Scientific Study on Indigenous Technology of Dahi Making of Eastern Nepal

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Abstract

Dahi is the traditional fermented milk product indigenous to Nepal having its history dating back to ancient times. The preparation method is unique with steps like saans marne, naasto banne and uses special close necked wooden vessel carved out of wood called theki for fermentation. Caramelization during heating and duration of fermentation affects color, appearance and form of dahi. The best flavor comes from dahi prepared in daar theki. Heat treatment affects microstructure, texture and rheology of dahi. A good dahi should possess firm body, consistent quality with equal ration of sweetness and sourness. Dahi is indispensable item in Nepalese religious and cultural occasions which is nutritionally and therapeutically superior to milk. Storage life of dahi can be extended by a semi-continuous mode.

Keywords: Dahi; Traditional knowledge; Method of preparation; Sensory quality; Nepal

Introduction

Nepal is a country of diverse culture, religion and ethnicity. The country is divided into three main physiographic regions namely Mountain, Hill and Plains or Terai. Different ethnic communities living in hills and mountains are Brahmin, Chhetri, Newar, Limbu, Rai, Gurung, Sherpa, Bhot, Tamang, Magar, Damai, Kami, Sharki and others. Dhimal, Tharu, Satar, Rajbansi and other ethnic groups are indigenous people of Terai. Due to migration and other reasons, Terai now has mixed society contained of large different ethnic groups. The different races and ethnic groups have their own cultural practices and food habits conceived from their ancestors [1].

There are a variety of traditional food products found in different parts of the country. Among these, some are location or region specific e.g. chhurpi in mountain area and bhukka in terai, some are community specific e.g. chhoyala and kachila in Newar, kinema in Limbu, and Rai, whereas some foods e.g. gundruk, sinki, sel-roti, dahi etc. are common to almost all geographic regions and ethnic groups. The indigenous foods have been prepared by traditional methods and the technology is being transferred from generation to generation [1].

Fermentation is one of the oldest methods practiced by human beings for the transformation of milk into products with an extended shelf life [2]. Fermented milk has been claimed by some research findings for being more nutritious and health promoting than fresh milk [3,4]. The conversion of lactose to lactic acid has preservative effect on milk, moreover, the low pH of cultured milk inhabit the growth of putrefactive bacteria and other determined organisms, thereby, prolonging the shelf life of the products [5].

Dahi or curd is the traditional fermented milk product obtained from pasteurized or boiled milk by souring with natural microflora or by the harmless lactics or other bacterial culture. Dahi is popular throughout the Indian subcontinent. It is consumed either in the main course of meal, as a refreshing beverage or as dessert. It is assumed that over 50% of total milk produced in Nepalese households is converted into dahi: only a small amount of the milk produced is sold. The conversion of milk into dahi is an important intermediary step in the manufacture of nauni, ghee [6], mohi and chhurpi [7]. Dahi is also consumed by the Nepalese with boiled rice or “chewra” (beaten-rice) [7] or as lassi (sweet, salted or spiced), stirred and diluted dahi as steeping media for dahi-wada making.

Indigenous dahi is prepared in theki or earthenware pots at home and as well as local level for sell. It is interesting to note that proper documentation of its traditional technology is lacking specially dahi prepared in daar theki. Furthermore, no work on collection of important information and scientific approach as regards its production, nutritive value, quality; consumer perception and so on seems already undertaken. This is required not only to authenticate its origin, preserve its culture but also to improve and standardize its technology and commercialize this product.

Objective of the Study

The objective of this study has been to collect the production technology related information such as definition and origin, ingredients and functions, preparation procedure and method of preparation, utensils, cooking fuel, desirable quality characteristics and factors influencing them, production and marketing, occasions of use, nutritive and therapeutic value and storage of indigenous dahi and provide suitable scientific justifications.

