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Millets of North East India - With Special Reference to Wine Making

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ABSTRACT

Millets belonging to poaceae family is often called as nutricereals due to their high nutritional value. Millet is believed to be a climate-resilient crop, which could help feed the world's ever-growing population. Realizing the potential of millets in boosting sustainability, the UN General Assembly recently proclaimed 2023 as the International Year of Millets in March 2021, to promote cultivation as a solution to climate and global food security challenges. Prior to the Green Revolution, millet was a popular crop in different parts of Northeast India. Though it was neglected but it was a part of people's food system. Among all the Northeastern states of India, Millet was used to make local wine. These drinks were used during ceremonies, occasions and celebrations. These drinks are considered as nutritious and of high caloric value. This paper highlights the traditional method in preparation of millet wine and its benefits.

Keywords: Millets, Millet beverages, Millet Wine, Madua Apong, Kodo Ko Jaanr, Kiad Krai, Themsing, Rakshi, Tongba.

INTRODUCTION

Millets, one of the earliest cultivated food crops, are a variety of small-seeded grains belonging to Poaceae family. They were previously known as coarse cereals and have now been rebranded as nutri-cereals.[1] Millets were traditionally consumed, but due to the push given to food security through Green Revolution in the 1960s, millets were less consumed and almost forgotten.[2] The UN General Assembly recently proclaimed 2023 as the International Year of Millets in March 2021, to promote cultivation as a solution to climate and global food security challenges.[2] In Northeast India different types of Millets are cultivated such as Finger millet/Ragi (*Eleusine coracana*), Pearl millet/Bajra (*Pennisetum glaucum*), Sorghum/Great Millet/Jowar (*Sorghum bicolor*), and small millets such as Foxtail millet/Kangani/Kakun (*Setariaitalica*), Little millet/Kutki (*Panicum sumatrense*), Kodo millet (*Paspalum scrobiculatum*), Proso millet/Cheena(*Panicum miliaceum*) and Barnyardmillet/Sawa/Sanwa/Jhangora(*Echinochloa esculenta*).[1,3] Millet grains are rich sources of nutrients like carbohydrates, protein, dietary fibre, and good-quality fat; minerals like calcium, potassium, magnesium, iron, manganese, zinc and B complex vitamins. Millets also contain various phytochemicals which exert therapeutic properties owing to their anti-inflammatory and anti-oxidative properties.[2] Apart from the grain, the straw is used as a fodder for the cattle.[4] *Ayurveda* explains millets in detail under *Dhanya Varga*. Millets have been given many synonyms

like *Kudhanya* (Inferior among cereals)[5], *Kshudra Dhanya* (small sized cereals)[6] and *Trina Dhanya* (grass derived cereals).[7] Since times immemorial the tribal people of North- east India have been consuming different forms of fermented alcoholic beverages.[8] In many tribal communities, these traditional alcoholic beverages play a significant role in their social and cultural practices. They are often consumed during rituals, festivals, and other special occasions, serving as a symbol of hospitality and camaraderie among community members. The most common beverage used is that which is prepared from cereals either from rice and millets. The fermentation process is typically carried out using natural yeast and bacteria present in the environment, resulting in unique flavors and aromas.[9] Despite their importance in tribal societies, the production and consumption of these alcoholic beverages have faced challenges in recent years due to changing lifestyles, urbanization, and government regulations. As a result, there is a growing concern about the preservation of traditional knowledge and practices associated with these beverages. Efforts are being made to revive and promote the production of traditional alcoholic beverages in North-East India, both for cultural preservation and economic development. By supporting local communities in their efforts to sustainably produce these beverages, we can help preserve their heritage and promote cultural diversity in the region.

Millets in North- east India and their traditional wine making:

