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REVIEW ARTICLE **OPEN ACCESS**

A Comprehensive Review of *Bergenia ciliata* and with Its Traditional Uses

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ABSTRACT
Bergenia ciliata Stern (Saxifragaceae) is a very beneficial plant that has historically been used to treat kidney stones, fever, diarrhoea, antihelminthic, tonic, and wounds. The study was conducted in an effort to gather data on the plant's pharmacology, phytochemistry, and geographic distribution. The plant's phytochemistry exposed substances including afzelechin, (+) bergenin, (+) catechin, and -sitosterol. B. ciliata demonstrated great promise in the treatment of gastrointestinal issues, but it is best known for its success in treating renal issues, notably kidney stones. According to the pharmacological investigation, B. ciliata has strong antibacterial, antiviral, antiplasmodial, and antifungal properties. Additionally, the study found that it has beneficial anti-inflammatory, anti-tussive, anti-ulcer, and anti-neoplastic properties.
Keywords: *Bergenia ciliata, Pharmacology, Traditional use, Phytochemistry, Antibacterial, Antifungal, Anti urolithic.*

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INTRODUCTION

Numerous studies have demonstrated the medicinal value of numerous plant species, highlighting the possibility of using their active compounds to treat various ailments. Plants are also known for their capacity to reduce inflammation, combat bacteria and fungi, as well as many other benefits. Therefore, plants are extremely important for the health of human beings and play a vital role in both traditional and modern medicine (1). Plants are important sources of many bioactive substances which are used in the production of medicines. Over the past few decades, pharmaceutical companies have been investing heavily in the research and development of plant-based medicines. Many of these medicines have been used successfully to cure various diseases. The most common plant-based medicines include antibiotics, antifungals, and antivirals. These medicines are often derived from natural sources, such as plants, fungi, and bacteria, and are used to treat a wide range of illnesses. Plant-based medicines are also used to treat chronic diseases such as cancer, diabetes, and heart disease. Plant-based medicines are often used in combination with other treatments, such as surgery or radiation therapy, to increase their effectiveness. Plant-based medicines can also be used for preventive care, such as vaccinations and preventive screenings (2).

Bergenia ciliata, often known as winter begonia or hairy bergenia, is a perennial herb in the Saxifragaceae family, which has 580 species and 30 genera worldwide. It is grown throughout Europe, Asia, and North America but is indigenous to the Himalayas. *Bergenia ciliata* is a hardy plant, tolerant of both cold and heat and grows best in partial shade and moist soil. It is an ideal plant for rock gardens, woodland gardens and borders. *Bergenia ciliata* has several medicinal properties, including anti-bacterial, anti-viral activities, anti-inflammatory and anti-fungal activities. It is also used to treat digestive disorders, fever, dysentery, hypertension, rheumatism, and skin diseases. Since ancient times, the plant's roots and leaves have been employed in traditional medicine. Recent studies have shown that plant extracts contain a variety of polyphenols, flavonoids, triterpenoids, sterols and alkaloids which are responsible for their medicinal properties. The plant is also used in cosmetics and as a food additive (3).

Small perennial herb *B. ciliata* Sternb. (Saxifragaceae) can grow up to 30 cm or more tall in the autumn. It thrives in moist and shady areas, often found growing close to rocks. The few, widely spaced leaves range in size from 4-11 cm in length to 3-10 cm in breadth. They are glabrous or hirsute and suborbicular to

orbicular and broadly obovate in shape. The apex of the leaves is round or occasionally abruptly acuminate, with a cordate or occasionally rounded base. The leaf margins are mostly whole and sporadically top-denticulate with ciliate hairs. (Fig: 1).

Fig 1: Leaves of *B. ciliata* (4)

The 1-2(-5) cm long petiole can be either hirsute or glabrous. An oval leafy bract that is either glabrous or sparingly ciliate is frequently present along with the inflorescence, which is a one-sided raceme or corymbose. The scape and inflorescence have pinkish or greenish undertones. The pedicellate, pink to purple flowers with a peduncle that can be up to 10 cm long. (Fig: 2).

