

Biological Activities of *Blumea lacera* (Burm.f.) DC.: A Comprehensive Mini Review

Bushra Anjum Shaikh

Department of Botany, Shri Shivaji College of Arts, Commerce and Science, Akola (MS)
444003

Abstract:

Blumea lacera (Burm.f.) DC., a medicinal herb belonging to the family Asteraceae, has attracted increasing scientific interest owing to its broad spectrum of ethnomedicinal uses and pharmacological activities. Traditionally, the plant has been employed in the treatment of fever, inflammation, wounds, gastrointestinal disorders, helminthic infections, respiratory ailments, and skin diseases across various Asian countries including India, Bangladesh, Nepal, and Sri Lanka. Phytochemical investigations have revealed the presence of flavonoids, alkaloids, terpenoids, tannins, phenolic compounds, glycosides, steroids, and essential oils that contribute to its therapeutic potential. Experimental studies have demonstrated significant antioxidant, antimicrobial, anti-inflammatory, analgesic, antipyretic, antidiabetic, cytotoxic, wound-healing, anthelmintic, and hepatoprotective activities. The present review critically compiles and discusses available information on the phytochemistry and biological activities of *B. lacera*, highlighting its medicinal importance and future prospects in herbal drug development.

Keywords: *Blumea lacera* (Burm.f.) DC; Asteraceae; Ethnobotany; Phytochemistry; Pharmacological activities; Herbal drug development.

1. Introduction

Medicinal plants constitute one of the oldest and most reliable sources of therapeutic agents for human civilization. Approximately 80% of the global population depends partially or entirely on herbal medicine for primary healthcare, particularly in developing countries where traditional medicinal systems remain deeply rooted (World Health Organization [WHO], 2023). In recent decades, scientific interest in medicinal plants has increased significantly because of the growing demand for safer, affordable, and biologically effective natural products. Plants belonging to the family Asteraceae are especially known for their rich reservoir of secondary metabolites possessing diverse pharmacological properties (Saikia et al., 2026).

Blumea lacera (Burm.f.) DC. is an aromatic annual herb widely distributed throughout tropical and subtropical Asia. The plant commonly grows in wastelands, roadsides, grasslands, and

cultivated fields during the rainy season. In traditional systems of medicine, the entire plant is used for treating fever, bronchitis, intestinal worms, skin infections, wounds, diarrhea, dysentery, and inflammatory disorders (Singh, 2019; Sinha et al., 2024). Folk healers frequently prepare decoctions, leaf pastes, and infusions from the plant for external and internal therapeutic applications. The medicinal importance of *B. lacera* is largely attributed to its diverse phytochemical composition, particularly flavonoids and terpenoids that possess strong antioxidant and anti-inflammatory properties (Khair et al., 2014).

Modern pharmacological studies have validated several traditional claims associated with *B. lacera*. Different solvent extracts and isolated compounds from the plant have demonstrated antioxidant, antimicrobial, analgesic, antipyretic, cytotoxic, antidiabetic, and anthelmintic activities in various in vitro and in vivo models (Shirose et al., 2024). Moreover, recent studies have isolated novel flavonoids exhibiting apoptosis-inducing activity against cancer cell lines, suggesting the plant's potential role in anticancer drug development (Manome et al., 2023; Sinha et al., 2024). Therefore, a comprehensive review of the biological activities of *B. lacera* is necessary to consolidate current knowledge and identify future research directions.

2. Material and Methods:

A comprehensive literature survey was conducted to compile and critically evaluate available information on the ethnobotanical uses, phytochemical composition and biological activities of the selected plant. Relevant scientific literature was searched systematically using major electronic databases, including Scopus, Web of Science, PubMed, ScienceDirect, SpringerLink, Wiley Online Library, Google Scholar and ResearchGate. The search covered publications available up to 2026. Different combinations of keywords and Boolean operators were used, including the scientific name of the plant, common names, ethnobotany, traditional uses, ethnomedicine, phytochemistry, phytoconstituents, secondary metabolites, essential oils, flavonoids, phenolics, alkaloids, terpenoids, biological activity, pharmacological activity, antioxidant, antimicrobial, anti-inflammatory, anticancer, antidiabetic and related terms.

