IJP (2024), Vol. 11, Issue 3 **(Review Article)**

Received on 22 February 2024; received in revised form, 23 March 2024; accepted, 27 March 2024; published 31 March 2024

BAMBUSA ARUNDINACEAE: A REVIEW ON PHYTOCHEMISTRY AND PHARMACOLOGICAL ACTIVITY

Priyanka D. Gaikwad *, Apeksha N. Chavhat and Sakshi K. Daine

Mathoshri Institute of Pharmacy, Dhanore, Nashik - 423401, Maharashtra, India.

Keywords:

Bambusa arundinaceae, Phytochemical constituent, Pharmacological activity

Correspondence to Author:
Priyanka D. Gaikwad

Mathoshri Institute of Pharmacy, Dhanore, Nashik - 423401, Maharashtra, India.

E-mail: priyankagaikwad1601@gmail.com

ABSTRACT: There are numerous applications of the bamboo grass plant covered in this review paper. *Bambusa arundinaceae* (Retz.) Wild is an important species among the bamboo community. Young bamboo grass shoots can be processed into a variety of delectable, healthful meals and occasionally as medications. There are 26 species of bamboo in Bangladesh, classified into seven genus, encompassing both wild and domesticated exotics. The plant contains various bioactive compounds like silica 70 or Silicum as a hydrate of silicic acid, peroxide of iron, potash, lime, and alumina, proteins, phosphorus, iron, vitamin B, nicotinic acid, riboflavin, carotene, calcium phosphorus, thiamine, niacin, and oxalic acid. Diverse studies carried out on bans, by various researchers reported a wide spectrum of pharmacological actions like hepatoprotective, antioxidant, analgesic, antipyretic, anti-ulcer and antidiabetic activities, *etc*.

INTRODUCTION: Bamboo is a big woody grass that is a member of the Poaceae family. This ancient woody grass is extensively distributed throughout the world's tropical, subtropical, and mildly temperate regions. It's an incredibly varied plants with adaptable qualities any extremely harsh soil and climate conditions. There are roughly ninety there are over 1200 species of bamboo worldwide, divided into genera. The majority of bamboo is found in forests, where it is also widely commonly found outside of forests in farmlands, riverbanks, and roadside areas as well as rural regions. Bamboo is a long, non-woody stick found in forests. Product, and occasionally utilised as a wood alternative.

QUICK RESPONSE CODE

DOI: 10.13040/IJPSR.0975-8232.IJP.11(3).78-83

Article can be accessed online on: www.ijpjournal.com

DOI link: https://doi.org/10.13040/IJPSR.0975-8232.IJP.11(3).78-83

Additionally, since it is present everywhere in the planet and has a significant financial function. Despite being utilised for houses, crafts, and pulp, panels, paper [1]. There are 26 species of bamboo in Bangladesh, classified into seven genus, encompassing both wild and domesticated exotics [2]. Bamboo has a large having a positive effect on easing many of the social and environmental issues in numerous nations [3]. It has functioned as preservation of the environment through natural means and in the manufacture of furniture, artefacts, and handicrafts for the home.

Bamboo products such as flooring, laminated boards, and bamboo plywood Key wood has included props, roofing sheets, and many more. alternatives to bamboo used in the building and fence sectors globally. Additionally, it is utilised as food, medicine, and toiletries, vinegar, charcoal, drinks, and natural insecticide [4]. One such priceless herb that has been used medicinally in many ancient treatments, including Ayurveda and Siddha, is the ban *(Bambusa arundinaceae*).

The bamboo plant is incredibly adaptable and offers several advantages to all the organisms that make up the ecosystem. These big, woody grasses are a part of the family Graminae, however what sets it apart from the other grass family members is the existence of every node has branches [5]. It is widely accessible and spreads rapidly across the damp areas of India various plant parts, such as articulations, immature shoots and siliceous deposits, for therapeutic purposes, roots, leaves, and seeds are used [6]. Among the many different actions when using this medication, some of the primary actions include Mudirr-i-Hayd.

