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Mini Review

Country Liquors of Similipal Biosphere Reserve, Odisha, India: A Staple Fermented Food of the Tribal Communities

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Abstract

The Similipal biosphere reserve (SBR) is a home to number of tribal communities who prepare fermented foods, beverages such as rice wine, palm wine and many more for their consumption. These fermented beverages are rich in a number of microorganisms and bioactive compounds. This short note aims to capture and document the traditional beverages of the tribal of SBR, and their preparation procedure along with storing and preservation. This traditional information will be helpful for the industries in the development of medicinal fermented drinks.

Keywords: *Fermentation; Traditional Beverage; Rice Wine; Palm Wine; Similipal Biosphere Reserve*

Introduction

The fermentation process is one of the oldest practice in the world. Indigenous fermented foods have been prepared and consumed by the tribal people, for thousands of years around the world, and these are strongly linked to their culture and traditions. The effect of the fermentation process on the nutritional value of various foods is variable, although the evidence for improvement is substantial e.g. natural fermentation of cereal foods can lead to decreased carbohydrate levels [1]. The fermentation process may enrich and improve food through flavor, aroma, and textural changes, and contribute to its long-term preservation by producing organic acids. It may also provide nutritional enrichment, decrease endogenous toxins and decrease the duration of cooking, and thereby, energy input requirements. Indigenous food fermentation is one of the oldest biotechnology processes in which microorganisms play an essential role in production and preservation [1]. During traditional fermentation processes, locally available ingredients, which may be of plant or animal origin, are converted into edible products by the physiological activities of microorganisms [2].

Fermented beverages are particularly popular worldwide. In the modern era, fermented traditional beverages are a prime subject for scientific research aimed at understanding the role of microbes and plant components in the fermentation of food materials to produce nutritional beverages. Traditional alcoholic beverages play an important role in spiritual and cultural life all over the world. Many types of traditional alcoholic beverages are produced and consumed by various, diverse communities worldwide [3]. Most traditional alcoholic beverages rely on a starter or fermenter made by natural products, such as various plant components, cereal powders or rice, to mediate the fermentation process. These types of traditional alcoholic beverages are mostly produced and used by tribal people, where they play a crucial role [3]. In this context, this short review aims to capture and document the traditional beverages of the tribal communities of Similipal Biosphere Reserve (SBR), Odisha, India.

Similipal Biosphere Reserve (SBR)

SBR is located between 21°10′ to 22°12′ N latitude and 85°58′ to 86°42′ E longitude, and between 300 m to 1180 m above sea level. The biosphere reserve has a unique assemblage of a number of ecosystems, such as mountains, forests, grasslands and wetlands that congregate into a contiguous landscape with a range of diverse vegetation types along with habitats of tribal communities [4-9]. The extensive and densely forested hilly tracts of SBR are the home of many tribal communities, such as *Bathudi, Bhumija, Gonda, Ho, Kolha, Mahali, Munda, Pauri Bhuiyan Santhal*, and *Saunti*, including two primitive groups, *Hill-Kharia* and *Mankirdia* [10-15]. There are about 61 villages inside the core and buffer zone and approximately 1,200 villages in the transitional zone, having a total population of approximately 4.5 lakh (i.e. 10^5), of which the abovementioned tribes constitute 73.44 % of the total population of Similipal [9,13,16].

These poor tribal communities practice aboriginal culture, customs and rituals and have no or minimal acquired skills. Their main occupation is food gathering, hunting, collecting forest products and traditional farming or agriculture. Agriculture is performed on limited land and in limited time. Hence, they do not obtain sufficient food varieties for their livelihood. During agricultural lean agricultural periods, rice (*Oryza sativa*), vegetables and some wild pulses are grown. Apart from these food sources, most months of the year, they go into the forest and collect wild edible food to sustain their lives. They collect fruits, leaves, tubers, roots and seeds. The above scenario indicates that they mostly use the rice as a staple food along with wild edible foods and some local traditional beverages. Among the beverages, rice wine and palm wine are very common among the tribal communities of SBR.

Beverages of SBR

Rice Wine

The tribal communities of SBR boil rice but is not consumed as boiled rice due to the lack of a sufficient annual supply. Instead, they convert the rice into rice wine (Figure 1.3 and 1.4). This fermented rice is known locally as *Handia*. The tribal communities consume it throughout the year as a main meal along with other wild foods, such as tubers and vegetables. They also sell it in the weekly market to obtain some petty cash for the purchase of other goods (Figure 1.1 and 1.5). In SBR, the *Handia* is very important in the day-to-day life of the tribal communities. The manufacture of *Handia* relies on microbes, which predominant throughout the fermentation in association with their functional activities. They use some fermenter (Figure 1.2) and specific plant components to produce an enjoyable and effective *Handia*. The fermenter is locally known as "*Bakhar*" also starter "Ranu" (Figure 1.2). It is the mixture of some select locally available medicinal plant parts and rice powder (1:1 w/w)[3]. This mixture is combined with water to prepare a dough. The small rounded tablets are prepared and dried under direct sunlight. The dried *Ranu* tablets (starter) are retained for the fermentation of boiled rice in making rice wine. The plant parts used to make the starter for rice fermentation by the tribal communities of SBR are listed in Table 1. The starter is comprised of molds, which produce the amylases that degrade the starch into dextrins and sugars, and yeasts that convert these sugars to alcohol (Figure 1B) [17-19].

