PHARMACOGNOSTICAL AND PHYTOCHEMICAL EVALUATION OF THE STEMS OF *BERBERIS ARISTATA* DC.

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ABSTRACT

Various pharmacognostic parameters including macroscopy, microscopy, chemomicroscopy and behaviour of powdered drug on treatment with different chemical reagents were studied on the stems of *Berberis aristata* DC. (Family Berberidaceae). Phytochemical screening of the plant part with various solvents revealed the presence of phenolic compounds, tannins, flavonoids, phytosterols, saponins and glycosides in it.

The current study was therefore carried out to provide requisite pharmacognostic details. The study might be useful to supplement information in regard to its identification parameters assumed significantly in the way of acceptability of herbal drugs in the present scenario lacking regulatory laws to control quality of herbal drugs.

KEYWORDS

*Berberis aristata* DC., Phytochemical, Pharmacognostic, Morphology.

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INTRODUCTION

Plants are well known as a major source of modern medicines. From ancient times, humans have utilized plants for the treatment or prevention of diseases, leading to the dawn of traditional medicine. Some drugs of plant origin in conventional medical practice are not pure compounds but direct extracts of plant materials that have been suitably prepared and standardized. (1) Establishment of the pharmacognostic profile of the stems of Berberis aristata DC. will assist in standardization of the latter which can guarantee quality, purity and identification of samples. (2)

Berberis aristata DC. (Syn. Indian barberry; Daru haldi, Sanskrit: “daruharidra”) belongs to the family Berberidaceae (3). This plant has been traditionally useful in all types of inflammations, ENT infections, wound healing, dysentery, indigestion, uterine and vaginal disorders. It is well known for its anti-inflammatory and immunopotentiating property (4). One of its active constituent berbamine effectively inhibits chemically-induced hepatocarcinogenesis (5). Preliminary reports indicate that it possesses anticancer activity as tested against mouse leukemic L1210 cells, human hepatoma cells and colon cancer cells. It is postulated that its anticancer activity may be due to its COX-II inhibitory property (6). The other uses of Berberis aristata DC., are as diaphoretic, laxative and useful in rheumatism. The dried extract of the roots are applied externally to the eyelids to cure ophthalmia and other eye diseases. It is also reported to be a mild laxative, a tonic and is useful in curing ulcers and fevers (7). The chief constituent of Berberis aristata DC. is berberine, which is a bitter alkaloid (8).

MATERIALS AND METHODS

Plant Material

Stems of Berberis aristata DC. were collected from Midnapore district, West Bengal in December, 2008, shade dried and identified, authenticated by Senior Scientist, Dr. K.C. Bhatt, National Bureau of Plant & Genomic Resources (NBPGR), Pusa, New Delhi, India.(NHCP/NBPGR/2011-13/)

Macroscopy

The following macroscopic characters for the powdered dried stems were noted: size and shape, colour, surfaces, texture, odour and taste. (2, 9)

Microscopy

The outer epidermal membranous layer were cleared in chloral hydrate, mounted with glycerin and observed under a compound microscope. The presence/absence of the following was observed: stone cells, lignified fibres, tracheids, parenchyma and nonlignified medullary rays. The starch grains and prismatic crystals of calcium oxalate were also observed. (10, 11)

Chemomicroscopic Examination

The powdered stems were examined for starch grains and calcium oxalate crystals following standard methods. (11)
Phytochemical Investigations

Conventional standard protocols (9,15) for detecting the presence of different chemical constituents in the plant extract were employed. The tests for the secondary metabolites viz. alkaloids, tannins, sterols, saponins, amino acids, glycosides, proteins, sterols / terpenes, reducing sugars, non-reducing sugars, resins, flavonoids and phenols were carried out with the different extracts of stems of *Berberis aristata* DC. using preliminary phytochemical screening.

Qualitative and Quantitative Investigations

Quantitative stem microscopy to determine moisture content, total ash, acid insoluble ash, alcohol soluble extractive and water soluble extractive were determined. (12, 13) Fluorescence characteristic of the powder is an essential parameter for first line standardization of crude drug. The powdered drug of stems of *Berberis aristata* DC. was treated separately with different reagents and exposed to visible, UV light (short and long) to study their fluorescence behavior. (14).

