Bamboo: A Boon for North East India

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WORLD BAMBOO AMBASSADOR
North East India

Northeast India is geographically nestled in one of the most biodiversity-rich regions of the world.

Represents the transition zone between the Indian, Indo-Malayan and Indo-Chinese biogeographic Regions

The region contains a profusion of habitats characterized by diverse biota with a high level of endemism

Accounts for over 65% of the country’s total bamboo resources

Yet, it is the most neglected of all resources
An invaluable gift of nature to the people of North East India

Tightly interwoven with the daily life and culture of the region

‘Kalpavriksha’ for the people of the north-eastern region

Cutting of umbilical cord of a new born baby
building material, weapons,
household and agricultural implements
containers for water storage,
entertainment, food and medicine and
finally bier or coffin for the dead body

It fulfills numerous needs of an inhabitant and enables him to remain self-reliant in many respects.
Out of 136 bamboo species of India, 53 species under 9 genera are reported

Total growing area of 10,687 sq km which is 61.36% of the total forest area

### Bamboo area (sq.km.)

- **Arunachal Pradesh**
- **Manipur**
- **Assam**
- **Nagaland**
- **Meghalaya**
- **Tripura**
- **Mizoram**
- **Sikkim**

**Note:** The diagram visualizes the bamboo area in square kilometers for various states.
MULTIFARIOUS USES OF BAMBOO

Construction purposes
Paper industry
Furniture
Clothing
Utensils and household items
Medicine
Vehicles
Beaverages
(Tea, Beer and Wine)
Oils
Toiletries
Cosmetics
Food
Ecology and Environment
Bamboo as.....

...is the most neglected part

FOOD

MEDICINE
Food assurance to every single individual is a Magna Carta for human development.

Currently, FAO (2017) estimates that around 800 million people suffer from food and nutrition insecurity, particularly in underprivileged population groups.
Worldwide, about 800 million people are chronically hungry, meaning that they are undernourished in terms of calories.

More than 2 billion people are affected by hidden hunger, meaning that they suffer from micronutrient deficiencies.

Although progress was made in reducing these problems, ending hunger in all its forms – as stated in the Sustainable Development Goals (SDGs) – remains a global challenge.

The goal of ending hunger in all its forms involves a broad definition of hunger, including calorie deficiencies (chronic hunger), micronutrient deficiencies (hidden hunger), and related health problems.
2018
THE STATE OF FOOD SECURITY AND NUTRITION IN THE WORLD
End hunger, achieve food security and improved nutrition, maintain good health and promote sustainable agriculture

"Adopt urgent measures to combat climate change and its effects"

"Decent work and economic growth”

Making cities and human settlements inclusive, safe, resilient and sustainable"
Out of more than 200000 known plants, only 3000 are used as food

These crops developed under high agricultural intensity cannot meet the challenge of food insecurity as they have become vulnerable to biotic and abiotic stress
Modern agriculture system now is at the crossroads

- Stagnant productivity
- Declining soil fertility
- Ground water pollution
- High input cost

Exorbitant increase in food prices and non-availability of quality food commodity has shaken the foundation of the world community.

A shift in paradigm of food production and management has been recommended to handle the socioeconomic dynamics.
We need to focus on underutilized and neglected crops. Bamboo is one of them.
## CONTINENT & COUNTRY WISE DETAILS OF BAMBOO RESOURCES

<table>
<thead>
<tr>
<th>Country</th>
<th>Area of Bamboo (1,000 ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>India</td>
<td>11,361</td>
</tr>
<tr>
<td>China</td>
<td>5,444</td>
</tr>
<tr>
<td>Indonesia</td>
<td>2,081</td>
</tr>
<tr>
<td>Laos</td>
<td>1,612</td>
</tr>
<tr>
<td>Myanmar</td>
<td>859</td>
</tr>
<tr>
<td>Vietnam</td>
<td>813</td>
</tr>
<tr>
<td>Malaysia</td>
<td>677</td>
</tr>
<tr>
<td>Other</td>
<td>340</td>
</tr>
<tr>
<td>Thailand</td>
<td>261</td>
</tr>
<tr>
<td>Philippines</td>
<td>172</td>
</tr>
<tr>
<td>Total Asia</td>
<td>23,620</td>
</tr>
</tbody>
</table>

Source: FAO (2005)

Despite having largest area (11.4 m.ha) under bamboo in the world and comprising more than 100 species, India’s contribution to the global market is miniscule.
Bamboo area in different parts of India

- North East Region: 40%
- Madhya Pradesh: 9%
- Maharashtra: 8%
- Chhattisgarh: 8%
- Orissa: 8%
- Rest of India: 15%
- Andhra Pradesh: 6%
Bamboo area in the North East

- Arunachal Pradesh, 28.72%
- Manipur, 16.62%
- Mizoram, 16.51%
- Assam, 12.93%
- Nagaland, 8.75%
- Meghalaya, 8.56%
- Tripura, 5.80%
- Sikkim, 2.11%
Bamboo shoots
Bamboo shoots have a long history of being used as a source of both food and medicine in many Asian countries.

