

Food, medicinal and economic aspects of Bamboo species

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ABSTRACT

Bamboo represents one of the world's greatest natural and renewable resources. Owing to its many qualities, mankind has exploited it since time immemorial. It provides materials for household items as well as food, medicine, musical instruments, paper, clothing, transportation, etc. Bamboo is the source of economic aptitude for many communities and regions. Keeping in mind the versatile importance of bamboo, an attempt has been made to collect more information on bamboo for sustainable uses in the future through field and literature surveys in Chhattisgarh, Odisha, and Karnataka states, India. This document emphasizes the health benefits of bamboo shoots and their potential for utilization as health food. The results enumerated that about 15 species of bamboo are commonly used in Chhattisgarh, Odisha, and Karnataka states. It is observed that it is used as a multisource of food, shelter, medicine, socio-cultural and ecological needs, and has economic values.

Key words: Bamboo, Renewable resource, Health food, Economic values

Introduction

Bamboo, a group of tall arborescent grasses, has been associated with people since ancient times. In the areas of their prevalence, bamboo is intricately linked with the socio-economic development of rural communities (Chandra *et al.*, 2007). Bamboo, the giant grass in the world, is included in the Poaceae family (Canavan *et al.*, 2017), and is characterized as one of the most essential sustainable, easily gained, and profitable of all forest resources (Buckingham *et al.*, 2011). Bamboo is naturally found in almost all parts of the country. Owing to its many qualities, mankind has exploited it since time immemorial (Chongtham *et al.*, 2011). Its multipurpose uses, fast growth, easy propagation, and short gestation pe-

riod have made it very popular amongst rural people (Swain, 2018), and also popularly known for its industrial uses. A lesser-known fact about bamboo is the usage of its young shoots as food that can be consumed fresh, fermented, or canned. Most of the bamboo species seemed to be familiar and habituated by human beings since the origin of civilization (Dash *et al.*, 2022). Bamboos are explained in the traditional practice of pharmacology for treating a variety of health conditions (Table 1) (Plate 2) like high blood pressure, coronary artery disease, acute myocardial infarction, and certain classes of cancer. These curing properties are mainly beneficial to health and mediated due to their antioxidant property (Dash *et al.*, 2022). Several nutrients and bioactive compounds present in juvenile bamboo

Table 1. Pharmacological importance of different plant parts of Bamboo species

Botanical name	Plant parts	Pharmacological importance
<i>Bambusa vulgaris</i> Nees	Leaves & culm	Treat infantile epilepsy, haematuria, & kidney problems
<i>Bambusa nutans</i> Wall. ex Munro	Leaves	Anti-inflammatory, antioxidant, and antidiabetic
<i>Bambusa arundinacea</i> (Retz.)Willd.	Leaves and shoots	Antidote to snakebite, antiulcer, and antimicrobial
<i>Bambusa tulda</i> Roxb.	Leaves & shoots	Antifatigue, and antioxidant
<i>Bambusa balcooa</i> Roxb.	Leaves & stem	Antioxidant & treat peptic ulcer
<i>Bambusa bambos</i> (L.) Voss	Leaves	Leucoderma, antarthritic, & antiobesity
<i>Bambusa tuldoidea</i> Munro	Culm cortex	Treat febrile diseases
<i>Dendrocalamus asper</i> Backer ex K. Heyne	Leaves	Reduce hypertension
<i>Dendrocalamus strictus</i> Nees	Siliceous parts of leaves and nodes	Antipyretic and carminative
<i>Dendrocalamus giganteus</i> Munro	Culm	Aphrodisiac tonic
<i>Dendrocalamus latiflorus</i> Munro	Leaves	Antifungal
<i>Dendrocalamus hamiltonii</i> Nees & Arn. ex Munro	Shoots	Antioxidant & antimicrobial
<i>Phyllostachys bambusoides</i> Siebold & Zucc.	Leaves	Anti-inflammatory & lipid lowering
<i>Phyllostachys nigra</i> (Lodd. ex Lindl.) Munro	Young stems & epidermis of bark and leaves	Cardioprotective and lipid lowering
<i>Pseudosasa japonica</i> Makino ex Nakai	Leaves	Anthelmintic, antiviral

shoots like phenols, vitamin c, flavonoids, selenium, iron, copper, zinc, manganese etc. make it a rich source of secondary metabolites, which provide several health benefits and seem to protect against many incurable and degenerative diseases (Tanaka *et al.*, 2014). The present study brings attention to its importance.

Materials and Methods

The present study and field survey were carried out during 2021-2023. The scientific information on the Bamboo species from the survey is presented, which was collected from scientific databases such as Google Scholar, Science Open, Springer Link, Mendeley, Indian Journals online, Wikipedia, Pub Med Central, and offline publications, along with books. The field survey was carried out during several floristic works, day-to-day observations and field visits in Chhattisgarh, Odisha, and Karnataka states, India (Dash *et al.*, 2022).

