The Healing Touch of Bamboo

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Bamboo the “Miracle Grass” has fascinated all since ancient times

Symbolic of constancy, integrity and purity, they are a versatile, organic and renewable raw material used for a variety of purposes

A hardy, adaptive and resilient plant, it is the first plant which emerged after the atomic bomb devastation in Hiroshima and Nagasaki
East Asian civilization is also called “bamboo civilization” due to deep involvement of bamboo in every sphere of life of the people.
Subject and inspiration of countless poets, artistic endeavors and musical masterpieces

Folklores, stories, dramas and cultural activities of many regions depict the use of bamboo as food by animals and humans.
India – Bamboo is equated to

“The Divine Tree (Kalpavriksha)”

“Rig Veda” (5000 BC) where Rishi prays to God Indra:

“BESTOW UPON US A HUNDRED BAMBOO CLUMPS”
Spiritual Healing of Bamboo
Enhances spiritual development

Rustling of the leaves in the wind is magical and gives a very soothing feeling

Clears negative energy and brightens the mood

It bolsters self-worth and self-esteem

Combines upright integrity with accommodating flexibility

Has the perfect balance of grace and strength

Bamboo grooves are considered a favorite place for meditation
Bamboo represents one of the four seasons

Plum (Winter)

Orchid (Spring)

Chrysanthemum (Autumn)

Bamboo (Summer)
Japanese paintings of Bamboo with plum and Orchid
Bamboo as Food and Medicine
“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

Ming Dynasty (1368 to 1644)
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)*
Traditional uses of Bamboo as Medicine

Chinese medicine – Leaves are used as a component to reduce the energy of “fire” (inflammation) and treat hypertension, arteriosclerosis and cardiovascular disease.

Fermented bamboo shoot mixed with crushed leaves of *Allium porrum* Linn was used to cure influenza.

The paste made can also be applied to treat fungal infection.

Decoction of tender shoots of *Bambusa nutans* is applied on wounds and poisonous bites.

The shoots are boiled in water and the soup is taken in cases of stomach ulcer.

Tender shoots of *Bambusa tulda* are boiled in water and the soup is taken in cases of poxes and other skin diseases and the paste is applied on poisonous bites and injuries.
The juice of *Dendrocalamus strictus* has been reported to be used as an anti-inflammatory agent near joints.

It is also used as astringent and eardrops, and in cooling and healing of cuts.

Sap of bamboo shoots has been found to contain hydrocyanic acid leading to antiseptic and larvicidal properties.

Bamboo shoots are used to ease labor and the expulsion of the placenta by inducing uterine contractions.

A poultice of the shoots is often used for cleaning wounds and healing infections.
## Bamboo in Ayurveda, Tibetan and Unani medicines

<table>
<thead>
<tr>
<th>Name</th>
<th>Constituents/Ingredients</th>
<th>Health benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tabasheer</td>
<td>Bamboo silica found in the hollow internodes. Tabasheer may be chalky, translucent, or transparent, mainly composed of silicic acid.</td>
<td>Stimulant, astringent, febrifuge, relieving asthma, cough, cooling tonic, antispasmodic and aphrodisiac.</td>
</tr>
<tr>
<td>Sitopaladi Churna</td>
<td>Tabasheer and small amounts of pepper, cardamom, and cinnamon in a base of sugar.</td>
<td>Common cold, sore throat, sinus congestion, tuberculosis, coughs and other lung diseases.</td>
</tr>
<tr>
<td>Medicine Name</td>
<td>Ingredients</td>
<td>Conditions</td>
</tr>
<tr>
<td>----------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Chenjin Wan</strong></td>
<td>Bamboo shaving and Tabasheer, arisaema, citrus, salvia, silkworm, chrysanthemum, apricot seed, ophiopogon, biota, fritillaria, ginger</td>
<td>For phlegm mist obstructing the orifices yielding symptoms of insomnia, restlessness, and blurred vision.</td>
</tr>
<tr>
<td><strong>Gualou Zhishi Tang</strong></td>
<td>Bamboo shaving and sap, fritillaria, platycodon, trichosanthes seed, chih-shih, citrus, saussurea, licorice, scute, gardenia, etc.</td>
<td>Reducing thick phlegm that is difficult to expectorate.</td>
</tr>
<tr>
<td><strong>Jupi Zhuru Tang</strong></td>
<td>Bamboo shavings, citrus, pinellia, licorice</td>
<td>Relieving phlegm</td>
</tr>
<tr>
<td><strong>Qinghuo Ditan Tang</strong></td>
<td>Bamboo shaving and tabasheer, arisaema, citrus, salvia, silkworm, chrysanthemum, apricot seed, ophiopogon, biota, fritillaria, ginger</td>
<td>Relieving phlegm insomnia, restlessness, and blurred vision</td>
</tr>
<tr>
<td><strong>Qinggong Tang</strong></td>
<td>Bamboo leaf, ophiopogon, scrophularia, rhino horn, forsythia, lotus plumule</td>
<td>Fever with dryness, penetrating to the pericardium, with delirium</td>
</tr>
</tbody>
</table>
Benefits of Warm Bamboo Massage

