

Microscopical and Preliminary Phytochemical Studies on Aerial Part (Leaves and Stem) of *Bryophyllum Pinnatum Kurz*

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ABSTRACT

The plant *Bryophyllum pinnatum Kurz* (crassulaceae), has potent medicinal values. The plant have been found to possess pharmacological activities as immunomodulator, CNS depressant, analgesic, antimicrobial, anti-inflammatory, anti-allergic, anti-anaphylactic, antileishmanial, antiulcerous, antifungal, antihistamine, antiviral, febrifuge, gastroprotective, insecticidal, muscle relaxant, sedative. The present study deals with pharmacognostic examination of morphological and microscopical characters of *Bryophyllum pinnatum* including leaf constant, ash values, extractive values and preliminary phytochemical screening of the extracts revealed that the plant contains alkaloids, glycoside, carbohydrates, tannins, phenolic compound, steroids, gums, mucilage and lignins. The presence of anisocytic type stomata are the characteristic feature observed in microscopy of leaf. The results of the study could be useful in setting some diagnostic indices for the identification and preparation of monograph of the plant.

Keywords: *Bryophyllum pinnatum Kurz*, pharmacognostic study, phytochemical screening.

Editor: Srisailam Keshetti, Phcog.Net

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INTRODUCTION

India is one of the richest floristic regions of the world and has been a source of plants and its products, since antiquity, man uses them in different way according to his needs, particularly as food and medicine. Among the entire flora, 35000 to 70000 species have been used for medicinal purpose^[1]. The name *Bryophyllum* comes from 'I Sprout' and 'leaf', the plant, classified as a weed is notorious for its growth potential. Shortly after a leaf falls to the grounds, a whole garland of new little plants develops from the notches along the leaf margin. *Bryophyllum Pinnatum Kurz* (syn. *B. Calycium* and *Kalanchoe pinnata*) commonly known as parnbija, Zakhm-hyat (Hindi), life plant, love plant, air plant (Mexican), Good luck or resurrection plant^[2].

It is a glabrous, ornamental, crassulenscent herb, cultivated in houses and gardens. It is of about 1–1.5 m in height, with opposite, decussate, succulent, 10–20 cm long glabrous leaves (with 3–5 deeply crenulated, fleshy leaflet) with obtusely four angled stems. The

lower leaves are usually simple, whereas upper ones are usually 3–7 folioate, long-petioled, petioles united by a ridge round the stem, crenatures at the extremities of the lateral nerves furnished with rooting vegetative buds. The flowers are 5cm long, reddish purple, pendent, in large spreading panicles; fruits are membranous follicles enclosed in the persistent papery calyx and corolla, seeds smooth, ellipsoid. They widely grow in hot and humid areas, around the dwelling places, along road sides and in abandoned farm and fields. They are widely used in folk medicine of its indigenous region (Madagascar, Tropical Africa, India, China, Australia, Hawaii and Tropical America)^[3,4].

Bryophyllum pinnatum Kurz leaves have great medicinal values in the indigenous system of medicine. It is used for medicinal purpose both, internally as well as externally. The leaves are frequently used for an array of human disorders including hypertension, diabetes mellitus, bruises, wounds, boils, burns, sloughing ulcers, ophthalmia, corn, diarrhea, dysentery, vomiting, abscesses, insect bites, arthritis, rheumatism, joint pains, headaches, antifungal,

antibacterial, body pains and acute inflammation. The leaves are also used for lymphadenitis and ear disease [3]. The main constituents of this the plant are alkaloids, flavonoids, glycosides, steroids, bufadienolide and organic acid are reported [2,5,6]. The pharmacognostical studies of leaf and stem of this plant have not been reported. Therefore, the present investigation was planned to study the pharmacognostical and phytochemical aspects of the plant.