Meghalaya -

In Meghalaya millet is an important crop that has been traditionally grown by the indigenous communities since a very long time. Krai, kre, chan, or misi is the name by which the people in the different parts of Khasi, Jaiñtia and Garo hills call millet.[10] Indications of this are the traditional festivals which are linked to millets. It is about a weeding song called Long Hai which had not been sung in the village of Syndai (located in War Jaintia) for the last 60 years. Linked with millet, once its cultivation was abandoned, the song was also not performed anymore.[11] Similar to Long Hai, the festival of Bom Krai (Millet threshing) was revived in Nongtraw.[11] In Nongtraw, one type of millet that came to be prized above all was called *raishan*. Raishan (*Digitaria cruciata var. escu-lenta*), the Khasi's minor millet, these grains are dull white in colour, more or less like Italian millet grains.[4] The 2018 participatory mapping exercise conducted by NESFAS(North East Slow Food & Agrobiodiversity Society) in Khapmaw and Rasong (villages in Mawkynrew Block, East Khasi Hills) reports four millet species, viz., *Digitaria sanguinalis* (commonly known as crabgrass, finger grass and fonio), *Eleusine coracana* (commonly known as finger millet), *Setaria italica* (commonly known as foxtail millet) and *Coix lacryma-jobi* (commonly known as job's tears) being grown by the local community. These included the three varieties of finger millet. Garo Hills reported the additional millet species of *Pennisetum glaucum* (commonly known as pearl millet).[11] Traditionally, millet is cooked in the same way as rice. In many cases, it is often mixed with rice, the preferred proportion being one part of millet and two parts of rice. Millet was also being used to brew local liquor.[11]

Ra-chan/ Kiad-krai

Local millet grains (*Pennisetum typhoides*) 4–5 kg, are soaked in spring water and cooked for an hour in a metallic vessel on wood fire. During cooking, it is repeatedly stirred with a spoon to avoid burning or over cooking. The cooked millet is taken out, cooled, and dried by spreading on a wooden board or in a round bamboo basket. Natural yeast (thiat) cake is finely crushed by hand and mixed with the cooked millet. 1–2 thiat cakes are needed per kg of millet. The millet-yeast mixture is blended to uniformity by hand and transferred to a cone-shaped basket made of bamboo and left overnight. The next day, a yellowish

white liquid starts dripping. The liquid can be extracted as a beer, which is locally known as sadhiar. The fermenting millet (jyndem) is transferred from the shang into metallic drums and left to ferment (for 4–5 days in summer; 6–8 days in winter), depending on the surrounding temperature. A special set of apparatus (shet-kiad) is used to distill kiad from the fermented millet (jyndem). The shet-kiad is a crude distillation assembly consisting of a metallic boiler (kum), and a condenser and metal tubing assembly (khlieh-bhot). Fermented jyndem is mixed with spring water and transferred to the kum and boiled over a wood fire. The vapor receptacle, condenser, and tubing assembly (khlieh-bhot) is attached to the kum and the joint is made airtight by wrapping with a cloth (khats) or clay (kew byrtha) to prevent the leakage of vapor. The vapor arising from boiling jyndem passes through the metal tubing that is routed through cold water tanks, and the condensed vapours, in the form of liquid alcohol kiad, is collected in an appropriate container. The residual mass left after distillation is called ja-jyndem, which is used as fodder for cattle and pigs.[12]

Arunachal Pradesh -

Arunachal Pradesh is home to various type of millet such as Foxtail Millet, Finger Millet, Pearl Millet, Proso Millet and Kodo Millet.[3]

Madua Apong

A wine made from Marwa (finger millet) in which the grain is roasted to get a rich taste and colour. This is often described as one of the best wines in the world. Madua apong is made after harvesting of millets from the fields, it is dried in the sun or in some circumstances above a traditional kitchen hearth. Then, in a sizable wok, it is dry-roasted until it turns a dark shade of black while being constantly stirred to prevent burning. A bamboo mat (Epuh) is used to spread the roasted millet out to cool. The local yeast made by grinding rice (siye) is blended with the cooled millets when it has cooled, and then the mixture is transferred to an airtight container to stat the fermentation process. After 15-20 days or so the fermented stock gives off a strong aroma to show it is ready. The container is kept in a cool, dry location during this period. After that, the mixture is distilled to extract Madua apong. A good quality Madua apong, may take over 6 months to ferment. The more the ferment, better the quality. A good quality Madua is golden yellow in colour, sweet in taste and has good alcoholic flavour.[13, 14]