Traditional forest vegetable in China for more than 2500 years.

“There is no banquet without bamboo.”

In Japan, the bamboo shoot is called the “King of Forest Vegetables.”

Korea “A garden without bamboo is like a day without sunshine”

In Manipur, a house without bamboo was considered inauspicious.
Shoots gaining importance as a health food

“Poor man’s timber”

“A rich man’s delicacy”

Delicacy in up-scale markets, specialty restaurants and five star hotels though in India, it is consumed as a vegetable by rural people,

Bamboo shoots consumption is concentrated to South east Asia where it is a popular ingredient in their cuisine

Shoots are a part of the traditional cuisine of the North Eastern states of India
Consumed as vegetable by rural people

Delicacy in up-scale markets, speciality restaurants and five star hotels
Shoots have a crisp, crunchy taste imparting a unique taste

Soups, stir-fries, snacks, hot curries, salads, pickles

Used as an extender

Processed and preserved in many forms
Removal of culm sheaths

Peeled shoots

Boiled shoots,

Soaked shoots,

Fermented shoots
Dried samples of bamboo shoots
Nutritive value of Shoots
Nutritive value of bamboo shoots

Juvenile shoots are

- Rich in proteins, carbohydrates, amino acids, minerals, vitamins
- High content of minerals like K, P, Mg, Na, Fe, Ca and Se.
- Rich in dietary fibers
- Low in fat and sugar.

Fig.1. a. freshly harvested shoots; b. peeled shoots; c. Sliced shoots.
Fresh shoots have a crisp, crunchy taste and sweet flavor, imparting a unique taste.

Soups, stir-fries, snacks, hot curries, salads, pickles, aromatic fried rice, spring rolls and other stewed and fried dishes.

Used as an extender, because it takes on the flavor of the ingredients in which it is cooked.

Processed and preserved in many forms - dried, fermented, salted, pickled, water-soaked and canned.
Bamboo shoots are endowed with the following properties:

- Nutrients
- Bioactive compounds
- Appetizer
- Organic
- Low fat content
- Dietary fiber
**Nutrients**

- **Proteins**: 3.70 – 5.89 g/100g fr. wt. (*Bambusa balcooa, Dendrocalamus asper*)
- **Carbohydrates**: 3.22 – 3.55 g/100g fr. wt. (*B. balcooa, D. asper*)
- **Amino acids**: 3.71 – 4.61 g/100g fr. wt. (*B. polymorpha, Chimonobambusa callosa*)
- **Starch**: 1.74 – 2.38 g/100g fr. wt. (*D. hamiltonii, D giganteus*)
- **Vitamin C**: 2.63 – 4.80 mg/100g fr. wt. (*B. balcooa, B. vulgaris*)
- **Vitamin E**: 0.49 – 0.68 mg/100g fr. wt. (*B. nutans, D. hamiltonii*)
- **Ash**: 0.95 – 1.03 g/100g fr. wt. (*B. balcooa, D. asper*)
Protein 1.8g/100g
Fiber 1.0g/100g

Protein 0.9g/100g
Fiber 1.2g/100g

Protein 0.9g/100g
Fiber 1.2g/100g

Protein 2.0g/100g
Fiber 2.0g/100g

Protein: 3.92g/100g
Fiber: 3.90g/100g
Mineral: Potassium,
Bioactive compounds: Phenols and phytosterols

Bamboo shoots
Therapeutic potential of Bamboo

Cardiovascular diseases
- Anti-fatigue
- Anti-microbial
- Anti-inflammatory
- Anti-diabetic
- Anti-obesity
- Anti-hyperlipidemic
- Anti-cancer
“Let thy food be thy medicine, and let thy medicine be thy food.”

Hippocrates, father of medicine
Bamboo plays a significant role in traditional Asian medicine and therapeutic applications being mentioned around 500 AD

“It’s slightly cold, sweet, nontoxic, and it quenches thirst, benefits the liquid circulatory system and can be served as a daily dish”

“Ben Chao Qui Zheng”
“Ben Jing Feng Yuan”
“Yao Pin Hua Yi”
“Jing Yue”

Promote peristalsis of the stomach and intestine, Digestion
Relieve hypertension
Prevent cardiovascular disease and cancer
Promote the excretion of urine
## BAMBOO SHOOTS AND HUMAN HEALTH

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Ancient Ayurvedic, Indo-Persian and Tibetan system of Medicine recommend bamboo and its products for treatment of various ailments.

