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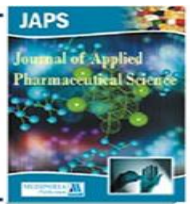

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Phytopharmacological Properties of *Bambusa arundinacea* as a Potential Medicinal Tree: An Overview

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ABSTRACT

Bambusa arundinacea family Graminae is highly reputed ayurvedic medicinal tree commonly known as the Bamboo. It is tall sized tree growing throughout India, moist parts of India. It also occurs in Sri Lanka, Malaya, Peru and Myanmar. The different parts of this plant contain silica, Cholin, betain, cynogenetic glycosides, albuminoids, Oxalic acid, reducing sugar, resins, waxes, benzoic acid, Arginine, cysteine, histidine, niacin, riboflavin, thiamine, Protein, gluteline, contains lysine, methionine, betain, cholin, proteolytic enzyme, nuclease, urease. Various parts of this plant such as Leaf, root, shoot and seed possess Anti-inflammatory, Anti-ulcer, Anti-diabetic, Anti-oxidant, anthelmintic, astringent, emmengogue activity. Various phytopharmacological evaluations have been reported in this literature for the important potential of the *Bambusa arundinacea*.

Keywords: *Bambusa arundinacea*, Phytopharmacological properties, Phytochemicals**.**

INTRODUCTION

Bamboo consist of fresh leaves & dried fruits *Bambusa arundinacea* Linn Graminae (Kirtikar and Basu, 1990). Bamboos are members of the Graminae (Poaceae) family, as are corn, sugar cane and other grasses. Bamboos differ from the other members of the grass family by the presence of branches at each node. A bamboo culm consists of an internode (which is hollow for most bamboo) and a node, which is solid and provides structural integrity for the plant. At the node are one or more buds (depending on the species) which produce side branches. The root (burnt root) is applied to ringworm, bleeding gums, painful joints (Khare, 2007). Seeds are acrid, laxative, said to be beneficial in strangury and urinary discharges (Chopra et al., 1958). Bark is used for skin eruptions (Khare, 2007). Leaf is emmenagogue, antileprotic, febrifuge, bechic, used in haemoptysis (Khare, 2007).

REGIONAL AND OTHER NAMES

Gujarati (Toncor, Wans, Vanskapur, Vas-nu-mitha); English (Bamboo, Bamboo manna, Giant Thorny Bamboo); Hindi(Bans-lochana, Banskapur, Vanoo , Banz); Bengoli (Bans-Kapur, Baans, Baansh, Baroowa Bans); Sanskrit (Vanshalochana, Venulavanam); Arab (Tabashir); Marthi (Bansa, Baambii, Bansamitha); Tamil(Munga-luppa, Mullumangila, Mulmunkil, Mungil); Telugu (Veduruppu, Mulkas Veduru, Mullu Veduru); Maliyalam (Moleuppa); Kannad (Bidaruppu, Tavakshira); Burma (Vd-chha, Vathega-kiyo, Vasan, Vathe gasu); Unani (Tabashir , Tawashir) (Watt, 1972).

Fig 1(a) Roots.

Fig 1 (b) Flowers.

Fig 1 (c) Leaves.

Fig 1: Describes photograph of *Bambusa arundinacea*.

AYURVEDIC DESCRIPTION

Ayurvedic description coriander sativum is described in Table 1.

Table: 1 Describe Ayurvedic Description of *Bambusa arundinacea* (Anonyms, 1988; Khare, 2007; Chandra et al., 2007; Purohit et al., 2007**).**