MATERIAL AND METHODS

Collection and Identification

The plant of *Bryophyllum pinnatum* Kurz were collected from Tau Devilal Herbal garden, Churpur and positively identified. The specimen was submitted to the A. R college of pharmacy, Vallabh Vidyanagar, Anand. The collected plant material was made thoroughly free from any foreign organic matter. The aerial parts of the plant were separated, cutted into small pieces, shade dried and powdered with mixer and sieved. Pharmacognostic studies were conducted with fresh leaves and stem.

Pharmacognostical studies

The morphological studies such as type, size, shape, apex, margin, venation, base, petiole, surface, phyllotaxy, color, odour and taste of *Bryophyllum pinnatum* Kurz leaf and stem were carried out [13]. The leaf and stem of *Bryophyllum pinnatum* Kurz were examined microscopically. The sections were stained with Toluidine blue, Saffranin and Fast green, Photograph of different magnifications were taken [7-9].

Physicochemical analysis

Ash values, loss on drying, ethanol soluble and water soluble extractive values were determine as per the procedure given in Indian Pharmacopoeia [10].

Phytochemical analysis

The aerial part of the plant were collected, washed with water, dried in shade and stored properly. The dried material was powdered with mechanical grinder and passed through the sieve no. 60. Coarse powder was used for pharmacognostic work. The dried powder material was extracted by successive extractioin method with Petroleum ether (60–80°C), benzene, chloroform, acetone, ethanol (95%) and water using a Soxhlet apparatus. The extracts were filtered while hot and concentrated under reduced pressure. The extractive

values were calculated. The extracts were then subjected to qualitative chemical test for the identification of various active constituents [8-12]. The dried powdered material was subjected to identification tests for detection of various phytoconstituents.

RESULTS AND DISCUSSION

The distinctive macroscopic features of the leaves (Fig. 1, 2) reflecting that the leaves are opposite, decussate, succulent, simple or compound, 8–12 cm and 5–8 cm in size, apex is obtuse, ovate or elliptic in shape, crenate or serrate margin, asymmetric base, reticulate venation, petiole is long, surface is smooth or glabrous, upper surface is dark green in color, lower surface lighter in color, with a characteristic odor and acrid taste.

Fig. 5 demonstrate the microscopic section of leaf. It is broadly shallow on the adaxial side and convex on the abaxial side. It has a thin adaxial epidermal layer of small, less prominent cells. The abaxial epidermis is also very thin and less distinct. The ground tissue of the midrib is parenchymatous and homogenous. The cells are circular or angular and compact. The vascular strand is single, small, collateral and hemispherical in shape. It consists of a thick horizontal band of xylem and fairly wide band of phloem. Xylem elements are narrow, angular, thin walled