Taxonomical Classification [7, 8]:

Kingdom: Plantae

Phylum: Tracheophyta

Class: Magnoliopsida

Order: Rosales

Family: Graminae

Genus: Bambusa

Species: *B. arundinaceae*

Vernaculars [7, 8]:

Arabic: Qasab

Persian: Nai

English: Spiny Bamboo, Thorny Bamboo

Greek: Bistaras, Qalaman, Aidqoon, Shalas

Hindi: Bans, Kantban, Bans-kapur, Bans-lochan

Urdu: Bansa

Sanskrit: Vansa, Bahupallava, Brihattrina

FIG. 1: *BAMBUSA ARUNDINACEAE*

Chemical Composition: Asia considers bamboo shoots to be a delicacy. Adenine-(1′R,2′R,3′R) and two new compounds(−) and -cyclic butanetetraolcarbonate (16)-(7R,8S)-(9-O-β-D-[6-O-4-hydroxy-3-methoxybenzoyl]; 4-hydroxy-3-methoxyphenylglycerol)-glucopyr-anoside (20), three amino acids (13–15), β-carboline (17), and two megastigmaneglycosides (18, 19) were extracted from bamboo shoots (Phyllostachys pubescens), together with twelve other known nucleosides (1–12).

Detailed spectroscopic research was used to rigorously determine their structures and absolute configurations, and ion chromatography was used to both qualitatively and quantitatively analyse the carbohydrate content of bamboo shoots. For routine edible quality monitoring of bamboo shoots, a quick, easy, sensitive, and precise HPLC-UV analysis was developed, and twelve main components of bamboo shoots were quantitatively examined.

It was found that the main chemical components of bamboo shoots were nucleotides, amino acids, and carbs. These results refute the conventional wisdom regarding the chemical makeup of bamboo shoots and the earlier research reports [8].

This plant's various sections include silica, cholin, betain, albuminoids, cynogenetic glycosides, oxalic acid, reducing sugar, waxes, resins, arginine, cysteine, histidine, and benzoic acid protein, gluteline, lysine, riboflavin, thiamine, and proteolytic enzyme, urease [10], nuclease, and methionine. Whitish, silicious material discovered inside the bud junction crystalline, like camphor and little sticky to the tongue and flavorful [11, 12].

Additionally, shoot has an active components that include reducing sugar, waxes, resins, and oxalic acid Benzoic acid [13] with HCN34Seeds are rich in histidine, cysteine, and arginine. leucine, lysine, methionine, phenylamine, threonine, and isoleucine thiamine, valine, tyrosine, niacin, and riboflavin.

In a similar vein, mostly found in leaves are protein, gluteline, lysine, and methionine. Urease [14] nuclease, betain, cholin, and proteolytic enzymes. It has observed that the bamboo plant possesses remarkably elevated amounts of Acetyl-choline [15].

TABLE 1: PHYSICOCHEMICAL CONSTITUENT OF *BAMBUSA ARUNDINACEAE* [9]

Phytochemical constituent	Leaves	Stem	Seed
Flavonoids	++	--	--
Lactone	++	--	--
Phenoilic acid	++	--	--
Saponin	--	++	--
Resin	--	++	--
Phytosterol	--	++	--
Phenol	--	++	++
Tannin	--	--	++
Phobatanin	--	--	++
Cardiac glycoside	--	--	++

Use as Food: A bamboo shoot is a young, tender culm made up of compressed internodes protected by several leathery sheaths that grows from the stem apex. When the shoots reach a height of 15–16 cm, they are often picked. The interior, sensitive meat has been removed from its fibrous sheaths, properly cleaned with water, and then sliced into pieces. The bits are typically consumed as pickles or as vegetable parts of soups or curries that are combined with fish or meat. Food is made from the shoots of both monopodial (running bamboos) and sympapodial (clump-forming) bamboos. Monopodial bamboo species, like *Phyllostachys edulis*, *P. mitis*, and *P. pubescens*, are the most prevalent and yield tasty bamboo shoots in Northern China and Japan [16].

