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Methodology of rice beer preparation by some ethnic communities residing in Sivasagar District of Assam, India: A survey

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Abstract
Consumption of rice-based alcoholic beverage is a popular traditional practice among the ethnic communities of North-East India. *Deoris, Misings* and *Ahoms* are three major ethnic communities in the district of Sivasagar, Assam, India. These three communities prepare their alcoholic beverages which are integral part of their socio-cultural and economic life. Their protocols are almost similar but difference is observed in the use of rice variety and the plant ingredients used for the preparation of fermentation starters. This paper emphasizes on the traditional protocols for the preparation of rice beers and also throws light on the consumption pattern of the people.

Keywords: Alcoholic beverage, ethnic communities, Sivasagar, rice variety, fermentation starters

1. Introduction

Rice beer preparation and its consumption is a traditional practice among the ethnic communities of North-East India [1, 2]. It plays a vital role in the socio-cultural life of the tribal people as it is considered indispensable in get-togethers, festivals and religious ceremonies such as child birth, marriages, death ceremonies, etc [3]. Moreover, it is also considered to possess medicinal properties. The rice beers are prepared entirely with traditional protocols which are passed from mother to daughters/ daughters-in-law, since time immemorial [4]. The traditional protocols are the yeast inoculums in the fermentation process. The yeast starter cakes are prepared by mixing a wide variety of plant ingredients with boiled rice [5]. These dried starters normally include yeasts, moulds and bacteria and convert starchy materials to fermentable sugars and subsequently to alcohol and organic acids [6-8]. Fermentation is the conversion of carbohydrates to alcohol and carbon dioxide or organic acids using yeast or bacteria, under anaerobic conditions [9] (Scheme 1).

$$\underset{\text{Starch}}{(C_6H_{10}O_5)_n} + n/2\ H_2O \xrightarrow{\text{Diastase}} n/2\ \underset{\text{maltose}}{C_{12}H_{22}O_{11}} \xrightarrow{\text{maltase}} n\underset{\text{glucose}}{C_6H_{12}O_6} \xrightarrow{\text{zymase}} 2n\underset{\text{ethanol}}{C_2H_5OH} + 2nCO_2$$

Scheme 1: Fermentation of starch

The principal yeast species responsible for fermentation is *Saccharomyces cerevisiae*, which has been used for thousands of years in the production of alcoholic beverages [10, 11]. The main metabolic pathway involved in the ethanol fermentation is glycolysis (Embden- Meyerhof–Parnas or EMP pathway) [12, 13]. Sivasagar district is one of the 32 districts of the state of Assam in northeastern India. It covers an area of 2668 square kilometers as against total area of 78438 square kilometers of Assam as per census of 2001. The district of Sivasagar lies between 26.45 °N and 27.15 °N latitudes and 94.25°E and 95.25 °E longitudes. The district is bounded by the river Brahmaputra on the north, the state of Nagaland on the south, the Charaideo district on the east and the river Jhanji on the west. The Sivasagar district has got its definite identity due to its different races, castes, languages and cultures. *Deoris, Misings* and *Ahoms* are the three major ethnic communities residing in this district. The rice beers prepared by these ethnic communities are quite popular. Some people of these communities sell the starter culture as well as the fermented beverage for their livelihood. Owing to the frequent and widespread consumption of these traditional alcoholic beverages, it is quite necessary for the extensive study of this commodity. We are reporting here a systematic study on the preparation of this commodity and its social, cultural, medicinal and economic importance.

2. Material and Methods

A field survey was conducted in nine villages densely populated by *Ahom, Mising* and *Deori* communities in *Sivasagar* district of Assam (India) from November 2013 to February 2014. About 20-30 people of each community, mostly women (since they are usually associated with the preparation and selling of rice beers) were interviewed. Details of the persons, their community, methods of preparation of the starter culture and the fermented beverage, plant ingredients, rice variety, consumption pattern, socio-cultural and medicinal applications, market price of the beverages, effect of consumption on personal health and behavior, etc were enquired.

During the survey, the procedures for preparation of rice beer and the starter cultures were keenly observed and comments of people interviewed were recorded carefully. With the help of

the local people, the plant samples were collected and their scientific names were confirmed from available literatures and also with the help of the Department of Botany, Gauhati University, Assam.

