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A Comprehensive Review on Ethnobotany, Phytochemical, Pharmacological Profile of *Barleria Prionitis* Linn.

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ABSTRACT

The perennial plant Barleria prionitis is also known as Vajradanti or porcupine flower. Acanthaceae family member Barleria prionitis is a tiny, spiky shrub. The majority of India is home to this shrub with yellow flowers and two flat seeds covered in matted hair. Ayurvedic and other traditional systems acknowledge the therapeutic use of its flower, root, stem, leaf, and in some cases the entire plant against a wide range of illnesses, including fever, cough, jaundice, and severe pain. Barlenoside, barlerine, acetylbarlerine, and balarenone are some of the compounds found in One of the essential components of many herbal preparations is barleria prionitis. This review provides information on the pharmacological properties, phytochemistry, ethnomedicinal applications, and botany of Barleria prionitis. plant. Lupeol, -sitosterol, vanillic acid, and syringic acid are some of the more widely distributed secondary metabolites.

INTRODUCTION:

A perennial plant with 300 species in the Barleria genus, Barleria prionitis is known for its medicinal properties going back thousands of years. It is widely found throughout Asia, especially in Malaysia, Pakistan, the Philippines, Sri Lanka, Bangladesh, Yemen, and tropical Africa in addition to India[29].It is commonly referred to as the "yellow nail dye plant" in English, but it is a medicinal plant with many vernacular names in ayurvedic, sidda, unani, and other traditional systems, including "sahachara," "baana," "kurantaka," "korand," "shairiya," "pita-saireyaka," "piyaabaasa," "jhinti," and "katsa[30]. It is a 1.5 m tall, single-stemmed, erect, perennial, prickly, and evergreen shrub that grows from a single taproot. Lateral roots with numerous branches. The leaves are up to 100 mm long and 40 mm wide, and they have an oval shape with narrow ends (ellipsoid). Three to five incisive, 10–20 mm long, light-colored spines guard the leaf base. At the top of the plant, flowers are grouped closely together, although they can also be found by themselves near the base of the leaves[31]. Two big, flat seeds are contained in an oval-shaped seed capsule that is covered in matted hairs and has a sharp, pointed beak. Branch and stems are firm, smooth, and light[32]. Recent pharmacological and pharmacognostic research on Barleria prionitis, a substantial source of numerous phytochemicals, has revealed enormous therapeutic promise against several disorders, which is summarised in this review along with its notable ethnomedicinal usage [33].

Taxonomy and Morphology: B. prionitis Linn. is an upright, bushy shrub that can reach heights of 1-2 m. They have two to four long, pointed axillary spines that are around 11 mm long. [1] Its 3–4 cm long, generally yellowish or whitish, tubular flowers have a same width to them. Its seeds are flattened, about 8 mm long and 5 mm wide, and covered with tangled hairs. Its fruits are ovoid and capsular. Its rigid, cylindrical, spherical, and glabrous stems are pale tan or grey in colour. Branch and stem colors range from light brown to light grey and are rigid and smooth. Tables provide the taxonomical classification of B. prionitis. Branch and stem colours range from light brown to light grey and are rigid and smooth taxonomical classification of B. prionitis is given in Table 1 [3].

Table: 1

Kingdom [1]	**Plantae**
Subkingdom	Tracheobionta
Superdivision	spermatophyta
Division	Magnoliophyta
Sub Class	Asteridae
Order	Lamials
Family	Acathaceae
Genus	Baleria Linn
Species	Porcupine flower

Habitat:

From plains to 500 metres, B. prionitis is frequently found in shrub jungles and wayside thickets. [3] The well-known perennial ayurvedic herb Barleria prionitis Linn. (Acanthaceae) is spread over tropical Asia, India, Sri Lanka, and Africa.[1]. It goes by a number of names in ayurveda, including kuranta, kurantaka, kuranda, kurandaka, sahachara, and shairiya. Popular names for it in traditional medicine include piyaabasaa, jhinti, and ketsariyaa.[1]

How to grow:

Both direct sunlight and some shades are beneficial for Barleria prionitis. It requires well-drained soil and can thrive in a variety of conditions. Plenty of compost added to the soil will be very beneficial to plants. This shrublet can be planted in mixed margins and banks. Regular pruning is necessary for orderly and compact growth after the shrub has flowered. To encourage additional blossoms, prune the shoots in the spring and the early summer. Barleria prionitis can easily be grown from seeds, cuttings, and layering. The seeds must be gathered when the seed capsules become brown before they may be dispersed. The flat seeds are sown in seed trays that are filled with a well-drained medium. Cover with sand or sifted dirt.[35]

Maintenance:

- **Fertilization:**

Use a balanced liquid fertilizer or a mixture with a high phosphorus content for blooming plants to feed your plants every two weeks. A plant that does not get enough nutrients develops discouraged. Throughout the winter, fertilizing takes place no more than once a month.

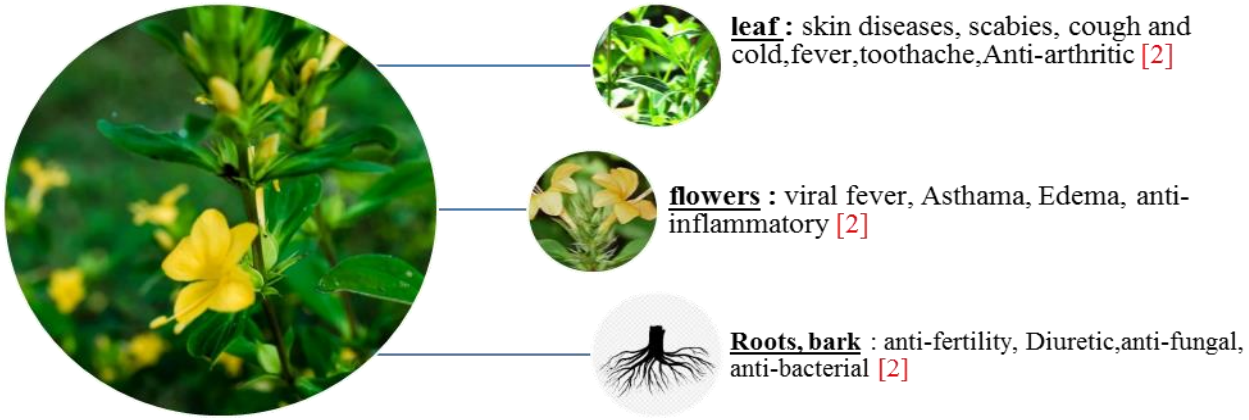
- **Water:**

It requires very little watering, and the soil must slightly dry out in between applications. Watering should be sparingly used in the winter because the substrate dries out.

- **Light:**

Bright, diffused light from Barleria. Poor lighting causes the plant to slowly flower, the branches to lengthen, and the leaves to grow shallow, while strong sunshine causes the leaves to get pale.

Traditional uses:



Plant parts and their applications

Table: 2

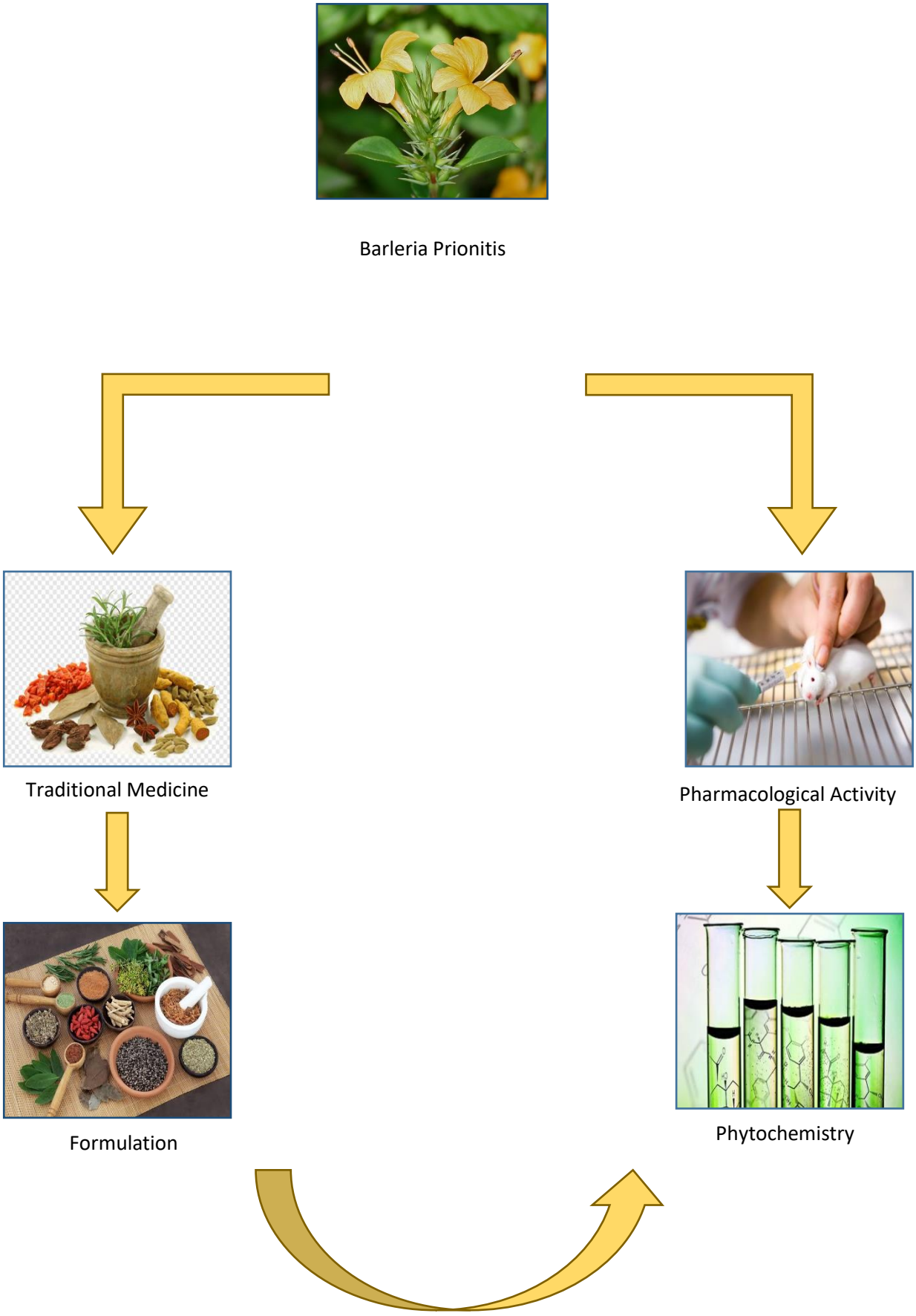
Plant Part	Disorder	Application mode
Leaf	Skin disease Glandular swellings Wounds Toothache Mouth ulcer	Crushed leaves Given as juice directly Crushed form Paste or juice Chewed and sap is swallowed
Flower	Viral fever	extract
Seed	Edema	Paste
Shoot	Asthma Whooping cough	Formulation Prepared tablets with honey
Stem	Liver congestion	Powder with cow milk
roots	Snakebite Rheumatic fever Whooping cough	The decoction is taken orally Paste with goat milk Used as formulation
Whole plant	Whooping cough Gout	The dried plant is used The paste is applied externally

Vernacular names

Table: 3

English	**Porcupine flower, Barleria**
Hindi	Vajradanti, Kat-sareya, Peela bansa
Marathi	Kalsunda, Kholeta, Pivalakoranta
Sanskrit	Vajradanti, Kurantaka, Koranta
Malayalam	Manjakkanakambaram, kanakambaram
Kannada	Gorante, Mullu jaali, Mullu madarangi
Tamil	Mirutam, Muli, Mulli, Mulliver

Graphical abstract:

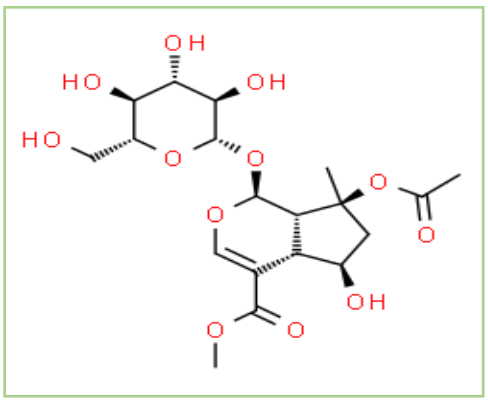


Phytochemicals:

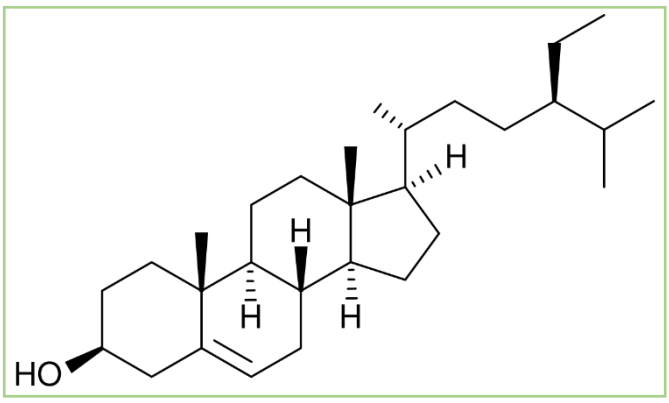
Plants are suitable to produce a variety of secondary metabolites, at least 57182 of which have formerly been linked. Understanding the connection between a medicinal factory's phytochemical factors and its pharmacological efficacity is pivotal. (6) The hydro-methanolic excerpt of the entireB. prionitis factory contained glycosides, saponins, flavonoids, steroids, and tannins, according to primary phytochemical disquisition. (4) phytochemicals similar as balarenone, pipataline, lupeol, prioniside A, and prioniside B that have been linked fromB. prionitis(8, 22). Barlerinoside, verbascoside, 6-0-trans-p-coumaroyl-8-o-acetylshanzhiside methyl ester, barlerin, acetylbarlerin, and 7- methoxy diderroside are glycosides uprooted from the areal factory. Barleria prionitis Linn's leaves and stems were uprooted in alcohol, and chromatographic analysis of the excerpt revealed the presence of iridinoid glycosides similar to acetyl barlerin. [9,13,24] Scutellarein, melilotic acid, synergic acid, and 6-hydroxyflavones were all said to be present in the leaves [10]. B. Prionitis contains beta-sitosterol, scutellarein 7-neohesperidoside, and apigenine 7-O-glucoside. In Barleria prionitis, two novel anthraquinones compounds were discovered and named 1,8, dihydroxy-2,7-dimethyl 3,6-dimethoxy anthraquinone and 1,3,6,8-tetra methoxy-2,7-dimethyl anthraquinone, respectively [5].

Table: 4

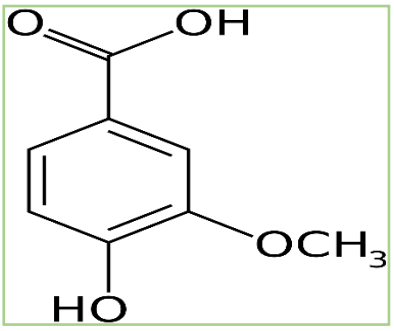
Plant part	chemical group	Phytoconstituent	Reference
Aerial	Terpenoid Phenylethanoid glycoside Phenylethanoid glycoside Iridoid glycosides	 Balarenone Barlerinoside Verbascoside Barlerin	 [7] [8] [9] [8]
Roots	Phytosterols	β-sitosterol	[6]
Leaves	Flavonoid Phenolic acid	Scutellarin Vanillic acid	[6] [10]



