Evaluation of minerals and phytochemicals present in aerial parts of *Barleria buxifolia* L. (Acanthaceae)

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Abstract

The family Acanthaceae consists of a significant number of medicinal plants with broad array of biological activities and generous number of phytoconstituents. Most of *Barleria* species are potent in anti-inflammatory, analgesic, antileukemic, antitumor, antihyperglycemic, anti-amoebic, virudal, antidiabetic, antifertility, hepatoprotective, nephroprotective and antibacterial activities. The objective of this study is to carry out the preliminary phytochemical screening aerial parts of *Barleria buxifolia* L. Fresh plant sample collected from various parts of Uthangarai. Plant extract prepared by using soxhlet apparatus, Quantitative mineral analysis and Phytochemical analysis carried out by standardized procedure. Selected plant extracts indicates the presence of glycosides, alkaloids, carbohydrates, tannin, phenolics, flavonoids, proteins and amino acids. Medicinal assessment of plants lies in some chemical substances like alkaloids, flavonoids, tannins and phenolic compounds which serve as defend against many microorganism. The results obtained from preliminary pharmacognostic standardization of aerial parts of *Barleria buxifolia* L. are helpful in resolve of quality and purity of the crude drug and its marketed formulation.

Keywords: phytochemical, *Barleria buxifolia*, acanthaceae, herbal, pharmacognostic

Introduction

India represents one of the great emporia of ethanobotanical wealth. Even today tribal communities in India still collect and preserve locally available wild and cultivated plant species and practice herbal medicine to treat a variety of diseases and disorders (Mahishi, 2005) [10]. Plants have been, a rich source of many natural products in major parts of India and other countries, most of which have been extensively used for traditional human health care systems. The vast majority of people in the world takes care of themselves and uses healing plants that have been used for hundreds of generations (Cordell, 1995; Farnsworth and Soejarto, 1991; Shengji, 2002; Taylor et al., 2001; Krishna et al., 2009) [4, 5, 16, 8, 17]. The Acanthaceae is a large dicotyledonous flowering plant family in the order Lamiales, which comprises approximately 220 genera and 4,000 species (Scotland and Vollesen, K, 2000) [15]. It is composed of mainly annual and perennial herbs, shrubs climbers, and some large trees (Fongod et al, 2013) [6]. A number of plant species in Acanthaceae has significant medicinal values (Manisha et al, 2012) [11]. Several Acanthaceae members are widely used by many ethnic communities as traditional medicine throughout the world (Mahubur Rahman et al, 2014) [9]. Acanthaceae family possess antifungal, cytotoxic, anti-inflammatory, anti-pyretic, antioxidant, insecticidal, hepatoprotective, immunomodulatory, anti-platelet aggregation and anti-viral potential (Awan et al, 2014) [2]. Various species of *Barleria*, reported as folk medicine. *Barleria longiflora* displays nephroprotective activity (Manjula and Saravana Ganthi, 2018) [13], *Barleria noctiflora* having antiinflammatory (Manjula and Saravana Ganthi, 2018) [12] and antidiabetic potential (Manjula and Saravana Ganthi, 2018) [14].

Systematic Position

Kingdom: Plantae
Class: Magnoliopsida
Order: Lamiales
Family: Acanthaceae
Genus: *Barleria*
Species: *buxifolia*
**Methodology**

**Morphological study**

Fresh plants material was collected from in and around Uthangarai. Plant material is identified by using Flora of the presidency of Madras by J.S. Gamble.

**Preliminary Phytochemical screening**

The air-dried and powdered plant materials were taken in different amber coloured bottles, extracted (by Soxhelt method) with petroleum ether, chloroform, benzene, ethanol and water, and then the solvent were filtered off. The extracts thus obtained from each plant were then subjected to qualitative tests for the identification of various plant constituents by the methods described by Trease and Evans (1989) [18], Harborne, (1998) [17] and Brindha et al. (1981) [3]. The preliminary phytochemical screening is a qualitative chemical evaluation which indicates spectrum of chemical constituents in the chosen plant.

**Quantitative estimations of minerals**

**Estimation of elements**

The percentage of major elements like carbon, nitrogen, phosphorus, potassium, sodium, calcium, magnesium and sulphur was determined by the standard method of AOAC (1984). The trace elements like zinc, copper, iron, manganese, boron and molybdenum were determined by the method of Williams and Twine (1960) [19].

**Estimation of major elements**

2 g of the dried powder of the sample was taken in 250 ml conical flask and 12 ml triple acid mixture (Nitric, sulphuric and perchloric acid in the ratio of 1:2:1) was added. The mouth of the conical flask was covered with a funnel. The contents were digested in the flask over a sand bath till a clear solution was obtained. The solution was filtered through Whatman No.40 filter paper and the filtrate was collected in a 250 ml volumetric flask. The conical flask was washed with small increments of hot water and the washing was added to the filter paper. The residue on the filter paper was also washed with hot water till the filtrate runs free of chloride. The volumetric flask was cooled under tap water and made up to 250 ml with cold distilled water. This triple extract was used for the analysis of major constituents. The minerals (N, P, K, Na and Ca) were estimated using Flame Photometer (Spectronics Flame Photometer, India).

