REDVET - Revista electrónica de Veterinaria - ISSN 1695-7504
Vol 25, No. 1S (2024)
http://www.veterinaria.org
Article Received: 21 May 2024 Revised:15 June 2024 Accepted: 29 July 2024

Exploring The Indigenous Food Fermentation Technology For Sustainable Food System In Manipur, India

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Abstract
The people of Manipur in India's north-eastern states produced and consumed several fermented food products using the locally available resources. The aim of the present study is to explore the indigenous fermented foods and understand the fermentation techniques adapted by the tribal population. A structured and pre-tested interview schedule designed to elicit and collect information on various traditional fermented foods and beverages was used for the study; One hundred womenfolk of 45 years and above, having good knowledge and currently producing fermented foods, were selected from different districts of Manipur. The present study documents over thirty different fermented food products from different parts of Manipur. The primary variety of fermented foods recorded during the study was from cereal and millets; pulses and seed; bamboo shoot; fish and meat; mustard leaves and fruits. The present study indicates the extensive use of indigenous technology and few of the foods fermented are not yet reported which needs documentation to carry on to the future generation for sustainable food supply and economic growth.

Keywords: *Foods, preservation, womenfolk, fermentation, sustainable, Manipur*

1. Introduction

For thousands of years human kind have been known for producing and consuming fermented foods with the use of microbes. A wide range of fermented foods and beverages have been significantly contributing to dietary and food habits of many worldwide (**Tanasupawat &Visessanguan, 2014).** They were integral to many ancient diets due to their pleasant taste compared to the raw materials used. There are thousand varieties of different fermented foods produced traditionally at household level and consumed locally, **(Mota et al., 2018)**, providing the food security to millions of people worldwide, particularly marginalised and vulnerable groups **(Marshall & Mejia, 2011).** They act as a source of essential nutrients during crisis due to their extended shelf life **(Muhaildin et al., 2022)** and stability of their starting materials **(Sivasankar, 2019)** to ensure supplies from time of surplus to those of needs **(Sarkar &Nout, 2014). A** wide variety of about 5000 major and minor unlisted fermented foods and beverages of different communities and ethnicities had been reported **(Tamang, 2010b).** A sustainable food system provides food and nutrition security for all not compromising the bases to generate food for the future generations **(Nguyen, 2018).** The traditional fermentation processes are needed to be understood and explored to preserve and improve the technologies and traditions **(Thanh& Viet, 2016).**

In the Indian subcontinent, fermented food and beverages have generally been prepared using locally available food crops since ancient times **(Roy, Kala, Farooquee &Majila, 2004);** they have incredible diversity due to the diversity in the geographical condition, culture and the raw material present in abundant amounts especially in the North-Eastern states of India **(Rawat et al., 2018).** Study have reported the collection of seasonally available wild edible vegetable resources which are often stored after processing either by cooking, drying, or fermenting in Mizoram **(Lalmuanpuii et al., 2021).**

Manipur lies between 23.83 degrees and 25.68 degrees north latitude and 93.03 degree and 94.78 degrees east longitude (www.mapsofindia.com). It is inhabited by different ethnic groups, with a total population of 28 55,794 according to the 2011 Census of India; 58.9% represents the valley population, and 41.1% represents the population of the hills which is inhabited by the tribal's comprising of the Nagas or the Kukis (www.mygov.com). The hills are populated mainly by the tribal communities (Nagas, Kukis, and other smaller tribes) and the valley region by the Meitei, Pangals and Bishnupriyas (www.wikipedia.org).