“Bamboo by nature is laxative, frigid seminal curative, palatable, bladder purifier and full of astringent juice. It splits cough, subsides bile and cures leprosy, flux, wounds and swellings”

Bamboo medicinal applications were first mentioned in India around 10,000 years.

“Tabasheer” “Banslochan” “Bamboo mana” has been used since ancient times as a cooling tonic and aphrodisiac and in asthma, cough and other debilitating diseases.

It is a siliceous secretion found in the culms of bamboos.
**Chyawanprash**, a health tonic prepared from a number of herbs, including **bamboo manna** after Rishi, or a sage by the name of Chyawan, who was the first person to prepare this tonic.

He regained his youthfulness and vitality with the use of this herbal tonic.

- Rejuvenates all tissues in the body*
- Supports overall strength and energy*
- Promotes muscle mass*
- Helps in supporting a healthy immune response and youthfulness*
- Supports healthy function of the heart and respiratory systems*
- Imparts youth, beauty and longevity.
- Kindles agni (digestive fire)*
Phyllostachys manii

Bambusa mizorameana

Dendrocalamus membranaceous
Bambusa balcooa

Dendrocalamus sikkimensis

Bambusa nutans
Removal of culm sheaths

Boiled shoots,
Soaked shoots,
Fermented shoots

Peeled shoots
Dried samples of bamboo shoots
Bamboo shoot dishes
MINERAL ELEMENTS
X-ray fluorescence spectra of fresh shoots of *B. balcooa*
SANACEL® bamboo

Nutritional value combined with beneficial technological properties

SANACEL® bamboo are insoluble dietary fibres useful for the improvement of the technological and nutritional properties of a Product

Fibres regulate the intestinal flora and support the human digestion.

CFF GmbH & Co. KG
Arnstädter Str.2
98708 Gehren, Germany
UNICELL® BF products are natural insoluble bamboo fibers obtained from fiber rich parts of the bamboo plant.

They combine the strength of bamboo with the benefits of dietary fiber to provide a unique natural fiber for various food products.

The final product resembles a flavorless and tasteless fibrous white powder. Used to increase freshness of meat and fish products as well as dough yield of baked goods.

It not only adds negligible calories to a product, it also improves texture in products from baked goods, to snacks, to frozen desserts.
Food Fortification with Bamboo shoots

Fortification is adding vitamins and minerals to staple foods to prevent nutritional deficiencies.
Food and medicine are considered equally important in preventing and curing diseases.

Economic, cultural and scientific development has led to change in food habits and lifestyle.

Foods have become highly caloric, rich in saturated fats and sugars, consumption of dietary fiber has become low.

Decrease in physical activity, has led to obesity and diseases.

Huge interest has been generated on food that can promote health and well-being.

Functional foods (fortified) and Nutraceuticals.
Bamboo shoots with high nutrient content and phytochemicals are potential ingredients for food fortification and pharmaceuticals.
Shoot Paste

Shoot Powder
(Fresh, Fermented, Brine treated, boiled)
### Application of bamboo fiber in the food industry