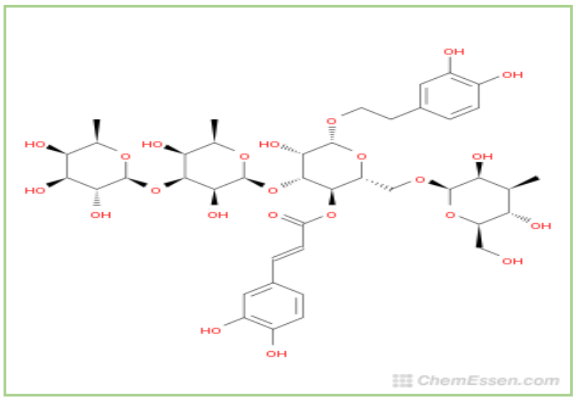
Barlerin



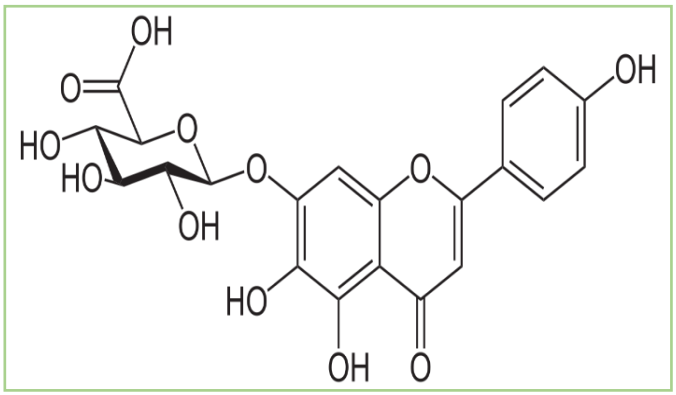
Beta-sitosterol



Vanillic acid



Barlerinoside



Scutellarin

Pharmacological activity:

- **Anti-inflammatory:**

Several studies have shown that B. prionitis can be used to treat inflammations. Through in vitro enzyme-based cyclooxygenase (COX-1 and COX-2) assays, the anti-inflammatory activity of B. prionitis was assessed. It was discovered that the COX-1 and COX-2 enzymes, which are implicated in pain perception, were significantly inhibited by the dichloromethane (DCM), PET, and EtOH extracts of leaves, stems, and roots [11]. The presence of barlein, acetyl barlerin, shanzhiside methyl ester, and iridoid glucosides in the "TAF" may contribute to its anti-inflammatory properties [1]. Barleria prionitis Linn. methanolic extract exhibits anti-inflammatory action in both the early and late stages [13]. Leaf sludge is used on the toothache area that has been invaded, while extract can be used on a patient who has piles. Additionally, it has been noted that both aerial portions and roots are employed in the treatment of a few inflammatory illnesses, including glandular swellies, rheumatic diseases, internal abscesses, boils, etc. Over the area affected by edema, seed paste is spread [12]. The given table shows anti inflammatory activity of various parts of *b.prionitis* :

Table: 5

Plant part	Phytoconstituent
Leaves	Scutellarin, p-hydroxybenzoic acid, Vanillic acid
Roots	β-sitosterol
aerial parts	Acetyl barlerin, Barlerin, Lupeol

- **Antidiabetic Activity:**

By considerably raising serum insulin (130%) and liver glycogen level (96.68%) and lowering blood sugar, the alcoholic leaf juice of B. prionitis showed anti-diabetic potentials. [11]. The alcoholic extract of the leaves of the well-known Ayurvedic herb B. prionitis Linn has been shown in a study to have anti-diabetic properties. Sterols, saponins, tannins, and flavonoids are all present in B. prionitis, according to a phytochemical investigation. The bioactive anti-diabetic components flavonoids, sterols/triterpenoids, tannins, and phenols are well known.[21] In alloxan-diabetic rats, flavonoids are also known to restore the damaged beta cells. Alloxan was employed as a diabetogenic [22]. Through the partial destruction of

pancreatic beta cells caused by the generation of reactive oxygen species, it causes diabetes.[14] The given table shows anti diabetic activity of various parts of *b.prionitis* :