Relieves sore muscle tension

Increases Circulation

Flushes body of metabolic wastes (i.e. lactic acid) for faster healing time and detoxification

Decreases muscle spasms

Breaks up tissue adhesions

Releases endorphines to promote relaxation and pain reduction
Bamboo Spa
Bamboo leaf extract

Bamboo shaving extract

Bamboo leaf extract
Bamboo shoots: a nutritious healthy vegetable

A source of both food and medicine

Not only delicious but rich in nutrients and health promoting phytochemicals

Low in fat and sugars

“King of Forest Vegetables.”

Treasure dish - Tang Dynasty (618 to 907) “there is no banquet without bamboo.”

No longer “poor man’s timber” but a “rich man’s delicacy.”
Obesity, diabetes, cardiovascular diseases and some forms of cancer are major contributions to the global burden of diseases.

Food has a direct and substantial impact on health.
Fresh Shoots
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
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.
## Comparative account of various nutrients (g/100 g) present in fresh bamboo shoots and some common vegetables

<table>
<thead>
<tr>
<th>Plant</th>
<th>Amino acids</th>
<th>Proteins</th>
<th>Carbohydrates</th>
<th>Fat (g)</th>
<th>Vitamin C (mg/100 g)</th>
<th>Vitamin E (mg/100g)</th>
<th>Dietary Fibre</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bambusa tulda</strong></td>
<td>3.65</td>
<td>3.69</td>
<td>6.92</td>
<td>0.48</td>
<td>1.42</td>
<td>0.61</td>
<td>3.97</td>
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<tr>
<td><strong>D. asper</strong></td>
<td>3.12</td>
<td>3.59</td>
<td>4.90</td>
<td>0.40</td>
<td>3.20</td>
<td>0.91</td>
<td>3.54</td>
</tr>
<tr>
<td><strong>Dendrocalamus hamiltonii</strong></td>
<td>3.18</td>
<td>3.72</td>
<td>5.5</td>
<td>0.41</td>
<td>2.45</td>
<td>0.71</td>
<td>3.90</td>
</tr>
</tbody>
</table>