Materials and Methods

Survey for information collection

A Survey was conducted in randomly selected households in eastern part of Nepal, representing the major ethnic Nepali as the producers of dahi. Information was collected with minimum of 10 respondents from each district belonging to different ethnicity, religion, age and sex groups on preparation and consumption of dahi, using the...
questionnaire (Appendix B), personal interviews and communication by telephone method. These samples of respondents were used as purposive sampling method [8]. The main criterion of sample selection was the knowledge of persons they possessed about dahi. That is, those people who often or regularly prepare dahi either for market or home consumption was selected as sample. The information was collected on respondent’s identity, knowledge and experience of dahi making, their knowledge about origin and definition, type of ingredients used and their functions, recipe, preparation procedure and method of preparation, utensils, cooking fuel, desirable quality characteristics and factors influencing them, production statistics, marketing, occasions of use, ethnical importance, nutritive and therapeutic value, storage practice and safety issues of dahi. The collected data were analyzed for mean, mode and standard deviation following the method of Ott et al. [9].

Scientific data

Temperature was measured by digital thermometer. pH was measured by pH meter and TSS by hand refractometer of milk/dahi at survey sites.

Response and its scientific analysis

Respondent profile: The total number of respondents was two hundred thirty six. Basically age groups > 30 years were chosen. Their profile is presented in Table 1.

The highest percentage (42.54) of respondents comprised of age between 50 and 70 years followed by 30-50 years. Among racial groups the highest number represented Brahmins and Chhetri followed by Rai and Magar. Likewise among the religious groups Hindu was highest the highest number represented Brahmins and Chhetri followed by Rai and Magar. Among racial groups the highest percentage (9.32%) of respondents was from Dhankuta followed by Ilam and other districts.

Table 1: Respondent Profile (n=236).

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Percentage</th>
<th>Demographics</th>
<th>Percentage</th>
</tr>
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<tbody>
<tr>
<td>Age Group</td>
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<td>Resident of</td>
<td></td>
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<tr>
<td>&lt;30</td>
<td>12.17</td>
<td>Bhojpur</td>
<td>7.2</td>
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<tr>
<td>30-50</td>
<td>35.23</td>
<td>Dhankuta</td>
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<td>50-70</td>
<td>42.54</td>
<td>Khotang</td>
<td>4.23</td>
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<tr>
<td>&gt;70</td>
<td>10.06</td>
<td>Ilam</td>
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</tr>
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<td>Teesta</td>
<td>8.05</td>
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<tr>
<td>Female</td>
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<td>Okhaldhunga</td>
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<td>Cast/Tribe</td>
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<tr>
<td>Brahmin and Chhetri</td>
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<td>Sankhuwasabha</td>
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<tr>
<td>Rai and Magar</td>
<td>17.51</td>
<td>Saptari</td>
<td>4.66</td>
</tr>
<tr>
<td>Newar</td>
<td>7.34</td>
<td>Siraha</td>
<td>4.66</td>
</tr>
<tr>
<td>Limbu</td>
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<td>Sunsari</td>
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<td>Tapelgunj</td>
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<td>Buddha</td>
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<tr>
<td>Christian</td>
<td>1.69</td>
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<tr>
<td>Not Mentioned</td>
<td>0.85</td>
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</table>

Origin, nomenclature and definition of dahi

Dahi which is Nepalese indigenous fermented milk analogous to yoghurt is consumed by large sections of population in the country as an indispensable item of the diet since time immemorial. Dahi has been spelled out in the old religious epics like Swasthani Bratakatha, Satyanarayan, Bratakatha and Puran giving the evidence of its ancient origin and spelt as argha. The term dahi might have been derived as originated in the different languages spoken in the country as depicted below:

Sanskrit: argha

Nepali: dahi

Ingredients and their functions

It was found that the majority of the respondents used cow, buffalo or combination and yak milk as major raw material when some of respondents used sheep and goat milk too. Different species of cow such as local, jersery and hybrid have been used in different region for milk production. Some respondents particularly the dahi traders used buffalo milk to prepare dahi because of good texture and thick consistency. Most of the respondents from mountains and hills used theki for fermentation purpose while rest of respondents belonging to terai region used earthenware pots (kantari) in place of theki for fermentation purpose. Most respondents stated not using back slopping method for dahi preparation. They do not used previous day culture if fermentation is done in theki. In case, when fermentation was done in other utensils, 5-8 g/L starter culture was used. In terai where fermentation was done in kantari, back slopping was mandatory. Response to addition of culture in theki while fermentation was obtained in two ways:

1. If theki is new, either they add 5-8 g of pervious day dahi or mohi
2. If theki is new, they let 4-5 times dahi to go as waste until natural and good microflora established.

