

Original Paper

Changing Consumption Patterns of Bamboo shoots: A Case Study of Traditional Food-Related Knowledge Systems

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Abstract— Bamboo shoots form an integral part of the local diet of the Northeastern states of India. Fermented shoots have been consumed by tribal communities since ancient times. However, with increasing globalization and fast-food consumption, the traditional knowledge and skills of processing bamboo shoots seem to be changing. This paper highlights the changes in processing ways over the years in the younger generation. Data were collected using an unstructured interview schedule and observation through home visits from *Adi* women of four villages namely Balek, Sibut, Runne, and Mirbuk in Pasighat Block of Arunachal Pradesh. It was observed that some newer practices of processing bamboo shoots had been adopted while ignoring the traditional practices which emphasized eliminating toxicity in bamboo shoots.

Keywords— Bamboo shoots, traditional knowledge, globalization

I. INTRODUCTION

Northeastern India is one of the richest regions in India, not only for its plant diversity but also in terms of cultural, social, and linguistic variability conserved by tribal people. These regions constitute a treasure of indigenous knowledge systems pertaining to agriculture, food, medicines, and natural resources. Among these resources, wild plants have been selected by rural women as the food staple in the local diet [1].

Bamboo shoots are one of the non-timber forest products (NTFPs) chosen by the tribal people in their diets to maintain food and nutritional security. Bamboos are a group of giant arborescent grasses and belong to the family *Poaceae* and sub-family *Bambuseae*. More than 1,250 species belonging to 75 genera have been reported to be distributed worldwide, out of which 125 species have been grown in India spreading over an area of 9.57 million hectares. This has made India the richest bamboo resource, after China. The tender shoots have ample food potential in countries like China, Japan, and Thailand. The tender shoots of a few species are consumed either as vegetables or in curries or as pickles in fermented form by various tribes since ancient times. The method of processing shoots varies across regions and tribes. Bamboo shoots are nutritionally and medicinally rich [2][12]. This has been acknowledged in recent studies demonstrating a positive correlation between the

consumption of bamboo shoots and the prevention of cholesterol and diabetes [3][4].

The consumption of traditional foods by tribes of the Northeastern region is virtually connected to socio-cultural aspects, spiritual well-being, and health. The new generation has undergone a rapid change in their diets over the past 30 years due to the intervention of modern crop varieties, fast-moving life, and the trend towards consuming commercially processed foods. The transformation has taken place from traditional food rich in nutrients to a more generic processed diet. Changing diet patterns, farming systems, and fast foods through globalization has resulted in many metabolic syndromes, heart diseases, diabetes, stroke, cancer, etc. [5][11]. As an attempt to address these adverse impacts, this paper tries to focus on the adoption of newer practices of processing bamboo shoots by the younger generation and erosion of the traditional knowledge system led by the older generation.

II. METHODOLOGY

A. Study Area

Arunachal Pradesh is situated between 26°28' and 29°30' North latitudes and 97°30' and 97°30' East Longitudes covering an area of 83,743 km². Rainfall varies from 1000 mm in higher reaches to 5,750 mm in the foot-hill areas, spread over 8-9 months, except during the drier days in the winter. The population of Arunachal is 1,091,117 according to the 2001 census and is scattered over 12 towns and 3649 villages. The State has the lowest density of 13 persons per km². The knowledge and skills of consuming and preparing bamboo shoots were studied among the *Adi* women of different age groups in randomly selected villages. The study was conducted in July when the bamboo shoot was abundant. The study was divided into two phases.

B. The Selection of Villages and Research Subjects

In the first phase, the data on different types of preparation and consumption pattern of bamboo shoots used by *Adi* women was collected purposively in the East Siang district of Arunachal Pradesh. In the second stage, Pasighat Block in Arunachal Pradesh was selected randomly. A list of villages was obtained

from the Block Development Office, and four villages namely, Balek, Sibut, Runne, and Mirbuk were selected randomly for the study. A list of *Adi* women who collected bamboo shoots from their *jhum* land (slash and burn agriculture) and community forest was prepared with the help of village *Gaon Burha* (customary chief). From that list, 30 women were chosen from each village, and thus a total of 120 women from four villages were sampled randomly. Out of these 120 women, 30 women were young (16-35 yrs), 50 were middle-aged (36-45 yrs) and 60 were old (46 to 75 years) group. Prior consent was obtained from the women included in the study and their respective village level customary chief (*Gaon Burha*) to use their information for publication.