In Manipur, varieties of fermented foods occupy a large portion of the daily food intake **(Jeyaram et al., 2009)** which are prepared by utilising the rich bio resources of the region with their traditional knowledge which they have acquired

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during their quest for survival to prepare various fermented and ethnic foods reflecting their culture and identity **(Keishing & Banu, 2021).** Women have played important role in ensuring food and nutritional security by conserving many local crops, ethnic vegetables and indigenous fruits used in the local diet **(Singh et al.,2007; Jamir & Deb, 2014).**

The region has a rich bio-resource of perishable fruits and vegetables available in plenty only during certain seasons of the year. Due to the lack of modern storage devices and processing, many food resources went wasted. However, indigenous preservation methods, such as fermentation, helped to provide sustainable food resource/supply to the local populace by extending the product's shelf life. Many investigators have reported the various fermented foods of Manipur **(Jeyaram et al., 2009; Devi & Kumar, 2021; Senrung et al., 2018; T.A Singh et al., 2018; Soibam & Ayam, 2018).** However, in-depth exploration of region-specific fermented foods and their processing remains undocumented, especially from the hill districts. Therefore, the present study reports the raw material used and the process of fermentation of food products, which will help document the technique and explore its role in sustainable food and nutrient supply.

2. Methodology

Manipur covers a total area of 22,327 km^2**.** Interviewed a total of one hundred local women folk of 45 years and above who have good knowledge of fermented foods and are currently producing fermented foods from selected districts of Manipur, namely, Ukhrul, Kamjong, Senapati, Kangpokpi, Noney, Tamenglong, Bishenpur, Imphal-East, and Imphal-West district using a developed structured and pre-tested interview schedule. An interview schedule was designed following standard procedures by **Kuhnlein et al. (2006), Tamang et al. (2007) and Ishwarappa (2009)** for collecting information on traditional knowledge. During the interview, the investigators recorded the information on various fermented foods and beverages and their role in Manipuri cuisine.

3. Results and discussion

Manipur is renowned for its rich biodiversity and vibrant food culture, particularly its diverse range of fermented foods. The study documented a wide variety of fermented foods from different districts of Manipur, including those made from cereals and millets, pulses and seeds, bamboo shoots, fish and meat, mustard leaves, and fruits. These indigenous fermented food products were categorized and detailed in Table 1, with visual representations provided in Plates 1 and 2. The processing and consumption of various fermented products, such as cereal and millet-based (Khor, Min Khor), seed-based (Gankhiaungkui, Matuisang/Seethu), mustard leaf-based (Ziangsang Dui, Ziangsangki & Anthramthu), meat-based (Saathu, Saayung & Khabaksaatin), fish and fish product-based (Khaiti, Ingamu, Chakhasang & Chagasang), mushroom-based (Pangamu), and fermented fruit-based non-alcoholic beverages, were primarily observed among the tribal populations in the hill districts of Manipur. Table 1 showcases 35 fermented foods documented during the study, along with the districts where they are produced and their modes of consumption. Notably, Hawaijar, a fermented soybean product, and fermented Heibi were produced across all districts of Manipur. Soibum and Soidon, fermented bamboo shoot products, were produced in the hill districts of Tamenlong, Noney, Ukhrul, Kamjong, Senapati, Kangpokpi, Churachandpur, Pherzual, Chandel, and Tengnoupal, as well as in the valley districts where bamboo is abundant, such as Bishenpur, Kakching, and Imphal-East (Andro). The production of Soibum and Soidon was reported in both the hill and valley regions of Manipur **(N.P. Singh and D.K. Singh, 1967; Bhatt et al., 2003; Jeyaram et al., 2009; Soibam & Ayam, 2018).** Ngari and Hentak, a fermented fish products, were found to be processed exclusively in the valley districts of Manipur, namely Imphal-East, Imphal-West, Bishenpur, and Thoubal, where it is consumed by nearly the entire population. In contrast, other fermented fish products like Khaiti, Ingamu, Chagasang, and Chakhasang were reported as substitutes for Ngari in the hill districts.

The processing and consumption of various fermented products such as cereal and millet-based (Khor, Min Khor), seed-based (Gankhiaungkui, Matuisang/Seethu), mustard leaf-based (Ziangsang Dui, Ziangsangki & Anthramthu), meat-based (Saathu, Saayung & Khabaksaatin), fish and fish product-based (Khaiti, Ingamu, Chagasang & Chakhasang), mushroom-based (Pangamu), and fermented fruit-based non-alcoholic beverages were primarily observed among the tribal populations in the hill districts of Manipur.

