Physicochemical and Organoleptic Evaluation of Misthi Doi Prepared With Different Herbs

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Abstract
The study was planned to prepare misthi doi with different types of herbs. Misthi doi is an Indian traditional milk product which is a well-established dessert in eastern part of India. It is most popular in West Bengal. It is also known as Lal Dahi. Herbs used for preparation of misthi doi were Tulsi (Ocimum sanctum L.) and Cinnamon (Cinnamomum verum L.). Both were used either separately or in combination. Total four products were prepared as sample I, II, III and IV. Sample I was plain misthi doi devoid of any herbal extract while sample II, III and IV were incorporated with tulsi, cinnamon and both in combinations respectively. Trials for the standardization of process showed the best use of the herbs as their extract. Herbal extracts were used in the rate of 1.0% separately and 0.5 % in combination. Physicochemical analysis and sensory evaluation of the product was done. Highest overall acceptability score was obtained by herbal tulsi and cinnamon misthi doi sample by sensory evaluation as compared to other herbal and plain misthi doi. This study shows that misthi doi have relatively good physicochemical, functional and sensory characteristics and can be used as a herbal misthi doi.

Key words: Misthi doi, Herbs, Organoleptic and Physicochemical evaluation.

1. INTRODUCTION
Milk is very nutritious and perhaps an indispensable food for human being. But in this era of industrialization, food habit of common people is changing. It is preferable as it is healthy, delicious food to fresh raw foods. Hence, milk is converted to various milk products including dahi or yoghurt. About 9% of the total milk produced in India is converted to fermented milk products [1]. Consumption of fermented milk products is associated with several types of human health benefits partly because of their content of lactic acid bacteria. Several experimental observations have indicated a potential effect of lactic acid bacteria against the development of colon tumours [2]. The traditional fermented dairy product dahi is popularly known as misthi dahi or misthi doi. Misthi dahi has creamish to light brown colour, firm consistency, smooth texture and pleasant aroma. Traditionally it is prepared with cow milk, buffalo milk, skim milk and mixed with required amount of sugar and partially concentrated by simmering over a low fire during which milk develop a distinctive light cream to light brown caramel colour and flavour. This is followed by cooling and culturing in ambient temperature using lactic culture and pouring into retails cups, left undisturbed overnight for fermentation. When the firm body curd has set it is stored at low temperature (40 °C) for chilling [3]. A wide variety of products are manufactured by processing raw milk into dairy products [4]. Various market survey reports on the quality of misthi dahi sold in different part of country revealed wide variation in the fat by 1-2 %, cane sugar by 6-25 content [5, 6]. Dahi, which came into use as a means of preserving milk nutrients, was probably used by Aryans in their daily diet, as it reduces putrefactive changes and provided an acidic, refreshing taste [7]. It is believed that dahi has valuable therapeutic properties and helps in curing gastrointestinal disorders.

2. MATERIAL AND METHODS
The research work was carried out at Animal By-products Laboratory, Division of Livestock Products Technology (LPT), Indian Veterinary Research Institute (IVRI), Izatnagar, Bareilly (UP).

2.1. Milk
Fresh and skimmed cow milk for preparation of misthi doi
was obtained from dairy unit of cattle and farm, IVRI, Izatnagar. Cooling and pasteurization was done at dairy technology unit of LPT division.

2.2. Preparation of Misthi Doi

2.3. Experiment Design

Experiments were planned and conducted to prepare plain and herbal misthi doi using tulsi and cinnamon herbs. Total four products were prepared as sample I, II, III and IV. Sample I was plain misthi doi in which no herbs were added while sample II, III and IV were incorporated with tulsi, cinnamon and both in combination respectively. Trials for the standardization of process showed the best use of the herbs as their extract. Herbal extracts were used in the rate of 1.0% separately and 0.5 % in combination.

