**BAMBOO SHOOT: A TRADITIONAL INDIAN SUPERFOOD FROM NORTHEAST**

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**Abstract**

Bamboo shoot is an important constituent of traditional cuisine of some parts of India, particularly in North-Eastern region and is highly valued for its nutritional and health benefits due to the presence of several bio-active compounds. In many Asian countries, bamboo shoots as vegetables are harvested as a national crop. The shoots are classic ingredients in Chinese and other Asian foods, but result from the sprouts of new growth on a mature bamboo plant. Not only are bamboo shoots edible but they are low in fat and calories, easy to grow and harvest, as well as containing loads of fiber and potassium.The present article gives an insight about bamboo shoot-based food products and their consumption pattern, the quality attributes, and the opportunities for value addition along with future prospects in view of international food safety, security and nutrition.

**Keywords:** Bamboo, Bamboo shoots, Traditional food, Therapeutic values, Nutritional values, North East Region.

**INTRODUCTION**

Bamboo shoots are the newly sprouted canes that form just under the soil, and have a firm crisp texture. Bamboo grows from rhizomes, which are underground stems carrying the genetic material necessary for growth and featuring growth nodes which are sprouting points on the stem. Bamboo has been used traditionally by tribal for decades all over the world.[[1]](#gjdgxs)

Bamboo belongs to the grass family Poaceae. The long straight stalks of this giant grass can reach up to 100 feet tall depending on the species. Bamboo in more temperate climates is usually less than half that size, but tropical bamboos can reach staggering heights. The stalks are jointed and hollow, often growing in thick stands. Out of 1575 known species of Bamboo only 110 species are recorded to have edible shoots, though some bamboo shoots are classified as edible they must be carefully prepared and boiled before consuming.[[2]](https://scholar.google.com/citations?user=1CH2-NEAAAAJ&hl=en&oi=sra)

Regarding the food applications, the leaves and shoots of edible bamboo have been under consideration for many years. Published articles had announced the anti-oxidant, anti-microbial, anti-inflammatory, anti-helminthic, anti-diabetic and anti-ulcer activities of various extracts and components from bamboo leaves. This was mainly ascribed to the phenolic components in bamboo leave such as orientin, homoorientin, isoorientin, vitexin, homovitexin, and tricin and phenolic acids.[[3]](https://doi.org/10.1016/j.tifs.2018.05.003)

Raw bamboo shoots contain cyanogenic glycosides, natural toxins also contained in cassava. The toxins must be destroyed by thorough cooking and for this reason fresh bamboo shoots are boiled before being used in other ways. The toxins are also destroyed in the canning process.[[4]](https://scholar.google.com/scholar?cluster=16247257509955626040&hl=en&as_sdt=2005&sciodt=0,5)

**NUTRIENT COMPOSITION**

**“***Simple is sustainable”* When it comes to eating and well-being, no complicated algorithms are necessary: eat less, make healthy choices and live more. Bamboo shoot being one of the simplest means of nutrient consumption is highly in demand due to its therapeutic and nutritional values. Bamboo shoots have immense potential of being used as important health food as they contain high proteins, amino acids, carbohydrates, many important minerals, and vitamins. Freshly collected bamboo shoots have a good amount of thiamine, niacin, vitamin A, vitamin B6, and vitamin E[[5]](#2et92p0). The table below shows the nutrient composition of bamboo shoots[[6]](#tyjcwt).

