EVALUATION OF MICROBIOLOGICAL QUALITY OF INDIGENOUS DAHI FROM EASTERN NEPAL

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INTRODUCTION

Fermentation has been regarded as the oldest food biotechnological process used to prolong the shelf life of milk by converting it into different products¹. Of them, dahi is one of the most popular traditional fermented milk products of the Himalayas ². It is obtained from pasteurized or boiled milk by souring with natural microflora or by harmless lactics or other bacterial culture³,⁴. Dahi is highly nutritious and more digestible than milk⁵ and recognized as healthy food product. Nutritionally, it contains higher amount of vitamins, minerals, whey proteins and bioactive lipid components but lower amount of lactose than milk⁶. The therapeutic properties of dahi is well known fact and has been extensively documented by Lalaye et al.⁷; Yadav et al.⁸; Arvind et al.⁹; Abdel-Salam¹⁰; Gandhi and Natrajan¹¹; Bhat and Bhat¹²; Rahaman et al.¹³; Bhattarai¹⁶; Bhattarai and Das⁴ and Bhattarai and Timilsina¹⁶. Owing to its chemical, microbiological and nutritional components, it is preferred as a source of probiotic⁶. Most importantly and since time immemorial, it has been used in curing gastrointestinal disorders like constipation, diarrhea, dysentery, etc.¹⁵,¹⁶,¹¹,⁴,⁶. The microorganisms in dahi fermentation include mixed strains of lactic acid bacteria and lactose fermenting yeasts¹⁷,¹⁸,⁴. Since the use of standard culture and method is not practiced while making dahi¹⁹, the quality of dahi may varies with the type of starter culture used ²⁰ and manufacturing techniques by different manufacturers ⁴. The important factors associated with low quality dahi production are the use of poor quality milk and unhygienic practices during preparation, handling, storage and transportation. In addition, loose packing further deteriorates keeping quality of dahi²¹,²² which consequently results in growth of unwanted microorganisms. Many pathogenic microorganisms were isolated from traditionally fermented dairy products of different parts of the world. These organisms are S. aureus, B. cereus, Klebsiella and coliforms²³,²⁴,²⁵. In the light of the above stated fact, the present study has been undertaken to evaluate the microbiological quality of indigenous dahi available in eastern Nepal.

MATERIAL AND METHODS

Collection of Samples: A total of 39 indigenous dahi samples were collected from sixteen districts of eastern Nepal during September-November 2012. The samples were collected in sterile screw capped test tubes and kept cool in ice-box until taken to the laboratory where they were kept at <4°C for further use.

Isolation and enumeration of microbes: The determination of microbial counts was done according to APHA²⁶.

Abstract

The present study was undertaken to evaluate the microbiological quality of indigenous dahi from eastern Nepal. A total of 39 indigenous dahi samples were collected from sixteen districts of eastern Nepal and analyzed. Results revealed the mean yeasts and mould count to be 20.5×10⁴±7503, coliform count 65±42, S. aureus 197±65 and total viable bacterial count 227×10⁶±17250 cfu/g. Total viable bacteria and yeasts and moulds were present in all samples examined. Coliforms were present in 90% and S. aureus were present in 63% of samples examined whereas salmonella species were not detected in any of the samples under study.

Keywords: Indigenous dahi, evaluation, microbial count, food safety, Nepal.
The present study. Ghosh et al., STCJ 2015;2(1):23-26

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The counts of different organisms are shown in Table 1. Results presented in Table 1 revealed that the total yeast and mold count ranged from $0.5 \times 10^3$ to $35 \times 10^3$ cfu/g, with mean count of $20.5 \times 10^4 \pm 7503$. Likewise, coliform count ranged from $0.5 \times 10^1$ to $0.27 \times 10^3$ cfu/g, with mean count of $65 \pm 42$. The salmonella organism was not detected in all samples collected from all districts under study whereas S. aureus was in the range of 53 to 315 cfu/g, with mean count of $197 \pm 65$. The total viable bacteria count ranged from $225 \times 10^6$ to $228 \times 10^6$ cfu/g, with mean count of $227 \times 10^6 \pm 17250$ in the present study.

**Table 1: Counts of different organisms**

<table>
<thead>
<tr>
<th>Yeast and Moulds</th>
<th>Coliforms</th>
<th>S. aureus</th>
<th>TVC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum*</td>
<td>$0.5 \times 10^3$</td>
<td>$0.5 \times 10^1$</td>
<td>53</td>
</tr>
<tr>
<td>Maximum*</td>
<td>$35 \times 10^3$</td>
<td>$0.27 \times 10^3$</td>
<td>315</td>
</tr>
<tr>
<td>Mean</td>
<td>$20.5 \times 10^4$</td>
<td>65</td>
<td>197</td>
</tr>
<tr>
<td>SD</td>
<td>7503</td>
<td>42</td>
<td>65</td>
</tr>
</tbody>
</table>

*The counts are mean of triplicate of thirty nine samples.

