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Original Research Paper

PHARMACOGNOSTIC AND PHYSICOCHEMICAL ANALYSIS OF *BARLERIA GIBSONI* DALZ

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ABSTRACT

The present investigation intended to evaluate the pharmacognostical features and physicochemical analysis of *Barleria gibsoni* Dalz. (*B.gibsoni*) leaves. Macroscopic, microscopic and physicochemical studies such as moisture content, ash values, extractive values were carried out as recommended by WHO. Microscopical studies revealed the presence of stomata, trichomes, vascular bundles and calcium oxalate crystals. Physicochemical parameters such as moisture content, extractive values, ash content and fluorescent studies were also determined. This is the first report on the pharmacognostic and physicochemical studies of *B. gibsoni* and is helpful in the characterization of the crude drug.

Keywords: *Barleria gibsoni*, Microscopy, Physicochemical, Pharmacognosy, Phytochemistry.

INTRODUCTION

Herbal medicines have recently attracted much attention as alternative medicines useful for treating or preventing life-style related disorders.[1] The use of plants as medicines is dated back to early man.[2] The therapeutic efficacy of many indigenous plants, for various diseases have been described by traditional herbal medicine practitioners.[3] The world health organization (WHO) estimates that about 80% of the populations living in the developing countries rely almost exclusively on traditional medicine for their primary health care needs. The macroscopic and microscopic description of a medicinal plant is the first step towards establishing the identity and the degree of purity of such materials and should be carried out before any tests are undertaken. To ensure reproducible quality of herbal products, proper control of starting material is utmost essential. The first step towards ensuring quality of starting material is authentication. Despite the modern techniques, identification of plant drugs by pharmacognostic studies is more reliable.[4,5]

Barleria gibsoni Dalz. (Acanthaceae) is widely distributed throughout Africa, India, Sri Lanka and tropical Asia. *Barleria* (Acanthaceae) is a large genus with about 230 species of herbs and shrubs distributed chiefly in the tropical and subtropical parts of the world. Out of it 30 species occurs in India, many of which are known for their ornamental and/or medicinal value. Some of the important species of this genus are *B. prionitis*, *B. greenii*, *B. albostellata*. *B. cristata*, *B. strigosa*, *B. tomentosa* etc. In some *Barleria* species biological activities such as anti-inflammatory, analgesic, antileukemic and hypoglycemic have been reported.[6] It is commonly known as Neel koranti, the juice of the leaf is used in cataract and fever. The dried bark is used in cough treatment and the leaves chewed to relieve toothache. The paste of the root is applied to disperse boils and glandular swellings.[7] It exhibits several medicinal properties. The leaves are chewed to relieve toothache. Juice of the leaves is used in ulcer and fever. Paste of the roots is applied to disperse boils and glandular

swellings. Leaves are also used by some tribal communities for the treatment of piles and to control irritation. Plant is also used in stiffness of limbs, enlargement of scrotum and sciatica.[8-13] Though the plant has been reported for many biological activities, no scientific data is available to identify the genuine sample. Therefore the present investigation was carried out to establish identity of fresh and dried leaves morphologically microscopically and physicochemically for the standardization of the drug.

MATERIAL AND METHODS

Procurement and Authentication of Plant Material

The fresh leaves of the *B. gibsoni* were collected during the month of May-June when flowering, from Satara region, Maharashtra, India. The plant authenticated by Botanical Survey of India (BSI), Pune, Maharashtra, India. For further reference a voucher specimen (BSI/WRC/Tech/2013/FAT 01 dated 27th December, 2013) has been deposited at the herbarium of same place.

Preparation of Extract

The collected fresh matured leaves of *B. gibsoni* were washed with tap water, air-dried at room temperature for 2-3 weeks at 35-40°C and then reduced to coarse powder. A 100 gm powdered leaves was obtained after defatted with petroleum ether and successively extracted with petroleum ether ,chloroform, ethyl acetate and ethanol using Soxhlet apparatus also aqueous extraction was carried out by maceration.

