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A traditional alcoholic beverage *Jou*: Prepared by Bodo community of Assam, India

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Abstract

Bodo, the largest tribal community of Assam, has been practicing fermentation of “Jou” since the time immemorial and this liquor is being used in various rituals ceremonies and cultural festivals and it has got a special repute in the society. It is purely a herbal mixture of total nine plant species viz. *Oryza sativa* L., *Ananas comosus* (L.) Merr., *Musa balbiciana* Colla., *Artocarpus heterophyllus* Lamk., *Scoparia dulcis* L., *Clerodendrum viscosum* Vent., *Plumbago zeylenica* L., *Polygonum glabrum* Willd., *Cyclosorus dentatus* (Forssk.) Ching. An endeavor has been made to understand the chemical and physical properties of the rice beer “Jou” by performing experimental study. Alcohol concentration ranges from 5- 6.4 % and pH was in between 3.5- 4.2. The method used for preparation of starter culture “Amao” and rice beer “Jou” and its economic importance has been discussed shortly in the present article.

Keywords: Rice beer, Bodo community, traditional fermentation, amao, jou, jou gwran, starter culture.

1. Introduction

Diverse ethnicity and linguistically-culturally varied is the identity of North Eastern region of India. Each state of N.E. region has its own distinct culture and tradition. The region inhabits many different tribal groups with different ethnicity and cultures (Bhaben, T. *et al.*, 2010). Bodos are one of the major ethnic tribal communities of Assam most dominantly residing in the Bodoland region (Lower Assam). “Jou” (rice beer) is an alcoholic beverage and is traditionally prepared and it has been associated with social life of tribal people for thousands of years. Starter culture or yeast culture is the main part of the rice beer preparation. The use of different starter cultures with varying microbial content and rice variety has been associated with the production of wine with different taste and flavors (Kishneth, P. *et al.*, 2013).

Different tribes prepare their indigenous alcoholic beverages at home using round to flattened solid ball-like mixed dough inocula or starter by using a mixture of different parts of various plant species (Tamang *et al.*, 2007; Jeyaram *et al.*, 2008) and these contain amyolytic and alcohol producing yeasts, starch degrading moulds and lactic acid bacteria (Dung *et al.*, 2006). Also the rice beer is known in varied names by different tribes such as “Jou” or “Jumai” in Bodo, *suze* by Deoris, *morpo* by Mikirs, *chu* by Garos, *Jou* by Meches and Dimasas, *zu* by Tiwas, *apong* by Mishings, *laopani* and *mod* by some other tribal communities. The traditionally prepared rice beer “Jou” is the traditional favorite drink of Bodo people and occupies a special place in this community because of its nutritive value, taste, health aspects, social and rituals, commercial and cultural value.

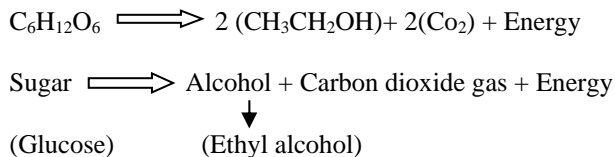
This old age methods of alcoholic fermentation has gained importance for the people who are living in rural areas since time immemorial as they are not equipped with modern biotechnological tools, they still follow the same method passed from generation to generation. Fermentation is the oldest transformation method used to preserve and enhance flavor, aroma and nutritive values of food (Steinkraus, 2002).

In food processing industry, fermentation is the conversion of carbohydrates to alcohol and carbon dioxide or organic acids using yeast or bacteria, under anaerobic conditions (William and Dennis, 2011). It is the process of digesting certain substances that leads to chemical conversion of organic substances into simpler compounds. The “Jou” prepared by the Bodo community is an alcoholic beverage made from rice grain through traditionally followed fermentation method. Rice beer “Jou” results from the fermentation of rice starch, which is converted into glucose through the process of Amylolysis. The process is carried out by yeast

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cell secreting a range of enzymes. During the process yeast cells get the energy from the conversion of the glucose into CO_2 and Alcohol. Lactic acid bacteria (LAB) and yeasts are responsible for most of these fermentations (Adenike *et al.*, 2007; Adeleke *et al.*, 2010).