Fig 2: Flower of *B. ciliata* (4)

Sepals of B. ciliate are 7 mm long, ranging in color from pink to red. Styles are also 7 mm long and may be either green or pinkish in hue. The capsule is 13×6 mm in size and includes the styles. The seeds of this species are elongated, measuring 1 mm in length and having a minutely tuberculate surface. Typically, they are both abundant and albuminous. The stamens, which are equal in number to or twice that of the petals, are inserted with them. The ovary is made up of two to three united carpels that are typically two to three cells wide with axile placentas, while it can also be one cell wide with parietal placentas and contain a large number of anatropous ovules. **(**Fig: 3)

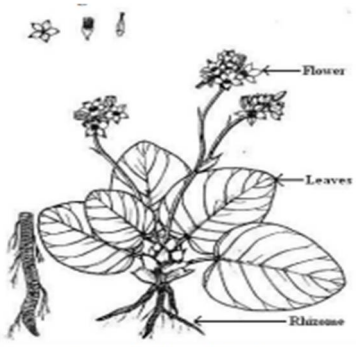

Fig 3: Plate of *B. ciliata* (1, 4)

Table 1- Scientific and Taxonomy Classification: (4)

Classification	*Bergenia Moench.*
Kingdom	*Plantae-plants*
Subkingdom	*Tracheobionta-vascular plants*
Super division	*Spermatophyta-seed plants*
Division	*Magnoliophyta*
Class	*Manoliopsida-dicotyledons*
Subclass	*Rosidae*
Order	*Saxifragales*
Family	*Saxifragacae*
Genera	*Bergenia*
Species	*Ciliata f. ciliata*

Geographical description:

Saxifragaceae is a family of plants which is commonly found near the neighbourhood of Murree, on the rocks, particularly in the area of Galis. This family is mainly distributed in the northern temperate zones, though it can also be found in the southern hemisphere. It is mainly found in areas with cold and moderate climates. Bergenia, a perennial herb, is found growing in the temperate Himalayas between an altitude of 800-3000m, reaching Southeast Tibet from Afghanistan. It has been reported by various parts of India, such as the Lushai Hills, Arunachal Pradesh, West Bengal, Meghalaya, Kyongnosla, the Himalayas (Kumaon), Karponanag, Gangtok in Sikkim and Almora district in Uttarakhand. In Bhutan, this species is located in the districts of Phuntsoling, Mongar, Ha and Deothang,. In Nepal, it can be found in the districts of Makanwanpur, Karepalanchwok, and Dolakha (5). (Fig: 4)

Fig 4: A map of the globe displaying the geographic distribution of the Bergenia species (in green) (5)

Vernacular names of *B. Ciliata*:

In India, this species is referred to as Sadpottar (6), while in Nepal, it is called Silpari (7) and Ghat pana in Swat, Pakistan (8). Some common names are presented in the table below;

Table 2- *B. ciliata* is known by various vernacular/common names across the world (3, 4)

LANGUAGES	**COMMON NAME**
Assamese	Patharkuchi
Bengali	Patharkuchi, Himasagara, Patrankur
Chitrali	Besabur
English	Stone breaker, Hairy bergenia
Garo	Singkhantha
Gujrati	Pashanbheda, Pakhanbheda
Hindi	Pakhanabheda, Patharcua, Silphara, Pakhanabhed, Silpbheda, Sadpottar, Dhoklumbo, Laoo-patra, patharchat, Pandamdawi,
Kannada	Pahanbhedi, epgaya, Hittaga, Pasanaberu, Hittulaka Khasi
Kashmiri	Pashanbhed, Batweyaa
Khasi	La Khowang
Kumaoni	Patharchur
Malayalam	Kallurvanni, Kallurvanchi, Kallorvanchi
Marathi	Pashanbheda