Macroscopic, Microscopic and Powder Analysis

The macroscopy of the leaves were studied according to standard methods.[14, 15] For anatomical studies hand section of the leaf was taken, stained and mounted following usual microtechniques.[16] The dried powder of whole plant of *B. gibsoni* examined for its microscopic characters. First powder of drug was boiled with chloral hydrate to remove the coloring matters mounted on the glass slides using glycerin and covered with a cover slip and viewed under microscope. Different staing agent used for identification of powder characters.[17]

Quantitative Microscopy

The cleared materials were washed thoroughly and stained with safranin for quantitative microscopic studies of Stomatal Number, Stomatal Index, Vein-Islet and Vein termination number and Palisade Ratio.

Physicochemical Analysis

Total ash value, water and acid, soluble and insoluble ash value, and moisture content were determined as per Indian pharmacopoeia.[17,18] The fluorescence characters of the plant material in different solvents were observed using visible, short UV and long UV light.[19]

Preliminary Phytochemical Screening

Preliminary phytochemical screening for the detection of various chemical constituents was carried out by using standard procedures described by Khandelwal[17] and Harborne.[20]

RESULTS

Macroscopic and Microscopic Evaluation of Leaves

The leaf of *Barleria gibsoni* Dalz., an undershrub up to 1.7 m high, dorsiventral, size varies from 6-10.5 cm long, 2.5 - 4 cm wide, simple, elliptic, acuminate, entire, acute, unicostate, glabrous. The transverse section of leaf shown in Figure1 single layered epidermis on both surface. Epidermis shows Wavy epidermal cells with stomata, unicellular covering trichomes. The Lamina portion shows Palisade cells with spongy parenchyma cells representing the mesophyll tissue. The Midrib Showing phloem tissue and the xylem vessels in the centre of the midrib region, upper collenchyma cells below the upper epidermis and lower collenchymas cells above the lower epidermis are also seen. Powder sample of leaf shows presence of stomata, trichomes , Mesophyll and calcium oxalate crystals shown in Figure 2.

Quantitative Microscopy

The leaf surface constants such as stomatal index for upper epidermis (9.5-10.6 /mm^2), vein islet no (4.1- 4.5/mm^2), vein termination no (4.0-5.0/mm^2) and palisade ratio (7.8 -8.3) were found important diagnostic characters (Table 1).

Determination of Extractive Values

Different solvents were used for finding extractive values of each part of the plant. Leaf drug shows maximum (22.00%) extractive value in ethanol and minimum (8.2) in solvent ethyl acetate. Similarly bark has maximum (22.0 %) extractive value in Ethanol and minimum (8.2%) in ethyl acetate. Root has maximum (22.3%) extractive value in acetone and minimum (7.4%) in ethyl acetate. Maximum constituents were found to be present in polar solvents compare to non polar solvents in most parts of plant studied. Solvent ether, chloroform and petroleum ether are poor solvents (Table 2).

Physiochemical Analysis

The physiochemical analysis shown in Table 3.

Fluorescence Study

The Fluorescence Study of powdered leaves of *Barleria gibsoni* Dlaz shown in Table 4.

Preliminary Phytochemical Screening

The Preliminary phytochemical screening shown in Table 5.

DISCUSSION

The evaluation of a crude drug is an important tool for correct identification of a plant material. For this, pharmacognostic and physicochemical parameters must be determined. In this regard, the microscopic and macroscopic features of leaf have been studied. Studies revealed the presence of stomata, trichomes, vascular bundles and calcium oxalate crystals. Physicochemical constants gives source of information and are usually used in judging the purity and quality of the drug. The extractive values are also helpful in estimation of specific constituents soluble in particular solvent. The fluorescence analysis of the powdered drug from the leaves of *B.gibsoni* in various solvents was performed under normal and UV light. All the leaf extracts are examined in short UV (254 nm) and long UV (366 nm) to detect the fluorescent compounds. The ash value determines the earthy matter or inorganic composition and other impurities present along with the drug. Phytochemical investigation reveals the presence of alkaloids, terpenoids, flavonoids, glycosides and tannins. The pharmacognostic, Physiochemical standard for the leaves of *B. gibsoni* is laid down for the first time in this study.