Botanical name	*Bambusa arundinacea*
Sanskrit name	Vanshlochana
Synonyms	Vamsa, Venu, Rujasaha, Vamsalekhana
Properties	
Rasa	Madhura (Sweet); Kashaya (Astringent)
Guna	Ruksha (Un-unctuous); Laghu (Light); Teekshna (Sharp in action)
Virya	Sheeta (Cold)
Vipaka	Madhura (Sweet)
Doshaghnata	Vanshamoola-kaphapitta shamaka; Patrankur and fruit Pittavardhaka; Vanshoalochana, Vatapittashamaka; Vanshakarir – Vatapitavardhaka (Sharma, 1978; B.N., 1982).
Rogaghnata	External – Paste of root used in Varnavikar, Bhasma used in Dadru, Kushtha and Khalitya. Internal– Agnimandya, Ajeerna, Krimi. Vamana, Atisara & Trishna roga, Hridroga, Kasa, Shwasa.
Karma (Actions)	Vasti Shodhana: Vanshlochana cleanses the urinary system Chhedana: Vanshlochanapossess cutting action so it is used in kidney stones Kushthsjit:Vanshlochana is useful in all skin diseases Vranajit: Vanshlochanafastens the healing of wounds. Bruhana: Vanshlochananourishes the body so increases the bulk of body Vrushya: Vanshlochanais a good aphrodisiac Balya: Vanshlochanaincreases the strength of body Swashjit: Vanshlochanais useful in respiratory distress Kshayajit:Vanshlochana is useful in emaciating or under nutrition conditions.
Therapeutic uses	A good aphrodisiac Nourishes the body so increases the bulk of body Cleanses the urinary system Fastens the healing of wounds Useful in emaciating or under nutrition conditions Increases the strength of body.

DISTRIBUTION

A common bamboo found distributed throughout the moist parts of India, upto an altitude of 1250 m particularly near river banks (Anonymous, 1988), in Central and South India ascending upto 1100 m on the Nilgiri (Nadkarni, 1976), also cultivated in many places in North-West India and Bengal. It also occurs in Sri Lanka, Malaya, Peru and Myanmar (Burma) (Chopra et al., 1958; Gamble, 1967; Kirtikar and Basu, 1989; Brandis, 1972; Agharkar, 1991; Watt, 1972).

BOTANICAL DESCRIPTION

Thorny tree, stems many, tufted on a stout root-stock, grows upto 30 meter high; culms 15-18cm across; nodes prominent, the lower emiting horizontal almost naked shoots armed at the nodes with 2-3 stout recurved spines; internodes upto 45 cm. long. Leaves 17.5 – 20.5 X 2-2.5 cm, linear or linear – lanceolate, tip stiff, glabrous or puberulous beneath, margins scabrous, base cilliate, mid-rib narrow, leaf-sheath ending on a thick callus and shortly bristly auricle. Inflorescence, an enormous panicles often occupying the whole stem. Caryopsis (grain) oblong, 5-8 mm long, grooved on one side. Flowering and Fruiting : Once in life time, often during September – May (Cooke, 1967; Anonymous, 1996; Anonymous, 1988; Bole and Pathak, 1988; Brandis, 1972).

Macroscopic Characteristic

Bamboos characterized by woody, pointed stems, commonly called culms arising from the underground woody jointed rhizomes. Culms are round & smooth. Diameter – few mm to > 30cm. the number of fiber bundles & the manner of their scattering add much to the hardness of the culm. The thickness of the outer shell & the deposit of silica in outer cortical layer also make it very hard.when cums are fresh --- green colour. Ordinarily culms don't bear any branches to a considerable height. Rhizomes is the pachymorph type., woody in nature, arched slightly, upturned sharply at the tip in manner of a walking stick handle, becoming thick & broad at the end bearing the culms & narrow at the proximate end called neck where it attached to the older rhizoms (Anonymous, 1988; Purohit et a., 2007).

PHYTOCHEMICALS

The silicious substance found near the joint inside is a white camphor like crystalline in appearance, slightly sticky to the tongue and sweet in taste (Vaidya, 1982; Watt, 1972). Shoot has active constituents are Oxalic acid, reducing sugar, resins, waxes, HCN, benzoic acid (Ghosh *et al.*, 1938), diferuloyl arabinoxylanhexasaccharide, diferuloyl oligosaccharide (Tadash, 1991), (5, 5'-di--(diferul-9, 9'-dioyl)-[α-Larabinofuranosyl-(1→3)-O-β-D-xylopyranosyl-9 (1→4) –D-xylopyranose] (taxiphyllin) (Leslic, 1978). Seed contain arginine, cysteine, histidine, isoleucine, leucine, lysine, methionine, phenylamine, threonine, valine, tyrosine, niacin, riboflavin, thiamine (Chatterjee and Pakrashi, 2001). Leaves mainly contain Protein, gluteline, contains lysine, methionine, betain, cholin, proteolytic enzyme, nuclease, urease (Chatterjee and Pakrashi, 2001).

