

**PHYTOCHEMISTRY AND PHARMACOLOGY OF *BRYONIA LACINOSA*: A REVIEW**

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**ABSTRACT**

Many herbal remedies have been employed in various medical systems for treatment and management of different diseases. The plant *Bryonia lacinosa* has been used in different system of traditional medication for the treatment of diseases and ailments of human beings. Goniotalamin, punicic acid and lipids were previously isolated from the whole plant of *Bryonia lacinosa*. From leaves a bitter principle, bryonin, has been reported. Arabinoglucomannan, a polysaccharide is present in the fruit which is mainly used for anti-microbial activity. It has been reported that the plant contains anti-inflammatory, analgesic, anticonvulsant, anti microbial and cytotoxic properties. The current study is therefore reviewed to provide requisite phytochemical and pharmacological detail about the plant.

**Keywords:** *Bryonia lacinosa*, Phytochemistry, Pharmacology, Medicinal plants

**INTRODUCTION**

There exists a plethora of knowledge and information and benefits of herbal drugs in our ancient literature of Ayurvedic and Unani medicine. One of the earliest treatises of Indian medicine, the Charaka Samhita (1000 B.C.) mentions the use of over 2000 herbs for medicinal purpose.<sup>[1]</sup> According to the WHO survey 80% of the populations living in the developing countries rely almost exclusively on traditional medicine for their primary health care needs.<sup>[2]</sup> Plants continue to serve as possible sources for new drugs and chemicals derived from various parts of plants.<sup>[3]</sup>

Exploration of the chemical constituents of the plants and pharmacological screening may provide us the basis for developing the leads for development of novel agents. In addition, herbs have provided us some of the very important life saving drugs used in the armamentarium of modern medicine.<sup>[4]</sup> There is a worldwide belief that herbal remedies are safer and less damaging to the human body than synthetic drugs. Therefore laboratories around the world are engaged in screening of plants for biological activities with therapeutics potential. One major criterion for the selection of plant for such a study is traditional healer's claim for its therapeutics

usefulness. The traditional Indian medicinal system mentions herbal remedies for the treatment of variety of diseases.

The ayurveda has emphasized importance of food in the management of diseases. Even practitioner of modern system has realized the significance of dietary items, in the form of nutraceutical elements, in the treatment of chronic diseases.<sup>[5]</sup> *Bryonia lacinosa* (Family: Cucurbitaceae) is a well known in India and is one of the most versatile medicinal plants having a wide spectrum of biological activity.

It is commonly known as Shivlingi, an excellent plant in the nature having composition of all the essential constituents that are required for normal and good health of humans. This plant is a shrub found widely in India, Philippines and some parts of Africa. Whole plant is used to treat adenopathy, ague, asthma, bronchitis, carbuncles, cholera, colic, consumption, convulsions, cough, delirium, fertility, headache, megalosplenly, paralysis, phthisis, snake bite.<sup>[6]</sup> Traditional healers use the leaves and the seeds of this plant for treatment of fevers. It is also taken in impotency and used as a tonic. The leaf extract of this plant is also used as a cathartic and in inflammation.<sup>[7]</sup>

The present review is dealing with medicinal importance of the *Bryonia lacinosa* with reference to its Pharmacognosy, Phytochemistry and pharmacological activities.

#### TAXONOMIC CLASSIFICATION<sup>[8]</sup>

Domain	: <i>Eukaryota</i>
Kingdom	: <i>Plantae</i>
Subkingdom	: <i>Viridaeplantae</i>
Phylum	: <i>Tracheophyta</i>
Subphylum	: <i>Euphylllophytina</i>
Infraphylum	: <i>Radiatopses</i>
Class	: <i>Magnoliopsida</i>
Subclass	: <i>Rosidae</i>
Superorder	: <i>Violanae</i>
Order	: <i>Cucurbitales</i>
Family	: <i>Cucurbitaceae</i>
Subfamily	: <i>Cucurbitioideae</i>
Tribe	: <i>Benincaseae</i>
Genus	: <i>Bryonia</i>
Species	: <i>laciniosa</i> - L.
Botanical name	: <i>Bryonia laciniosa</i> L

#### BOTANICAL DISCRPTION AND VERNACULAR NAMES<sup>[9]</sup>

*Bryonia lacinosa* is one of the most valuable drug in traditional system of medicine from ancient time. Other synonym of *Bryonia lacinosa* is *Bryonopsis laciniosa*. The genus *Bryonia* also contains 6 species, subspecies, varieties, forms, and cultivars like *B. alba* (White Bryony) · *B. aspera* (Turkish Bryony) · *B. cretica* (Cret Bryony) · *B. cretica dioica* (Cretan Bryony) · *B. dioica dioica* (Cretan Bryony) · *B. verrucosa* (Venenillo).