The overall process of fermentation is to convert Glucose Sugar ($\text{C}_6\text{H}_{12}\text{O}_6$) to alcohol ($\text{CH}_3\text{CH}_2\text{OH}$) and Carbon Dioxide (CO_2). The reaction within the yeast cell which initiates the fermentation secreting a range of enzyme is very complex, but the overall chemical reaction is as follows-



In Bodo community, the Amylolytic process is assisted by addition of "Amao" which acts as a source of yeasts cell and initiates the process of Amylolysis and converts the carbohydrate into "Jou". The plants varieties that are used in preparation of "Amao" are highly medicinal. Among all the plants, rice grain is the most important without which "Amao" can't be prepared and undergo fermentation. The "Jou" has been consumed by this community since long ago and it has therapeutic property and antiaging (Singh and Singh, 2006).

Therefore, the present study was carried out to document the methodology and compositions followed by this community in preparation of "Amao" and "Jou" as well as physico chemical properties and economic value of "Jou" which makes it a part of the life of Bodo community.

2. Material and Methods

The study was undertaken with an objective of documenting the methodology and composition followed by the Bodo community in preparation of alcoholic beverage. The study was mainly done in some Bodo dominated villages of Kokrajhar district of Assam by visiting them and interrogating with some elderly person who are associated with brewing and commercialization of rice beer. The local knowledgeable persons were inquired about the practices of preparation such as preparation of rice beer and plants parts used in preparation of "Amao". The plant species used for preparation of starter culture were collected by visiting nearby forest and planted in the nursery. Taxonomic identification was verified in Institutional Level Biotech Hub Laboratory, Science College, Kokrajhar with the help of available literatures (Kanjilal, U.N. and Bor, N.L., 2005; Begum, S. S. and Gogoi, R., 2006). The traditionally prepared starter culture "Amao" samples were also collected from the local people and fermentation of two different rice type- common glutinous rice and boiled rice were done in the laboratory by following the traditional methods for further studies and comparison of two different rice varieties.

3. Observations

It has been revealed that Bodo community used traditionally followed method to prepare a starter culture "Amao" and different types of alcoholic drinks viz. rice beer "Jou", distilled alcohol "Jou gwan" and squeezed beer "Jou gishi". From one preparation they produce 3 different types of alcoholic drinks.

3.1 Preparation of starter culture "Amao"

"Amao" is traditionally prepared from plant parts of selective plants and soaked rice grain "mairong". The preparation of "Amao" consists of the following steps:-

- ❖ The plants were collected and washed properly and allowed to dry for 2- 3 hours under the sun.
- ❖ Previously soaked rice "mairong" is mixed with the dried plant and grinded into fine powder with the help of wooden mortar "woowal" and pestle "gaihen".
- ❖ The powdered material is then sieved with traditionally made bamboo craft "sandri" and then mixed well.
- ❖ The fine powdered material was sprinkled with ample amount of water to make sticky paste, after that small rounded flat rice cake is made.
- ❖ Little amount of previously prepared matured "Amao" is powdered and sprinkled on the surface of newly prepared starter culture "Amao".
- ❖ The cakes are then kept on clean, dry paddy straw or dhekia leaves spread over a bamboo craft "songrai" and allowed to dry for 6-7 days.
- ❖ After that when the "Amao" becomes hard after drying, it is ready to be used for brewing rice beer.

