Diversified traditional cured food products of certain indigenous tribes of Tripura, India

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The diversified traditional cured food products which include fermented, dried and smoked bamboo shoot, wild leaf, vegetable, fruit, alcoholic beverage and fish are processed and prepared by the ethnic groups of Tripura and these are intimately associated to their ecological, socio-cultural, spiritual life and health. These cured foods are consumed as a regular food item in different recipes and culinary style over a long period of time by the original inhabitants of this state. From the socio-cultural point of view, although these are nutritious, moreover, there are popular beliefs on the use of such traditional food products regarding their curing effect of number of seasonal and chronic health problems. The paper describes the various traditional cured foods of certain tribes of Tripura, their method of preparation, uses, nutritional and medicinal values as they play a vital role in the traditional life style of the people of Tripura.

Keywords: Fermented foods, Dried foods, Smoked products, Debbarma tribe, Uchoi tribe

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Tripura (23.8400°N, 91.2800°E), the IIIrd smallest state in the country and IIrd youngest state in North east India covers 10,491 sq km (4,051 sq miles) areas and comprise 3,671,032 residents as of 2011 census which constitute about 0.3% of the country’s populace. Being a hilly state it is the homeland of 19 different tribes like Tripuri, Reang, Jamatia, Noatia, Lusai, Uchoi, Chaimal, Halam, Kukis, Garos, Mog and Chakma. Other tribes like Bill, Munda, Orang, Santal, Lepcha, Khasia, Bhutias are the immigrant tribes came and settled here for economic reasons. The Kokborok-speaking people of Tripura are the major group among 19 tribes and many sub tribes; whereas, the Bengali speaking people forms the ethno-linguistic majority in Tripura1. The economy of Tripura is mainly depending on agriculture. Nearly 64% of the employment is generated through agriculture and its related work. Fruits like pineapple, jackfruit, orange, litchi, cashew nut, etc., are produced in abundance. Tripura is the IIrd largest rubber producer in the country after Kerala. The state is also rich in livestock production like sheep, goat, pig, duck, poultry as well as fish and fisheries2.

The traditional food habits amongst tribal populace of Tripura are very simple but differ from tribe to tribe. Fermented products form a common food recipe in the daily diets of almost all the above mentioned tribes of Tripura. The chemical constituents of raw substrates of plant or animal sources convert by microbes during food fermentation and enhance the nutritional value, improve the flavour and texture, antioxidant and antimicrobial compounds and stimulate the probiotic functions3. The different ethnic tribes believe that regular consumption of fermented fish product (locally known as Shidal) keep themselves away from fatal disease like malaria. The most popular raw materials for preparation of cured food items are: Colocasia leaves, rice, bamboo shoots, leafy vegetables and fish. Traditional fermented foods and beverages of certain tribes have been reported from Himachal Pradesh, Naga tribes, Manipur and Arunachal Pradesh4-7. However, no detail studies have been reported so far about the tribes of Tripura and their traditional cured food products and beverages. The present study therefore aims to report the descriptions of some traditional cured foods, i.e., fermented, dried and smoked of certain tribes of Tripura as well as their nutritional and medicinal values for the first time in details.
Methodology
Ethnological survey was undertaken in West, South, Gomati, North and Dhalai districts of Tripura. Ten blocks were selected from 5 districts (2 blocks from each district). The selected blocks for the study include Mohanpur, Jirania, Amarpur, Rajnagar, Panisagar, Dasda, Ambasa, Manu, Kakraban and Matabari. One or two villages were selected from each blocks and a total of 20 villages were randomly selected from these blocks. The idea of the study was to collect step by step information on indigenous knowledge associated with production and consumption of different fermented food products by the Chakma, Uchoi, Debbarma, Jamatia and Reang tribes of Tripura through personal interviews with aged villagers. For documenting the indigenous knowledge a semi structured interview method was adopted. For the ease of understanding the processing and consumption aspect, the items were grouped into bamboo shoot based, fermented rice based, vegetable or fruit based and fish based cured food products (Figs. 1-16).

Results and discussion
Fermented bamboo shoot products
Bamboo shoot is one of the popular raw materials for preparation of traditional food items in different processed forms. It is consumed in different cured forms like dried, smoked and fermented by the tribes of Tripura. Some popular fermented bamboo shoot products of North east India are Soibum, Soidon and Soijin in Manipur6 and Bamboo Tenga in Arunachal Pradesh7. Moiya Koshak, Melye Amiley, Midukeye and Moiya Pangsung are fermented bamboo shoot products of Debbarma, Chakma and Uchoi tribes of Tripura, respectively.

