

A Cheap, Consumable and Healthy Fermented Drink from Rice - A Review

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Abstract: Rice wine is an alcoholic beverage made from rice. Unlike wine, which is made by fermentation of naturally sweet grapes and other fruits, rice "wine" results from the fermentation of rice starch converted to sugars. Rice wine uses the different amyolytic process. The amyolytic process is used in the brewing of alcohol from grains. Since grains contain starches but little to no simple sugars, the sugar needed to produce alcohol is derived from starch via the amyolytic process. Alcoholic beverages distilled from rice were exclusive to East and Southeast Asian countries.

Key words: Rice wine • Amyolytic process • Fermentation

INTRODUCTION

Rice wine is a part of daily life throughout Asia and has been for centuries. The wine is mentioned as early as China's Shang Dynasty in inscriptions carved into bone and tortoise shell that date between the 16th and 11th centuries B.C. Today it is still made at home and is considered a traditional staple of any family or community festivity [1]. Rice brew typically has higher alcohol content (18-25%) than wine (10-20%), which in turn has higher alcohol content than beer (3-8%). Rice wine is produced by amyolytic process, which is the conversion of starch into sugar by the action of acids or enzymes like amylase.

Traditional Process of Making Rice Wine Pre-Treatment of Raw Materials

Water: For thousands of years, the quality of water used in brewing has been considered as a major factor in determining rice wines quality. The hardness of brewing water had better be in the range of 2-6 and pH is around 7. The water for rice wine brewing needs to be colorless, tasteless and odorless, containing traces of iron, calcium and other minerals. Water with low iron content is ideal for rice wine brewing [1].

Polishing of Rice: The main purpose of polishing is to remove protein, lipids and minerals contained more than necessary in the germ and surface parts of the rice grain, which are considered undesirable to rice wines brewing in so much quantity. In general, rice used for rice wine

brewing is polished to remove about 10% of its weight. Crude fat and ash contents decrease most rapidly, while the protein content decreases gradually [2].

Rice Wine Brewing Technology

Washing and Steeping of Rice: The next step in the rice wine brewing process is to wash the polished rice. Usually the rice should be washed repeatedly until the drained water become clear. During washing, the grains absorb water up to 9 to 17 % of their weights. Washed rice grains are steeped in water immediately. After this procedure the grains absorb water to about 25 to 30 % of their weights, which promotes penetration of heat into the grains during steaming [3].

The factors affecting the steeping of rice include hardness of water, temperature of the steeping water and the varieties of the rice grains. Rice-steeping times vary from 1 day to 20 days. In traditional processes, rice-steeping time lasts 13-20 days. The purpose of steeping rice for such a long time is for the rice not only to absorb enough water, but also to obtain acidified rice-steeping liquid derived from lactic souring of rice-steeping water [3].

After the acidified liquid being collected, the acidified liquid is evaporated to remove the extra water. The concentrated liquid is used to mix with the cooled steamed rice as acidifying liquid for mash. Because the pH of the steeping liquid is lower, after mixing with the steamed rice, the pH of the mash is accordingly reduced to a suitable range favorable for yeast growth [3].

Steaming of Rice: The purpose of steaming of rice is to gelatinize the starch contained in rice kernel by the effect of water vapor penetrated into it. During the course of steaming, the crystal structure of rice starch is destroyed, which favors the growth of mycelial mold. The gelatinized starch is easily hydrolyzed by amylase or glucoamylase. The common reason for rice steaming is to sterilize the raw materials [4].

Cooling of the Steamed Rice: There are two basic operating methods for cooling the steamed rice. Using the first method, the rice is spread evenly on a bamboo mat to be cooled. Using a wooden spade, the rice will be turned over, breaking up large clumps by whacking them with the spade's flat blade. By using the second method, the steamed rice is scooped into a bamboo basket or a wooden tub with a screen mounted beneath the bottom. Cold water is poured into the rice layer and the drained water is collected and poured into the rice again. It is important to keep the rice cooled evenly [3, 4].