3. Taxonomy and Botanical Description

3.1 Taxonomy

Taxonomic Rank	Classification
Kingdom	Plantae
Division	Magnoliophyta
Class	Magnoliopsida
Order	Asterales
Family	Asteraceae
Genus	<i>Blumea</i>
Species	<i>Blumea lacera</i> (Burm.f.) DC.

3.2 Botanical Description

Blumea lacera is an erect, branched, aromatic herb that usually attains a height of 30–90 cm. The stem is cylindrical, pubescent, and often glandular. Leaves are simple, alternate, ovate to lanceolate, serrated along the margins, and covered with fine hairs. The plant emits a characteristic pungent odor due to the presence of volatile oils. Flower heads are yellowish or purplish and arranged in terminal panicles. The fruits are small achenes with a pappus that aids seed dispersal (Sinha et al., 2024; Kopare and Koche, 2025).

The species is well adapted to tropical climatic conditions and grows abundantly during monsoon seasons. Ecologically, *B. lacera* acts as a pioneer species capable of colonizing disturbed habitats. Such ecological adaptability may be linked with its production of bioactive secondary metabolites that provide protection against herbivores, pathogens, and environmental stress (Saikia et al., 2026).

4. Ethnomedicinal Importance

Traditional medicinal systems across South Asia have extensively utilized *B. lacera* for managing a variety of ailments. In Ayurvedic and folk medicine, the plant is considered febrifuge, digestive, expectorant, anthelmintic, diuretic, and anti-inflammatory. Tribal communities in India use crushed leaves for wound healing and treatment of skin diseases,

while decoctions are administered orally for fever, dysentery, bronchitis, and intestinal disorders (Sinha et al., 2024).

In Bangladesh, local healers use leaf juice for treating diarrhea and urinary complications. The roots and aerial parts are also applied externally for boils and ulcers. Ethnobotanical surveys indicate that *B. lacera* is commonly used either alone or in combination with other medicinal herbs to improve therapeutic efficacy (Khair et al., 2014). Such widespread ethnomedicinal applications suggest the presence of biologically active compounds that justify scientific validation.

The continued use of *B. lacera* in indigenous healthcare systems demonstrates the importance of traditional knowledge in drug discovery. Many modern pharmaceutical compounds have originated from plants initially identified through ethnobotanical practices. Therefore, systematic investigation of traditionally important species such as *B. lacera* may contribute significantly to the development of novel therapeutic agents (WHO, 2023; Sinha et al., 2024).

5. Phytochemical Constituents

Phytochemical investigations of *B. lacera* have revealed the occurrence of numerous bioactive secondary metabolites responsible for its pharmacological properties. Preliminary phytochemical screening of methanolic and ethanolic extracts showed the presence of flavonoids, alkaloids, tannins, saponins, glycosides, terpenoids, steroids, and phenolic compounds (Khair et al., 2014; Mishra et al., 2015., Yadav et al., 2018). These compounds are well known for their antioxidant, antimicrobial, and anti-inflammatory properties.

Flavonoids constitute one of the major groups of phytochemicals identified in *B. lacera*. Several flavonoid derivatives isolated from the plant have demonstrated potent biological activities, particularly anticancer and antioxidant effects (Manome et al., 2023., Harborne, 1998). Flavonoids act primarily by scavenging reactive oxygen species (ROS), inhibiting lipid peroxidation, and modulating intracellular signaling pathways associated with inflammation and apoptosis.

Terpenoids and essential oils isolated from aerial parts of *B. lacera* are also pharmacologically significant. These compounds possess antimicrobial, insecticidal, and anti-inflammatory activities. Sesquiterpenes and diterpenes present in the plant contribute to its characteristic aroma and therapeutic properties (Khatri et al., 2016; Saikia et al., 2026). In addition, tannins

and phenolic acids exhibit strong antimicrobial and free radical scavenging activities that may protect tissues from oxidative damage.

