

# Development of Bamboo (*Dendrocalamus strictus*) Shoot Powder and its Nutritional Value

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**ABSTRACT** *Dendrocalamus strictus* is a bamboo species widely found in different parts of India. It is an indigenous food material consumed mainly by the tribes of Chhattisgarh. Bamboo shoots are consumed fresh as vegetables or as fermented product “Karil” by the tribes of Chhattisgarh. Bamboo shoot is highly perishable and seasonal forest produce. Its food application and utilization is limited in tribal areas of the state. Various researches concluded many functional and nutritional properties of Bamboo shoots. Fresh bamboo shoot contains a cyanogenic compound which can cause health implications when consumed raw. However, the cyanogenic compound can be destroyed with the help of novel food processing methods. This paper discusses the processing method of fresh bamboo shoots into the powder and its nutritional property. The purpose of the study is to process the underutilized fresh bamboo shoots and explore the nutritional property of Bamboo shoot powder (BSP).

**Keywords:** Bamboo, Bamboo shoot powder, *Dendrocalamus strictus*, Food fortification, Karil

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## INTRODUCTION

Bamboo belongs to the *Poaceae* family. Bamboos are important forest produce, and they play a vital role in people's day-to-day lives. Bamboos are majorly found in the mixed deciduous and tropical evergreen forests and partly found in the dry dipterocarps forest. More than 1,250 bamboo species belong to 75 genera and are distributed worldwide, of which 125 species are spread in India over an area of 9.57 million hectares.<sup>[1]</sup> The most famous and widely distributed bamboo species of Chhattisgarh is *Dendrocalamus Strictus*. Bamboo forests occupy a large area in Chhattisgarh. The total recorded bamboo forest area is 11,368 km<sup>2</sup> which is around 19% of the total recorded forest area in Chhattisgarh.<sup>[2]</sup> Bamboo shoot is one of the indigenous food consumed mainly by the tribes of Chhattisgarh and Northeast states of India. Bamboo shoots are known as *Karil* in Chhattisgarh. The shoots are generally consumed after fermentation. The succulent and soft shoots are consumed as vegetables by the natives of this state.

Analysis of various bamboo species for their nutritional benefits is done by many researchers.<sup>[3,4,5,6,7,8,9,10]</sup> Based on the

nutritional analysis, it has been determined that bamboo shoots are a good source of food energy, and they are projected as a new health food. Bamboo shoots are delicious and contain nutrient components, mainly proteins, carbohydrates, minerals, and fibre. They are low in fats and sugars. They also contain phytosterols and a high amount of fibres that can be labelled as nutraceuticals. This is because bamboo shoot consists of these health-enhancing properties. Moreover, the bamboo shoots do not contain residual toxicity and grow without the application of fertilizers.

Fresh bamboo shoots have high protein content (amino acids), carbohydrates, minerals, and several vitamins. Nutraceuticals are everyday foods with components or ingredients imparting a specific medical or physiological benefit other than a purely nutritional effect. Bamboo shoots contain phytosterols and a high amount of fibre that can qualify as “nutraceuticals” or “natural medicines.” Phytosterols have cholesterol-lowering activity.<sup>[11]</sup> Bamboo

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shoots are an excellent source of edible fibre (6 to 8 g/100 g fresh weight), which helps in lowering blood cholesterol. Dietary fibres are vegetable fibres obtained from fibre-rich parts of plants.<sup>[12]</sup> They are neutral in taste, odour free and have no calories and fats. Bamboo fibre is available as a powder with at least 95% fibre. Many food companies market such fibre additives that are rich sources of dietary fibre. Fat content is reported to be extremely low in the bamboo shoot; that's why they are suitable for weight-conscious people. Bamboo shoots have high cellulosic content that stimulates appetite. They are crisp, crunchy, and tender with a sweet flavour. Bamboo shoots have a unique and delicious taste that acts as an appetizer.<sup>[12]</sup>

It has been reported that fresh bamboo shoots contain an anti-nutrient (cyanogenic compound) in many bamboo species. They have a peculiar smell due to this cyanogenic compound, which can be minimized by boiling, fermentation, washing and drying.

