

## A REVIEW ON PHARMACOLOGICAL ACTIVITY OF BAMBOO

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## ABSTRACT

In the Ayurveda family, it is a very popular name. Through India commonly known as bamboo. Especially in the moist area in India, it is commonly grown. Silica, choline, glycoside, albumin, waxes, cysteine, oxalic acids, and other important phytochemicals are present in the different parts of the plant. According to ethnomedicinal activity shows, it is used as common cold, fever, etc. Nowadays science developed, based on its ethnomedicinal activity it is reported that anti-inflammatory activity, anti-ulcer, hypoglycaemic, anti-cancer, anti-diabetic, anti-microbial activity and show on. As described many pharmacological activities are described in this article.

**KEYWORDS:** Phytochemicals, Ethno-medicinal activity, Pharmacological activity, Traditional Medicine.

## INTRODUCTION

Nature is always standing golden evidence for its medicinal activity. It is a complete storehouse of remedies to cure all elements of mankind. The accumulation of knowledge of drugs, over a thousand years, gives the effective means of ensuring health care. A warm climate, productive soil abundant moisture is the favorite condition for growing this plant.<sup>[1,2]</sup>

In recent years the research about this plant is increased. The evidence shows the bamboo is very potential for its medicinal activity. In ancient times there is plenty of use of this plant in traditional systems of medicine like Ayurveda, Siddha, Unani, etc. As an herbal drug bamboo has a great platform in the global health care system. The beneficial therapeutic effect of bamboo is scientifically proved. As a flock medicine, it is used in the treatment of cold cough, fever, leprosy. It was scientifically reported that bamboo shows anti-inflammatory activity, anti-ulcer, hypoglycaemic, anti-cancer, anti-diabetic, anti-microbial activity, and show on. On the other hand, besides pharmaceutical preparation, it is used in cosmetics and food additives. It has an important role in cardiovascular disease. In human civilization, bamboo has a significant role.<sup>[3]</sup>



Fig 1- Leaves of Bamboo.



Fig 2: Photograph of Bamboo.

### Botanical Description

Plant: Thorny  
 Stems: many stems are seen.  
 Rootstock: Tufted  
 Height: approx. 30meter  
 Culms: 15-18 cm. across  
 Nodes: prominent, internodes up to 45 cm. long.  
 Shoots: naked, armed at the nodes with 2-4 stout recurved spines  
 Leaves: 17.4 - 20.5 X 2 - 2.6 cm, containing linear-lanceolate shape, and tips are stiffed, glabrous, or puberulous beneath. The margin is scabrous, base silicate midrib, and narrow midrib. On a thick callus, leaf-sheath is ended and also shortly bristly auricle.  
 Panicles: Inflorescence and often occupying the whole stem.  
 Caryopsis: 5-8 mm long and oblong, grooved on one side  
 Flowering and fruiting: Once in a lifetime (September to May).<sup>[4]</sup>

### Scientific Classification<sup>[2,5]</sup>

Kingdom: Plantae  
 Clade: Tracheophytes  
 Clade: Angiosperms  
 Clade: Monocots  
 Clade: Commelinids  
 Order: Poales  
 Family: Poaceae  
 Subfamily: Bambusoideae  
 Supertribe: Bambusodae  
 Genus: Bambusa  
 Species: *B. vulgaris*

### Phytochemicals

It contains cellulose and hemicellulose, 90% over its mass. On the other hand, it contains Resins, tannins waxes in organic salts. There are some alkaline extractive materials is also present. Ash, some organic component is also attached with cellulose. Lignin is another important component of it. Bamboo contains 2-6% protein, 2% deoxidized Saccharide, 0.8-6% protein and 2-4% fat. In the joint inside, siliceous substances are found in the white camphor-like crystalline appearance. Shoot contains active ingredients, that are Oxalic acid, resins, waxes, HCN, benzoic acid, reducing sugar, feruloyl arabinoxylanhexasaccharide, diferuloyl-oligosaccharide, (5,5'-di--(diferul-9, 9'-dioyl)-[ $\alpha$ -L-arabinofuranosyl-(1 $\rightarrow$ 3)-O- $\beta$ -D-xylopyranosyl-9 (1 $\rightarrow$ 4) -D-xylopyranose] (taxiphyllin). Arginine, histidine, cysteine, isoleucine, lysine, leucine, methionine, threonine, phenylamine, valine, niacin, riboflavin, tyrosine, and thiamine are all found in the seeds. Protein, lysine, glutelin, methionine, choline, betaine, nuclease, proteolytic enzyme, and urease are all found in the leaves.<sup>[2,4]</sup>

