QUALITATIVE ANALYSIS OF PHYTOCHEMICALS IN LEAF EXTRACTS OF *ADHATODA VASICA* AND *BACOPA MONNIERI*

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Abstract: According to World Health Organization, most of the people primarily depend on plants for their health care needs. *Adhatoda Vasica,* commonly known as 'Adusa' and *Bacopa Monnieri*, commonly called as 'Brahmi' are renowned for its various effects in medical care for centuries. This study was carried out to screen qualitatively the presence of phytochemicals in the leaf extracts of the medicinal plants, *Adhatoda vasica* and *Bacopa monnieri*. Various solvents such as acetone, methanol, ethanol and water were used to extract the leaves and the presence of phytochemicals varies with the polarity of solvents. The study revealed the presence of phytochemicals such as alkaloids, saponins, tannins, flavonoids, etc thereby, supported the use of leaves of both plants in traditional medicine. Thus this study showed that these plants can be used as a significant source for the development of drugs of definite actions.

Index terms: ***Adhatoda vasica, Bacopa monnieri,*** **qualitative, solvents, phytochemical tests.**

1. INTRODUCTION:

India has one of the oldest and richest traditions in association with the use of medicinal plants (Ayetree, 2016). World Health Organization (WHO) reported that about 80% of the world population relies upon plant parts for their primary health care (Kumar and Sunita, 2017). Plants produce many active compounds known as phytochemicals. These phytochemicals include alkaloids, steroids, tannins, glycosides, resins, phenols and flavonoids which are found deposited in various parts of the plants (Joseph *et al*., 2013). Phytochemicals are natural and non-nutritive bioactive compounds that act as defending agents in plants against external stress and pathogenic worry (Tepe *et al.,* 2005). Phytochemicals are largely used for medicinal purposes due to the properties they are known to possess which include antibacterial (Nair *et al*., 2005), antifungal (Khan and Wassilew, 1987), antidiabetic (Singh and Gupta, 2007; Kumar *et al*., 2008a), anti-inflammatory (Kumar *et al*., 2008b), antioxidant (Wong *et al*., 2009) and radio-protective activity (Jagetia *et al*., 2005). Preliminary screening of phytochemicals in plants seems to be significant, as it aids in the discovery of therapeutic agents of novelty from medicinal plants (Bimala *et al*., 2016).

Adhatoda vasica belongs to the family *Acanthaceae* is a well known plant in Siddha, Ayurveda and Unani systems of medicine. It is a small, evergreen, sub-herbaceous bush which grows commonly in open plains (Shahriar, 2013). It is a perennial shrub attains a height of 1.0 m to 2.5 m, with opposite ascending branches retaining its leaves throughout the year (Arabind *et al.*, 2013). Traditionally this plant is used to treat various ailments such as cough, cold, whooping cough, bronchitis, asthma, jaundice, diarrhea, dysentery, rheumatism, etc (Kaur *et al*., 2012 and Santosh *et al*., 2014). The plant possesses antispasmodic, sedative, antihelminthic, antioxidant properties (Mulla and More, 2010). They also act as antidiabetic (Bhatt *et al.,* 2011), wound healing (Vinothapooshan and Sundar, 2010), antimicrobial (Sheeba and Mohan, 2012), antiulcer (Vinothapooshan and Sundar, 2011), infertility (Ganguli and Paramesh, 2010), thrombopoietic (Garg *et al.*, 2010), antibacterial (Kavitha *et al*., 2012) agents.

Bacopa monnieri, commonly known as Brahmi belongs to the family *Scrophulariaceae*, is used as a brain tonic in Ayurvedic system of medicine (Sai *et al.,* 2012). It is a small creepy herb with many branches, small fleshy oblong leaves, found common in wet and sandy areas. Traditionally, it is used to treat nervous disorders, to enhance memory, learning, concentration and to treat anxiety, digestive and skin disorders. It also possesses antipyretic, analgesic, antiepileptic, anticancer, anticonvulsant and antiseptic properties (Bammidi *et al*., 2011 and Sampathkumar *et al*., 2008).