2.4. Organoleptic Evaluation

All the samples were evaluated for sensory characteristics and overall acceptability by a panel of judges selected among personnel’s from Division of Livestock Product Technology, IVRI using nine point Hedonic scale [8]. The research was carried out to study the quality of misthi doi prepared with different herbs. Misthi doi was analyzed for physicochemical and organoleptic characteristics.

2.5. Physicochemical analysis

pH: - The pH was measured by digital pH meter.

Fat content: - Fat content in percentage (%) was determined by Gerber method [9].

Protein (%), Moisture (%) and Ash (%): - Protein, Moisture and Ash contents of milk were estimated by AOAC method [10].

Total titratable acidity: - Total titratable acidity was measured by AOAC method [11].

Solid Not Fat (SNF) and Total solids (%): - Solid Not Fat and Total solids were estimated by AOAC [12]

2.6. Statistical Analysis

All experiments were conducted in triplicates. Data reported in three determinations. The data was analyzed with the help of suitable statistical parameters and tools [13].

3. RESULTS AND DISCUSSIONS

The study was planned to prepare misthi doi with different types of herbs. In present study, total four misthi doi samples were prepared to characterize for physicochemical analysis and sensory evaluation. The data obtained from all the studied quality attributes were statistically analyzed and the results are interpreted and discussed in the following sections.

3.1. pH Value

From the table 1, it is observed that mean pH value for plain, herbal tulsi, herbal cinnamon and herbal tulsi and cinnamon were 4.45, 4.62, 4.82 and 4.37 with standard deviation of 0.15, 0.14, 0.08, 0.33 respectively. Statistical analyses showed that there were significant (P<0.05) difference within the value of different dahi samples. Our reports are concurrent with the findings of Rahman [14] and Ali [15] who reported the average pH value of plain and herbal tulsi dahi as 4.47 ± 0.45 and 4.79 ± 0.01 respectively.

3.2. Protein (%)

Statistical analyses showed that there were significant difference (P<0.05) within the protein content of different groups of misthi dahi. The mean protein content of plain, herbal tulsi, herbal cinnamon and herbal tulsi & cinnamon is 4.32, 4.36, 4.37 and 4.37 respectively with standard deviation of 0.04, 0.02, 0.01 and 0.51. Our findings of herbal tulsi, herbal cinnamon and herbal tulsi + cinnamon correlates with the findings of Ali [16] who reported 4.22 and 4.44 protein percentage in two different types of milk dahi samples.

3.3. Fat (%)

The mean fat content of plain, herbal tulsi, herbal cinnamon, herbal tulsi & cinnamon were 4.01, 4.23, 4.21 and 4.18 % respectively with standard deviation of 0.01, 0.02, 0.11, and 0.08. Statistical analyses showed that fat content of different dahi samples differ significantly (P<0.05). Akin et al. [17] reported 3.9% fat in yoghurt of their experiment. El-Samragy YA and Samragy El YA [18] reported 4.3% fat in fresh yoghurt. In the present investigation, the fat percentage of all dahi groups was higher than any researcher’s report. This indicates the better quality of misthi dahi.

3.4. Moisture (%)

The mean moisture content of plain, herbal tulsi, herbal cinnamon, herbal tulsi & cinnamon were 84.74, 84.51, 84.75 and 84.55 % respectively with standard deviation of 0.20, 0.53, 0.21, and 0.07. There were found no significant variation (P<0.05) in moisture percentage.

3.5. Ash (%)

The mean ash content of plain, herbal tulsi, herbal cinnamon, herbal tulsi & cinnamon were 0.76, 0.78, 0.75 and 0.76 respectively with standard deviation of 0.08, 0.05, 0.07, and 0.14 respectively. Significant differences (P<0.05) were found among those mean values. The results are concurrent with the findings of Park [19] who reported in Gabtoli dahi and sherpur dahi sample 0.78 ± 0.02 and 0.818 ± 0.01 ash percent respectively.