<table>
<thead>
<tr>
<th>Food items</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bakery Products</strong></td>
<td>Improves dough yield and consistency due to water binding capacity.</td>
</tr>
<tr>
<td>Fragile dry bakery products like pretzels, ice cream cones and cookies, cakes, wafers, baked and fried tortilla chips. Noncaloric health bars.</td>
<td>Decrease of product breakage or crumbling; controls moisture loss.</td>
</tr>
<tr>
<td></td>
<td>Fiber enrichment health nutrition bars.</td>
</tr>
<tr>
<td><strong>Dairy products</strong></td>
<td>Noncaloric fiber enrichment.</td>
</tr>
<tr>
<td>Milk, yogurt, ice cream, shredded cheeses.</td>
<td>Viscosity and consistency improvement, stabilizer. Creamy mouth-feel.</td>
</tr>
<tr>
<td><strong>Meat and aquatic products</strong></td>
<td>Excellent water retention capacity.</td>
</tr>
<tr>
<td></td>
<td>Texture improvement and binding.</td>
</tr>
<tr>
<td></td>
<td>Longer freshness and less fat absorption in product</td>
</tr>
<tr>
<td><strong>Health beverages</strong></td>
<td>Noncaloric fiber enrichment.</td>
</tr>
<tr>
<td></td>
<td>Viscosity and consistency improvement, stabilizer. Creamy mouth-feel.</td>
</tr>
<tr>
<td><strong>Miscellaneous</strong></td>
<td>Noncaloric fiber enrichment.</td>
</tr>
<tr>
<td>Sauces, dressings, juices, ketchup, mustard, low-calorie dressings, pasta, nuggets</td>
<td>Viscosity and consistency improvement, stabilizer Creamy mouth-feel.</td>
</tr>
<tr>
<td>Sl. no.</td>
<td>Product</td>
</tr>
<tr>
<td>--------</td>
<td>------------------------------</td>
</tr>
<tr>
<td>1.</td>
<td>Milk pudding</td>
</tr>
<tr>
<td>2.</td>
<td>Pork Nuggets</td>
</tr>
<tr>
<td>3.</td>
<td>Cookies</td>
</tr>
<tr>
<td>5.</td>
<td>Biscuit</td>
</tr>
<tr>
<td>6.</td>
<td>Candies</td>
</tr>
<tr>
<td>7.</td>
<td>Chips</td>
</tr>
<tr>
<td>9.</td>
<td>Pork Nuggets</td>
</tr>
<tr>
<td>10.</td>
<td>Candy, chutney, chukh, cracker, nugget</td>
</tr>
<tr>
<td>11.</td>
<td>Chicken nuggets</td>
</tr>
<tr>
<td>13.</td>
<td>Amaretti cookies</td>
</tr>
</tbody>
</table>
Bamboo shoot fortified shoot products
Medicinal uses of bamboo

Ancient Ayurvedic, Indo-Persian and Tibetan system of medicine use the siliceous secretions present in the internodes for various ailments

“Tabasheer”, “Banslochan” “Bamboo manna”

‘Bhavpraksh Nighantu’, mentions that,” bamboo by nature is laxative, frigid seminal curative, palatable, bladder purifier and full of astringent juice.

Chinese medicinal books - consumption of young shoots help in improving digestion, relieving hypertension, sweating, preventing cardiovascular diseases and cancer
Health Promoting Phytochemicals in Bamboos

Dietary Fibers

Soluble Fibers: Dissolve in water

Insoluble Fibers: Do not dissolve in water

Dietary fibers

Phytosterols

Phenols
Bioactive compounds

Secondary metabolites known to elicit pharmacological and toxicological effects in humans and animals

Extranutritional constituents in food occurring in small quantities that provide health benefits beyond the basic nutritional value of the product
Phenolic content in bamboo shoots

<table>
<thead>
<tr>
<th>Species</th>
<th>Phenols (mg/100 g, fresh weight)</th>
</tr>
</thead>
<tbody>
<tr>
<td>B. bambos</td>
<td>360.0</td>
</tr>
<tr>
<td>B. balcooa</td>
<td>191.37</td>
</tr>
<tr>
<td>B. tulda</td>
<td>390.0-443.97</td>
</tr>
<tr>
<td>B. nutans</td>
<td>275.36-489.83</td>
</tr>
<tr>
<td>D. asper</td>
<td>580.0</td>
</tr>
<tr>
<td>D. giganteus</td>
<td>347.27</td>
</tr>
<tr>
<td>D. hamiltonii</td>
<td>505.93-586.36</td>
</tr>
<tr>
<td>D. latiflorus</td>
<td>612.24</td>
</tr>
<tr>
<td>B. membranaceus</td>
<td>302.73</td>
</tr>
<tr>
<td>D. strictus</td>
<td>271.23-630.0</td>
</tr>
</tbody>
</table>

Phenols
Benzene Rings with an OH group

Antioxidant property is of interest for both nutritional and health benefits
Phenolic compounds in Bamboo shoots

Exhibit numerous positive effects beneficial to health

- Anti-oxidant,
- Anti-inflammatory,
- Anti-allergic,
- Antimicrobial,
- Cardioprotective properties

Antioxidants – Scavenging free radicals, quenching of ROS and inhibition of oxidative enzymes.
Antioxidants

Very significant in terms of Functional Foods and nutraceuticals as oxidation causes food rancidity and spoilage of medicines

Food: To prolong shelf-life

Pharmaceutical products To enhance stability to therapeutic agents

Search of natural antioxidants to replace the synthetic ones which have raised certain health issues
Addition of antioxidant rich bamboo leaf extract reduced acrylamide during formation in potato chips and French fries by 75% thermal processing.

Acrylamide is a carcinogen that is created when starchy foods are baked, roasted or fried.

Extract contains, flavonoids, lactones and phenolic acids.