Meeteilon	Tatenpiu Chitrali Besabur
Oriya	Pasanbhedi, Pashanabheda
Pahari	Butpawh
Pashto	Ghat pana, Kamargul, Maknar path, Qamar Panra, Gatpanra, Barmia, Shapur, But pewa, Batpia, Budpiah
Punjabi	Pashanbhed, Kachalu
Sanskrit	Amabhedaka
Tamil	Sirupilai
Telugu	Kondapindi
Urdu	Zahkm -e –hayat

Chemical constituents:

To ensure the efficacy, safety, and quality of herbal medications, which have seen a remarkable rise in demand in the past two decades, phytochemical evaluation has been deemed necessary. Analyzing marker compounds, screening for phytochemicals, and chemo profiling are all part of this examination. Terpenoids, tannins, saponins, flavonoids, and steroids were found in *B. ciliata* during phytochemical analysis (9). The rhizome of *B. ciliata* has been reported to contain flavonoids, alkaloids, tannins, coumarins, and glycosides.6. According to the research, 58 different chemicals have been identified as being present in B. Ciliata. Furthermore, (10) it reported 48 volatile organic compounds which were classified into 11 categories such as phenols (19%), alcohols (19%), VOCs (16%), terpenoids (14%), fatty acids (8%), sterols (5%), glycosides (5%), carboxylic acids (5%), flavonoids (3%), cinnamic acid (3%), and nitro compounds (3%) (11).

PHYTOCHEMICALS AND THEIR ACTIVITY

Pharmacological activity:

Anti-bacterial activity:

The rhizome's methanolic extract with 200–1000 g of concentration was utilised for antibacterial action being stinged by disc diffusion technique utilising gram-negative and gram-positive microorganisms like *Bacillus Staphylococcus, Bacillus subtilis*, and *pumilis Pseudomonas aureus*, and *Escherichia coli*, *Shigella dysenteriae*, *P. aeruginosa*, and *Vibrio cholera*. Molecule) The extract's antibacterial effectiveness was potent at 1000g disc, concentration dependent against all tested pathogens, with the greatest effect observed against S. aureus NCTC 6571. Like that of 10 g/disc chloramphenicol (25). Against *S. auereus*, extract of B.C. leaves exhibited a 10–20 mm zone of inhibition and 8–12 mm zone of inhibition (26, 27) According to several reports, *B. ciliata* leaf extract has substantially less antibacterial activity than the plant's root extract. This could be as a result of the roots and rhizomes of B. C. having a higher concentration of active chemicals than the leaves do (26, 28).

Antifungal activity:

An investigation of antifungal activity of B.C was carried out using hexane, ethanol, ethyl acetate, butanol, chloroform and aqueous extracts from leaves and roots. The efficacy of extracts derived from leaves and roots were examined against *Microsporum canis*, *Aspergillus- niger*, Candidaalbi-ca, *Alternaria solani*, *Fusarium solani, Nigrospora oryza, Curvularia lunta*, *Penicillium funiculosium*. The greatest inhibitory effect was observed on *P. oustreatus* and P. funiculosium with the ethanolic and aqueous extract of leaves, with respective zones of inhibition of 22 mm and 20 mm. The root extracts tested did not demonstrate any activity against *N. oryza* and *C. lunta*. Against *M. canis*, the aqueous extract exhibited the highest zone of inhibition (10 mm) while the ethyl acetate and hexane extracts displayed the least response (6 mm). However, there was no evidence of any activity against *A. niger* and *A. solani*. The area that prevents P. oustreatus from growing was 10 mm for butanol and 6 mm for hexane. Root hexane extract had 14 mm of inhibition zone, whereas an extract of ethyl acetate had 6 mm against C. albicans (26, 32)

Antidiabetic activity:

The ability of the plant B.C to reduce blood sugar levels is caused by its ability to block the digestive enzymes glucosidase and mylase. From a 50% aqueous-methanol extract of B.C. rhizome [10]-3-O-galloylepicatechin and [10]-3-O-galloylcatechin, two active substances, were found. These substances significantly inhibited rat intestinal glucosidase and porcine pancreatic amylase in a dose-dependent manner, which results in the usage of B.C as a diabetes treatment as a conventional medicine. With different extract of roots and leaves of B.C shows that the blood glucose level was reduced by 70.13% with ethanolic extract. Aqueous extract decreased blood sugar by 71.34%. With chloroform extract, blood glucose levels were reduced by 42.23%. Blood glucose level was reduced by ethyl acetate extract between 443.0 to 22.3 mg/dl. Rats when given extracts of butanol and hexane didn't exhibit any hypoglycemic action or a significant drop in blood glucose levels 3 (33, 35).

Anti- inflammatory activity:

Bergenin, a primary bioactive compound of this plant, has been shown to selectively inhibit IL-6 and possess anti-inflammatory and anti-arthritic properties in animal models, such as collagen-induced arthritis [9] and LPS-induced mouse mastitis [10]. The methanolic extract showed a marked anti-inflammatory effect in all the animal models. The carrageenan-induced rat paw oedema was most effectively inhibited by the methanol extract at 300 mg kg−1, with a result of $32.4^{3}2.89\%$ after 3 h of drug treatment. This was still lower than the rate of 44.12.7% observed with the standard phenylbutazone. In the study of the rat paw oedema induced by serotonin, the methanol extract at 300 mg kg−1 inhibited oedema by $45.33^{3}2.09\%$, while the standard achieved $53.5^{3}4.3\%$ of suppression. The methanol extract demonstrated a dose-dependent decrease in granuloma weight in the chronic inflammation model (cotton pouch granuloma), with a maximum of $31.4^{3}1.09\%$ inhibition at a dose of 300mg/kg. This was significantly lower ($P<0.001$) than the $41.1^{3}1.32\%$ inhibition observed with the standard.00223 (36).

Antimalarial activity:

Studies have demonstrated that bergenin and its derivatives or extracts display antimalarial properties both in vivo and in vitro. Rhizomes from B.C. were extracted using ethanol and revealed antimalarial activity at an IC50 of 5µg/mL against the P. falciparum strain RKL-9 and MRC-2. 15(mol.) 500 mg/kg of EREBC demonstrated potent antimalarial action, with 96.48% inhibition, which was more effective than chloroquine (96.08%). With an ED50 of < 50 mg/kg, When, the extract was given to mice in doses of 50–500 mg/kg, no deaths were observed in the mice over a 28-day period. 15(mol.). The plant's leaf extract demonstrated effective antiplasmodial action in vitro, with an IC50 less than 10 µg/ml. Assessment in vivo revealed considerable chemo-suppression at concentrations of the extract ranging from 250 - 1,000 mg/kg on the 7^{th} day, rising in a dose-dependent way. The most effective chemoprevention, 87.50 %, was noticed at 1,000 mg/kg. Moreover, the typical mouse survival period administered (750-1,000 mg/kg) was significantly ($p <0.0005$) (37).

Anti-neoplastic activity:

This research investigated the ability of aqueous and methanolic extracts of *Bergenia ciliata*'s rhizome to fight cancer. To determine whether the extracts are cytotoxic, human breast carcinoma MDA-MB-435S, human hepatocellular carcinoma Hep3B, and human prostate cancer PC-3 cell lines were subjected to the XTT assay. In addition, the extracts' potential to trigger apoptosis was assessed by means of ELISA. The outcomes show that the extracts contain cancer-fighting compounds, making them a possible option for the development of anti-cancer drugs (38).

