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Medicinal Plants Used in Traditional Alcoholic Beverage Preparation by Tribes of Assam.

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ABSTRACT

The north eastern state of Assam is home to many tribes with different socio-cultural practices. These tribes use traditional fermented alcoholic beverages for many social occasions. Such beverages are mainly made from rice and rice starter cakes. Each tribe have their own method of preparation of starter cake and fermentation conditions. The names of starter cake and the fermented beverage are different for each tribe. However, the use of different plants and plant parts as ingredient for starter cake and fermentation are common in most of these indigenous preparations. The plants used for preparation of the beverages have several medicinal properties and uses. Fermentation is generally done in earthen pots at room temperature with varying incubation days depending upon season. The methods of starter cake preparation, fermentation and plants used by some of the tribes *viz*., Dimasa, Boro, Rabha, Mising, Karbi, Ahom, Deori and Sonowal Kachari are discussed in this review.

Keywords: Rice beer; Assam tribes; Medicinal plants; Starter cake

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INTRODUCTION

The north-eastern state of Assam is located at 90-96 degree East (longitude), 24-28 degree North (latitude). It is surrounded by the states, Arunachal Pradesh, Nagaland, Manipur, Mizoram, Tripura and Meghalaya which altogether are known as Seven Sisters states of India [1]. It is situated in the border region of India, surrounded by the countries, Bangladesh and Bhutan. Assam is divided into Brahmaputra valley, Barak plain, and Karbi Anglong and North Cachar hills.

Negritos, Dravidian, Alpines, Tibeto-Burmese and Aryan race were the first tribes of Assam who had migrated from different places to the heart of Assam. The places surrounded by the river Brahmaputra and Barak are populated with Bodo and Mishing tribes who are thought to have originated from Tibeto-Burmese tribal race. The indigenous tribal communities of Assam are Chakma, Dimasa, Garo, Hajong, Hmar, Khasi, Jaintia, Khamti, Kuki, Lakher, Barmans in Cachar, Boro, Borokachari, Deori, Hojai, Kachari, Sonowal, Lalung, Mech, Miri and Rabha [2,3].

Most of these indigenous tribes have the culture of preparing local fermented beverages mainly from rice with variations in methods and ingredients. Fermentation is the oldest method of post harvest preservation which has been practised all over the world for enhancing flavour, aroma and nutritive values of food. The technique and methods of preparation of rice beer in these communities have been passed on from one generation to another. As the starter cultures for beer preparation are different, the beverages of the different tribes are found to vary from one another. Preparation of starter culture is the most important step in the preparation of rice beer. They contain yeasts, lactic acid bacteria, amylolytic microorganisms and starch degrading molds [4]. The microbial content and rice variety which is used also contribute to the different taste and flavour of these beverages.

The quality of the starter cakes depend upon the variety of plant parts used, rice variety used and maintenance of hygienic and sanitary conditions. Some of the amylolytic microorganisms reported in fermented food of Sikkim starter 'marcha' include *M. circinelloides, R. chinensis, S. fibuligera, S. capsularis* and *P.burtonii.* Ethanol producing microbes, *S. bayanus, C. glabrata* and *P. anomala* and presence of lactic acid bacteria *Lactobacillus plantarum, Lactobacillus brevis* and *Pediococcus pentosaceus* have been reported in samples of starter cultures used in the states of Sikkim and Manipur [2].

The tribal cultures follow the preparation of the liquors from ancient time during the socio-cultural activities like merry making, ritual ceremonies, festivals, marriages and death ceremonies [5]. The preparation and consumption of such fermented beverages are also an important component during different agricultural activities like ploughing, sowing and harvesting. The climatic conditions prevalent over the area are favourable for preparation of these beverages. The abundantly available variety of herbs in the fertile land also features as integral ingredients of the beverages. Each tribe have their own method of preparation and most process start with preparation of starter culture for fermentation. Duration of fermentation and uses may vary from tribe to tribe. These beverages are known to be used through the ages as therapeutic agents. Many are reported to alleviate insomnia, headache, body ache, inflammation of body parts, diarrhoea and urinary problems and in many other diseases [6].

This review deals with the fermented beverage preparation of some of the tribes of Assam, the herbs and plants used by these tribes and the medicinal uses of these plants. The tribes discussed are Dimasa, Boro, Rabha, Mising, Karbi, Ahom, Deori and Sonowal Kachari.

DIMASA TRIBE

This tribe from Assam, is a part of the greater Bodo-Kachari group. Dimasas live in the Jatinga Valley in the North Chhachar Hills of Assam. The Dimasa tribe prepare and consume rice beer (wine) infused with different parts of plants. They use roots, stems, leaves, flowers, fruits, bark etc. of plants to prepare the unique starter culture for fermentation purpose. The homemade alcoholic beverage prepared by this tribe is called 'Judima'. Judima preparation comprises of two steps; (1) Preparation of starter cake and (2) production of rice beer. The starter cake is known as 'Umhu' or 'Humao'[7].