Themsing

The grains of finger millet or barley are cooked and taken out. These are spread on the bamboo mat or polythene sheet on the floor. Small amount of starter 'pham' (yeast tablet made of indigenous rice paste and leaves of *Solanum khasianum*) is mixed thoroughly with the cooked grains. Zarsi is smeared inside the special wooden container for preparation of themsing (zom) before keeping the cooked grains in itnto avoid development of foul smell. Then whole mixture is kept in the zom (special wooden container for preparation of themsing) The paste is covered with leaves of Zola (*Brassiopsis* sp.) or banana (Zola is more preferred), over which a thin layer of wooden ash is spread. Then, whole container is made air tight. Small pipe is fitted at the bottom of the container and packed with yak ghee. The container is kept undisturbed for 1-3 years. Themsing looks like black tea and has a good aroma. Finger millet gives low yield but high quality of themsing, whereas when barley is used alone or incombination with finger millet gives high yield of themsing.[15]

Rakshi

Finger millets are cooked till becomes soft and spread on bamboo mat (charang). Yeast tablets (pham) are added to the lukewarm seeds covered with plastic sheet and kept for 2-3 days to begin fermentation. After fermentation, water is added to the fermented stock and a large vessel

containing fermented material is kept on fire. A small metallic container is kept inside the large vessel above a triplet stand to collect the distillate. A wide vessel containing cold water is kept above the large vessel as condenser whose water is changed at frequent intervals to keep the water continuously cool. The drink prepared in this method has good alcoholic aroma and a very effective ethanol taste.[14, 15]

Sikkim -

An organic certified state and millets form an ideal crop to adopt in the state profile with no synthetic inputs and provide superior nutrition. With only small millets (mainly finger millet) and buckwheat being grown in the state, there is a scope to increase area under organic agriculture.[3]

Kodo ka Jannr/ Chyang

Kodo ka jannr is a traditional mild alcoholic beverage prepared from the seeds of finger millets (*Eleusine coracana*) in the Eastern Himalayas.[16] During the preparation of kodo ka janar, dry seeds of finger millet are cleaned, washed, and cooked for about 30 min in an open cooker, excess water is drained off, and the cooked seeds are spread on a mat made up of bamboo, locally called mandra, for cooling. After this, 2% of a mixed starter culture of dry, powdered, marcha[17] is sprinkled over cooked seeds, mixed thoroughly and packed into a bamboo basket lined with fresh fern (*Thelypterise rubescens*), locally called thadre unioon, or banana leaves. It is covered with sack cloth and kept for 2–4 days at room temperature for saccharification. During saccharification a sweet aroma is emitted, and the saccharified mass of finger millet is transferred into an earthen pot or into a specially made bamboo basket called a septu, and made air-tight and fermented for 3–4 days during summer (5–7 days in winter) at room temperature. About 200–500 g of the fermented mass is put into a vessel called a toongbaa and lukewarm water is added up to the rim. After about 10–15 min, the milky white extract of jaanr can be sip through a narrow bamboo straw called a pipsing, which has a hole in the side near the bottom to avoid the passing of grits. Water can be added 2–3 times after drinking the extract.[17, 18] Good quality jannr has a sweet taste with a mild alcoholic flavor.[8]

Tongba

The ingredient for its preparation is pearl millet (Pennisetum glaucum) or fingermillet (*Eleusine coracana*). It is cooked and combined with traditionally cultured khesung/ murcha/ phab which is a microbial colony or starter culture and served in glass-shaped wooden or bamboo vessels after pouring hot water over the fermented grains and sipped through a special bamboo straw with a perforated bottom that also functions as a filter.[19] The resulting whitish liquor is thick and astringent, with a pleasant, mild flavour and distinctive taste. The vessel is refilled three to four times with hot water until the grains lose their potency (flavour, astringency, and taste) and the alcohol is exhausted. The term "tongba" actually means the bamboo vessel that holds the fermented millet beverage, which is traditionally referred to as 'mandokpenaa thee'.[19] Traditionally, it is stored or aged for about six months, when the fermentation culture matures and flavours intensify and become mellower.[20]

DISCUSSION

In North-East India, millets are mainly used in preparation of many varieties of indigenous food item and also in preparation of special wine for traditional used such as ceremonies, occasions and celebrations. In Ayurveda, the process of fermentation of rice, *kodrava* etc is known as *Kanjika* or *Dhanyamla*. It is nourishing, light and stimulates digestive capacity. It is useful in anorexia, disorders due to *vata dosha* and for *Asthapana basti*. *Dhanyamla* is hot in potency. It mitigates vitiated *Vata Dosha* and *Kapha Dosha*.[21, 22] Therefore, *Dhanyamla* is effectively used for *Vataja*, *Kaphaja* or *Vata Kapha Samsarjana Janya* diseases. The traditional wine making by the