C. Data Collection

An unstructured interview with open-ended questions was employed to garner the data from sampled population. The questions made were designed to capture the knowledge and skills of the women. Before the final application, the interview guideline was tested in a pilot study with 30 *Adi* women in non-sampled villages to refine and validate the types of questions (for qualitative and quantitative data). Data on the knowledge of food processing was collected on a four-point continuum of efficiency: 'full knowledge' 'partial knowledge', 'limited knowledge' and 'no knowledge' [6,7]. A score of 3 was assigned for 'full knowledge, while 2, 1, and 0 were assigned to 'partial knowledge', 'limited knowledge', and 'no knowledge' respectively. The skill was also tested by observing the actual food processing to determine the efficiency. Before recording the final data, the women were asked to collect bamboo shoots and prepare the required recipe in front of the researchers.

D. Statistical Analysis

The significance of knowledge variation was tested by applying the 'Z' test.

III. RESULTS AND DISCUSSION

A. Foods prepared from a bamboo shoot and their ethnomedicinal usage

It was observed that the bamboo shoot was used in the boiled form, and the frequency of using fresh bamboo shoots was found relatively low amongst *Adi* women. The women selected new emerging shoots from a bamboo garden to peel out the bark and then chop the slices for preparing *ekung* (fermented bamboo shoots) and *eup* (dried bamboo shoot) for further use (Fig. 1). These slices were separated from selected emerging new bamboo shoot (Fig. 2) and kept in a bamboo basket after being wrapped with *ekkam* (*Phyrrinum pubenerve*) leaves. After 2-3 days, this pack of slices was transferred into a plastic bucket where it would be left for over 10-15 days. After this period, the bamboo shoot would be ready to consume (Fig 3). The second category of bamboo-based food consumed at a large scale was called '*eup*'. Green slices of bamboo shoots were prepared as mentioned for *ekung* and dried in the sun. This powder was then packed in a poly bag and stored for use throughout the year. *Eup* was used in variety of ethnobotanicals harvested from community forests and *jhum* land (Fig 4). Depending on the food habits, locations, and types of food resources available *ekung* and *eup* were mixed with variety of indigenous vegetarian and non-vegetarian foods (Table 1). The market demand for *eup*

was relatively lower than *ekung*, though it was easier to store *eup* than *ekung*.

TABLE I. TYPES OF FOODS AND MIXTURE OF EKUNG AND EUP ADDITION

Name of foods	Mixture of <i>ekung/eup</i>	Percentage*
Leafy vegetables	<i>Ekung</i> and or <i>eup</i> both	89.8
Pork	<i>Eup</i> only	78.5
Mithun (<i>Bosfrontalis</i>) meat	<i>Eup</i> only	92.4
Rice granules	<i>Ekung</i> and or <i>eup</i>	71.2
Local fishes	<i>Eup</i> and or <i>ekung</i>	68.7

* Multiple percentages



Fig. 1. Bamboo shoots collected to be peeled and sliced



Fig. 2. Sliced and un-sliced bamboo shoots ready for fermentation



Fig. 3. Fermented bamboo shoots in a green bamboo cylinder ready to serve



Fig. 4. Boiled eup mixed with ethnobotanicals ready to consume

The fermented preparation was also found to have some ethnomedicinal usage and was given for constipation and indigestion when mixed with green leaves of *ongin* (*Clerodendrum colebrookianum*). About 30 ml extract of '*ekung*' was mixed with a local fresh green leafy vegetable called '*ongin*' or '*pakum saag*' and local ingredients like ginger, chilly, salt, and local onion called '*dilap*'. This mixture was boiled for about 15-20 minutes and given for constipation and indigestion. This food was given twice a day generally for lunch and dinner regularly for 3 to 4 days. It helped to cure constipation, and indigestion and also controlled high blood pressure.