Among the mustard leaf-based fermented products, Gundruk is processed by the Nepali community, Ziangsang Dui and Ziangsangki by the Zeliangrong Naga community, and Anthramthu by the Kuki-Chin-Mizo community in the hill districts of Kangpokpi, Ukhrul, Tamenglong, Noney, Churachandpur, and Pherzual.

Saathu, a fermented meat-based product, is considered a delicacy among the Kuki-Chin-Mizo community in the hill districts of Churachandpur, Pherzual, Kangpokpi, and Chandel. Saayung and Khabaksaatin, fermented pork products, are processed and consumed by the Tangkhul Naga community in Ukhrul and Kamjong and the Zeliangrong Naga community in Tamenglong and Noney.

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Fermented mushroom products, like Pangamu, were reported only in certain villages among the Tangkhul Naga community in the southern part of Kamjong district. Similarly, Gankhiangkhui and Matuisang, fermented hibiscus seed and sesame seed products, were observed only among the Zeliangrong community of Noney and Tamenglong districts. Additionally, various seasonal fruits are fermented during times of abundance to produce beverages in the hill districts inhabited by the Naga and Kuki communities.

Table-1 Fermented foods and beverages of Manipur

Base ingredients	**Fermented product**	**Mode of consumption**	**Districts producing fermented foods (N=100)**
Cereal and millet-based	Khor	Non-alcoholic beverage	Ukhrul, Kamjong, Churachandpur, Kangpokpi, Chandel
	Min Khor	Non-alcoholic beverage	Ukhrul, Kamjong, Churachandpur, Kangpokpi, Chandel
Soybean and seeds based	Hawaijar	Curry, chutney, pickle	All district
	Gankhingkhui	Curry, chutney	Tamenglong, Noney
	Matuisang	Curry, chutney	Tamenglong, Noney
Bamboo shoot based	Soibum	Curry	All the hill districts, Imphal-east, Bishenpur
	Soidon	Curry	Kakching, Chandel, Tamenglong, Noney, Senapati, Bishenpur
	Tashunkhiang	Curry	Tamenglong, Noney
	Tanuishun	Curry	Tamenglong, Noney
Fish& its products based	Ngari	Curry, side dish, chutney	Imphal East, Imphal West, Thoubal, Bishenpur
	Hentai	Curry, side dish, chutney	Imphal East, Imphal West, Thoubal, Bishenpur
	Khaiti	Curry, side dish, chutney	Ukhrul, Kamjong
	Ingame	Curry, side dish, chutney	Kamjong
	Chakhasang	Curry, side dish, chutney	Tamenglong, Noney
	Chagasang	Curry, side dish, chutney	Tamenglong, Noney
Meat-based	Saathu (vokthu/bongthu)	Curry	Churachandpur, Pherzual, Kangpokpi, Chandel
	Samsung	Curry	Ukhrul, Kamjong
	KabakShatin	Curry	Tamenglong, Noney
Mustard leave based	Gundruk	Curry	Kangpokpi, Ukhrul
	Ziangsang dui	Curry, chutney	Tamenglong, Noney
	Ziangsangki	Curry	Tamenglong, Noney
	Anthramthu	Curry	Churachanpur, Pherzaul, Kangpokpi
Mushroom based	Panama	Curry, chutney	Kamjong
Fruit-based	Heibi	Fruit	All district
	Fermented banana beverage	Non-alcoholic beverage	Ukhrul, Kamjong, Churachandpur
	Fermented Gooseberry beverage	Non-alcoholic beverage	Ukhrul, Kamjong
	Fermented Pineapple beverage	Non-alcoholic beverage	Ukhrul, Kamjong
	Fermented Plum beverage	Non-alcoholic beverage	Ukhrul, Kamjong
	Fermented Peach beverage	Non-alcoholic beverage	Ukhrul, Kamjong
	Fermented Jamun beverage	Non-alcoholic beverage	Ukhrul, Kamjong
	Fermented Fig beverage	Non-alcoholic beverage	Ukhrul, Kamjong, Churachandpur