Table: 6

Plant part	Phytoconstituent
leaves	Syringic acid
roots	β-sitosterol

- **Anti-oxidant Activity:**

The antioxidant conditioning of the insulated composites barlerisides A and B, shanzhiside methyl ester, 6- O- trans- p- coumaroyl-8-O-acetylshanzhiside, methyl ester, barlerin, acetylbarlerin, 7- methoxydiderroside, and lupulinoside have also been assessed using a variety of ways. In all factory excerpts, antioxidant exertion has been noted and reported by multitudinous experimenters using a variety of tests. Antioxidants are chemicals that, despite their presence at low amounts, significantly decelerate down or help the oxidation of an oxidizable patch. shops contain antioxidants that can be veritably helpful. The results of this disquisition show that. prionitis methanol leaves have substantial antioxidant conditioning that alleviate the dangerous goods of free revolutionaries. The results of this study give sanguinity for B. prionitis as an oxidative agent. .[15]The given table shows anti-oxidant activity of various parts of *b.prionitis* :

Table: 7

Plant part	Phytoconstituent
Aerial parts	lupulinoside
leaves	Melilotic acid
Aerial parts	barlerin
leaves	scutellarin

- **Antibacterial Activity:**

E. coli, Salmonella typhi, Alcaligenes faecalis, and three Gramme-positive (Bacillus cereus, Bacillus licheniformis, and Staphylococcus aureus) pathogenic bacteria were used to test the antibacterial activity of Barleria prionitis leaf and bark extract (petroleum ether and

methanol). A measurement of the inhibitory zone that formed around the discs was used to determine the antibacterial activity. To quantify the antibacterial activity, the diameter of the zone of inhibition, was represented by a clear area devoid of microbial growth. [17] When compared to aqueous extracts of both herbs, the results of antibacterial activity revealed that ethanolic extracts were more effective. All extracts were discovered to be more antibacterial than antifungal, except for the ethanolic extract of B. prionitis. Extracts were shown to have less antibacterial action than chlorhexidine. In comparison to chlorhexidine, all of the extracts' antibacterial activity was statistically significant (p 0.05). B. prionitis extract demonstrated strong antibacterial potential, with MIC values ranging from 106.2 to 312.5 g/mL for bacterial strains and from 312.5 to 625 g/mL for fungal strains.[16] The given table shows anti-bacterial activity of various parts of *b.prionitis* :

Table: 8

Plant Part	Phytoconstituents
Leaves	Syringic acid
Leaves	P- hydroxy benzoic acid
Aerial part	Luteolin-7-o glycoside

- **Anthelmintic Activity:**

The research has demonstrated that anthelmintic activity has been considerably determined by ethanolic and aqueous extracts of the entire Barleria prionitis plant. However, when compared to the aqueous extracts, ethanolic extracts of Barleria prionitis showed the most substantial anthelmintic efficacy. [12] In comparison to the usual medicine Albendazole, the whole plant extract of prionitis not only produced worm death but also displayed paralysis, particularly at concentrations of 100 mg/ml or higher. The crude extract contains tannins as well as other chemical components, according to a phytochemical study of them. Tannins have been found to have anthelmintic effects. Chemically speaking, tannins are polyphenolic substances.[It is probable that the tannins found in the complete Barleria prionitis extracts had a comparable impact. According to reports, tannins have an anthelmintic impact by binding to free proteins in the host animal's gastrointestinal system or glycoprotein on the parasite's cuticle, which may result in death. [18].The given table shows antihelmintic activity of various parts of *b.prionitis*

Table: 9

Plant part	Phytoconstituents
Leaves	P- hydroxy benzoic acid
Roots	β-sitosterol

- **Antifungal Activity:**

'Using the good diffusion method and amphotericin-B as the reference drug, the bark extracts of B. prionitis in ethanol, methanol, and acetone at doses of 100 mg/ml demonstrated antifungal potential against oral pathogenic fungal strains of Saccharomyces cerevisiae and other two strains of Candida albicans, respectively [12]. ACE, EtOH, and MeOH bark extracts of B. prionitis were discovered to have antifungal action against S. cerevisiae and C. albicans, while MeOH extract was found to be more potent against all fungal strains [20,23]. When CHCl3, acetonitrate, and an extract of the stem, leaves, and roots in EtOH were used, B. prionitis was found to have antifungal action against C. neoformans, C. albicans, C. vaginitis, and B. dermatidis5. [24] Both the natural dye made from B. prionitis aerial parts and the materials treated with it has potent antifungal properties. With its remarkable antifungal activity as evident from the studies,[19]The given table shows anti-fungal activity of various parts of *b.prionitis*