Recent chromatographic and spectroscopic analyses including LC-MS, HPLC, and GC-MS have enabled the identification of several bioactive molecules from *B. lacera*. These advanced analytical approaches have enhanced understanding of the plant's phytochemical complexity and therapeutic potential (Mokat et al., 2020; Shirose et al., 2024). The structures of major phytochemicals reported from *B. lacera* are presented in fig. 1. These broadly includes the members of flavonoids, terpenoids, diterpenes, alkaloids, phenolic acids, steroids, fatty acids and essential oil constituents.

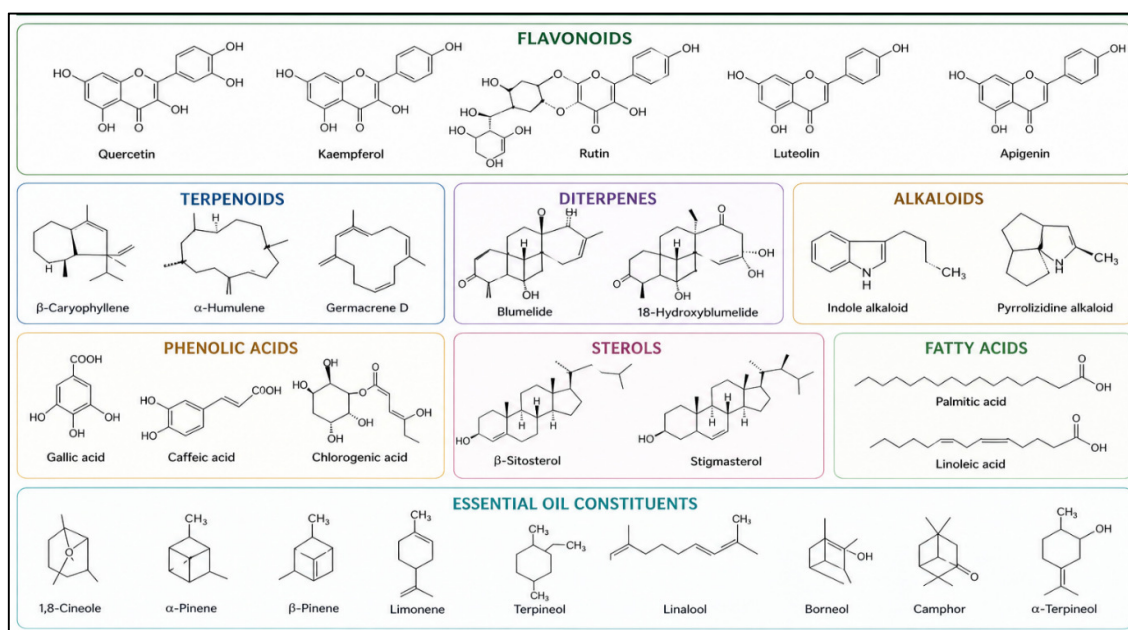


Fig. 1. Major Phytochemical compounds reported from *Blumea lacera*.

6. Biological Activities

Blumea lacera is a medicinal plant widely used by tribals from various geographical areas especially from Indian subcontinent. Since past 20 years several biologists worked out different biological activities of this plant. They have reported several activities (fig. 2) and tried to validate the claims of this folklore medicinal plant.