The mean and SD values are mean of all thirty nine samples.

**RESULTS**

The counts of different organisms are shown in Table 1. Results presented in Table 1 revealed that the total yeast and mold count ranged from $0.5 \times 10^3$ to $35 \times 10^3$ cfu/g, with mean count of $20.5 \times 10^4 \pm 7503$. Likewise, coliform count ranged from $0.5 \times 10^1$ to $0.27 \times 10^3$ cfu/g, with mean count of $65 \pm 42$. The salmonella organism was not detected in all samples collected from all districts under study whereas S. aureus was in the range of 53 to 315 cfu/g, with mean count of $197 \pm 65$. The total viable bacteria count ranged from $225 \times 10^6$ to $228 \times 10^6$ cfu/g, with mean count of $227 \times 10^6 \pm 17250$ in the present study.

**DISCUSSION**

**Yeasts and moulds count:** Yeasts and moulds were present in all samples examined. Nearly similar results were previously reported by Lore et al.24, Al-Otaibi et al.27, Sun et al.28, Dey et al.29. Lower results were reported by Fleet and Mian10 and El-Malt et al.31. However, somewhat higher results were recorded in similar studies 32-40, 41-44. The present result is above the standard set by BIS for yeasts and molds of not greater than 10 cfu/g. Traditional practices and unhygienic conditions might have resulted higher values in present study. Ghosh et al.45 in their study reported that the higher counts of yeasts and moulds in dahi above the standard might be because these organisms can grow at a low pH and in low water activity (a_w) created by high sugar concentration. Abdalla and Hussain44 and Dey et al.29 focused on poor processing conditions and/or uncontrolled fermentation for contamination with yeasts and moulds. According to Abdel All and Dardir42 and El-Malt et al.31, the presence of yeasts and molds indicates poor sanitary conditions during preparation, packaging or transportation.

**Coliform bacteria count:** The present result is above the standard set by BIS for coliforms of not greater than 10 cfu/g. Coliforms were present in 90% of samples examined in present study. Despite heating milk for longer periods in traditional methods of dahi making in Nepal, such higher coliform values might be due to post processing contamination. Nearly similar results were reported in similar studies 24, 27. However higher results were found in other similar studies 43, 33, 25, 42. Abdel All and Dardir42 stated that coliforms count might be a consequence of the low level of hygiene maintained during processing. This includes the handlers, quality of water used and the utensils. El-Malt et al.31 reported coliforms as an indication of post processing contamination.

**Salmonella sp.:** The present result did not detect any salmonella species. Similar results were recorded in similar studies 23, 46, 47, 42, 43. This might be due to growth of other micro-organisms which suppressed the growth of salmonella species.

**S. aureus count:** S. aureus in this study were present in 63% of samples examined. Nearly similar results were reported in similar studies 47 but higher results reported in other studies 42, 31. According to El-Malt et al.31, presence of S. aureus indicates contamination from food handlers through hand or arm lesions caused by S. aureus or by coughing and sneezing which is common during respiratory infections or in symptomatic carriers that come in contact with food. As reported by Abdel All and Dardir42, the presence of staphylococci in high count is a potential health hazard if toxin producing strains are present.

**Total viable bacteria count (TVC):** The mean TVC in this study was $227 \times 10^6 \pm 17250$ cfu/g. Abdalla and Hussain44 reported similar values of TVC ($33 \times 10^6$ to $295 \times 10^6$ cfu/mL) whereas Dey et al.29 reported lower values ($7 \times 10^3$ to $8 \times 10^5$) in their studies. The possibility for such variations might be due to the use of undefined wild starter culture in improper ratio and amount. It also contains heterogeneous mixture of lactic acid bacteria; as a result TVC in dahi samples varies 29.

**CONCLUSION**

The initial high levels of contamination with bacteria, yeasts and moulds are undesirable and it has resulted in dahi of inferior quality. Presences of these organisms are critical for the safety of fermented milk. Minimizing contamination of milk is therefore recommended for controlling pathogen levels in dahi. Measures should be taken to interrupt the transmission of pathogens to dahi at the household level. This could be achieved by applying Good Manufacturing Practices (GMP), Good Hygienic Practices (GHP) and educating food handlers particularly mothers.

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