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To prepare starter rice cake for Judima, glutinous rice is soaked in water and ground in a wooden or metallic mortar and pestle 'rimin'. The barks of thempra are collected, cut into small pieces and sun dried. The mixture is prepared by combining ground rice and bark of thempra with a little amount of water to make a paste. The starter cake of radius 5-7cm, weight 80-100g is prepared. The powdered previously prepared rice cake is then sprinkled over new rice cake and sun dried for 24 hours. The dried rice cake can be stored for further use in cool and dry place. For fermentation process, rice is boiled and a large rice cake humao is added to it in a large container which is then covered by jute gunny bags. During fermentation temperature around 30^{o}C is maintained. As the fermentation proceeds, the colour of the broth becomes yellowish, which indicates the completion of preparation process [7,8]. The Dimasa tribe are known to use different plants and plant parts as part of the preparation of rice beer [9]. These plants are reported to have various types of medicinal properties. Some of them are listed in Table 1.

Table 1: Plants used in preparation of Judima

Local name of plant	Scientific name	Family	Plant parts used	Medicinal properties	Name of starter culture; Fermentation conditons
Thempra	*Accacia pennata*	Fabaceae	Bark	Leaves used for cholera treatment, indigestion, headache, body pain and even to cure snake poisoning, stem bark is anti-inflammatory and spasmolytic, roots used in dysentery and urinary discharges	Umhu/Humao; Fermentation at around 30°C until appearance of yellowish colour of beverage
Taamul	*Piper betel*	Piperaceae	Leaves	Used in headache	
Neemda	*Buddleja asiatica*	Buddlejaceae	Leaves / twigs	Used as topical antiseptic and diuretic	
Bhedeli –lota	*Hedyotis scandens*	Rubiaceae	Leaves / twigs	Used in treatment of eye diseases	

BORO TRIBE

Boro tribe is one of the most ancient tribes of Assam residing at Udalguri and Kokrajhar. The rice beer of Boro tribe is called 'Jou/Jou Bishi', which also uses different plants as ingredients of preparation. The starter cake is called 'amao' or 'angkur'. For preparation of angkur, pre-soaked rice for five-six hours is ground with plant parts in a wooden mortar pestle called 'wayal'. List of plants used in Jou Bishi preparation are given in Table 2 [2,3,10]. There are three main types of alcoholic beverage prepared from one fermentation process with Amao/Angkur starter culture. The initial fermented rice beer is called 'Jou'; The distilled drink prepared from Jou is called 'Jou gwran' and the sieved beverage is called 'Jou Gishi'[10].

Table 2: Plants used in preparation of Jou Bishi

Local name of plant	Scientific name	family	Parts used	Medicinal Properties	Name of starter culture; Fermentation conditions
Bisongali	*Polygonum glabrum*	Polygonaceae	Young leaf and shoot	Used as astringent, diuretic, pneumonia, piles, jaundice, rheumatism	Amao/Angkur; Fermentation done for 3-4 days
Anaras	*Ananas comosus*	Bromeliaceae	Young leaves, bark	Leaf base crushed and	

				extract given for amoebic dysentery, intestinal worms	
Agarsita	*Plumbago zeylanica*	Plumbagenaceae	Root and stem	Used as carminative, digestive, useful in hemorrhoids, anti inflammatory, anti colic	
Talir	*Musa balbiciana* Colla.	Musaceae	Young leaf	Antiulcer, wound healing	
Kathal	*Artocarpus heterophyllus*	Moraceae	Young leaf, shoot, bark	Leaf juice used to cure eye problem, seeds used in indigestion, stem bark used to cure boils	
Bongfang rakeb	*Scoparia dulcis*	Scrophulariaceae	Leaf & stem	Antimalarial, antiulcer, antipyretic	
Sal daokumwi	*Cyclosorus dentatus*	Polypodiaceae	Leaf are used as substrate for drying “Amao”	Rhizome used as antibacterial agent	
Dongphang rakhep	*Scoparia dulcis*	Scrophulariaceae	Leaves	Leaf juice used in indigestion, roots used for dental pain	
Lokhunath	*Clerodendrum viscosum*	Verbenaceae	Leaves/ roots	Leaf juice used for fever, cough, dysentery, stomach pain, used externally in ulcer due to scabies; bark, flower and roots used for skin diseases	
Agara	*Xanthium strumarium*	Asteraceae	Whole plant	Diaphoretic, sedative, antimalarial, root has anticancer activity and used in arthritis, fruit used against small pox	
Dhapat tita	*Clerodendrum viscosum*	Verbenaceae	Young leaves, shoot, flower, bark, root	Leaf juice used in fever, cough, dysentery, stomach pain; ulcer due to scabies. Bark, flower and roots used in skin diseases, malaria	

