

ORIGINAL ARTICLE

Bakhar-Handia Fermentation: General Analysis and a Correlation between Traditional Claims and Scientific Evidences

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ABSTRACT

Handia, an indigenous alcoholic-fermented beverage is prepared by mixing boiled rice with traditional fermenting inoculums Bakhar and widely consumed by the ethnic tribes in eastern region of India. In the field study of collecting the information on Handia, a list of traditional claims in preparing and drinking came into contact. This paper made an attempt to analyze the general composition and justify the traditional claims in regarding processing and consumption. According to the general analysis the drink is an acidic-alcoholic beverage. Its ethanol content varies from 6.5 to 10% according to the source of Bakhar. The data obtained in the present study justify that (i) Bakhar from varying native origin in preparing Handia yield different degree of intoxicant, (ii) Handia made in earthen pot is more intoxicating (iii) Handia in winter season takes 5 to 6 days where as in summer takes only 2.5 to 3 days, and (iv) Over cooked rice cannot yield Handia.

KEY WORDS: Handia, Bakhar, Traditional claims, Scientific evidences

INTRODUCTION

Handia, an indigenous alcoholic-fermented beverage is prepared from parboiled rice by the ethnic tribes Santal, Sabar, Bhumij, Paroja, Kondh, kolh, Mundari, Juang etc spread among eastern region specially in Orissa and West Bengal. It is made by mixing traditional fermenting culture- Bakhar with boiled rice and allowing them to ferment in a earthen pot (*Handia*) for 2-3 days with mouth slightly open. Bakhar holds the source of several microorganism prepared by mixing different plant ingredient with rice powder, water and giving batter to the shape of small round balls [1], sometime Bakhar powder from previous batches are also added in batter [2]. Then balls are then wrapped in leaves, allowed to ferment and dry continuously in shade for 3 days. The available information on the Bakhar and the plants used for preparation of Bakhar suggest a link between ethno botany and microbiology [3-7]. Traditional fermenting culture Bakhar, not only used in Handia fermentation but also some time used as inoculum to palm wine and varieties of traditionally fermented beverages in parallel with natural fermentation.

After fermentation, the fermented slurry is filtered and weak cream-colored product is taken as drink. Handia is a staple beverage consumed by the people of mentioned ethnic group both men and women of all ages. It is used in day to day life both as a food and an intoxicant [2]. This practice of processing and drinking of Handia is the integral part of mentioned ethnic tribes. The consumption pattern increases on special occasions, like new born, weddings, worshipping god etc. There were several claims in regarding Handia processing. Traditional manufacturer and consumer claims (i) Bakhar from varying native origin yield different degree of intoxicant, (ii) Handia made in earthen pot is more intoxicating [2], (iii) Handia in winter season takes 5 to six days where as in summer takes only 2.5 to 3 days, (iv). Over cooked rice cannot yield Handia.

In the present study, the fermented alcoholic drink Handia was investigated. An attempt was also made correlate the claims regarding its processing.

MATERIAL AND METHODS**Reagents**

All chemicals used in this experiment were of highest purity and obtained from Sigma (Bangalore, India) and Merck (Mumbai, India).

Samples collection of traditionally prepared Handia and seed culture Bakhar

A few sample of Bakhar and fresh traditionally prepared handia was collected from a local village of the indigenous ethnic group of Radhanagar, Panchkhuri, Jhargram in Paschim Medinipur in India. The precise method for making *Handia* was determined during fieldwork in the mentioned place. The samples were stored at 4° centigrade for future use.

Rice grain

Rice (*Oryza sativa* var. Indica) was purchased from the local market of Haldia, India.

Production of Handia in Laboratory**Boiling of Rice**

The process for boiling of rice gelatinizes the starch in it. During boiling, the crystal structure of rice starch is destroyed and moisture content is increased. That makes the flavorful condition for microbial growth. Boiling pots, containing 1 kg of rice were boiled. After boiling the rice, excess water was drained off. Steamed rice was immediately taken out from the pot and continued for further processing.

Cooling of the boiled Rice

According traditional process, after the excess water is drained off, steamed rice is evenly spread on a bamboo mat or on the mat prepared from dates palm leaves to make it cool. Then rice is turned over, breaking up large clumps using a wooden spade, by whacking them with the spade's flat blade. In experimental set up the rice was spread over a plastic sheet and air flow is given by the fan.

Addition of Bakhar

Generally 1kg rice is boiled and steamed rice is cooled in previous mentioned process. 3 small ball of Bakhar around 3 gram of weight is grinded and mixed well in the traditional process. Traditional manufacturer generally uses earthen pot for fermentation. Some Bakhar powder is spread inside the earthen pot –Handi (Fig1). Fermentation is carried out for two and half to three days. This ration was followed in the laboratory set also. The fermenting pot used in the laboratory was of stainless steel and earth clay (earthen pot) and plastic and glass beaker.

