

REVIEW**A Review on *Barleria Cristata* Linn (*Acanthaceae*)**

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Abstract

Herbs traditionally used for medication. This medicinal plants produced a therapeutic properties because it contains a chemical composition and it is used for treatment of human illness. This herbs produced a low adverse effect, it is easier to obtain and are well tolerated. *Barleria cristata* referred to as Philippine violet or crested Barleria and its common names are (Raktajhinti,vajradanti) and Tamil name is (December poo or December flower) is the flowering plant in the *Acanthaceae* family and its native to southeast Asia and large presence in central and south India, it is extensively grown for ornamental purposes due to its vibrant purple to blue flowers. It bloom as a shrub 60-100cm tall. Leaf surface is dark green colour in top and pastel greenish in bottom. Beyond its aesthetic appeal, *Barleria cristata* has gained attention for its ethano medicinal uses and pharmacological properties. Traditionally used in folk medicine to treat various condition like cough, inflammation, wounds, tuberculosis, hepatic obstruction, diabetic, fever, snake bite, anemia, toothache and lungs ailments. The plant contains chemical constituents like flavonoids, alkaloids, tannins, protein, amino acids and phenolic compounds and pharmacological activities are antioxidant, hepatoprotective, anti-inflammatory, antibacterial, anti-diabetic, anti- fungal, anticancer and thrombolytic properties were also studied. This information may be useful for future studies aimed to enhance human health care.

Keywords:

Medicinal plants of *Barleria cristata* Linn, phytochemical compounds, pharmacological activity,

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1. Introduction

Throughout history, plants have been acknowledged as essential sources of pharmaceutical substances, often preferred for their minimal side effects and established use in traditional therapies. The World Health Organization (WHO) indicates that 80% of the population depends on traditional medicine for their healthcare, especially in developing countries, which underscores the importance of natural biodiversity in health practices. Medicinal plants play a crucial role in both preventative and therapeutic healthcare. The country has been utilizing plants for healing purposes since ancient times. Medicinal and aromatic plants are vital in India due to their pharmacological benefits and economic potential, with around 8,000 plant species traditionally employed by tribal communities for healing purposes within systems like Ayurveda, Siddha and Unani. The history of using these plant goes back roughly to approximately 5600 BC as well as well documented in pharmacopoeia. Many plants provide nutritional and therapeutic value, often serving as nutraceuticals. India remains a crucial center for the new medicinal treatments, and nearly 8% of the world's diversity. The *Acanthaceae* family, are the *Barleria* genus, substantial diversity. In tropical forests, and are in Asia and Africa. Out of approximately 300 species in this family, *Barleria* accounts for the third highest diversity. In India, 32 species are identified, and noted 30 species, which include six varieties and 29 subspecies. One such variety, the Philippine violet, is native to the Philippine Islands. *Barleria cristata*, known for its ornamental value, is a dense, hairy stemmed shrub that reaches heights of 3 to 4 feet and is indigenous to South and Southeast Asia. This plant thrives in tropical and subtropical climates, including regions in the united States like

Florida, Texas and California, where it is often viewed as potentially invasive. In India, *Barleria cristata* is commonly used as a garden hedge and fence. This plant traditionally used for the treatment of blood disorders, inflammation, diabetes, anemia, snake bites, and oral health issues, and this medicinal properties are supported by phytochemical studies. This plant contains phytochemicals compounds, are triterpenes, flavonoids, phenolics, iridoids, and glycosides, which contribute to its medicinal effects including liver protection, anti-parasitic activity, antimicrobial properties, anti-inflammatory and antioxidant effects. Thus, *Barleria cristata* shows significant therapeutic potential, underscoring the importance of further investigating its chemical composition for possible medical applications. A deeper understanding of the phytochemicals and ethnobotanical uses of *Barleria cristata* could offer significant contribution to researches, academics and health care professional by providing new avenues for scientific exploration, medicinal advancements and therapeutic innovation. [1,2,3,4,5,6]

2. DESCRIPTION OF THE PLANT

Botanical name: *Barleria Cristata* Linn

Family: *Acanthaceae*

Common name: Crested Philippine violet, Bluebell
Barleria, Philippine violet

Plant part used: Whole plant, especially the leaves.
 [7].