#### MORPHOLOGY

Stem is much branched, slender, grooved, Glabrous. Tendrils are Slender, striate, glabrous. Leaves are Membraneous, 10-15 cm long and broad, green and scabrid above, paler and smooth or nearly so beneath. Deeply cordate at base. 5 lobed, the lobes are oblong, lanceolate, midrib sometimes subserrate. Petioles are 2.5-7.5 cm long, striate, slender. Male Flowers are with small fascicles of 3-6, penduncle 5-20 mm long, filiform, glabrous [Figure 1].

Calyx is glabrous, 205 mm long, teeth subulate. Corolla is 3-4 mm long, segments ovate, oblong, acute, pubescent and Female-Solitary or few, or many peduncles and shorter than male. Fruits are Subsessile, 1.3 - 205 cm in diameter, globose, smooth, bluish green, streaked with broad vertical lines and having seeds with 5-6 mm long, yellowish brown [Figure 2].<sup>[8]</sup>

#### ETHNOBOTONY

The plant holds an important role in tribal culture and rituals and also used in many herbal medicinal practices. It is commonly known as 'Shivlingi' and 'Gargumaru in India, an annual climber with bright red fruits [Figure 3] and is reported to be highly medicinal. Locally in India its seeds are being used for promoting conception in women.<sup>[10]</sup> Gond and Bharia tribes of Patalkot valley worship this plant. According to them, this herb is boon for the childless parents.

The herbal healers (Bhumkas) prepare certain combination of herb and prescribe it to the needed person. Interestingly, Bhumkas in Harra-Ka-Chhar village in Patalkot prescribe the seeds of this herb for conceiving male babies. In Gaildubba, traditional healers make a combination of Shivlingi seeds with Tulsi (*Ocimum basilicum*) leaves and mix it in Jaggery (the traditional unrefined sugar used in India) and give it to the lady who is not conceiving baby due to any reason. Shivlingi is a twinner and can be well identified by its flower/ fruits/ seeds. The foul and just different sort of smell of the plant is also a way of identifying it.<sup>[11]</sup>

#### PHYTOCHEMISTRY

*Bryonia lacinosa* is being used as trivial medicine since long in India, but no work has been done except few fatty acids and sugars are reported to be present in the Seeds.<sup>[12]</sup> Due to tremendous medicinal importance of the seeds, the seed mucilage from *B. lacinosa* was subjected to phytochemical investigation.<sup>[10]</sup> The different successive extracts so obtained were subjected to preliminary phytochemical screening by applying different qualitative testes for phytoconstituents. The different extracts of *Bryonia lacinosa* contained, punicic acid, lipids, Bryonin, polysaccharides like Goniotalamin, Glucomannan and Arabinoglucomannan

**Glucomannan:** Extraction of defatted and decolorized seeds of *Bryonia lacinosa* with 1% aqueous acetic acid yielded a polysaccharide material, having D-glucose and D-mannose in the molar ratio of 1.00:1.01 [Figure 4]. Hydrolysis of the fully methylated seed gum furnished 2,3,4,6-tetra-O-methyl-D-glucose and 2,3-di-O-methyl-D-mannose in equimolar ratio. Partial hydrolysis of the polysaccharide furnished three oligosaccharides namely; epigentiobiose, mannobiose, and mannotriose along with the component monosaccharides.<sup>[10]</sup>

**Goniothalamine:** Goniothalamine, a natural occurring styryl-lactone [Figure 5], is a novel compound present in the whole plant of *Bryonia laciniosa* with putative anticancer activities.<sup>[13]</sup> Ashik Mosaddik M et al., reported the presence of goniothalamine in *Bryonia laciniosa*. They extracted the whole plant powder (750 g) with methanol in a Soxhlet apparatus. The MeOH extract was subjected to fractionation with petroleum ether (50 ml), chloroform (50 ml) and ethyl acetate (40 ml) successively. From the ethyl acetate fraction goniothalamine (58 mg) was isolated by washing with diethyl ether followed by recrystallization.<sup>[14]</sup>

**Arabinoglucomannan:** It is a polysaccharide material, having d-glucose, d-mannose and l-arabinose in the molar ratio of. 5.00:3.01:4.00. It is yielded from the extraction of the pulp of ripe berries of *Bryonia laciniosa* with 1% aqueous acetic acid. Singh et al.,(2009) evaluated the polysaccharide Arabinoglucomannan for the microbial activity and was found to be active against *Escherichia coli* with a minimum dose of 6.25 mg/mL<sup>[15]</sup>.