In China, it is permitted as an additive in food including fish and meat products, edible oils and puffed food.
Bioactive components representing the major part of the nonsaponifiable fraction of lipids

- Reduces or inhibits cholesterol absorption and synthesis
- Increases fecal excretion of neutral and acid sterols

Indicated to have anticancer properties

Precursors of pharmaceutically important steroidal products - corticosteroids, sex hormones and oral contraceptives

Bamboo shoots which are easily available in large amounts can be used as a source of phytosterols
Dietary fiber in bamboo shoots

- Weight loss
- Decrease the accumulation and/or assimilation of fats
- Facilitates bowel movement
- Lowers cholesterol level
- Acts as a prebiotic

Influence of bamboo shoots on blood glucose, lipid profiles and liver functions were studied

(Park and Jhon, 2009, Azmi et al., 2012, Bajwa et al 2017)
Bamboo leaf extract

Bamboo shaving extract

Bamboo leaf extract
Silica in bamboo shoot
Silicon in the form of silica, or silicon dioxide (SiO2), is an essential mineral mainly for bone formation and maintenance. It is also vital for healthy skin, fingernails, hair, ligaments, tendons.

Dietary sources of bioavailable silicon include whole grains, cereals, beer, and some vegetables such as green beans and bamboo. It is used as a common food additive.
An emerging class of natural products that makes the line between food and drugs to fade.

**Functional food & Nutraceuticals**

- **New foods designed specifically to enhance health**
  - Whole, fortified or enriched food

- **Dietary supplements from a bioactive agent from food**
  - Present in a non-food matrix - capsule, powder or solution

**Functional Food**

**Nutraceutical**
Bamboo in Pharmaceuticals
Nutraceuticals
Traditional uses of Bamboo as medicine

“Zhu Li Kou Fu Ye” - an extract of bamboo leaves inhibits inflammation in the throat.

Shoot decoction: infections, cleaning wounds, maggot infected sores and ulcers and skin diseases

In Java, sap from shoots is used for curing jaundice

Fermented bamboo shoot mixed with crushed leaves of *Allium porrum* Linn and chilli is used to cure influenza and treatment of fungal infection

Seeds of bamboo (*Bambusa arundinacea*) are consumed with a belief that it enhances fertility and reproductive ability

These ancient medical practices were not given much importance due to lack of scientific evidences.
Bamboo capsules

Organic bamboo powder supplement

promotes hair growth, healthy gums and teeth

strengthens nails

increases bone density, speeds healing of bone fractures

building block of collagen, strengthens connective tissues

rejuvenates skin

anti-inflammatory, anti-oxidant activity
Bamboo Silica: The Ultimate Anti-Aging Superfood

The richest known source of silica (70%)

Silica has a restorative effect on many of the body’s tissues.

- Build healthy bones, nails and teeth
- Prevent premature aging and preserve skin youthfulness
- Maintains vascular and heart health
- Supports nervous and glandular system health
- Enhances the function of iron, calcium magnesium, potassium and boron
Bamboo salt

- Prevention or treatment of inflammatory diseases.
- Helps purifying blood thus lowering the risk of blood pressure.
- Assists the absorption of calcium and maintains fluid balance.
- Contraction of muscle.
- Calcium, magnesium and zinc protect against the development of diabetes.
Dietary fiber from Bamboo

Bamboo dietary fiber is inert, has zero calories and is a white tasteless powder; the content of dietary fiber can be up to 75%

Application:
Food additives
Slimming food supplements
Weight loss food
Medicine material

Shennong Honey Bio-Tech Co., Ltd.
Changsha Winner Bio-Tech Co., Ltd.
Harbin Yeekong Herb Inc.
Essential micronutrient for several metabolic pathways

- Thyroid hormone metabolism
- Antioxidant defense system
- Immune function

Protective effects against

- Prostate, colon and lung cancer
- Cardiovascular disease
- Asthma
Bamboo charcoal and Vinegar

Antibiotics
Modern research has scientifically validated most of the health claims of bamboos.

Biomedical investigations on health beneficial effects of bamboos have been carried out since 1960s and a wide range of protective effects of bamboo derived products have been documented.