On the other hand, because of bamboo's high value, production, crop regularity, and selection of species associated with peoples' and industrial need. According to estimates, bamboo plants make up around 13% of India's total forest area. Approximately 50% of bamboo grown in West Bengal and the Northeastern India. Additionally, India is thought to possess the second greatest after China, the world's reserves of bamboo [17].

Several delectable species, intriguing food items (pickles, fermented shoots, etc.), and bamboo shoot instructions bamboo beer, bamboo worldwide consumption of cookies. Various species of There are differences in the nutritional makeup of bamboo shoots. Bamboo shoots are traditionally utilised as food by the tribe community the in various nations. Shoots of bamboo are used being low in calories and fat and an excellent source of dietary fibre for human being [18]. Bamboo shoots contain high protein but less fat, moderate dietary fiber, having essential amino acids, selenium, potassium, a potent antioxidant and minerals for healthy heart. Besides all the versatile uses of bamboo, people has been using shoots of this plant as one of his food items since prehistoric days when they were ignorant about vegetable growing. Young shoots of several species of bamboo are used as important vegetable in the daily meals in China, Japan, Taiwan and Thailand. These young bamboo shoots have been considered as gourmet items in the western world where these are available only as imported canned products [16].

They can be stir-fried with very little oil, by themselves, or combined with other vegetables and meat. In recipes, bamboo juice is also utilised. To obtain some delectable result, it must draw moisture out of the roots, especially the slightly sweet ones [19]. Bamboo soft drink Moreover, wine made from bamboo shoots [20]. Additionally, dietary Bamboo shoots vary in value among species and even within the same species in light of regional circumstances. Typically, the nutritional values are fairly comparable. Nutritional worth of bamboo shoots that have been boiled and salted Bamboo shoots are abundant and they include roughly eighteen amino acids [21] as well as 96% of the moisture [22].

Skin Care: Exfoliants such as finely ground bamboo powder are incorporated into cleansers and scrubs. The uneven, straggly bamboo particles are more abrasive than the smooth ones. It is safer because the grains are made of nuts and salt. Additionally less harsh on skin that is sensitive [23].

Pharmacological Activity:

Hepatoprotective Effect: In thioacetamide-induced liver damage, Chauhan *et al.* (2017) assessed the hepatoprotective potential of a methanolic extract of young *Bambusa arundinaceae* shoots. Damage to the liver in rats.

In-vitro efficacy was evaluated by tracking the health of HepG2 and Hep3b tumour cells line, primary hepatocytes, as well as *in-vivo* activity was measured by taking biochemical parameter readings in addition to the investigations on histopathology. The outcomes demonstrated that The methanolic extract exhibited a notable dose-dependent improvement in cell viability, a decrease in the high concentrations of Histopathology and biochemical parameters also indicated towards the shielding outcome [24].

Effect of Antioxidants: The antioxidant activity of several methanolic fractions (n-hexane, chloroform, ethyl acetate, and n-butanol) was evaluated by Chauhan *et al.* (2017). extract from *Bambusa arundinaceae* young shoots. DPPH method's radical scavenging activity and anti-lipid The reducing power assay methods and the peroxidation effect were utilised. The outcomes showed a strong antioxidant impact. Which could be explained by the high concentration of flavonoids as well as phenolic components. Out of all the fractions, ethyl more antioxidant activity was demonstrated by the acetate fraction [25].