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| **S. NO.** | **NUTRIENT** | **COMPOSITION** |
| **1.** | Amino acid | Bamboo shoots have a rich amount of amino acids. Out of 17 amino acids found in bamboo shoots, 8 are essential for the human body. However, the amount of amino acids in fermented and canned shoots is less than in the freshly collected juvenile shoots. |
| **2.** | Proteins | Bamboo shoots are a good source of protein and +protein content ranging from 1.49g/100g to 4.04g/100g fresh weight. |
| **3.** | Minerals | Has a good profile of over 10 types of mineral elements, i.e. chromium (Cr), zinc (Zn), manganese (Mn), magnesium (Mg), nickel (Ni), cobalt (Co), copper (Cu), lysine, germaclinium and other nutritious phytoconstituents. |
| **4.** | Carbohydrate | The level of carbohydrates present in bamboo shoots is reported to be high and its content in edible shoots of*Bambusanutans, Bambusa vulgaris, Dendrocalamusstrictus,* and*Dendrocalamusasper* was found at 3.3%, 3.4%, 0.6%, and 2.9%, respectively. |
| **5.** | Fat | Bamboos shoots are known to have very less amount of fats and its low content makes them an ideal candidate for providing healthy nutrition to people with diabetic and cardio thoracic diseases. |
| **6.** | Fibre | Dietary fibre components such as NDF, ADF, lignin, hemicellulose, and cellulose are found in bamboo shoots. |
| **7.** | Phytosterol | Phytosterols with a structure similar to cholesterol are extensively found in plants and their presence in fresh or fermented bamboo shoots is very prominent. |
| **8.** | Phenol | There are eight phenolic acids in bamboo shoots of*Phyllostachyspubescens* of which protocatechuic acid, p-hydroxybenzoic acid, and syringic acid were found to be most abundant. |

**WAYS OF CONSUMING BAMBOO SHOOT**

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| **Fermented bamboo shoot** | The bamboo shoots in fermented form are consumed as one of the favourite traditional foods by different ethnic communities. Fermented bamboo shoots not only have extended shelf life but fermentation also enhances the safety of foods using the natural microflora and their antibacterial compounds.[[7]](#3dy6vkm) |  |
| **Fresh bamboo shoot** | The indigenous people of northeast India take fresh shoots as one of the popular food items. Fresh bamboo shoots are boiled before being used to destroy the toxins present in it. They have a flavor that's somewhat similar to water chestnuts with an extremely mild flavor. It's subtly earthy, woody and a touch nutty.[[8]](#1t3h5sf) |  |
| **Bamboo shoots pickle** | Bamboo shoots are pickled and can be stored in brine for years. Pickled bamboo shoots are removed from the brine when needed and are used in cooking. Pickled bamboos get soft with time but still remain chewy. |  |
| **Dried bamboo shoots:** | A dried bamboo shoot is mangkho(“mahngkoh”). Dried bamboo shoots are not hard, but rather leathery. Once reconstituted and boiled until chewy-tender, dried bamboo shoots have a chewy-tenderness and pleasant sweetness that's not found in fresh or canned bamboo.[[9]](#4d34og8) |  |

**HEALTH BENEFITS OF BAMBOO SHOOT**

The bamboo shoots are the integral constituents of many of the popular traditional cuisines. It possesses a number of health benefits.

* The presence of tyrosine facilitates biochemical metabolism of our body as it is a major constituent of adrenals which are precursors for adrenaline, necessary for active body metabolic activities. It also plays an important role in the function of thyroid and pituitary glands which are involved in producing and regulating hormones in the human body.[[10]](#2s8eyo1)
* Presence of high fibre and phytosterols in bamboo shoots reduces fat and cholesterol levels of blood.
* The dietary fibre possesses a number of health benefits as it controls blood pressure, hypertension, and obesity and also protects our body from coronary diseases and potential carcinogens.[[11]](#17dp8vu)
* The high dietary fibres and low fat in bamboo shoots help in reducing the thickening of arteries maintaining the blood pressure.
* There are instances of using bamboo shoots by KarbiAnglong tribes of India to control early stages of cancer.
* The production of carcinogens, growth of cancer cells, cell invasion, and metastasis are inhibited by phytosterol.[[12]](#3rdcrjn)
* Bamboo shoots are used by local tribes belonging to Bodo, Thadau, Mosang, and Tiwa for treatment of irregular menstrual cycle, heavy bleeding after delivery, infertility problems, reducing labour pain, and also for inducing puberty in young females.