Melye Amiley
Melye Amiley is a bamboo shoot (Melocanna baccifera (Roxb.) Kurz syn. Melocanna bambusoides Trin.) based indigenous fermented food product and exclusively prepared by Chakma tribes. The procedure followed for Melye Amiley preparation is almost similar to Moiya Koshak except additional step of water soaking. The cut pieces of bamboo shoot are soaked in water for 2 days in a traditional earthen container and it is kept closed for subsequent fermentation.

Moiya Pangsung
It is also a bamboo shoot (Melocanna baccifera (Roxb.) Kurz syn. Melocanna bambusoides Trin.) based indigenous fermented food product and exclusively prepared by Uchoi tribe which belongs to southern parts of Tripura. Here the large piece of bamboo shoot is fermented first in a container filled with water. After fermentation for 2 nights, the product is sliced into smaller pieces before cooking (Fig. 2).

Nutritional value of bamboo shoot based products
Fresh bamboo shoot contains approximately 2.65% protein on average. The bamboo protein produces 8 essential and 2 semi-essential amino acids. Beside that it also possess moderate fibre, selenium, a potent antioxidant and potassium, a healthy heart mineral9.

Medicinal value of bamboo shoot based products
It improves appetite and digestion, weight loss and curing cardiovascular diseases and cancer. Shoots have antioxidant capacity due to the presence of phenolic compounds10.

Microorganisms
Microorganisms involved in certain fermented bamboo shoot products of N.E. India are Lactobacillus plantarum, Lb. brevis, Pediococcus pentosaceus in Mesu, Soibum and Soidon11.

Fermented elephant yam product
The raw material elephant foot yam [Amorphophallus paeoniifolius (Dennst.) Nicolson] (domestic and wild) are used for preparation of traditional food products in Tripura. The leaf part of domestic elephant foot yam is used for wrapping while preparing different fermented food items like Midukeye, Moiya Koshak, etc. Batema is a fermented elephant foot yam product which is prepared by boiling, pasting and forming into discus shaped.
Batema

The tuber part of *Amorphophallus paeoniifolius* (Dennst.) Nicolson commonly called Elephant foot yam in fermented form is a popular food item for the Debbarma tribes of Tripura. The skin of the tuber is removed first followed by making into smaller pieces. Boiled for 30 minutes and kept aside after taking out. It is then smashed by using hand and mixed with traditionally prepared liquid soda which is locally known as *Chakhoi*. *Chakhoi* is prepared by adding ashes with water and the mixture are then filter in a traditional bamboo made container which contains small holes for filtrating. This device is traditionally known as *Chakhoi-Kho* (Fig. 3). The smashed product is given a round shape by using some traditional dices. The product is then spread over a bamboo made sieve and kept for sun-drying for 2-3 days. It turns into red colour after sufficient sun drying. The red coloured dried product is then stored into a traditional bamboo container for 5-6 days fermentation.

**Nutritional value**

Fresh elephant foot yam is rich in omega 3 fatty acids, and key minerals like copper, iron, etc.\(^\text{12}\).

**Medicinal value**

They are traditionally used in arthralgia, cough, bronchitis, anaemia and general debility.\(^\text{13}\).

**Fermented fruit and vegetable products**

There are some fermented fruit and vegetable products which are exclusively prepared by certain tribes of Tripura. *Ziang Sang* and *Tapyo* is fermented leaf product of Manipur and Arunachal Pradesh\(^\text{9,10}\). *Amlai Ntoi*, *Bikang*, *Bochu-mba*, *Kosoi*, etc., are
traditional products prepared by Uchoi and Jamatia tribes by fermenting Amla, Bombax ceiba L. flower and bean, respectively.

**Amlai Ntoi**

_Amlai Ntoi_ is exclusively prepared by the Uchoi tribe by fermenting raw amla fruit (_Phyllanthus emblica_ L.). At first Indian gooseberry or amla is boiled in water followed by packing in earthen mutka (container) with alternative layer of molasses. The first and final layer should be of molasses. The earthen mutka is then buried under ground for 5-6 months fermentation.

**Nutritional value**

The raw amla fruit contains high amount of Vitamin C and adequate levels of minerals

**Medicinal value**

It promotes digestion, reduces cholesterol level from body, and lowers blood pressure.

**Kosoi and Bikang**

Traditional people of Jamatia tribe prepare an indigenous fermented product from whole Lima bean (_Phaseolus lunatus_ L.) which is locally known as Kosoi. The sword bean (_Canavalia gladiate_ (Jacq.) DC.) is known as Bikang by the Uchoi tribe (Fig. 4). Both the fresh whole beans were dried under the sun for 3-4 days. Before consumption, these dried products are soaked in water for overnight fermentation.

