



## BERGENIA CILIATA MINE OF MEDICINAL PROPERTIES: A REVIEW

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### ABSTRACT

*Bergenia ciliata* of family Saxifragaceae is known as Kodiya or Pashanbheda in Dhanolti (Uttanchal). It is a second good source of bergenin after *Bergenia ligulata*. It has many medicinal properties such as antibacterial, anti-inflammatory, anticancer, antidiabetic. *Bergenia ciliata* is used mainly for kidney disorder. Its phytochemical constituents are Gallic acid, Tannic acid, (-)-3-O-Galloylepicatchin, (-)-3-O-Galloylcatechin, (+)-Catechin, Gallicin.

**Keywords:** Bergenin, Tannic acid, Gallic acid, (+)-Catechin, kidney disorders.

### INTRODUCTION

*Bergenia ciliata* is the source of Pashanbheda after *Bergenia ligulata*. It is found in Afghanistan, South Tibet, Bhutan (Phuntsoling district, Deothang district, Ha district and Mongar district). In India it is found in Himalayas (Kumaon), Meghalaya, Lushai hills West Bengal (Darjeeling, Labha, Takdah, Rimbick( Kalimpong), Arunachal Pradesh (Nyam Jang Chu), Kyongnosla, Changu, Karponanag, Lachen to Thongu, Nathang, Prekchu-Tsokha, Pangolakha-Subaney Dara, Gangtok (domesticated) in sikkim.<sup>1,2,3</sup>

### Scientific Classification<sup>4,5</sup>

Kingdom : Plantae  
Division : Magnoliophyta  
Class : Magnoliopsida  
Order : Saxifragales  
Family : Saxifragaceae  
Genus : *Bergenia*  
Species : *ciliata*

### MORPHOLOGY

*Bergenia ciliata* leaves are suborbicular or broadly obovate, rounded at base and apex, margin finely denticulate and densely ciliata, leaves otherwise glabrous. Flowers green, lobes acute, denticulate near apex; petals obovate, white tinged pink.<sup>2,3</sup> Flowering time of *Bergenia ciliata* is February to April and fruiting time is March to July.<sup>2,3</sup>



Fig 1: *Bergenia ciliata* whole plant



Fig 2: *Bergenia ciliata* flower

### Different language names of *Bergenia ciliata*<sup>6</sup>

Language	Names
Sanskrit	Pashanbheda
Hindi	Pakhenbhed
Nepalese	Pakanabadha
Sinhalese	Pahanabeya
Japanese	Yukinoshita
German	Steinbrech
Unani	Mukha
Arabian	Junteyenah
Persian	Gashah
Gujrati	Pashanbheda
Assamese	Patharkuchi
Kannada	Alepgaya, Pahanbhedi, Hittaga, Pasanaberu, Hittulaka
Kashmir	Pashanbhed
Marathi	Pashanbheda
Oriya	Pasanbhedi, Pashanabheda
Tamil	Sirupilai
Punjabi	Kachalu, Pashanbhed
Telugu	Kondapindi
Malayalam	Kallurvanchi, Kallurvanni, Kallorvanchi

### DESCRIPTION OF BERGENIA CILIATA

#### 1. Macroscopic

Rhizome of *Bergenia ciliata* is solid, barrel shaped, cylindrical, 1.5-3 cm long and 1-2 cm in diameter with small roots, ridges, furrows and root scars distinct, transversely cut surface shows outer ring of brown coloured cork, short middle cortex, vascular bundles and large central pith, odour aromatic, taste astringent.<sup>7</sup>

#### 2. Microscopic

Transverse section of rhizome shows cork divided into two zones, outer zone has a few layers of slightly compressed and brown coloured cells, inner zone multilayered consisting of thin-walled tangentially elongated and colourless cells, followed by a single layered cork cambium and 2-3 layers of secondary cortex



composed of thick-walled, tangentially elongated, rectangular cells with intercellular spaces, some cells contain rosette crystals of calcium oxalate and simple starch grains cortex a narrow-zone of parenchymatous cells containing a number of simple starch grains, most of cortical cells also contain large rosette crystals of calcium oxalate, endoderm is and pericycle absent. 120vascular bundles, arranged in a ring, collateral, conjoint and open, phloem tissues corn-posed of sieve elements and parenchyma, in outer region found as compressed masses while in inner region intact. A number of rosette crystals of calcium oxalate are also found as crystal fibres, cambium present as continuous ring composed of 2-3 layers of thin-walled, tangentially elongated cells, xylem consist of fibres, tracheids, vessels anparenchyma, with centre occupied by large pith composed of circular to oval, parenchymatous cells, varying in size and containing starch grains with crystals of calcium oxalate similar to those found in cortical region.<sup>7</sup>

