals in the selected medicinal plant *Bacopa monnieri* from Kanja Malai, salem, Tamilnadu used for healing and curing of various disease.

## MATERIALS AND METHOD

### Plant Materials:

The fully mature tubers of *Bacopa monnieri* are collected from Kanja Malai, salem, Tamilnadu during October 2021. The plants were identified at the plant anatomy research Centre. A voucher specimen of the plants has been deposited (Accession No: PARC/2021/5339. The *Bacopa monnieri* root were washed thoroughly and dried in sunlight.



**Figure 1: *Bacopa monnieri***

### **Extraction of Plant Materials**

Nearly 30g of air dried powder were taken in 200ml of aqueous, methanol, ethanol, ethyl acetate and chloroform separately, plugged with cotton wool and then kept on orbital shaker for 48 hours with 150rpm at room temperature. The extracts were filtered with whatman no 1 filter paper and collect the supernatant. Then solvent evaporated through Rota vapor and make the final volume one-fourth of the original volume and stored at the 4°C in air tight containers.

### **Preliminary Phytochemical Screening**

The various extracts were used for preliminary screening for phytochemicals such as carbohydrates (molisch's test), cholesterol (liberman burchard test), protein, amino acid (ninhydrin test), alkaloid (wagner and dragandreff's test), saponins, tannins, flavinoids, cardiac glycosides, terpenoids and phlobatanins.

### **Screening Procedures**

#### **Test for Carbohydrates**

To 2ml of extract 2drops of molisch's reagent was added and shaken well. 2ml of conc. H<sub>2</sub>SO<sub>4</sub> was added on the sides of the test tube. A reddish violet colour ring appeared at the junction of two layers immediately indicated the presence of observed<sup>14</sup>.

#### **Test for Steroids**

##### **Libermann Burchard test:**

To 2ml of acetic anhydride was added to 0.5ml of ethanolic extract added to 2ml of H<sub>2</sub>SO<sub>4</sub>. The colour change from violet to blue or green indicated the presence of steroids<sup>14</sup>.

#### **Test for Cholesterol**

To 2ml of the extract 2ml of the chloroform was added in a dry test tube. Then 10 drop of acetic anhydride and 2 to 3 drops of conc H<sub>2</sub>SO<sub>4</sub> was added. A red rose colour changed to blue green

colour<sup>14</sup>.

### **Test for Proteins**

The detection of proteins was carried out by Xanthoproteic acid test by adding the concentrated nitric acid solution to the plant extract. The formation of yellow colour indicates the presence of proteins<sup>14</sup>.

### **Test for Amino Acids**

The detection of amino acids was carried out by Ninhydrin test, by adding Ninhydrin reagent to the plant extract and boiled for few minutes. The formation of blue colour indicates the presence of amino acids<sup>14</sup>.

### **Test for Alkaloids**

To the extract added the 1%Hcl and 6drops of mayer's reagent and dragendroff's reagent. An organic precipitate indicated the presence of alkaloids in the sample<sup>14</sup>.

### **Test for Flavonoids**

5ml of dilute ammonia solution were added to a portion of aqueous extract and add conc H<sub>2</sub>SO<sub>4</sub>. A yellow coloration is observed which confirms the presence of flavonoids and it disappears on standing<sup>14</sup>.

### **Test for Terpenoids**

**Salkowski Test:** To 2ml of extract add 2ml of chloroform and 3ml of conc H<sub>2</sub>SO<sub>4</sub> to form a monolayer of reddish brown coloration of the interface was showed to form positive result for the terpenoids.

### **Test for Cardiac Glycosides**

5ml of extract was treated with 2ml of glacial acetic acid containing one drop of ferric chloride solution. This was under layered with 1ml of conc H<sub>2</sub>SO<sub>4</sub>. A brown ring of the interface indicated a deoxy sugar characteristic of cardenolides. A violet ring might appear below the brown ring whereas the acetic acid layer, a greenish ring might form just gradually throughout thin layer<sup>14</sup>.

### **Test for Tannins**

5ml of extract was added to few drops of 1% of lead acetate. A yellow precipitate indicated the presence of tannins. Test for Saponins The extract with 20ml of distilled water agitated in a graduated cylinder for 15minutes. The formation of 1cm layer of foam indicated the presence of saponins<sup>14</sup>.