Saccharification and Fermentation:

The traditional process allows the Bakhar mixed rice to be kept in earthen pot in room temperature for two and half to three days with lead slightly open for saccharification and fermentation. In experimental process pots were kept at 15, 20, 25, 30, 35, 40°c for varying time interval.

Separation of Spent Grains by Squeezing

Once fermentation completes, the fermented mash become dense and mushy with cream white in color and characteristic odor. The traditional process uses cloth called gamcha for filtering the liquid. A little amount of water (150 ml) was mixed during the separation of fermented liquid from the fermented mass as mentioned by the traditional manufacturer. In the laboratory, Handia was centrifuged at 3000 r.p.m for 5 min, and filtered through filter paper (no. 101).

General Analysis of Handia and study on traditional claims

All three samples were centrifuged at 3000 r.p.m for 5 min, filtered through filter paper (no. 101) and analyzed by standard methods. Acidity was measured titrating 10 ml of sample with 0.1 M NaOH and indicated as the volume of 0.1 M NaOH (ml) needed for neutralization [8]. Reducing sugars and total sugar were quantified as described previously [9]. Quantity of Protein in both the samples is estimated by the method of Lowry *et al.* [10] using serum albumin as standard protein. Ethanol content was measured using standard A.O.A.C methods [11]. Study was conducted to justify the traditional claims on ethanol yield using varying source of Bakhar, fermenting pot. Time required completing fermentation in regarding environment temperature was also studied. Excess boiled rice was prepared and inoculated with Bakhar to verify the traditional claims of no ethanol fermentation in excess boiled rice.

RESULTS AND DISCUSSION**Analysis of Handia**

Handia collected from three native places were off-white slurry and was drunk with filtration by cloths. The result shows a difference in its composition from the three native sources (Table 1). Ethanol content in of laboratory prepared fermented drink from different source of Bakhar varies significantly. For all the cases ethanol production in earthen pot results higher alcohol content as compared to stainless steel and plastic container (Fig 2). Using Bakhar from Jhargram as a culture and study the effect of fermentation temperature on the time required to complete ethanol fermentation results a sharp increase in completion of fermentation in regards to $9.5 \pm 3\%$ ethanol production (fig 3). Excess boiled rice which became slurry did not show the fermentation in all the cases. Only the steamed rice with Bengali eaten quality shows the best results.

Table 1. Characteristics of samples from three native sources

Characteristic	From Jhargram	From Panchkhuri	From Radhanagar
Fermentation Time (day)	70 hour	70 hour	70 hour
Sample collection Date	03.03.2012	05.03.2012	06.03.2012
Ethanol (% v/v)	9.5333 ± 0.1332	7.5767 ± 0.1079	6.5 ± 0.2
pH	3.4167 ± 0.1041	3.4233 ± 0.0929	3.41 ± 0.0854
Acidity (ml)	5.0167 ± 0.0764	5.125 ± 0.0354	5.0733 ± 0.0929
Reducing sugar (mg/ml)	6.5 ± 0.1	7.1 ± 0.1414	7.3467 ± 0.0503
Total sugar (mg/ml)	51.1733 ± 1.7135	58.2667 ± 1.0214	60.9167 ± 0.7654
Protein content (mg/ml)	0.63 ± 0.0141	0.5667 ± 0.0115	0.54 ± 0.01

Values are the mean of three replicates \pm SD.



Fig1: 1a- Showing Traditional fermenting culture Bakhar, 1b: Making Bakhar Powder from ball, 1c: Cooling of boiled rice, 1d & e :Mixing of Bakhar with rice, 1f: Pouring Bakhar inside earthen pot (Handi), 1 g: Placing Bakhar mixed rice inside the pot, 1h: Keeping in a dry place for fermentation