## PHARMACOLOGY

The plant *Bryonia laciniosa* LINN is a shrub found wild in India, Philippines and some parts of Africa. Whole plant is used to treat adenopathy, ague, asthma, bronchitis, carbuncles, cholera, colic, consumption, convulsions, cough, delirium, fertility, headache, megalosplen, paralysis, phthisis, snake bite.<sup>[6]</sup> Traditional healers use the leaves and the seeds of this plant for treatment of fevers. It is also taken in impotency and used as a tonic.

The leaf extract of the plant is also used as a cathartic and in inflammation. Hot aqueous extract of the roots and seeds has an effect on conception in barren women.<sup>[7]</sup> Roots of this plant with roots of *Michelia champaca* is given against asthma and promotes conception.<sup>[9]</sup> Locally in India its seeds are being used for promoting conception in women.<sup>[10]</sup> From leaves a bitter principle, bryonin, has been reported<sup>[16]</sup>. It has been reported that the extraction of dry ripe fruit of *Bryonia laciniosa* with petroleum ether gave 10.2% dark viscous oil.<sup>[9]</sup>

## DIFFERENT ACTIVITIES OF BRYONIA LACINIOSA

**Anti Microbial activity:** Bonyadi Rad Ehsan et al.,(2009) evaluated the antimicrobial activity of ethanol extract of different parts of *B. Laciniosa*. This activity evaluated against Gram positive and Gram negative bacterial isolates, they include three strains

of gram-negative bacteria like *Escherichia coli*, *Salmonella typhimurium*, and *Pseudomonas aeruginosa* and three strains of gram-positive bacteria, *Bacillus cerues*, *Staphylococcus aureus* and *Micrococcus luteus*. The ethanolic extract of leaves and stem showed direct antimicrobial activity against all tested microorganism with minimum inhibitory concentration ranging between 0.625 to 10 mg/ml and 0.156 to 5 mg/ml, respectively which reveals that the leaves shows more antimicrobial action than the stem.<sup>[6]</sup>

**Anti inflammatory activity:** Gupta M et al.,(2003) evaluated the anti-inflammatory effect of the chloroform extract of leaves of *Bryonia laciniosa*(CEBL) using carrageenan, dextran, histamine, serotonin induced rat paw oedema and cotton pellet induced granuloma (chronic) models in rats. In mice, carrageenan peritonitis test was performed for the extract by oral administration. The CEBL exhibited significant anti-inflammatory effect at the dose 50, 100 and 200 mg/kg. Maximum inhibition (52.4%) was noted at the dose of 200 mg/kg after 3 h of drug treatment in carrageenan induced paw oedema, whereas the indomethacin (standard drug) produced 62.1% of inhibition. The extract exhibited significant anti-inflammatory activity in dextran induced paw oedema in a dose dependent manner. The extract also exhibited significant inhibition on the hind paw oedema in rats caused by histamine and serotonin respectively. In the chronic model (cotton pellet induced granuloma) the CEBL (200 mg/kg) and standard drug showed decreased formation of granuloma tissue by 50.1 and 57.3% respectively. The extract also inhibited peritoneal leukocyte migration in mice.<sup>[7]</sup>

**Anti Epileptic activity:** Jayarama Reddy et al.,(2010) evaluated the 70% alcoholic extract of whole plant of *Bryonia Laciniosa* on anticonvulsant activity by delaying the onset of MES induced seizures and protecting treated mice from mortality induced by seizures. The results suggest that % reduction of extensor phase was less(39.27) in *B.laciniosa* treated group when compared to the group treated with Carbamazepine(95.58) which reveals that there was significant increase in anticonvulsant activity in the case of *B.laciniosa* treated group.<sup>[9]</sup>

**Anti-asthmatic activity:** Jayarama Reddy et al.,(2010) evaluated the effect of 70% alcoholic extract of dried aerial parts of *Bryonia laciniosa* on the degranulation rate of sensitized peritoneal mast cells of albino rats when challenged with antigen. Triple antigen was used as adjuvant and prednisolone was used for comparison as standard. The number of

intact and disrupted mast cells, in ten randomly selected fields for each tissue was counted. Increase in % granulation was recorded in *Bryonia Laciniosa* treated samples compared to control. 56.27% was recorded in *B.Laciniosa* treatment and 81.26% granulation was recorded in prednisolone.<sup>[9]</sup>