B. The Loss of traditional knowledge system

It was observed that in the abovementioned process a quicker pre-processing technique had been adopted by the people. The preparation of *ekung* through a classical method using green bamboo stem was observed among only 2-3 elder women (80 yrs). Conical bamboo baskets lined with banana (*ekkam*) leaves used traditionally by the tribes had been replaced by plastic jars. Traditionally, a hole was made at the bottom of the basket and a bamboo stick was inserted for draining the sap [8]. Nowadays, people do not make any holes and the water remains accumulated in the jars. Earlier processing techniques during fermentation aided in reducing the cyanide percentage. Cyanide causes several disorders

related to the neural system, miscarriage, abnormal childbirth, and goiter problem. Fresh bamboo shoots contain high cyanogenic glycoside (551mg/kg), followed by thiocyanate (24mg/kg) and glucosinolate (9.57mg/kg), and chronic consumption can lead to hypothyroidism by inhibiting thyroid peroxidase activity (TPO) activity [9]. Due to these problems, aged women still advise pregnant women not to eat any bamboo-based product unless it is rigorously processed. For reducing the cyanide content during processing, 2-3 small holes were made inside the *edung*. During the fermentation, these *edung* are kept near the water stream in such a manner that water touches the bottom of *edung*. In this way, the toxic compound is leached out and it becomes safe for consumption [10]. Nevertheless, it was observed that the practice of leaching out the toxic chemical in the water stream seemed to be fading out in cities with more modern and quicker techniques. Local people followed processing steps like dipping shoots in water, removing the tip, slicing into gratings, etc. These were known to help remove bitterness and toxic compound.

C. Knowledge and skills of processing using bamboo shoots across the generations

We managed to measure the knowledge status across the generation to see the rate of knowledge erosion on processing and use of *ekung*. Scores obtained by women of different age groups in the interview on possessing traditional knowledge and skills for processing bamboo shoots are given in Table 2 and Table 3. It was found that older women were found to have significantly higher traditional knowledge status in preparing *ekung* (fermented bamboo shoots) as they scored high in all the parameters defined as the basis for having traditional knowledge. It was observed that there was a significant gap in 'traditional knowledge' among young, middle, and old age *Adi* women leading to diverse preparations of *ekung*. Older women also possessed a greater degree of skills as compared to the young generation with regard to processing, storing, packaging, and marketing skills. These findings revealed a massive erosion in traditional knowledge and skills required for the collection, fermentation, processing, marketing, and use of traditional foods prepared from bamboo shoots.

TABLE II. STATUS OF TRADITIONAL KNOWLEDGE OF ADI WOMEN IN PREPARING EKUNG (FERMENTED BAMBOO SHOOTS)

Particulars	Age groups			'Z' value		
	Old	Middle	Young	Old vs middle age	Old vs young age	Middle vs young age
Identification of species for preparation of <i>ekung</i>	2.89	2.18	0.78	7.89**	10.24**	8.74**
Identification of appropriate bamboo shoots	2.72	1.75	0.90	6.71**	9.47**	9.87**
Selection of portions for making slices	2.85	1.92	0.68	8.90**	11.87**	6.98**
Selection of utensils for fermenting bamboo shoots	2.69	1.45	0.60	4.57**	12.41**	10.14**
Processing techniques for fermentation	2.75	1.31	0.45	6.80**	13.47**	9.45**
Use method	2.80	1.46	0.58	5.60**	8.97**	6.74**
Precautions to be taken for use: like avoiding malaria, acidity, etc.	2.80	1.10	0.40	6.87**	10.64**	9.84**
Health-related knowledge	2.90	1.21	0.39	8.67**	14.47**	7.80**

** Significant at $p < 0.01$

TABLE III. SKILLS STATUS IN FERMENTATION AMONG DIFFERENT AGE GROUPS OF ADI WOMEN

Particulars	Age groups			‘Z’ value			
	Old age	Middle age	Young age	Old vs middle age	Old young age	vs Middle age	vs young
Processing techniques for fermentation of <i>ekung</i>	2.87	1.48	0.42	8.87**	10.24**	10.34**	
Making mixture with various food resources	2.82	1.61	0.55	9.45**	9.31**	7.98**	
Preparation techniques of <i>ekung</i>	2.60	1.34	0.61	7.90**	9.45**	8.84**	
Storage method	2.65	1.45	0.58	6.32**	10.32**	6.48**	
Package skill	2.70	1.25	0.40	5.50**	7.84**	7.41**	
Marketing skill	2.18	1.95	0.63	7.62**	6.78**	5.24**	

** Significant at $p < 0.01$

IV. CONCLUSION

Traditional knowledge systems and practices of food preparation engraved in tribal communities have relevance to the recent measures on maintaining food and nutrition security. The preparation of fermented bamboo shoots, which is not only rich in nutrition but also reflects rich traditional knowledge, in the Northeast seems to be vanishing. With the increase in fast food consumption and changing food choices coupled with the fear of nutritional crises, we need to strengthen our existing traditional knowledge system among the youths through educational programs emphasizing the importance of these foods in terms of health, social, cultural, and nutritional security.

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