Antioxidant activity:

Column chromatography was used to isolate bergenin from an aqueous extract of B. ciliata, and its structure was subsequently elucidated by nuclear magnetic resonance. Bergenin's antioxidant activity was evaluated using the DPPH (2, 2-diphenyl-1-picrylhydrazyl) assay and furthermore, docking studies were done to explore bergenin's interaction with molecular targets related to urinary issues. The results indicated an antioxidant activity of mild-to-moderate intensity, while docking studies of bergenin against pathogens showed strong ligand-binding interaction (39).Another investigation was done to establish the antioxidant capacity of the methanolic and aqueous extracts from the rhizome of B.C. Both extracts' total phenolic content was calculated. The extracts' capacity to neutralise free radicals was evaluated using DPPH and OH, which showed that both extracts had strong free radical scavenging abilities. Both extracts had the potential to stop lipid peroxidation and defend against oxidative damage to biomolecules, which was evident in the reduction of (Fe^{+3}-Fe^{+2}) power and the inhibition efficiency of the TBARS assay. The protective effect of the two extracts against oxidative damage of pBR322 DNA, induced by UV-photolyzed H_2O_2, was examined, and the study suggests that *B. ciliata* extracts have potential for therapeutic applications (40).

Anti-pyretic activity:

The rhizome of *B. ciliata* extracted in methanol was found to be effective in lowering rats' normal body temperatures and pyrexia brought on by yeast. Oral dose of 100, 200 and 300mg/kg of B.C extract were tested in both models, and it was found to significantly reduce the rat's normal body temperature up to five hours after receiving 300 mg/kg of the medication. Following the administration of the extract in a dose-dependent manner, yeast-induced pyrexia saw a similar to the effects of paracetamol, a common antipyretic drug, and a considerable drop in body temperature lasting up to 4 hours (41).

Anti-tussive activity:

A methanolic extract made from the rhizome of B.C Sternb was examined to see if it might stop mice from coughing up due to sulphur dioxide gas. When compared to the control, the extract demonstrated a considerable anti-tussive impact in a dose-dependent manner. It also displayed an anti-tussive similar to the 10 mg/kg body weight action of codeine phosphate, a widely used anti-coughing medication. When

taken in doses of 100 mg, 200 mg, and 300 mg/kg b.w. respectively, they demonstrated a noticeable reduction in coughing by 28.7, 33.9, and 44.2% within 90 minutes of the trial (27).

Antiulcer activity:

The antiulcer activity of B.C is being tested to examine the medication's capacity to prevent rat pylorus ligation, indomethacin, and ethanol/HCl-induced stomach ulcers. One hour after ulcerogenic treatment, the rhizome's methanol and aqueous extracts were given in dosages of 15, 30, and 60 mg/kg b/w. After 3 hours, the animals were slaughtered, their stomachs extracted, and the average ulcer lesion area was measured. Additionally, the quantity of mucus and stomach acidity was assessed. Aqueous extract was found to be more effective in reducing the ulcer lesion, than the methanolic extract; however, a decrease in effect was seen at higher doses. It is hypothesized that the antiulcer activity is derived from an increase in the mucosal barrier's structural integrity, rather than a decrease in pH level or production of gastric acid (42).

Anti urolithic activity:

Examining the effect of B.C extract on the kidneys of adult female Wistar rats with urolithiasis induced by ethylene glycol. B.C hydro-alcoholic extract and cystone standard drug were co-administered at doses of 150 and 300 mg/kg body weight per day. This was done for 28 days along with 0.75% ethylene glycol v/v. The body weight and height significantly differed from each other and absolute organ weight of the rats after ethylene glycol treatment. Histopathological studies also demonstrated disruption of renal parenchyma, and in the treated animals, there was localised calcification in glomerulo-tubular structures and glomeruli degeneration. The results of administering B.C extract alongside ethylene glycol were impressive, with body weight and organ weight showing a marked protective effect, and only some minor calcifications visible in glomeruli (43). In another study through an in-vitro model, B.C leaves were investigated to evaluate their power to dissolve experimentally formed kidney stones composed of calcium oxalate and calcium phosphate. The phenolic compound P, which was taken from the ethyl acetate fraction of the leaves, was tested at a 10 mg concentration and was found to have the greatest ability to dissolve both stones compared to the other tested extracts. Calcium phosphate stones were easier to dissolve with Compound P (67.74%) than oxalate stones (36.95%). However, the standardized formula for reference Compound P (48.48%) was shown to be less efficient than Cystone (44).

