Production and Biochemical Analysis of Bamboo Rice Wine

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Abstract **- An innovative type of alcoholic beverage is developed using Bamboo rice, which is fermented using *Saccharomyces cerevisiae* and *Aspergillus oryzae,* which convert starch into sugar and finally sugar into alcohol. The cooked bamboo rice, along with yeast, culture, and sugar, is allowed to ferment for 20 days in an airtight glass bottle. The filtered final product is analysed for alcohol content, acidity, pH and total soluble solids (TSS). The product constituted 10% alcohol, 5.3°brix TSS, 4.18 pH, and total acidity of 0.014g/L. It also contains 111.5 mg/ml of phytosterol and 23.91 mg/ml of flavonoids, making it beneficial for reducing blood cholesterol levels. Since the bamboo rice is low in glycemic index, it can also be used as an alternative to other rice beverages, and further innovative value-added products can be developed.**

***Index Terms*— Bamboo rice, fermentation, functional food, saccharification, sensory analysis.**

I. INTRODUCTION

India being one of the largest tropical countries, has regions where bamboo rice is naturally available. However, the rice is produced only when the bamboo shoots complete their lifecycle. Studies indicate that bamboo rice is packed with carbohydrates, proteins, amino acids, fibre, vitamins, and minerals. Bamboo rice has a low glycemic index compared to other varieties of rice, which makes it a healthier option. The rice has low or no fat and is rich in vitamin B. Bamboo rice has a sweet, earthy taste, but is special because it retains its crunchy characteristics even when cooked.

Fermentation, one of the oldest transformation methods used to preserve and enhance flavour, aroma and nutritive values of food, is widely used for the production of various beverages. Rice wine is widely consumed during social and cultural events, and is part of offerings for a good harvest, traditional medicine and postnatal recovery in most Asian countries. The fermentation of sugar derived from rice starch results in rice wine. The enzymes that turn carbohydrates into sugar come from microbes.

The key step in separating wine from juice involves the use of yeast. Fermentation occurring in the absence of oxygen relies on yeast to convert carbohydrates into alcohol and carbon dioxide. *Saccharomyces cerevisiae* is a commonly used yeast to prepare wine and has proven to be the best choice due to its consistent and ferocious fermentation ability, tolerance for relatively high alcohol concentrations, and sulphur dioxide tolerance. To develop alcoholic beverages from bamboo rice, *Aspergillus oryzae*, a filamentous mould and *Saccharomyces cerevisiae* are used.

II. MATERIALS AND METHODS

Bamboo rice used for wine preparation was procured from Future Foods, Fortune Corporation Company, Mumbai. Other ingredients used were yeast, *Aspergillus oryzae* culture, sugar, and drinking water. The product development and analysis were conducted at Padmashree Institute of Management and Sciences, Bangalore. The process for the preparation of the bamboo rice wine was standardised.

250g of bamboo rice was soaked for 4 hours. The soaked rice was cooked with water in the ratio 1:6. Later, the cooked rice was cooled to room temperature. The quantity of cooked rice obtained was 960g. 5g of yeast was allowed to dissolve in 100 mL of lukewarm water. The dissolved yeast with 125g of sugar and 1g of *Aspergillus oryzae* culture was added to cooked rice and mixed thoroughly. The mixture was then transferred to a sterile glass jar and allowed to ferment in a cool and dark place for 10 days.

After 10 days, the mixture was filtered using a sterile strainer and the filtrate was kept for further fermentation for another 10 days. Then the completely

fermented wine was pasteurised at 60°C for 15 minutes and stored in an air-tight glass bottle.

Determination of alcohol content.

The alcohol content of the developed bamboo rice wine was determined using the pycnometer method according to the FSSAI manual of methods for analysis of alcoholic beverages. A clean and dry pycnometer was taken, and it was weighed empty along with the stopper (W). The sample was filled to the brim and the stopper was inserted gently. The liquid spilled out was wiped using water-absorbing filter paper and weighed (W1). Then, the sample was removed, and pycnometer was washed thoroughly with distilled water. The pycnometer was filled with distilled water in the same manner as described above and weighed (W2).

Specific gravity = (W1 – W) / (W2 – W)

The corresponding alcohol percentage by volume was determined from the table showing Specific gravity versus Alcohol per cent.

Determination of Acidity.

The acidity of the product was determined using the titration method. A 10mL sample with 2 drops of phenolphthalein as an indicator was titrated against 0.1N NaOH until the colourless sample turned a pale red colour. The acidity of the sample was calculated using the following formula.

Total acidity = (Volume of NaOH × 7.5) / Volume of sample taken

Determination of pH and Total Soluble Solids (TSS).

The pH and TSS of the product were measured using a digital pH meter and refractometer.

Determination of bioactive compounds and vitamins.

The bioactive compounds and vitamin content of the product were determined using the HPLC method.

III. RESULTS AND DISCUSSIONS

To assess the quality of bamboo rice wine, a comprehensive sensory evaluation was conducted. The sensory evaluation demonstrated that the bamboo rice wine has a pleasant aroma with a slightly sweet, woody and fruity taste, appealing to the panelists. The overall acceptability was rated positively, indicating the potential for consumer satisfaction.

The developed Bamboo rice wine was found to contain alcohol content 10% v/v, acidity 0.014 g/L, pH 4.28, and TSS 5.3ºBrix.

The biochemical and vitamin composition of the product is shown in Table 1.

Table 1: Biochemical estimation of the sample

Compound	Quantity
Phytosterol mg/ml	111.5 ± 0.92
Flavonoids mg/ml	23.91 ± 1.50
Thiamine (B1) μg/ml	0.0055 ± 0
Riboflavin (B2)	Negligible
Niacin (B3) μg/ml	0.0024 ± 0.0001
Pyridoxine (B6)	Negligible
Folic acid (B9)	Negligible
Pantothenic acid (B5) μg/ml	0.0013 ± 0
Cobalamin (B12) μg/ml	0.052 ± 0.0005

The developed bamboo rice wine majorly contained 111.5 mg/ml of phytosterol and 23.91 mg/ml of flavonoids. It also contained Vitamin B1, B3, B5 and B12 in small amounts. The analysed results shows that the bamboo rice wine has functional food properties which can be used as an antioxidant, anti-inflammatory, and to reduce blood cholesterol levels.

IV. CONCLUSION

The unique sensory characteristics of bamboo rice wine are attributed to the unique aroma compounds. Its distinct aroma profile, smooth taste, and cultural significance makes it an appealing option for consumers looking for both novel and traditional alcoholic beverages. The product had a moderate alcohol content, making it suitable for a wide range of consumers. According to the findings of this study, bamboo rice wine has the potential to be marketed as an innovative alcoholic beverage. The analysis results shows that the properties of the product are very close to the standard wine available in the market. The bioactive compounds present in it further underscores its health benefits. In conclusion, this research provides valuable insights into bamboo rice wine production, offering a foundation for future studies and potential commercialisation.

V. REFERENCES

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