

## Ethnobotany of foods and beverages among the rural farmers of Tai Ahom of North Lakhimpur district, Asom

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The Northeastern region of India including Asom is one of the core area widely recognized as the centre of origin of rice germplasm. It is the largest region exceptionally rich in the rice genetic diversity. The physiographic and agro-ecological conditions vary in Asom very widely. The physical features, geographical isolation and historical realities have made the state an area of unique ethnic diversity. All the people of this state from the time immemorial have been using rice as staple food and some of the ethnic group use rice for preparation of alcoholic beverage. The present paper emphasized on ethnobotany and taxonomy of traditional rice varieties cultivated among the Tai Ahom of North Lakhimpur district of Asom for food security. Emphasis is also given on beverage processing techniques using rice varieties and other plant material used during preparation of rice beer commonly known as *Sajpani (Tai)* & *Laopani (Ass.)* by the *Ahom* caste of Asom.

**Key words:** Ethnobotany, Lakhimpur district, Asom, Traditional foods, Traditional beverage, *Ahom*, *Sajpani*, *Laopani*, Rice beer

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The state of Asom and Northeast India is repository of about 2054 local rice cultivars which account for 16.75% out of 12256 cultivars reported all over the world<sup>1,2</sup>. Traditionally, rice is the staple food of Asom, where 80% of their cultivable lands are used for such cultivation<sup>3</sup>. The traditional farmer of Asom with the help of their age-old agricultural wisdom have identified three distinct rice growing season in its diverse agroclimatic zone in the state namely, *Sali* (winter rice) sown in June–July which is harvested in November–December, *Ahu* (autumn rice) sown in March - April which is harvested during the summer month of June–July, and *Boro* (summer rice), which is generally sown in November–December and harvested in the month of May–June. Out of these three rice growing season, the local farmers of Asom for a long have adapted to only two principal seasons—*Ahu* and *Sali* for the cultivation of different rice varieties. So far, 24 species of rice have been reported from the globe out of which only two species namely *Oryza sativa* Linn. and *Oryza slaberina* are commonly cultivated by the humankind. *Oryza sativa* is the most widely cultivated and most important staple food crop

from commercial point of view, which is further divided into 4 subspecies namely *indica*, *japonica*, *bravendica* and *braves*<sup>4</sup>. In Asom, ethnic people have been the main custodian of many primitive rice germplasm. Historically, the present cultivated rice variety in Asom is based on primitive rice germplasm maintained by different ethnic group since time immemorial. These ethnic groups were rather isolated from one another and used different local landraces. It is interesting to note that the thousand years of cultivation trial and selection by the traditional farmers have resulted into present genetic treasure of rice cultivars, and some of the varieties have developed a resistant against the invasion of pest and diseases, while others have successfully emerged as environmental stress tolerant<sup>5</sup>. Earlier, the workers reported the agriculture status and rice cultivars of Asom from Regional Agriculture Research Station, Lakhimpur and Assam Agriculture University. Researchers of Indian Council of Agricultural Research (ICAR) have reported the status of agriculture and local rice cultivars of North Lakhimpur region<sup>6,7</sup>. Variations in grain protein content of few selected varieties found in NE region were also investigated<sup>8</sup>. However, traditional food and

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beverage preparation technology and associated plants used for such purpose were not thoroughly discussed. Keeping in view such loophole in IKS documentation of Tai Ahom of North Lakhimpur District based on traditional knowledge approach to local food and beverage processing technology, and also considering the growing significance of traditional nutraceutical agents as one of the major thrust area globally, and to develop plant germplasm for alternative healthcare among the rural population, present ethnobotanical investigation has been carried out in rural Tai Ahom of North Lakhimpur district of Asom during the year 2005-2006 which is mainly intended to update eroding traditional agriculture and food processing knowledge prevalent among both rural and urban dwellers. The brief report presented in this paper would immensely helpful to a scientists and policy makers of agriculture and food processing sector of the region and for further research in proteomic and biochemical level to prove their scientific validation for the nutritional potential. A fruitful research finding on such line would enhance food security of the region and state as a whole.