3. TAXONOMIC CLASSIFICATION

Domain: Eukaryote Kingdom: Plantae

Subkingdom: Tracheobionta (vascular plants)

Division: Magnoliophyta (angiosperms / flowering plants)

Super division: spermatophyta (seed plants)

Class: Magnoliopsida (dicotyledons)

Sub Class: Asteridae

Order: Lamiales

Sub family: Acanthoideae

Genus: Barleria Species: Barleria cristata linn

Synonym: Barleria alba, barleria indica. [8,9]

4. VERNACULAR NAMES

Hindi: Vajra danti, Jhinti, Nil Jhinti

Kannada: Jhinti, Kuruvaka, Mullugoranta

Tamil: December Poo, Semmulli

Marathi: Gokran

Malayalam: Chulli, Kankambram

Telugu: Neelambaramu, Gobbi, Neeru goranta

Odisha: Daskarada, Banfetali, Banpatol. [10]

5. MORPHOLOGICAL PARAMETERS

Habit: A large, everlasting shrub Growing

Conditions: Grows well in fertile, well-drained soil with full sun or partial shade.

6. GEOGRAPHICAL DISTRIBUTION AND HABITAT

Barleria cristata Linn, widely known as the Philippine violet, crested Barleria, or December flower, is a plant species that originates from India and parts of Southeast Asia. It is extensively distributed across India, particularly in the plains and low hill regions, where it is often grown along roadsides and in home gardens. This species is also found in countries such as Sri Lanka, Myanmar, Thailand, the Philippines, Southern China, Malaysia, and Vietnam. In the Philippines, the plant is especially familiar and well-established, which is why it is popularly recognized as the Philippine violet. Outside its native range, Barleria

Stem: Consists of appressed trichomes and dense hairy nodes.

Leaves: Range from 2.5-10 cm length, elliptic lanceolate, and dark green.

Petals or blooms: Whitish pink, have dense, ovoid spikes.

Plant Structure: Has a persistent, green, ovate-lanceolate calyx, a slender-tubed corolla, and flowers with four stamens, anthers, and staminodes.

Ovary: Has two ovules, a terete style, and a pink stigma.

Seeds: Elliptical, flattened, and smooth and finely hairy.

Flowering and Fruit season: In the Indian subcontinent, it falls from September to February. [11]



Figure 1: *Barleria cristata* Linn whole plant

cristata has been introduced to various regions, including tropical parts of East and West Africa, where it has successfully adapted and become naturalized. It is also present in certain tropical zones of Australia and has native to tropical and subtropical zone of across the Americas, spanning the Caribbean, Central America, and South America. The plant prospers in hot, tropical, and subtropical environments and is frequently observed in open spaces, along roadways, at forest margins, in gardens, and in disturbed lands. It prefers soils that drain well and grows best in sunny areas or places with partial shade. [12]

7. ETHNOMEDICINAL USES

Barleria cristata Linn, often referred to as Philippine violet, has been traditionally utilized in herbal medicine for extensive medicinal properties. It is especially valued for promoting wound healing and reducing inflammation, making it effective in the treatment of minor cuts, skin irritations, and swelling. The plant is also widely used to relieve respiratory conditions such as coughs, bronchitis, and asthma. Traditionally, it has been employed in lowering fever and is sometimes used in the supportive management of malaria. Additionally, *Barleria cristata* is known to assist in treating digestive complaints, helping to soothe stomach discomfort and improve digestion. The plant exhibits notable antimicrobial and antifungal properties, which make it useful in fighting various infections. It is also recognized for its natural pain-relieving (analgesic) effects, offering relief from body aches and discomfort. In traditional hair care practices, the plant is thought encourage strong hair growth and reduce hair fall. Moreover, *Barleria cristata* has mild diuretic properties that support the elimination of excess fluids and aid in urinary health. The extensive use of this plant in traditional healing systems highlights its importance as a natural, multi-purpose remedy with low adverse effects. [13, 14]

8. PHARMACOGNOSY

8.1 Macroscopic Characteristics

Leaves:

- Shape: Simple, oppositely arranged.
- Size: Measure about 4-10 cm in length and 2-5 cm in width.
- Texture: Leaves are ovate to elliptic, with a smooth to slightly hairy surface, and they have an entire margin.
- Venation: Prominent venation can be observed on the leaves.