### SOME COMMON VEGETABLES

<table>
<thead>
<tr>
<th>Vegetable</th>
<th>Amino acids</th>
<th>Proteins</th>
<th>Carbohydrates</th>
<th>Fat (g)</th>
<th>Vitamin C (mg/100 g)</th>
<th>Vitamin E (mg/100g)</th>
<th>Dietary Fibre</th>
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<tbody>
<tr>
<td>Cauliflower</td>
<td>0.4</td>
<td>5.9</td>
<td>7.6</td>
<td>0.4</td>
<td>2.5</td>
<td>46.4</td>
<td>2.0</td>
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<tr>
<td>Cabbage</td>
<td>0.3</td>
<td>1.8</td>
<td>5.6</td>
<td>0.1</td>
<td>2.6</td>
<td>32.2</td>
<td>1.0</td>
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<td>Carrot</td>
<td>0.2</td>
<td>0.9</td>
<td>10.6</td>
<td>0.2</td>
<td>1.2</td>
<td>3.0</td>
<td>1.2</td>
</tr>
<tr>
<td>Radish</td>
<td>0.1</td>
<td>0.7</td>
<td>3.4</td>
<td>0.1</td>
<td>1.6</td>
<td>15.0</td>
<td>0.6</td>
</tr>
<tr>
<td>Spinach</td>
<td>0.3</td>
<td>2.0</td>
<td>2.9</td>
<td>0.7</td>
<td>0.6</td>
<td>28.1</td>
<td>2.0</td>
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<tr>
<td>Potato</td>
<td>0.2</td>
<td>1.6</td>
<td>22.6</td>
<td>0.1</td>
<td>0.4</td>
<td>19.7</td>
<td>0.4</td>
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</tbody>
</table>
Traditional dishes with bamboo shoots
Bamboo Shoot Fortified Food Items
One of World’s most expensive tea

Panda Dung Tea

$70,000 per kg,
$200 for a cup of tea!!

Ya’an Sichuan Province of China

Fertilized by the dung of Pandas who feed only on bamboos

The tea is considered healthy as Pandas absorb only 30% of the nutrients

Excrement is rich in fibers and nutrients and it has anti-cancerous property
INVENTOR: An Yanshi, a panda enthusiast from Sichuan and a lecturer at Sichuan University
Natural Bamboo Wine

A forest of bambrew!

Chinese villagers use new way to make alcohol - by leaving liquor to purify inside BAMBOO

A bamboo forest at Baishuijian village outside Lin'an city, eastern China, is being used to brew alcohol

Workers at the site inject primary liquid of liquor into bamboo shoot and leave it inside for a year and half

Customers can purchase the brewed liquor or wine for 500 yuan (£56) per stick,
Bamboo wine

Tapping the bamboo to check that the alcohol is ready for sale

Collecting the matured alcohol from a small hole in the bamboo culm
Dietary fiber content in juvenile shoots
Amino acids

Synthesis of proteins
Precursors of secondary metabolites
Types of amino acids

Essential and non-essential amino acids

- Cannot be produced by the body
- Must be obtained from food

- Can be produced by the body
- Not necessary to obtain from food
<table>
<thead>
<tr>
<th>Amino acids</th>
<th>Bambusa balcooa</th>
<th>Dendrocalamus giganteus</th>
<th>D. hamiltonii</th>
<th>D. membranaceus</th>
<th>Phyllostachys mannii</th>
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<tr>
<td>Aspartic acid</td>
<td>6.74</td>
<td>5.69</td>
<td>7.53</td>
<td>7.86</td>
<td>16.28</td>
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<tr>
<td>Glutamic acid</td>
<td>2.49</td>
<td>3.39</td>
<td>3.83</td>
<td>4.06</td>
<td>10.81</td>
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<tr>
<td>Asparagine</td>
<td>12.81</td>
<td>24.73</td>
<td>36.43</td>
<td>47.11</td>
<td>111.04</td>
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<td>Serine</td>
<td>1.97</td>
<td>4.29</td>
<td>2.62</td>
<td>7.82</td>
<td>9.57</td>
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<td>Glutamine</td>
<td>3.53</td>
<td>5.05</td>
<td>9.72</td>
<td>3.40</td>
<td>5.48</td>
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<tr>
<td>Histidine</td>
<td>1.63</td>
<td>3.66</td>
<td>2.41</td>
<td>1.77</td>
<td>4.21</td>
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<tr>
<td>Glycine</td>
<td>4.84</td>
<td>3.85</td>
<td>3.68</td>
<td>3.95</td>
<td>3.62</td>
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<tr>
<td>Threonine</td>
<td>0.46</td>
<td>2.74</td>
<td>1.28</td>
<td>-</td>
<td>8.91</td>
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<td>Arginine</td>
<td>7.39</td>
<td>2.50</td>
<td>2.67</td>
<td>1.64</td>
<td>14.70</td>
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<tr>
<td>Alanine</td>
<td>4.49</td>
<td>5.30</td>
<td>6.66</td>
<td>4.71</td>
<td>10.22</td>
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<tr>
<td>Taurine</td>
<td>2.33</td>
<td>7.77</td>
<td>1.33</td>
<td>1.42</td>
<td>9.77</td>
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<tr>
<td>Tyrosine</td>
<td>29.41</td>
<td>38.25</td>
<td>33.81</td>
<td>74.64</td>
<td>41.21</td>
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<tr>
<td>Valine</td>
<td>2.51</td>
<td>9.60</td>
<td>2.89</td>
<td>3.78</td>
<td>21.11</td>
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<tr>
<td>Methionine</td>
<td>5.48</td>
<td>9.02</td>
<td>5.01</td>
<td>4.58</td>
<td>6.39</td>
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<tr>
<td>Phenylalanine</td>
<td>1.98</td>
<td>3.63</td>
<td>2.74</td>
<td>4.03</td>
<td>7.54</td>
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<tr>
<td>Isoleucine</td>
<td>1.65</td>
<td>2.45</td>
<td>2.64</td>
<td>2.26</td>
<td>7.80</td>
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<tr>
<td>Ornithine</td>
<td>1.68</td>
<td>3.46</td>
<td>1.98</td>
<td>2.68</td>
<td>1.05</td>
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<tr>
<td>Leucine</td>
<td>2.77</td>
<td>4.36</td>
<td>1.59</td>
<td>2.97</td>
<td>12.84</td>
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<tr>
<td>Lysine</td>
<td>1.71</td>
<td>2.11</td>
<td>1.05</td>
<td>1.50</td>
<td>3.96</td>
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</tbody>
</table>
Amino acids in Bamboo shoots (HPLC chromatograph)
MINERAL ELEMENTS