Asom is the second largest landmass after Arunachal Pradesh in the northeastern India. The state lies between 24° and 28° latitude and covers an area of 78,438 sq km. The state is situated in sub-tropical monsoon zone of northeastern India and its climate is generally differs from rest of the country. The important climatic characteristics of Asom are high rainfall, high relative humidity, high temperature and cloudy weather during the summer monsoon period. The average annual rainfall recorded varies from 0.58 mm to 901.48 mm and the average minimum and maximum temperature were found to be 10.7° and 36.9°C respectively<sup>9</sup>.

Due to its favourable geographical location, the Asom had been an ideal meeting ground of diverse ethnic races since time immemorial. It has been sheltering stream of human waves with distinct culture and trends of different civilization. Races of Austro-Asiatic, Negritoid, Dravidians, Indo-mongoloids, Tibeto-Burman and Aryans penetrated into Asom through different routes in different historical period. The present Tai Ahoms of Asom belong to Indo-mongoloids racial group, who penetrated in its present habitat through the upper courses of river Irrawady of Myanmar in 12<sup>th</sup> century AD under the leadership of Tai Prince Sukapha of Great Tai Family of Southeast Asia, and established Ahom Kindom in present Asom

in 1228 AD at Kamjang and ruled till 1826 AD<sup>10</sup>. Traditionally, Tai food habit is quit simple, cooked without spices and used little oil, which is beneficial for both physical and mental health. Apart from using the rice as staple food, many beverages are also prepared through fermentation process using yeast and various plant materials as sub-ingredient collected from the forest wilderness. Such traditional rice varieties are essential for the preparation of typical Assamese food and beverage, which is inseparable part and parcel of their socio-cultural life. Rice beer is the most important beverage which is used frequently in religious rites and rituals practiced among *Ahom* caste.

Beverages are the drinks, which have stimulating and refreshing qualities, and it occupies an important position among the Tai Ahom. Generally beverages can be categorised as alcoholic and non alcoholic. The non-alcoholic beverages are stimulating and refreshing drinks consumed by most of the people and alcoholic drinks are generally brain depressing and are used by small groups of people specially the tribal peoples. They also play an important role in the socio-cultural life of tribal and other people of India specially the Ahom group of Asom. Almost all the tribal are fond of some alcoholic drinks or the other during merry making, ritual ceremonies, festivals, marriages and even in the death ceremonies. The Ahom people use their traditional rice beer during *Bihu* festivals as refreshing drink and also taken after hard labour. Their traditional rice beer is prepared by fermenting rice with the help of other ingredients.

### Methodology

During the survey, paddy varieties of different parts of Lakhimpur district were collected and for the determination of ethnic use in their socio-cultural life, oral and semi-structured questionnaire based interview with at least 15 local people were undertaken<sup>11,12</sup>. The mode of local dish preparation from different traditional rice varieties and preparation of local rice beer were observed and interviewed on the spot with other necessary plants material used as ingredients. The rice varieties used as food and beverage were collected from the field and cultivated in separate field for studying the morphological characters. Simultaneously, the botanical information of other plant group used for the preparation of beverage was gathered. Plants were identified with the help of standard Indian Flora and

deposited at Herbarium of Department of Botany, Rajiv Gandhi University for our future reference<sup>13</sup>. During field evaluation of each variety, grain to grain harvesting duration were noted and grouped into three classes, early variety (90-105 days), medium variety (105-120 days) and late variety (120-135 days). The average plant length of each variety was calculated by taking the mean length of five plants of each variety with the help of scale and was classified into following classes: dwarf variety (75-110 cm), medium variety (110-140 cm) and tall variety (140-180 cm). The seed characters were determined by taking the measurement of their length and width. The colour of the seed kernel, outer glume (OG), inner glume (IG) and apiculus (AP), endosperm colour (EC) and pericarp color (PC), awn characters and their length were determined. The annual yield per hectare was calculated out by weighting the rice grain of one square meter and multiplied it by 1000 (1 hectare = 1000 square meter). During the survey period, information regarding cooking and nutritional quality of each rice varieties was collected from the farmers. In order to determine the aroma of each varieties, the rice grain were cooked and characteristics aroma were noted.