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Plate-1 Fermented foods of Manipur

a. Khor (Non-alcoholic)

b. Khorson

c. Hawaijar

d. Gankhiangkhui (roselleseeds)

e. Soibum sold in the local market

f.Mass fermentation of bamboo shoot in Noney district

g. Tashunlang

h. Soidon

i. Tashunkhiang

j. A women Ngari vendor in local market

k. Hentak

l. Khaiti stored in bamboo cylinders

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Plate-2 Fermented foods of Manipur

a.Saathuuum (meat fermenting pot) b. Saayung

c.Ziangsang dui

d. Making of Ziangsang dui in traditional mortar pestle

e. Gundruk

e. Dried Gundruk

3.1 Fermented cereal and millet beverage

Rice khor/Min khor

Khor is a non-alcoholic beverage traditionally made from sticky rice or Job's tear millet, locally known as Mum/Min (Charik/Mon in Manipuri), in the hill districts of Ukhrul and Kamjong. This beverage is particularly associated with festivals such as Luita/Luiraphanit (the seed-sowing festival) and the Shirui Lily festival among the Tangkhul community, where it is served in a Khorson a container made from dried gourd. During the hot summer months, Khor is consumed as a refreshing beverage.

Historically, before the advent of Christianity, fermenting and drinking Khor was a daily practice. However, in recent times, it is primarily consumed during festive occasions. The preparation involves double-cooking the sticky rice or Job's tears millet, which is locally known as "Paso." This is then mixed with pounded raw sorghum, stirred in hot water, a mixture locally called "Yaoyi," and left to ferment in an airtight container for 3 to 5 days among the Tangkhul of Ukhrul and Kamjong district.

Once the fermentation is complete, the beverage can be diluted with water and sweetened with sugar before consumption, as it might be too strong if consumed directly. Yaoyi, made from sorghum, can be substituted with plain maida or atta flour. Reports suggest that Khor tastes best within 3-4 days after opening the airtight container, as prolonged storage tends to develop a strong bitter taste.

3.2 Fermented Soyabean and seed

Hawaijar

Hawaijar is an indigenous fermented soya bean product of Manipur with distinct flavour and taste. Small-sized soybean grown locally are collected, cleaned, shade dried, soaked overnight and boiled till soft and excess water were drained off and washed with tap water. The washed soya were packed in fig (*Ficus hispida*) leaves and kept in a bamboo basket lined for 4-5 days during winter and 2-3 days during the summer for fermentation. Appearance of sticky white slimy substances with a pungent ammoniacal smell indicated the maturity of the product. The preparation method was in line with the studies of **Premarani & Chhetry, (2011) and Keishing et al., (2015).** The product is the same as bekang (Kuki/Mizo), khui (Zeliangrong) and akhone (Nagaland) which are called by different names as per their dialect in different communities. Study revealed that hawaijar were used as a side dish chutney or used as taste enhancer in curries.

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Gankhiangkhui

This fermented product is made from the seeds of Roselle (*Hibiscus sabdariffa*). The preparation method is similar to that of Hawaijar, with some slight differences. To prepare it, Roselle seeds are cleaned, washed, and boiled for 4-5 hours until fully cooked. The cooked seeds are then wrapped in banana leaves and fermented near a fireplace for 3-4 days. This fermented product is consumed exclusively by the Zeliangrong community as a taste enhancer. It was previously reported by T.A. Singh et al. (2018).

Matuisang/Seethu

Matuisang is another fermented product from the Zeliangrong community, made from Perilla seeds (*Perilla frutescens*). The preparation process is identical to that of Hawaijar. The Perilla seeds are cleaned, washed, and cooked until tender, then wrapped in fig or banana leaves and fermented for 3-4 days near a fireplace. It is typically eaten as a side dish, chutney, or added to curry to enhance flavor. Among the Kuki-Chin-Mizo community, this same product is known as Seethu.