The detailed procedure of preparation of rice wine is presented in Figure 2. The two essential stages involved in rice wine production are the saccharification of starch in an aerobic solid-state fermentation and a subsequent alcoholic fermentation. Starters for rice wine fermentation generally include mycelial fungi, yeasts and bacteria but the mycelial fungi and yeasts have more importance as they are crucial for both fermentation stages. During the solid-state fermentation, the molds induce saccharification of the rice starch to form sugars that are fermented into alcohol by the yeasts. The quality of the final product depends mainly on the activities of these microorganisms. The major molds in traditional starters are *Amylomyces rouxii, Rhizopus* spp. and *Mucor* spp., and the yeasts generally present are *Saccharomyces cerevisiae, Hansenula* spp., *Endomycopsis filbuligera* and *Candida* spp. The molds produce α-amylase and amyloglucosidase (also called glucoamylase) that hydrolyze starch to mainly, glucose but dextrins and maltose are also formed [19-21].

Figure 1: *1) Selling of roots of C. periara and starter; 2) Ranu tables (starter); 3) Demonstration of traditional wine making; 4) Handia (rice wine) is consumed by the tribal communities of SBR; 5) Selling of Handia (rice wine) in the weekly haat by the tribal communities of SBR for petty cash.*

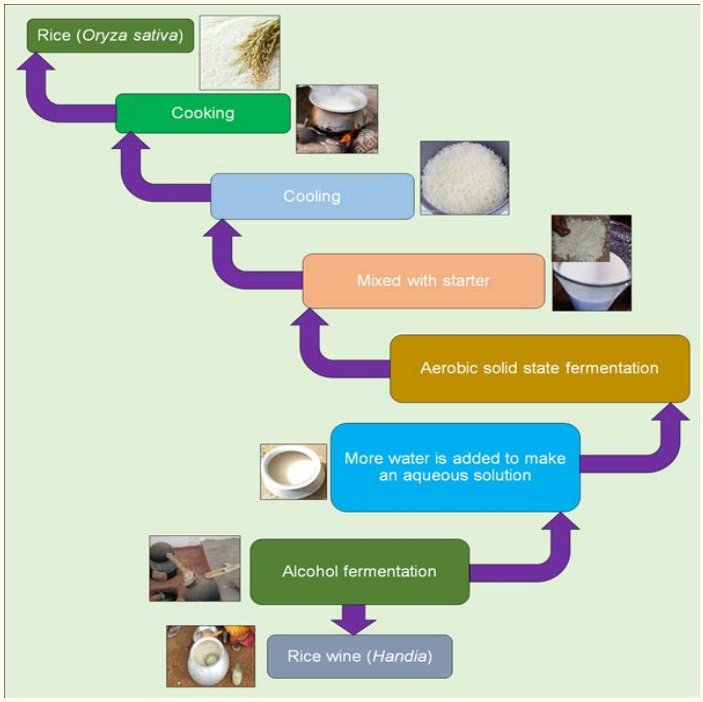

Figure 2: *Preparation of rice wine in Similipal biosphere reserve (Odisha, India) by the tribal communities.*

Palm Wine

In almost all part of SBR, palm trees grow. The sap obtained from the stem of the palm tree (*Phoenix sylvestris*; local name: *Khajuri*) is fermented to produce an alcoholic beverage called palm wine or *Taadi* [14]. Palm wine is either consumed fresh as it is brought down from the tree or as a fermented beverage. It is a light brown, sweet liquid containing 10 - 18% w/w sugar, which after fermentation results in the formation of a product containing as much as 9% v/v ethanol and sour in taste [2]. The palm wine fermentation is always an alcoholic-lactic-acetic acid one, involving lactic acid bacteria (LAB) (*Lactobacillus* spp.), yeast (*Saccharomyces* spp.) and acetic acid bacteria (*Acetobacter* spp.), as well as other bacterial species, such as *Leuconostoc* sp. and *Zymomonas* sp., may be present and all are early bacterial inhabitants of the palm sap. *S. cerevisiae* carries out the alcohol fermentation. The main ingredient of the fresh sap is sucrose (12 - 15% weight basis). There is negligible reducing sugar, although glucose, fructose, maltose and raffinose are present. In addition to sugar, the sap also contains 0.23% protein, 0.02% fat, mineral matter and ascorbic acid (5.7 mg/100 ml). During the first 24 hours of fermentation, more than half of the total sugars are fermented. Sucrose is always rapidly degraded. Acetic and lactic acids are produced along with ethanol during fermentation. After approximately 36 - 48 hours, the concentration of ethanol reaches a maximum of 5.0 - 5.28% v/v; the concentration of ethanol soon starts to decrease if the palm wine is stored for a long period. The original palm sap is approximately pH 7.2 and after 8 hours it has decreased to pH 5.5 - 5.8 [22,23].

Role of Microbes in Making Traditional Wine

Fungi (molds) and bacteria are the prime microbes involved in generating traditional wine. Traditional wine typically has an alcohol content of 18 - 25% v/v. During the production of traditional wine, microbes convert the starch into simple sugars, prior to alcohol conversion [24]. The alcohol level in traditional wine is inversely proportional to the sugar content of the base. The quality, aroma and taste of the traditional wine are influenced by the volatile hydrocarbon composition and production of secondary metabolites by the action of microbes during fermentation. Microbes also decrease the weight of the base/cereals/rice by the fermentation process. In 2011, Rhee and his co-worker showed the presence of LAB and the role of LAB in rice wine production [25,26].

Conclusion

Traditional wine is the prime food for the tribal communities of SBR, Odisha, India. They mostly use *Handia* (rice wine) and *Taadi* (palm wine) obtained from rice (*O. sativa*) and stem sap of *Phoenix sylvestris*, respectively. A natural fermenter or starter, locally known as "*Ranu*" in SBR is used, which comprises powdered rice and plant parts of select, locally available medicinal plants. The starter provides beneficial microbes, which play an essential role in traditional wine making. They convert the starch to sugars, which degrades to produce alcohol. These traditional wines have a crucial socio-economic importance among the tribal communities of SBR.

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