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# PHARMACOGNOSITIC AND PHYTOCHEMICAL INVESTIGATIONS ON LEAF OF *POLYGONUM BARBATUM*

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**ABSTRACT:** Pharmacognostical standardization and phytochemical screening of *Polygonum barbatum* leaves were assessed. Transverse section of *Polygonum barbatum* leaves shows that the midrib consists of broad boat shaped abaxial and broad conical adaxial side. The lamina shows the presence of glandular trichome, paracytic stomata and drused calcium oxalate crystals. The phytochemical screening of the extracts confirmed the presence of alkaloids, carbohydrates, saponin and flavanoids.Fluorescence analysis of leaf powder and their extracts in different solvents were studied. The different physico chemical studies such as total ash, water soluble ash, acid-insoluble ash, sulphated ash and moisture were also determined.

**Key words:** *Polygonum barbatum*, Pharmacognosy, Phytochemical screening

## INTRODUCTION

There are hundreds of medicinal plants that have a long history of curative properties against various diseases and aliments. Plants have formed the basis of sophisticated traditional medicine systems among which are Ayurvedic, Unani and Chinese. These systems of medicine have given rise to some important drugs which are still in use. Though the traditional Indian system of medicine has a long history of use, they lack adequate scientific documentation, particularly in the light of modern knowledge.

*Polygonum barbatum Linn* (Family: Polygonaceae) a stout, annual herb, with erect stem, distributed throughout the hotter parts of India, particularly in wet places (Fig.1). In Malabar and Canara the seeds are used to relieve the griping pains of colic. In, North India the roots are used as an astringent and cooling remedy. In Chinese medicine, decoction of the leaves and stalks are used to treat ulcers (Kirtikar and Basu, 1993). It has been reported that dichloromethane extract of *Polygonum barbatum* showed brine shrimp toxicity and spasmolypic activity. The methanolic extract of *Polygonum barbatum* was found to possess cholinergic activity (Bashir Ahmad Chaudhry et.al, 2003). The antinociceptive, anti-inflammatory and diuretic properties were also studied (Abdul Mazid et.al, 2009). This study was aimed at providing the pharmacognostical standards of *Polygonum barbatum* which will be helpful for distinguish it from other species.

Fig.1. Polygonum barbatum

## MATERIALS AND METHODS

### Plant Collection and Identification

The leaves of *Polygonum barbatum* were collected along the beds of Cauvery river, near Trichy, Tamil Nadu, India in February 2008. The plant was identified and authenticated by Dr.G.V.S.Moorthy, Joint Director, Botanical Survey of India (BSI 0020©), Agriculture University campus, Coimbatore, India. The voucher specimen number was BIS/SC/5/23/08-09/Tech-1614, and the specimen was deposited at herbarium of botany department.

### Anatomical investigation

Anatomical studies were carried out as per standard methods (Johansen, 1940). For anatomical studies, the sections of root and stem of about 10-12 µm thickness were prepared and stained with polychromatic stain, toluene blue, safranin and fast green (O' Brien et.al, 1964). Micro photographs at different magnifications were taken with Nikon Lab photo 2 microscopic units. Polarized light was employed to study the nature of crystals in the midrib (Sass, 1940).

### Preparation of extract

About 500 g of dried course powdered leaf of *Polygonum barbatum* were successively extracted by using solvents of increasing polarity i.e. Petroleum ether, Chloroform, Ethyl acetate and Ethanol. The extracts were filtered and distilled in vacuum under reduced pressure to remove the solvent completely. The extracts thus obtained were used for further analysis.

## RESULTS AND DISCUSSION

The midrib consists of broad boat shaped abaxial part and broad conical adaxial side. The abaxial vascular bundles have few circular xylem elements in radial multiples and thin band of phloem on the abaxial side of the midrib. The adaxial apidermis is single layered, and the epidermal cells are small and cubical to squarish. The upper part of the adaxial cone consists of compact angular collenchyma cells. The abaxial epidermis is similar to the adaxial epidermal cells. The ground tissue is parenchymatous, thin walled, angular and compact (Fig.2).