Several *in vitro* and *in vivo* experiments on animals have confirmed important biological and medicinal properties of bamboo extracts.
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Antitumor activity

Phyllostachys nigra, Sinocalamus beecheyana, Bambusa tuldoides

Cholesterol lowering activity

(Patent 1998057545; Wo, 1998)
Bambusa oldhami, Bambusa edulis, Dendrocalamus latiflorus
Phyllostachys edulis, Phyllostachys pubescens,

Antimicrobial peptide Pp-AMP1

(Fujimura et al., 2005)
Phyllostachys pubescens

Antibacterial activity

(Zhang et al 2010)
Phyllostachys nigra, Sinocalamus beecheyana, Bambusa tuldoides
Anticancer effects

*Phyllostachys pubescens*  
(Hiromichi, 2007)

Alcohol extracted prepared from moso bamboo has an excellent antitumor effect

Mice with malignant sarcoma cells were fed with the extract for 25 days

Tumor growth was suppressed

If a health food comprising such an alcohol extract of bamboo is orally consumed on a regular basis, the progression of malignant tumors may be prevented or limited
Cholesterol lowering activity of dietary fiber (Park and Jones, 2011)

Bamboo shoot as a dietary fiber source has a beneficial effect on lipid profile and bowel function

8% soluble fiber and 92% insoluble fiber

Hemicellulose, cellulose, pectin and lignin

Eight subjects – 21-23 yrs old women

Serum total cholesterol, LDL cholesterol and atherogenic index decreased

Fecal volume and bowel movement significantly increased
Anti-diabetic properties

Diabetes affects about 25% of worldwide population

Exhibit anti-hyperglycemic and anti diabetic activities by increasing insulin secretion

Reduced blood glucose and triglyceride levels in streptozotocin (STZ) induced diabetic mice.

Beneficial effect on levels of adiponectin, resistin and related molecules which are involved in cardiovascular diseases

*Sasa borealis*

When meat in hamburger patties was substituted by *S. borealis* leaf extracts, plasma glucose was significantly reduced
**Anti-obesity**

*Sasa borealis* (Yang et al 2010)

Decreased body weight and adipose tissue

*S. quelpaertensis* (Kang et al 2012)

Decreased the body weight, adipose tissue weight, serum cholesterol

Anti-obesity effect of extract is mediated by the activation of AMP-activated protein kinase (AMPK) in adipose tissue

*B. textilis* (Liu et al. 2016)

Decreased the levels of Total cholesterol (TC), Triglycerides (TG) and Low density lipoprotein (LDL) in the serum and effectively increase serum High Density Lipoprotein (HDL) concentration
Bamboo as a nutraceutical
Bamboo Extract used for treatment of:

- Acute and Chronic Throat or Lung Conditions
- Cough
- Phlegm
- Sore Throat
- Runny Nose
- Ear Irritation in Children

Bamboo Extract: One of nature's richest sources of silica, a natural source of nourishment for hair, skin and nails

Changsha Winner Bio-Tech Co., Ltd.

Harbin Yeekong Herb Inc.
Dietary fiber from Bamboo

Bamboo dietary fiber is inert, has zero calories and is a white tasteless powder; the content of dietary fiber can be up to 75%

Application:
- Food additives
- Slimming food supplements
- Weight loss food
- Medicine material

Shennong Honey Bio-Tech Co., Ltd.
Changsha Winner Bio-Tech Co., Ltd.
Harbin Yeekong Herb Inc.
## Bamboo based nutraceutical products

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Content</th>
<th>Health benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bamboo Nutra</td>
<td>Bamboo fiber</td>
<td>Anti-ageing, Anti-obesity</td>
</tr>
<tr>
<td>Bamboo silica</td>
<td>Bamboo silica</td>
<td>Anti ageing, preserves skin youthfulness</td>
</tr>
<tr>
<td>Bamboo flex</td>
<td>Bamboo leaf</td>
<td>Anti-inflammatory, remineralization and development of bone structure</td>
</tr>
<tr>
<td>Bonusan forte</td>
<td>Tabashir exudates</td>
<td>Anti-fatigue, supports energy metabolism, good for nervous system</td>
</tr>
<tr>
<td>Guozen bamboo leaf essence</td>
<td>Bamboo leaf</td>
<td>Purifies blood and strengthens bones</td>
</tr>
<tr>
<td>Hawlik Cappillary capsules</td>
<td>Bamboo shoot</td>
<td>Improves hair health</td>
</tr>
<tr>
<td>Lambert silica capsules</td>
<td>Tabashir exudates</td>
<td>Contributes to structure and resilience of connective tissue,, synthesis of bone</td>
</tr>
<tr>
<td></td>
<td></td>
<td>collagen and cartilage</td>
</tr>
<tr>
<td>Sanacel</td>
<td>Bamboo fiber</td>
<td>Improves digestion</td>
</tr>
<tr>
<td>Silice de Bambou Capsules</td>
<td>Tabashir exudates</td>
<td>Prevents premature ageing, preserves skin youthfulness, promotes strong hair, healthy bones and teeth</td>
</tr>
<tr>
<td>Solary bamboo capsules</td>
<td>Culm powder</td>
<td>Stimulates collagen synthesis in bone and connective tissue</td>
</tr>
</tbody>
</table>
In-vivo antioxidant studies