different tribes of North- east India helps enhancing its nutritional quality and bio-availability of millet grains.[23] It was noted that various communities in Northeast India follow nearly identical fermentation protocols, yet they utilize different plant species in the preparation of the starter culture, which are believed to contribute to the intoxicating properties of the beverages.[24] Traditionally in wine making , preparation of starter culture which is the prime source of yeast is needed for fermentation. Usually rice of local variety along with number of plants having medicinal properties is added to make the starter cake. The starter cakes are the source of amylolytic enzymes, starch degrading moulds, lactic acid bacteria and alcohol producing yeasts[25] and the phytochemical components of these plant species either alone and/or in combination have remarkable therapeutic potential.[26] Microorganisms present in these starter cultures are also known to be responsible for suppressing pathogenic population, carbohydrate metabolism, protein metabolism, etc.[27] Additionally, microorganisms associated with these foods are also known for the production of several enzymes, flavoring substances, vitamins, etc., which are used in the fermentation industry for commercial purposes.[28] The advantages of using millet as a base for starter culture compared to rice is that millet is gluten-free, making it a good option for people with gluten sensitivities or celiac disease. Additionally, millet has a higher protein content than rice, which can help improve the nutritional benefits of the beverage. Also Millet has a higher starch content compared to rice, which can lead to a more efficient fermentation process for the starter culture and it has a distinct nutty flavor which can enhance the overall taste of the traditional beverage.[29, 30] Fermentation process not only preserves foods, it also improves digestibility by breaking down proteins within foods and enables the production of organic acids, nutritional enrichment, reduction of endogenous toxins, and reduction in the duration of cooking.[31, 32]It is enriched in nutrients such as vitamins, amino acids, and fatty acids.[33] Fermentation produces beneficial enzymes, B-vitamins, Omega-3 fatty acids, and various strains of probiotics.[34] These drinks prepared from millet grains are mainly taken to provide refreshment and to generate energy in the body to tolerate very low temperature of the hilly areas due to adverse climatic conditions. These drinks are mainly consumed after hard labour as a stress relieving agent.[35] These beverages is also mainly consume for prevention of cold.[36] The quality of beverages is judged by its taste (sweetness), smell, and strength. Generally, it is known for low alcohol concentration.[37, 38]In some parts of Northeast India, a fermented finger millet called Kodo ko jaanr or chhang due to its high calorie is giving to ailing persons and post- natal women to regain the strength. It was also observed in kodo ko jaanr that there is an increase in calcium, magnesium, manganese, iron and phosphorous.[16,39] It is seen that Themsing is not only enjoy as beverages but also given in curing certain disease like waist and muscles pain and added as an ingredient in formulation of certain local medicines. These medicines formulated with local beverages (rakshi and lohpani) and given in the delivery, stomach pain, dysentery and chhatpa (a syndrome affecting people of cooler region when they go to hotter places).[15] A studies has been done on beverages Raksi and it has shown that it has large peaks of highly bioactive coumarin compound auraptene, shows having antioxidant and antibiotic agent. Thus studies on bioactivities of metabolites of raksi, and biosynthesis of those components, together helped evaluate the health claims of raksi which are used for high altitude sickness.[40] The metabolomic study regarding the beverages tongba revealed that it contains the collagen-producing and moisture-retaining compound ethyl-α-EG which could heal damages occurred to the skin and other connective

tissues due to exposure to high altitude. Inflammation and high altitude are closely associated, as body muscle inflammation, joint pains, peripheral oedema (swelling of hands, feet, and face), etc. are common high-altitude problems.[41]

CONCLUSION

Though Millet cultivation has been part of the people's culture and traditions since a long time in North- east India but after the green revolution was initiated, the production of millet decreased. Millet grain has become a neglected crop.[10,11] Thus, the traditional wine making prepared from millet grain has also declined in North east India. The millet based fermented products is nutrients rich, has probiotic properties and improved digestibility.[42] It is well known and studied that consumption of traditional alcoholic beverages in small amounts is good for the health but frequent intake of alcohol badly affects the body and leads to health problems.[43] In conclusion, the health benefits of millet based fermented products are still being explored, and there is a need for more research in this area. By shedding light on the potential risks and benefits of these products, we can better understand their role in a healthy diet and make informed choices about their consumption.

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