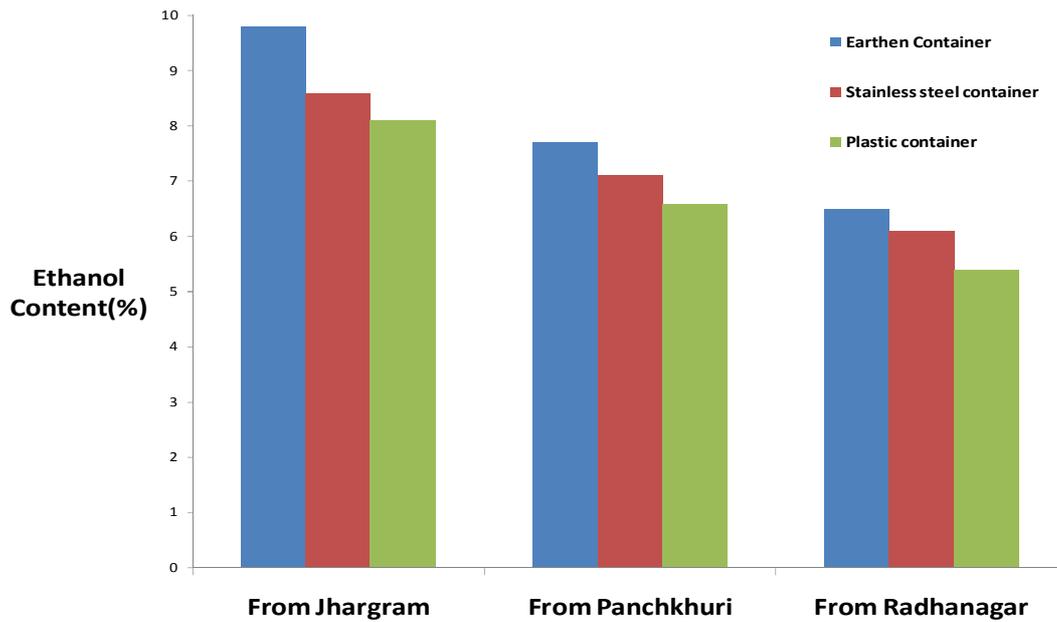


Fig 2: Ethanol production varying Bakhar Source and using container of different material

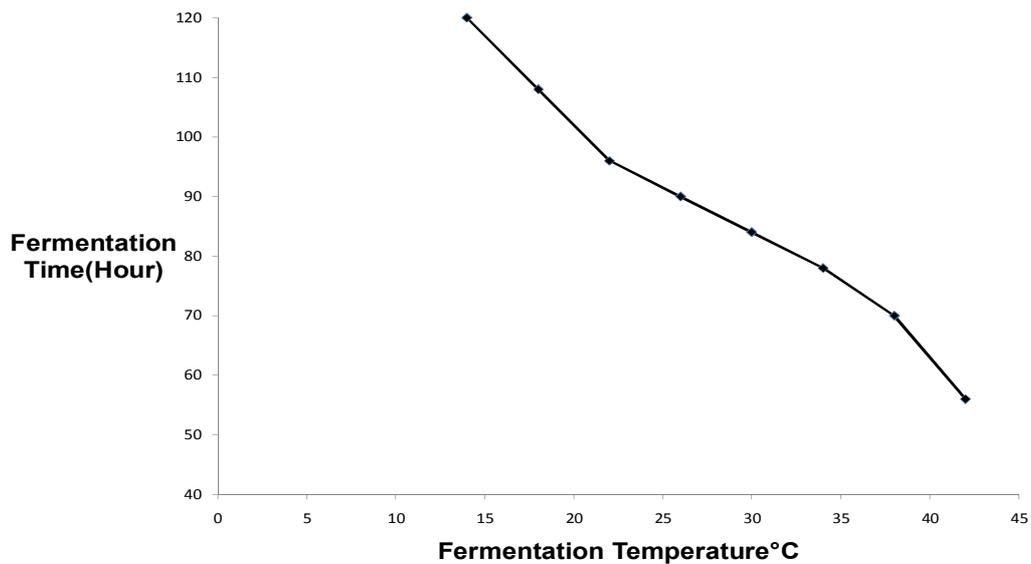


Fig3:Effect of fermentation temperature on the time required to complete ethanol fermentation

According to the results from the experiments, correlations can be easily done. The claim of Bakhar from varying native origin yield different degree of intoxicant is thought to be true as alcohol % varies according the source of Bakhar. The results from all the case shows that Handia made in earthen pot are more intoxicating. The claim of reduction in fermentation time in summer season and increase in winter season is also true as result say at 42 °C the fermentation takes only 56 hour and at 14°C it takes around 120 hour. Excess boiled rice which became slurry did not show the sign of alcoholic fermentation also proves the claims of over cooked rice cannot yield Handia.

CONCLUSION

Experimental results justified the traditional claims in regarding Bakhar- Handia fermentation. But the reason behind the claims can only be exposed after exploring the manufacturing of Bakhar

from different areas (different herbs used in it which is region and ethnic group specific), microorganism associated with it and fermentation dynamics. It is quite clear from the experiment (as the results of general analysis are quite same) that although the principle microorganism are constant for all the cases but the supporting microorganism associate with the microbial consortium of Bakhar may varies. Besides, the other therapeutic claims of Handia like relief from liver cancer, liver disorder and constipation, treating urinary infections and prevention of cancer and cardiovascular disease should come to the attention of the researcher to explore the reality and potentiality of this traditional rice fermented beverage.

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