Morphology

Basically, bamboo plant consists of ramifying system of segmented vegetative axes such as rhizomes, culms, and culm branches (Plate 1). Roots are the only unsegmented part of the bamboo plant; each segmented axis is a branch of another segmented

axis and consists of nodes and internodes (Dash *et al.*, 2020). During the period of its active growth, it is clothed with enveloping sheaths facing alternate sides at successive nodes (Kumari and Singh, 2014).

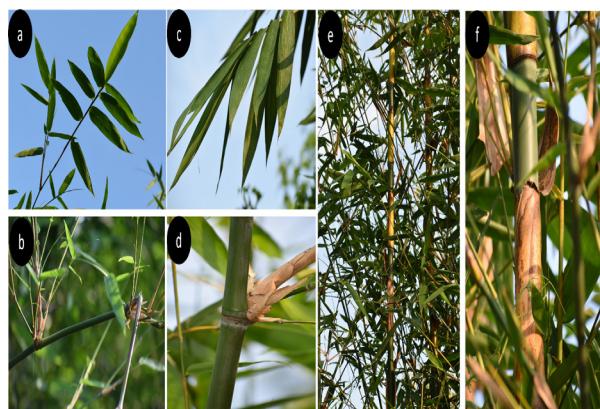


Plate 1. Different parts of the plant body of bamboo (a) stem with leaves, (b) branch growing from node, (c) Leaves, (d) Nodes, (e) Whole plant, (f) Internodes & Sheath

Rhizome system

The rhizome system constitutes the structural foundation of the plant and performs important functions in the plant life. Each rhizome develops from a bud on another rhizome. These are complete under-

ground stem or the basal portion of stems (Kumari and Singh, 2014). They serve to support aerial stems, store food reserves and also help in vegetative reproduction. Rhizomes are composed of repeating units consisting of a node, an internode, a leaf, and usually a bud and one or more roots. The repeating units of an individual rhizome consist typically of 2 parts: the rhizome neck and the rhizome proper (Dash *et al.*, 2020).

Roots

Roots are the only unsegmented vegetative axis of a bamboo plant. They are slender, roughly cylindrical and apparently not increasing in diameter with age. In bamboos, the seedling root system may continue to grow and function, but the majority of the root system is formed by additional adventitious roots that grow from the nodal regions of the underground stem system, including the rhizomes and bases of the aerial culms. The adventitious root system of any bamboo plant forms an extensive, delicate network in the soil that is essential for the growth and development of that individual plant (Long *et al.*, 2023).

Nodes and Internodes

The node is where a leaf is attached to the stem; a bud, associated with the node, is present in the axil of the leaf. The portion between two nodes is termed internodes (Long *et al.*, 2023). In most of the Indian bamboos, internode is terete but often it is flattened or grooved on branching side or quadrangular, and is smooth, but the surface may be rough to scabrous or warty (Kumari and Singh, 2014).

Flowers

The flowers are very small and adapted for wind pollination. In bamboos, the flower comprises the lodicules, the stamens, and the pistil. The lodicules are always delicate structures, thick at base and thin, translucent, and often fringed at distal part. Next to the lodicules, there are stamens, which may be usually 6, 3 or 4, 5, 7 when irregular. The pistil consists of three clear distinct structures: ovary, style, and stigma. Pollination mechanism is relatively less known in bamboos but wind pollination is the rule in woody bamboos (Sanchez *et al.*, 2017).

Fruits

The bamboo fruit is indehiscent and the single seed usually fills the pericarp completely. The external

features of bamboo embrace a wide range of forms such as a caryopsis furnished with a thin pericarp and shaped like a wheat grain but with the short two or three prolonged stylar column or its base persistent at the apex. After maturation the florets usually break apart or disarticulate from glumes (Gopal and Ram, 1987).

Results and Discussion

Considering the following versatile uses of bamboo in every aspect of human survival from ecological values to food and uncountable economic values, it would be a right decision to uplift this plant for research and development, its plantation and encourage the sustainable uses of its products.

Food Values

Bamboo shoots are considered as one of the useful health food. A lesser-known fact of bamboos is the usage of its young shoots as food that can be consumed fresh, fermented, or canned (Choudhary *et al.*, 2012). The juvenile shoots are not only delicious but are rich in nutrient components, mainly proteins, carbohydrates, minerals, and fibres and are low in fats and sugars (Dash *et al.*, 2020). In addition, they contain phytosterols and a high amount of fiber that can be labeled as nutraceuticals (Nongdam and Tikendra, 2014). The raising trends of health consciousness among consumers have stimulated the field of functional foods and bamboo shoots can be one of them. Bamboo fiber is now a common ingredient in breakfast cereals, fruit juices, bakery and meat products, sauces, shredded cheeses, cookies, pastas, snacks, frozen desserts, and many other food products. Bamboo seeds are locally known as *baunsa dhana* or *baunsa paddy* collected by poor



Plate 2. Traditional food and economic importance of Bamboo in rural areas

people (Plate 2) as the inferior substitute of rice, to cook and consume like over-boiled rice (jau) (Soumya *et al.*, 2016). Bamboo has a huge use in food and beverage industries, such as bamboo bear, bamboo vinegar etc. (Satya *et al.*, 2012).