**BAMBOO-BASED TRADITIONAL FOODS OF NORTH-EAST INDIA**

About 16 edible bamboo species are reported in Northeast India [[13]](#26in1rg) and some of the important edible bamboo species are Arundinariacallosa, Bambusanutans, Bambusapallida, Bam- busapolymorpha, Bambusatulda, Dendrocalamushamiltonii, Dendrocalamusgiganteus, Dendrocalamusbrandisii, Melocannabaccifera, Melocannabambusoides, Dendrocalamushookeri, Dendrocalamussikkimensis, Dendrocalamusstrictus, and Phyllostachysmanni. The bamboo shoots form an integral part of many of popular traditional cuisines and the locals consumed either fresh or fermented bamboo shoots in the form of various local delicacies.

In Arunachal Pradesh, young bamboo shoots are boiled and cut into pieces and used as vegetables for prepa- ration of a traditional dish called kupe.[[14]](#lnxbz9) Shoots obtained from Bambusabalcooa, Bambusanutans, and Dendrocalamusstrictus are slightly bitter and require proper processing by either steaming or boiling briefly and changing the water intermittently till the bitterness is lost.

In states like Meghalaya, Mizoram, and Sikkim, the fresh young shoots of Melocannabaccifera, Dendrocalamushamiltonii, Bambusabalcooa, and Chimonobambusahookeriana are consumed either boiled with other leafy vegetables or fried with other non vegetable components.[[15]](#35nkun2)The bamboo shoots in fermented form are consumed as one of favourite traditional foods by different ethnic communities. Some of the important fermented bamboo shoot products familiar with locals are soibum, soidon, soijim, bastangapani, rep, eup, mesu, and so forth.

Soibum is one of the most popular fermented foods of Manipur normally available in almost all local vegetable markets . It is made from tender shoots of Dendrocalamushamiltonii, Dendrocalamusgiganteus, Bam- busatulda, Bambusabalcooa, and Bambusa pallid and is widely used in preparation of special delicacies. Jeyaram et al.[[16]](#1ksv4uv)reported two approaches of soibum production normally practised in the region.

The more popular kwatha or noney method uses traditionally designed chambers lined with Colocasia leaves or polythene sheets and packed with thinly sliced bamboo shoots. While the Andro type involves the use of a big earthen pot filled partly with shredded bamboo shoots, the quantity of which is increased by external addition as fermentation proceeds. The liquid portion is not removed as the fermentation continues for 6–8 months.

A simpler method practised in Bishenpur is use of a large plastic tub which contains finely chopped shoots with enough water to submerge them; the shoots are kept in aerobic condition for 15–20 days before being removed and packed in closed plastic bags for 2-3 months. The liquid remnants can be repeatedly used as starter culture for the next round of soibum production as it shortens the fermentation process by 6-7 days. Giri and Janmejay indicated the increase in quality of soibum with increase in incubation period.

Tangkhul tribes use a local bamboo variety called nathan to produce dried soibum which looks like noodles with twisted appearances.

The Barman community of Tripura prepares a traditional dish called godhak which is made by mixing fermented bamboo shoots along with pseudobulbs of banana, dry fishes, salt, chili, and garlic.[17]

Mesu is another fermented shoot product which is a favourite among the people of Sikkim and Darjeeling as a locally made pickle. Naga tribes of Nagaland use bamboo juice extracted from fermented shoots as an integral component.