3.6. Total Titratable Acidity

The total titratable acidity of misthi doi (A) and three brands of misthi doi i.e. B, C and D are shown in table 1.
Table No 1. Physicochemical analysis (Mean ± SD) of Misthi Doi

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Plain Misthi Doi</th>
<th>Tulsi</th>
<th>Cinnamon</th>
<th>Tulsi+ Cinnamon</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>4.45±0.15</td>
<td>4.64±0.1</td>
<td>4.82±0.08</td>
<td>4.37±0.33</td>
</tr>
<tr>
<td>Protein %</td>
<td>4.32±0.04</td>
<td>4.36±0.08</td>
<td>4.37±0.02</td>
<td>4.37±0.51</td>
</tr>
<tr>
<td>Fat %</td>
<td>4.01±0.01</td>
<td>4.23±0.02</td>
<td>4.21±0.11</td>
<td>4.18±0.08</td>
</tr>
<tr>
<td>Moisture %</td>
<td>84.74±0.20</td>
<td>84.51±0.53</td>
<td>84.75±0.21</td>
<td>84.55±0.07</td>
</tr>
<tr>
<td>Ash %</td>
<td>0.74±0.08</td>
<td>0.78±0.05</td>
<td>0.75±0.07</td>
<td>0.76±0.14</td>
</tr>
<tr>
<td>Titrable Acidity %</td>
<td>1.16 ±0.32</td>
<td>0.89 ± 0.02</td>
<td>0.87 ±0.04</td>
<td>1.13 ±0.05</td>
</tr>
<tr>
<td>Solid Not Fat (SNF) %</td>
<td>9.64 ±1.19</td>
<td>11.47 ±0.01</td>
<td>9.94 ±0.04</td>
<td>12.78 ±0.14</td>
</tr>
<tr>
<td>Total Solids %</td>
<td>13.38 ±1.34</td>
<td>14.96±0.02</td>
<td>12.93±0.005</td>
<td>15.73±0.18</td>
</tr>
</tbody>
</table>

*Values are Mean ± SD.
Any two means not sharing same letter differ significantly (P<0.05) from each other.

The average acidity of plain misthi doi, herbal tulsi, herbal cinnamon, herbal tulsi & cinnamon were 1.16 0.89, 0.87 and 1.13 with standard deviation of 0.32, 0.02, 0.04 and 0.05 respectively. These results are in accordance with the findings of Davis and Mclachlan [20].

3.7. Solid -Not-Fat (SNF)
The SNF content of misthi doi and three brands of misthi doi i.e. A, B and C D are shown in Table 1. The average SNF content of Plain misthi doi, herbal tulsi, herbal cinnamon, herbal tulsi +cinnamon was 9.64 11.47, 9.94 and 12.78 with standard deviation of 1.19, 0.01, 0.04 and 0.14, respectively. These results are in agreement with the findings of Richter [21].

3.8. Total Solids
The total solids content of plain misthi doi and 3 brands of misthi doi i.e. herbal tulsi, herbal cinnamon and herbal tulsi + cinnamon was 13.38, 14.96, 12.93 and 15.73 with standard deviation 1.34, 0.02, 0.005 and 0.18 respectively. The results were totally different from the earlier findings of Sarkar [6].

3.9. Sensory scores of Mishi Doi

Organoleptic evaluation: The organoleptic evaluation of plain misthi doi (A) and three brands of misthi doi (B,C,D) were evaluated for sensory attributes like appearance, colour, flavour, texture, overall acceptability on nine point Hedonic scale (9 for extremely like; 1 for extremely dislike) by the scientists of LPT division and shown in table 2.

3.10. 1. Appearance Acceptability
The mean values of appearance of plain and three brands misthi doi were 6.62, 7.04, 6.84 and 7.06 with standard deviation of 1.21, 0.80, 0.49 and 0.65 respectively. Statistical analysis showed that significant difference exists among the appearance of different samples (p ≤ 0.05). The mean value of appearance of herbal tulsi + cinnamon (D) is more as compared to others. In the appearance test, hedonic scale showed that the herbal tulsi and herbal cinnamon misthi doi (D) sample scored (7.06) excellent and herbal tulsi (B) sample scored ( 7.04 ) very good, herbal cinnamon (C) scored (6.84) good while plain misthi doi (A) scored least ( 6.62 ) by the subjects as compared to rest three samples.