Figure 1. *Bryophyllum Pinnatum*



Figure 2. Leaf

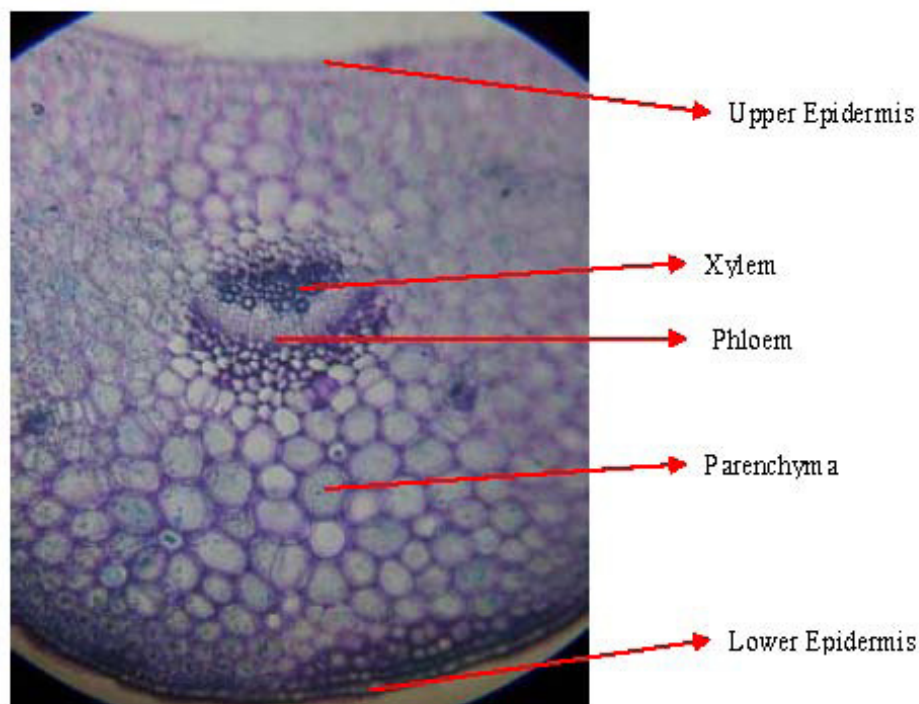


Figure 5. T.S. of Midrib Portion of Leaf

and somewhat diffuse. The lamina is uniformly flat with even surface. The mesophyll tissue is not differentiated into palisade and spongy parenchyma. The epidermal layer appears as flat polygonal cells are variable in shape and size. Stomata are abundant, these are 18–20 stomata per mm². The stomata are anisocytic type (Fig. 7, 8).

The cross sectioned outline of petiole shows the shape of circular with shallow adaxial concavity. The epidermal layer consists of layer of rectangular cells; inner epidermis

is made up of 2 to 3 layer of collenchyma cells; remaining ground tissue is parenchymatous with large, circular thin walled cells. Vascular system consists of collateral and hemispherical in shape. Xylem elements are narrow, angular, thin walled and diffused. Phloem appears as thick hemispherical arc (Fig. 6).

The distinctive macroscopic features of the stems are highlighted in Fig. 1, 3 reflecting that the stems are of kind herbaceous, direction is upright and spreading,