Flowers:

- Inflorescence: Flowers are borne in axillary racemes.
- Color: Typically purple, blue, or white, with five lobes.
- Structure: The corolla is tubular, and the flowering occurs throughout the year in suitable climates.

Fruits:

- Type: The fruit is a capsule that splits open when mature.
- Seeds: Contains small seeds that are dispersed upon maturity. [15]

8.2. Microscopic characteristics

8.2.1. Leaf Microscopy:

- **Epidermis:** The leaf has a layer of epidermal cells with a slightly thick cuticle, which helps in reducing water loss. Stomata are present, showing a typical distribution (either on the upper or lower surface).
- **Mesophyll:** The mesophyll is divided into two types of tissue palisade parenchyma and spongy parenchyma.
- **Vascular Bundles:** Vascular bundles are arranged in a parallel pattern, typical of dicot plants, with well-defined xylem and phloem tissues. [16]

8.2.2. Stem Microscopy:

- **Epidermis:** The stem is covered with a thick, protective epidermis.
- **Cortex:** The cortex consists of collenchyma cells providing support, and may contain sclerenchyma for additional strength.
- **Vascular Tissue:** A ring of vascular bundles is present, consisting of xylem and

- phloem; the xylem is usually located towards the center. [17]

8.2.3. Powder Microscopy

- Starch grains: Confirmed via iodine.

- Calcium oxalate crystals: Needle- or rhomboid-shaped.
- Trichome fragments, fibers, and epidermal cell bits. [18]



Figure:2 Leaves and Flowers of *Barleria cristata* Linn

9. PHYTOCHEMISTRY

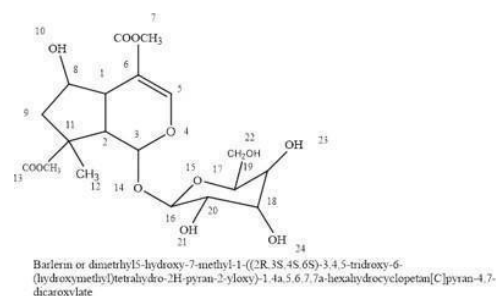
9.1. Polyphenols

Polyphenols are naturally occurring antioxidants present in a wide range of foods including fruits, vegetables, grains and drinks. These compounds play a crucial role in promoting health and preventing diseases by protecting the body against harmful ultraviolet (UV) radiation and microbial threats. [19]

9.2. Phenolic compounds

Phenolic compounds derived from plants act primarily as protective agents against infections and insect attacks. In *Barleria cristata*, several aromatic compounds, particularly 4-hydroxy trans-cinnamate derivatives, have been identified. These phytochemicals contribute to the plant's defense mechanisms and offer significant pharmacological potential. Studies have revealed that these derivatives exhibit antioxidant, antimicrobial, anti-inflammatory, and anticarcinogenic properties.. [20]

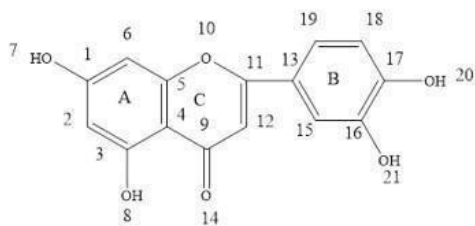
9.3. Flavanoids: The leaves of *Barleria cristata* are



rich in flavanoids, a class of polyphenolic compounds known for their anti-inflammatory, antioxidant, and potential anticancer activities. Notably, compounds such as luteolin and 7-methoxy luteolin are present in the plant." [21]