3.11. 2. Colour Acceptability
Colour of curd depends on the colour of milk or careemlized colour obtained during heating of milk or added colouring materials [22].The mean values of colour of plain misthi doi and three brands of misthi doi were 7.13 7.40, 6.84 and 7.14 with standard deviation of 0.73, 0.36, 0.85 and 0.21, respectively. Statistical analysis showed that significant difference exist among the colour acceptability of different samples (p ≤ 0.05). The mean value of Colour of herbal tulsi (B) is more as compare to others. In the colour test hedonic scale showed that the misthi doi herbal tulsi sample (B) scored excellent and herbal tulsi+cinnamon (D) sample scored very good and plain misthi doi (A) were scored as good sample and herbal cinnamon (C) were least acceptable but the subject’s scores less as compare to others.

3.12. 3. Texture Acceptability
Textures of the curd depend mainly upon the rate of development of the acidity. The wide variation of the quality parameter of the curd attributed to the manufacturing conditions and type of organism used [9]. The mean values of texture of plain misthi doi and three brands of misthi doi were 7.12, 7.4, 8.03 and 7.68 with standard deviation of 0.73, 0.85 and 0.34 respectively. Statistical analysis showed that significant difference exists among the texture acceptability of different samples (p ≤ 0.05). The mean value of texture of herbal cinnamon (C) is more (8.03) as compared to others. In the texture test, hedonic scale showed that the misthi doi herbal cinnamon (C) scored excellent, herbal tulsi + cinnamon sample scored better than other samples.
very good, plain misthi doi (A) scored good acceptability while herbal tulsi (B) misthi doi was least acceptable by the subjects as compared to others.

3.13.4. Flavour Acceptability
The mean values of flavour of plain misthi doi and three brands of misthi doi were 7.82, 7.87, 7.82 and 7.62 with standard deviation of 0.25, 0.42, 0.47 and 0.70, respectively. Statistical analysis showed that significant (p ≤ 0.05) difference exists among the overall acceptability of different samples. The mean value of flavour for herbal tulsi doi (B) was more as compared to others. In the texture test, hedonic scale showed that the herbal tulsi misthi doi (B) scored excellent, herbal cinnamon and plain misthi doi scored very good while herbal tulsi + cinnamon was scored as acceptable sample and obtained less score as compared to others.

3.14.5. Overall Acceptability
Overall score was given by the judges on the basis of appearance, colour, flavour and texture. The mean score of the mean values of overall acceptability of plain misthi doi and three brands of misthi doi were 7.53, 7.86, 7.71 and 7.87 with standard deviation of 0.60, 0.34, 0.45, and 0.25 respectively. Statistical analysis showed that significant difference exists among the overall acceptability of different samples (p ≤ 0.05). Higher score were obtained by herbal tulsi and cinnamon (D). Overall acceptability of herbal tulsi were scored very good and overall acceptability of herbal cinnamon was good by the panel of judges and overall acceptability of plain misthi doi was least as compare to others but acceptable by the judges. Our reports are accordance with the findings of Munzar [23] and Nahar [24] who reported in dahi sample higher score was obtained by D sample followed by C and B sample and lowest score was obtained by A sample (indicate the sample A, 10 % Non-fat dry milk dahi B 15% non-fat dry milk dahi, C 20 % of non-fat dry milk dahi and D whole milk dahi.

4. CONCLUSION
Dahi and its related products were, are and will remain an essential part of the daily diet of Indian population. Innovation and value addition to dahi and its related products will provide ample opportunities to food manufacturing Goods Company and co-operative food industries for increasing their products. Conclusively, this study shows that misthi doi have relatively good physicochemical, functional and sensory characteristics and can be used as a herbal misthi doi.

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