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Table 3: Plants used in preparation of Jonga mod

Local name of plant	Scientific name	family	Parts used	Medicinal Properties	Name of starter culture; Fermentation conditions
Anaras	*Ananas comosus*	Bromeliaceae	Young leaves, bark	Leaf base crushed and extract given for amoebic dysentery, intestinal worms	Surachi/ phap/ bakhor; Fermentaion for 4-5 days during summer and 7-8 days during winter
Kathal	*Artocarpus heterophyllus*	Moraceae	Young leaf, shoot, bark	Leaf juice used to cure eye problem, seeds used in Indigestion, stem bark used to cure boils	
Aakon	*Calotropis gigantea*	Asclepiadaceae	Leaves	Leaves analgesic, antiseptic, anthelmentic; used in burn, ear, eye ailments	
Jolokia .	*Capsicum annuum*	Solanaceae	Fruit	Roots used in asthma; fruits used for stomach pain	
Dhapat tita	*Clerodendrum viscosum*	Verbenaceae	Young leaves, shoot, flower, bark, root	Leaf juice used in fever, cough, dysentery, stomach pain; ulcer due to scabies. Bark, flower and roots used in skin diseases, malaria	
Dhan	*Oryza sativa*	Poaceae	Rice grain	Rice-wash water used in diarrhoea and dysentery	
Jaluk	*Piper nigrum*	Piperaceae	Seeds	Seeds used in indigestion, body ache, bone fracture and post labour ailment	
Kuhiyar	*Saccharum officinarum*	Poaceae	Leaves	Roots used in dysuria and haematuria; fresh stem juice used in jaundice	
Bisdhinkia	*Dennstaedtia scabra*	Dennstaedtiaceae	Fronds	Fronds analgesic, used in malaria, stomachache	
Kuchibun	*Ochthochloa coracana*	Poaceae	Leaves	Leaves used in measles, pneumonia	
Agiachit	*Plumbago indica*	Plumbaginaceae	Roots	Used as abortifacient, headache	

The dough for amao/angkur is prepared by mixing water with the mixture of rice and plant and it is covered by 'gigab' (paddy straw) for 4-5 days. The dried starter cake can be stored for years as it is moisture free. For the fermentation process, rice is cooked and cooled down and mixed with angkur. The mixture is kept overnight and following day little water is added to it. The prepared fusion is kept in earthern pots for 3-4 days and covered by banana leaves. The liquor is strained out from the preparation and used for ethnic drink on different occasions as well as in daily meals. Alcohol concentration ranges from 5- 6.4 % and pH was in between 3.5- 4.2 [10].The finished product is transparent, light golden brown in colour and having sweet tongue sensitizing taste. The distilled 'Jou' is reported to have alcohol content of 18.53± 6.17% (v/v) and pH 4.21 ± 0.04 [11].

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RABHA TRIBE

The Rabha are also one of the largest tribes of Assam with major contributions in the fields of culture and literature of Assam. They mainly reside in the Goalpara, Kamrup and Daraang district. There are seven sub tribes of Rabha; Rangdaniya, Moitariya, Pati, Koch, Bitliya, Dahuriya and Sangha. The tribes prepare their own way of traditional drink by using various medicinal plants. The starter cake for the drink is 'surachi' or 'phap' or 'bakhor' [12].

Rice grains are pre-soaked for 24 hrs and ground with plant parts in wooden mortar and pestle. The starter cake is then prepared from the paste and sun dried placing on paddy straw. To prepare 'jonga mod' or 'kecha mod', the tribal people cool the cooked rice. The powdered 'surachi' is added to it and the mixture is kept in an earthern pot. Bamboo net (janthi) cylinder is kept above the mixture and the pot (jonga) is covered by banana leaves. The pot is warmed on flame and kept in a dark place for fermentation. The mixture takes 4-5 days to ferment during summer and 7-8 days during winter. A little amount of water is added to the fermented product and kept for further fermentation again. It is then distilled in a set up that has three pots with holes, kept on top of each other; junction is covered by jute and mud to maintain the fermentation anaerobically. The fermented strong liquor collected is called 'fotika'. The tribes consider this strong liquor as medicine for psychiatric patients [3,12].

MISING (MIRI) TRIBE

Mising is one of the Indo-Mongoloid tribes Mongoloid group tribal community owned the areas of Brahmaputra valley in Dhemaji, Lakhimpur, Sonitpur, Sibsagar, Majuli , Tinsukia, Dibrugarh, Jorhat, Golaghat & Sonitpur districts of Assam [13,1]. They are reported to have migrated from the eastern Himalayan regions in Tibet. Traditional fermented rice beverage is generally prepared by Mising women and involves preparation of starter cakes, collection of plants and plant parts and fermentation process.