Antidiadetic Effect: In streptozotocin-induced diabetic rats, Nazreen *et al.* (2011) investigated the hypoglycemic impact of ethanolic extract and various fractions of *Bambusa arundinacea* leaves. decreased lipid peroxidation antioxidant enzyme activity and glutathione levels along histological examination were viewed as distinct parameters. When administered, the extracts containing ethanol at a 150 mg/kg and 350 mg/kg doses resulted in a notable glucose-lowering impact. The fraction of ethyl acetate was higher. powerful in reducing blood glucose levels in contrast to Glibenclamide dosage standard (95 ± 10.64 mg/dL) (3 mg/kg) with minimal ulceration in contrast to the norm [26]. The water-based ethanolic seed extracts of B. The anti-diabetic properties of *Bambusa arundinacea* were investigated using Rats given alloxan to induce diabetes were compared to standard. The outcome indicated that considerable safeguarding and maximum decrease [27].

Antifertility: Male rats' fertility was found to be decreased by an ethanolic extract of *Bambusa arundinacea* tender shoots (BASE). The quantity of sperm cells in the caput and cauda epididymis were reduced concurrent with a reduction in the motility of spermatozoa. The testicular, epididymal, vas deferens, and prostate were likewise considerably reduced (Vanithakumari *et al* 1989) [28].

Anti imflammatory: Particularly, bamboo leaf extracts have been shown to have anti-inflammatory properties in a variety of cellular settings [22–24]. While more and more chemical compounds found in bamboo are being identified, most pharmacological research has concentrated on flavonoids found in bamboo leaves [19]. Thus, more research is required to determine the effects of various bamboo by-products and to determine the plant's toxicity. Within this framework, the objective of this study was to assess the bioactivity of two bamboo processing by-products: sheaths and leaves [35]. Because of this, the phytochemical profile of bamboo extracts was investigated, as well as their possible anti-inflammatory and antioxidant properties, utilising human hepatocellular carcinoma HepG2 and THP-1 monocytic cell lines as cellular model systems [29].

Antibacterial Activity: A special plant that nature created in a magical way is bamboo. It is among the strongest and fastest-growing plants in the world. This plant's remarkable natural antibacterial qualities are largely responsible for its popularity. The main factor behind bamboo's fast growth in the wild is its antibacterial qualities. The majority of bacteria and insects that try to flourish on bamboo plants are naturally eliminated upon contact because bamboo has an innate natural barrier against bacteria. One of the few plants that can withstand everything that nature throws at it is bamboo [30].

Anti-Cancer Activity: According to research by Vivek Sharma *et al.,* bamboo shoots contain a number of bioactive compounds with strong anti-cancer effects. Subsequent research showed that significant concentrations of phenolic compounds have strong anti-carcinogenic properties and can scavenge radicals. They also regulate ROS levels, signal transduction cascades, angiogenesis, and cell proliferation [31].

Proliferative Activity: Hyunjin Lee *et al.* (2017) detailed the proliferative effect on human stem cells and showed that *B. tulda* extracts could boost

mesenchymal stromal cell multiplication and enhance cartilage I expression at initial time points. They disclosed the *B. tulda* plant's proliferative activity [31].

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 was 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 potential; this may be because the extract contains alkaloids and saponins [32].

Anti-Ulcer Activity: In rats, a hot-water extract (Folin) of bamboo grass (Sasaalbomarginata) 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 [34, 35].

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 *Bambusavulgaris* 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 [33].

CONCLUSION: Bamboo has wide range of medicinal use. More research and overview is required. Present review is to get attention of researcher for giving more emphasis to the different part of bamboo.

Bamboo plant usually uses for making houses in sub-urban and rural areas. It is also, used as raw materials of different house Research Journal of Biological Sciences hold products, production of paper and useful handicrafts. Bamboo shoot has been suing one of the delicious vegetable in different countries. Research has revealed that bamboo shoots have a number of health benefits. So, it is necessary to promote bamboo cultivation through appropriate methods. As well as verify the impacts of the plants extract in human body as traditional medicine by using modern technology for further recommendation.

ACKNOWLEDGEMENT: The authers are thankful to the Deparment of Pharmacognosy, Matoshri Institute of Pharmacy College, Dhanore, Maharashtra, India for their kind support and guidance for this review article.