Seed Mash Used for Rice Wine Brewing: The seed mash (or called starter) for rice wine brewing is called "Jiu Mu", meaning "Mother of rice wine" and is partly analogous to yeast inoculum in beer brewing. The seed mashes used for rice wine brewing can be classified into three types according to the preparation processes, "Traditional seed mash", "Pure Cultured Seed Mash" and Active Instant Dried Yeast (AIDY) [4].

Sacchrification and Fermentation: The *Rhizopus spp.* produces organic acids such as lactic acid and fumaric acid which lower down the pH of the mash. This favors the growth of yeasts and discourages the growth of unwanted microorganisms, yeasts ferment reducing sugars to ethanol. When the sweet liquid has reached to a height of about four fifths of the seed mash, fresh water can be added to the fermenting mash. Fresh air is incorporated to nourish the growing yeasts and molds, carbon dioxide is expelled and the mash from the vat's center is mixed with the cooler portions from the sides and bottom. When all the mash has been turned, its surface is smoothed and recovered. Yeasts multiply rapidly further after stirring. Stirring is repeated three times more and keeping the temperature of the seed mash between 26-30°C [3, 4].

Sacchrification and fermentation of the seed mash lasts about 7 days and then the young seed mash is

poured into jars with narrow neck for secondary fermentation. Much ethanol is produced after 30- 60 days. Usually the ethanol content of the seed mash can reached up to 15%.The seed mash can also be drunk after being pressed and this product is called new rice wine. With continued incubation the product becomes more liquid [4].

Post-Fermentation Treatments

Separation of Spent Grains by Squeezing: Since the rice wine mash is very dense and mushy, it is difficult to obtain the liquid part (rice wine) by filtration or sedimentation. Combination of filtration and squeezing provides effective approach for separating the liquid part from the mash. The plate and frame filter-press is widely used in rice wine breweries [4]. The rice wine mash is pumped into the frames and the liquid part is firstly filtered out through filter cloths. At this stage, new rice wine can be obtained by filtration. By increasing the pressure gradually, the remaining liquid in the cakes is squeezed out and the cake is re fermented for manufacturing distilled spirits, or used for feed [4].

Clarification: The slightly turbid rice wine is pumped to the fining tanks for clarification. A kind of natural colorant called caramel is added to the rice wine which is allowed to stand for 2-3 day's for clarification until the clarified rice wine tastes smooth and sweet. The caramel deepens the color of rice wine [4].

Pasteurization: The fresh rice wine is pasteurized at 85°C to 90°C, at this temperature; the rice wine is kept for about 5- 10 minutes, so as to kill the vegetative cells of microorganisms. Enzymes are also denatured and proteins are coagulated. Heat treatment also has the function of facilitating maturation of rice wine [4].

Aging and Maturation: The pasteurized rice wine is stored in narrow necked jars. The jars are tightly sealed and are piled up one above another and placed outside. Most rice wine starts its fermentation during the colder months, undergoes most of its transformation during the warmer ones and is finally consumed about one year later. Thus the rice wine experiences a rise and fall of temperature. During storage, rice wine is gradually matured, deepens color and diminishes harsh taste. After storage, rice wine is blended and is diluted to the appropriate alcohol content and sugar content. Finally, the rice wine is filtered and packed [4].

Packaging: Traditionally, the pasteurized rice wine when it is still hot is packaged in sterilized ceramic jars which are considered good for the further maturation of rice wine. The mouth of the jar is immediately covered with sterilized lotus leaf and other sealing materials and tied with string. The sealed mouth is further sealed with specially treated mud mound that is cylindrically shaped, so as to prevent contaminating microorganism from getting into the jars [5].

In conclusion, rice wine consists about 80% of water. It gives 134 kcals/100g. It contains 0.5g/100g of protein and 5g/100g of carbohydrate. It is rich in minerals like calcium, magnesium, iron, phosphorus, potassium, sodium, zinc, copper and selenium. It is healthier when consumed in small amounts. Rice wine is proved to have health benefits similar to that of wine made from grapes.

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