### MEDICINAL PROPERTIES OF BERGENIA CILIATA

The toxicological investigations of *Bergenia ciliata* with particular reference to acute systematic toxicity and intracutaneous toxicity in experimental animals displayed that it elicit severe toxicity. The symptoms of toxicity in intracutaneous test showed erythema and edema whereas assessment of acute systemic toxicity frequently observed breathing problem and initiations of diarrhea with blood in stool of experimental model and caused gastro-intestinal syndrome. *Bergenia ciliata* can produce toxicity suggesting a role in certain diseases. It is therefore, premature to speculate about mechanism of effect until toxin is unequivocally identified.<sup>8</sup> The hemolysis test on the extract of *Bergenia ciliata* was almost devoid of activity.<sup>8,9</sup> In the period 2000-2008 have made various activity such as antibacterial, anti-tussive, antioxidant and DNA protection abilities, isolate natural antiviral agents by asian scientists.<sup>10,11,12,15</sup> *Bergenia ciliata* reported to be helpful in dissolving kidney-stones.<sup>1</sup>

#### Medicinal properties of *Bergenia ciliata* rhizome

##### Anti-inflammatory activity

Anti-inflammatory activity of aqueous extract of *Bergenia ciliata* rhizome performed and concluded that aqueous extract of *Bergenia ciliata* showed a potent and dose dependent anti-inflammatory effect comparable to Diclofenac sodium on induce paw edma in rats.<sup>14</sup>

##### Anti-tussive activity

The methanol extract of the rhizome of *Bergenia ciliata* Sternb. (*Saxifragaceae*) has been evaluated for its potential in a cough model induced by sulphur dioxide gas in mice. The extract exhibited significant anti-tussive activity in a dose-dependent manner, as compared with control. The antitussive activity of the extract was comparable to that of codeine phosphate (10 mg/kg body wt.), a standard anti-tussive agent. The extract at doses of 100, 200 and 300 mg/kg body wt. showed significant

inhibition of cough reflex by 28.7, 33.9 and 44.2%, respectively, within 90 min of the experiment<sup>15</sup>

The methanolic extract of *Bergenia ciliata* rhizome were screened for their antiviral activity against herpes simplex virus and influenza virus A by dye uptake assay. The methanolic extracts of *Bergenia ciliata* rhizome were found to be highly active against antiviral activity against HSV-1 (IC<sub>50</sub> value 6.25µgml<sup>-1</sup>) and influenza virus A (IC<sub>50</sub> values from 8to 10µgml<sup>-1</sup>)<sup>9,13</sup>

##### Antiulcer activity

*Bergenia ciliata* is used for the treatment of stomach disorders in the folk medicine of some areas of South East Asia. This study was designed to evaluate its gastroprotective effects on ethanol/HCl, indomethacin and pylorus ligation-induced gastric ulcers in rats. Doses of 15, 30 and 60 mg/kg between of the aqueous and methanol extracts of the rhizome were administered 1 h after ulcerogenic treatment. The animals were killed 3 h later, their stomachs removed and the mean area of ulcer lesion was determined. The weight of mucus and gastric acidity were also measured. The aqueous extract decreased the ulcer lesion (p < 0.05) in all models to a greater extent than the methanol extract, but at the higher doses the effect was reduced. In addition, the antiulcer activity appears to be mediated via cytoprotective effects conferred by enhancement of the mucosal barrier, rather than by prevention of gastric acid secretion or the lowering of pH and acidity.<sup>16,9</sup>

##### Anti-cancer activity

Methanolic and aqueous extract of *Bergenia ciliata* rhizome were found to have promising potential towards the development of drug that might be used to target tumours for chemoprevention/chemotherapy to check neoplastic growth and malignancy. Both extracts showed concentration-dependent cytotoxicity in each of the three cell lines. According to the American national cancer institute, the IC<sub>50</sub> value to consider a crude extract promising for development of anticancer drugs is lower than a limit threshold (30µg/ml).<sup>17</sup> IC<sub>50</sub> value of both the extracts falls well within this prescribed threshold in all cell lines (except the aqueous extract with higher IC<sub>50</sub> in help 3B cell lines) *B.ciliata* bear potent anti-neoplastic activities that may have prospective clinical use as precursor for preventive medicine.<sup>18</sup>

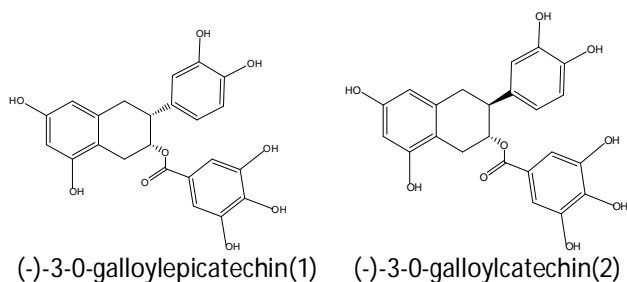
##### Antioxidant activity

Methanolic and aqueous *B. ciliata* rhizome extracts were found to possess antioxidant activity, including reducing power, free radical scavenging activity and lipid peroxidation inhibition potential. The methanolic extract displayed greater potential in all antioxidant assays. It is interesting to note that the aqueous extract demonstrated considerably higher DNA protection, albeit lagging behind its methanolic counterpart as an antioxidant.<sup>18</sup>