Table 3- Phytochemicals with their activities

S. No	Phytochemical	Class of compounds	Activity	Parts of plant	Reference
1.	Bergenin	Phenols	Antioxidant, protects against ascorbic acid, anti-infammatory, antitussive, antiarrhythmic, immune enhancement, antifungal, anticancer, antitumor, antiviral, wound repair, anticoagulant, neuroprotective analgesic, antidiabetic, (s4+ BC	Rhizome	(12)
2.	Catechin	Phenol	Histidine decarboxylase inhibitor, Protective against neurotoxic oxidative stress.	Rhizome	(13)
3.	Gallic acid	Phenol	Antifungal, Antiviral, Cytotoxicity, Antioxidant,	Seed, rhizomes	(14)
4.	Tannic acid	Phenol	Anti- tussive, anti- diarrhea, antihistamine, Antimicrobial, antioxidant, antiviral	Methanolic, ethanolic rhizomes	(12,15)
5.	Camphor	Terpenoid	Antinociceptive, Antispasmodic, Antimicrobial	Ethanolic rhizomes	(13)
6.	Glucosides	Terpenoid	-		
7.	Decanoic acid	Fatty acids	Antifungal, Antimicrobial,	Flower	(14,16)
8.	Nonanoic acid	Fatty acid	Herbicidal activity	Flower	(17)
9.	Hexadecanoic acid	Fatty acid	Antioxidant, pesticides, lubricant, hemolytic	Flower	(18)
10.	Methylester2-methyl butanoic acid	Fatty acid	-	Flower	
11.	Oleic acid	Fatty acid	Anemiagenic, Cancer preventive, antiandrogenic	Rhizome	(19)
12.	Gallicin β-Sitosterol	Phenolic acid sterol	Inhibits cholesterol inhibition	Roots and leaves	(16,20)
13.	Arbutin	Glycoside	Prevents the formation of Melanin	Rhizome	(13,21)

14.	Pentanoic acid 2,4-Nonadienal	Carboxylic acid	Fragrant causing agent, Bio antimutagenic		(10)
15.	Afzelechin	Flavonoid	α-glucosidase inhibitor	Rhizome	(16,22,23)
16.	Quercetin 3-oβ-D xylopyranoside	Flavonoid	Antioxidative, detoxification,	Rhizome	(21)
17.	Quercetin 3-oα-L arbinofuranoxide	Flavonoid	anti-inflammatory, iron chelating effectiveness.	Rhizome	
18.	Methyl cinnamate	Cinnamic acid	Antimicrobial activity		(24)
19.	2- Nitropropane	Nitro compound	Show's hepatotoxicity		