X-ray fluorescence spectra of fresh shoots of *B. balcooa*
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.
### Silica content in Bamboo and other Plants

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Plant</th>
<th>Silica content (mg/100 g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>High bran cereals</td>
<td>10.17</td>
</tr>
<tr>
<td>2.</td>
<td>Banana</td>
<td>5.44</td>
</tr>
<tr>
<td>3.</td>
<td>Green beans</td>
<td>2.44</td>
</tr>
<tr>
<td>4.</td>
<td>Carrot</td>
<td>2.26</td>
</tr>
<tr>
<td>5.</td>
<td>Brown rice</td>
<td>2.07</td>
</tr>
<tr>
<td>6.</td>
<td>White rice</td>
<td>1.24</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Bamboo species</th>
<th>Silica content (mg/100 g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td><em>Dendrocalamus hamiltonii</em></td>
<td>190</td>
</tr>
<tr>
<td>2.</td>
<td><em>D. sikkimensis</em></td>
<td>160</td>
</tr>
<tr>
<td>3.</td>
<td><em>Bambusa nutans</em></td>
<td>160</td>
</tr>
<tr>
<td>4.</td>
<td><em>B. tulda</em></td>
<td>160</td>
</tr>
<tr>
<td>5.</td>
<td><em>D. membranaceaeous</em></td>
<td>150</td>
</tr>
<tr>
<td>6.</td>
<td><em>D. latiflorus</em></td>
<td>140</td>
</tr>
<tr>
<td>5.</td>
<td><em>B. bambos</em></td>
<td>130</td>
</tr>
<tr>
<td>6.</td>
<td><em>D. giganteus</em></td>
<td>120</td>
</tr>
<tr>
<td>7.</td>
<td><em>B. balcooa</em></td>
<td>110</td>
</tr>
<tr>
<td>8.</td>
<td><em>Phyllostachys manii</em></td>
<td>70</td>
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</tbody>
</table>
Selenium

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
Health Promoting Bioactive compounds in Bamboos

- **Dietary Fibers**
  - **Soluble Fibers:** Dissolve in water
  - **Insoluble Fibers:** Do not dissolve in water

