

PHYTOCHEMICAL INVESTIGATION OF BOERHAVIA DIFFUSA AND ANDROGRAPHIS PANICULATA: A COMPARATIVE STUDY

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ABSTRACT

Among ancient civilizations, India has been known to be rich repository of medicinal plants. The traditional medicine involves the use of different plant extracts or the bioactive constituents. This type of study provides the health application at affordable cost. The study such as ethno medicine keenly represents one of the best avenues in searching new economic plants for medicine. A comparative study of phytochemicals was made on leaf extracts of two herbal plants- *Andrographis paniculata* and *Boerhavia diffusa*. The leaf extracts were prepared with six different selected solvents for each plant to adjudge the major active principles in the solvent that have value in rational drug design. An increasing number of patients are resorting to complementary and alternative systems of medicine, in the majority of instances to complement conventional care. *Boerhavia diffusa* and *Andrographis paniculata* species have been of keen interest in phytochemical and pharmacological research due to their excellent medicinal values. The qualitative analysis of phytochemicals encompasses steroids, alkaloids, flavonoids, triterpenoids, tannins, quinone, coumarin, protein, sugar. The presence of these various phytochemicals shows the importance of *A.paniculata* and *B.diffusa* which could be used to cure various ailments.

Keywords: *Andrographis paniculata*, *Boerhavia diffusa*, Phytochemicals.

INTRODUCTION

Human beings have been utilizing plants for basic preventive and curative health care since time immemorial. Plant extracts or bioactive herbal compounds have been reported scientifically for their biological activities. Phytochemicals may protect human from a host of diseases. Phytochemicals are non-nutritive plant chemicals that have protective or disease preventive properties. Plant produces these chemicals to protect itself but recent research demonstrates that many phytochemicals can protect humans against diseases. There are many phytochemicals in fruits and herbs and each works differently¹. *Andrographis paniculata* (Burm.f.) Nees (Acanthaceae) native to Taiwan, Main land China and India, is a medicinal herb with an extremely bitter taste used to treat liver disorders, bowel complaints of children, colic pain, common cold and upper respiratory tract infection. It grows erect to a height of 30–110 cm in moist, shady places, locally it is known as Nilavembu, Sirunangai, Siriyangai. *Andrographis paniculata* is having a number of bioactivities such as anti-inflammation, anti-cancer, immunomodulation, anti-infection, anti-hepatotoxicity, antiatherosclerosis, anti-diabetes and anti-oxidation².

Boerhavia diffusa Linn (Nyctaginaceae), commonly known as 'Punarnava'. In the Indian system of medicine, is a perennial creeping herb found throughout the waste land of India. In Indian traditional medicine, roots of this weed are used for the treatment of dyspepsia, jaundice, enlargement of spleen, abdominal pain and as an antistress agent^{3, 4}. The drug consists of dried and fully mature whole plant of *Boerhavia diffusa* Linn. A Perennial diffuse herb found commonly throughout India, up to altitude of 2000 m⁵. *Boerhavia diffusa* is a perennial herbaceous plant growing in the tropical regions such as Antilles, South America, India and Africa. In the Asian medicine practiced in Britain the roots are used as diuretic, laxative, stomachic preparations and the leaves are used as an appetizer. The seeds are used carminative and tonic preparation⁶. A number of natural products have been used as lead compounds because of specific activity and low toxicity. Medicinal plant have provided the modern medicine with the numerous plant therapeutic agents many plant contains a various phytochemical which have found in the field of human, agriculture and veterinary medicine. Natural products play a vital role in the development of the novels drugs and in the treatments of the disease.

MATERIALS AND METHODS

Collection and Authentication of Plant Material

Based on the documented ethno pharmacological knowledge on the use of medicinal plants in the treatment of pathological diseases,

whole plant of *Andrographis paniculata* and *Boerhavia diffusa* were collected during the month of January from herbal garden, Rajiv Academy for Pharmacy, Mathura. Both the plant were authenticated by the Dr. H. B. Singh (Chief Scientist & Head of Raw Materials Herbarium & Museum), NISCAIR, New Delhi. Voucher specimen No. NISCAIR/RHMD/Consult/-2011-12/1829/129 and NISCAIR/RHMD/Consult/-2011-12/1828/128 were preserved for further references. Both plant washed 2-3 times from distilled water then dried in shade and grinded into fine powder, stored in closed container separately with proper labeling for further use. Powdered plant leaves were subjected to organic fraction collection based on polarity, crude alcohol extraction and aqueous extraction.

Organic fraction collection

100g of powdered (whole plant of *Boerhavia diffusa* and *Andrographis paniculata*) plant material were successively extracted with cold petroleum ether, chloroform, acetone and methanol. Containers containing plant material were immersed in the solvent individually for 72 hours and the fractions were collected. Fractions were dried by evaporation at room temperature for complete dried fraction collection and stored in sterile containers.

