Traditional fermented foods of Lahaul and Spiti area of Himachal Pradesh

S S Kanwar, M K Gupta, Chhaya Katoch, Rajeev Kumar & Promila Kanwar*
Departments of Microbiology and *Home Science Extension Education,
CSK Himachal Pradesh Krishi Vishvavidyalaya, Palampur 176062, Himachal Pradesh
Email: promilak@hillagric.ernet.in
sskanwar@hillagric.ernet.in

Received 24 July 2006; revised 10 November 2006

Some traditional fermented foods consumed by people of Lahaul and Spiti area of Himachal Pradesh were explored microbiologically and documented. Chilra, Jhan chang, Babru, Bhaturu and Seera were the main food products made from cereals. These products were prepared by using traditional / natural inoculum, i.e. khameer / malera or phab as a starter culture. All the fermented foods were acidic in nature. Microbiological examination of these food products and their source of inoculum revealed the dominance of yeasts mainly from genera Saccharomyces, Debaromyces and Schizosaccharomyces. The bacteria were mainly from the genera lactobacillus, Lactococcus, and Leuconostoc.

Key words: Traditional foods, Fermentation, Cereals, Indigenous knowledge, Fermented foods, Lahaul, Spiti, Himachal Pradesh

A food is considered fermented when one or more of its constituents are acted upon by microorganisms to produce a considerably altered final product acceptable for human use1. Fermented foods contribute to about one-third of the diet over worldwide, and cereals are the important substrate for these products in all parts of the world2. In tribal areas of Himachal Pradesh, several indigenous fermented foods are consumed and traditionally prepared from a variety of substrates, viz. cereals, pulses, vegetables, etc. without much awareness about the role or involvement of microorganisms. Inhabitants of Lahaul and Spiti area of Himachal Pradesh as a part of their routine diet extensively consume some of these indigenous products having cereals as the main substrate. These products are primarily restricted to households and are prepared according to the traditional methods using simple equipments, under natural conditions with defined/ undefined microflora from the staple and surroundings. Therefore, it was essential to document these products and to explore the specific microflora associated with these products to evaluate their quality and consistency.

Methodology

Lahaul and Spiti district of Himachal Pradesh was selected as the main study area for traditional fermented foods. Indigenous knowledge of these products was documented using Participatory Rural Appraisal (PRA) Technique, which consisted of discussion with key informants and focused group discussion with the groups chosen randomly from different residential areas of Lahaul and Spiti3. The study was conducted in Hinsa, Chimrit, Tamlu, Khanjar, Karpat and Jundla villages of Lahaul, and Hansa and Lari villages of Spiti.

Samples of each product along with their source of inoculum were collected from the above-mentioned areas in sterilized containers/vials for processing. pH of each sample before fermentation and after fermentation was determined by using Cyberscan digital pH meter. To study the microbial diversity, collected samples of each product were processed on selective media, viz. Potato dextrose agar for yeasts and molds; MRS agar for Lactobacillus; Acetobacter isolation agar for Acetobacter, and Nutrient agar for other general type of bacteria. The colonies of each type were selected and purified by culturing them on their respective selective media and maintained at 4°C in refrigerator. Each purified yeast isolate was then identified on the basis of morphological and biochemical characteristics4,5. The bacterial isolates were identified on the basis of morphological and
biochemical characteristics. Each identified isolate was then stocked on its respective soft agar in small screw-capped vial.

Results and discussion

Traditional fermented food products documented from Lahaul and Spiti area of Himachal Pradesh (Table 1) are mainly prepared from cereals. Some of them, viz. Chilra and Bhaturu are frequently consumed and prepared by using natural, source of inoculum viz. Khameer / malera which is prepared by the principle of inoculum enrichment by natural selection as commonly seen in sour dough process. This inoculum is generally prepared on the basis of requirement at the home level and cannot be stored for longer duration as is observed in case of commercially available inoculum like phab, used in the preparation of Jhan chang, a product mainly prepared in winter months by maintaining the temperature artificially. However, Babru and Seera are not inoculated with any prepared inoculum and are achieved only through the microorganisms present as staple and surroundings. Seasonal variation in the production of these documented fermented foods was also noticed. Since the ambient temperature in winter season is very low (up to -15°C), that's why most of the products are reported to be prepared in the summer season, when the temperature is in the mesophillic range. These observations are in concurrence with the earlier observations reported for other indigenous fermented foods of India. Chilra is the most preferred product followed by Bhaturu and Jhanchang. However, Babru and Seera are reported to be prepared occasionally / rarely. Chilra is preferred due to its easy digestibility, better taste & flavour and nutritional benefits, whereas Jhan chang is preferred due to its alcoholic taste and flavour.

People of the area consider it a very nutritional stuff especially in winter months. All these reasons for preferences are based on people’s opinion and not on the basis of any scientific analytical data.