Table 2: Describes chemical composition of *Bambusa arundinacea* (Watt, 1972).

Component Content	Percentage (%)
Silica	90.56%,
Potash	1.10%
Peroxide of Iron	0.90%;,
Alumina	0.40%;
Moisture	4.87%

CULTIVATION AND COLLECTION

Climate

Primarily growing in regions of warmer climates during the Cretaceous period, vast fields existed in what is now Asia. Bambusa occurs in moist forests as well as in temperate regions at high altitudes. Bamboo prefers loamy and sandy loamy soils. Best period for cultivation is end of the dry season, a few months prior to the start of the wet. As an irrigated crop, it is grown during June-July and September-October at the onset of northeastern monsoon and harvested on maturity during January-February (Khare et al., 2007; Anonymous, 1988; Purohit et al., 2007).

Soils and Preparation of Land

Nearly all bamboos will do well in either loam or marly soil. Loam is a type of soil composted of sand, silt, and clay, with the concentration being 40%, 40%, and 20%, respectively. Loam generally has a high amount of nutrients and provides a greater amount of drainage than silty soils. In general, bamboos prefer a slightly acidic to moderately acidic soil. Rocky and/or soggy soils should be avoided. Heavy and impermeable soils are also undesirable due to their tendency to slow the growth of bamboos and can also lead to water pondage and rhizome rotting. This tends to be a problem on a flat landscape and can be avoided by installing a drainage system before planting. If you already have a garden growing in your area, there should be little soil preparation needed to get a bamboo plant established. It is a desirable to create a layer of mulch around the bamboo to protect its roots and rhizomes, which are especially vulnerable during the early stages of growth. Mulch is used as a protective layer to shield the base of the plant from the effects of a harsh environment. In areas with heavy storms, wind, or heat, using a layer of mulch is a highly recommended practice. For bamboo growing, organic mulch is the ideal choice. You can create your own blend of mulch by mixing together 1 part dried leaves and 1 part organic compost. This will give the plant sufficient protection, while also feeding the bamboo nutrients (Anonymous, 1988; Purohit et al., 2007).

Manures and Fertilizes

Natural regeneration by seed, the blowing of wind cause transfer of the seeds to near by land, which cause natural regeneration. Artificial regeneration by seeds, divisions, offsets, marcotting, stem or rhizome cutting or by layers, & are ready for exploitation in 10-12 years. Generally fertilizer application is not resorted to for plantations but small doses of Nitrogenous fertilizers (200 g Ammonium sulphate or Calcium-Ammonium nitrate) are applied in a furrow during the 1st year of planting , 200 g superphosphate per plant applied at the time of planting, promotes better development of roots. Similarly, a fertilizer dose in the 2nd year in july is also recommended (Kirtikar et al., 1999; Khare et al., 2007; Anonymous, 1988).

Direct sowing

Before the onset of monsoon the seeds are sown directly at the depth of 20-30 cm in piths, 3-5 m aparts. Direct sowing of seeds is also done in furrows,c 15 cm wide & 3-5 m apart, along the contours. 1 kg seed is sufficient for planting in a hectar. The seed decay if if they get waterlogged or if germination is delayeddue to low soil temp. resulting from early monsoon. Regular weeding & soil-working are attended to. post monsoonal sowing eliminates the weeds (Anonymous, 1988; Purohit et a., 2007).

Irrigation

Deep pipe irrigation is commonly done with 2.5-5 cm diameter plastic pipe placed vertically 30-50 cm deep in the soil near a tree seedling. A screen cover (1 mm mesh) can be added to keep out Lizards and animals. Alternatively, bamboo with the node partitions drilled or punched out, rolled veneer, or a slat box can be used. If none of these are available a bundle of tightly tied straight twigs can be used. The seedling should be fairly close to deep pipe (2.5-7.5 cm away), while the pipe can be set further from larger plants. Several pipes may be used for larger tree. These can be arranged around the tree to encourage symmetrical root growth to resist winthrow. By delivering irrigation water through deep pipes rather than on the surface, tree roots tend to grow down rather than at the surface where grains or vegetables may be seasonally intercropped (Kolakar and Muthana, 1984; Mathew, 1987; Bainbridge and Virginia, 1990; Bainbridge, 1992).