This study focuses on the qualitative screening of the phytochemicals present in various solvent extracts of leaves of *Adhatoda vasica* and *Bacopa monnieri* by adopting standard phytochemical tests.

2. MATERIALS AND METHODS:

2.1. Collection of plants:

Fresh, healthy leaves of *Adhatoda vasica* and *Bacopa monnieri* were collected from the regions of Athiyanoor, Trivandrum, Kerala. The leaves of both plants were washed thoroughly under running tap water prior to remove any dust and dirt, and then washed

with distilled water and shade dried at room temperature for seven days. The dried leaves are then homogenized into fine powder using a mixer grinder and stored in airtight bottles for further study.

2.2. Preparation of leaf extracts:

About 10 gm of the dried powdered leaves of *Adhatoda vasica* and *Bacopa monnieri* were taken separately in airtight bottles and 50 ml of solvents (acetone, methanol, ethanol and water) were added. The bottles were labelled as per the contents as AA (Acetone *Adhatoda*), MA (Methanol *Adhatoda*), EA (Ethanol *Adhatoda*), WA (Water *Adhatoda*), AB (Acetone *Bacopa*), MB (Methanol *Bacopa*), EB (Ethanol *Bacopa*) and WB (Water *Bacopa)* and then kept undisturbed under dark. After two days, the contents were stirred well and again kept undisturbed for two days. Again the contents were stirred well and filtered using Whatmann no. 1 filter paper. The filtrates were collected and evaporated using water bath and stored in refrigerator at 4°C for further studies.

2.3. Phytochemical analysis:

The presence of phytochemicals in various solvent extracts of leaves of *Adhatoda vasica* and *Bacopa monnieri* were analyzed qualitatively using standard tests (Baghel and Sudip, 2017).

2.3.1. Test for Alkaloids (Dragendroff's test):

To each of the extracts, dilute Hydrochloric acid was added, shaken well and filtered. To this few drops of Dragendroff's reagent was added. Formation of red precipitate indicates the presence of alkaloids.

2.3.2. Test for Carbohydrates (Fehling's test):

To 1 ml of each extracts, 1 ml of Fehling's A and 1 ml of Fehling's B solutions were added in a test tube and heated in the water bath for 10 minutes. Formation of red precipitate indicates the presence of carbohydrates.

2.3.3. Test for Saponins (Froth test):

Each of the extracts was diluted with distilled water and shaken in graduated cylinder for 15 minutes. The formation of layer of stable foam indicates the presence of saponins.

2.3.4. Test for Steroids (Salkowski's test):

Each of the extracts was treated with chloroform, and then to the chloroform layer sulphuric acid was added slowly by the sides of test tube. Formation of red color indicates the presence of steroids.

2.3.5. Test for Glycosides (Keller-Killiani test):

To 2 ml of each of the extracts, 3 ml of glacial acetic acid and 1 drop of 5% ferric chloride solution were added in a test tube. 0.5 ml of concentrated sulphuric acid was added carefully by the side of the test tube. Formation of blue color in the acetic acid layer indicates the presence of glycosides.

2.3.6. Test for Tannins (Ferric chloride test):

About 2 ml of filtered extracts was taken in a test tube and 2 ml of 5% ferric chloride solution was added. The presence of blue-black colored precipitate indicates the presence of tannins.

2.3.7. Test for Terpenoids (Salkowski's Test):

To each of the extracts, 2 ml of chloroform was added. To it, 3 ml of concentrated Sulphuric acid was carefully added along the sides of the test tube to form a layer. A reddish brown coloration of the interface indicates the presence of terpenoids.

2.3.8. Test for Flavonoids (Lead Acetate Test):

Each of the extracts was treated with few drops of lead acetate solution. Formation of yellow precipitate indicates the presence of flavonoids.