Crude alcohol and aqueous extraction

100g of powdered (whole plant of *Boerhavia diffusa* and *Andrographis paniculata*) plant materials were taken in two separate containers and 250ml of ethyl alcohol and water added in individual containers. The materials held for 72 hours to collect the extract and dried.

Preliminary phytochemical screening

The extracts thus obtained were subjected to preliminary phytochemical screening to detect the presence and absence of phytochemicals like alkaloids, amino acids, flavonoids, coumarins, tannins, proteins, steroids and triterpenoids, naphthoquinones following the standard protocols^{7,8} by performing various chemical tests like Dragendorff's reagent, Mayer's reagent, Wagner's reagent and Hager's reagent for alkaloids, Millon's test and Ninhydrin test for amino acids, Shinoda test, Alkaline reagent test and Zinc hydrochloride test for flavonoids, Goldbeater's skin test, Ferric chloride test and Phenazone test for tannins, Heat test, Test with trichloroacetic acid, Biuret test and Hydrolysis test for proteins, Libermann-Burchard test and Salkowski test for steroids and triterpenoids, Juglone test and Dam-Karrer test for naphthoquinones.

RESULTS

In the present investigation, preliminary phytochemical screening has been done in the various extracts of *Andrographis paniculata* and *Boerhavia diffusa* whole plant and comparison made between each other. It showed the presence and absence of various phytoconstituents (Table 1).

DISCUSSION

Studies on the native or folk medicinal use of medicinal plants are important from the scientific point of view in that it enables rapid scientific studies towards finding and development of newer drugs from centuries old practical user derived knowledge of medicinal plants. Green plants represent a reservoir of effective chemicals, and can provide valuable sources of natural pesticides⁹. Herbal extracts contain different phytochemicals with biological activity that can be of valuable therapeutic index. In the present study, it was observed that the plants *Andrographis paniculata* and *Boerhavia diffusa* on which scientific studies have been conducted are validated in their uses by the various parts of India. The medicinal value of these

plants lies in some chemical substances that have a definite physiological action on the human body. Different phytochemicals have been found to possess a wide range of activities, which may help in protection against chronic diseases. For example, Alkaloids protect against chronic disease. Steroids and triterpenoids show the analgesic properties. The Steroids were responsible for central nervous system activities. Phytochemical screening of the various extracts of *Andrographis paniculata* and *Boerhavia diffusa* plant used to study the presence of contained alkaloids, flavonoids, steroids, tannins and triterpenoids and also have various medicinal values such as anti-inflammatory¹⁰, an blood purifier¹¹, antiasthmatic¹², an expectorant, antidiabetic and analgesic activities¹³, for wound healing¹⁴ and for central nervous system activity¹⁵.

The comparison of phytochemicals between these two herbal plants showed that *B.diffusa* is having more phytochemicals than *A.paniculata* in the various extracts examined in this study¹⁶. But both of these herbs can be used to cure many diseases and the identification and isolation of the active compounds could lead to the new drug discovery of cheaper cost which would be useful for the patients.

Table 1: The analysis of phytochemicals in the different organic extracts of *Andrographis paniculata* and *Boerhavia diffusa*.

Phytochemicals	Petroleum ether		Chloroform		Benzene		Acetone		Ethanol		Water	
	A	B	A	B	A	B	A	B	A	B	A	B
Steroids	+	+	+	+	-	+	+	+	+	+	-	-
Alkaloids	-	+	-	+	-	+	-	+	-	+	-	-
Flavonoids	-	+	-	+	-	+	-	+	+	+	-	-
Triterpenoids	+	+	-	+	-	+	+	+	-	+	-	-
Tannins	+	-	-	-	-	-	-	-	-	-	-	-
Quinones	-	+	-	+	-	+	-	+	+	+	-	-
Coumarins	-	-	-	-	-	-	-	-	+	-	-	-
Proteins	+	+	+	+	+	+	+	+	+	+	-	-
Sugar	+	-	+	-	-	-	+	-	-	-	-	-

A = *Andrographis paniculata*; B = *Boerhavia diffusa*; + = Presence; - = Absence

CONCLUSION

The experimental plants *Andrographis paniculata* and *Boerhavia diffusa* studied and found to be a potential source of useful drugs exploiting the antiinflammation, anticancer, immunomodulation, anti-infection, antihepatotoxicity, anti-atherosclerosis and anti-diabetes activities of these plants. This type of study provides the health application at affordable cost. Further research needs in the angle whether the phytochemicals could be useful to treat other dreadful diseases. Advanced studies are being conducted on these plants in order to isolate, identify, characterize and elucidate the structure of the bioactive compounds.

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