## Results

The present ethnobotanical survey on local rice varieties of various Ahom dominant areas of Lakhimpur district of Asom revealed that the local farmers are rich repository of traditional rice germplasm. In all, 9 varieties of *Ahu* and 8 varieties of *Sali* rice were found. Cultivation duration and taxonomic profiles of each variety were examined and evaluated (Tables 1 & 2).

The grain-to-grain harvesting duration shows a great variation in maturation period among the varieties. The minimum and maximum duration taken for grain maturation and subsequent harvesting of *Senga* and *Ishwajoy* of *Ahu* rice varieties ranged from 90-115 days, whereas *Bora*, *Hatidota* and *Jahinga* of *Sali* rice varieties ranged from 90-135 days. Plants showed variation in their plant height, tiller per plant, spike-bearing tiller, inter node per culm and length and width of leaf. *Bengoongooti* variety was found tallest with a maximum height of 130 cm and the *Senga* variety was found to be shortest with a maximum height of upto 79 cm. *Senga* variety was found with maximum tillering ability with 12.6 tillers per plant, while *Bengoongooti* was found with lowest tillering ability of 6.7 tillers per plant. *Ishwaguni* variety was found with highest

Table 1—Taxonomic profile of traditional *Ahu* rice varieties and annual yield/ha

1	2	3	4	5	6	7	8	9	10	11	12
Tezpuria	95	86	9.2	7.80	4.2	8	Y	W	+	-	3.59
Saphila	95	89.3	10.2	10.0	3.8	7	Y	W	+	-	3.33
Koiamari	105	96	6.7	6.20	4.5	8	Br	W	+	-	3.01
Senga	90	79	12.6	9.89	4	9	Y	W	+	-	4.81
Ishwajoy	110	100	12	9.50	4.2	7	Y	LO	+	+	3.69
Unehpriya	100	112	7.6	6.67	4.2	9	Y	W	+	-	4.23
Kola ahu	90	105	8.66	7.89	4	7	Bl	LO	+	-	2.97
Issaguni	115	110	12.2	10.0	4.3	7	Y	W	+	-	3.49
Bengoonguti	105	130	6.7	5.22	3.9	8	Y	W	+	-	3.85

Table 2—Taxonomic profile of traditional *Sali* rice varieties and annual yield/ha

1	2	3	4	5	6	7	8	9	10	11	12
Jahinga	135	133	911.6	10.7	4.3	8.2	Y	W	+	-	6.08
Ampakhi	120	115	9.7	8.2	4.8	8	Y	W	+	-	7.5
Solpona	115	110	9.0	7.5	3.8	7	Y	W	+	-	5.9
Hatidotia	90	97.6	7.6	6	4	8.5	Y	W	+	+	3.8
Bora	90	101	8.2	5.8	3.2	6.5	Bl	Gr	+	-	4.4
Nania	95	92.5	10.3	8.7	3.5	7	Y	W	+	-	4.02
Kolajoha	100	122	8.4	7	4.2	8	Gr	Gr	+	-	4.8
Maguri	125	130	14.5	12.2	4.8	8.2	Y	W	+	+	7.4