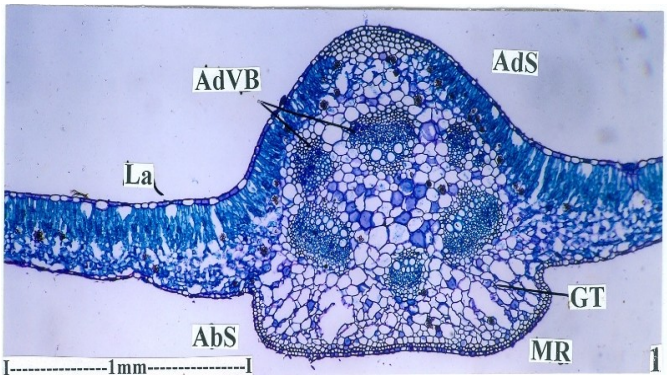


Fig.2. T.S. of Leaf through midrib with lamina

**Legend for the figure**

(AbS- Abaxial side, AdS- Adaxial side, AdvB- Adaxial vascular bundle, GT- Ground tissue, La- Lamina, MR-Midrib )

The calcium oxalate crystals are druses. They are distributed in palisade region of the midrib and the ground tissue around the vascular bundle (Fig.3).

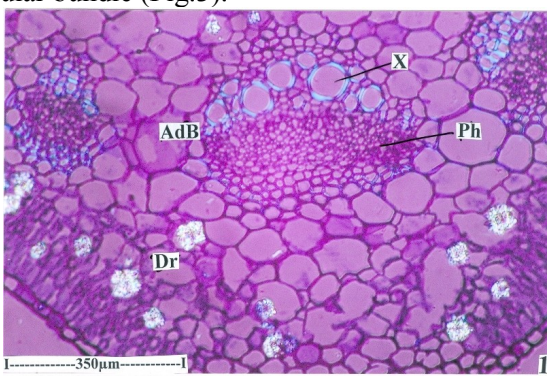


Fig.3. Crystal distribution in the midrib ground tissue (under polarized light)

**Legend for the figure :** ( AdB-Adaxial bundle, Dr- Druses, Ph-Phloem, X-Xylem)

In lamina, both the abaxial and adaxial epidermis is interrupted by the glandular trichome. The glandular trichomes are small, globose and multicellular with short stalk. The glandular trichomes are sunken in between the epidermal cells. The palisade mesophyll tissue occupy two third thickness of the lamina. Drused calcium oxalate crystals are present at the median of the lamina (Fig.4).

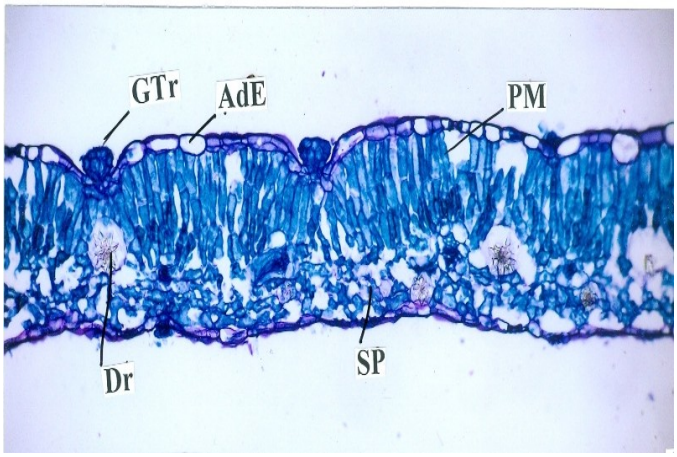


Fig.4. T.S. of lamina with glandular trichomes

**Legend for the figure**

(AdE- Adaxial epidermis, Dr- Druses, GTr- Glandular trichome, PM- Palisade mesophyll, SP-Spongy tissue)

Presence of glandular trichome in the lamina is a characteristic diagnosing feature of Polygonum. Each gland has a conspicuous cavity which leads the gland from the epidermis to the mesophyll tissue of the lamina (Fig.5).