### Ethnomedical Uses

Bamboo sap is employed in medicines for children's feverish diseases and epilepsy because it heals colds, resolves phlegm, fever, and loss of consciousness

connected with phlegm-heat. *Pleioblastus amarus* is a tall bamboo that grows in Southern China. Its leaves have a somewhat bitter, spicy taste and are used to cure fever, lung irritation, and agitation. The *Bambusa arundinacea* seeds boost fertility, which has led to an upsurge in the demand for seeds from this species in the pharmaceutical industry to make fertility-improving medications. In osteoarthritis and osteoporosis, bambusa leaf juice is used to improve cartilage. It is important for the health of bones, skin, teeth, artery walls, gums, nails, hair, and it has been used to treat eczema and psoriasis.<sup>[4,18]</sup> In Ghana's Dangme West District, it is traditionally used to cure malaria. Diabetes was historically treated by the Karo people of North Sumatra, Indonesia with bambusa.<sup>[6,7]</sup>

### Pharmacological Activity

#### Analgesics Activity

Methanolic extract of the aerial part of *Bambusa vulgaris* at doses of 50mg, 100mg, 200mg, and 400 mg per kg reduced writhing in Swiss albino model mice induced by acetic acid by 25.9 percent, 29.6 percent, 37.0 percent, and 44.4 percent, respectively, compared to 40.7 percent and 51.9 percent reductions obtained with 200mg and 400 mg per kg of the standard analgesic drug, aspirin. In general, the studies show that the aerial component of this plant has significant analgesic potential, which could be due to the presence of saponins and alkaloids in the extract.<sup>[8]</sup>

#### Antidiabetic activity

In mice, *Bambusa vulgaris* methanol extract at dosages of 100mg, 200mg, and 400 mg per kg lowered blood glucose levels by 32.8 percent, 45.8 percent, and 55.3 percent, respectively, as compared to control mice. When taken at a dose of 10 mg per kg, the typical antihyperglycemic medication glibenclamide reduces blood glucose levels by 50.8 percent. Overall, According to the findings, the plant's aerial section has significant antihyperglycemic potential, which could be attributed to the presence of saponins and alkaloids in the extract.<sup>[9]</sup>

The methanolic extract of *Bambusa vulgaris* has been examined for the improved nature of glucose absorption in vitro in the L-6 cell line in anti-diabetic investigations. In L-6 cells, the methanol extract from this plant enhances glucose absorption higher than controls. In comparison to controls, the *Bambusa vulgaris* methanol extract enhanced glucose absorption by 13.50 ( $\pm$  3.10) percent. The same results were found in studies of glucose uptake in the hemidiaphragm of isolated animals. *Bambusa vulgaris* methanol extract improved glucose absorption by 11.25 ( $\pm$  1.35) percent compared to controls.<sup>[8]</sup>

#### Antipyretic activity

The antipyretic effects of *Bambusa vulgaris* methanol extract have been investigated. Brewer's yeast infusion resulted in a substantial rise in rectal temperature in experimental mice 18 hours later. The *Bambusa vulgaris*

methanol extract was found to have an antipyretic effect with varied potency in this investigation. *Bambusa vulgaris* has an antipyretic effect when given at a level of 1000 mg/kg BW. From 2 hours, both doses of the *Bambusa vulgaris* test cause a fall in temperature, and by the conclusion of the 5th hour, both groups' temperatures have returned to normal.<sup>[9]</sup>

#### Anti-inflammatory activity

In this study, mice were given *B. Vulgaris* methanol extract (MEBV) to see if it has anti-inflammatory properties. Acute inflammatory models such as formaldehyde-induced paw edema and vascular permeability caused by acetic acid, as well as subacute anti-inflammatory models such as cotton pellet granuloma, carrageenan-induced peritonitis, and estimation of plasma MDA were used to investigate anti-inflammatory effects. In all experimental models, MEBV (100, 200, and 400 mg/kg, p.o.) demonstrated dose-dependent and substantial inhibition ( $P < 0.01$ ). Flavonoids, glycosides, proteins, alkaloids, and carbohydrates were discovered during the initial phytochemical screening. In doses up to 2000 mg/kg, p.o., the extract did not cause death. The findings demonstrate MEBV's true anti-inflammatory properties and back up its historic use in a variety of painful and inflammatory illnesses.<sup>[10]</sup>