- **Phytosterols**
- **Phenols**
Phytosterols in Bamboo Shoots

β-Sitosterol

Campesterol

Ergosterol

Stigmasterol

Stigmastanol

Desmosterol
Antioxidants

Substance that neutralizes free radicals or their actions

Decreases the adverse effects of reactive oxygen species (ROS)

Dietary antioxidants in shoots are vitamin C, vitamin E, and phenols
Orientin  Isoorientin  Vitexin  Homovitexin  Tricin

Flavanoids

Protocatechuic acid  p-Hydroxybenzoic acid  Catechin  Syringic acid

p-coumaric acid  Chlorogenic acid  Caffeic acid  Ferulic acid

Phenols
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.
**Anti-diabetic properties**

*Sasa borealis, Phyllostachys edulis, Bambusa vulgaris, Pseudosasa japonica*
Ko et al 2006, Yang et al 2010, Nam et al 2013

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

The extract significantly reduced blood glucose and triglyceride levels in streptozotocin (STZ) induced diabetic mice.

AMP-activated protein kinase (AMPK) was activated in both skeletal muscle and liver cells and increased insulin sensitivity

When meat in hamburger patties was substituted by *S. borealis* leaf extracts, plasma glucose was significantly reduced
**Anticancer effects**


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 extract of bamboo is orally consumed on a regular basis, the progression of malignant tumors may be prevented or limited.
Anti-fatigue properties

*B. tuldoides* Munro, *Phylostachys nigra var hernonis*, *Sasa borealis*

Extract from bamboo shavings and leaf extract was tested on mice

Body weight, swimming and climbing test and oxidative metabolism

Accumulation of plasma lactate was delayed and fat utilization was increased

Metabolic capacity was increased through the upregulation of energy generating genes
**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
Traditionally, culm sheaths have been used for packaging foods such as rice balls, sushi and meat in Japan.

In India, young shoots and seeds are used as food and medicine.

*Phyllostachys pubescens* (Tanaka et al 2010), Fujimura (2005)

i) 2,6-Dimethoxy-p-benzoquinone
ii) Pp-AMP1 and Pp-AMP2

*Aspergillus niger, Bacillus subtilis, Escherichia coli, Staphylococcus aureus, Pseudomonas aeruginosa, Enterococcus faecalis, Fusarium oxysporum*
**Prevention of Cardiovascular diseases**

**Bamboo shoot is known to prevent hypertension**

**Park and Jhon (2009)**
Studied effect of bamboo shoot consumption on lipid profile, hepatic function and blood glucose in healthy young women

TC, LDL decreased but HDL were not affected

**Lu et al (2010)** investigated the hypolipidemic effect of Bamboo shoot oil in Sprague Dawley rats

TC, TG, LDL, atherogenic index in serum decreased


TC, TG LDL and MDA level was decreased
In-vivo antioxidant studies

BALB/c Mice
Fresh shoots (Group II)

Boiled (Group V)

Fermented (Group III)

Brine treated (Group IV)
Effect of fresh bamboo shoot extract on body and organ weight of Balb/c mice

<table>
<thead>
<tr>
<th>Weight (g)</th>
<th>Control</th>
<th>FBSE (mg/kg bw.) treated group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Initial body weight</td>
<td>32</td>
<td>0.58</td>
</tr>
<tr>
<td>First week</td>
<td>36</td>
<td>1.53</td>
</tr>
<tr>
<td>Second week</td>
<td>37</td>
<td>0.67</td>
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<tr>
<td>Third week</td>
<td>36</td>
<td>1.00</td>
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<tr>
<td>Fourth week</td>
<td>36</td>
<td>0.89</td>
</tr>
<tr>
<td>Liver weight</td>
<td>1.27</td>
<td>0.27</td>
</tr>
<tr>
<td>Kidney weight</td>
<td>0.300</td>
<td>0.082</td>
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</tbody>
</table>

Values are expressed as mean ± SD (N = 5)
### Effect of fresh and processed shoot extract on glucose, lipid profile and lipid peroxidation level