**Nutritional value**

The mature raw sword bean seeds contain 28.39% of protein and 49.91% of carbohydrates.

**Medicinal value**

Lima beans have anti-oxidant properties, anti-cancer and reduce cholesterol level.

**Microorganisms**

Microorganisms involved in some fermented vegetable food products of N.E. India are *Lactobacillus fermentum, Lb. plantarum, Pediococcus pentosaceus*, etc. in Gundruk.

**Fermented Bombax ceiba flower product**

_Bocchu-mba_

_Bocchu-mba_ is a traditional fermented product of Bombax ceiba L. flower exclusively prepared by _Uchoi_ tribes. The petal and centre petiole part is removed first from _Bambax ceiba_ L. flower and followed by drying under sun light (Fig. 5). The dried products are soaked in water for 24 hrs and wrapped with banana leaf after removing the water portion. The products are left for fermentation in this condition for 1-2 nights.

**Nutritional value**

Raw material Bombax ceiba L. flower contains protein- 0.4gm and dietary fibre 1gm.

**Medicinal value**

This product is used against ulceration of bladder & kidney and for healing of wounds.

**Fermented beverage**

Fermented beverage is most popular traditional alcoholic drink prepared and mostly consumed during festival or occasion times. The traditional rice beer is the favourite drink of the local people and it also has ritualistic values of the tribal societies attached to it. Some popular traditional alcoholic beverages of N. E. India are Apong and Ennog in Arunachal Pradesh, Bhaati Jaanr prepared by the Gorkha tribes.

**Lungi or Gora**

Alcoholic beverage prepared from rice (_Oryza sativa_ L.) after fermenting is a common and most popular traditional drink prepared by all the tribes of Tripura. Lungi or Gora is white rice beer with rice, water and yeast tablet which is locally called Chuwan (Fig. 6) as main ingredients for its preparation. Locally available rice is fully boiled for 20-30 minutes until it becomes fully dried followed by spreading over a bamboo mat for cooling. The rice is then mixed with _Chuwan_ and makes a paste by using a traditional huller. The mixture is then tightly packed in an earthen container (locally known as _Mutka_) for fermentation and the mouth portion is closed by earthen lid, leaf, etc. The _mutkas_ are left in this condition for 3 days. Water is added up to the mouth portion of the _mutka_ and kept for 6-8 hrs. The white coloured transparent liquid which floats at top is known as _Lungi_ or _Gora_ and it is sweet in taste.

Traditional wine (locally known as Bangla) is prepared from _Lungi_ after next processing. _Lungi_ is heated in an earthen pot having some holes at the top (Fig. 7) which helps to evaporate the vapours and it also contains a narrow pipe from that portion which collects the vapours in droplets form which is locally known as Bangla or local wine (Fig. 8).

**Fermented beverage**

Some fermented beverages of North east India like Bhaati Jaanr and Kodo Ko Jaanr contain 86.9 and 83.7% carbohydrate on dry weight basis and 5.9 and 4.8% alcohol, respectively.
Medicinal value

Lungi is high in carbohydrate, a major source of energy. Lungi is rich with probiotic bacteria which help to maintain our body healthy by balancing the gut micro-flora.

Microorganisms

Microorganisms involved in some fermented beverages of N.E. India are yeasts- *Saccharomycopsis fibuligera*, *S. cerevisiae*, bacteria- *Lactobacillus bifermens*.

Fermented fish products

Fermented fish products are most popular food items among all the tribes of Tripura. Some indigenous fermented and dried fish products of North east India are *Karoti* and *Bardia* in Assam, *Ngari* and *Hentak* in Manipur, *Tungtap* in Meghalaya, *Gnuchi*, *Sidra* and *Sukuti* in Sikkim. *Shidal* and *Lona ilish* are two fermented fish products of Tripura.

Shidal

*Shidal* is a popular fermented fish product in Northeast India and it is widely consumed by almost all the tribes of Tripura. *Shidal* is mainly prepared from *Puntius* sp. (locally called *Pathi shidal*) (Fig. 9) and *SetipInna phasa* (Hamilton, 1822) (locally called *Phasa shidal, telesech* or *Baspati shidal*) (Fig. 10) by fermenting them in a traditional earthen container called *mutka*. *Shidal* is traditionally consumed by different tribes after preparing some traditional recipes like *Godak* (Debbarma, Uchoi, Chakma, Jamatia tribe), *Shidal chutney* (Bengali community), *Chakhoe* (Debbarma tribe), etc. *Godak* is a popular traditional recipe prepared by boiling *shidal* with different combination of vegetables and bamboo shoot. *Shidal chutney* is prepared by the Bengali community people of the state after frying *shidal* with onion and other spices. *Chakhoe* is prepared by the Debbarma tribes with dried bamboo shoot, *Colocasia* stem, banana stem, etc. along with *shidal* and traditionally prepared soda (locally known as *Chakhwak*). *A vontro* is another method of making vegetable dish by rice flour.

