



ISSN (E): 2277- 7695

ISSN (P): 2349-8242

NAAS Rating: 5.03

TPI 2019; 8(3): 257-260

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www.thepharmajournal.com

Received: 01-01-2019

Accepted: 03-02-2019

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## Effect of pre-treatment on quality attributes of fresh bamboo shoot pickle

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### Abstract

The present investigation was carried out to study different pretreatment of blanching for a prepared a fresh bamboo shoot pickle. Bamboo shoots being low in fat, high in dietary fiber and rich in mineral content, like an ideal vegetable have been used traditionally. Besides nutrients, bamboo shoots also contain lethal concentration of the anti-nutrient (cyanogen glycosides) that need to be reduced and removed before human consumption. Therefore, an attempt has been made to find out the best processing method for confiscation of cyanogen's. Fresh and processed bamboo shoots pickle were analysed for their various nutritional and organoleptic quality and storage condition of pickle. Carbohydrate content in fresh bamboo shoots pickle of studied species ranged from 2.08g–2.42g, ash from 1.40g–1.80g, fats from 0.83g–0.52g, cyanogen from 0.007mg–0.004mg, pH from 3.57-3.45. The shoots were processed by boiling in water and different concentrations of NaCl (1%, 5%, 10% and 15%) for different intervals (15, 25, 35 and 45 min) to achieve maximum removal of cyanogen's with minimum loss of nutrients. Boiling shoots in 10% NaCl for 35 min was found to be the best method and overall acceptable for a bamboo shoot pickle. These processing methods will be very useful in utilization of bamboo shoots as these are very simple and can be used by the local inhabitants and shoot processing industries.

**Keywords:** Bamboo shoot pickle, recipe standardization, effect of pretreatment of blanching, NaCl

### Introduction

Bamboos are a unique group of giant arborescent grasses in which the woody culms arise from underground rhizomes. They are shrubs and have tree-like a habit; their culms are erect and sometimes climbing. Bamboos are characterized by woody, mostly hollow culms with internodes and branches at the culm's nodes belonging to the tribe Bambuseae of family Poaceae (Meher *et al.*, 2012). India is the second largest resource of bamboos next only to China with 130 species covering an area of 96,000km<sup>2</sup> (Scurlock *et al.*, 2000 and Yuming *et al.*, 2004) <sup>[1]</sup>.

The edible genera of bamboo shoots available in the USA are Phyllostachys, the important being Phyllostachys Dulcis, Phyllostachys edulis, Phyllostachys bambusoides, Phyllostachys pubescens, Phyllostachys Nuda and Phyllostachys viridis (Rubatzky and Yamaguchi 1997) <sup>[10]</sup>. 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." Bamboos in addition to their multiple applications have another important usage in utilizing their juvenile shoots as popular food items. The presence of high content of protein, amino acids, minerals, fibre, carbohydrates, and low fat makes the bamboo shoot one of the \*widely acclaimed nutrient-rich food items. Also, the presence of phytosterols in young shoots provides youthful feeling, athletic energy, and longevity to regular consumers. Bamboos shoots are popular in Asiatic countries and form a major component of their traditional cuisines (Bao 2006) <sup>[3]</sup>.

Bamboo shoots are seasonal, perishable, short-lived and unpreserved but are becoming one of the preferred food items among the people all over the world. Implying thereby a need to explore a well-organized bamboo shoot processing scheme making them available throughout the year. The edible bamboo shoots are of two types- winter and spring (Choudhury *et al.*, 2012) <sup>[5]</sup>. The people of Northeast India with their mongoloid features are endowed with rich bamboo culture and the plants are an inseparable part of several diverse traditions and religious beliefs of many ethnic people residing at both hilly and plain areas. Consumption of bamboo shoots as food in India is mainly confined to the Northeast states where they are taken either fresh at the time of harvesting season or dried, fermented or pickled forms during offseason (Nirmala *et al.*, 2008) <sup>[8]</sup>.

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Pickle is one of the oldest and most successful methods of food preservation known to human. The optimization of pickle quality depends on the maintenance of proper acidity, salt concentration, temperature and sanitary conditions. Pickle products add spice to meals and snacks. The skilful blending of spice, sugar and oil with fruit and vegetable gives crisp, firm texture and pungent, sweet-sour flavour. Pickles serve as appetizers and help in digestion by aiding the flow of gastric juices. fermented pickles also have beneficial bacteria that can control harmful intestinal microbes.