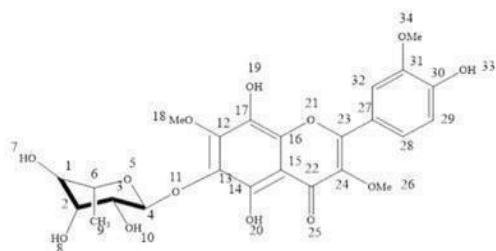
9.4. Glycosides

Research has revealed the presence of iridoid glycosides in the leaves of *Barleria cristata*, including key compounds like barlerin and shanshiside methyl ester. Additionally, phenylethanoid glycosides such as desrhamnosyl acteoside, acteoside, and poliumoside have also been identified. These glycosides are known to possess a variety of therapeutic properties, demonstrating antiviral,



Luteolin or 2-(4,5-dihydroxy phenyl)-5,7-dihydroxy-4H-chromen-4-one

antifungal, immunosuppressive, antiproliferative,

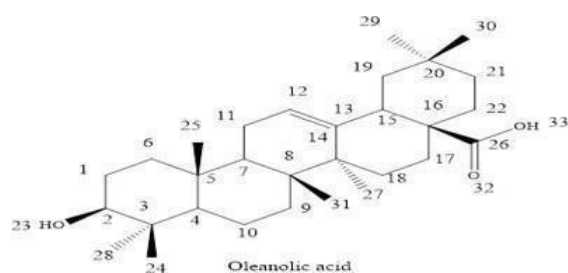


6-O-alpha-L-rhamanopyranoside-3,7,3'-trimethylated-8-hydroxy quercetin

and analgesic (pain-relieving) effects. [22]

9.5. Triterpenes

The plant has been reported to contain oleanolic acid, a triterpenoid compound known for its diverse medicinal benefits. Studies have indicated that oleanolic acid exhibits anti inflammatory, liver-protective, anticancer, antibacterial, anti-ulcer, blood sugar-lowering, anti-cariogenic, antifertility, and cholesterol-lowering properties. [23]



AROMATIC COMPOUNDS The main function of aromatic compounds made from plants is to protect against insects and infections. Aromatic compounds, including derivatives of 4-hydroxy-trans-cinnamate, have been identified from the whole *B. cristata* plant. A list of the substances that were separated from *Barleria cristata* Linn. [24,25,26,27]

10. PHARMACOLOGICAL ACTIVITY

10.1. Hepatoprotective Activity

CCl_4 -Induced Hepatotoxicity, Protective role of ethanolic extract of *B. cristata* leaves on CCl_4 induced hepatic damage in Wistar rats. Pretreatment with 100–200 mg/kg (p.o.) significantly decreased serum markers aspartate aminotransferase (AST), alanine aminotransferase (ALT), alkaline phosphatase (ALP), total protein, and lipid profile, which was similar to the standard drug silymarin (25 mg/kg). Histopathology observed near normal hepatic architecture with centrilobular vein and portal triads in the extract treated rats. [28]

10.2. Anti-Inflammatory Activity

Barleria cristata has been used in different experimental models for the evaluation of anti inflammatory activity. More special interest was given to leaf extract (methanolic and ethanolic extracts) and various models of both chronic and acute inflammation have been studied. Indeed, carrageenan-induced paw edema mice model demonstrated dose-dependent decreases in the paw

volume, and similar inhibition rate was obtained in both indomethacin (10 mg/kg) and the methanolic fraction at 200 mg/kg. Further experimentations on cotton pellet induced granuloma also accounted for its effectiveness in chronic inflammation control. The anti-inflammatory activities are mainly due to the presence of phytochemicals, including flavonoids (luteolin, apigenin, quercetin), iridoid glycosides (barlerin, shanzhiside methyl ester), phenylethanoid glycosides (acteoside, desrhamnosylacteoside), triterpenes (oleanolic acid), and phenolic compound (p-coumaric acid, α -tocopherol). These compounds function by blocking prostaglandin production, supporting cellular

membranes, removing free radicals, and controlling immune reactions. [29]

10.3. Antifungal Activity

Saponin Fraction from Leaves: An HPTLC-based study isolated the saponin-rich fraction from ethanolic leaf extracts of *B. cristata*. When tested via agar disc diffusion, this fraction significantly inhibited fungal strains including *Aspergillus parasiticus*, *A. flavus*, *A. niger*, *Penicillium* spp., and *Candida albicans*. In a comparative assay, the saponin extract (1 mg/mL) showed notable efficacy—especially against *A. niger* (zone ~6 mm)—rivaling the standard antifungal drug clotrimazole.