**GLOBAL IMPORTANCE OF BAMBOO SHOOT**

People from different countries address bamboos in different names because of their highly multipurpose properties. The Chinese called bamboos as “Friends of the people,” Vietnamese as “My brother,” and Indians as “Green Gold.”[[6]](#tyjcwt)

Being seasonal plants,with high demand throughout the year, especially in China, Japan, USA, Canada, Thailand, Nepal, Bhutan, Australia and India, there is a need to develop process technologies to preserve the bamboo shoots in consistent and imperishable forms to be used during the off-seasons.[[27]](#qsh70q)

Nepal and Bhutan prepare and consume a variety of domesticated and wild bamboo shoots and their fermented products. Bamboo shoots are crunchy and slightly sweet tasting. For a Japanese, Taiwanese, Chinese, Thai or Nepalese, bamboo shoot is the staple diet. In Nepal, each household consumes about 46 stems per year. Taiwan consumes 80,000 tonnes of bamboo shoots annually, constituting a us $50 industry.[[7]](#3dy6vkm)

In Indonesia, they are sliced thinly to be boiled with coconut milk and spices to make gulairebung. Other recipes using bamboo shoots are sayurlodeh (mixed vegetables in coconut milk) and lunpia (sometimes written lumpia: fried wrapped bamboo shoots with vegetables). The shoots of some species contain cyanide that must be leached or boiled out before they can be eaten safely. Slicing the bamboo shoots thinly assists in this leaching.[[8]](#1t3h5sf)

In the Philippines, bamboo shoots are primarily harvested from bolo bamboo (Gigantochloalevis), giant bamboo (Dendrocalamusasper), common bamboo (Bambusa vulgaris), spiny bamboo (Bambusablumeana), and two endemic species, bayog (Bambusamerrilliana) and laak (Bambusaphilippinensis). Other economically important species also harvested for bamboo shoots include kayali (Gigantochloaatter), male bamboo (Dendrocalamusstrictus), and climbing bamboos (Dinochloa spp.) Another endemic species, the lumampao or bagacay bamboo (Schizostachyumlumampao), which are used for making sawali (woven bamboo strips), are also occasionally harvested for bamboo shoots.[[18]](#2jxsxqh)

In Filipino cuisine, the shoots are commonly called labóng (other names include rabong, dabong, or tambo). The two most popular dishes for these are ginataánglabóng (shoots in coconut milk and chilies) and dinengdengnalabóng (shoots in fish bagoóng and stew of string beans, saluyot, and tinapa). They are also sautéed alone or with other ingredients as in paklay, or cooked as fried or fresh lumpia. Bamboo shoots are also preserved as atchara, traditional sweet pickles that are often made from papaya.[[19]](#z337ya)[[20]](#3j2qqm3)In Thai cuisine bamboo shoots are called no mai. It can be used in stir-fries, soups such as tom khakai, curries such as kaengtaipla, as well as in salads such as sup no-mai. Some dishes ask for fresh bamboo shoots, others for pickled bamboo shoots (no mai dong).

In Vietnamese cuisine, shredded bamboo shoots are used alone or with other vegetables in many stir-fried vegetable dishes. It may also be used as the sole vegetable ingredient in pork chop soup. Duck and bamboo shoot noodles (Búnmăngvịt) [[21]](#1y810tw) is also a famous noodle dish in Vietnam.

In Burma (Myanmar), bamboo shoots are called myahait. They can be used in a soup called myahaithcaut tar la bot. The preparation of this dish generally follows three steps. First, the bamboo shoots are collected from a bamboo forest (called warr taw in Burmese). Bamboo can be found in the whole of Myanmar but the bamboo shoots from the two northernmost regions (Kachin State and Sagaing Region) are soft and good in taste. The bamboo shoots are then boiled in water after which they can be cooked with curry powder, rice powder etc. One of the most famous dishes in Burmese cuisine is a sour bamboo shoot curry called myahaithkyainhainn, a specialty of Naypyidaw in central Burma.[[22]](#4i7ojhp)

Below is the list of commercially important edible bamboo consumed in various countries.[[23]](#2xcytpi)