3.2 Preparation of rice beer "Jou"

"Jou" is prepared by fermenting different varieties of cooked rice most commonly (common glutinous rice and brown rice) by adding "Amao". The stepwise preparation of rice beer "Jou" is as follows-

- ❖ Rice is cooked nicely (rice *var.* Common glutinous rice, brown sticky rice, also mixed sometimes).
- ❖ Spread over a bamboo craft "songrai" and covered with banana leaves and allowed to cool. They also use the thin polythene sheet in case if there is no big bamboo craft "Songrai".
- ❖ When it cools down, the grinded powdered "Amao" is sprinkled over the cooked rice and mixed thoroughly with clean hands (amount 1: 1 kg of rice). The preparation is kept for 1-2 days covered with banana leaves "Talir bilai".
- ❖ In the next day the mixture is transferred to the earthen pot "Maldang" or plastic bucket "Bulting". Along with the mixture the conical bamboo sieve "Janta" is also inserted inside for easy harvesting of the rice beer "Jou".
- ❖ The earthen pot is then covered with banana leaves and wrapped tightly with a cloth and kept for fermentation.
- ❖ After 5-6 days a golden yellow juice is formed inside the earthen pot "Maldang" which can be harvested from inside the conical bamboo sieve "Janta". This golden yellow juice is the rice beer "Jou" which can be consumed directly.

3.3 Preparation of distilled alcohol "Jou gwan"

The process of distillation for preparation of "Jou gwan" consists of following steps-

- ❖ Before distillation the "Jumai" is transferred from the earthen pot "maldang" to silver pot and diluted with water and usually kept for 2- 3 hours.
- ❖ The distillation process requires 2-4 hrs. The process consists of three parts, the lower part is silver pot where the diluted fermented rice "Jumai" is kept, and the middle part is earthen pot with small holes at the base which is called "Mwkra koro". Inside the "Mwkra koro" a small bowl is kept for receiving the distilled alcohol "Jou gwan". The upper part is again a silver utensil

with short neck and open mouth that acts as a condenser usually filled with cold water during the whole process (Fig. 15).

- ❖ The gaps between these three components are sealed with moistened muslin clothes and squeezed Jumai or mud to make it sticky and to prevent the leakage of vapour.
- ❖ Now it is ready for heating, on constant heating the “Jumai” present in the lower part the components forms vapour, and the vapour passes through the small holes of the “Mwkra koro” and reaches to the cool base of the upper part that acts as a condenser.
- ❖ When the vapour strikes on the cooled base of upper part component it forms liquid drop by continuous vaporization from the lower part and the liquid falls back to the small bowl which is kept inside the “Mwkra koro” as receiver.
- ❖ The liquid received inside the “Mwkrakoro” is known as distilled alcohol “Jou gwan”. In the meantime, when the cold water in the upper part becomes hot it is poured off and again filled with cold water, it is done during the whole process usually 2-3 times.