**Analgesic activity:** Jayarama Reddy et al.,(2010) evaluated the 70% alcoholic extract of *Bryonia laciniosa* by Eddy's hot plate method for Analgesic activity. Morphine sulphate was used as standard. It was found that *B.laciniosa* showed fairly good analgesic activity at 30 and 60 minutes when compared with standard drug. *B.laciniosa* treated group showed an increase in response time to pain stimuli when compared to the control group. The increase in response time was from 5.83 to 8.50 seconds at 30 minutes and from 5.67 to 10.50 seconds after 1 hour of treatment. Response time to pain stimuli shown by Morphine sulphate was 15.33 and 18.17 seconds respectively after 30 and 60 minutes of treatment.<sup>[9]</sup>

Sivakumar T et al.,(2004) evaluated the methanol extract of the leaves of *Bryonia laciniosa* (MEBL) for analgesic activity by hot plate and acetic acid-induced writhing methods to assess analgesic activity. The results of this study suggest that the MEBL has significant analgesic activity.<sup>[19]</sup>

**Anticancer or Cytotoxic activity:** Alpana S Moghe et al.,(2011) evaluated the water, methanol and chloroform extracts of *B.laciniosa* leaves were tested on human cancer and normal cell lines using three in vitro cytotoxicity assays i.e cell viability, SRB and clonogenic potential. The effect was compared with that of standard anticancer drugs doxorubicin and vincristine. Activation of caspase-8 and caspase-3 enzymes was assessed to evaluate the effect of extract on induction of apoptosis in cells. Of the different extracts, the aqueous extract demonstrated maximum cytotoxicity to cancer cells. The IC<sub>50</sub> value was estimated to be 18 µg/mL. Nearly all cancer cells could be killed by the leaf extracts of *B.laciniosa* in vitro, where as small fraction of cells from cancer cell lines showed resistance to doxorubicin even at concentration much higher than IC<sub>50</sub>.

Results of caspase assay demonstrated activation of both caspase-8 and caspase-3 enzymes indicating induction of apoptosis in *B.laciniosa* leaf extract treated cells. The results thus show that aqueous extract of *B. laciniosa* leaves possess cytotoxicity to cancer cells and are able to kill all cancer cells without leaving residual population.<sup>[17]</sup>

**Antifertility activity:** Chauhan NS et al.,(2010) evaluated the Ethanolic extract of seeds of *Bryonia laciniosa* Linn orally on male albino rats at the dose levels of 50, 100, and 150 mg /kg body weight per day for 28 days. The changes in sexual behaviour, reproductive organ weights, histology of testis and epididymis, epididymal sperm density, and androgenic hormone levels were evaluated. The sexual behaviour parameters studied such as mount frequency, intromission frequency, mount latency, intromission latency were significantly affected. Increase in body weight as well as weight of testis, prostate, seminal vesicle, and epididymis was noticed. Transverse sections of testis exhibited increased spermatogenesis and a significant increase in sperm count in epididymis. The fructose content of seminal vesicle was also increased. The extract treatment also brought a significant increase in serum testosterone and luteinizing hormone levels. The studies clearly reflect androgenic activity of the extract and its effects on hypothalamic pituitary gonadal axis.<sup>[18]</sup>

**Antipyretic activity:** Sivakumar T et al.,(2004) evaluated methanol extract of the leaves of *Bryonia laciniosa* (MEBL) for anti pyretic activity. MEBL was evaluated for anti pyretic activity by normal body temperature and yeast-induced hyperpyrexia. The results of this study suggest that the MEBL has significant antipyretic activity.<sup>[19]</sup>

## CONCLUSION

The herbals occupied a distinct place in the life right from the primitive period till date and provided information on the use of plants or plant products and products as medicine. The use of medicinal plants in the management of various illnesses is due to their phytochemical constituents and dates back antiquity .It is seen from the literature that *bryonia laciniosa* is a very important plant for its large number of medicinal properties as well as medicinally important chemicals like Glucomannan, Goniotalamin, Arabinoglucomannan. The plant shows many pharmacological activities like analgesic, antipyretic, anti convulsant, antimicrobial, cytotoxic, antiasthmatic, anti-inflammatory and anti fertility. Many traditional uses are also reported like adenopathy, ague, asthma, bronchitis, carbuncles, cholera, colic, consumption, convulsions, cough, delirium, fertility, headache, megalosplenly, paralysis, phthisis, snake bite which are being studied till today and further research has to be done. Thus, *bryonia laciniosa* is quite promising as a multipurpose medicinal agent so further clinical trials should be performed to prove its efficacy.