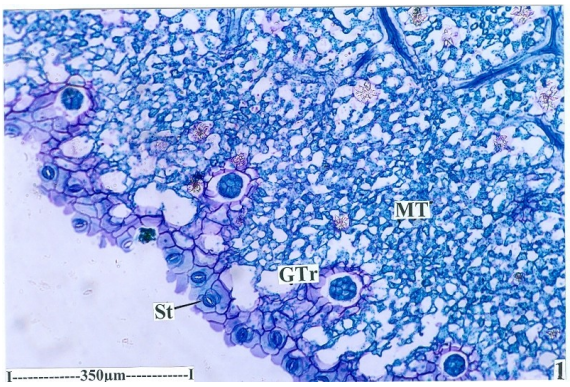


Fig.5. Paradermal section showing distribution of glandular trichomes with stomata

**Legend for the figure :** (GTr- Glandular trichome, Mt- Mesophyll tissue, St- Stomata)

Both the abaxial and adaxial epidermis is stomatiferous. The stomata are paracytic. The subsidiary cells are unequal in size (Fig.6).

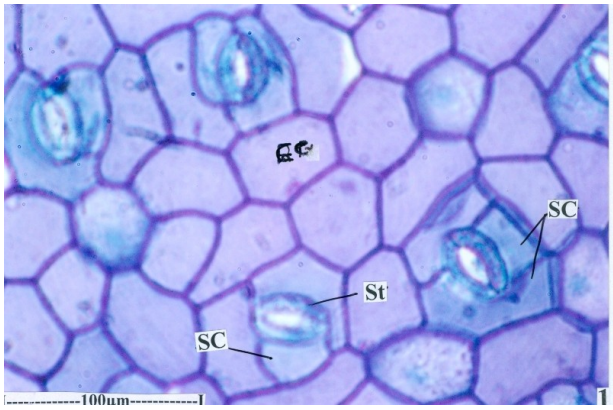


Fig.6. Adaxial epidermis with stomata

**Legend for the figure :** (EC-Epidermal cells, SC- Subsidiary cells, St- Stomata)

## Preliminary phytochemical screening

The individual extracts of *Polygonum barbatum* were subjected to different qualitative chemical tests for the presence of phytoconstituents using the standards methods (Raaman, 2006 and Harbone, 2005). The results were shown in Table 1.

## Fluorescence analysis on powdered leaves and their extracts in different solvents

The leaf powder was treated with 1 N aqueous NaOH, alcoholic NaOH, 1N HCl, 50% $HNO_3$ and 50% $H_2SO_4$.The different extracts of leaf powder have also been subjected to fluorescence analysis and the results were given in Table 2 and 3.

## Physico-chemical studies on leaves of *Polygonum barbatum*

Air dried coarsely powdered leaves of *Polygonum barbatum* was subjected to different physico chemical studies such as total ash, water soluble ash, acid-insoluble ash, sulphated ash and moisture and the results were shown in Table 4.