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Group I</th>
<th>Group II</th>
<th>Group III</th>
<th>Group IV</th>
<th>Group V</th>
</tr>
</thead>
<tbody>
<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>
</tr>
<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>
</tr>
<tr>
<td>HDL</td>
<td>90</td>
<td>0.94</td>
<td>94</td>
<td>0.53</td>
<td>97</td>
</tr>
<tr>
<td>LDL</td>
<td>21</td>
<td>3.44</td>
<td>16</td>
<td>1.52</td>
<td>8</td>
</tr>
<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
### Effect of fresh and processed shoot extract on lipid profile and lipid peroxidation level

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Group I</th>
<th>Group II</th>
<th>Group III</th>
<th>Group IV</th>
<th>Group V</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean SD</td>
<td>Mean SD</td>
<td>Mean SD</td>
<td>Mean SD</td>
<td>Mean SD</td>
</tr>
<tr>
<td><strong>Lipid profile (mg/dl)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total cholesterol</td>
<td>118 3.67</td>
<td>106 4.25</td>
<td>82 3.22</td>
<td>100 1.13</td>
<td>97 2.23</td>
</tr>
<tr>
<td>HDL</td>
<td>90 0.94</td>
<td>94 0.53</td>
<td>97 1.13</td>
<td>93 1.33</td>
<td>91 0.61</td>
</tr>
<tr>
<td>LDL</td>
<td><strong>21</strong> 3.44</td>
<td>16 1.52</td>
<td><strong>8</strong> 0.74</td>
<td>13 2.84</td>
<td>10 2.73</td>
</tr>
<tr>
<td>Triglycerides</td>
<td><strong>228</strong> 0.81</td>
<td>131 1.35</td>
<td><strong>119</strong> 1.87</td>
<td>211 3.84</td>
<td>176 1.45</td>
</tr>
<tr>
<td>MDA (nmole/min/mg protein)</td>
<td><strong>3.19</strong> 0.12</td>
<td>0.897 0.06</td>
<td><strong>2.63</strong> 0.11</td>
<td>1.09 0.21</td>
<td>1.56 0.22</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
Effect of fresh and processed shoots extract on the liver functions in Balb/c mice

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Group I</th>
<th>Group II</th>
<th>Group III</th>
<th>Group IV</th>
<th>Group V</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
</tr>
<tr>
<td>Billirubin (mg/dl)</td>
<td>0.27</td>
<td>0.02</td>
<td>0.28</td>
<td>0.04</td>
<td>0.36</td>
</tr>
<tr>
<td></td>
<td>0.28</td>
<td>0.03</td>
<td>0.28</td>
<td>0.03</td>
<td>0.33</td>
</tr>
<tr>
<td>Proteins (mg/dl)</td>
<td>79</td>
<td>1.50</td>
<td>66</td>
<td>1.55</td>
<td>69</td>
</tr>
<tr>
<td></td>
<td>72</td>
<td>1.81</td>
<td>76</td>
<td>1.18</td>
<td></td>
</tr>
<tr>
<td>Albumin (mg/dl)</td>
<td>16</td>
<td>0.76</td>
<td>15</td>
<td>1.25</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>17</td>
<td>0.95</td>
<td>16</td>
<td>0.71</td>
<td></td>
</tr>
<tr>
<td>Globulin (mg/dl)</td>
<td>63</td>
<td>0.61</td>
<td>52</td>
<td>0.90</td>
<td>55</td>
</tr>
<tr>
<td></td>
<td>56</td>
<td>0.58</td>
<td>62</td>
<td>1.21</td>
<td></td>
</tr>
<tr>
<td>Alkaline phosphatase (U/L)</td>
<td>62</td>
<td>6.24</td>
<td>91</td>
<td>9.36</td>
<td>64</td>
</tr>
<tr>
<td></td>
<td>76</td>
<td>7.70</td>
<td>87</td>
<td>9.25</td>
<td></td>
</tr>
<tr>
<td>SGOT (U/L)</td>
<td>109</td>
<td>4.85</td>
<td>93</td>
<td>9.12</td>
<td>69</td>
</tr>
<tr>
<td></td>
<td>125</td>
<td>9.72</td>
<td>105</td>
<td>5.33</td>
<td></td>
</tr>
<tr>
<td>SGPT (U/L)</td>
<td>58</td>
<td>7.31</td>
<td>45</td>
<td>9.66</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>93</td>
<td>5.64</td>
<td>54</td>
<td>5.11</td>
<td></td>
</tr>
<tr>
<td>LDH (U/L)</td>
<td>998</td>
<td>18.9</td>
<td>984</td>
<td>26.8</td>
<td>647</td>
</tr>
<tr>
<td></td>
<td>976</td>
<td>6.98</td>
<td>968</td>
<td>15.0</td>
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</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
# Effect of fresh and processed shoots on the kidney functions in Balb/c mice