BALB/c Mice
Effect of fresh and processed shoots on body and organ weight of Balb/c mice

<table>
<thead>
<tr>
<th>Weight (g)</th>
<th>Control</th>
<th>Fresh shoots</th>
<th>Fermented shoots</th>
<th>Brine treated shoots</th>
<th>Boiled shoots</th>
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</thead>
<tbody>
<tr>
<td>Initial body weight</td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
</tr>
<tr>
<td>30</td>
<td>2.06</td>
<td>36</td>
<td>0.72</td>
<td>34</td>
<td>0.41</td>
</tr>
<tr>
<td>1st week</td>
<td>34</td>
<td>1.14</td>
<td>37</td>
<td>0.07</td>
<td>35</td>
</tr>
<tr>
<td>2nd week</td>
<td>35</td>
<td>0.98</td>
<td>38</td>
<td>0.72</td>
<td>37</td>
</tr>
<tr>
<td>3rd week</td>
<td>36</td>
<td>1.00</td>
<td>38</td>
<td>1.06</td>
<td>36</td>
</tr>
<tr>
<td>4th week</td>
<td>36</td>
<td>1.21</td>
<td>38</td>
<td>0.05</td>
<td>33</td>
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<tr>
<td>5th week</td>
<td>37</td>
<td>0.82</td>
<td>38</td>
<td>0.26</td>
<td>33</td>
</tr>
<tr>
<td>6th week</td>
<td>37</td>
<td>1.03</td>
<td>37</td>
<td>0.08</td>
<td>32</td>
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<tr>
<td>Liver weight</td>
<td>1.37</td>
<td>0.21</td>
<td>1.42</td>
<td>0.17</td>
<td>0.948</td>
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<tr>
<td>Kidney weight</td>
<td>0.247</td>
<td>0.04</td>
<td>0.295</td>
<td>0.03</td>
<td>0.228</td>
</tr>
<tr>
<td>Parameter</td>
<td>Group I</td>
<td></td>
<td>Group II</td>
<td></td>
<td>Group III</td>
</tr>
<tr>
<td>---------------------------</td>
<td>---------</td>
<td>--------</td>
<td>----------</td>
<td>--------</td>
<td>-----------</td>
</tr>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
</tr>
<tr>
<td>Glucose (mg/dl)</td>
<td>68</td>
<td>2.92</td>
<td>76</td>
<td>2.35</td>
<td>107</td>
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<tr>
<td>Lipid profile (mg/dl)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total cholesterol</td>
<td>118</td>
<td>3.67</td>
<td>106</td>
<td>4.25</td>
<td>82</td>
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<tr>
<td>HDL</td>
<td>90</td>
<td>0.94</td>
<td>94</td>
<td>0.53</td>
<td>97</td>
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<tr>
<td>LDL</td>
<td>21</td>
<td>3.44</td>
<td>16</td>
<td>1.52</td>
<td>8</td>
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<tr>
<td>Triglycerides</td>
<td>228</td>
<td>0.81</td>
<td>131</td>
<td>1.35</td>
<td>119</td>
</tr>
<tr>
<td>MDA (nmoles/min/mg protein)</td>
<td>3.19</td>
<td>0.12</td>
<td>0.897</td>
<td>0.06</td>
<td>2.63</td>
</tr>
</tbody>
</table>

Values are expressed as mean ± SD (N = 5);
Group I: Control, Group II: Fresh shoots; Group III: Fermented shoots;
Group IV: Brine treated shoots; Group V: Boiled shoots
Why is bamboo shoot a neglected food item?

Bamboo shoot is considered as a vegetable for the rural people and marketed at the local level.
Bamboo shoots sold in the markets of the North East
A Face Lift is needed
Bamboo shoot processing

South Korea

North-East India
Imported bamboo shoots available in India

From Thailand

From Bhutan
The shoots are still consumed in the traditional way which may not be palatable to all specially the younger generation.

Traditional ways of cooking needs to be modified in conjunction with modern ways to suit the palate of all.

New food preparation and products needs to be introduced.

Bamboo shoots in the form of powder or paste can be used as an additive in the preparation of various food items.
Rapid changes in diets and lifestyles due to industrialization, urbanization and economic development are having a significant impact on nutritional status and overall health of population worldwide.

Bamboo is a very good source of Food and Medicine being rich in nutrient and health enhancing bioactive compounds.

Regular consumption of bamboo shoots can help in promoting health and prevention of a number of disease.

Efforts should be made to select bamboo species with high nutritive and medicinal value which can be used for the development of Functional foods and Nutraceuticals.