Dahal [10] reported best quality dahi was obtained using 10% old dahi as inoculums for 22 hours fermentation time at room temperature (22 ± 2°C). Zaman et al. [11] reported 5-8% as inoculum for dahi making in Bangladesh. Kharel et al. [6] reported 1-3% starter culture for dahi making.

Equipment and accessories

The equipment required and used during dahi preparation and their functions were as following:

a. Balti: It is a bucket made of steel or silver for milking purpose.
b. Dhungro: It is a bucket made of wooden or bamboo for milking purpose/fermentation purpose.
c. Daadu: It is a stirrer made up of coconut and bamboo or silver or wood used to stir the milk while heating.
d. Kunde: It is a vessel made of brass to boil the milk.
e. Karahi: It is a heavy deep iron pan with two holding rings which is used for boiling milk.
f. Dhungr: It is a hollow iron cylinder used to provide air to coal or firewood during milk boiling.
g. Theki: It is a close-necked wooden vessel carved out of wood.
like daar (Boehmeria rugulosa) Wed, or other tree used for fermenting milk. Most respondents used theki to ferment dahi. Majority possesses and prefers daar and katar theki. Due to high cost, some respondents had theki made of other wood like katar (Artocarpus heterophyllus), chilau (Schima wallichii), karam (Adina orientalis), khamar (Gmelina arborea), khirro (Sapindus insigne), etc.

h. Kantari: It is circular earthenware pot used to ferment dahi especially in Terai regions. Majority of people of terai community prefer this. The earthenware pot can be cup, chhanch or taulo/ghyampo.

Cooking fuel

About 72.2% of respondents used firewood as fuel as it is easily obtainable from forest and in the market; 23.8% of respondents used gas stove and 4% used kerosene stove for the preparation of dahi. High temperature and long time heating is necessary to boil milk. Hard wood is preferred as this type of wood can produce high heat and gives constant temperature for a long time. The respondents of Terai especially Tharu/Choudhary and gives constant temperature for a long time. The respondents of Terai especially Tharu/Choudhary used dried cow-dung and firewood together.

Method of preparation

There were some variations with respect to milk used, season of dahi making, culture addition, and availability of milk. No significant difference was found in the procedure, however. The procedure followed in dahi making was found as in Figure 1.

Milk procurement: Fresh cow, buffalo or yak milk is drawn and filtered by muslin cloth. Alternately, milk is collected from local level for commercial purposes.

Boiling: Filtered milk is transferred to heating vessel called kunde or kanti and boiled in high temperature for 10-15 minutes. During this process, about 1/3rd milk is frequently taken out in balti and add back, the process referred as saans marne. This process takes place for 3-5 times and is done to sterilize balti. The volume of milk reduces by 10-20% and consequently TSS increases to 16-18%. The color of milk becomes reddish brown. Continuous stirring must be done during boiling by use of daadu made of coconut and bamboo or of silver or other materials. Three phases can occur during boiling:

a. If boiling is less, milk will be unsweet and thin consistency.

b. If boiling is adequate, milk will be sweet and desirable consistency

c. If over boiling is done, milk will be develop cooked flavor and dahi have grainy texture.

The explanation for these three phases while boiling milk in Nepalese indigenous dahi making can be correlated to yogurt milk. It is considered that insufficient heating will result in a weak-bodied yogurt, while excessive heating will lower gel strength and result in a grainy textured yogurt with a tendency towards syneresis. The phenomenon of grainy texture could be due to structural rearrangements following gelification. The continued aggregation of casein particles after the aggregation and gelation of whey proteins has been initiated may cause local stresses in the network, leading to localized fractures shortly after gel formation [12].

Milk transfer: The well boiled milk is transferred to hollow wooden vessel or container locally called as theki in boiling hot condition or alternately, cooled for 10-15 minutes. If transferred hot, lidding of theki with cap is not done for 10 minutes, else curd will be sour. Care should be taken not to contaminate with rice. This may lead to sour dahi. There is no addition of culture in theki. The microorganisms entrapped in cracks of theki acts as source of inoculums. After lidding, theki should be covered with cloth at top, the process called as naato banne. In terai region baked earthen container is used in which cooled inoculated (joran) milk is transferred for fermentation.