The fresh bamboo shoots are perishable in nature and cannot be stored for longer period. They are prone to undergo texture change during storage because of Phenylalanine Ammonia Lyase (PAL) activity (Matsui *et al.*, 2004) [6]. Therefore, different value-added edible products (nuggets, pickle and cracker) made from bamboo shoots were good in taste and texture as assessed by the Organoleptic and sensory evaluation. The products were accepted in terms of flavour, odour, appearance and taste (Pandey *et al.*, 2012) [9].

**Materials and Methods**

Present investigation was planned to analyze the effect of on quality of fresh bamboo shoot pickle. Preparation of bamboo shoot pickle from fresh bamboo shoot having different

pretreatment of boiling with NaCl.

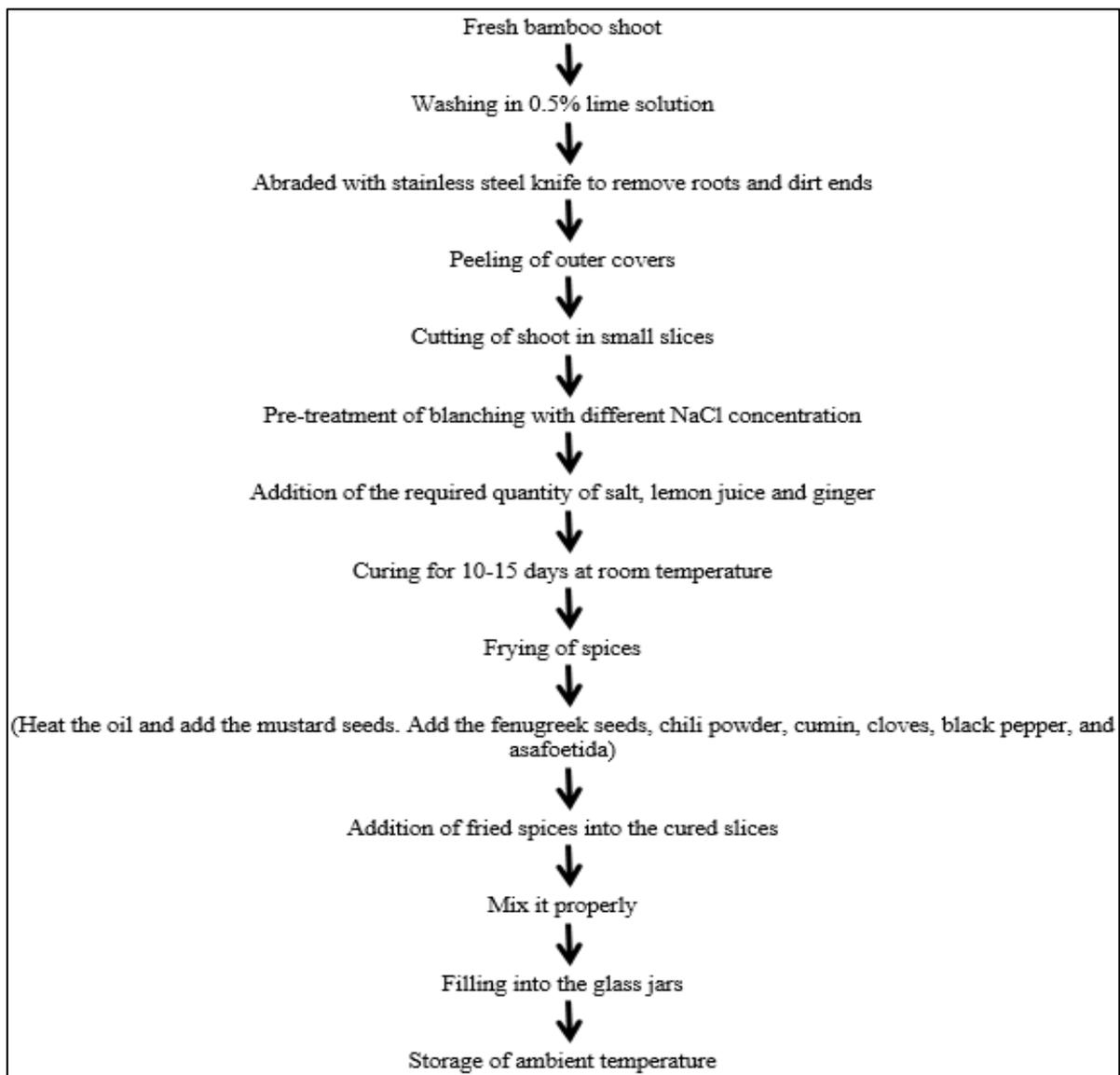
**Standardized recipe for preparation of fresh bamboo shoot pickle**

The data on ingredients in specific quantities for standardization of recipe for fresh bamboo shoot pickle are given in table 1.