Lona ilish

*Lona ilish* is another popular salt fermented fish product which is prepared from *Tenulosa ilisha* (locally known as *Ilish maach*) mainly by the Bengali community people of this state (Fig. 11). It is traditionally prepared by dry salting the diagonally cut *hilsa* chunks followed by fermentation in saturated brine in metal container till appearance of the characteristic flavour and texture.

Nutritional value of fermented fish products

Fermented fish product *shidal* contains 38.35% protein, 20.31% fat and 7.19% ash. Beside these products are having good antioxidant activity and health beneficial bioactive compounds.

Microorganisms

*Lactococcus lactis* subsp cremoris, *Lc. plantarum, Enterococcus faecium*, *Micrococcus*, Yeast: *Saccharomycosis* is involved during fermentation of *shidal*.

Dried food items

Dried food products are prepared in lesser extent in Tripura compared to fermented products. The preparation of dried food items is exclusively confined to tribal belts. Some popular and traditionally processed dried food items are discussed below:

Thalikho-bwlai

It is a sundried product exclusively prepared by Debbarma tribe from the leaves of *Dioscorea* spp. The leaf is cut into smaller pieces and followed by sun drying until it dried fully. The dried product is stored in closed container before consumption generally during the festival time.

Medicinal value

It is used against stomachache, insomnia, pneumonia, prostate cancer, stroke and arthritis.

Konga kran

*Konga Kran* is a traditional dried product of *Uchoi* tribe which is prepared from a wild yam (*Dioscorea esculenta* (Lour.) Burkill) (Fig. 12). At first the skin is removed and followed by cutting into desirable length (6-8 inches). It is then split vertically into mat like structure and dried under sunlight for continuously 10-15 days. Before consumption the dried products are soaked in water and cooked.

Medicinal value

It is used to treat gall bladder problems and helpful in treating the nausea of pregnant women.

Moiya kran

It is also prepared from *Warthwi moiya*, a non-bitter variety of bamboo (*Melocanna baccifera* (Roxb.) Kurz syn. *Melocanna bambusoides* Trin.). The bamboo was slice into small pieces and soaked into hot water for 5-10 min. This soaked bamboo is then dried under the sun on a container made of bamboo strip locally called *Baileng* (Fig. 13). It can...
be prepared and consumed as Moiya Chakhoi (Fig. 14).

Kanmatri kran
It is exclusively prepared by Uchoi tribes from Gandhaki stem (Homalomena aromatic) which is also locally known as Sugandhamantri (Fig. 15).

Khakolo-Kwran
It is prepared from ash gourd [Benincasa hispida (Thunb.) Cogn.] which is locally known as Chal kunra and generally prepared by Debbarma tribe. The raw material is cut into smaller pieces and dried under sun until the desirable texture appears.

Medicinal value
It acts as a good diet for diabetics, also acts as blood coagulant and treats common cold.

Tha-ktoma bya
It is prepared from Alocasia spp. stem by Uchoi tribe which is locally known as boro kachu. The stem portion is cut into smaller pieces or otherwise whole stem as such is dried under sunlight till it become light in weight and golden brown in colour (Fig. 16).

Smoked products
Smoked products are not so much popular currently unlike olden days and are prepared in very less extent in Tripura. In earlier days, some fishes like Puntius, Channa, Anabas, Aor, etc., were used for smoking when they were caught in huge quantity. But now due to shortage of these fish people rarely do smoking. In addition, the Manipuri community people which generally belong to West and Dhalai district of Tripura used to prepare some smoked fish products in their household by traditional smoking. Besides smoked fish, there are some smoked vegetables items like batema-nkon, tha-nkon and moiya-hokhutoi which are found in Uchoi tribe of Gomati district.

Conclusion
Traditional cured food products of Tripura are prepared at house hold level through the indigenous practices of food processing and preservation. But there is lacking of hygienic knowledge of production for Good Manufacturing Practice (GMP) and safety of the marketed food products are the major issues. The preparation of these traditional cured foods and associated dynamics are transmitted from generation to generation and over a period of time it exchanged within and between the communities. Except few, most of the products are not yet standardized and they are not available in the local markets. The traditional people of this state used to consume these products as their daily recipe with some ethnic believes and these products are highly nutritious as well as they possess a lot of medicinal importance. Now there is necessary for new biotechnological tools for standardising these traditional cured foods and need for exploring them in the local markets for their commercial application.

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