3.3 Fermented Bamboo shoot Soibum

Soibum is a traditional fermented product made from bamboo shoots in Manipur. The fermentation method can vary slightly between regions. In the hills, shredded bamboo shoots are packed tightly in a large bamboo basket lined with broad leaves. Nowadays, polythene bags are often used instead of leaves for easier handling and durability. When using polythene bags, the bottom is typically perforated to allow the exudate from the bamboo shoots to drain during the fermentation process, which lasts for 9-12 months. The top of the basket is sealed with broad leaves and weighted down with heavy stones to ensure it is airtight.

No starter cultures are used in Soibum production. For large-scale production, the bamboo baskets, which can hold up to 400 kg, are partially buried underground, as shown in Plate 2. In small-scale production, smaller bamboo baskets are kept in elevated areas in the backyard to allow the exudate to drain, and the smell is generally tolerable. Large-scale production is typically conducted in remote forests or jungles away from residential areas due to the strong, unpleasant odor produced by the exudate. According to **Nongdam (2005)**, the tribal people in hill districts often dig pits to bury the bamboo baskets during Soibum production.

Sidon/Tashunlang

Sidon, also known as Tashunlang, is a fermented product made from edible bamboo shoots cut into large chunks by the Zeliangrong community in the Tamenglong and Noney districts. The apical part of the bamboo shoots is sliced into chunks, washed, and immersed in water within a large bamboo basket lined with polythene bags. The natural fermentation process occurs without the use of starter cultures. The basket is sealed airtight by covering it with leaves and placing heavy stones on top, allowing the bamboo shoots to ferment for 8-12 months. A similar fermentation process for Soidon has been documented by Jeyaram et al. (2009) and Nongdam (2015).

Tashunkhiang and Tanuishun

These are varieties of fermented bamboo shoot products made by the Zeliangrong Naga community. Tashunkhiang is prepared from finely sliced shredded bamboo shoots, which are fermented in an airtight container without adding any starter culture for one year. Tanuishun, on the other hand, involves cutting the apical portion of the bamboo shoots horizontally to create a hollow shape, submerging it in water, and fermenting it in an airtight container for 6-9 months.

3.4 Fermented Fish and fish products

Ngari

Ngari is a widely consumed fermented product made from *Puntius sophore* fish, fermented in an earthen pot for 6-12 months. It is commonly added to curry to enhance taste and flavor or served as a side dish. Ngari production is limited to the valley districts of Manipur—Imphal-East, Imphal-West and Bishenpur where it is consumed by nearly the entire population. In the hill districts, other fermented fish products such as Hentak, Khaiti, Ingamu, Chagasang, and Chakhasang are used as substitutes for Ngari. The artisanal production of high-quality Ngari is a specialty of the artisans in the valley region of Manipur **(Asem et al., 2012 & Jeyaram et al., 2009).**

Hentak

Hentak is a fermented fish paste made from dried *Esomus danricus* fish and the petioles of *Alocasia macrorhiza*, which are pounded together using a traditional mortar and pestle. Before pounding, *Alocasia macrorhiza* is sun-dried and cut into pieces. Variations in the recipe include the use of garlic or onion instead of Alocasia. The paste is shaped into balls

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and fermented in an earthen pot for one month. Hentak is often used as a substitute for Ngari to enhance taste. Previous studies have reported on the preparation methods and nutritional value of Hentak **(Jeyaram et al., 2009; Tamang et al., 2012; Devi & Kumar, 2012).**

Khaiti/Chakhasang

Khaiti is a fermented product made from small, fresh trash fish. It is known as Khaiti among the Tangkhul community and as Chakhasang in the Liangmei dialect of the Zeliangrong community. The fresh fish are placed in bamboo cylinders or glass containers, sealed airtight, and fermented near the fireplace for 30 days, after which they can be stored for up to a year. The use of bamboo cylinders for fish fermentation has been reported by **Mao and Odyuo (2007).** This product is a common substitute for Ngari in the hilly regions of Ukhrul, Kamjong, Tamenglong, and Noney districts.