Table 4- Anti-bacterial activity of *Bergenia ciliata.*

Plant part used	**Model**	**Extract**	**Tested dose**	**Observation**	**Reference**
Rhizomes	Gram positive and gramme negative microorganisms, including Bacillus subtilis, Bacillus pumilis, Escherichia coliaureus, Pseudomonasaureus, Pseudomonas aeruginosa, Shigella dysenteriae, and Vibrio cholera, were used in the antibacterial activity using disc diffusion method.	Methalonic extract	200-1000 µg	At a concentration of 1000 µg/disc, the extract showed excellent antibacterial efficiency against all examined strains, with the strongest effect observed against S. aureus.	(25)
Leaves and roots	The extract showed inhibitory activity towards *Bacillus subtilis* and *Bacillus megaterium,* two gram-positive bacteria, as well as the Gram-negative bacteria *Pseudomonas aeruginosa*.	ehanol, ethyl acetate, hexane, chloroform, aqueousand butanol		Plant root extract has antibacterial properties which was observed against *Pseudomonas aeruginosa* (zone of inhibition 12-20 mm), *Staphylococcus aureus* (zone of inhibition 8-12 mm) *Escherichia coli* (zone of inhibition 6-8 mm), *Bacillus megaterium, Bacillus subtilis*, and *Micrococus* (zone of inhibition 10-20 mm).	(24)
Rhizomes	*B. subtilis*, *E. coli* and S. *aureus*	Aqueous, 50% ethanolic and methanolic extracts	10, 25 or 50 mg/ml for each extract	50 mg/ml was the dosage at which the antibacterial effect was most pronounced.	(29)
Roots	*E. coli, B. subtilis, P.vulgaris, S. aureus*, and *P. aeruginosa*	Aqueous		The maximum growth of B. subtilis (19mm) was recorded in the cold-water extract, followed by E. coli (17 mm), S. aureus (16 mm), *P. aeruginosa* (16 mm) and *P. vulgaris* (15 mm). In the hot water extract, *E. coli* (19 mm) was the highest, with *P. vulgaris* (16 mm), *P. aeruginosa* (17 mm), *S. aureus* (13 mm) and *B. subtilis* (14 mm).	(30)
Rhizomes	Bacillus subtilis, Escherichia coli, Pseudomonas aeruginosa,	Chloro-form, Methano, Aceto-ne		The diameter of *Escherichia coli* was between 12 and 13 mm., while *P. aeruginosa* was	(31)

				measured at 13 mm and 16 mm.	

Table 5- Anti-fungal activity of *Bergenia ciliata.*

Plant part used	Model	Extract	Tested dose	Observation	Reference
Roots, leaves	*Microsporum canis, Aspergillus- niger, Candidaalbi-ca, Alternaria- solani, , Fusarium solani, Nigrospora oryza, Curvularia lunta, Penicillium funiculosium*	Ethylacetate, Ethanol, Hexane, Chloroform, Aqueous, Butanol,	5mg/ml	The extracts of both roots and leaves have been found to be effective against *Pleuroetus oustreatus, Microsporum canis*, and *Candida albican*.	(24)
Leaves	*Penicillium funiculosium, Curvularia lunta Microsporum canis,*	Aqueous, ethanolic, Ethyl acetate,	5mg/ml	The leaves effectively inhibited a 12 mm zone of *Microsporum canis* growth.	(33)
Whole plant	*Aspergillusnig*	Dichloromethane, methanol, n-hexane	2ml	Afzelechin displayed a strong antifungal activity of 7 (± 0.3) mm, while asarone, terpenin-4-o1, parascorbic acid, and damascenone had less activity ranging from 5 (± 0.12) to 2 (± 0.1) mm.	(34)

CONCLUSION

The current review offers extensive data on the biological, pharmacological, and phytochemical analysis of the medicinal plant B. ciliata. It has been discovered that this miraculous herb has a long history of use among many communities in the Himalayan region of the world for inflammatory, infectious, and urinary, gastrointestinal, skin, and respiratory disorders. Nearly every component of the plant is used to treat various diseases; the rhizome is the component that is utilised the most frequently, followed by the root, leaf, flower, latex, and entire plant. The species may have antifungal, antiviral, antibacterial, antioxidant, antitussive, anti-inflammatory, anti-neoplastic, and anti-ulcer properties, according to biological and pharmacological research. The major phytochemical compounds reported in this species are of wide range such as phenols, flavonoids, fatty acid and terpenoids. Researchers have reported experimental evidence for various traditional uses, including anti-inflammatory, anti-diabetic, anti-tussive, and antiulcer properties. However, a variety of experimental investigations must be conducted for a variety of activities. Therefore, several clinical investigations can be conducted to determine the effectiveness of *B. ciliata* against various disorders and to advance the field of medicine, because the plant's primary benefit is its extremely low degree of toxicity, its adverse effects are also extremely minimal.

CONFLICT OF INTEREST

We declare that we have no conflict of interest.

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