

Pharmacological Overview on Bambusa Vulgaris

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Abstract: It's an interesting common name in the Ayurveda family known as bamboo across India. It is widely grown throughout India, particularly in the wet regions. The various sections of the plant contain silica, choline, glycoside, albumin, waxes, cysteine, oxalic acids, and other significant phytochemicals. Ethno-medicinal activity indicates that it is used to treat fever, common colds, and other ailments. As research has advanced, it has been reported to have anti-inflammatory, anti-ulcer, hypoglycemic, anti-cancer, anti-diabetic, anti-microbial, anticonvulsant, anti-amnesia and other effects based on its ethno-medicinal action. This page describes a wide range of pharmacological activity.

Keywords: Traditional medicine, pharmacological action, ethno-medicinal activity, phytochemicals

I. INTRODUCTION

Because of its potential health benefits, herbal medicine has been practiced for centuries in many civilizations all over the world. It entails the use of plants, plant extracts, and plant-based products to enhance wellbeing. Here are a few instances of conventional applications for herbal remedies. In recent years the research about this plant is increased. It is a complete storehouse of remedies to cure all elements of mankind. 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.¹ 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 folk 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, anticancer, 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.²

According to CABI (Invasive Species Compendium), new bamboo culms that emerge from the ground (bamboo sprouts) are the edible shoots of several bamboo species particularly *B. vulgaris* and *Phyllostachys edulis*. It's a vegetable that's used in a variety of Asian dishes and broths. They are sold in a variety of processed shapes and come in fresh, dried, and canned varieties.³

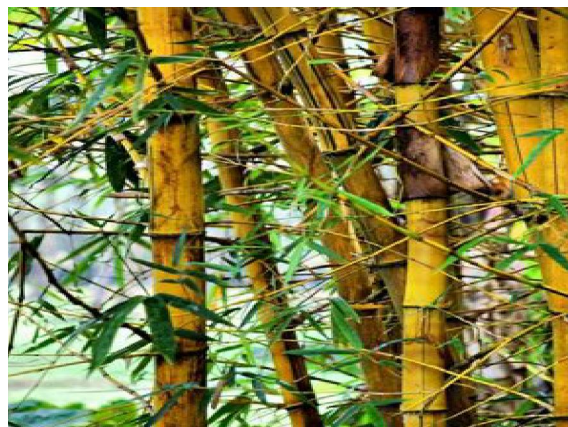


Fig. Bamboo Plants

BOTANICAL DESCRIPTION:

Bambusa vulgaris, a species of bamboo that is classified as part of the Poaceae family of grasses, may also be referred to as common bamboo or vulgar bamboo. Here is a brief description of *Bambusa vulgaris*'s Botanical description:

Culm (Stem):

Height: Achieving heights of 15 to 30 meters, the *Bambusa vulgaris* plant is a tall and erect species of bamboo.

Diameter: The diameter of the culms vary between 10 and 20 cm. Varying internodes, or parts connecting the nodes, and nodes, or the joints where leaves and branches emerge, constitute which identify a stem.

Leaves :

Leaf Arrangement: Along the stems, the leaves are arranged in an alternating pattern. The leaves possess a tip that's pointed and are lanceolate, means they are long and narrow.

Leaf Size: Leaves can vary in size but are generally large, contributing to the canopy of the bamboo.

Root System:

Rhizomes: Like many bamboo species, *Bambusa vulgaris* often spreads through underground rhizomes, forming clumps or thickets of interconnected stems.

Inflorescence:

Blooming: *Bambusa vulgaris* is renowned for its sporadic and erratic flowering cycles, in which every individual bamboo plant blooms all at once, frequently over the course of several years.

Flower Structure: On branched inflorescences, the tiny, insignificant flowers are arranged in spikelets.

Culm Sheaths:

Sheath Characteristics: Sheaths encase the immature shoots and cover the culms. The bamboo gradually sheds these sheaths as it ages.