#### Hepatoprotective activity

The objective of this research was to see if various *Bambusa vulgaris* extracts could protect mice whose livers had been damaged by CCl<sub>4</sub> (carbon tetrachloride). SGOT (the enzymes serum glutamate oxytransaminase), ALP (alkaline phosphatase) are used to detect liver injury), and SGPT (serum glutamate pyruvate transaminase). The chloroform extract of *Bambusa vulgaris* at a concentration of 250 mg/kg body weight demonstrated a substantial protective effect against liver damage in CCl<sub>4</sub>-induced hepatotoxicity rats, according to serum biochemical analyses. The result further confirms the protective effect of liver diseases, as histopathological investigation of mice generated by CCl<sub>4</sub> indicates significant necrosis.<sup>[11]</sup>

#### Antifertility activity

Male rats' fertility was reduced by *Bambusa arundinacea* tender shoots ethanolic extract (BASE). After receiving 300 mg/kg of the BASE each day for 7 days, the index of fertility in control rats reduced to 15% and to 23% after a seven-day recuperation period, respectively. The number of successfully inseminated cohabiting females was lowered, notably after 4 days of therapy. After 8 days of BASE withdrawal, the mating behavior had fully recovered. The quantity of spermatozoa in the cauda epididymis and caput was reduced, and sperm cell motility obtained from the cauda epididymis was also reduced. Testes, epididymides, vas deferens, and prostate weights were all dramatically reduced. The extract appears to be reasonably non-toxic based on serum

protein profiles and oxaloacetic/pyruvic transaminase activity.<sup>[12]</sup>

#### Antioxidant activity

*Bambusa vulgaris* leaves were extracted with aqueous and methanolic extracts (1:100 w/v) and used for subsequent investigation. In vitro, the antioxidant capabilities of the extracts were investigated, as well as their inhibitory effect on cisplatin, FeSO<sub>4</sub>, and nephrotoxicity caused by a single nucleotide polymorphism in rats. The presence of cisplatin and other pro-oxidants in kidney homogenate caused nephrotoxicity in rats by inducing a significant increase in kidney malondialdehyde (MDA) content. Aqueous and methanolic extracts of *Bambusa vulgaris* leaves were found to reduce this damage, implying that the plant may have antioxidant and therapeutic qualities. The methanolic extract also had the largest free radical scavenging potentials, as well as the highest phenolic and flavonoid content. The extract's free radical scavenging abilities were shown to be proportionate to their phenolic and flavonoid concentration. The findings suggest that methanol may be a good solvent for extracting the antioxidant properties of *Bambusa vulgaris* leaves and that Fe<sup>2+</sup>-chelation, DPPH, ABTS\*, hydroxyl radical scavenging abilities, and reducing power may be part of the process by which *Bambusa vulgaris* leaves protect against oxidative stress and also some pro-oxidants induced nephrotoxicity. As a result, *Bambusa vulgaris* leaves may be utilised to treat cisplatin toxicity and acute renal failure traditionally.<sup>[13]</sup>

#### Antibacterial activity

The antibacterial activity of a WEBS (water-phase extract of bamboo shavings) derived using supercritical CO<sub>2</sub> extraction was tested using an agar disc diffusion assay in nutritional agar and Czapek Dox Agar medium against a variety of food spoilage and foodborne microorganisms. The WEBS showed concentration-dependent antibacterial action against *Staphylococcus aureus*, *Escherichia coli*, *Bacillus subtilis*, *Saccharomyces cerevisiae*, *Aspergillus niger*, and *Penicillium citrinum*. Using the two-fold dilution approach, the WEBS' minimum inhibitory concentrations (MICs) against the bacteria strains were determined to be in the range of 4.9 - 32 mg/ml. The antibacterial activity is unaffected by the different heat treatment parameters. To test for the content of the total anthraquinone component and to preliminarily validate its antibacterial function, Emodin was used as the standard sample, laying the theoretical framework for the development of natural preservatives.<sup>[14]</sup>

#### Anti-Ulcer activity

In rats, a hot-water extract (Folin) of bamboo grass (*Sasa albomarginata*) considerably decreased the incidence of water immersion and restraint stress, as well as ethanol and indomethacin-induced stomach ulcers. The antiulcer effect of bamboo grass in rats was determined by histological analysis of the Folin-treated gastric mucosa

of the rats, which revealed that microscopic blood clots superimposed the superficial epithelium, preserving the cellular integrity of the gastric mucosa, particularly against stress ulcer. Folin was found to reduce the release of histamine from rat mast cells, stabilise erythrocytes, and increase their agglutination under acidic conditions, and reduce the hyperaemia's prevalence and a reduction of acid mucopolysaccharides in the ulcer caused by ethanol. Their findings revealed that a microscopic haemostatic impact of Folin, along with a membrane-stabilizing effect, could be involved in gastric lesions prevention.<sup>[15,16]</sup>