CONCLUSION

From the above studies it can be concluded that the present study on *B. gibsoni* leaf can serve as an important source of information to ascertain the identity and to determine the quality and purity of the plant material hence this study could be used as a diagnostic tool for the standardization of this medicinal plant and will helpful in characterization of the crude drug.

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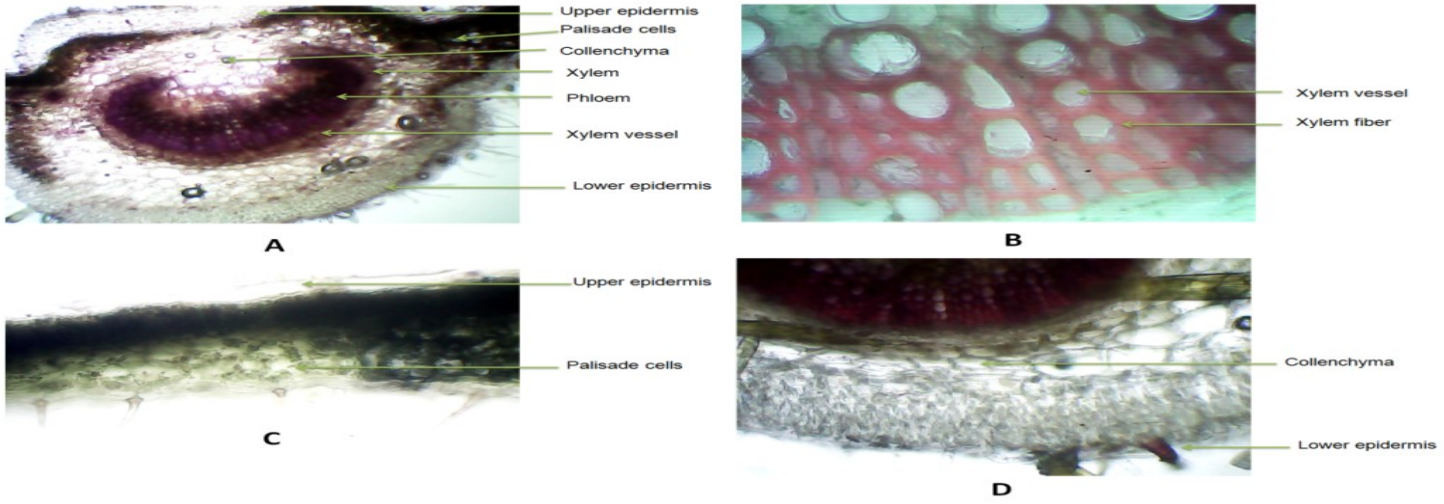

Figure 1: A: T.S. of Leaf, **B:** Midrib portion with lignified xylem **C:** Part of lamina with upper epidermis and palisade cells **D:** Part of midrib with lower epidermis and collenchyma