The traditional drink prepared by the tribe is known as 'Apong' and the starter cake used is 'apop pitha'. The starter cake is prepared by cleaning and drying the leaves of the plants on a bamboo mat (opoh) or the leaves can be used fresh also. Some of the plants used in the preparation of starter culture are bormanimuni, horumanimuni, banjaluk, kuhiar, dhapat tita, bhilongoni, bam kolmou, senikuthi, lai jabori, jalokia, anaras and kopou dhekia. The medicinal properties of the plants are listed in Table 4. Rice is soaked and ground in a wooden grinder (*kipar*) and leaves are powdered separately in the same method. The rice and leaves powder mixed with little water in a vessel. The dough is made and aopo pitha are dried in the sun. For fermentation process, the boiled rice is cooled down on banana leaf (kol paat) and powdered starter cake is mixed with it. The earthen pot (kiling) used for fermentation is fumigated on a bamboo frame constructed over the fire place (torap) till it turns into black colour. The mixture of cooked rice and starter culture is transferred in an earthen pot and covered with banana leaves (*bhilongoni*). The fermentation takes 5 days. A little amount of water is added to the fermented mixture and it is strained to get 'apong'. The tribe also prepares another variety of traditional drink called 'sai mod'. To prepare sai mod, the burnt black ash of hay and husk and equal amount of boiled rice is mixed with apop pitha. Double quantity of apop pitha is added for the preparation of apong. The mixture is tightly kept in earthen pot, 'kiling'. The fermented product will be ready after 15 days. The filtration technique is same as apong [14,2]. The medicinal plants used for the preparation of Apong listed in Table 4 [15,16,17,18,19]

Table 4: Plants used in preparation of Apong

Local name of plant	Scientific name	family	Parts used	Medicinal Properties	Name of starter culture; Fermentation conditions
Bioni-hakuta	*Achyranthes aspera*	Amaranthaceae	Leaf	Leaf decoction used in treatment of cough	Apop pitha; Fermentation done for 5 days
Patihanda	Cinnamomum bejolghota	Lauraceae	Leaves	Leaves used as anti-diabetic	
Titabahak	*Adhatoda vasica*	Acanthaceae	Leaves and Shoot	Juice of leaves used as expectorant, cough relief	

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Gendelabon	*Ageratum conyzoides*	Asteraceae	Flowers	Bruised leaves applied to cuts and wounds as antiseptic.	
Anaras	*Ananas comosus*	Bromeliaceae	Young leaves, bark	Leaf base crushed and extract given for amoebic dysentery, intestinal worms	
Kathal	*Artocarpus heterophyllus*	Moraceae	Young leaf, shoot, bark	Leaves antihelmenthic	
Satmul	*Asparagus racemosus*	Liliaceae	Tuberous root	Root decoction diuretic, phthalmic, galactagogue	
Tezpat	*Cinnamomum tamala*	Lauraceae	Leaves	Leaves useful in gonorrhoea, rheumatism, diarrhoea, enlargement of spleen and diabetes	
Jolokia .	*Capsicum annuum*	Solanaceae	Fruit	Roots used in asthma; fruits used for stomach pain	
Barmanimuni	*Centella asiatica*	Apiaceae	Whole plant	Leaves used in amoebic dysentery or any kind of liver problem	
Dhapat tita	*Clerodendrum viscosum*	Verbenaceae	Young leaves, shoot, flower, bark, root	Leaf juice used in fever, cough, dysentery, stomach pain; ulcer due to scabies. Bark, flower and roots used in skin diseases, malaria	
Jomlakhuti	*Costus speciosus*	Liliaceae	Leaves, Barks	Rhizome paste used for jaundice treatment	
Lai jabori	*Drymeria cordata*	Caryophyllaceae	Young Leaves	Paste of whole plant is applied on tongue in fungal infection, juice given in sinusitis.	
Bhedaitita	*Gomphostemma parviflora*	Lamiaceae	Tender leaves	Leaves used in malaria	
Bam kolmou	*Ipomoea aquatica*	Convulvulaceae	Leaves	Taken as a vegetable is said to be useful in diabetes and as galactagogue to nursing mother	
Bhui komora	*Ipomea mauritiana*	Convolvulaceae	Tubers	Tubers used to reduce fever	
Bhumichampa	*Kaempferia rotunda*	Zingiberaceae	Tubers	The tubers used for wounds, ulcers, tumors, swellings and gastroenteritis	
Durun	*Leucas plukenetii*	Lamiaceae	Leaf	Leaf juice used in sinusitis	
Kapou dhekia	*Lygodium flexuosum*	Lycopodiaceae	Leaves	Rhizome used for skin disease and in rheumatism; leaves used for treating female infertility, fix fractured bones	
Belipoka	*Melothrea heterophylla*	Cucurbitaceae	Leaves	Roots have anticancer activity	
Bhimkol	*Musa balbisiana*	Musaceae	Leaves	Young pseudo stems eaten as vegetables; used as medicine against tuberculosis	
Goropsoi	*Naravelia feylavica*	Rananculaceae	Leaves	Leaves are anthelmintic; they are useful for wounds	