Processing fresh bamboo shoots have its advantages as the anti-nutrient compound can be minimized, shelf life is increased and processed product can be used in number of food items to increase their nutritional value.

## MATERIALS AND METHODS

### Collection of Raw Materials

Edible shoots of the *Dendrocalamus strictus* sample was collected from local market of Bastar, Chhattisgarh, India. The samples were transported to the laboratory within 24 hours of collection. In the laboratory, the shoots were defoliated and washed. The unwanted parts were removed, and the soft edible portions were used for further processing.

### Cutting and Blanching

The shoots were cut into circular pieces and rinsed under running water for any dirt or unwanted parts. The bamboo

**Figure 1: Fresh Bamboo Shoots After Defoliation of Outer Covering and Rinsing with Running Water**



**Figure 2: Fresh Bamboo Shoot Pieces After Cutting**



**Figure 3: Bamboo Shoot Pieces After Blanching**



shoot pieces were blanched for 30 minutes by changing the water after every 10 minutes. Blanched pieces were drained and spread into metal sheets for evaporating excess water.

### **Drying and Grinding**

Blanched and drained bamboo shoot pieces were dried in a tray drier (IKON Instruments, Delhi, India) at 70 °C until they reached an equilibrium moisture content of about 5%.<sup>[9]</sup>

**Figure 4: Bamboo Shoot Pieces Spread in Trays, Ready for Tray Drying**



**Figure 5: Dried Bamboo Shoot Pieces**



**Figure 6: Bamboo Shoot Powder (BSP)**



Dried pieces of shoots were ground to get powder, passed through a sieve of 100 mesh size and stored in polyethylene pouches with proper sealing.

### **Nutritional Analysis**

Bamboo shoot powder was analyzed for moisture, fat,

protein, ash content and crude fibre by standard methods.<sup>[13]</sup> Value for carbohydrates was measured by subtracting moisture, fat, protein, fibre and ash content from the total gram weight of the sample. Calorie was measured by multiplying standard calorie values of Carbohydrates (4 Kcal/g), Proteins (4 Kcal/g) and Fats (9 Kcal/g).