**Table 1:** Standardization of recipe for preparation of fresh bamboo shoot pickle (1 kg)

Ingredients	Per 100 gm
Fresh bamboo shoot	100g
Ginger	15g
Lemon juice	20ml
Salt	17g
Mustard oil	15g
Mustard dal	10g
Fenugreek	3g
Cumin	2g
Chilli powder	2g
Black Pepper	0.25g
Cloves	0.10g
Asafoetida	0.10g

Flow sheet for preparation of fresh bamboo shoot pickle



### Study of storage behaviour/shelf life

The prepared pickle was analysed for storage study at ambient conditions. The product was packed and sealed in Glass bottles. The effect of storage was studied up to two and half months at ambient condition at 15 days intervals and the changes were evaluated based Sensory attributes.

### Chemical analysis

Determination of moisture, protein, fat, Fibre, Ash, pH by AOAC method. Determination of carbohydrate by Wankhede (1976) [14].

### Sensory evaluation

The bamboo shoot pickle and stored pickles were evaluated at 15 days intervals by the panel of ten semi- trained judges by using nine-point hedonic scale as per the method adopted by (Srilakshmi, 2003) [12].

### Results and Discussion

#### Effect of pretreatment (Boiling with different NaCl concentration) on chemical composition of fresh bamboo shoot pickle

Data pertaining to various chemical properties like fat, carbohydrates, protein, ash, pH, crude fiber and acidity were investigated and results obtained are depicted in Table 2.

**Table 2:** Effect of pretreatment of blanching on chemical composition of fresh bamboo shoot pickle

Parameter							
Pre-treatment of blanching with NaCl	CHO (g/100g)	Fat (g/100g)	Ash (g/100g)	Fiber (g/100g)	Cyanogen (mg/100g)	pH	Acidity (%citric acid)
1% NaCl (45 min)	2.08	0.83	1.40	5.59	0.007	3.57	1.47
5% NaCl (35 min)	2.04	0.41	1.52	5.73	0.006	3.55	1.50
10% NaCl (25 min)	2.39	0.56	2.90	5.89	0.005	3.52	1.66
15% NaCl (15 min)	2.42	0.52	1.80	5.03	0.004	3.45	1.78
SE ±	0.206	0.431	0.116	0.057	0.001	0.029	0.026
CD@ 5%	0.711	1.491	NS	0.199	0.003	0.101	0.092

\*Each value is average of three determinations

The data regarding the chemical composition of fresh bamboo shoot pickle prepared from three different blanching treatment with NaCl added was tabulated in table 2. Carbohydrates content was found to be increase from 2.08 to 2.42 g for pickle prepared from pre-treatment of the shoot of NaCl 1% a, 5%, 10% and 15% (15, 25, 35, 45 mi) at Temperature 850 C respectively. Fat content was found to be lowest in a pickle from 10% for 25 min of blanched bamboo shoot followed by 1%, 5% and 15% NaCl. Highest fiber content (5.89 g) was found in pickle from 10% NaCl concentration followed by 1% (5.59g), 5% (5.73) and 15% (5.03g) NaCl Concentration. Highest ash content (2.90 per cent) was observed in a pickle

from 10% NaCl concentration bamboo shoot followed by 1% (1.40 g), 5% (1.52g) and 15% (1.80g) of NaCl Concentration. pH was found to be decreased with a decrease in treated bamboo shoot pickle. Acidity was found to be in the range of 1.47 to 1.78. On the basis of statistical analysis, it was clear that the chemical constituents of blanching with Different NaCl concentration added 1%, 5% and 15% are not much different as compared to 10% for 25 min blanching of fresh bamboo shoot except cyanogen content.