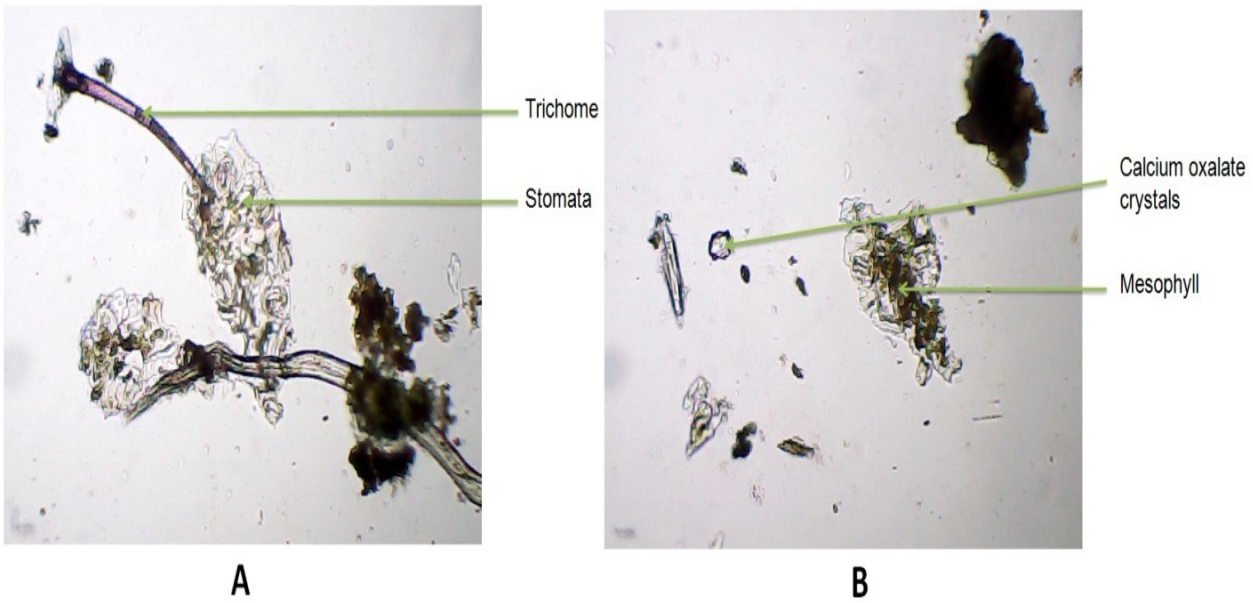

Figure 2: Powder Study of Leaf **A:** Trichome and Stomata, **B:** Calcium oxalate crystals and Mesophyll

Table 1: Quantitative measurements of *Barleria gibsoni* leaf

Sr. No.	Parameters studied	Value in 1 sq.mm (average of 10 fields)
1	Stomatal Index (Upper epidermis)	9.5-10.6
2	Vein-islet no.	4.1- 4.5
3	Vein -termination no.	4.0- 5.0
4	Palisade ratio	7.8 -8.3

Table 2: Solvents, extraction methods and respective yield from leaves

Sr. No.	Extract	Solvents	Colour	Nature	% Yield w/w
1.	Successive	Peroleum ether	Greenish brown	Semisolid	22.0
2.		Chloroform	Greenish black	Semisolid	12.1
3.		Ethyl acetate	Dark brown	Solid	8.2
4.		Ethanol	Brown	Solid	16.2
5.	Individual	Aqueous	Dark brown	Solid	10.1
6.		Ethanolic	Dark brown	Semisolid	25.3

Table 3: Physicochemical parameters

WHO parameters	Average values %w/w leaves
Moisture content	5.98
Water soluble extractive	10.1
Alcohol soluble extractive	25.3
Total ash content	6.22
Water soluble ash	3.6
Acid insoluble ash	2.22

Table 4: Fluorescence Study of powdered leaves of *Barleria gibsoni* Dlaz

Sr. No.	Particulars	Under Visible light	U.V. Light Short wavelength	U.V. Light Long wavelength
1.	Powder as such	Dull green	Dark yellow	Yellowish -brown
2.	Powdered drug + Conc. HCl	Dull yellow	Dark yellow	Yellowish -brown
3.	Powdered drug + Conc. H_2SO_4	Dark brown	Dark brown	Dark brown
4.	Powdered drug + Conc. HNO_3	Dark brown	Dark brown	Bluish green
5.	Powdered drug + Glacial acetic acid	Dark brown	Dark brown	light green fluorescence
6.	Powdered drug + NaOH (Aq.)	Dull yellow	Dark yellow	Dark brown
7.	Powdered drug + NaOH (Alc.)	Dull yellow	Dark yellow	Dark brown
8.	Powdered drug + 10% HCl	Dark yellow	Dark yellow	Golden Yellow
9.	Powdered drug + 10% H_2SO_4	Yellow	Dark yellow	Bluish green
10.	Powdered drug + 10% HNO_3	Dull yellow	Dark yellow	Dark bluish green
11.	Powdered drug + 10% Glacial acetic acid	Dull yellow	Dark yellow	light green fluorescence
12.	Powdered drug + water	Dull yellow	Dull yellow	Blackish brown

Table 5: Phytochemical screening of *B. gibsoni*

Extracts	Major Secondary Metabolites present						
	Alkaloids	Saponins	Terpenoids	Flavonoids	Steroids	Glycosides	Tannins
Leaves	+	-	+	+	+	+	+

‘‘+ ’’ indicates presence and ‘‘– ’’ indicates absences of the phytochemical constituents.

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