Ethanol Extracts of Leaf & Stem: Ethanol extracts from *B. cristata* leaves and stems exhibited broad-spectrum antifungal activity. One study reported MIC values around 22–23 µg/mL for fungi such as *A. flavus*, *C. albicans*, *A. niger*, *Penicillium* spp., and *Trichophyton* spp. (agar diffusion method). [30, 31]

10.4. Antioxidants Activity

Free Radical Scavenging Activity: *Barleria cristata* extracts (especially methanolic and ethanolic) exhibit potent antioxidant properties through scavenging free radicals like DPPH, nitric oxide, and hydroxyl radicals. These effects are attributed to high contents of phenolic compounds, flavonoids, and terpenoids.

Inhibition of Lipid Peroxidation: Extracts reduce malondialdehyde (MDA) levels, indicating a reduction in oxidative damage to lipids in cell membranes.

Enhancement of Endogenous Antioxidant Enzymes: Animal studies reveal increased

activities of superoxide dismutase (SOD), catalase (CAT), and glutathione peroxidase (GPx), showing systemic antioxidant protection. [32,33]

Anti-inflammatory and Cytoprotective Effects:

The antioxidant effect of *B. cristata* indirectly reduces oxidative stress-induced inflammation and protects organs like the liver and kidneys from damage. [34, 35, 36, 37, 38 39]

10.5. Antidiabetic Activity

The anti - diabetic activity of *Barleria cristata* was assessed due to the increasing demand for phytomedicines, which are generally less expensive with least side effects than synthetic drugs. Wistar rats were treated with the alcoholic seed extracts of *B. cristata*, shown to cause a decrease in blood glucose level when orally administered to 200 mg/kg body weight. This corroborates its potential use in controlling diabetes and justifies the exploration of this plant in search of its bioactive compounds. Moreover, antioxidant activity of *B. cristata* was evaluated. Phytochemical screening depicted alkaloids, flavonoids, glycosides, saponins, phenolic compounds, and tannins in ethanol and aqueous extracts. The antioxidant activity produced by the 50% ethanolic leaf extract is probably related to the presence of these secondary metabolites. These observations further validate the traditional use of this plant as a medicine in India and support its utility in conditions, related to oxidative stress. [40,41,42]

10.6. Antihyperlipidemic Activity

Barleria cristata Linn. exhibits promising hypolipidemic effects, as demonstrated by Mohd Nazam Ansari et al., who evaluated its impact on lipid metabolism in alloxan-induced diabetic rats. To ensure the integrity of vital organs such as the liver

and kidneys, the study monitored serum markers including SGOT, SGPT, creatinine kinase, and urea. Research by K. Amutha et al. focused on the hypolipidemic potential of a hydroethanolic extract (50% concentration) from *Barleria cristata* leaves. Rats induced with hyperlipidemia (HLD) and treated with this extract showed dose-dependent reductions in lipid parameters, including total cholesterol (TC), triglycerides (TG), low-density lipoprotein (LDL), and very low-density lipoprotein (VLDL). Interestingly, high-density lipoprotein (HDL), known as "good cholesterol," exhibited an increase. These results suggest that the hydroethanolic leaf extract of *Barleria cristata* possesses significant lipid-lowering activity. [43]

10.7. Cardioprotective Activity

The cardioprotective efficacy of the ethanolic leaf extract of *B. cristata* was assessed by Kowsalya J et al., using an in vivo model of *Daphnia magna*. The study tested multiple concentrations (20, 40, 60, 80, 100 µg/mL) of the extract for their ability to counteract lactose-induced arrhythmias. The results demonstrated that the extract could ameliorate cardiac arrhythmias in a dose-dependent manner, with higher doses offering greater protection. When compared to metoprolol, a standard beta-blocker, the extract showed comparable cardioprotective effects, indicating its potential as a natural therapeutic alternative for cardiac health. This may be attributed to the presence of bioactive compounds like flavonoids and phenolics, known for their antioxidant and anti-arrhythmic properties. [44]