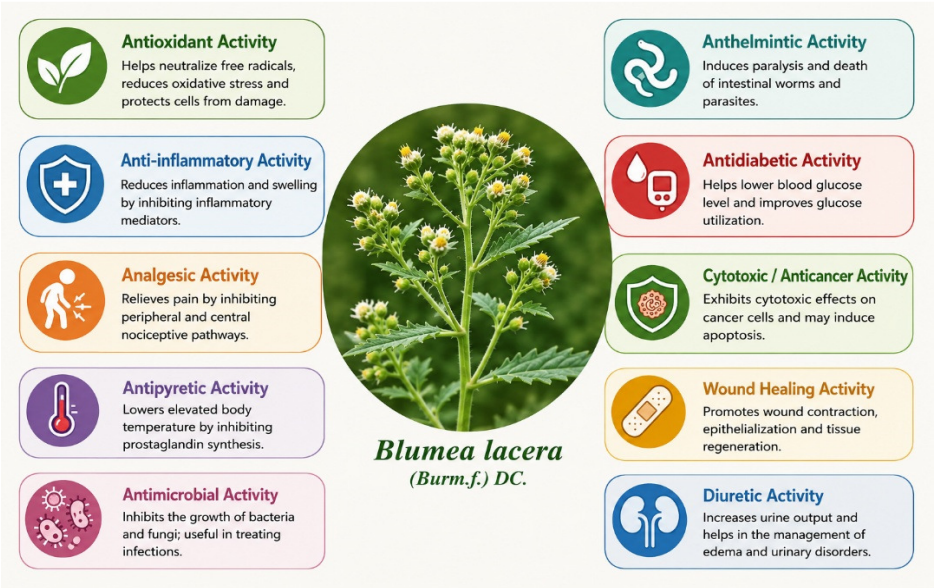


Fig. 2. Major Bioactivities of *B. lacera* reported so far

6.1 Antioxidant Activity

Oxidative stress is implicated in the pathogenesis of numerous chronic diseases including cancer, diabetes mellitus, neurodegenerative disorders, and cardiovascular diseases. Antioxidants neutralize reactive oxygen species and protect cellular components from oxidative damage. Extracts of *B. lacera* have shown remarkable antioxidant activity in various in vitro assays including DPPH radical scavenging, nitric oxide scavenging, ferric reducing antioxidant power (FRAP), and lipid peroxidation inhibition assays (Khair et al., 2014).

Methanolic extracts of the plant demonstrated strong reducing capacity due to high phenolic and flavonoid contents. These compounds donate hydrogen atoms or electrons to free radicals, thereby terminating oxidative chain reactions. Several studies reported a positive correlation between total phenolic content and antioxidant activity of *B. lacera* extracts (Khatri et al., 2016; Saikia et al., 2026).

The antioxidant activity of *B. lacera* may have therapeutic implications in preventing oxidative stress-mediated tissue injury. Natural antioxidants are increasingly preferred over synthetic antioxidants because of their lower toxicity and broader biological compatibility. Therefore, *B. lacera* may serve as a promising source of natural antioxidant compounds for pharmaceutical and nutraceutical applications (Khandekar et al., 2013; Rao, 2021; Shirose et al., 2024).

6.2 Anti-inflammatory Activity

Inflammation is a complex biological response involving various mediators such as prostaglandins, cytokines, histamine, and nitric oxide. Persistent inflammation contributes to the development of chronic disorders including arthritis, cardiovascular diseases, and cancer. Experimental studies have demonstrated significant anti-inflammatory activity of *B. lacera* extracts in animal models such as carrageenan-induced paw edema and membrane stabilization assays (Khair et al., 2014).

The anti-inflammatory mechanism is primarily associated with flavonoids and terpenoids that inhibit cyclooxygenase (COX) and lipoxygenase pathways responsible for prostaglandin synthesis. Flavonoids also suppress inflammatory cytokines including TNF- α and IL-6, thereby reducing tissue inflammation (Saikia et al., 2026).

Traditional applications of the plant in treating wounds, boils, rheumatism, and inflammatory skin disorders further support its anti-inflammatory efficacy. Since synthetic anti-inflammatory drugs often produce adverse effects such as gastric irritation and renal toxicity, medicinal plants like *B. lacera* represent safer alternatives for long-term therapeutic use (Ashrafi et al., 2022; WHO, 2023).

6.3 Analgesic Activity

Pain management remains a major challenge in clinical medicine due to the side effects associated with opioid and non-steroidal anti-inflammatory drugs (NSAIDs). Studies on *B. lacera* extracts have demonstrated significant analgesic activity using acetic acid-induced writhing and hot plate methods in experimental animals (Khair et al., 2014).