Pharmacological properties

Modern researches have revealed that bamboo shoots have several health benefits: improving appetite and digestion, weight loss, and treating cardiovascular diseases and cancer. The shoots are reported to have anticancer, antibacterial, and antiviral activity (Watcho *et al.*, 2019). Shoots have antioxidant capacity due to the presence of phenolic compounds. This study emphasizes the health benefits of bamboo shoots and their potential for utilization as a health regulatory plant species (Panee, 2015). Bamboo leaves set right the irregular menstruation, used as an expectorant to relieve nasal congestion, used as an antibiotic and anti-inflammatory, induces labor, meant for acid digestion, anti-venomous, diuretic for stool elimination, antidiabetic, treat aphrodisiac etc. Black bamboo leaves control bacterial infections, help in urination, reduce fever, treat chest cold and heat colds, treat pharyngitis. Stem sap of black bamboo treat bronchial and cerebral infections, lung infections, control phlegms. Roots and leaves reduce fever in babies (Satya *et al.*, 2012). Timber bamboo is used to reduce fever, stems of new shoots are used as a remedy for treating urine infection. Bamboo mana are used in chyawanprash, used to cure asthma, cough (Chandra *et al.*, 2004). Finely milled bamboo powder used as cleanser and scrub. Bamboo silica extract is good for damaged and dry hair. It also helps to repair and rebuild collagen and used as moisturizer, that reduces wrinkles and smoothen skins (Nasri *et al.*, 2015).

Ecological security

Bamboo with its giant ecological benefits alone is quickly becoming more than just a poor man's timber (Basumatary *et al.*, 2015). In present time, bamboo is also seen as the 'wonder plant'. It stands as an ideal species capable of achieving eco-restoration of degraded lands, conservation of soil, moisture, and providing economic security as well (Swamy, 2011). It can mitigate the pressure on natural forests as well as contribute conservation of biodiversity. The role of bamboo is manifold. Its biological characteristics make it a perfect tool for reducing carbon dioxide levels in atmosphere. It could be a unique and ideal

ecofriendly species as carbon credits (Mishra *et al.*, 2014). Altogether, it is an atmospheric and soil purifier, generating more oxygen than equivalent strand of trees. The great diversity of species makes bamboo adaptable to many environments, needing relatively few nutrients to grow. Moreover, thriving on degraded lands, it restores them into functional forest ecosystems.

Socio-cultural and economic values

In ancient times, bamboo has been integral element to religion ceremonies, art, music, and daily life. Many studies have revealed that the bamboo trees were source of paintings, poems and these cultures are mainly established in Asian civilization. People use bamboo stems for food and also as weapons for hunting (Basumatary *et al.*, 2017). Lucky bamboo is used for home decoration. Wind chime, toys, jewellery design, wall decors, tray designing can be made from bamboos (Hazzar, 2011). Generally musical instruments are made from bamboos. Two types of instruments such as string instruments, blowing instruments and percussion instruments like guitar, flute, drum, xylophone, piano, whistles, cornet etc. are made from bamboos (Cottingham, 2014). Bamboo cultivation creates an opportunity for income generation for rural dwellers and serves as job creation for those who engage in its activities as well as employment in small and medium scale enterprises. The most important economic benefit that most rural dwellers get is when they engage in commercial transaction in their bamboo produce. The findings reveal that most communities where bamboo is cultivated commercially benefit from infrastructure such as housing, roads, power, schools and hospitals (Akwada, 2016). The local community is benefited from community development projects from these industries. Bamboo needs only 3-5 years to mature. After harvesting, bamboo will regrow itself without planting a new tree. Just like this, bamboo brings economic values almost year around. The government of India and many other countries are encouraging the farmers to develop bamboos to replace timber trees.

Conclusion

In the daily life of human beings, bamboo is a plant species that can provide food, health, economic and ecological benefits. Considering the above aspects, it is indeed highly needed to emphasise on mass plan-

tation of bamboo on a large scale in our country. This will hopefully help to go a long way in mitigating the erosion of biodiversity, climate change, dietary deficiencies, and insecure economy. Apart from all the uses, it can be a great way to conserve biodiversity and many faunal species that rely on bamboo as their habitat. It will employ people directly or indirectly through marketing and the production of raw bamboo and its value added products, thereby improving food, economic and environmental security as well as ecological security.

Conflict of interest

Authors declare no conflict of interest.

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