Ingamu/Chagasang

Ingamu is a crab-based fermented product traditionally made by the Tangkhul Naga community in the Kamjong district. Small crabs are washed, pounded with wild pepper (*Zanthoxylum armatum D.C*.) or Perilla seeds (*Perilla frutescens*), and fermented in an airtight glass container near the fireplace for 30 days. Chagasang, a similar product, is made by the Zeliangrong community in Tamenglong and Noney districts. In this process, broken rice is stuffed into the crabs' chests, then wrapped in banana leaves and fermented for a month near the fireplace. Crabs are also pounded with black sesame seeds (*Sesamum orientale L*.) and left to ferment over the fireplace for a week. According to **Mao and Odyuo (2007)** and **Senrung et al. (2018),** crabs are sometimes mixed with sesame seed paste, pounded further, and left to ferment in a container for two days in summer or longer in winter.

3.5 Fermented Meat

Saathu / KabakShatin

Saathu, a fermented meat-based product, are considered delicacies among the Kuki-Chin-Mizo community residing in the hill districts of Churachandpur, Pherzual, Kangpokpi, and Chandel. Meat is called “saa", and "Thu” stands for fermentation or fermented foods in their community dialect, which means fermented meat. The fermented product is prepared from either pork or beef with more fat. For fermented pork, it is known as vokthu, and for beef as bongthu. In itsfermentation, the pork/beef was cut into small pieces and boiled till cooked with ash water or soda to make it tender. The cooked meat was transferred into a traditional bottle gourd known as saathu-uum or steel container and closed airtight. Then the containers were fermented in a warm place for a minimum of 3 days to 1 week. They were consumed as a side dish or added to the curry to improve taste and flavour. Other investigators have also recorded fermented meat saathu among the Vaiphei tribe of the Kuki-Chin-Mizo community both in Manipur and Assam **(N.S. Singh et al., 2007; Das &Deka, 2012; T.A. Singh et al., 2018).**

Kabak Shatin is fermented pork produced by the Zeliangrong community of Tamenglong and Noney district. Pork cut into small pieces were put inside a bamboo cylinder and closed airtight by leaves for its fermentation. The airtight bamboo cylinder containing the meat was inserted inside a boiling pot (double boiler) and cooked for 2-3hour. After this, the bamboo cylinder is removed from boiling water and fermented for 2-3 months in the sun. **Senrung et al. (2018)** have also indicated that fermented animal fat was fermented and used to prepare vegetables to soften and add flavour among the tribes of Nagaland.

Saayung

Saayung is a fermented meat product made from pork among the Tangkhul Naga community of the Ukhrul and Kamjong districts. The name itself justifies fermented meat (Saa=meat, yung= fermented in Tangkhul dialects). In its preparation, pork was cut into the lengthwise chunk and boiled by submerging it in water with salt. The cooked pork is placed near the fireplace or house roofs made of tin sheets where the temperature is usually high during daytime to allow solid-state fermentation and dried for six months.

3.6 Fermented mustard leaves

Ziangsang Dui/ Anthramthu

Anthramthu is a fermented mustard sauce produced from mustard leaves. Reports indicate different tribal communities of Manipur viz, Zeliangrong, Tangkhul, Hmar, Kuki, etc.. consumed this as a sauce, condiment and taste enhancer in their chutney, curry and side dish. The Hmar and Kuki community called it as Anthramthu and the Zeliangrong as Ziangsang Dui. In the preparation of ziangsang dui, yellow-wilted mustard leaves were washed properly and rolled between palms or pounded in a traditional mortar pestle and allowed to undergo solid-state fermentation for a week. After the 6-7 days, fermented leaves were pressed to collect their juice in a pot. The juice of fermented mustard leave

was concentrated by vigorous boiling till they were thick in consistency. However, in the case of Anthramthu, the juice of mustard leaves was collected by pounding in a traditional mortar pestle. The collected juice was kept near the fireplace for fermentation for one week in an airtight container. After fermentation, the juice was made thick and concentrated by boiling. Ziangsangki is the fibrous leafy part of the mustard leaves after the extraction of the juice. They are usually sundried and used as thickeners or vegetables in many preparations. Among the Zeliangrong community, it is a delicacy.