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				and ulcers	
Banjaluk	*Oldenlandia corymbosa*	Rubiaceae	Leaves	Plant is diuretic, stomachic, carminative and used as liver tonic; also used in jaundice	
Dhan	*Oryza sativa*	Poaceae	Rice grain	Rice-wash water is used in diarrhea and dysentery	
Pipoli	*Piper longum*	Piperaceae	Leaves	Fruits and roots are eaten in respiratory disorders, muscular pains, epilepsy and drowsiness.	
Jaluk	*Piper nigrum*	Piperaceae	Seeds	Seeds used in indigestion, body ache, bone fracture and post labour ailment	
Titaphool	*Phlogacanthus thyrsiformis*	Acanthaceae	Flower	Eaten as vegetable;used for rheumatism, anemia and cough	
Madhuriam	*Psidium guajava*	Myrtaceae	Leaves	Tender leaves are used in amoebic dysentery	
Bhuin Komora	*Pueraria tuberose*	Papilionaceae	Tuberous roots	Tubers used for fever	
Bihlongoni	*Ptridium aquilinum*	Polypodiaceae	Leaves	Leaves are antibacterial and germicidal	
Kuhiar	*Saccharum officinarum*	Poaceae	Leaves	Aerial part used in jaundice, fever, tooth-ache, stomach troubles	
Selaginella	*Selaginella species*		Whole plant	Roots have anticancer property	
Chirota tita	*Swernia chirata*	Gentianaceae	Leaves and barks	Decoction of bark is used as bitter tonic	
Posotia	*Vitex negundo*	Verbenaceae	Leaves Root, twigs, leaves	Leaves & roots are used as febrifuse and tonic	
Tezmori	*Zanthoxylum nitidum*	Rutaceae	Root,stem, fruit	The stem and root extract is used in tooth-ache, stomachache and externally on boils	

Table 5: Plants used in preparation of Hor-alank

Local name of plant	Scientific name	family	Parts used	Medicinal Properties	Name of starter culture; Fermentation conditions
Marthu	*Croton joufra*	Euphorbiaceae	Leaves	Leaf juice used to cure eye problem, Seeds used for indigestion, stem bark used to cure boils	Thap; 2 days of fermentation in summer and 3 days during winter
Thempra	*Acacia pennata*	Fabaceae	Barks	Leaves used for cholera treatment, indigestion, headache, body pain and even to cure snake poisoning, stem bark is anti-inflammatory and spasmolytic, roots used in dysentery and urinary discharges	
Kathal	*Artocarpus heterophyllus*	Moraceae	Young leaf, shoot, bark	Leaf juice used to cure eye problem, seeds used in Indigestion, stem bark used to cure boils	

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Dhan	*Oryza sativa*	Poaceae	Rice grain	Rice-wash water used in diarrhoea and dysentery	
Titaphool	*Phlogacanthus thyrsiflorus*	Acanthaceae	Leaves	Eaten as vegetable;used for rheumatism, anemia and cough	
Bhekuri tita	*Solanum torvum*	Solanaceae	Leaves	Roots used in puerperal diseases; fruits used in bronchial asthma, intestinal colic	

KARBI TRIBE

The Karbis are Mongoloid in origin group and speak a dialect 'Karbi' a Tibeto Burman language. They are the principal tribe of Karbi Anglong district of Assam. The tribe mainly reside in North Cachar Hills, Dima Hasao, Kamrup, Marigaon, Nagaon, Golaghat, Karimganj and Sonitpur districts of Assam. Like other tribes, the Karbi also prepare their traditional drink using different types of herbs and plant parts.

Yeast based starter culture namely 'thap' used for the preparation of the refreshing drink called 'hor-alank'. The alcohol distilled from 'hor-alank' is called 'hor-arak'. The former is used during traditional marriage and worship and latter in all social occasions including death ceremonies. The yeast based starter cake is prepared by mixing leaves of the plants with 24 hr presoaked rice. Commonly used plants for 'thap' preparation are *marthu*, *janphong*, *jockan*, *hisou-kehou* and barks of *thempra*.