3.4 Different names are attributed to rice beer products

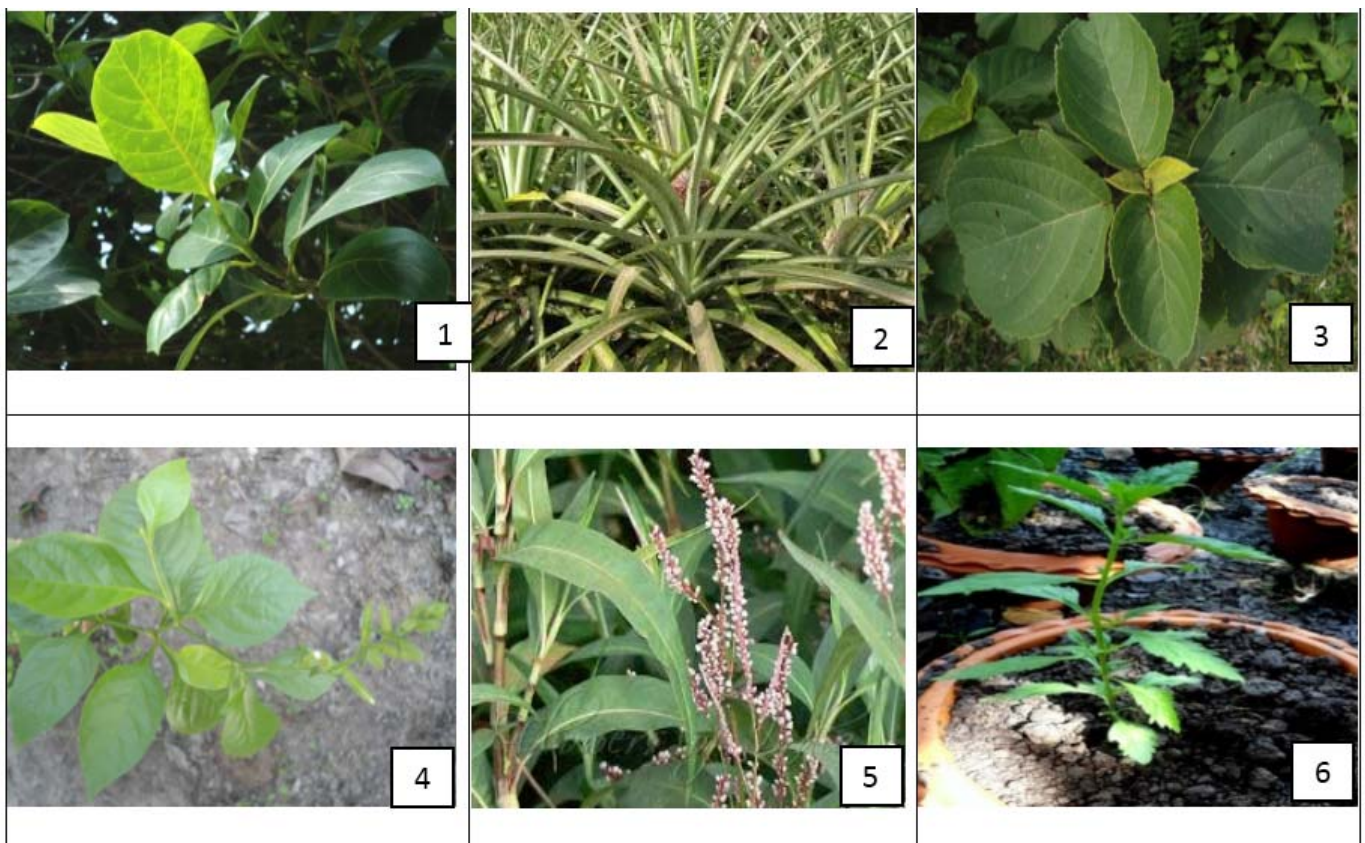
The fermented rice is known as “Jumai” after harvesting rice beer “Jou” the “Jumai” becomes ready for distillation. The alcohol produce from “Jumai” through distillation process is known as “Jou gwan” distilled alcohol. Sometimes the diluted mixture of “Jumai” is squeezed with the help of flexible bamboo sieve “Janta”, the juice produced is directly consumed as diluted beer which is known as “Jou Gishi”. During the survey it has been reported that the quality of distilled alcohol “Jou gwan” remains strong when it is distilled without harvesting rice beer and adding more amount of “Amao” at the early stage of rice beer preparation and dilution with less amount of water.

4. Results and discussion

The rice beer “Jou” preparation is one of the oldest tradition of Bodo community which has been practicing since time immemorial. This tradition is very important part of their life and it serves as a source of livelihood earnings of some of the family which is having poor financial condition. This is one of the popular drink of Bodo people in rural areas and generally used for entertaining guest during local festival and marriages (Basumatary, T. *et al.*, 2014). It forms an integral part of social life of Bodo as it is served to the guest during local festivals, fairs, marriage ceremonies and even death ceremonies. (Basumatary, T. *et al.*, 2014; Saikia *et al.*, 2007; Das, A. J. *et al*, 2012).

The *Jou* has high medicinal value which helps to improve the health condition and cure various diseases. It has revealed that “Jou” is helpful against jaundice, diarrhea, expelling worms, cholera, gastro gastrointestinal disorder, Urinary disorder, clear urine, keeps body healthy and relaxes the body when taken in a appropriate quantity as it was previously reported by (Samati and Begum, 2007; Deka and Sarma, 2010). Each and every household in this community, those who are living in rural areas prepares this drink during a special festival called “Bwisagu” celebrated during the mid of April as New Year of Bodo communities.