Interculture

In drier areas, with rainfall less than 800 mm, it has been found that mulching around seedlings encourages growth through reduced evaporation of soil water. Spot weeding rids the seedlings of competing weeds. This should be done at a radius of 60 cm around the seedlings after outplanting. Weeding should be regular or as necessary to avoid competition from weeds. The soil should be loosened at least three times during the plantation establishment year to improve aeration (Kigomo, 2007).

Pests and Diseases

Rats and porcupines which gnaw through the rhizome and bases of culms; squirrels which gnaw the tender growing shoots, pigs which dig up and eat rhizomes; hares, deer, goats and cattle which browse and trample growing seedlings are the enemies in the seedling stage. Monkeys and langurs (*Pithecus enlellees*) damage the tender shoots and elephants and other wild animals pull down, trample and destroy the whole clump. Spotted deers do considerable damage to new culms during the rains. Insects like *Estigmena chinensis* and *Cyntotrachelus longimanus* attack growing culms, but insect pests like *Dinoderus ocellaris* and *Stromatium barbatum* attack cut culms and *Dinoderus minutus* attack both cut and living ones. The most important precautionary

measure that could be taken against beetle attacks is to restrict bamboo cutting to cold and rainy periods. Mass build-up of a bug, *Udonga montana* was found in flowered areas during 1992 in Wynad (Mathew and Sudheendra Kumar, 1992).

Natural durability and Preservation

General preservative treatment used for bamboos can be adopted for this species. In addition to the traditional method of adjusting cutting season (for regulation of starch) and immersion in mud ponds, many chemical treatments especially copper based preservatives are effective. Preservatives can be given by dipping the cut ends in solutions for two to three days and allowing the excess solution to drip under gravity. It is better to leave the branches and leaves as such in order to accelerate the process of absorption of preservatives (Jayanetti, 1975). A field experiment of chemical treatment showed that the use of 10 per cent copper sulphate solution (butt end immersed in chemical solution for seven days) can extend service life considerably. For bamboos stored without ground contact, boric acid is better (Kumar et al., 1994).

PHARMACOLOGICAL STUDIES

Antidiabetic activity

Aqueous ethanolic solvent extracts of *Bambusa arundinacea* seeda werw tested for anti-diabetic activity using alloxan indused diabetic rats and compared with standard. The result expressed that aqueous ethanolic extracts had shown significant protection and maximum reduction in blood glucose was observed in alloxan indused diabetic rats. The results of this comprehensive study reveal that *Bambusa arundinacea* seed shown statistically significant Anti-Diabetic activity in comparision to the standard glibenclamide (Macharla, 2011).

Antifertility effect

An ethanolic extract of *Bambusa arundinacea* tender shoots (BASE) caused a reduction in fertility of male rats. After administration of 300 mg/kg per day of BASE for 7 days, the fertility index decreased to 15% for control rats and to 23% after a 7day recovery period, respectively. The number of cohabited females being successfully inseminated was reduced especially after 4 days of treatment. Complete recovery of mating behavior was evident 8 days after BASE withdrawal. The number of spermatozoa in the caput and cauda epididymis were decreased concomitant with a decrease in the motility of spermatozoa collected from the cauda epididymis. The weights of testes, epididymides, vas deferens and prostate were also significantly decreased. The serum profile of protein and oxaloacetic/pyruvic transaminase activity show the extract to be relatively non-toxic (Vanithakumari et al., 1989).