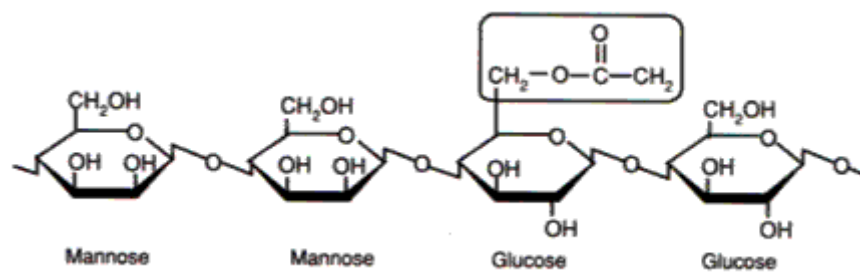
**Figure 1:** Twig of *Bryonia lacinosa*



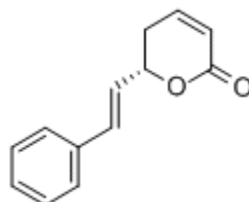
**Figure 2:** Fruits of *Bryonia lacinosa*



**Figure 3:** *Bryonia lacinosa* plant



**Figure 4:** A portion of the glucomannan repeating unit. The second glucose has an acetate group



**Figure 5:** goniotalamin (C<sub>13</sub>H<sub>12</sub>O<sub>2</sub>)

**REFERENCES**

1. Meenal S, kubde S, Khadabadi S, Farooqui IA, Deore SL. Report and Opinion. 2010; 2(12):24-31.
2. Y Tijani, M. O. Uguru, O. A. Salawu. Afr J Biotechnol, 2008; 7(6): 696-700.
3. Saurabh Srivastav, Pradeep Singh, Garima Mishra, K. K. Jha, R. L. Khosa. J Nat Products Plant Resources. 2011, 1 (1): 1-14
4. Bhoomika R Goyal, Ramesh K Goyal, Anita A Mehta. Pharmacog Rev, 2007; 1(1):143-50.
5. Elizabeth M. Williamson, D. T. Okpako, Fred J. Evans. Selection, Preparation and Pharmacological Evaluation of Plant Material, John Wiley and Sons, England, 1996, Vol 1, pp.1-3
6. Bonyadi Rad Ehsan, Awad Vital, Nirichan Kunchiraman Bipinraj. Afr J Biotechnol, 2009; 8 (15): 3565-7.
7. Gupta M, Sivakumar T, Mazumdar UK, Vamsi ML, Karki SS, Sambathkumar R, Manikandan L. Biol Pharm Bull, 2003; 26(9): 1342-4.
8. Kirtikar KR, Basu BD. Indian Medicinal Plants, 2nd ed., The Indian Press, Allahabad, 1988, 1158-61
9. Jayarama Reddy, Gnanasekaran D, Vijay D, Ranganathan TV. Int J Drug Discovery, 2010; 2(2): 1-10
10. Vandana Singh, Tulika Malviya. Carbohydrate Polymers, 2006; 64 (3): 481-3.
11. Deepak Acharya, Shivlingi: A Common but Important Twine in Patalkot. Ame Chronicle. Dec 18 :2006
12. Paul V, Hem Raj K. K. Proceedings of the National Academy of Sciences of the USA, United states national academy of sciences, USA:1960: A29(Pt 3): 218-221
13. Wen-Ying Chen, et al. Eur J Pharmacol, 2005; 522: 20-9.
14. Ashik Mosaddik M, Ekramul Haque M, Abdur Rashid M. Biochem Systematics Ecol, 2000; 28: 1039-40.
15. Singh, Vandana. Carbohydrate Polymers, 2009; 75(3): 534-7.
16. Chopra RN, Chopra SL, Chopra IC. Glossary of Indian medicinal plant New Delhi, India: CSIR. 1956: pp. 42.
17. Alpana S Moghe, Sudha G Gangal, priya R Shilkar. Ind J Nat Products and Resources, 2011: 2(3): 322-9.
18. Chauhan NS, Dixit VK. Int J Impotence Res. 2010; 22(3):190-5.
19. Sivakumar T, et al. Am J Chinese Med. 2004; 32(4): 531-9.