Color: The color of the sheath might vary, although it usually starts out green and eventually turns brown.⁴

Kingdom	Plantae
Clade	Tracheophytes
Clade	Angiosperms
Clade	Monocots
Clade	Commelinids
Order	Poales
Family	Poaceae
Subfamily	Bambusoideae

SCIENTIFIC CLASSIFICATION⁵:

GEOGRAPHICAL LOCATION:

Around the world, bamboo covers at least 37 million hectares of land and accounts for 3.2% of the forest areas in the nations where it is grown, or almost 1% of the total forest area. About 80% of the land in Asia's southern tropical region is covered in bamboo. Neither South America nor Africa have a lot of bamboo. Madagascar is the richest country in Africa in terms of the variety of bamboo species. Information on the size of their bamboo forests was provided to the Global Forest Resources Assessment 2000 (FRA 2000) by eleven countries: two from Central and South America, eight from Asia, and one from Africa.⁶

Bamboo is extensively found throughout Asia, Africa, and America. The world's bamboo distribution center is the Southeast Asia monsoon zone, which includes southern China, Indo-China, and the Indian subcontinent. It is home to 80% of all bamboo species and 90% of the world's total bamboo forest area. Bamboo comes in a wide variety of species in South Africa and America. It has to do with some of these countries' histories, cultures, and architectural styles. Latin America—more especially, the Amazon Basin close to the South Tropic of Cancer, which encompasses Mexico, Guatemala, Costa Rica, Nicaragua, Honduras, Colombia, Venezuela, and Brazil—is home to the world's bamboo

distribution center. Furthermore, the center of African bamboo distribution lies on Madagascar's east coast.⁷ When it comes to genetic resources related to bamboo, India is the second richest nation in the world, after China.⁶

CHEMICAL CONSTITUENTS;

90 percent of its mass component is made up of cellulose and hemicellulose. However, it also contains tannins, waxes, resins, and organic salts. Additionally, several alkaline extractive materials exist there. Ash and other organic materials are also joined by cellulose. Another significant part of it is lignin. Bamboo has 0.8–6% protein, 2–4% fat, 2% deoxidized saccharide, and 2–6% protein. Silica-like materials with a white, crystalline appearance resembling camphor are present in the internal joint. Oxalic acid, resins, waxes, HCN, benzoic acid, reducing sugar, feruloyl arabinoxylohexasaccharide, diferuloyl-oligosaccharide, and 5,5'-di--(diferul-9, 9'-dioyl) are among the active components found in Shoot.-[α -L-arabinofuranosyl-(1 \rightarrow 3)-O- β -D-xylopyranosyl-9 (1 \rightarrow 4) -D-xylopyranose] (taxiphyllin). The seeds include the following amino acids: valine, niacin, riboflavin, tyrosine, thiamine, isoleucine, lysine, leucine, methionine, threonine, phenylamine, and histidine. The leaves contain protein, lysine, glutelin, methionine, choline, betaine, nuclease, proteolytic enzyme, and urease.⁸

BIOLOGICAL STUDY

A lot of research on the biological characteristics of the bamboo plant have been conducted all over the world. However, there are too few and insignificant studies on *Bambusa vulgaris*, particularly when it comes to the species' biological characteristics, which include both biological and microbiological aspects. It has been discovered that the leaf chloroform extract applied in opposition to *Mycobacterium tuberculosis*. I discovered in another study that kidney problems can also be resolved. Further, the plant has anthelmintic, antibacterial, and antimalarial actions, which is one of the Poaceae/Gramineae family's strongest traits. There is also evidence of a prospective application for the plant's reproductive systems, where it may have antifertility and abortifacient properties related to the endocrine system. It also exhibits hypoglycemic properties.⁹

TRADITIONAL USE:

In many Asian nations, bamboo has a strong connection with people's cultural, social, and economic circumstances. It is the multipurpose, fastest-growing woody plant with a wide range of commercial and domestic use. Its use is not limited to substitute wood in construction, furnishings, flooring, and scaffolding; in China and Southeast Asia, it has long been used as a food and medicinal source. The bamboo plant is utilized medicinally for its rhizome, culm, bark shavings, shoots, leaves, roots, and seeds.^{10,11} Bamboo is essential to the food, pharmaceutical, and cosmeceutical industries and is currently garnering interest on a global basis for its nutritional and therapeutic potential. Bamboo leaves and shoots have an abundance of medicinal potential and can be utilized in an ecological and natural way to cure diseases.^{12,13} Bamboo has been a vital component of traditional Asian medicines for a long time, especially Chinese and Indian (Ayurvedic) medicines. Bamboo was first used medicinally in India about 10,000 years ago. It was used to make a health tonic called Chyawanprash, which included bamboo manna among other plants, and was meant to encourage youth, beauty, and longevity. Due to its potent anti-stress and anti-aging properties, Chyawanprash has become well-known globally.

Ayurveda, the traditional Indian medical system, recommends using bamboo and its products, such as Tabasheer, Banslochan, and SitopaladiChurna, to treat a range of ailments.¹³ It has reportedly been used traditionally as an astringent, emmanogogue, and abortifacient in Tanzania, Brazil, India, and Pakistan.¹⁴ According to Asase et al. (2010), it is a herbal medication used in Ghana to cure malaria.¹⁵ Using this age-old knowledge, modern herbal remedies from bamboos, including bamboo salt, starch, extracts, vinegar, silica, and more, are created to treat a range of health conditions, including diabetes, inflammations, constipation, and more.^{16,17}

PHARMACOLOGICAL ACTIVITY:

Analgesics Activity

The writhing in Swiss albino model mice induced by acetic acid was reduced by 25.9 percent, 29.6 percent, 37.0 percent, and 44.4 percent, respectively, by methanolic extract of the aerial part of *Bambusa vulgaris* at doses of 50 mg,

100 mg, 200 mg, and 400 mg per kg. This is in contrast to reductions of 40.7 percent and 51.9 percent obtained with 200 mg and 400 mg per kg of the standard analgesic drug, aspirin. Studies generally indicate that this plant's aerial part has a strong analgesic capability; this may be because the extract contains alkaloids and saponins.¹⁸

Anti-Ulcer Activity

A hot-water extract (Folin) of *Sasa albomarginata*, or bamboo grass, significantly reduced the incidence of stomach ulcers caused by indomethacin and ethanol, as well as the incidence of water immersion and restraint stress in rats. The histological examination of the rats' gastric mucosa after Folin treatment demonstrated that microscopic blood clots placed the superficial epithelium, protecting the gastric mucosa's cellular integrity, especially against stress ulcers, and indicating the antiulcer effect of bamboo grass. Folin was discovered to decrease the amount of histamine released by rat mast cells, stabilize erythrocytes and enhance their agglutination in acidic environments, as well as lessen the frequency of hyperaemia and the amount of acid mucopolysaccharides in ulcers brought on by ethanol. Their results suggested that Folin may have a role in the prevention of gastric lesions through both a membrane-stabilizing action and a microscopic haemostatic effect.^{19,20}

Antidiabetic Activity

When *Bambusa vulgaris* methanol extract was given to mice at dosages of 100 mg, 200 mg, and 400 mg per kg, it reduced blood glucose levels in comparison to control mice by 32.8 percent, 45.8 percent, and 55.3 percent, respectively. The usual antihyperglycemic drug glibenclamide lowers blood glucose levels by 50.8 percent when administered at a dose of 10 mg per kg. Overall, the results show that the aerial portion of the plant has a strong antihyperglycemic potential, which may be related to the extract's saponins and alkaloids.²¹ In studies aimed at treating diabetes, the methanolic extract of *Bambusa vulgaris* has been tested for its ability to enhance glucose absorption in vitro in the L-6 cell line. This plant's methanol extract improves glucose absorption in L-6 cells more than controls. The *Bambusa vulgaris* methanol extract improved glucose absorption by 13.50 (\pm 3.10) percent as compared to controls. Studies on the uptake of glucose in the hemidiaphragm of solitary animals revealed similar outcomes. Methanol extract from *Bambusa vulgaris* increased glucose absorption by 11.25 (\pm 1.35) percent as compared to controls.¹⁸