The “Amao” is the major part of traditional rice beer. It converts the carbohydrate present in the rice into ethanol (William, C.F. and Dennis, C. W., 2011). Bodo community used a total of nine plant species as given in (Table. 1). Data incorporated in the present article is on the basis of our observations and outcomes of experiment which has been performed in the biotech hub laboratory of Science College, Kokrajhar and detail biomolecular analysis can lead to better understanding the rice beer “Jou” fermentation process.



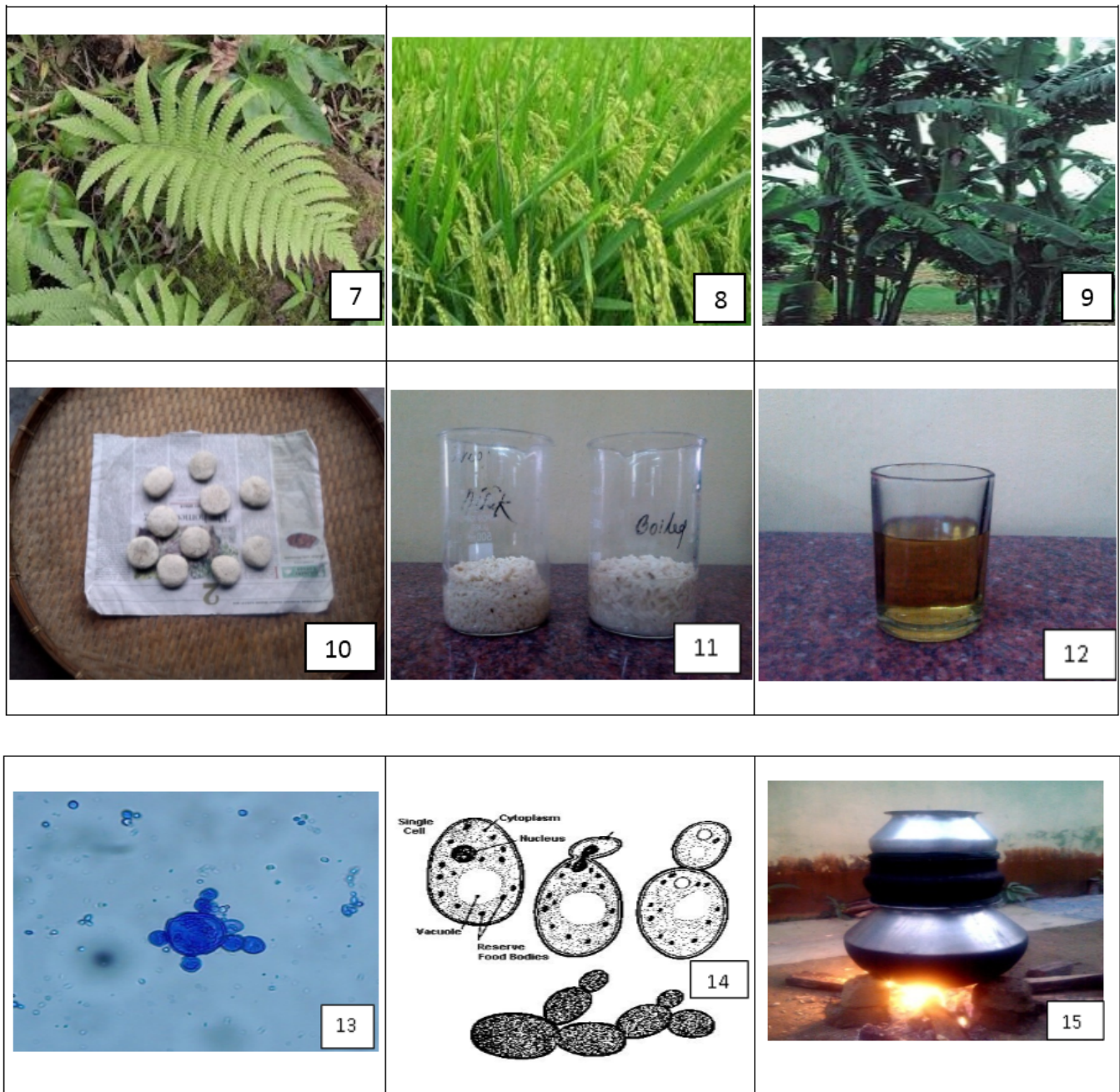


Fig.1: *Artocarpus heterophyllus* Lamk., **Fig.2:** *Ananas comosus* (L.) Merr., **Fig.3:** *Clerodendrum viscosum* Vent., **Fig. 4:** *Plumbago zeylanica* L., **Fig.5:** *Polygonum glabrum* Willd., **Fig.6:** *Scoparia dulcis* L., **Fig.7:** *Cyclosorus dentatus* (Forssk.) Ching., **Fig.8:** *Oryza sativa* L., **Fig.9:** *Musa balbiciana* Colla., **Fig.10:** Starter culture “Amao”, **Fig.11:** Fermented rice “Jumai”, **Fig.12:** Rice beer “Jou”, **Fig.13:** Micro photograph of yeast **Fig.14:** Illustration of yeast (source: internet), **Fig.15:** Distillation apparatus.

Table 1. List of plant varieties used for preparation of starter culture “Amao” by Bodo community

Local name	Scientific Name	Family	Plant parts used
Mai, Mairong	<i>Oryza sativa</i> L.	Poaceae	Rice grain
Anaros	<i>Ananas comosus</i> (L.) Merr	Bromeliaceae	Young leaf
Talir	<i>Musa balbiciana</i> Colla.	Musaceae	Young leaf
Kanthal	<i>Artocarpus heterophyllus</i> Lamk.	Moraceae	Young leaf and shoot
Bongfang rakeb	<i>Scoparia dulcis</i> L.	Scrophulariaceae	Leaf & stem
Mwkwna	<i>Clerodendrum viscosum</i> Vent.	Verbenaceae	Young leaf and shoot
Agarsita	<i>Plumbago zeylanica</i> L.	Plumbagenaceae	Root and stem