Fermentation: The milk is fermented in the vessel for 12-16 hours in summer and 1-2 days in winter depending on altitude. In winter, the vessel especially theki is covered with warm cloth and/or kept near fireplace. Generally, in hills of Nepal, if fermentation is started in morning, dahi will be ready next morning. There is a belief milk must be fermented as least one night. The duration of fermentation depends on the season as well as on the geographical location of the place.

Dahi: After suitable time temperature fermentation, the obtained product is dahi having thick consistency and firm texture called chakana chakana dahi in Nepali. The prepared dahi has three distinct phases:

a. Creamery layer on top

b. Homogenous body of curd and the surface being silt and glossy

c. Watery portion at bottom (though excess not desirable, not quite apparent when earthen pot is used).

Cleaning of fermentation vessel: Prepared dahi is consumed as such, sold in market or churned to prepare ghee and mohi. The fermentation vessel is cleaned with hot water and used for next batch. In case of theki if spoilage of dahi occurs (called chokha in Nepali), it is cleaned with the leaf of bimiro (Citrus medica L.) plant and hot water. Literature survey revealed that this plant reported for the antioxidant activity, antimicrobial activity and anti fungal activity. Phytochemical screening states that it contains fixed oils, volatile oils, and citric oxide and flavanone glycosides are abundant constituents of citrus leaves and fruits [13]. The medicinal value of this plant has also been described in Nepalese Ayurveda (Nepalese Traditional Medicine) [14].
Results and Discussion

Sensory quality of dahi and factors affecting it

Appearance, color, flavor, taste, texture and other impressions like syneresis and consistency make up the sensory quality of any fermented dairy foods including dahi. When asked about the sensory quality of dahi most of the respondents identified the following as the desirable characteristics:

**Appearance, color and form:** The dahi should be good set, has natural milk or caramelized color and has smooth and glossy surface.

**Odor:** It should be balance of sweet and sour (1:1).

**Taste:** The taste should be sweetish to sweet and sour.

**Texture:** Preference of most of the respondents was for smooth, glossy surface and solid texture dahi with no whey off and good mouthfeel.

**Consistency:** Dahi should have firm and solid body and consistency quality.

**Eating quality:** Dahi should produce good mouthfeel. It should feel like a soft and sponge when pressed in tongue.

According to BIS [15] specifications for fermented milk product-Dahi, that it should have a pleasing flavor and a clean acid taste, devoid of undesirable flavor, should have firm and solid body and texture and be uniform with negligible whey separation. Other characteristics of a good quality dahi made from whole milk which has a cream layer on the top, the rest being made up of a homogenous body of curd and the surface being smooth and glossy, while the cut surface should be firm and free from cracks of gas bubbles and it should have a pleasant acid taste with sweetish aroma.

Factors affecting appearance, form and color

Appearance, form and color are affected by color of milk, heating intensity of milk or added coloring materials. Caramelized color is obtained during excessive high temperature heating of the milk [16]. Appearance is also affected by duration of fermentation. Many respondents opined that dahi not fermented overnight or for adequate time and in proper temperature develops thin curd, high wheying off (called jholayilo in Nepali) and bad taste.

Factors affecting flavor

Flavor is one of the most important properties of food products, and is an important factor determining its acceptability and preference. The percentage response of the respondents approving the factors having effect on the flavor of dahi is given in Table 2.

Most respondents opined milk plays significant role in flavor of dahi. Cheng [17] reported the sensory properties of dairy products depend largely on the relative balance of flavor compounds derived from fat, protein, or carbohydrate in the milk. Good quality product comes from good quality raw material. The fat content in milk determines quality of finished product. Dahi prepared from whole milk is preferred by most respondents. The respondents opined that best dahi comes from daar theki. Few respondents from terai region claimed dahi prepared in earthenware vessel more desirable and thick consistency than dahi prepared in theki. Almost all respondents agree on flavorful dahi comes from daar theki. The flavorful dahi prepared in daar theki can be generalized in same way as wine aged in oak barrel. Campbell et al. [18] reported impact of oak on wine flavor is derived primarily from extraction of volatile aroma and flavor compounds from oak into wine. The characteristics of oak and daar wood are similar in many aspects.