Legends for Table 1 & 2: 1 = Variety; 2 = Duration in days; 3 = Mean height (cm); 4 = Tiller/plant; 5 = Spike bearing tiller; 6 = Internode/culm; 7 = Length of grain; 8 = Kernal colour; 9 = Glume colour; 10 = Hair; 11 = Awn; 12 = Annual yield/ha (in tone); Y = Yellow; Br = Brown; Bl = Black; W = white; LO = Light Orange; Gr = Grey. + - = Presence and absence

number of spike bearing tiller, while *Bengoogooti* was found with lowest number of spikes per tiller. There was no significant variation in length of internodes per culm among the *Ahu* varieties. Among the *Sali* rice varieties, *Jahinga* was found to be the tallest while *Nania* found to be the shortest with a total height of 133 cm and 92.5 cm, respectively. A variation was also observed in tillering ability among the *Sali* rice varieties, where *Maguri* showed maximum number of 14.5 tillers per plant while *Hatidotia* was found lowest with 7.6 tillers per plant. In terms of spike bearing ability and tiller characters, *Maguri* was found at the top with number of SBT up to 12, 2 SBT while *Hatidotia* was found lowest with 6 number of SBT. Unlike *Ahu* rice varieties, great variations were observed in the internodes per culm. *Maguri* was found with maximum value 4.8 internodes per culm, while *Bora* was found lowest with 3.2 internodes per culm.

There was a size variation of grains in each variety of *Ahu* and *Sali*. Among the *Ahu* varieties, the grains of *Senga* and *Unehpriya* varieties showed a maximum grain length of 9.0 mm, which is longest while *Saphila*, *Ishwajoy*, *Kola Ahu* and *Iswaguni* have the shortest grain length ranging up to 7 mm. Except the *Kola Ahu*, the kernel colour of all the varieties were found to be yellow, while the seed colour of *Kola ahu* were found to be black. Likewise, there was no variation in the glume colour. Among the *Ahu* varieties, awns were found only in *Ishwajoy*, while hairs were found in all varieties. Similar variations in grain morphology were found in *Sali* varieties, where seed of *Jahinga* and *Maguri* were found longest, with a maximum length of 8.2 mm, while the seed of *Bora* were found to be the shortest with a maximum length of 6.5 mm. Except *Kolajaha*, the kernal colour of all the varieties were found yellow and its glume colour were found distinct among the rest, where kernel and glume colours are black and gray, respectively. Surface hairs were found in all varieties. Awns were found only in *Hatidotia* and *Maguri*. It was observed that, the annual yield per ha of *Ahu* varieties ranged from 2.97 tones per ha to 4.81 tones per ha for *Koiamari* and *Unehpriya*, respectively (Table 1). *Sali* varieties with annual yield per ha ranged from 7.4–7.5 tones of *Jahinga* and *Kolajaha*, respectively (Table 2) were mostly cultivated by the local farmers of Tai Ahom ethnic group. The local farmers sold their products in the market at the highest rate due to its appealing aroma, highly nutritious with attractive grain size.

### Preparation techniques of Ahom beverage (rice beer)

The traditional *pitha* of Tai Ahom can be otherwise called cake, which is basically made of, powdered rice grain mixed with some wild plant materials. The traditional farmers of rural Ahom have been employing such dish preparation techniques since centuries as part of their culture, where leaves of few wild plants are used as additive ingredients which act as attracting agent of Yeast-*Saccharomyces cereviceae*. Among the plant material used with yeast are *Lygodium flaxuosum* Linn. (Fig. 5), *Leucas aspera* Spreng. (Fig. 6), *Cissampelos Pereira* Linn., *Scoparia dulcis* Linn. (Fig. 4), *Cinamomum glanduliferum* Meissn. and *Piper betle* Linn. (Fig. 3). The leaves of these plants are collected from the wilderness and dried in sunlight for 1-2 days. Sun dried leaves are ground to powder and mixed with the powder of rice grain in a vessel containing few ml of water. Here, the powder of previously prepared *pitha* commonly called *ghai pitha* is mixed with freshly prepared *pitha* as source of Yeast. The semi-solid *pitha* is mixed with required ingredients and rolled into plate-disc shaped. It is then wrapped with leaves of *Musa paradisiaca* Linn. and kept in air locked condition over fire heart. The fire heat is maintained at 90-180 cm. height for 4-5 days till dry. The disc shaped dried *pitha* (fermenting agent) containing yeast, rice powder and plant material is known as *Vekur pitha*, which is kept for future use. It is rough in texture and grey or dull white in appearance. Taboos are observed during preparation of *Vekur pitha* among the Tai Ahom, which they considered as scared.