Table: 10

Plant part	Phytoconstituents
leaves	Syringic acid

- **Enzyme inhibitory effects:**

Acetylcholinesterase (AChE) and glutathione S-transferase (GST) has been revealed to be clinically relevant enzymes that are inhibited by extracts from various sections and isolated phytochemicals of B. prionitis [25]. The therapeutically relevant enzymes glutathione S-transferase (GST) and acetylcholinesterase (AChE) are considerably inhibited by extracts from the various sections and separated phytoconstituents of B. prionitis, according to the pertinent literature [26]. Methanolic leaf, stem, and root extracts display AChE inhibitory

activity, however the stem extract inhibits AChE more effectively than the root extract does [27].

The given table shows enzyme inhibitory activity of various parts of *b.prionitis*.

Table: 11

Plant part	Phytoconstituents
aerial parts	Barlerinoside, Balarenone, Lupeol, Pipataline

- **Hepatoprotective:**

The hydroethanolic extract of the stalk and leaves of B. prionitis showed significant hepatoprotection when the iridoid glycosides fraction was added [12]. According to studies done on mice and rats, the hydroethanolic extract of B. prionitis' leaves and stems showed considerable hepatoprotection against hepatotoxicity caused by carbon tetrachloride, galactosamine, and paracetamol. [1]The given table shows the hepatoprotective activity of various parts of *b.prionitis.*

Table: 12

Plant part	Phytoconstituents
leaves	Syringic acid, Scutellarin
aerial parts	Luteolin-7-O-glucoside

- **Mast cell stabilization activity:**

Hydroalcoholic extract of the entire B. prionitis plant was investigated for its ability to preserve mast cells and stabilize membranes. Hypo saline erythrocyte membrane hemolysis was used to stabilize the membrane in vitro, and compound 48/80 was used to cause mast cell degranulation. The compound 48/80 and low saline-induced erythrocyte membrane hemolysis were both strongly reduced by the hydroalcoholic extract in a dose-dependent manner [5].

- **Diuretic Activity :**

The extract of leaves and young flowers from B. prionitis was reported to have diuretic action. Leaf juice is applied to urinary ailments. The diuretic properties could be caused by the high potassium concentration present.[34]Oral flower H2O extract delivery (200 mg kg-1) significantly improved urination (dieresis) and salt elimination in rats but not potassium removal. With the medicine furosemide, the diuretic effect of floral extract (200 mg kg-1) was combined and statistically significant. [1]

- **Antihypertensive Activity :**

Uninephrectomized albino Wistar rats were used to test the antihypertensive activity. Rats were divided into five groups and given injections of deoxycorticosterone acetate salt to cause hypertension. Different dose levels were given twice a week for a total of six weeks, and 1% NaCl was given to drink in place of water. The highest antihypertensive effects were seen with doses of 200 and 400 mg/kg bw (body weight). Alkaloids, flavonoids, steroids, phenolic compounds, tannins, and saponins are examples of phytoconstituents that appeared to be responsible for the antihypertensive action according to the phytochemical screening [28].

CONCLUSION:

The botanical, phytochemical, and pharmacological properties of B. prionitis are explained in this article using examples ranging from ancient human communities to more recent medical applications. The article also carefully examines the varied therapeutic potential of phytoconstituents derived from the plant in the context of the field's current research. An ethnomedical investigation found that B. prionits is a very safe and effective therapeutic substance. From this analysis, traditional doctors have effectively used various parts of Barleria prionitis, either separately or in combination, to treat conditions like fever, excruciating pain, asthma, ulcers, and more. The value of these species as medicinal plants and a potential source of new and beneficial medications will therefore be better understood with more study on the bioactive substances and pharmacological activities of plants within this genus.

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