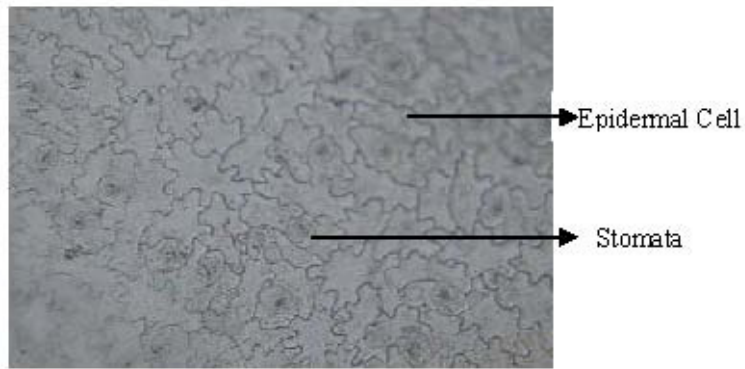


Figure 7. Lower Epidermal Peel

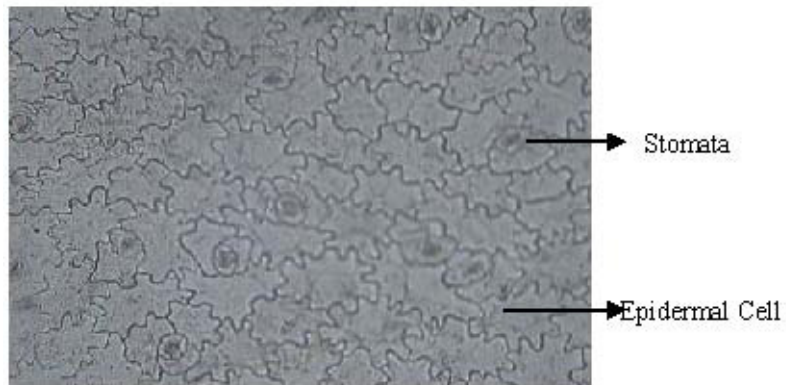


Figure 8. Upper Epidermal Peel

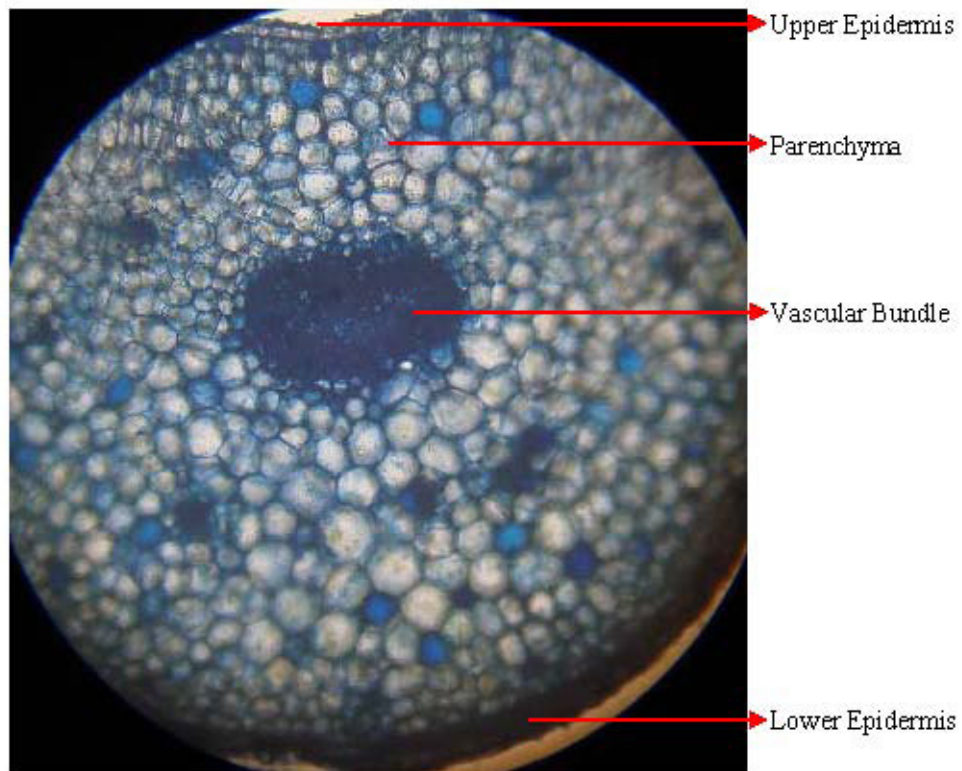


Figure 6. T.S. of Petiole



Figure 3. Stem

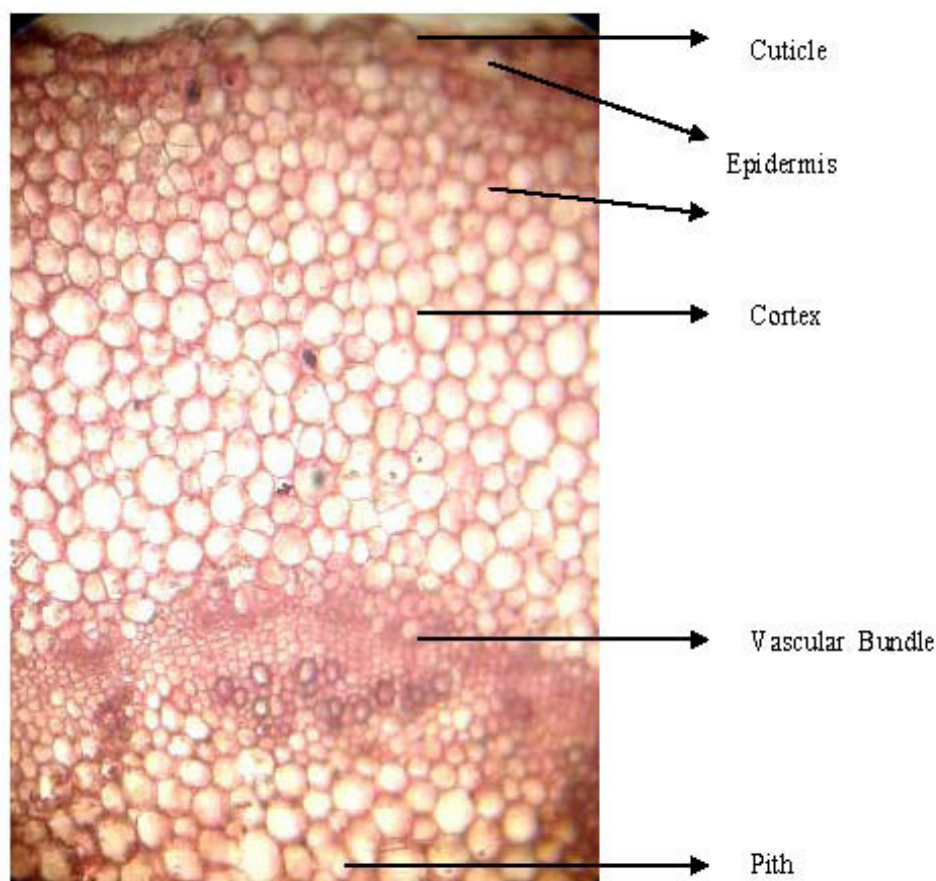


Figure 4. T.S. of Stem

cylindrical or angular in shape, greenish smooth surface when fresh, phyllotaxis is opposite and decussate. The dry stem is pale brownish, shrunken with longitudinal ridges on the surface, hollow in the centre with characteristic odour, and acrid taste.

Figure 4 demonstrate the microscopically diagnostic features of the stem include single layered epidermis consisting of thin walled rectangular cells and covered

by moderately thick and striated cuticle. The vascular bundles are 10–20 of open collateral type forming a discontinuous ring. Medullary rays showing funnel shaped dilatations. Pith i.e central portion is occupied by large thin walled parenchymatous cells with intercellular spaces.

Physicochemical parameters of aerial part of the plant are like total ash (25.0%), acid insoluble ash (3.00 %),

water soluble ash (23.5 %) and sulphated ash (14.0 %). Loss on drying (4.8%) and % retain was found to be 95.20% w/w.

Alcohol soluble extractive and aqueous extractive values were 8.33 & 38.33% w/w, respectively. The extractive values of aerial parts of the plant in various solvents by successive extraction method using Soxhlet apparatus are 5.04, 1.09, 1.26, 0.43, 3.48, 22.70% w/w in Petroleum ether (60–80°), benzene, chloroform, acetone, ethanol, water respectively and total extractive value was found to be approximately 34.00% w/w.

Phytochemical screening of the extracts revealed that the petroleum ether and chloroform extracts of the powdered leaves and stems of *Bryophyllum pinnatum* showed the presence of steroids and terpenoids. The ethyl acetate extract responded positively to the tests for steroids, terpenoids, phenolics and tannins. Ethanolic extract of the leaves produced positive tests for flavonoids, steroids, terpenoids, phenolics, tannins, alkaloids and glycosides. Aqueous extract showed the presence of carbohydrates, proteins, flavonoids, phenolics, tannins and glycosides. These secondary plant metabolites are known to possess various pharmacological effects and might be responsible for the various actions exerted by *Bryophyllum pinnatum*.

Bryophyllum pinnatum is used in the treatment of various disease conditions. The standardization of a crude drug is an integral part of establishing its correct identity. Before any crude drug can be included in a herbal pharmacopoeia, pharmacognostic parameters and standards must be established. The results of the

present investigations could serve as a basis for proper identification, collection and investigation of the plant. Phytochemical evaluation revealed the presence of various secondary plant metabolites which have been claimed to be responsible for various pharmacological activities.

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