10.8. Thrombolytic Activity

Research by Tasnuva Sharmin et al. evaluated the thrombolytic potential of *B. cristata* using a clot lysis model. Streptokinase served as the positive control, while water acted as the negative control. The water-soluble fraction of the plant extract exhibited mild clot lysis (0.22%), while its soluble fraction in aqueous medium achieved a significant clot lysis rate of $45.0 \pm 0.22\%$. More impressively, the aqueous solution fraction reached a clot lysis rate of 65.66%, suggesting that *B. cristata* contains phytochemicals with fibrinolytic or thrombolytic properties. Although lower than streptokinase (85%), these results underline the plant's potential for natural clot dissolving agents, which may be useful in preventing thromboembolic disorders [45].

10.9. Cytotoxic Activity

Cancer-cell inhibition (in vitro MTT assay): Leaf extracts using solvents like acetone, ethanol, chloroform, and water were tested against human cancer lines (MCF-7 for breast cancer, Hep-G2 for liver cancer). These extracts showed significant inhibition of cell proliferation, with measurable IC_{50} values indicating cytotoxic potency. Brine-shrimp lethality (a general cytotoxicity screen): Methanol and acetone fractions from both leaves and bark demonstrated strong, dose-dependent lethality in *Artemia salina* (brine shrimp), with LC_{50} values as low as 1.5 µg/mL—a potent indication of toxicity. Nanoparticle-mediated effect on HeLa cells: Gold nanoparticles synthesized from leaf extracts significantly suppressed HeLa (cervical cancer) cell growth, again showing cytotoxic effect in a dose-duration-dependent manner. [46]

CONCLUSION

Barleria cristata Linn., commonly known for its traditional medicinal use, exhibits a diverse range of beneficial properties due to its rich phytochemical profile and pharmacological potential.

Pharmacognosy Summary

The plant shows distinct macroscopic and microscopic features, including simple, oppositely arranged leaves with ovate to elliptic shapes and hairy surfaces, tubular purple or blue flowers, and capsule-type fruits. Microscopically, it possesses well-differentiated epidermal tissues, vascular bundles, and identifiable elements like starch grains, trichomes, and calcium oxalate crystals, making it easy to characterize and identify.

Phytochemical Insights

Polyphenols, especially flavonoids, phenolic compounds, glycosides and triterpenes are rich in *B. cristata*. These phytoconstituents are responsible for the therapeutic potential of the plant. Flavonoids such as luteolin and 7-methoxy luteolin possess antioxidant and anticancer activities, whereas iridoid and phenylethanoid glycosides as well as oleanolic acid (a triterpenoid) contribute to a variety of biological activities of the latter part, including anti-inflammatory, immunomodulatoric and antimicrobial effects.

Pharmacological Activities

The plant demonstrates multifaceted pharmacological benefits, including:

- Antioxidant: Potent free radical scavenger and inducer of endogenous antioxidant enzymes.
- Antiinflammatory: Active in acute and chronic inflammation models.
- Antifungal: Inhibits many forms of fungus.
- Hepatoprotective: Protects liver from toxic effects of CCl₄.
- Antidiabetic: Reduces the blood sugar level in diabetic models.
- Cardioprotective: Antagonizes cardiac arrhythmias with efficacy similar to the standard beta blockers.
- Antihyperlipidemic: lowers harmful lipids and increases HDL.

Barleria cristata Linn. stands out as a pharmacologically versatile plant, justified by its rich phytochemical composition and validated through various experimental studies. Its therapeutic potential across anti-inflammatory, antioxidant, hepatoprotective, antidiabetic, and cardioprotective domains suggests a promising future in natural drug development and supports its traditional medicinal applications.

Ethical Statement

This work did not involve any studies with human participants or animals; therefore, ethical approval and informed consent were not required.

Conflict of interest

The authors do not have any conflict of interest.

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