Bisongali	<i>Polygonum glabrum</i> Willd.	Polygonaceae	Young leaf and shoot
Sal daokumwi	<i>Cyclosorus dentatus</i> (Forssk.) Ching.	Polypodiaceae	Leaf are used as substrate for drying “Amao”

Local name: Mwkhwna, Dhopat tita
Scientific name: *Clerodendrum viscosum* Vent.
Family: Verbanaceae



Characters
The flowering shrub with square stems and rarely branching ; leaves are simple, opposite, both surfaces sparsely villious-pubescent, broadly elliptic, dented; inflorescence in terminal, peduncle, few flowers cymes; flower white with purplish pink or dull-purple throat, pubescent; fruit berry, globose turned to bluish-black when ripe.

Local name: Anaros, Mati-kothal
Scientific name: *Ananas comosus* (L.) Merr.
Family: Bromeliaceae



Characters
Tropical plant with edible fruit consisting of coalesced to barriers. Plants are herbaceous, perennial with short, stocked and tough stem. Leaves are lanceolate, sheathing base and spiny in both side of the blade; Flower grows in raceme produce multiple fruits.

Local name: Bongfang rakeb, Bon ceni
Scientific name: *Scoparia dulcis* L.
Family- Scrophulariaceae



Characters
Plant is a wasteland herb; small, annual, much branched, glabrous and perennial. leaves are opposite and 3-notely whorled, elliptic lanceolate, obtuse at apex, base tapering, margin serrate; Flowers many in terminal panicles, pedicelled; Pedicels slender, rigid; calyx lobes 4, oblong; corolla white; fruits are small globular capsule.

Local name: Kanthal, Khatol.
Scientific name: *Artocarpus heterophyllus* Lamk.
Family: Moraceae



Characters
A tropical tree plant, much branching, deciduous and contains milky latex; leaves are alternate, simple, entire and stipulate; flowers are small, unisexual (flowers covering the outside of fleshy receptacle) and grow in condensed spike; fruits aggregate.