Northeast India should work out strategies to explore and exploit its rich bamboo resources combining both traditional and modern technologies.
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Special thanks
Our team

Harjit Kaur Bajwa

Kanchan Rawat

Vivek Sharma

Natasha Saini

Santosh Oinam

Premlata Thounaujam

Aribam Indira
Review

Bamboo: A rich source of natural antioxidants and its applications in the food and pharmaceutical industry

Chengming Niemala1, Madhu Singh Bhat, Harjit Kaur Bajwa, Citoom Santhek

1Department of Biotechnology, Dyal Singh College, Ludhiana, India

Abstract

Background: Background bamboo is a multipurpose plant whose leave serve for traditional use and are being recognized as a potential source of functional compounds and antioxidant activities. All the parts of the bamboo plant as shoots, foliar leaves, leaves, stem, shoots and bark have antiallergic activities. Studies have revealed that bamboo is a rich source of antioxidant and radical scavenging of functional food-based products may reduce the risk of age-related diseases, namely cardiovascular diseases, Alzheimer’s diseases, Parkinson’s diseases, cancer and diabetes.

Introduction: In this review article, we have compiled the recent review focusing on the antioxidant activities and antiallergic properties of bamboo leaves and its trend for application in the development of functional foods and beverages. Antioxidant are vital components in the food and pharmaceutical industry as they preserve the quality of plant-derived products during processing and storage. They also possess potential benefits by controlling overall damage caused by free radicals.

Key findings and conclusions: Antioxidants are known to combat stress through their capacity to prevent and protect cells and tissues from free radicals. Bamboo leaves rich in polyphenol, amino acids, and mineral elements such as calcium, copper, iron, and magnesium, among others, are one of the most promising antioxidants. Furthermore, due to the unique components and bioactivity-related properties, bamboo leaves are at the forefront of research to develop functional foods and beverages.

Keywords: bamboo leaves, antioxidant properties, functional foods

Qualitative and Quantitative Mineral Element Variations in Shoots of Two Edible Bamboo Species after Processing and Storage Evaluated by Wavelength Dispersion X-ray Fluorescence Spectrometry

Natalia Sato1, Kanchan Rawat2, Madhu Singh Bhat1 and Chengming Niemala1

1Department of Biotechnology, Dyal Singh College, Ludhiana, India
2Department of Chemistry, Panjab University, Chandigarh, India

Abstract

Background: Bamboo shoots are an important source of minerals and trace elements. Minerals have a major role in maintaining the overall health of human beings. Understanding the variations in the mineral content of bamboo shoots at different stages of growth and after storage is important for the development of functional foods.

Methods: Bamboo shoots from two different species (Dendrocalamus hamiltonii and Dendrocalamus strictus) were collected and stored at room temperature. The shoots were then subjected to X-ray fluorescence (XRF) analysis to determine the variations in mineral content.

Results: The results showed that the concentration of minerals varied significantly. Calcium, magnesium, and potassium were found to be the major minerals present in the bamboo shoots.

Conclusion: The results of this study indicate that bamboo shoots are a rich source of minerals and can be used as a functional food ingredient.

Keywords: bamboo shoots, minerals, X-ray fluorescence spectrometry

Spectral analysis of fresh and processed shoots of an edible bamboo Dendrocalamus hamiltonii (Nees & Arn) EX MUNRO during processing

Harjit Kaur Bajwa, Citoom Santhek, C Niemala, Ashwani Kaul and MS Bhat

Abstract

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Keywords: bamboo shoots, minerals, X-ray fluorescence spectrometry

Changes in organoleptic, physiochemical and nutritional qualities of shoots of edible bamboo Dendrocalamus hamiltonii Nees & Arn. Ex Munro during processing

Harjit Kaur Bajwa, C Niemala, Ashwani Kaul and M.S. Bhat

Abstract

Background: Bamboo shoots have significant attention worldwide due to their nutritional value and health-promoting properties. The aim of the current study was to investigate the effects of boiling, salting, fermenting, and drying on the organoleptic, physiochemical, and nutritional value of bamboo shoots (Dendrocalamus hamiltonii).

Methods: Bamboo shoots were boiled, salted, and dried at different temperatures and times to investigate the changes in organoleptic, physiochemical, and nutritional qualities.

Results: The results showed that boiling, salting, and drying have significant effects on texture and taste of the shoots, decreasing the value of nutritional and organoleptic qualities.

Conclusion: The results of this study indicate that bamboo shoots have significant potential as functional food ingredients.
Thank You
Eat Bamboo shoots and be Healthy and Young!

Nirmala Chongtham
Bamboo in a new Avatar