CONFLICT OF INTEREST: Nil

REFERANCES:

1. FAO, World bamboo resources: A thematic study prepared in the framework of the Global Forest Resources Assessment. Non-wood forest products-18, Food and Agriculture Organization of the United Nations, Rome 2007.
2. Alam MK: Bamboos of Bangladesh: A Field Identification Manual. Government of the People's Republic of Bangladesh, Bangladesh Forest Research Institute Chittagong 2001; 35.
3. Quintans KN: Ancient Grass-Future Natural Resource, The National Bamboo Project of Costa Rica: A case study of the role bamboo in international development, INBAR Working paper 1998; 16-58.
4. Hammond KO: Cultivate bamboo for employment and income generation, Ghanaian Chronicle (Accra) 2006.
5. Rathod JD, Pathak L, Patel G, Jivani NP, Bhatt Nayna M. Phytopharmacological properties of Bambusa. Chopra RN, Chopra IC, Handa KL and Kapur LD: Chopra's Indigenous Drugs of India, Academic Publisher, Kolkata, Ed. 2nd 2006.
6. Khare CP: Indian Medicinal Plants. An Illustrated Dictionary. Springer publication, New Delhi India 2007; 90.
7. Sangeetha R, Diea YKT, Chaitra C, Malvi PG and Shinomol GK: The amazing bamboo: a review on its