**Figure 7: Flow Chart for Processing of Bamboo Shoot Powder (BSP)**

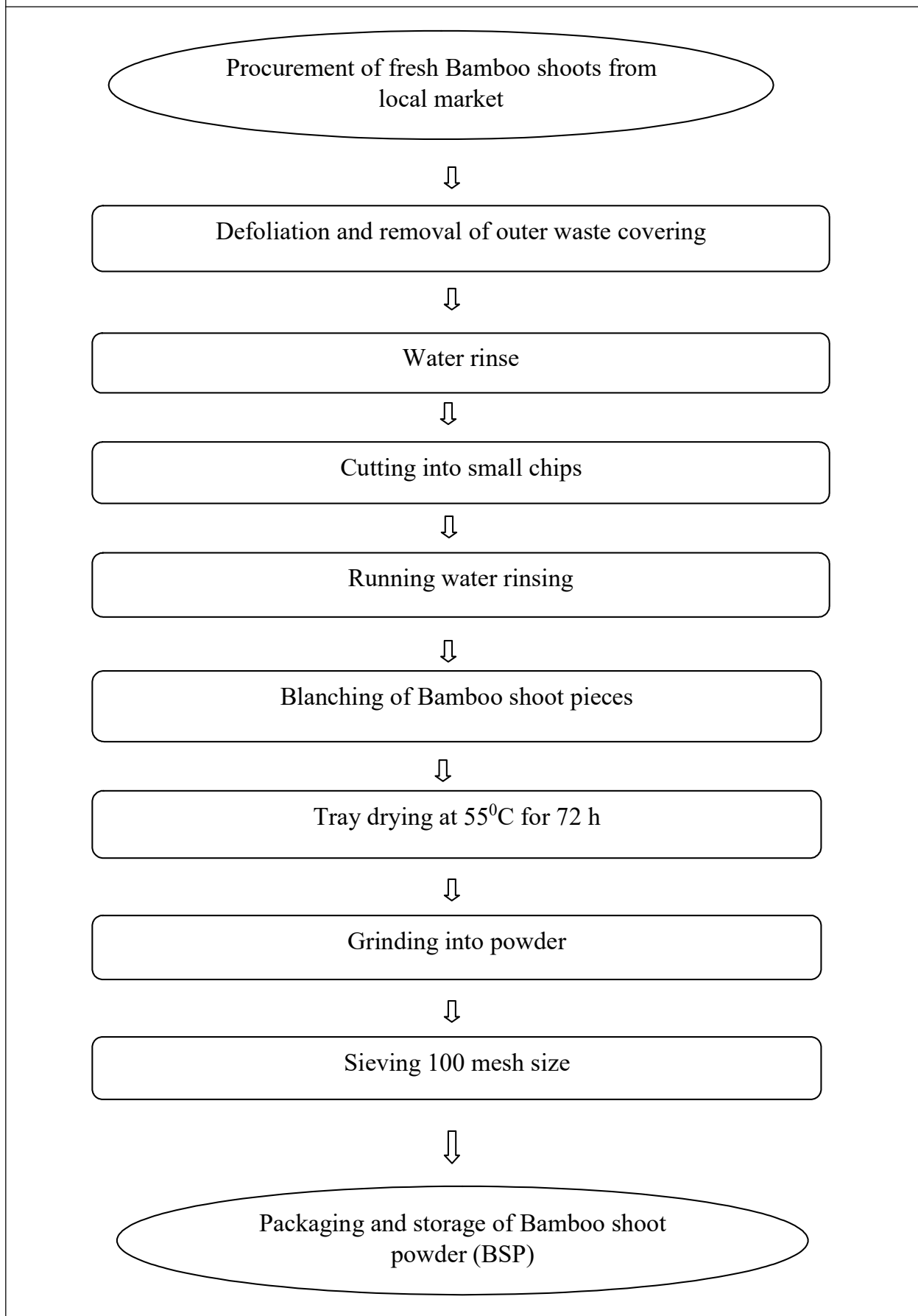


Table 1: Chemical Composition of Bamboo Shoot Powder		
S. No.	Particulars	Values (g/100 g)
01	Moisture (g/100 g)	05 ± 0.20
02	Fat (g/100 g)	04.83 ± 0.28
03	Protein (g/100 g)	26.28 ± 0.50
04	Fibre (g/100 g)	17.42 ± 0.57
05	Ash (g/100 g)	09.63 ± 0.20
06	Carbohydrates (g/100)	36.84
07	Calorie (Kcal)	296

**Note:** \*All data are the mean ± SD of three replicates.

## RESULTS AND DISCUSSION

Bamboo shoot powder (BSP) is easy to store and preserve for a more extended period. Table 1 shows the chemical composition of BSP. The Moisture content of BSP was found to be 5 g after drying process and this is ideal for better preservation and storage. The BSP is superior in protein content as 100 g of BSP contains 26.28 g of proteins while the fat content is 4.83 g. The fat content of bamboo shoots varied on different cut sections from tip to cut end. BSP is a good source of fibre which helps to lower blood cholesterol levels. BSP contains 17.42 g of fibre per 100 g. The fibre content also varies on different section of bamboo shoots. The amount of fibre is higher on cut end and decreases towards tip of the bamboo shoots.<sup>[9]</sup> It contains 9.63 g of ash per 100 g which suggests that a good quantity of mineral content is present in BSP.

## CONCLUSION

Bamboo shoot is a perishable forest produce, which can be preserved by blanching and drying. These preservation methods not only help to preserve the bamboo shoots but also help to get rid of its cyanogenic compound which, when consumed fresh could cause health implications. The bamboo shoot powder is nutrient rich which makes it more productive in food applications. It has good amount of protein and fibre. Hence, nutritious fortified food products using bamboo shoot powder can be formulated. The Bamboo species *D. Strictus* is an underutilized species and is only consumed by tribal's of Chhattisgarh either as vegetable or as fermented product. The powdered bamboo shoot can be used in fortification of food products and its utilization can be increased among larger populations. Other nutritional aspects of bamboo shoot powder need to be explored.

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