**RESULTS**

Macroscopic Characters of Stems of *Berberis aristata* DC

The observed macroscopical characters of the Stems of *Berberis aristata* DC. were as follows:

- **Size:** 15-20mm
- **Shape:** cylindrical
- **Colour:** Light yellowish
- **Odour:** aromatic
- **Taste:** woody taste

(Fig-1): *Berberis aristata* DC. Plant

(Fig-2): Stems of *Berberis aristata* DC.
Microscopy

T.S of stem is circular in outline with outer well developed cork, narrow cortex and pericycle traversed by stone cells, central narrow pith surrounded by wide xylem with medullary rays. T.S of stem showed multilayered cork, cortex narrow, 2-3 stone cells, lignified fibres, phloem narrow. Xylem consists of vessels, tracheids and parenchyma. Simple starch grains and prismatic crystals of calcium oxalate are present throughout the parenchymatous cells of the section.

Chemomicroscopy

Chemomicroscopical examination showed the presence of starch grains and calcium oxalate crystal.

Phytochemical Investigation

The chemical analyses of the stems of *Berberis aristata* DC. showed the presence of alkaloids, amino acids, flavonoids, phenol, proteins, sterols/terpenes, reducing sugars, non-reducing sugars and tannins (Table 1). These secondary plant metabolites are known to possess various pharmacological effects and may be responsible for the various actions of *Berberis aristata* DC.

Table 1. Preliminary phytochemical screening of various extracts of *Berberis aristata* DC. Stems

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Plant constituents</th>
<th>Petroleum ether extract</th>
<th>Chloroform extract</th>
<th>Ethyl acetate extract</th>
<th>Acetone extract</th>
<th>Methanol extract</th>
<th>Aqueous extract</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Alkaloids</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>2</td>
<td>Carbohydrates</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>Glycosides</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>Saponins</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>5</td>
<td>Phenolic compds &amp; Tannins</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>6</td>
<td>Flavonoids</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>7</td>
<td>Phytosterols</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>8</td>
<td>Terpenes</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>9</td>
<td>Proteins</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>10</td>
<td>Resins</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>11</td>
<td>Reducing Sugar</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>
Qualitative and Quantitative Evaluation Parameters

The calculated quantitative values and physical parameters of the stems of *Berberis aristata* are presented in Table 2. The fluorescence characters of the powdered stem with different chemical reagents are shown in Table 3.

**Table 2. Results of quantitative microscopy and Physical parameters of the stems of *Berberis aristata* DC.**

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Parameters</th>
<th>Result (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Total ash value</td>
<td>2.650</td>
</tr>
<tr>
<td>2</td>
<td>Acid insoluble value</td>
<td>0.266</td>
</tr>
<tr>
<td>3</td>
<td>Moisture content</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>Extractive value (water soluble)</td>
<td>15.333</td>
</tr>
<tr>
<td></td>
<td>(Alcohol soluble)</td>
<td>11.833</td>
</tr>
</tbody>
</table>

**Table 3. Fluorescence characters of the powdered stems of *Berberis aristata* DC. under UV light.**

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Colour developed under UV light</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Short (254 nm)</td>
</tr>
<tr>
<td>Powder as such</td>
<td>Yellow</td>
</tr>
<tr>
<td>1N HNO3</td>
<td>Yellow</td>
</tr>
<tr>
<td>5N NaOH in water</td>
<td>Pale Yellow</td>
</tr>
<tr>
<td>1N HCl</td>
<td>Pale brown</td>
</tr>
<tr>
<td>50% HNO3</td>
<td>Yellow</td>
</tr>
<tr>
<td>Acetic acid</td>
<td>Grey</td>
</tr>
<tr>
<td>Picric acid</td>
<td>Dark Yellow</td>
</tr>
<tr>
<td>FeCl₃ (5% w/v aqueous solution)</td>
<td>Black</td>
</tr>
</tbody>
</table>
DISCUSSION

Some drugs of plant origin in conventional medical practice are not pure compounds but direct extracts or plant materials that have been suitably prepared and standardized. *Berberis aristata* DC. is currently being used in the treatment of various diseases. Standardization of a crude drug is an integral part of establishing its correct identity. Before any crude drug can be included in an herbal pharmacopoeia, pharmacognostic standards & parameters must be established as per WHO guidelines.

*Berberis aristata* is a plant that has been confused with other species due to their relative similarities. The results, of these investigations could serve as a basis for proper identification, collection and investigation of the plant. The macro and micro features of the stem described, distinguishes it from other members of the genera. Chemo- microscopy, physical parameters are unique to the plant and are required in its standardization.

CONCLUSION

Establishment of the pharmacognostic profile of the stems of *Berberis aristata* DC. will assist in standardization which can guarantee quality, purity and identification of sample.

To conclude, the results of this investigation serve as a basis for proper identification, collection and investigation of the plant *Berberis aristata* DC.
ACKNOWLEDGEMENTS
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REFERENCES