Local name: Bisongali, Bihlongoni
Scientific name: *Polygonum glabrum* Willd.
Family: Polygonaceae



Characters
An annual herb grows gregariously in marshy areas; reddish coloured with swollen nodes; leaves are alternate, simple, entire, stipulate; small, pink and bisexual flowers are borne in raceme or panicle.

Local name: Agarsita, Agiasi.
Scientific name: *Plumbago zeylanica* L.
Family: Plumbagenaceae



Characters
A perennial tropical plant with glabrous small herbaceous branchlets which shows erect undershrub habit. Leaves are petiolate and have ovate lance elliptic blades. Flower in raceme with white petals; fruit capsule.

Local name: Mai, Dhan
Scientific name: *Oryza sativa* Linn.
Family: Poaceae



Characters

Plants are annual herbs, grow in clumps, usually grow in both dry wet lands; stems are solid at the nodes and hollow at the internodes with linear thin leaf ; Flowers in spikelet of white, brown, black, purple and red coloured rice (caryopsis) when ripe.

Local name: Saldaokumwi, Bih dhekia
Scientific name: *Cyclosorus dentatus* (Forssk.) Ching.
Family: Polypodiaceae



Characters

Perennial herbs with creeping rhizomatous stems, grow in shady places. Leaves are spirally arranged with pinnately compound large frond. Young leaves are pale green and show circinate vernation and with hair in its ventral surface.

Local name: Talir, Kol gas
Scientific name: *Musa balbiciana* Colla.
Family: Musaceae



Characters

The plant is perennial large herb with rhizomatous stem and grows lush leaves in clumps with upright habit. Leaves are large, simple and oblong with sheath extends to the rhizome. Flowers grow in inflorescence (spadix) red to maroon coloured.

The finished product rice beer “Jou” is an alcoholic drink with an attractive sweet taste, texture and light golden yellow colour having pH range of 3.5- 4.2 which indicates that the traditionally prepared rice beer “Jou” is acidic in nature. In comparison, of both preparations common glutinous rice was found to produce more amount of “Jou” as compared to boiled rice. And the alcohol concentration was found in between 5-6.4% in both the preparations. The laboratory preparation of 100 gm of both the rice is found to produce more than 150 ml of “Jou” that means it can be predicted that 1kg of rice can produce 1500ml i.e. 1.5 litre of “Jou” which cost around 100 rupees per 250ml. The local brewers mostly commercialize the distilled alcohol “Jou gwan” rather than rice beer “Jou” and the product is sold at local market at the rate of Rs. 25 per 250 ml. It has also been reported that 5 kg of rice gives 3 litre of “Jou gwan”. Hardly, they earn Rs. 300 from one preparation.

As it acts as a source of income and means for poverty alleviation for some of the poor family, the government can extend hands towards them through the poverty alleviation scheme for commercial production of local rice beer “Jou” and help to alleviate poverty among the poor people of the community. The technological improvement can help the traditional fermentation towards the development of new cost effective method in increasing the product and its nutritive value and it can be used as a good source of earning of livelihood for the people of this community. Therefore, preservation and documentation of indigenous knowledge based on indigenous culture are very important for uplift of the Bodo society.

5. Conclusion

Bodo community plays a very important role in conservation of various important plant species through their indigenous knowledge as they have to use plant parts in preparation of starter culture “Amao”.

Since various plant species having high medicinal value are being used in preparation of starter culture “Amao”, there is probability of having medicinal property of rice beer. So, wise use of the traditionally prepared rice beer “Jou” may act as a source of medication as it has been used by the indigenous people and it can be serve for the people of other part of the country too.

It can be concluded that, rice beer is very important drink of Bodo tribe and is a source of livelihood earning. It plays a very important role in preserving long-standing traditions. So documentation and preservation are prime necessary to preserve the traditional culture along with rice beer preparation method. It has been reported by some workers that “Amao” has some antioxidant and fibrinolytic properties, making it freely consumable and the “Jou” helps to maintain good health of the community people by preventing and curing many diseases.

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