The fermentation time and temperature affects dahi quality and flavor. One night fermented dahi in theki kept near fireplace or covered with cloth gives best quality dahi. One third respondents emphasized quality culture addition in development of consistent product whereas other believed in no need for addition of culture (especially theki users).

The odor and taste as a whole gave flavor which depended on the volatile constituents of milk [11] and those produced by dairy starter. Most flavor compounds in dahi are expected to be produced from lipolysis of milkfat and microbiological transformations of lactose and citrate into diacetyl and acetaldehyde. According to Cheng [17] more than 100 volatiles, including carbonyl compounds, alcohols, acids, esters, hydrocarbons, aromatic compounds, sulfur-containing compounds, and heterocyclic compounds, are found in yogurt at low to trace concentrations. Besides lactic acid, acetaldehyde, diacetyl, acetoin, acetone, and 2-butanol contribute most to the typical aroma and flavor of yogurt. Extended storage of yogurt causes off-flavor development, which is mainly attributed to the production of undesired aldehydes and fatty acids during lipid oxidation. Similar observations of off-flavor have been reported by all of the respondents in present study.

Factors affecting texture

One of the most important sensorial attributes for dahi is texture, which could be assessed by sensory or instrumental analysis. Many of the factors were found to be responsible for the texture and microstructure of dahi. The respondents’ response is presented in Table 3.

Milk solid totals topped the list of factors followed by fat content, fermentation vessel; culture addition, fermentation time, temperature and manufacturing process were found notable. The respondents opined that the texture of dahi depended upon the times milk is heated on fire and volume reduction thereby increase in total solids. The higher the TSS of milk, better the texture of dahi.

One of the most important processing parameters affecting microstructure, texture, and rheology of dahi is heat treatment of milk. This is according to Lucey and Lee [19] when milk is heated at >70°C, Respondents were allowed multiple responses, percentages may exceed 100%.

<table>
<thead>
<tr>
<th>Particular</th>
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<tbody>
<tr>
<td>Milk</td>
<td>100</td>
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<tr>
<td>Fat Content</td>
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<tr>
<td>Fermentation Vessel</td>
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<tr>
<td>Fermentation Time</td>
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<td>Fermentation Temperature</td>
<td>62.3</td>
</tr>
<tr>
<td>Culture Addition</td>
<td>33.5</td>
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</tbody>
</table>

Table 2: Factors influencing the flavor.

Respondents were allowed multiple responses, percentages may exceed 100%.

<table>
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<tr>
<th>Particular</th>
<th>Percentage of respondents (n=236)</th>
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</thead>
<tbody>
<tr>
<td>Milk TSS</td>
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<tr>
<td>Fat Content</td>
<td>93.3</td>
</tr>
<tr>
<td>Culture Addition</td>
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<tr>
<td>Fermentation Vessel</td>
<td>87.6</td>
</tr>
<tr>
<td>Fermentation Time</td>
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<td>Fermentation Temperature</td>
<td>24.6</td>
</tr>
<tr>
<td>Manufacturing Process</td>
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</tbody>
</table>

Table 3: Factors affecting texture.
the major whey proteins, such as, β-lactoglobulin, are denatured. During denaturation β-lactoglobulin interacts with the κ-casein on the casein micelle surface (and any soluble κ-casein molecules, i.e. κ-casein that dissociates from the micelle at high temperatures) by disulfide bridging, which results in increased gel firmness and viscosity.

Many respondents opined *dahi* made of whole milk have better texture. As reported by De Ross [20] fat plays a major role in the determination of texture and flavor of complex food products and its quantitative impact was largely investigated in the past. The better texture might be due to better water holding capacity. Becker and Puhan observed that yogurt made from whole milk did not show any whey separation. An increase in WHC from 10% to 16% was also reported by Keogh and O’Kennedy in yogurt containing 5% fat compared to non-fat yogurt [12].

Forty five percent respondents believed addition of previous day culture in milk enhances better texture as it would have good set compared to non cultured added milk. But majority of respondents claimed better textured *dahi* in *theki* without culture addition. This might be due to better temperature control and desirable microflora in *theki*.