The mixing is done in a wooden mortar and pestle called '*long'* and '*lingpum'* respectively. To this sticky mixture previously prepared 'thap' called 'thap aphi' is added. From this mixture cakes of 6 cm in diameter and 0.5 cm in thickness are prepared. The starter cake is wrapped in banana leaf and kept for sun drying for three days. Commonly rice of inferior quality is used for preparation of beverage. Besides rice, finger millet ripe banana and jackfruit are also used as hor-alank substrate. Rice for beverage preparation is boiled and spread for cooling. After cooling, boiled rice is mixed with thap in the proportion of 7 thaps for 5 kg of rice. 40 grams of thap when added to 5kg of rice, approximately 5.5 litres of alcohol can be distilled. The mixture is kept in a large storage container for 2 days at room temperature. It is covered with plastic bags initially and afterwards with the help of gunny bags. Then a little amount of water is added to it and it is kept for 2 days of fermentation in summer and 3 days during winter. From hor-alank, hor-arak is distilled using a crude form of distillation still called 'Bhot'. The fermented rice left after distillation is used as animal feed. Another variation of hor-alank is prepared with whole water melon, by removing the pericarp through a hole and adding thap inside it. The hole is sealed and incubated for three nights and the beverage is consumed directly without distillation [20].

AHOM TRIBE

The Ahoms are also known **as** *Tai-Ahoms* as they belong to Tai origin. This ethnic tribal group settled in the Brahmaputra valley of Assam and they are also found all over Assam. The traditional drink of Ahom tribe is called 'xaj pani' or 'kolohi pani'. Different plants like *banjaluk, kopou lota, horuminimuni, bormanmunii, tubuki lota, jaluk,etc* are used for the preparation of xai pani. The medicinal properties of these commonly used plants are listed in Table 6.

Table 6: Plants used in preparation of Xaj pani

Local name of plant	Scientific name	Family	Parts used	Medicinal Properties	Name of starter culture; Fermentation conditions
Bar manimuni	*Centella asiatica*	Apiaceae	Whole plant	Whole plant used in chronic dysentery, spermatorrhoea, liver disorder, carbuncle, cuts and wounds, nervous deability, hermicrania; roots used in stomach ache; leaves used in	Vekur pitha; Fermentation is done in a closed dark room for 3-5 days

				dyspepsia, gastric trouble	
Patihanda	*Cinnamomum bejolghota*	Lauraceae	Leaves	Leaves are used as anti-diabetic agent	
Tubuki lota	*Cissampelos pareira*	Menispermaceae	Leaves	Roots used in diarrhoea, piles, dysuria, bone fracture, to control labour pain, fruits used in liver disorder	
Dhapat tita	*Clerodendrum viscosum*	Verbenaceae	Young leaves, shoot, flower, bark, root	Leaf juice used in fever, cough, dysentery, stomach pain; ulcer due to scabies. Bark, flower and roots used in skin diseases, malaria	
Lota mahudi	*Croton caudatus*	Euphorbiaceae	Leaves	Leaves used in urinary trouble	
Haru manimuni	*Hydrocotyle sibthorpioides*	Apiaceae	Whole plant	Whole plant used in amoebic dysentery, malaena and for improving memory; leaves in dysentery and hypertension	
Kapou dhekia	*Lygodium flexuosum*	Lycopodiaceae	Leaves	Rhizome used for skin disease and in rheumatism; leaves used for treating female infertility, fix fractured bones	
Gorob-choi	*Naravelia zeylanica*	Ranunculaceae	Leaves	Stem is used in tooth ache	
Dhan	*Oryza sativa*	Poaceae	Rice grain	Rice-wash water used in diarrhoea and dysentery	
Bihlongoni	*Pteridium aquilinum*	Pteridaceae	Fronds and roots	Leaves antibacterial and germicidal	
Jaluk	*Piper nigrum*	Piperaceae	Seeds	Seeds used in indigestion, body ache, bone fracture, post labour ailment	
Sonbarial	*Sida rhombifolia*	Malvaceae	Leaves	Decoction of tender leaf is given to cure hypertension	
Tikoni barual	*Smilax perfoliata*	Smilaceae	Leaves	Roots used in post natal care and in odorous Urine, stem used in swelling of gum	

The starter culture of Ahom rice beer is called 'Vekur pitha'. To prepare vekur pitha, rice grain is soaked in water overnight. Then different types of plant parts like leaves and seeds are washed properly and mix with the soaked rice grain. The mixture is ground in wooden mortar called 'ural' and pestle. Water is added to the mixture and paste of the mixture is prepared. From the paste, the starter cake of size 4.5 cm x 3 cm is made and wrapped in banana leaves (kol pat) and kept for drying either in sun or over fire. Care is taken when drying vekur pitha over fire so that it does not contact the flame. After 5 days vekur pitha becomes hard and can be used. This dried vekur pitha can be preserved for one year. The vekur pitha is used in the preparation of the traditional drink 'xaj pani' or 'kolohi pani'. The rice is half cooked and made to cool. To the half cooked cooled rice, powdered vekur pitha in the ratio of 1 per 1kg of rice is added and again spread for cooling. The mixture is kept in earthern pot 'kolohi' keeping its mouth airtight. The fermentation process is done in a closed dark room for 3-5 days. After fermentation a little quantity of water is added to it and the filtered with muslin cloth to obtain 'xaj pani' [2,3].