3. Results and Discussion

3.1.1. Procedure for preparation of *Apop* (starter cake) of *Mising* community

Leaves from a number of plants such as *Centella asiatica, Hydrocotyle sibthorpioides, Oldenlandia corymbosa, Clerodendrum viscosum, Saccharum officinarum, Ipoemea sp, Cyclosorus exlensa, Scoparia dulcis, Drymeria cordata, Capsicum annuum, Ananas comosus, Lygodium flexuosum, Zanthoxylum hamiltonianum, Piper nigrum, Pteridium aquilinum, Phogocanthus thyrsiflorus* and *Piper longum* are used in the preparation of *Apop* (starter cake). The leaves of the plants are dried in sunlight for 6-7 days and then powdered. The leave powder is then mixed with rice powder of '*Bao*' or '*Sali*' variety of paddy in the ratio 1:50 (w/w) approximately and adequate quantity of water added to make a paste. The paste is converted to spheres of weight ranging from 11g to 16g. The spheres are spread over straw, covered with *Rukji* leaves (*Cyclosorus exlensa*) and left in sunlight to dry. The spheres, on drying, are hardened and these are called *Apop* (Fig 1a). *Apops* are stored in dry places, traditionally over fire-heat in kitchens.

3.1.2. Procedure for preparation of *Apong* (*Nogin Apong*)- rice beer of the *Misings*

In summer, *Sali* (one variety of paddy) rice is cooked and spread to cool down over a '*Dola'* (Fig 2b). *Apop* spheres are powdered and mixed thoroughly with the cooled cooked rice in a ratio of approximately 1:45 (w/w). The mixture is then stored in a dry earthen pot called *Koloh* (Fig 2c). The *Koloh,* mouth covered with straw and *Rukji* leaves is hung over fire at 3 to 4 ft for 4-5 days. Thereafter the mixture is taken out of the *Koloh,* mixed with water (2 litres to 5 kg) and filtered through a cloth. The filtrate is called *Apong*. The residue called *Aaruk,* is used as feed for pig, fish and cattle.

In winter, the cooked rice, while still warm, is mixed with powdered *Apop*. It takes 8 to 9 days for fermentation.

3.2.1. Procedure for preparation of *Sujen fero* (starter cake) of *Deori* community

Some of plant leaves used for the preparation of *Sujen fero* of *Deori* community are *Jasminum sambac, Cinnamomum byolghata, Zanthoxylum hamiltonianum, Lygodium flexuosum, Acanthus leucostychys, Cyclosorus exlensa, Alstonia scholaris, Alpinia malaccensis, Costus speciosus, Allium sativum, Artocarpus heterophyllus, Capsicum annuum, Centella asiatica, Desmodium* sp, *Desmodium pulchellum, Mussaenda roxburghii, Naravelia zeylanica, Equisetum sp, Pothos scandens Pteridium aquilinum, Zanthoxylum oxyphyllum, Zingiber officinale* and *Psidium guajava.* The plant leaves are collected traditionally in a *Heso* (Fig 2h), washed and then spread over a *Saloni* (Fig 2a) overnight in order to allow the water to run off. Rice grains of *Khamti Lahi or Bora* variety, soaked in water for atleast an hour, are removed and spread over a *Saloni* to allow water to drain out. The soaked rice grains are powdered and mixed with the plant leaves smashed in a wooden mortar (Fig 2i). Requisite amount of water is added to this to make a paste. The paste is then converted into small spheres of weight ranging from 8g to 10g. The latter are spread over straw and dried under sun. These dry spheres are called *Sujen fero.* These are then stored in a dry place, preferably over '*Gisong'* (a bamboo frame at a height of about 1 m over fire heat, Fig 2e).

3.2.2. Procedure for preparation of *Sujen*- rice beer of the *Deoris*

In summer cooked rice is spread over a *Dola* (Fig.2b) and allowed to cool down. *Sujen fero* are crushed to powder and then mixed with the cooked rice in a ratio of approximately 1:50 (w/w). This mixture is then kept on a *Dola* covered with a *Saloni* (Fig 2a) for air circulation, overnight. The mixture is kept in an earthen pot called *Tekeli* (sterilized by washing with ash and fumigating over fire heat, Fig 2g). The mouth of the *Tekeli* is covered with *Bihlongoni (Cyclosorus exlensa)* (Fig 2f) followed by banana leaves. After 4-5 days, the content is filtered through a strainer. The filtrate is *Sujen.* The residue, called '*Soba*' can be used as pig feed.

In winter the cooked rice, while still warm, is mixed with powdered *Sujen fero.* It takes 7-8 days for fermentation.

3.3.1. Procedure for preparation of *Vekur Pitha/ Xaj Pitha* (starter cake) of *Ahom* community

Some of the plant ingredients used to make *Vekur Pitha* (Fig 1b) are *Oldenlandia corymbosa, Lygodium japonicum, Hydrocotyle sibthorpioides, Centella asiatica, Cissampelos pareira, Piper nigrum, Naravelia feylavica, Actinodaphne obovata, Lygodium flaxuosum, Leucas aspera, Zanthoxylum nitidum, Clerodendrum viscosum, Scoparia dulsis* and *Artocarpus integrifolia.* Plant leaves and stems are washed properly and dried in sunlight for a day or two. Sun dried leaves are smashed and mixed with the rice grain powder of *Sali* variety in a ratio approximately1:50 (w/w). Requisite amount of water is added to make dough like mixture. This mixture is made into spheres (*Laddu*) of weight ranging from about 15g to 35g. The spheres are then wrapped with straw, covered with *Bihlongoni (Cyclosorus exlensa)* and stored in dry place, preferably on a *Dhuasang* (Fig 2d).