#### Effect of harvesting period on organoleptic qualities of fresh bamboo shoot pickle

**Table 3:** Effect of harvesting period on organoleptic qualities of fresh bamboo shoot pickle

Pre-treatment of blanching with NaCl	Colour	Flavour	Taste	Texture	Mouthfeel	Overall Acceptability
1% NaCl	8.2	7.4	7.9	7.8	8.1	8.2
5% NaCl	8.4	8.5	8.8	8.2	8.5	8.4
10% NaCl	8.6	8.7	8.6	8.7	8.8	8.6
15% NaCl	8.5	8.5	8.0	8.5	8.2	8.3
SE ±	0.023	0.089	0.081	0.089	0.073	0.076
CD@ 5%	0.081	0.310	0.282	0.310	0.254	0.263

\*Each value is average of three determinations

The mean scores of different organoleptic characteristics of fresh bamboo shoot pickle prepared from different blanching treatment with NaCl concentration added as such as (1%, 5%, 10% and 15% for 15, 25, 35, 45 min at Temperature 850C) are summarized in table number 3. It is clear from the table that pickle from 10% NaCl for 25 min blanching was significantly superior in colour content over pickle from different Boiling with NaCl concentration.

On the contrary flavour of pickle from boiling with 10%, NaCl for 25 min was most liked by test panellists over the

pickle from different Boiling with (1%, 5%, and 15%) NaCl. Taste of prepared pickles from boiling in 10% NaCl recorded higher organoleptic score as compared to other boiled with NaCl bamboo shoot pickle. The texture and mouthfeel of 10% NaCl for 25 min boiled shoot pickle was also organoleptically recorded more score as compared to other boiled shoots with NaCl of bamboo shoot pickle. And hence pickle prepared from boiling with 10% NaCl for 25 min bamboo shoots was found to be higher overall acceptable.

## Effect of Storage period on organoleptic quality of fresh bamboo shoot pickle stored at ambient temperature

**Table 4:** Effect of Storage period on organoleptic quality of fresh bamboo shoot pickle stored as ambient temperature.

Parameters						
Storage period in days	Colour	Flavour	Taste	Texture	Mouthfeel	Overall acceptability
0	8.40	8.50	8.80	8.20	8.60	8.80
15	8.20	7.10	7.80	8.28	8.75	8.40
30	8.10	7.00	7.50	8.35	8.75	8.20
45	7.50	7.00	7.10	8.50	8.20	7.80
60	7.30	6.20	7.00	8.50	8.20	7.50
SE ±	0.057	0.057	0.057	0.057	0.069	0.257
CD @ 5%	0.177	0.177	0.177	0.177	0.213	0.792

\*Each value is average of three determinations

The data on changes in sensory properties are depicted in table number 4. The data indicated that changes in organoleptic quality of fresh bamboo shoot pickle during storage at ambient storage condition. The scores for all parameters decrease continuously except texture and mouthfeel. The mean overall acceptability of fresh bamboo shoot pickle decreased from 8.8 to 7.0 at ambient condition. Colour characteristics decreased from 8.40 to 7.0 up to 60 days of storage period may be due to enzymatic browning during storage of pickle Verma *et al.* (1986)<sup>[13]</sup>. A significant decrease was also found in flavour during the first 15 days of storage (8.50 to 7.10) as compared to the loss of flavour during further storage period (7.10 to 6.0). The taste was also found to progressively increase in storage period. Up to 45 days of storage mouthfeel was found to be increases and after 45 days of storage, mouthfeel was found to be stable. It was observed that after 60 days of storage period visual fungal growth was observed on fresh bamboo shoot pickle. The overall acceptability of stored bamboo shoot pickle was also gradually decreasing during the storage period.

### Conclusion

Overall it can be concluded that nutritional status in fresh bamboo shoot pickle may vary from species to species significantly. Scientific validations of indigenous knowledge of tribal's coupled with modern scientific inputs have provided a simple, efficient and cost-effective method for processing of bamboo shoots. The processing methods used significantly reduce the amount of cyanogen's and retains considerable amount of nutrients thus may be utilized for processing of bamboo shoots. Being a lesser known food product, bamboo shoot processing has vast potential to be developed as a new, innovative and promising enterprise in India. Thus, experimentation on effect of processing on nutritional status of various bamboo species growing in different agro-ecological regions needs to be carried out. Being a smaller known food, fresh bamboo shoot processing and valued addition has very large scope in future for developing new products. Pickle can be stored up to two and a half months at ambient storage condition after that there was evidence of visual fungal growth.

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