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DEORI TRIBE

The Deori tribe is one of the oldest ethnic tribe of Assam which belong to the Tibeto Mongolian race. They reside in the districts of Lakhimpur, Dibrugarh, Tinsukia, Dhemaji, Sibsagar, Darrang of Assam. Like other tribes, Deori tribe also prepare their indigenous drink in a different way as part of their socio cultural life. The traditional drink is known as 'Sujen' and the starter cake for its preparation is known as 'Mod Pitha' or '*perok kushi'.*

In olden days, *Deori* tribe used more than 100 plant species for the preparation of 'Mod pitha' for brewing *Sujen* but these days, only a few plant species that are commonly available are used. To prepare Mod pitha certain plants and their parts are used like the leaves of bhatar duamali, thok thok, tesmuri, zing zing, zuuro, bhilongoni, sotiona, roots of dubusiring and stem and rhizome of the plant jomlakhoti. The medicinal properties of these plants are listed in Table 7.

The plant parts are washed properly before cutting into pieces. The cut plant materials are ground using wooden mortar and pestle 'dheki'. The powdered mixture is soaked in a vessel with water till the colour of water develops. Ground rice and paste of plant is mixed well for dough preparation. From this dough, the starter cake of 4 cm diameter is prepared and dried in sun or in the fire after wrapping it in a bamboo mat '*aaphey'*. The dried starter cake is placed in a bamboo container called 'kula' and mouth is covered with paddy straw 'kher' and kept on the hearth for preservation. For fermentation process, an earthen pot is sterilised by washing, drying and fumigating over fire. Rice is boiled and cooled on banana leaves. To this, starter cake is mixed in the ratio of 1 piece per 3kg of rice and transferred in a container 'dosoh' which is covered by banana leaves. Now the contents are kept for 4 to 5 days for fermentation. The finished product can be stored upto 1-2 months at room temperature [21,2].

Table 7 : Plants used in preparation of Sujen

Local name of plant	Scientific name	family	Parts used	Medicinal Properties	Name of starter culture; Fermentation conditions
Nohoru	*Allium sativum*	Liliaceae	Bulb	Used in gastric ulcer, hypertension, liver disorder, loss of appetite, whooping cough	Mod pitha/Perok kushi; fermentation process is done in a closed dark room for 3-5 days
Kathal	*Artocarpus heterophyllus*	Moraceae	Young leaf, shoot, bark	Leaf juice used to cure eye problem, seeds used in Indigestion, stem bark used to cure boils	
Anaras	*Ananas comosus*	Bromeliaceae	Young leaves, bark	Leaf base crushed and extract given for amoebic dysentery, intestinal worms	
Sotiana	*Alstonia scholaris*	Apocynaceae	Leaves	Stem bark used in asthma, liver disorder, and spleen enlargement; latex used in septic ulcer, scabies, and chronic dysentery	
Mati kaduri	*Alternanthera sessilis*	Amaranthaceae	Leaves	Leaves used in dysentery and liver disorder; roots used in spermatorrhoea	
Jolokia	*Capsicum annuum*	Solanaceae	Fruit	Roots used in asthma; fruits used in pain in stomach	
Patihanda	*Cinnamomum*	Lauraceae	Leaves	Leaves used as anti-	