Texture of the curd depends mainly upon the rate of development of the acidity i.e. type of organisms present in the culture. The wide variation in the quality parameter of the curd can be attributed to the manufacturing conditions and type of organisms used [21]. The texture is always enhanced when a texturing (i.e. EPS producing) starter is used. They also allow for the increasing smoothness (2 times) and improvement WHC (1.5 times higher in average) [12]. Katawal and Subba [1] in their research have also found milk and milk products having considerable fat content have influence on texture development and has preserved the eating and keeping quality.

Respondents’ opined fermentor must be kept near fireplace or covered with clothes for maintaining optimum incubation temperature. Otherwise, *dahi* will not be fermented and bad textured. Dahi incubation temperature has marked effect on *dahi* texture. *Dahi* made at around 25-30°C will have more viscous, smoother and slimy appearance. Lucey et al. [22] who studied the microstructure of chemical and bacterial lactic curd, showed that gels made at 42°C appeared to be coarser and to have much less branches or cross-links, thinner strands, and larger pores in comparison to gels made at 30°C. The denser protein matrix observed at lower temperatures induces a better WHC and a lower permeability of the gel than obtained at higher temperatures.

Factors affecting consistency

*Dahi* should have firm body and consistent quality. During the study, variation in consistency was observed. Variation in consistency among *dahi* of different region may be due to the variation in the strains of bacteria in the mixed culture and variation in the manufacturing techniques by different manufacturers. Additional material may also have influence the body and consistency score. It was reported by Gupta et al. [21] that addition of non-fat dry milk and vegetable oil to skim milk improves the body and consistency of prepared curd.

Factors affecting eating quality

Eating quality might be understood as the total or overall sensory impression perceived from a food [1]. The response of respondents on the eating quality is presented in Table 4 and it is shown that sweetness, sourness, texture, color and fermentation vessel significantly affect the eating quality.

<table>
<thead>
<tr>
<th>Particular</th>
<th>Percentage of respondents (n=236)</th>
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<tbody>
<tr>
<td>Sweetness</td>
<td>50</td>
</tr>
<tr>
<td>Sourness</td>
<td>50</td>
</tr>
<tr>
<td>Texture</td>
<td>95</td>
</tr>
<tr>
<td>Color (Yellow)</td>
<td>45</td>
</tr>
<tr>
<td>Fermentation Vessel</td>
<td>75</td>
</tr>
</tbody>
</table>

Respondents were allowed multiple responses, percentages may exceed 100%.

Table 4: Factors influencing eating quality.

Half of respondents liked sweet *dahi* whereas other half showed preference for sour type. Most respondents showed preference for *dahi* having sweet: sour=1:1 flavor. Ninety five percent of respondents opined texture of *dahi* as desirable quality. In terms of color, forty percent gave preference to colored (yellow from cow) *dahi* whereas other likes white *dahi*. Seventy percent respondents opined *daa theki-fermented-dahi* as first choice. In similar way seventy five percent respondents, all from terai preferred earthenware-pot-fermented *dahi* as their first choice. Rest has preference for *dahi* made in *theki* of other woods, stainless steel vessel, paper or plastic cups.

**Occasions of production, use and marketing of *dahi***

Generally *dahi* is made at home for consumption by family, for sale in sweetmaker’s shop or hotels and during religious, ritual, cultural occasions. *Dahi* is prepared at home also for the purpose of *ghee* and *mohi* making and for welcoming guests at home. *Dahi* is almost as essential in some religious and cultural occasions like *Swasthani Pooja*, *Satyanarayan Pooja*, *Saraswati pooja*, *Tihar*, *Dassain*, wedding, *Nwaran*, *Barakhi*, *Shraddha*, birthday, *Puran*, *Pashni* or as token of good omen. It is important item regarded as *argha* offered to Gods. *Dahi* is used as ‘binder in *tika*’. It is used as *daun* in *selroti* preparation. *Dahi* is highly preferred during intestinal disorders like diarrhea as a source of probiotics. Almost all respondents prepared *dahi* in *Dassain*, *Tihar* and *Pooja/Shraddha*. Traders of Tarahara prepared *dahi* on regular basis for sale as well as on people’s special demand in special occasions. Some traders were found to prepare *dahi* in large quantity during summer season because people preferred to consume *dahi* as such or as a refreshing nonalcoholic beverage and savoury to beat hot days in summer. Sugar may or may not be added before consumption. It is also consumed after mixing it with rice or *chiura* (beaten rice) anytime and especially in Ashad 15 (*dhun diwas*, padday transplantation day). This has further increased and popularized *dahi* throughout Nepal.