### **Test for Phlobatinins**

When an aqueous extract was boiled with 1% aqueous HCl, red precipitate was deposited which was taken as evidence for the presence of phlobatinins<sup>14</sup>.

**Test for Fatty Acids**

0.5ml of extract was mixed with 5ml of ether. This extract was allowed it for evaporation on filter paper and dried the filter paper. The appearance of transporence on filter paper indicates the presence of fatty acids<sup>14</sup>.

**Test for Anthocyanins**

2ml of aqueous extract is added to 2ml of 2NHCl and ammonia. The appearance of pink-red turns blue violet indicates the presence of anthocyanins<sup>14</sup>.

**Test for Leucoanthocyanins**

5ml of aqueous extract added to 5ml of isoamyl alcohol. Upper layer appears red in colour indicates for the presence of leucoanthocyanins. Test for Coumarins 3ml of 10%NaOH was added to 2ml of aqueous extract formation of yellow colour indicates the presence of coumarins<sup>14</sup>.

**Test for Phenols**

The detection of Phenols was carried out by using the Ferric chloride test. Extracts of three individual plants were treated with few drops of ferric chloride solution. The formation of bluish-green colour indicates the presence of phenols<sup>14</sup>.

**Test for Quinones**

Take 2ml of extract to add 3ml of concentrated HCl to form green colour indicates the presence of quinines<sup>14</sup>.

**Test for Emodins**

Take 2ml of NH<sub>4</sub>OH and 3ml of benzene was added to the extract. Appearance of red colour indicates the presence of emodins<sup>14</sup>.

**RESULTS AND DISCUSSION**

The present study carried out on the *Bacopa monnieri* root that revealed the presence of medicinally active metabolites. The phytochemical characters of *Bacopa monnieri* root extracts are showed in Table 1.

The aqueous extract of this plant contains metabolites like carbohydrates, proteins, amino acids, steroids, alkaloids, cardiac glycosides, tannins, phlobatanins, coumarins and phenols. When compared with tested extracts, ethanolic extract found to be containing more bio- and phyto-compounds like carbohydrates, cholesterol, proteins, amino acids, steroids, alkaloids, flavonoids, cardiac glycosides, saponins, tannins, terpenoids, phlobatanins, coumarins and phenols. The methanolic extract shown the various metabolites like carbohydrates, cholesterol, amino acids, steroids, alkaloids, cardiac glycosides, tannins, terpenoids, phlobatanins, fatty acids, anthocyanins,

coumarins, phenols and quinones. The ethyl acetate had shown very less metabolites in their extract like proteins, amino acids and tannins. The chloroform extract found to be containing carbohydrates, cholesterol, amino acids, alkaloids, saponins and fatty acids.

**Table 1: Phytochemical screening of *Bacopa monnieri* root**

Name of the compound	Ethanol extract	Methanol extract	Ethyl acetate extract	Chloroform extract	Aqueous extract
Carbohydrates	+	+	-	+	+
Cholesterol	+	+	-	+	-
Protein	+	-	+	-	+
Amino acids	+	+	+	+	+
Steroids	+	+	-	-	+
Alkaloids	+	+	-	+	+
Flavonoids	+	-	-	-	-
Cardiac glycosides	+	+	-	-	+
Saponins	+	-	-	+	-
Tannins	+	+	+	-	+
Terpenoids	+	+	-	-	-
Phlobatanins	+	+	-	-	+
Fatty acids	-	+	-	+	-
Anthocyanins	-	+	-	-	-
Leucoanthocyanins	-	-	-	-	-
Coumarins	+	+	-	-	+
Phenols	+	+	-	-	+
Quinones	-	+	-	-	-
Emodins	-	-	-	-	-