Table 1. Preliminary phytochemical screening of *Polygonum barbatum*

| **Phytochemical Test** | **Petroleum ether (60- 80°C) extract** | **Chloroform extract** | **Ethyl acetate extract** | **Methanol extract** |
|---|---|---|---|---|
| **Test for Alkaloids** | | | | |
| Mayer's Test | - | + | + | + |
| Wagner's Test | - | + | + | + |
| Hager's Test | - | + | + | + |
| Dragendorff's Test | - | + | + | + |
| **Test for Carbohydrates and Glycosides** | | | | |
| Molish's Test | + | + | + | + |
| Fehling's Test | - | - | + | + |
| Barfoed's test | - | - | + | + |
| Benedict's Test | - | - | + | + |
| Borntrager's Test | + | + | + | + |
| Legal's Test | + | + | + | + |
| **Test for Saponin** | | | | |
| Foam Test | + | + | + | + |
| **Test for Proteins and Amino acids** | | | | |
| Millon's Test | - | - | + | + |
| Biuret's Test | - | - | + | + |
| Ninhydrin Test | - | - | + | + |
| **Test for Phytosteroids** | | | | |
| Libermann | | | + | + |
| **Test for Gums and Mucilages** | | | | |
| Alcohols 95% Test | + | + | + | + |
| **Test for Phenolic Compounds and Flavanoids** | | | | |
| Ferric chloride Test | + | + | + | + |
| Lead acetate Test | + | + | + | + |
| Alkaline Test | + | + | + | + |

Table 2. Fluorescence analysis of *Polygonum barbatum*

| **Chemical Test** | **Day Light** | **UV Light** |
|---|---|---|
| Sample as such | Light brown | Dark brown |
| Powder + aqueous 1N NaOH | Greenish brown | Fluorescent green |
| Powder + alcoholic NaOH | Light brown | Fluorescent green |
| Powder + 1N HCl | Light brown | Fluorescent green |
| Powder + 50% $HNO_3$ | Light brown | Greenish brown |
| Powder + 50% $H_2SO_4$ | Dark brown | Fluorescent green |

Table 3. Fluorescence analysis of different solvent extracts of *Polygonum barbatum*

| Extracts | Day Light | UV Light |
|---|---|---|
| Petroleum ether (60- 80°C) | Light brown | Light green |
| Chloroform | Light yellow | Yellowish green |
| Ethyl acetate | Deep brown | Brown |
| Ethanol | Brown | Green |

Table 4. Physico-chemical studies of *Polygonum barbatum*

| Parameters | Percentage % |
|---|---|
| Total ash | 1.54 |
| Water soluble ash | 1.76 |
| Acid insoluble ash | 1.35 |
| Sulphated ash | 1.10 |
| Determination of moisture content | 16.4 |

## CONCLUSION

The pharmacognostical characters reported in this work can serve as a valuable source of information and provide suitable diagnostic tool for the standardization as well as adulterant identification of this medicinal plant in future investigation. The phytochemical screening reveals the presence of alkaloids, flavanoids, carbohydrates, phenols and saponins which may helpful in the isolation of compounds.

**Acknowledgement**

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## REFERENCES

Abdul Mazid, M., Bidyut K. Datta., Lutfun Nahar, S., Khairul Bashar, A. M., Sitesh, C. Bachar., Satyajit D. Sarker., (**2009)** Antinociceptive, Anti-inflammatory and Diuretic Properties of *Polygonum barbatum* (L.) Hara var.*barbata. Brazilian Journal of Pharmacognosy,* Vol.19, 749-754.

Bashir Ahmad Chaudhry., Muhammad Younas Syad., Khalid Hussain Janbaz., Altaf Ahmed Dasti., Bashir Ahmad Loothar., (2003) Biological Activity of *Polygonum barbatum*. *Journal of Research (Science),* Vol.14, 169-175.

Harbone, J.B., (2005) Phytochemical methods, A guide to modern technique of plant analysis, Chapman and Hall, London, 182-189.

Johansen, D.A., (1940) Plant Micro technique. McGraw Hill Book Co, New York, 523.

Kirtikar, K.R., Basu, B.D., (1993) Indian Medicinal plants, 2nd Edition, International Book Distributors, India, Vol.3, 2100.

O'Brien, T.P., Feder, N., Mcull, M.E., (1964) Polychromatic Staining of Plant Cell Walls by Toluidine Blue -O, *Protoplasma*, Vol. 59, 364-373.

Raaman, N., (2006) Phyochemical Techniques, 2nd Edition, New Indian Publishing Agency, New Delhi, 19-30.

Sass, J.E., (1940) Elements of Botanical Microtechnique, McGraw – Hill Book Co, Inc, New York, 222.