



HIMALAYAN BERGENIA A COMPREHENSIVE REVIEW

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Accepted on: 30-04-2012; Finalized on: 30-05-2012.

ABSTRACT

Bergenia stracheyi is also known as Himalayan bergenia is known species of genus bergenia in local people and not more exploited in scientific way. This is a source of Bergenin, Quercetin-3-O- α -L-rhamnoside, Kaempferol-3-O- α -L-rhamnoside constituents. Bergenin pentacetate is a derivatives of Bergenin and Bergenin-3,4,10,11-tetraacetate, Hexanoate, Benzoate, Decanoate, Myristate are the compound made from Bergenin pentacetate. Bergecins A and Bergecins B are the new compound searched on it. All the compound have good activity checked on it such as antioxidant, antibacterial, antifungal anticancer.

Keywords: *Bergenia stracheyi*, Bergenin, Bergecins A, Bergecins B.

INTRODUCTION

Bergenia stracheyi (HK.) is a rhizometric herb species found in Afghanistan to Uttarakhand, between 3300-4500 m in alpine slopes. W. Himalayas from 2700-4700 m, Afghanistan, Tadjikistan. Commonly growing on moist rocky slopes in Kashmir, Baltistan, Gilgit, Chitral and Upper Kaghan areas on much higher and colder altitudes. The plant, rather small in stature, is very attractive in autumn when the leaf colour changes to red.^{1,2}

Scientific classification^{3,4}

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



Figure 1: *Bergenia stracheyi* plants with different flower colour

DESCRIPTION

Plants are 13-37cm tall. Leaves are 3-15 x 1-8 cm, obovate to oblong-obovate, base cuneate, apex rounded, margin crenate to dentate, ciliate. Scapa is usually 12-24 cm long, pink tinged, glabrous to glandular-villous. Flowers white, pink tinged or yellowish. Sepals are 5-7 mm long, oblong, obtuse, glabrous to pubescent, ciliate. Petals are 7-10 mm long, unguiculate, limb orbicular. Carpels are 2(-3), the third when present smaller. Capsule 10-13 x 5-6 mm, including styles; seeds dark brown, c. 1 mm, elongated; testa scalariform.

Flowering and fruiting: June-August.²

Chemical constituents of *Bergenia stracheyi*

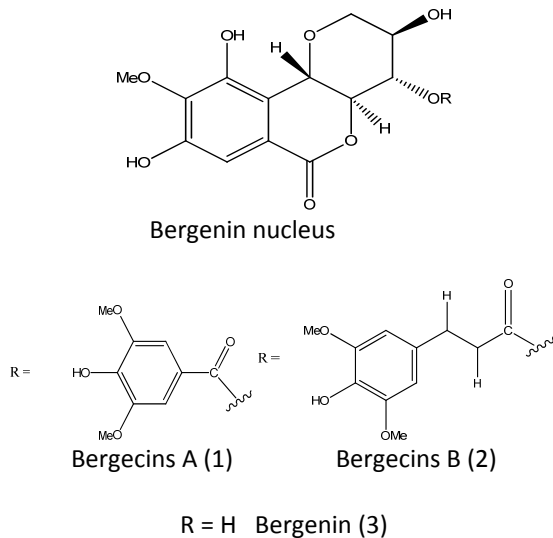
Preliminary phytochemical analysis shows the presence of glycosides, gallic acid, tannic acid, mucilage, wax, albumens, starch etc. Antibacterial, antifungal, antiprotozoal, antiviral, antifertility cardiovascular, analgesia, and diuretic activity on plant excluding root of *Bergenia stracheyi* was performed which show the negative result.⁵

Bergenia stracheyi have potential to act as broad spectrum antimicrobial agent because of the presence of phytochemicals showed positive result for free anthraquinone, ascorbic acid, carbohydrates, phenolics, saponins and steroids. The presence of phenolics, ascorbic acid, steroids in *Bergenia stracheyi* have potential to act as antioxidant, anticancer and antimicrobial agents.⁶

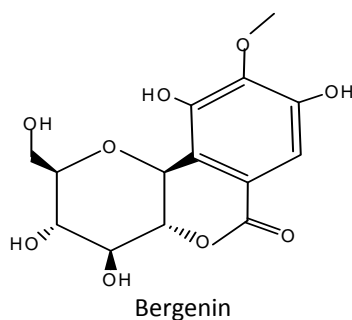
The ethylacetate fraction of *Bergenia stracheyi* whole plant is involved for the search of new derivatives of *Bergenia* named as bergecins A and bergecins B along with bergenin conformed on the basis of ¹H and ¹³C-NMR spectra, and by COSY, HMQC, and HMBC experiments. Bergecins B has good inhibitory potential against the enzyme lipoxygenase, Bergecins A was moderately active. On the other hand, both compounds exhibited significant



antioxidant activities in 1,1-diphenyl-2-picrylhydrazyl (DPPH) scavenging assay.⁷