## CONCLUSION

The phytochemical screening and qualitative estimation of the plants studied showed that the root was rich in amino acids, cardiac glycosides, and fatty acids in all the extracts. Methanolic and ethanolic extracts shown in some common metabolites like carbohydrates, amino acids, cholesterol, steroids, alkaloids, cardiac glycosides, tannins, terpenoids, phlobatanins, fatty acids and phenols. Terpenoids and tannins are attributed for analgesic and anti-inflammatory activities. Apart from this tannins contribute property of astringency i.e. faster the healing of wounds and inflamed mucous membrane<sup>14</sup>. The presence of cardiac glycosides in medicinal plants is used in the Indian medicinal system<sup>15,16</sup>. Steroids compounds are of importance and of interest in pharmacy due to their relationship with sex hormones. The curative properties of medicinal plants are perhaps due to the presence of various secondary metabolites such as alkaloids, flavonoids, glycosides, phenols, saponins, steroids<sup>17</sup>. Saponins natural tendency to ward off microbes makes them good candidates for treating fungal and yeast infections. In the present study, it has been observed that *Bacopa monnieri* has antioxidant and phytochemical contents which might be

responsible for its therapeutical potential in treatment or prevention of neurological diseases. Further studies are going on *Bacopa monnieri* root extracts to identify benefits and uses in the field of medicine.

## REFERENCES:

1. Sivaranjini K, Shakila R, Manickavasakam K. Standardization of siddha polyherbal formulation of parangipattai chooranam. International journal of research in Ayurveda and Pharmacy. 2015;6(4):443-448.
2. Calixto JB. The role of natural products in modern drug discovery. *Anais da Academia Brasileira de Ciências*. 2019; 91.
3. Lale NES. Bio-activity and Limitation against wide spread use of neem products for the management of insect pests. Nigerian Journal of Applied Biology, 2003;3:115–125.
4. Vinodini R, Amala M, Amala Hazel AM, Meenakshi Sundaram M, Banumathi V. Standardization of the drug Parangipattai chooranam–A Siddha herbal formulation. Int. Journal of Current Research Chemistry Pharm. Sci. (2018). 5(8): 10-19.
5. Bigonia P, Singh CS and Shukla A. Pharmacognostical and physiochemical standardization of ethno pharmacologically important seeds of *Lepidium Sativum* Linn. And *Wrightia tinctoria* R. British Indian Journal of Natural products and resources 2011;2(4): 464-471.
6. Narasinga Rao V and DSVGK Kaladhar. Phytochemical and Biochemical Studies of Medicinal Plant *Globba Bulbifera*. International Journal of Phytotherapy. 2014;4(1):50-53.
7. Sushma Kumari, Anil Sindhu, Mansi and Parveen Kaur Sidhu. Biochemical Profiling of Medicinally Important Plant *Bacopa Monnieri* L. International journal of current research, 2016;8(07) 33917-33921.
8. Paras Jain, Sharma HP, Fauziya Basri, Kumari Priya & Pallavi Singh. Phytochemical analysis of *Bacopa monnieri* (L.) Wettst. and their anti-fungal activities. Indian Journal of Traditional Knowledge. 2017;16(2):310-318.
9. Bammidi SR, Volluri SS, Chippada SC, Avanigadda S & Vangalapati M, A review on pharmacological studies of *Bacopa Monniera*. J Chem Bio Phy Sci, Sec B, 2011;1 (2):250-259.
10. Sampathkumar P, Dheebe B, Vidhyasagar V, et al., Potential antimicrobial activity of various extracts of *Bacopa monnieri* (Linn.), Int J Pharm, 2008;4(3):230-232.
11. Jain P, and Kulshreshtha D. Bacoside A1, a minor saponin from *Bacopa monnieri*. Phytochemistry, 1993;33:449- 451.



12. Satyavati GV, Raina MK. and Sharma M. Indian medicinal plants Vol. I. Indian Council of Medical Research, 1976;1:20-35.
13. Basu NK. and Walia. The chemical investigations of the leaves of *Herpestis monniera*. Indian J. Pharma, 1994;4: 84- 85.
14. Okwu DE and Josiah C. Evaluation of the chemical composition of two Nigerian medicinal plants. African Journal of Biotechnology. 2006;5: 357-361.
15. Shellon RM. Aloe Vera Its Chemical Properties. International Journal of Dermatology. 1996; 30:679–683.
16. Sofowora A. Medicinal Plants and Traditional Medicine in African Spectrum Book Ltd. University of Ife Press, Nigeria, 1993, 119.
17. Anubha Arora. 2013. Phytochemical analysis of methanolic extracts of leaves of some medicinal plants. Biology Forum – An Int J. 2013;5(2): 91-93.

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