The traditional local women prepare *pitha* confidentially in a small room free from dust, away from scent of acidic substances and human sight. Such taboos are in accordance with their age-old mythology. They are apprehensive of medicine being turn sour if taboos are not observed in proper manner.

### Process of rice beer fermentation

The main rice variety used by the Ahom is *Bora* rice belonging to *Sali* variety. The fermentation technique from *Bora* rice is known as *Sewa diya*, which in Tai language is known as *Lao fuk*. Firstly, the *Bora* rice is cooked and spread on plain plate, which is left open for about 1 hr. The cooled and dried cooked rice is then mixed with the fermenting agents (*vekur pitha*), which contains yeast (*Sacharomysis cereveceae*). The *vekur pitha* treated cooked rice is poured into a clay pot, commonly



Fig.1 Fermenting rice beer



Fig.2 Extraction of fermenting rice beer

Fig. 3 *Piper betle* Linn.Fig. 4 *Scoparia dulcis* Linn.Fig. 5 *Lygodium flaxuosum* Linn.Fig. 6 *Leucas aspera* Spreng.

known as *Kalah* and the pot is kept at dark place inside the corner of house/huts for 4-5 days in air locked condition (Fig. 1). After 4-5 days of fermentation, old woman of the family collect the concentrated alcoholic juice from *Kalah* through filtration process by using vessel with appropriate size which fit to the mouth of *Kalah* acting as lid or by blocking the mouth of *Kalah* by using rice straw to prevent exit of fermented semi-solid rice (Fig. 2). The fermented juice is highly aromatic, alcoholic, sweet and with property of hallucination, which is taken as energy booster during physical labour, and other important ceremonial occasion of family and the societies.

### Discussion and conclusion

It is concluded that the rural Tai Ahom of North Lakhimpur district of Asom are rich in indigenous knowledge system relating to cultivation of different local rice varieties in their respective localities. Rice apart from being the staple food of Ahom is used for the preparation of different varieties of traditional dishes such as rice cake, flacks, popped and puffed rice, etc. Such delicious home preparation are distributed and consumed among the folk during *Bihu* festivals, religious rites and rituals, and marriage ceremonies. It is also served to the guest at home as a mark of respect and symbol of grand hospitality. This implies that the *Sali* local rice varieties cultivated among the *Ahom* have deep rooted cultural wisdom since time immemorial and such associated biocultural knowledge has helped in cultivation and conservation of those landraces. The cultivation trial and field selection by the traditional farmers has resulted into an emergence of improved variety in present century of Tai Ahom of North Lakhimpur, some of which are found to be resistant to pest, diseases, and environmental stress. The indigenous rice farming system among the *Ahom* is a scientific, time tested, ecofriendly and sustainable. Their traditional ecological and environmental knowledge, evolved through different stages of trial and error, has resulted into rich repository of knowledge, which they use to apply the best out of many experimented farming technique in present generation, best suited to their local need. It is also recommended that these traditional farmers may be encouraged to continue their time tested system in their own locality using their existing traditional rice varieties as principal source of germplasm. It is also noticed that the plant

used as an ingredient in preparation of fermentation medicine are mostly found in wild and some of them were found to be rare species, which is difficult to locate from their locality. The juice of fermented rice is alcoholic in nature, which is considered as the best beverage, healthy, and energy booster, generally used during socio- religious ceremonies, which is vital part of Ahom culture. Biochemical investigation of their food and beverage items and plants ingredients could yield valuable nutraceutical agents, which can be commercialised. Modern biotechnological methods through cell line culture could yield new HYV varieties of pest and diseases resistant and environmental stress tolerant apart from improving aroma and nutrient contents. Such hybrid HYV could open up marketing scope and source of income generation for the local farmers.

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