Antibacterial activity

Water-phase extract of bamboo shavings (WEBS), by supercritical carbon dioxide extraction, was evaluated for its antimicrobial action against the range of food borne and food spoilage pathogens using agar disc diffusion assay in nutrient agar and Czapek Dox Agar media. The WEBS exhibited antimicrobial activity against *Staphylococcus aureus*, *Bacillus subtilis*, *Escherichia coli*, *Aspergillus niger*, *Penicillium citrinum* and *Saccharomyces cerevisiae* with a concentration-dependent relationship. The minimum inhibitory concentrations (MICs) of the WEBS against the tested bacterial strains were found in the range of 4.9 - 32 mg/ml using the two-fold dilution method. Different heat treatment conditions have no significant influence on the antibacterial activity. Emodin was taken as the standard sample to test for the content of total anthraquinone compound and preliminarily verify its antibacterial mechanism, so as to lay a theoretical foundation for development of its natural preservatives (Zang et al., 2010).

Antiinflammatory and Antiulcer

The extracts of *Bambusa arundinacea* have been used in Indian folk medicine to treat various inflammatory conditions. The plant has got antiulcer activity also. It is thought that these two properties in the same extract are very much useful in the treatment of inflammatory conditions. It is well known fact that the most of the available antiinflammatory drugs are ulcerogenic. The antiinflammatory effect of the methanol extract of the leaves of *Bambusa arundinacea* against carrageenin-induced as well as immunologically induced paw oedema and also its antiulcer activity in albino rats have been studied and found to be significant when compared to the standard drugs. The combination of methanol extract and phenylbutazone (Non-Steroidal Antiinflammatory Agent, NSAIA) has been studied and found to be the most potent antiinflammatory activity experimentally with least toxic (no ulcerogenic) activity. Thus, the combination of herbal product (methanol extract of *Bambusa arundinacea*) with modern medicine (NSAIAs) will produce the best antiinflammatory drug and will be useful for long-term treatment of chronic inflammatory conditions like rheumatoid arthritis with peptic ulcer, which are common (Muniappan et al., 2003).

Protective effects

Two biological activities of bamboo-derived pyrolyzates were investigated; the protective effects against N-methyl-d-aspartate (NMDA)-induced cell death in primary cultured cortical neuron and the anti-plasmin effects determined by using fibrin and fibrinogen degradation products (FDPs) assay. Results: Treatment of neuronal cells with pyrolyzates of Phyllostachys pubescens, Phyllostachys nigra and Phyllostachys bambusoides resulted in restored cell viability when compared to untreated cells in an NMDA-induced neuronal cell death assay. In addition, cortical neurons treated with Phyllostachys pubescens and Phyllostachys nigra showed a reduction of apoptosis following exposure to NMDA, as determined by Hoechst 33342 staining. In addition, Phyllostachys nigra pyrolyzates also exhibited anti-plasmin action in a FDP assay. It is of interest to note that pyrolyzates exhibited activities of NMDA-receptor antagonist and antifebrin (ogen), since a combination of NMDA receptor antagonists, glucocorticosteroids, GABAergic drugs and heparin are useful for

treatment in delayed postischemic injury. Conclusion: Our results indicate that the pyrolyzates derived from bamboo may have anti-apoptotic effects, and can be useful as a supplement for ischemic injury treatment (Hong et al., 2010).

CONCLUSION

Numerous phytochemical and pharmacological studies have been conducted on different parts of *Bambusa arundinacea*.. The present literature supports the potential of *Bambusa arundinacea* as a medicinal tree. In view of the nature of the plant, more research can be done to investigate the unexplored and unexploited potential of this plant.

REFERENCES

Agharkar SP. Medicinal Plants of Bombay presidency, Scientific Publisher, Jodhpur. (1991) 35-36.

Anonymous. Flora of Maharashtra State, Monocotyledones, edited by Sharma BD *et al*. Botanical Survey of India, Calcutta. 1996; 412.

Anonymous. The Wealth of India, Raw materials, volume-2B, Council of Scientific and Industrial Research, New Delhi (1988) 1-38.

Bainbridge DA., Virginia RA. Restoration in the Sonoran desert of California. Restor. And Mgmt. 1990; Notes. 8(1) : 1-14.

Bainbridge DA. Deep pipe irrigation, Rverside, CA, groundworks. 1992; 1.

Bole PV and Pathak JM. Flora of Saurashtra, Botanical Survey of India. Part – III. (1988) 392.