The reduction in writhing response suggests peripheral analgesic activity through inhibition of prostaglandin synthesis, while increased reaction time in thermal models indicates central analgesic action. Flavonoids and alkaloids present in the plant may modulate nociceptive pathways and reduce pain perception (Ashrafi et al., 2022).

The analgesic property of *B. lacera* supports its traditional use for relieving headaches, body pain, and inflammatory discomfort. Further pharmacological studies are required to isolate specific analgesic compounds and elucidate their molecular mechanisms.

6.4 Antipyretic Activity

Fever is a common physiological response to infection and inflammation mediated by prostaglandin E2 synthesis in the hypothalamus. Extracts of *B. lacera* significantly reduced body temperature in yeast-induced pyrexia models, demonstrating potent antipyretic activity (Khair et al., 2014).

The antipyretic effect may result from inhibition of cyclooxygenase enzymes involved in prostaglandin synthesis. Flavonoids and phenolic compounds are believed to play major roles in regulating inflammatory mediators associated with fever generation (Fancy et al., 2015; Saikia et al., 2026).

Traditional healers commonly use decoctions of *B. lacera* as febrifuge preparations, especially during seasonal fevers and respiratory infections. Scientific validation of these ethnomedicinal claims highlights the pharmacological relevance of the plant in managing febrile conditions.

6.5 Antimicrobial Activity

The emergence of multidrug-resistant microbial strains has intensified the search for novel antimicrobial agents from medicinal plants. Several studies have reported broad-spectrum antibacterial and antifungal activities of *B. lacera* extracts against both Gram-positive and Gram-negative microorganisms (Ashrafi et al., 2022; Shirose et al., 2024; Kopare and Koche, 2026).

Methanolic and ethanolic extracts inhibited the growth of pathogens such as *Staphylococcus aureus*, *Escherichia coli*, *Bacillus subtilis*, and *Pseudomonas aeruginosa*. Antifungal activity against *Candida albicans* and other fungal species has also been reported. These antimicrobial effects are attributed to flavonoids, phenolics, tannins, and essential oils that disrupt microbial cell membranes and interfere with metabolic processes (Khandekar et al., 2013; Saikia et al., 2026).

The antimicrobial activity of *B. lacera* supports its traditional application in treating wounds, skin infections, and gastrointestinal disorders. Plant-derived antimicrobial agents may offer safer alternatives to synthetic antibiotics while minimizing resistance development.

6.6 Anthelmintic Activity

Helminthic infections remain significant public health concerns in tropical and developing countries. Traditional medicinal systems frequently utilize *B. lacera* for expelling intestinal

worms. Experimental studies confirmed significant anthelmintic activity of plant extracts against earthworms and parasitic helminths (Khair et al., 2014).

The extracts induced paralysis and subsequent death of worms in a dose-dependent manner. Tannins may exert anthelmintic effects by binding to glycoproteins on the cuticle of parasites, while alkaloids interfere with neuromuscular coordination and energy metabolism (Saikia et al., 2026).

Natural anthelmintic agents derived from medicinal plants are increasingly important because of rising resistance to synthetic antiparasitic drugs. Therefore, *B. lacera* may provide valuable bioactive compounds for the development of novel anthelmintic therapeutics.

6.7 Antidiabetic Activity

Diabetes mellitus is a chronic metabolic disorder characterized by persistent hyperglycemia and oxidative stress. Preliminary pharmacological studies suggest that *B. lacera* possesses antihyperglycemic activity capable of lowering blood glucose levels in experimental diabetic models (Shirose et al., 2024).

The antidiabetic effect may be mediated through enhancement of insulin secretion, improvement of glucose uptake, inhibition of carbohydrate-digesting enzymes, and reduction of oxidative stress. Flavonoids and phenolic compounds are particularly important in protecting pancreatic β -cells from oxidative damage.

Although the available evidence is promising, further investigations involving molecular studies, toxicity evaluation, and clinical trials are necessary before therapeutic applications can be recommended.