## CONCLUSION

Bamboo plants have long been utilized to cure a variety of human ailments in various traditional treatment systems. Carbohydrates, saponins, glycosides, alkaloids, phenolics and tannins, flavonoids, phytosterols, oils, triterpenoids, and fats have all been found in this plant's phytochemistry. Bamboo plants have analgesic, antidiabetic, antipyretic, anti-inflammatory, hepatoprotective, antibacterial, antifertility, antioxidant, anti-ulcer properties in their pharmacological actions. So, apart from its use in making food and crafts, there is a need for in-depth research on Bamboo. Because of the plant's nature, more studies can be performed to uncover the plant's untapped and exploited potential.

## REFERENCES

1. Kokate CK, Purohit AP, Gokhale SB. Pharmacognosy 51edition. Nirali prokashani, Kolkata, 2015; 01.01-01.16.
2. Sangeetha R, Diea YKT, Chaitra C, Malvi PG, Shinomol GK. The Amazing Bamboo: A Review on its Medicinal and Pharmacological Potential. Indian J Nutri, 2015; 2(1): 106.
3. Nazreen S, Alam Ms, Hamid H, Kaur G, alam MM, et al. Phytochemical investigation of Bambusa arundinacea Retz. International Journal of Natural Product Science, 2011; 3: 1-7.
4. Rathod Jaimik D, Pathak Nimish L, Patel Ritesh G, N.P. Jivani and Bhatt Nayna M. Phytopharmacological Properties of Bambusa arundinacea as a Potential Medicinal Tree: An Overview. Journal of Applied Pharmaceutical Science, 2011; 01(10): 27-31.
5. [https://en.wikipedia.org/wiki/Bambusa\\_vulgaris](https://en.wikipedia.org/wiki/Bambusa_vulgaris).
6. Asase A, Akwetey GA, Achel DG. Ethnopharmacological use of herbal remedies for the treatment of malaria in the Dangme West District of Ghana. Journal of ethnopharmacology, 2010; 129(3): 367-76.
7. Situmorang RO, Harianja AH, Silalahi J. Karo's local wisdom: The use of woody plants for traditional diabetic medicines. Indonesian Journal of Forestry Research, 2015; 2(2): 121-30.
8. Haque AM, Das AK, Bashar SS, Al-Mahamud R, Rahmatullah M. Analgesic and antihyperglycemic activity evaluation of Bambusa vulgaris aerial parts. Journal of Applied Pharmaceutical Science, 2015; 5(09): 127-30.
9. Senthil Kumar MK. Pharmacognostical, Phytochemical and Pharmacological screening for Bambusa Vulgaris (Gramineae) and Pandanus Odoratissimus (Pandanaceae) (Doctoral dissertation, CL Baid Metha College of Pharmacy, Chennai), 2012.
10. Carey WM, Dasi JM, Rao NV, Gottumukkala KM. Anti-inflammatory activity of methanolic extract of Bambusa vulgaris leaves. International Journal of Green Pharmacy (IJGP), 2009; 3(3): 234-238.
11. Anghore D, Kulkarni GT. Hepatoprotective effect of various extracts of Bambusa vulgaris Striata on Carbon tetrachloride-induced liver injuries. International Journal of Pharmaceutical Research and Allied Sciences, 2016; 1, 5(3): 16-22.
12. Vanithakumari G., Manonayagi S., Padma S., Malini T. Antifertility effect of Bambusa arundinacea shoot extracts in male rats. J Ethnopharmacol, 1989; 25(2): 173.
13. Adeyanju O, Akomolafe SF, Atoki V, Oboh G. The Leaves of Bambusa vulgaris (L.) Ameliorate Pro-Oxidants Induced Nephrotoxicity In Rats - In Vitro. FUTA Journal of Research in Sciences, 2019; 15(1): 102-112.
14. Zhang J., Gong J., Ding Y., Lu B., Wu X., Zhang Y. Antibacterial activity of water-phase extracts from bamboo shavings against food spoilage microorganisms. African Journal of Biotechnology, 2010; 9(45): 7710-7717.
15. Otani K, Yanaura S, Yuda Y, Kawaoto H, Kajita T, et al. (1990) Histo-chemical studies on the anti-ulcer effect of bamboo grass in rats. Int J Tissue React, 12: 319-332.
16. Muniappan M, Sundararaj T. Anti inflammatory and antiulcer activities of Bambusa arundinacea. J Ethnopharmacol, 2003; 88: 161-167.