	bejolghota			diabetic	
Bar manimuni	*Centella asiatica*	Apiaceae	Whole plant	Whole plant used in chronic dysentery, spermatorrhoea, liver disorder, carbuncle, cuts, wounds, nervous deability, and hermicrania, roots used in stomach ache, leaves used in dyspepsia and gastric trouble	
Jamlakhuti	*Costus speciosus*	Costaceae	Leaves	Rhizome used in whooping cough and jaundice	
Kapou dhekia	*Lygodium flexuosum*	Lycopodiaceae	Leaves	Rhizome used for skin disease and in rheumatism; leaves used for treating female infertility, fractured bones	
Phutuki	*Melastoma malabathricum*	Melastomataceae	Leaves	Leaves used in ulceration in mouth	
Hukloti	*Mussaenda roxburghii*	Rubiaceae	Leaves	Leaves used in post natal care and jaundice	
Gorob-choi	*Naravelia zeylanica*	Ranunculaceae	Leaves	Stem used in tooth ache	
Dhan	*Oryza sativa*	Poaceae	Rice grain	Rice-wash water used in diarrhoea and dysentery	
Bihlongoni	*Pteridium aquilinum*	Pteridaceae	Fronds and roots	Leaves antibacterial and germicidal	
Kuhiyar	*Saccharum officinarum*	Poaceae	Leaves	Roots used in dysuria, haematuria, fresh stem juice used in jaundice	
Senikuthi	*Scoparia dulcis*	Scrophulariaceae	Leaves	Roots are used in menstrual problems and respiratory troubles; leaves are used in diabetes, jaundice, stomach problem, skin disease and piles	
Bhekuri tita	*Solanum torvum*	Solanaceae	Leaves	Roots are used in puerperal diseases; fruits are used in bronchial asthma and intestinal colic	
Phirphiria pat	*Thunbergia grandiflora*	Acanthaceae	Leaves	Leaves are used in dyspepsia, cuts, wounds and menorrhagia	
Tezmuri	*Zanthoxylum nitidum*	Rutaceae	Leaves	Roots used in asthma and rheumatism; stem used in pyorrhoea and to control labour pain	
Ada	*Zingiber officinalis*	Zingiberaceae	Bulb	Rhizome used in abdominal pain, arthritis, cough, influenza	

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Table 8: Plants used in preparation of Rohi

Local name of plant	Scientific name	family	Parts used	Medicinal Properties	Name of starter culture; Fermentation conditions
Barmanimuni	*Centella asiatica*	Apiaceae	Whole plant	Whole plant used in chronic dysentery, spermatorrhoea, liver disorder, carbuncle, cuts and wounds, nervous deability, and hermicrania; roots used in stomach ache; leave used in dyspepsia and gastric trouble	Saoul Pitha; Fermentation is done for 3-5 days
Dhapat tita	*Cleroden-drum viscosum*	Verbenaceae	Young leaves, shoot, flower, bark, root	Leaf juice used in fever, cough, dysentery, stomach pain; ulcer due to scabies. Bark, flower and roots used in skin diseases, malaria	
Mithamora	*Corchorus olitorius*	Malvaceae	Leaves	Leaf decoction used as demulcent and diuretic and antioxidant	
Gorob-choi	*Naravelia zeylanica*	Ranunculaceae	Leaves	Stem used in tooth ache	
Dhan	*Oryza sativa*	Poaceae	Rice grain	Rice-wash water used in diarrhoea and dysentery	
Bihlongoni	*Pteridium aquilinum*	Pteridaceae	Fronds and roots	Leaves antibacterial, germicidal	
Sonbarial	*Sida rhombifolia*	Malvaceae	Leaves	Decoction of tender leaf given to cure hypertension	

SONOWAL KACHARI TRIBE

The endogamous tribe belong to the Mongol and mughal family and reside mainly in Dibrugarh, Lakhimpur, Dhemaji, Tinsukia, Jorhat, and Golaghat districts of Assam.

Their traditional beer is known as ‘Rohi’ and the starter material used to prepare Rohi is ‘Saoul Pitha’. For the preparation of saoul pitha, the required plant parts are collected, washed and ground with presoaked rice grains in a wooden mortar and pestle. From the paste, starter cake is prepared and dried on banana leaves for 3 to 5 days. To prepare Rohi, rice is half cooked and cooled down. To this starter powdered cake is mixed properly and kept in the earthen pot 3-5 days is sealed with banana leaves. The earthen pot with mixture is kept for fermentation. The fermented product is strained to get the strong liquor ‘Rohi’ [3].

CONCLUSION

Indigenous fermented rice beer is part of the tradition and socio-cultural activities of many tribes of Assam. The climatic conditions prevalent over the area, practice of use of local herbs in cuisine, lack of other post harvest management of rice grains may have contributed to the development of alcoholic rice beverage. The rice beer is consumed on celebratory occasions and death ceremonies. The consumption is also done for many kinds of therapeutic properties against ailments. The medicinal properties may be possibly contributed by the local plants and plant parts used in the preparation and the microbial transformation of the substrate

into beverage. These remarkable properties hold a very interesting area of study by microbiologists, pharmacologists, biotechnologists, nutritionists, horticulturists and agronomists. Very few of the beverages have been functionally characterized so far and majority of them have not been fully pursued. The elucidation of the active components responsible for therapeutic properties will increase the market value of the local plants and aid farmers to cultivate and generate revenue. It will also serve to conserve the rich biodiversity of plants in the state of Assam. Thus investigations on nutritive parameters and pharmacologically potent active biomolecules are desirable.

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