6.8 Cytotoxic and Anticancer Activity

Cancer remains one of the leading causes of mortality worldwide, necessitating the development of safer and more effective anticancer agents. Recent investigations on *B. lacera* have identified several flavonoids exhibiting cytotoxic and apoptosis-inducing activities against cancer cell lines (Ashrafi et al., 2022; Manome et al., 2023).

Particularly noteworthy is the discovery of flavonoids capable of overcoming TRAIL (Tumor Necrosis Factor-Related Apoptosis-Inducing Ligand) resistance in cancer cells. TRAIL-based therapies are considered promising strategies in cancer treatment because they selectively induce apoptosis in malignant cells while sparing normal tissues. Compounds isolated from *B.*

lacera enhanced apoptotic sensitivity and promoted cancer cell death (Manome et al., 2023; Shaikh et al., 2026).

The anticancer potential of *B. lacera* may involve multiple mechanisms including antioxidant activity, modulation of signaling pathways, inhibition of cell proliferation, induction of apoptosis, and suppression of metastasis-related factors. However, comprehensive in vivo studies and clinical investigations are still required.

6.9 Wound Healing Activity

Wound healing is a complex process involving inflammation, tissue proliferation, collagen synthesis, and remodeling. Traditional medicinal practitioners commonly apply crushed leaves or paste of *B. lacera* on cuts, burns, ulcers, and infected wounds (Sinha et al., 2024).

Experimental evidence suggests that the plant accelerates wound contraction, epithelialization, and collagen deposition. The wound-healing property may be associated with antimicrobial and anti-inflammatory effects that prevent infection and promote tissue regeneration. Antioxidants present in the plant further protect tissues from oxidative stress during healing (Saikia et al., 2026).

Herbal wound-healing agents are gaining popularity because they are cost-effective, biocompatible, and associated with fewer side effects than synthetic drugs.

6.10 Diuretic Activity

Traditional systems of medicine have long employed *B. lacera* as a diuretic agent for treating urinary disorders and edema. Experimental studies reported increased urine output and electrolyte excretion following administration of plant extracts (Shirose et al., 2024).

Flavonoids and potassium salts present in the plant may contribute to enhanced renal excretion and improved kidney function. Diuretic activity can be beneficial in hypertension, urinary tract infections, and fluid retention disorders (Ashrafi et al., 2022). Further studies are needed to evaluate the mechanism and therapeutic safety of long-term use.

7. Toxicological Studies

Acute toxicity studies have shown that *B. lacera* extracts are relatively safe at experimental doses, with no significant mortality or severe behavioral abnormalities observed in animal models (Khair et al., 2014). However, comprehensive chronic toxicity, genotoxicity, reproductive toxicity, and clinical safety studies remain limited.

Despite its traditional usage, standardization of dosage and quality control are essential before pharmaceutical applications can be recommended. Variations in phytochemical composition due to environmental and geographical factors may influence therapeutic efficacy and toxicity.

8. Future Perspectives

The pharmacological potential of *B. lacera* indicates substantial opportunities for future research and drug development. Isolation of novel bioactive molecules, elucidation of molecular mechanisms, metabolomic profiling, and clinical evaluation are important future directions.

Advanced biotechnological tools such as molecular docking, nanotechnology-based drug delivery, and tissue culture techniques may enhance the medicinal applications of *B. lacera*. Standardization of herbal formulations and conservation of medicinal plant resources are equally important for sustainable utilization.

9. Conclusion

Blumea lacera is a medicinally important herb possessing diverse biological activities supported by both ethnomedicinal knowledge and modern scientific investigations. The plant exhibits antioxidant, anti-inflammatory, antimicrobial, analgesic, antipyretic, anthelmintic, antidiabetic, wound-healing, and anticancer properties primarily due to the presence of flavonoids, terpenoids, phenolics, and other secondary metabolites. Although existing findings are promising, further pharmacological, toxicological, and clinical studies are necessary to validate its therapeutic applications and facilitate development of standardized herbal medicines.

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