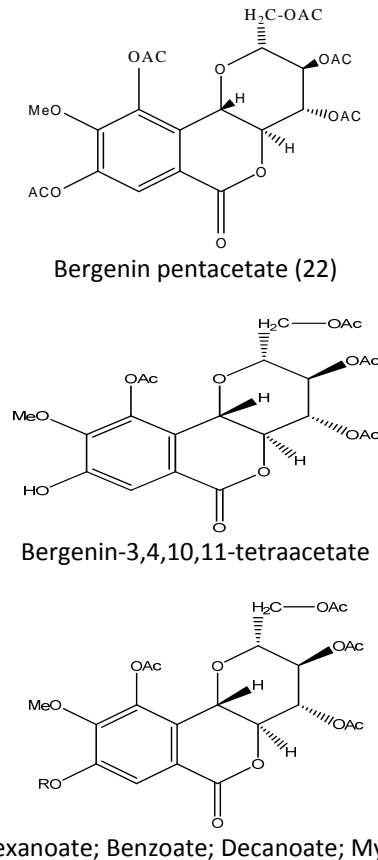
Bergenin, a C-glycoside of 4-O-methylgallic acid, isolated from rhizomes of *Bergenia stracheyi* (Saxifragaceae) and its O-demethylated derivative norbergenin, prepared from bergenin, are reported to show anti-arthritis activity through possible modulation of Th1/Th2 cytokine balance. Flow cytometric study showed that the oral administration of bergenin and norbergenin at doses of 5, 10, 20, 40 and 80mg/kg per oral dose inhibit the production of proinflammatory Th1 cytokines (IL-2, IFN-gamma and TNF-alpha) while as potentiate anti-inflammatory Th2 cytokines (IL-4 and IL-5) in the peripheral blood of adjuvant-induced arthritic BALB/c mice. This shows the potential Th1/Th2 cytokine balancing activity of bergenin and norbergenin which is strongly correlated with their anti-arthritis activity. At similar dose levels, the effect of norbergenin was found to be more than that of bergenin. The oral LD(0) for bergenin and norbergenin was more than 2000mg/kg body weight of the mice.⁸



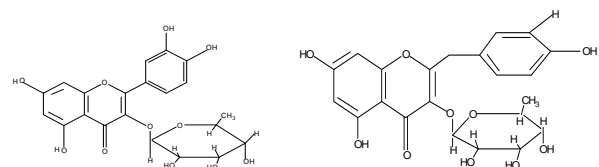
DPPH (diphenyl picrylhydrazyl) radical scavenging, antimicrobial and xanthine oxidase inhibitory activities

Bergenin pentacetate(22), a peracetate derivative of biologically active lead compound Bergenin isolated from methanol extract of *Bergenia stracheyi* rhizomes was subjected to lipase catalyzed regioselective alcoholysis to obtain 3,4,10,11-tetraacetate of Bergenin. The free hydroxyl group of Bergenin-3,4,10,11-tetraacetate was derivatised using higher carboxylic acids to obtain acyl derivatives (Hexanoate, Benzoate, Decanoate, Myristate).

These compounds synthesized via chemoenzymatic route were characterized using ^1H NMR, ^{13}C NMR and mass spectral data and evaluated for DPPH radical scavenging, antimicrobial and xanthine oxidase inhibitory activities. The studies revealed that biological activity of Bergenin can be optimized by selective modification of its structure.⁹

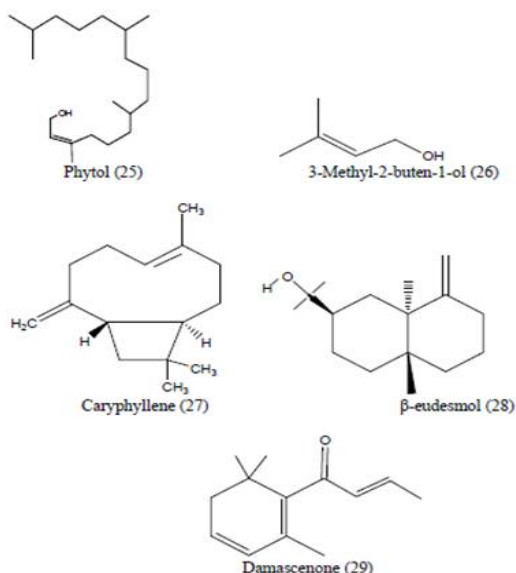


The leaves of *Bergenia stracheyi* for evaluation of antioxidant activity from flavonoidal positive fraction. quercetin-3-O- α -L-rhamnoside, kaempferol-3-O- α -L-rhamnoside and kaempferol-3-O-rhamnosyl(1-6)glucoside. among these three flavonol glycosides, the compound quercetin-3-O- α -L-rhamnoside and kaempferol-3-O- α -rhamnoside gave promising antioxidative activity while the compound kaempferol-3-O-rhamnosyl(1-6)glucoside did not show effective activity.¹⁰



phytoecdysteroids are analogues of invertebrate steroids hormones. That occur in a wide variety of plant species.¹¹ a number of ecdysteroid conjugates have been isolated from plant sources.⁹¹ seed extractes of *Bergenia stracheyi* were assased for the presence of ecdysteroid conjugates by incubation of the extract with a mixture of hydrolases from the gut juices of *H.pomatoca*.¹³ The roots of *B.stracheyi* contain a new derivative (+) catechin-3-gallate.¹⁴

Volatiles were distilled from leaves *Bergenia stracheyi* collected from Yunnan, Xinjiang and Tibet in western China and analyzed using GC/MS instrumentation. The contents of extractable volatiles are 0.13% (v/w) in *B. stracheyi*. In *B. stracheyi*, 3-methyl-2-buten-1-ol was the dominant sort of volatile (52.71%), whereas detected major constituents included β -eudesmol (7.44%), damascenone (3.22%), caryophyllene (2.75%) and phytol (2.57%).¹⁰



Flavonoids are also found in other species of *Bergenia* as glycosides.¹⁰⁰ Flavonoids has widely been associated with various biological activities such as antimicrobial, antioxidant, anti-inflammation and anticancerogenic.¹⁰⁰ Antioxidant play a role in maintenance of the pro/antioxidant balance by neutralizing the radical oxygen and nitrogen species which are responsible for deleterious processes in biological system.¹⁵

Bergenia stracheyi has highest percentage of all physicochemical parameters such as total ash 15.8, alcohol and water soluble extractives 13.83 and 16.83, suger 5.5 and tannins 7.86, expect starch and acid insoluble ash.¹⁶

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