<table>
<thead>
<tr>
<th>Parameter (mg/dl)</th>
<th>Group I Mean</th>
<th>Group I SD</th>
<th>Group II Mean</th>
<th>Group II SD</th>
<th>Group III Mean</th>
<th>Group III SD</th>
<th>Group IV Mean</th>
<th>Group IV SD</th>
<th>Group V Mean</th>
<th>Group V SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creatinine</td>
<td>0.306</td>
<td>0.01</td>
<td>0.335</td>
<td>0.04</td>
<td>0.437</td>
<td>0.03</td>
<td>0.321</td>
<td>0.03</td>
<td>0.363</td>
<td>0.01</td>
</tr>
<tr>
<td>Blood urea</td>
<td>56</td>
<td>1.01</td>
<td>51</td>
<td>0.43</td>
<td>49</td>
<td>0.50</td>
<td>62</td>
<td>0.33</td>
<td>63</td>
<td>0.30</td>
</tr>
<tr>
<td>Blood urea nitrogen</td>
<td>24</td>
<td>0.52</td>
<td>26</td>
<td>0.20</td>
<td>23</td>
<td>0.41</td>
<td>29</td>
<td>0.53</td>
<td>30</td>
<td>0.14</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
<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 collagen and cartilage</td>
</tr>
<tr>
<td>Sanacel</td>
<td>Bamboo fiber</td>
<td>Improves digestion</td>
</tr>
<tr>
<td>Silice de Bambou</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>
Bamboo as a nutraceutical
Transcends the body, mind and soul
The Healing Power of bamboo transcends body, mind and soul

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.

Conclusion
Projects funded by

Ministry of Food Processing Industries
Government of India

DEPARTMENT OF BIOTECHNOLOGY
GOVERNMENT OF INDIA
Special thanks

Ned Jaquith
FOUNDSATION

ABS
AMERICAN BAMBOO SOCIETY
Collaboration

Prof. M.S. Bisht
Centre for Science Education
North Eastern Hill University
Shillong, Meghalaya
Our team

Harjit Kaur Bajwa
Vivek Sharma
Natasha Saini
Premlata Thounaujam

Kanchan Rawat
Santosh Oinam
Aribam Indira
**Qualitative and Quantitative Mineral Element Variances in Shoots of Two Edible Bamboo Species after Processing and Storage Evaluation by Wavelength Dispersion X-Ray Fluorescence Spectrometry**

Natasha Saini1, Kanchan Rawal2, Madho Singh Bishnoi3 and Chongthum Nirmanual4

1Ph.D. Scholar, Department of Botany, Panjab University, Chandigarh, India
2Ph.D. Scholar, Department of Botany, Panjab University, Chandigarh, India
3Professor, Centre for Science Education, North-Eastern Hill University, Meghalaya, India
4Professor, Department of Botany, Panjab University, Chandigarh, India

**Abstract:** Bamboo shoots are renowned for their numerous health benefits and have been consumed in several cuisines. However, there is a need to understand the mineral composition of bamboo shoots. The present study investigated the qualitative and quantitative mineral content of shoots of two edible bamboo species, *Bambusa bambos* and *Bambusa blumei* after processing and storage. The results showed significant differences in the mineral content of the shoots. The study highlights the importance of processing and storage conditions on the mineral composition of bamboo shoots, which could be useful for further studies.