medicinal and pharmacological potential Indian J Nutr 2015; 2(1): 1-7.
8. Jia Sun, Zhao-Qing Ding, Quan Gao, Hang Xun, Feng Tang and Er-Dong Xia: The major chemical consttuent of bamboo shoots (phylloatachyspubescence): Qualitative and Quantitative research Journal of agricultural and food chemistry.
9. Manohari RG, Saravanamoorthy MD, Vijayakumar TP, Vijayan B, Gowri Manohari R and Poongodi Vijayakumar T: Preliminary phytochemical analysis of bamboo seed. World J Pharm Pharm Sci 2016; 5: 1336- 42.
10. 10.Rathod Jaimik D, Pathak Nimish L, Patel Ritesh G, Jivani NP and Bhatt Nayna M: Phyto-pharmacological Properties of *Bambusa arundinacea* as a Potential Medicinal Tree: An Overview J Applied Pharmaceutical Sci 2011; 01(10): 27-31.
11. Vaidya B: Some Controversial Drugs in Indian Medicine, Chaukhambha Orientalia, Varanasi 1982; 203-207.
12. Watt GA: Dictionary of the Economic Products of India, reprinted edition Periodical Expert, Delhi 1972; 1: 383-91.
13. Ghosh NN, Ghosh S and Chopra RN: Chemical and pharmacological examination of the young sprouts of *Bambusa arundinacea*, Arch Pharm Berl 1938; 276- 351.
14. Chatterjee A and Pakrashi SC: The Treatise on Indian Medicinal plants, National Institute of Science communication, New Delhi 2001; 6: 50-51.
15. Singhal P, Lalit Mohan Bal, Santosh Satya P, Sudhakar and Naik SN: Bamboo Shoots: A Novel Source of Nutrition and Medicine 2013; 53(5): 517-534.
16. McClure FA: Bamboos: A Fresh perspective, Harvard university press, Cambridge, Mas, USA 1996; 347.
17. Panda H: Bamboo Plantation and Utilization. Handbook, Publisher: Asia Pacific Business Press Inc 2011.
18. Bal ML, Singhal P, Satya S, Naik SN and Kar A: Bamboo shoot preservation for enhancing its business potential and local economy: A Review Critical Reviews in Food Science and Nutrition 2012; 52(9): 804-814.
19. Jummy Devi O and Priyanka Pamba: "antihypertensive activity of bamboo shoot: a review. "Asian Journal of Pharmacetical Clinical Research 2015; 8.
20. Sangeeta R, Diea YKT, Chaitra C, Malvi PG and Shinomol GK: The amezing bamboo: A review on its medicinal and Pharmaceutical Potential Indian Journal of Nutrition 2015; 1(2).
21. Rahul Shukla, Sumit G, Sajal S, PK Dwivedi and Ashutosh Mishra:" Medicinal importance of bamboo" International Journal of Biopharm and Phytochemical Research.
22. Abdurrahman, Samar Zakir and Mohd Anwar: "ethno medicinal, phytochemical and therapeutic importance of bambusa arundinaceae: A review". International Journal of Unani and Intergrative Medicine 2021; 5(2): 161-164.
23. Rahul Shukla, Sumit G, Sajal S, PK Dwivedi and Ashutosh Mishra: Medicinal important of bamboo International Journal of Biopharm and Phytochemical Research 2012; 1(1): 9-15.
24. Chauhan KN, Shah B, Nivsarkar M and Mehta AA: Hepatoprotective activity of methanolic extract of young shoots of *Bambusa arundinaceae* in thioacetamide induced liver injury in rats. World Journal of Pharmacy and Pharmaceutical Sciences 2017; 6(8): 2492-2503.
25. Chauhan KN, Shah B, Nivsarkar M and Mehta AA: Antioxidant activity of different fractions of methanolic extract of young shoots of *Bambusa arundinaceae*. World J of Pharmacy and Pharma Scien 2017; 6(8): 2492-2503.
26. Nazreen S, Kaur G, Alam MM, Haider S, Hamid H and Alam MS: Hypoglycemic activity of bambusa arundinaceae leaf ethanolic extract i streptozotoci i duced diabetic rats. Pharmacology Online 2011; 1: 964- 97.
27. Macharla SP: Antidiabetic activity of *Bambusa arundinacea* seed extract on alloxan induced diabetic rats. Int J Pharmaceut Res Dev 2011; 83-86.
28. Abdurraahman, Samar Zakir and Mohd Anwar: Ethno medicinal, phytovhemical and therapeutic importance of bambusa arundinaceae: Areview International Journal of Unani and Integrative Medicine 2021; 5(2):161-164.
29. Rosa Tundis, Giuseppina Augimeri, Adele Vivacqua, Rosa Romeo, Vincenzo Sicari, Daniela Bonofiglo and Monica Rosa Loizzo: Anti imfamatory and antioxidant effect of leaves and sheath from bamboo article.
30. bamboosheetsaustralia.com.au/antibacterial-properties-of-bamboo.
31. Ex Munroe: Phytochemical, antioxidant and antimicrobial analysis of *Bambusa tulda* ROXB and *Bambusa nutans* wall, J of Indian Bot Soc 2020; 99: 25-35.
32. Odoratissimus Haque AM, Das AK, Bashar SS, Al-Mahamud R and Rahmatullah M: Analgesic and Activity evaluation of *Bambusa vulgarisaerial* parts. Journal of Applied Pharmaceutical Science 2015; 5(09): 127-30.
33. Senthil Kumar MK: Pharmacognostical, Phytochemical and Pharmacological screening for *Bambusa vulgaris* (Gramineae) and Pandanus (Pandanaceae) (Doctoral dissertation, CL BaidMetha College of Pharmacy Chennai 2012.
34. Otani K, Yanaura S, Yuda Y, Kawaoto H and Kajita T: Histo-chemical studies on the anti-ulcer effect of bamboo grass in rats. Int J Tissue React 1990; 12: 319-332.
35. Muniappan M and Sundararaj T: Anti inflammatory and antiulcer activities of *Bambus aarundinacea*. J Ethnopharmacol 2003; 88: 161-167.

How to cite this article:
Gaikwad PD, Chavhat AN and Daine SK: *Bambusa arundinaceae*: a review on phytochemistry and pharmacological activity. Int J Pharmacognosy 2024; 11(3): 78-83. doi link: http://dx.doi.org/10.13040/IJPSR.0975-8232.IJP.11(3).78-83.