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| **S.No** | **Country** | **Species of bamboo shoots consumed** |
| **1.** | Australia | Bambusaoldhamii, Dendrocalamusasper, D. brandisii, D. latiflorus, |
| **2.** | Bhutan | Dendrocalamusgiganteus, D. hamiltoniivar.edulis, D. hookeri, |
| **3.** | China | Bambusaoldhamii, Dendrocalamusasper, D. brandisii, D. latiflorus, |
| **4.** | Japan | Bambusaoldhamii, Dendrocalamusasper, Phyllostachysedulis, P. |
| **5.** | Korea | Phyllostachypubescens, P. nigra, P. heterocycla |
| **6.** | Taiwan | Bambusaedulis, B. multiplex, B. oldhamii, B. pallida, |
| **7.** | United States | Phyllostachysdulcis, P. edulis, P. bambusoides, P. pubescens |

**FUTURE PERSPECTIVE**

Bamboo utilization has been practiced in many tropical countries for thousands of years and is considered as a cash crop mainly in the northeastern parts of India. There are many species of edible bamboo available in this region.Stewed bamboo shoots, pickled bamboo shoots,and fermented bamboo shoots are regarded as delicacies. Prevailing scarcity of pulses and exorbitant prices in many developing countries (including India) have deprived a large population of their protein requirements. [[24]](#1ci93xb)

Bamboo shoot is not only the poor man’s meal but also has the potential to become an urban man’s favorite. As per literature ﬁndings, bamboo shoots contain essential minerals, vitamins and dietary ﬁber and being low in fat helps in lowering down the blood glucose and cholesterol and can be easily integrated in several dishes made at domestic level. These ﬁndings may help in popularizing bamboo cultivation like coconut trees and herbal/medicinal plants in kitchen gardens and thus lead to integration in agro-horticultural practices.[[25]](#3whwml4)

In developing bamboo shoots as a staple food, the following issues should be in serious consideration. First, the harvest of bamboo shoots and the protection of the forest should be carefully balanced. Second, the detection and detoxification of cyanogen glycosides, even the breeding of edible bamboo shoots with lower levels of cyanogen glycosides should be highlighted in view of food safety. Third, the mechanisms underlying the traditional use of bamboo shoots in regional medications deserve further exploration. [[26]](#2bn6wsx)

**CONCLUSION**

India which is the second largest producer of bamboo shoots after china, the food potential seems grossly underutilized. This may be primarily due to lack of awareness about the edible characteristics of the shoots. Consumption of tender shoots is confined mainly to the Northeastern states and some southern peninsulas like in Kerala, Karnataka.

Bamboo shoots have immense potential of being used as important health food as they have high content of useful proteins, amino acids, carbohydrates, and many important minerals and vitamins and very low fat. Bamboo shoots are consumed predominantly in Asiatic countries where they form an integral part of several traditional cuisines of the region. The usefulness of bamboo shoots as health food is not largely known by the general public due to ignorance of their high nutritional values. There is a greater necessity to create awareness among the people about their nutritional health benefits so that they are widely accepted. Bamboos occupy a very significant position in everyday life of indigenous people of Northeast India due to their enormous utility as traditional food, house construction materials, and raw materials for production of useful domestic and other handicraft items.

The fresh or fermented bamboo shoots form an indispensable part of a number of ethnic dishes. But shoots should be properly processed as they contain high levels of toxic cyanogenic glycosides. Using improved shoot processing methods based on scientific approach instead of crude and unhygienic ones will not only reduce toxic cyanogenic compounds but also retain nutritional values. The region being the largest producer of bamboo in India has a bright prospect for the bamboo shoot industry but presently bamboo shoot production is predominantly for fulfilling the local needs.

There is a need to increase bamboo processing and packaging units as very few operate actively in the region. Effective marketing strategies should also be formulated to extract maximum profits by making bamboo shoot products available to as many potential and prospective customers inside and outside the country. The local bamboo shoot industry if properly established will not only help in socio economic upliftment of the region but also generate huge income for the country.

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