**Estimation of trace elements**

The ground plant samples were sieved with a 2 mm rubber sieve and 2 g of the plant samples were weighed and subjected to dry ashing in a well-cleaned porcelain crucible at 550°C in a muffle furnace. The resultant ash was dissolved in 5 ml of HNO₃: HCl: H₂O (1:2:3) mixture and heated gently on a hot plate until brown fumes disappeared. To the remaining material in each crucible, 5 ml of deionized water was added and heated until the colour less solution was obtained. The mineral solution in each crucible was transferred into a 100 ml volumetric flask by filtration through Whatman No. 42 filter paper and the volume was made to the mark with deionized water. This solution was used for elemental analysis. Potassium, sodium, calcium, magnesium, sulphur, zinc, copper, iron, manganese, boron and molybdenum were estimated using Atomic Absorption Spectrophotometer.

**Result**

**Morphological study**

Box-Leaved *Barleria* is a shrub 5-6 feet tall, with strong spines under the leaves. Flowers are purple-blue, produced in whorls towards the upper part of the stem. The species name *buxifolia* means leaves like Boxwood tree. Leaves are 8-16mm long, ovate or obovate, tip blunt with a sharp point. Leaves are nearly stalk less, with hairs on both sides scattered, white, short. Spines below the leaves are 6-8mm long, simple and straight. Flowers arise mostly solitary, purple-blue. Bracts are 6-8mm long, reduced to simple spines. Corolla-tube is 1.8-2.5cm long, slightly widened upwards.

![Plate 1: Morphology of *Barleria buxifolia* L.](image)
Preliminary phytochemical screening

Table 1: Preliminary Phytochemical analysis of Barleria buxifolia L.

<table>
<thead>
<tr>
<th>S. No</th>
<th>Extract</th>
<th>Triterpenoids</th>
<th>Reducing sugars</th>
<th>Sugars</th>
<th>Alkaloids</th>
<th>Phenolic compounds</th>
<th>Catechins</th>
<th>Saponins</th>
<th>Tannins</th>
<th>Anthraquinones</th>
<th>Amino acids</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Petroleum ether</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>Benzene</td>
<td></td>
<td></td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>Ethanol extract</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>Distilled water</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Results of preliminary phytochemical analysis shows (Table 1) the presence of various constituents. The ethanol and distilled water extracts indicates the presence of more phytochemicals comparatively the other extracts.

Table 2: Quantitative Minerals analysis of Barleria buxifolia L.

<table>
<thead>
<tr>
<th>S.No</th>
<th>Estimation</th>
<th>Aerial parts</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Organic Carbon (%)</td>
<td>2.02</td>
</tr>
<tr>
<td>2</td>
<td>Total Nitrogen (%)</td>
<td>1.30</td>
</tr>
<tr>
<td>3</td>
<td>Total Phosphorus (%)</td>
<td>0.21</td>
</tr>
<tr>
<td>4</td>
<td>Total Potassium (%)</td>
<td>2.26</td>
</tr>
<tr>
<td>5</td>
<td>Total Sodium (%)</td>
<td>0.13</td>
</tr>
<tr>
<td>6</td>
<td>Total Calcium (%)</td>
<td>2.41</td>
</tr>
<tr>
<td>7</td>
<td>Total Magnesium (%)</td>
<td>1.02</td>
</tr>
<tr>
<td>8</td>
<td>Total Sulfur (%)</td>
<td>0.24</td>
</tr>
<tr>
<td>9</td>
<td>Total Zinc (ppm)</td>
<td>0.52</td>
</tr>
<tr>
<td>10</td>
<td>Total Copper (ppm)</td>
<td>0.09</td>
</tr>
<tr>
<td>11</td>
<td>Total Iron (ppm)</td>
<td>66.06</td>
</tr>
<tr>
<td>12</td>
<td>Total Manganese (ppm)</td>
<td>1.36</td>
</tr>
<tr>
<td>13</td>
<td>Total Boron (ppm)</td>
<td>Nil</td>
</tr>
<tr>
<td>14</td>
<td>Total Molybdenum (ppm)</td>
<td>Nil</td>
</tr>
</tbody>
</table>

Mineral analysis also shows (Table 2) the presence of most of the studied minerals except Boron and Molybdenum. Potassium, Calcium and Iron are the richest source of minerals.

Discussion

Ethanoic extract of selected plant samples shows the presence of glycosides, alkaloids, carbohydrates, tannin, phenolics, flavonoids, proteins and amino acids. Medicinal value of plants lies in some chemical substances like alkaloids, flavonoids, tannin and phenolic compounds which serve as defend against many microorganisms. Presents of all essential minerals especially calcium, potassium, iron, and magnesium denotes it may be used as a source of food. The results obtained from preliminary pharmacognostic standardization of aerial parts of Barleria buxifolia L. are helpful in determination of quality and purity of the crude drug and its marketed formulation.

References