**Antidiabetic activity**

50% aqueous –methanol extract of *Bergenia ciliata* rhizome lead to the isolation of two active compounds, (-)-3-O-galloylepicatechin and (-)-3-O-galloylcatechin. These isolated compounds demonstrated significant dose dependent enzyme inhibitory activities against rat intestinal  $\alpha$ -glucosidase and porcine pancreatic  $\alpha$ -amylase. IC<sub>50</sub> value for sucrose, maltase and  $\alpha$ -amylase were 560, 334 and 739  $\mu$ M, respectively. for [(-)-3-O-galloylepicatechin] and 297, 150 and 401  $\mu$ M, respectively for [(-)-3-O-galloylcatechin]. The anti-diabetic potential of *Pakhanbhed* could be helpful to develop medicinal preparations or nutraceutical and functional foods for diabetes and related symptoms.<sup>19</sup>

**Medicinal properties of *Bergenia ciliata* roots and leaves****Antibacterial activity**

The roots and leaves extracts viz ethanol, hexane, ethyl acetate, chloroform, butanol and aqueous (5mg/ml) aliquots of *Bergenia ciliata* were used to test of antibacterial activity. *Bergenia ciliata* root extract was found to inhibit the growth of gram positive bacteria as compared to gram negative strain. Therefore in a way it can be inferred that *Bergenia ciliata* extracts exhibit rather a narrow spectrum antibacterial activity. The screening result of various leaves extract of *Bergenia ciliata* exhibited activity against the gram positive *staphylococcus aureus* (zone of inhibition 8-12 mm) whereas chloroform butanol and aqueous extracts were found active against *Bacillus subtilis*, *Bacillus megalerium* and *micrococcus*.(zone of inhibition 10-20). Consequently it can be suggested that the activity of root extract is much higher as compared to the leaves extract of *Bergenia ciliata*.<sup>15,22</sup>

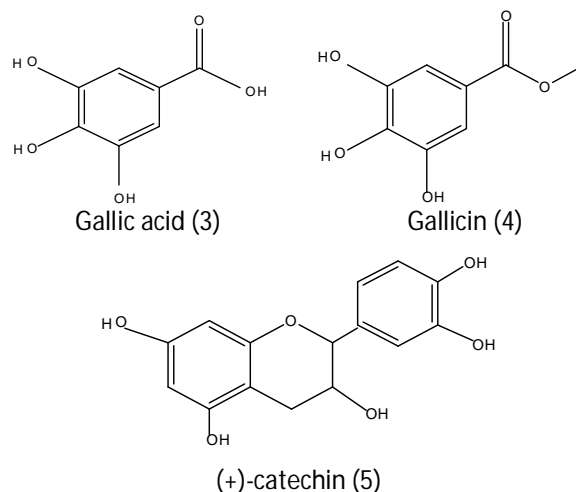
**Antidiabetic activity**

The roots and leaves extracts viz ethanol, hexane, ethyl acetate, chloroform, butanol and aqueous of *Bergenia ciliata* were used to test of hypoglycemic activity. All the extracts except chloroform extract of root and leaves of *Bergenia ciliata* were found to possess hypoglycemic activity in Streptozotocin (STZ) treated rats. Therefore the plant can be classified as hypoglycemic activity in experimental diabetes ranging from 40-70% of its onset to reduce blood glucose level.<sup>8,22</sup>

**PHYTOCHEMICALS OF BERGENIA CILIATA**

The plant contains tannic acid, gallic acid, glucose, mucilage, wax, metarbin, albumen and mineral Salts<sup>99</sup>

Bergenin, (+)-Catechin, Gallicin and Gallic acid quantified by using solvent System of Toluene: Ethyl acetate: Formic acid (6: 6: 1, v/v/v) by HPTLC. Developed method permitted simultaneous quantification of Bergenin, (+)-Catechin, Gallicin and Gallic acid, and showed good resolution and separation from other constituents of extract and was found to be simple, precise, specific, sensitive and accurate. It can be adopted for routine quality control of herbal material and formulations containing *Bergenia ciliata*.<sup>18,22</sup>



*B. ciliata* rhizome is used for tinctures by macerating in different percentage of ethanol (30, 40, 50, 60, 70, 80, 90 and 100%, v/v) for 7, 14 and 21 days. After maceration, the pH, specific gravity and total solid matter, chemical contents were determined. The pH of the tinctures decreased with increase in alcohol strength, as well as with the number of days of maceration. Results showed that the tinctures prepared with 50% alcohol had the highest specific gravity of 0.9907 and yield of 9.11% (w/v) when macerated for 21 days. The chemical components of the tinctures irrespective of alcohol strengths were steroid, triterpenoid, flavonoid, tannins, carbohydrates and saponins.<sup>19</sup> The rhizome of *B.ciliata* yield gallolyted leucoanthocyanidin-4-(2-galloyl) glucoside as well.<sup>23,22</sup>

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