Gundruk

It is a fermented mustard leave product processed by the Nepali community of Manipur. In its preparation, wilted mustard leaves were washed, put in closed air tight vessel and fermented for almost a week or more in sunlight. The subjects reported that squeezing the fermented leaves before drying would decrease the product's taste. Hence, they were sundried without squeezing and stored, used as curry. Many investigators have already reported the processing and fermentation of ziangsangki / dui, anthramthu and gundruk from mustard leaves **(Tamang & J.P.Tamang, 2009; Jeyaram et al., 2009; Tamang et al, 2012; Senrung et al.,2018).**The processing methods were almost similar, slightly different from region to region.

The Nepali community ferments a variety of mustard leaves, namely Gundruk; ziangsang dui and ziangsangki among the zeliangrong community and anthramthu among the Kuki- Chin settling in the hill district of Kangpokpi Churachandpur and Pherzual respectively. The production of fermented mustard leave products such as ziangsangki and ziangsangdui, among the Naga tribes of Manipur and gundruk among the Nepali, are reported by many investigators **(Tamang et al., 2012; T.A. Singh et al., 2018).**

3.7 Fermented Mushroom

Pa-ngamu

Fermented mushroom (pangamu) product was reported only in the pocket of villages among the Tangkhul Nagas community in the southern part of the Kamjong district. This product is a fermented product processed from various edible wild mushrooms. In its preparation, mushrooms were collected, washed, drained, wrapped in a plastic bag or airtight container and fermented for 4-5 days. It has a strong ammoniacal smell, and they are usually shallow fried and consumed as a side dish. It is a unique fermented product practised only in the southern part of the Kamjong district.

3.8 Fermented Fruit beverages

Fermented Banana juice

The ripe banana was put inside an airtight container and sugar and kept for two weeks. Its exudates are collected and diluted with water and sugar and drank as a beverage during the fermentation period. **Lokendrajit, (1997)** and **Devi and Kumar, (2012**) reported that banana wine was prepared from riped bananas by fermenting in a closed container with a small amount of water among the Naga tribes of Manipur.

Fermented gooseberry juice

Gooseberries were put inside an airtight container with sugar for fermentation and kept for three months. After three months, the juice was collected and diluted with water before consuming as a beverage.

Fermented fig juice

Figs are not available throughout the year; during the season, they are plenty, and their shelf life is short. They are preserved by fermentation or sun-drying techniques and usually fermented by putting the peeled fig in an airtight container with sugar for two weeks. During the two weeks, the fruit produces its juice diluted with water and drank as a beverage.

Fermented plum/ peach/ pears

Seasonally available fruits such as plum, peach, and pear were fermented locally for use as a beverage. The washed (peeled in case of pears) fruits were blanched for 2-3 minutes for their production. The water from the boiling fruit was transferred to a larger plastic container, added with sugar, kept open for frequent stirring during the daytime, and closed the lid at night. This stirring process lasts for three days, during which bubbles evaporate and frequent stirring subsides the bubbles and the solid fibrous parts of the fruits float on the upper surface. The surface floats are removed with sieves. Finally, the container was sealed airtight and allowed to ferment for 21 days.

Conclusion

It is clear from the study that there are a variety of fermented food products made and consumed by the people of Manipur following their traditional methods. It is comprehended that the preparation methods from the same substrate or raw material were slightly different from one region to another, and their names were similar or different in their

dialects. It is clear that there is no intentional addition of starter culture to initiate the fermentation process, and it takes place by natural fermentation the majority of the fermented products reported in the hilly region of Manipur. During the study, certain fermented foods such as Tashunkhiang, Tanuishun, saayung(fermented pork), pangamu (fermented wild mushroom), and fermented juice of fruits(gooseberry, plum, peaches, fig, Jamun, pears, etc..) were reported for the first time and not earlier reported by any investigators as there is no literature available. Among the fermented products, ngari, a fermented fish product extensively produced in the highest quantity, indicates that the ngari is consumed extensively by the people of Manipur daily.

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