3.3.2. Procedure for preparation of *Xaj*- rice beer of the *Ahoms*

In summer, *Sali* or *Bora* rice or a mixture of both is cooked and spread over banana leaves for cooling down. The *Vekur Pitha*(s) is/are crushed down and mixed with the cooked rice in a ratio of approximately 1:45 (w/w). The mixture is put into a *Koloh* (Fig 2c) with its mouth sealed. The container is left untouched for fermentation to occur for 4 to 6 days. The fermented mass is mixed with water and filtered through a cloth. 1kg of rice yields about 2.5 litres of *Xajpani*.

In winter, the cooked rice, while still warm, is mixed with the powdered *Vekur Pitha*. 7-8 days are allowed for fermentation to take place.

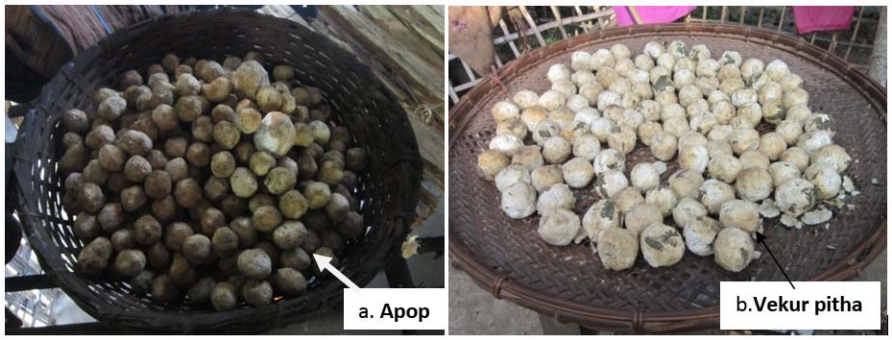

Fig 1: Starter cultures used for preparation of rice beers

Fig 2: Traditional accessories used in preparation of rice beers

3.4. Consumption pattern

For all the three communities, the consumption pattern is more or less similar. The fermented beverages are directly consumed without distillation. The beverages are prepared and consumed throughout the year. Consumption is low to moderate among the females and relatively high among males and older women. Consumption is more frequent, almost daily, among the *Deoris* and the *Misings* as compared to the *Ahoms.* In villages, rice beers are generally consumed after a day's hard labour and also offered to guests instead of tea/coffee. But now-a-days, consumption of rice beers among these communities are gradually decreasing due to shifting to towns and cities. Production and consumption are more during special occasions like marriages, child birth, festivals, get-togethers and other religious and death ceremonies

3.5. Socio-cultural, economic and medicinal importance

Fermented food and beverages have strong connection with the socio-cultural lives of the various ethnic groups of the state. People of all ages, gender and social status come together during special occasions and consume rice beers along with other food items. The traditional alcoholic beverages are also a source of livelihood for many rural people. Many households sell rice beers and starter cultures and earn livelihood. The price of the starter cultures ranges from two to five rupees (depending upon the size of the cake) while that of rice beer ranges from ten rupees to fifty rupees per 500 ml. The commercialization of rice beers is limited due to its short shelf life, transport problems and pressure of the Excise Department.

Rice beers prepared by the *Ahoms, Misings* and *Deoris* are believed to have medicinal values. Apart from its role as an energy booster, it is also used as medicines against insomnia, dysentery, headache, bodyache and urinary problems [14, 15]. These effects may be attributed to the combined effect of various ingredients including the plant ingredients present in the beverages [16, 17].

3.6. Effect of consumption on human behaviour

The rice beers, when consumed in small quantity, are refreshing. But consumption in large quantity may lead to unconsciousness, unusual behaviours, domestic violence and disputes [18]. Effect of consumption in personal behavior is similar to those of consumption of other alcoholic beverages.

4. Conclusion

The protocols followed for rice beer preparation by the *Deoris*, *Misings* and *Ahoms* inhabiting the *Sivasagar* district of Assam, India are almost similar. There are differences in the choice of rice variety used as substrate for fermentation. Some plant varieties used for starter culture preparation are also different. The protocols followed in the production of rice beers are not based on sound scientific knowledge. The fermentation is carried out in poor hygienic conditions without any scientific knowledge which result in short shelf life and sometimes poor quality of the rice beers. There is an urgent need for qualitative as well as quantitative evaluation of the rice beers for their commercialization. Complete evaluation of the various components of rice beers will surely help in uplifting the economic status of the rural people of the ethnic communities who earn their livelihood by selling rice beers and starter cakes. Moreover the lead molecules responsible for the medicinal properties of rice beers, if identified, can become a boon in medicinal chemistry.

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