Anti-inflammatory activity

In order to determine if *B. vulgaris* methanol extract (MEBV) has anti-inflammatory effects, mice were used in this investigation. The anti-inflammatory effects were investigated using subacute anti-inflammatory models such as cotton pellet granuloma, carrageenan-induced peritonitis, and estimation of plasma MDA, as well as acute inflammatory models such as formaldehyde-induced paw edema and acetic acid-induced vascular permeability. MEBV (100, 200, and 400 mg/kg, p.o.) showed significant and dose-dependent suppression in all experimental models ($P < 0.01$). During the first round of phytochemical screening, flavonoids, glycosides, proteins, alkaloids, and carbohydrates were identified. Up to 2000 mg/kg, p.o. the extract did not result in fatalities. The results support MEBV's long-standing use in a range of excruciating and inflammatory diseases and show its genuine anti-inflammatory qualities.²²

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.²¹

Antioxidant Activity:

Free radical-induced oxidative stress can be defended against by antioxidants. In a recent study, Satya et al. (2009) found that when fresh shoots of *B. vulgaris* were examined using the DPPH technique to scavenge free radicals, they had a 28.21% antioxidant activity.²³ The DPPH experiment yielded IC₅₀ values of 389.23 μ g/ml, 300.55 μ g/ml, and

262.90 µg/ml for the radical scavenging activity of the chloroform, acetone, and methanol extract of *B. vulgaris* leaves, respectively.²⁴

Antimalarial activity

Ghanaians have long treated malaria with a solution of *B. vulgaris* leaf. In their 2016 study, Komlaga et al. examined the antiplasmodial activity of various *B. vulgaris* extracts against the chloroquine-sensitive 3D7 *P. falciparum* and the chloroquine-resistant W2 demand of *P. falciparum*. They discovered that the aqueous extract exhibited moderate activity ($5 < IC_{50} < 15$ µg/mL), while the extracts derived from petroleum ether and ethyl acetate demonstrated high activity ($IC_{50} < 1$ µg/mL).²⁵

Anticonvulsant activity

The anticonvulsant efficacy of *B. vulgaris* leaf extract was studied. In their investigation of the extract's impact on the pentylenetetrazole-induced convulsion model, Adebayo et al. discovered that at doses of 100 mg/kg, 200 mg/kg, and 400 mg/kg, the death time was prolonged ($p < 0.05$) and the percentage of protection was 60%, 80%, and 100%, respectively, in contrast to the control group (10ml/kg), which received no protection at all. The 400 mg/kg dose prolonged death latency and the onset of tonic and clonic convulsions.²⁶

Antiamnesic activity

Using scopolamine-induced amnesia on the Y-maze test, the antiamnesic activity of *B. vulgaris* leaf methanol extract was investigated. When comparing the percentage of correct alternation on the Y-maze task between the Scopolamine-treated group and the control-treated group, the difference was statistically significant ($p < 0.05$). But *B. vulgaris* extract increased the decreased alternation caused by Scopolamine in a dose-dependent manner, with a significant ($p < 0.05$) difference when compared to the control-treated group. A positive control medication called piracetam dramatically ($p < 0.05$) corrected the decreased alternation that Scopolamine had caused in mice.²⁷

Antivirus

Using standard laboratory assays, the ethanol extract of *B. vulgaris* was tested for its antiviral activity against three human viruses: the measles, yellow fever, and poliovirus. Only the measles virus showed inhibition at MIC 62.5 µg/mL, according to the analysis.²⁸

II. CONCLUSION

Bamboo plants have long been used in many traditional treatment systems to heal a wide range of human illnesses. The phytochemistry of this plant includes the following: oils, triterpenoids, lipids, flavonoids, phenolics and tannins, alkaloids, saponins, glycosides, and carbohydrates. Given the pharmacological characteristics of bamboo plants, which include analgesic, antidiabetic, antipyretic, anti-inflammatory, hepatoprotective, antibacterial, antioxidant, and anti-ulcer qualities, more research on the plant's potential can be conducted.

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