**Key Words:** bamboo shoots, mineral composition, processing, storage

**Introduction:** Bamboo shoots are an important source of natural minerals and are consumed in various cuisines around the world. The study was carried out to understand the mineral content of bamboo shoots before and after processing and storage. The results showed significant differences in the mineral content of the shoots, which could be useful for further studies.

**Methods:** The study was carried out on two bamboo species, *Bambusa bambos* and *Bambusa blumei*. The bamboo shoots were processed and stored under different conditions. The mineral content of the shoots was measured using X-ray fluorescence spectroscopy.

**Results:** The results showed significant differences in the mineral content of the shoots. The study highlights the importance of processing and storage conditions on the mineral composition of bamboo shoots, which could be useful for further studies.

**Conclusion:** The study highlights the importance of processing and storage conditions on the mineral composition of bamboo shoots, which could be useful for further studies.

**References:**

---

**Changes in Organooleptic, Physiochemical and Nutritional Qualities of an Edible Bamboo *Dendrocalamus Hamiltonii* Shoots and Nuts: An Ex Muno during Processing**

Harjit Kaur Bajwa1, C. Nirmlala2, A. Sharmila3 and M. S. Bishnoi4

1Department of Botany, Panjab University, Chandigarh, India
2Department of Biotechnology, North-Eastern Hill University, Shillong, India
3Centre for Science Education, North-Eastern Hill University, Shillong, India
4Centre for Science Education, North-Eastern Hill University, Shillong, India

**Abstract:** Bamboo shoots have attracted significant attention worldwide due to their nutritional value and health-promoting properties. The present study investigated the changes in organoleptic, physiochemical, and nutritional properties of *Dendrocalamus Hamiltonii* shoots and nuts during processing. The results showed significant changes in the organoleptic, physiochemical, and nutritional properties of the bamboo shoots during processing, which could be useful for further studies.

**Methods:** The study was carried out on bamboo shoots and nuts of *Dendrocalamus Hamiltonii*. The shoots and nuts were processed under different conditions, and the changes in organoleptic, physiochemical, and nutritional properties were measured.

**Results:** The results showed significant changes in the organoleptic, physiochemical, and nutritional properties of the bamboo shoots during processing. The study highlights the importance of processing conditions on the organoleptic, physiochemical, and nutritional properties of bamboo shoots, which could be useful for further studies.

**Conclusion:** The study highlights the importance of processing conditions on the organoleptic, physiochemical, and nutritional properties of bamboo shoots, which could be useful for further studies.

**References:**
Thank You

Eat Bamboo shoots and be Healthy!

Nirmala Chongtham
Thank You

Eat Bamboo shoots and be Healthy and Young!

Nirmala Chongtham
Bamboo represents one of the four seasons

- Plum (Winter)
- Orchid (Spring)
- Bamboo (Summer)
- Chrysanthemum (Autumn)
The Healing Touch of Bamboo

Dr. Nirmala Chongtham
Professor
Department of Botany
Panjab University
Chandigarh, INDIA
Used by scientists in their inventions

**Thomas Edison** used Bamboo as a filament for his glass bulb

The needle in **Alexander Graham Bell’s** first Phonogram was made of bamboo
THE ESSENTIAL AMINO ACIDS

WHICH OUR BODIES CANNOT MAKE:

<table>
<thead>
<tr>
<th>Histidine</th>
<th>Isoleucine</th>
<th>Leucine</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Histidine" /></td>
<td><img src="image" alt="Isoleucine" /></td>
<td><img src="image" alt="Leucine" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lysine</th>
<th>Methionine</th>
<th>Phenylalanine</th>
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</thead>
<tbody>
<tr>
<td><img src="image" alt="Lysine" /></td>
<td><img src="image" alt="Methionine" /></td>
<td><img src="image" alt="Phenylalanine" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Threonine</th>
<th>Tryptophan</th>
<th>Valine</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Threonine" /></td>
<td><img src="image" alt="Tryptophan" /></td>
<td><img src="image" alt="Valine" /></td>
</tr>
</tbody>
</table>