Food samples procured from the study area were examined for their initial pH (pH before fermentation), which was in the range of 5.8 to 6.4, and final pH (pH after fermentation), which was in the range of 2.9 to 3.6. Reduction in pH during natural fermentation of indigenous food products is a well established phenomena. Not only that, even the appropriate starters has been shown to reduce the pH, and thereby increase titrable acidity and overall acceptability of the product. The low pH of the product ensures longer shelf life and discourages the growth of undesirable bacterial contaminants. Microbiological examination of these fermented products as well as their source of inoculum revealed the dominance of yeasts mainly from genera Saccharomyces, Debaryomyces and Schizosaccharomyces (Table 2). However, bacteria were primarily from genera Lactobacillus, Leuconostoc and Lactococcus (Table 3).

Two isolates observed in the present study could not be identified due to unusual pattern of biochemical characteristics. As evident from the results, lactic acid bacteria and yeasts were the predominating microorganisms in these fermented foods, because they can survive and tolerate acid conditions very well and are mainly responsible for acid and gas production. The reduction in final pH values of these fermented products is also a reflection of growth of lactic acid bacteria and thereby production of organic acid(s), which impart them an edge to compete with other contaminants. Another important feature of these bacteria is their ability to produce secondary metabolites, which effect the
<table>
<thead>
<tr>
<th>Product</th>
<th>Chilra</th>
<th>Jhan chang</th>
<th>Bhaturu</th>
<th>Babru</th>
<th>Seera</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw material used</td>
<td>Buck wheat (Fig. 1) flour and wheat flour</td>
<td>Barley grains</td>
<td>Wheat flour</td>
<td>Rice flour</td>
<td>Wheat grains</td>
</tr>
<tr>
<td>Source of inoculum</td>
<td>Khameer/ Malera</td>
<td>Phab</td>
<td>Khameer/ Malera</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Nature of product</td>
<td>Flat spongy pan cake</td>
<td>Halwa like preparation</td>
<td>Flat deep fried leavened chapatti</td>
<td>Flat spongy pan cake</td>
<td>Halwa like preparation</td>
</tr>
<tr>
<td>Methodology</td>
<td>Raw material used is cultivated/purchased. Buckwheat flour and wheat flour are mixed (4:1) into a semi-solid paste (Fig. 2). <em>Khameer</em> is added. Mixture is fermented at 25-30°C for 8-10 hrs. It becomes double in quantity with the presence of gas. It is made into flattened cakes with oil (Fig. 3).</td>
<td>Raw material is cultivated. Barley grains are washed and ground into a paste. Cooked for 2 hrs in an open vessel or for 15-30 min in a pressure cooker. Cooled, <em>phab</em> is added (one granule for 1-2k barley grains). Mixed and wrapped in woolen cloth. Fermented at 25-30°C for 2-3 days.</td>
<td>Raw material is cultivated/ purchased. Wheat flour and water is mixed along with inoculum and is made into dough. Fermented at 25-30°C for 7-8 hrs or overnight. Small chapatti (about 1cm thick) is made. Kept for 15-20 min. Deep-fry it.</td>
<td>Raw material is cultivated. Rice flour and water (2:1) are mixed and made into semi solid paste. Salt or spices are added for taste. Kept for fermentation at 25-30°C for 3-4 hrs. Cooked as flat pancake with oil.</td>
<td>Raw material is cultivated/purchased. Wheat grains are soaked in water for 3-4 days. Excess water is drained off and fresh one is added on each day. Swollen grains are grounded into a paste. Liquid white part is separated from seex coats. It is kept in a vessel for 3-6 hrs. Excess water is drained off. Smooth solid part is collected and sun dried for 10-15 day. It is broken into small pieces and soaked in water for 1-2 hr. It is made into a halwa like preparation.</td>
</tr>
<tr>
<td>Consumption time/pattern</td>
<td>Breakfast/staple food</td>
<td>Snack food</td>
<td>Snack food</td>
<td>Breakfast/ Snack food</td>
<td>Sweet dish</td>
</tr>
<tr>
<td>Variation in production</td>
<td>Regularly prepared and consumed by both gender as a part of their diet. Consumption is less during winter as compared to summer due to low temperature and longer fermentation duration (about 2-3 days).</td>
<td>Prepared and consumed more during winter season.</td>
<td>Occasionally prepared.</td>
<td>Prepared and consumed during summer due to availability of raw material.</td>
<td>Rarely prepared due to long fermentation period and availability of less sunlight.</td>
</tr>
</tbody>
</table>

*Khameer / Malera*: A starter culture or inoculum prepared by natural fermentation of wheat flour dough. It is used in various food preparations as a starter culture.
growth of pathogenic and spoilage bacteria and thereby help in extending the shelf life of these products. However, yeast flora contributes to pleasant flavour whereas presence of *Saccharomyces cerevisiae* provides an additive advantage in further improving the digestibility, amylolytic and nutritive value of food products.

References