Brandis D: The Forest Flora of North West and Central India, Bishen Singh Mahendra Pal Singh, DehraDun. (1972) 564-566.

Chandra K., Chaudhari BG., Dhar BP., Joseph GVR., Mangal AK., Dabur R., Mandal T K., Gaurav AM., Yelne MB., Singh SP. Database on medicinal plants used in ayurveda, Central Council for Research in Ayurveda & Siddha, Department of AYUSH, Ministry of Health & Family Welfare, New Delhi (2007) 462-470.

Chatterjee A., Pakrashi SC. The Treatise on Indian Medicinal plants, National Institute of Science communication, New Delhi. (2001); 6: 50-51.

Chopra RN., Chopra IC., Handa KL., Kapur LD. Indigenous Drugs of India, U.N.Dhur and Sons Pvt. Ltd., Calcutta (1958) 289, 665.

Cooke T. The Flora of the Presidency of Bombay, reprinted edition, volume-III, Botanical Survey of India, Calcutta (1967) 569.

Eui-Ju Honga, Eui-Man Junga, Geun-Shik Leea, Joo Youn Kima, Ki-Jeong Naa, Mi-Jin Parkb, Ha-Young Kangb, Kyung-Chul Choia, Yeon Hee Seonga, In-Gyu Choic, Eui-Bae Jeunga._Protective effects of the pyrolyzates derived from bamboo against neuronal damage and hematoaggregation, Journal of Ethanopharmacology. 2010; 594–599.

Gamble JS. Flora of the Presidency of Madras, second reprinted edition, volume-III, Botanical Survey of India, Calcutta (1967) 1286.

Ghosh NN., Ghosh S., Chopra R N. Chemical and pharmacological examination of the young sprouts of *Bambusa arundinacea*. Arch Pharm Berl. 1938; 276- 351.

Jayanetti DL. Some methods for preservative treatment of bamboo. The Sri Lanka Forester, Sri Lanka (1975) 12: 101-103.

Khare CP. Indian Medicinal Plants. An Illustrated Dictionary. Springer publication. New Delhi, India (2007) 90.

Kigomo NB. Guide lines for growing Bamboo, Kenya Forestry Research Institute (2007) 4.

Kirtikar KR., Basu BD. Indian Medicinal Plants, volume-IV, International Book Distributers, Dehradun, India (1990) 2724– 2727.

Kolakar AS., Muthana KD. Subsurface watering of tree seedling in arid regions using discarded plastic infusion sets, Desert Plants. 1984; 6(1) : 5-8.

Kumar S., Shukla K S., Dev I., Dobriyal P B. Bamboo Preservation Technique: A Review. INBAR Technical Report No.3. International Network for Bamboo and Rattan, New Delhi and Indian Council of Forestry Research and Education, Dehra Dun. 1994; 59.

Mathew G., Sudheendrakumar VV. Outbreak of *Udonga montana* (Distant) (Heteroptera; Pentatomidae) on bamboo in natural forests and adjoining plantations in Wynad, Kerala. BIC-India Bulletin. 1992; 2(2): 17-18.

Mathew TJ. Cheap micro-irrigation by plastic pipes, In Simple Methods of Localized Water Conservation, Areeplachy, Kerala, India: Soc. For Water and Envir. Cons. 1987; 22.

Muniappan M., Sundararaj T. Antiinflammatory and antiulcer activities of *Bambusa arundinacea*. J. Ethnopharmacolgy. 2003; 88 : 161–167.

Sharma PV. Classical Uses of Medicinal Plants, Chaukhambha Visvabharati, Varanasi, India (1996) 333.

Vaidya B. Some Controversial Drugs in Indian Medicine, Chaukhambha Orientalia, Varanasi (1982) 203-207.

Vanithakumari G., Manonayagi S., Padma S., Malini T. Antifertility effect of *Bambusa arundinacea* shoot extracts in male rats. J Ethnopharmacol. 1989; 25(2): 173.

Watt G. A Dictionary of the Economic Products of India, reprinted edition, volume-I, Periodical Expert, Delhi (1972) 383-391.

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.