2.3.9. Test for Phenols (Dilute Iodine Solution test):

To 2-3 ml of extract, few drops of dilute iodine solution were added. Appearance of transient red color indicates presence of phenolic compounds.

2.3.10. Test for Amino acids (Ninhydrin Test):

3 ml of the extracts were heated with 3 drops of 5 % Ninhydrin solution in a water bath for 10 minutes. The presence of amino acids was indicated by the appearance of blue colour.

3. RESULTS AND DISCUSSION:

Leaves of *Adhatoda vasica* and *Bacopa monnieri* were analyzed for the presence of phytochemicals using various phytochemical tests. Solvents such as acetone, methanol, ethanol and water were used for extraction of the leaves of both plants. The

phytochemical constituents of various solvent extracts of leaves of *Adhatoda vasica* and *Bacopa monnieri* were detected and the results were tabulated in Table 1 and 2.

The detailed analysis of all the four solvent extracts of leaves of *Adhatoda vasika* showed the presence of alkaloids, saponins and flavonoids, whereas glycosides and steroids were found absent in all the four extracts. The methanolic and ethanolic extracts showed the presence of tannins, phenols, terpenoids and amino acids, whereas tannins, terpenoids and phenols were found absent in water extracts. Carbohydrates were present in ethanol and water extracts.

The phytochemical analysis of all the four solvent extracts of leaves of *Bacopa monnieri* revealed the presence of alkaloids, saponins, flavonoids, tannins, steroids and glycosides. Phenols and carbohydrates were present in all the extracts except in acetone extracts. Terpenoids were found present in both methanolic and ethanolic extracts whereas the amino acids were absent in both extracts.

Among the four different extracts, ethanol extract of both plants showed the presence of maximum number of phytochemical constituents, followed by methanol extracts, which may be due to variation of nature of solvents used for extraction. Different phytochemicals have been found to possess a wide range of medicinal properties, which provide protection against various diseases. For example, alkaloids can act against chronic diseases whereas saponins show activity against hypercholesterolemia and steroids and terpenoids show the analgesic properties (Geetha *et al.*, 2014). The presence of above said phytochemicals in the medicinal plants used for this study is an indicator that these plants can be used as a potential source for the development of novel drugs.

4. CONCLUSION:

In the present study, we have found that most of the biologically active phytochemicals were present in the ethanol and methanol leaf extracts of plants, *Adhatoda vasica* and *Bacopa monnieri*. The medicinal properties of these plants may be due to the presence of phytochemicals in them. This study supported the use of these plants in traditional medical systems. Further studies should be done to isolate and characterize the active components that are responsible for their medicinal property, which leads to the development of drugs with defined action against many infections and diseases.

Table-1: Phytochemical screening of *Adhatoda vasica* leaves

S.No.	Phytochemical test for	Leaf extracts prepared from solvents			
		Acetone	Methanol	Ethanol	water
01.	Alkaloids	+	+	+	+
02.	Carbohydrates	-	-	+	+
03.	Saponins	+	+	+	+
04.	Steroids	-	-	-	-
05.	Glycosides	-	-	-	-
06.	Tannins	+	+	+	-
07.	Terpenoids	+	+	+	-
08.	Flavonoids	+	+	+	+
09.	Phenols	-	+	+	-
10.	Amino acids	-	+	+	+

Table-2: Phytochemical screening of *Bacopa monnieri* leaves

S.No.	Phytochemical test for	Leaf extracts prepared from solvents			
		Acetone	Methanol	Ethanol	water
01.	Alkaloids	+	+	+	+
02.	Carbohydrates	-	+	+	+
03.	Saponins	+	+	+	+
04.	Steroids	+	+	+	+
05.	Glycosides	+	+	+	+

06.	Tannins	+	+	+	+
07.	Terpenoids	-	+	+	-
08.	Flavonoids	+	+	+	+
09.	Phenols	-	+	+	+
10.	Amino acids	-	-	-	+

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