**Nutritional value of *dahi***

*Dahi* is one of the most important products in the family of fermented milks. Of the total quantity of milk converted into milk products, about 45% is used for *dahi* making and for welcoming guests at home. *Dahi* is reported to have better nutritive value than milk. All respondents agreed with this point of view. Though there is no increase in fat or protein content of milk during fermentation, however, the digestibility of *dahi* is more than that of milk. This fact has also been discussed by Gandhi and Natrajan [23].

Gandhi and Natrajan [23] reported that Calcium and Phosphorus content of *dahi* are more easily assimilated in the body as compared to milk. *Dahi* contains more vitamins, which is synthesized by specific lactic acid bacteria. During the curd formation, lactose of milk is converted to lactic acid. There is a breakdown of protein resulting an increase in the non-protein nitrogen. The fat globules coalesce and distribute themselves on the top. Physically during *dahi* formation, milk proteins are jellified under thin exudates and a clear serum on the curd is seen. The formation of consistently good quality *dahi* depends...
upon the use of right type of starter cultures. As a result of metabolic activity of dahi starters, quantitative nutritive changes occur in milk during dahi making process. There are appreciable changes in mineral and vitamins contents of dahi depending on the type of organism used for fermentation. A mixture of L. bulgaricus and Leuconostoc cremoris decrease thiamine, riboflavin and nicotinic acid in milk during dahi fermentation. However, single culture of L. lactis and L. cremoris raised the thiamine concentration from 2-20% over that of milk. Similarly, riboflavin content of dahi made from whole buffalo milk is almost four fold that of skim milk dahi.

Therapeutic value of dahi

All respondents opined Nepalese indigenous dahi having therapeutic properties. It has natural benefits and curative properties for different diseases. The diseases and percentage of response is shown in Table 5.

All respondents opined for cure of gastrointestinal diseases by consumption of dahi like chronic constipation, diarrhea, dysentery, chronic appendicitis and gastric ulcer. Twenty three percentage respondents stated its cure for hepatitis and jaundice, thirty six percentages for skin disorders like psoriasis and eczema, sixty percentages opined premature old age and decay could be prevented by taking sufficient curd in the daily diet. Similarly, more than ninety percent respondents believed dahi mixed with other suitable ingredient can be regarded as beauty enhancer. It can cure hair fall, dandruff and pimples. Very few respondents reported dahi as treatment of osteoporosis and insomnia. Half of respondents opined dahi as cure for cancer. Our findings on therapeutic properties are supported by Gandhi and Natrajan [23].

In the same way, 1/3rd of respondents believed that the use of dahi in the form of mohi is highly beneficial in the treatment of diabetes. They strongly recommended consuming dahi/mohi prepared in daar theki for diabetics. Samwal et al. [24] repoted chemical constituents from the leaves of daar (Boehmeria rugulosa) with anti diabetic and antimicrobial activities.

Storage of dahi

Normally dahi is not stored. It is consumed fresh and prepared as per demand during different occasions and festivals. However earthenware pot or theki dahi can remain in good condition for 3-4 days. The storage life is reported to extend by 6-7 days by the process called thanuwa dahi where milk addition at times into the fermentation vessel/container is done in a semi continuous mode. Generally evening or next morning milk (lue warm) is added to morning fermented dahi. Dahi will be ready the following day. Like many other milk products, dahi is prone to deterioration, especially at an ambient temperature, within a matter of days. Various microbial, enzymatic, or chemical reactions occurring within dahi during storage may alter its physical, chemical, and microbiological structure, causing deterioration or spoilage. Cheng [17] reported generation of volatile by-products leads to off-flavors and makes the product unsatisfactory for the tastes of consumers.

Age and preference

The response to the question as who in the family like dahi most is shown in Table 6. It was found that the adult like to consume dahi very much. The children like dahi due to top creamy portion. Very old people liked it least which could be due to their weak health condition, feeling cold with dahi and hypersensitive reaction reactions. People avoid dahi during common cold, fever and pneumonia.


