Studies on chemical quality of ginger (Zingiber officinale L.) milk shake

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Received: 21-04-2017
Accepted: 02-12-2017

ABSTRACT
India is the largest milk producing country in the world with 155.5 million tones milk production (2015-16). Milk shake, a product of Western origin, is obtained by freezing a mix very similar to soft serve ice-cream mix and speed mixing the frozen product in a mixture to make it pourable and generate foam in it. It has lower fat and sugar contents and higher milk SNF content than ice-cream. Ginger is a popular home remedy in India today. The medicinal properties of ginger in preventing cough and cold are well documented taking into account the medicinal properties of ginger, the present research “Studies on Chemical Quality of Zingiber officinale L. milk shake by addition of Ginger juice control, 2.5 per cent, 5 per cent, 7.5 per cent, 10 per cent of milk (V/V). The different chemical properties and sensory quality are determined. It was concluded that increase in level of ginger juice significantly decreased in total solid, fat, protein and increased in acidity per cent of milk shake. most accepted Treatment i.e. addition of ginger juice 5 per cent was contained 6.67, 26.71, 0.162 and 5.58 per cent fat, total solid, acidity and protein respectively.

Key words: Buffalo milk, Chemical analysis, Ginger, Milk shake, Sensory quality.

INTRODUCTION
India is the largest milk producing country in the world with 155.5 million tones milk production (GOI 2015-16). Its production and consumption has been on a continuous rise for the last two decades. Now India has been ranked as the first in total milk production. Out of the total milk produced, about 45 to 50 per cent is converted into indigenous dairy products (Kumar et al., 2005). On the other hand, only 9 per cent of milk is converted into fermented type of milk products and this sector is showing an annual growth rate of more than 20 per cent per annum (Singh, 2006). Milk shake, a product of Western origin, is obtained by freezing a mix very similar to soft serve ice-cream mix and speed mixing the frozen product in a mixture to make it pourable and generate foam in it. It has lower fat and sugar contents and higher milk SNF content than ice-cream. The milk shake is generally served with some flavour blends. The most commonly used flavour blends are of rose, coffee and chocolate. Ginger, being a major spice, has many uses in food as a flavouring and medicinal products. The aroma of ginger is pleasant with flavour, slightly biting due to antiseptic compounds present in it, which make it indispensable in the manufacture of number of food products. It is common ingredient in Asian cooking. Ginger has a several medicinal properties. According to the Ayurvedic medical system, ginger is carminative, stimulant and gives stimulating remedies. Ginger is diaphoretic, spasmytic and intestinal stimulant. Fresh ginger has been used for cold induced diseases, asthma, nausea, cough, heart palpitation, swelling and rheumatism. Ginger extracts also have antibacterial, antispasmoctic, antiulcer, antiallergenic and antioxidant qualities as well. Ginger is a popular home remedy in India today. The medicinal properties of ginger in preventing cough and cold are well documented. (Buchman, 1980) There are tendency of some people to refrain from consuming chilled/ cold drinks for fear of catching cold. Ginger milk shake, however, may be acceptable to them. Lately, there is tendency among people to assume a high degree of confidence in wholesomeness and safety of natural foods and natural flavors than those based on chemical.

The foregoing information reveals that blending of milk shake with ginger extract would yield a novel dairy neutracetical. This may improve the acceptability of milk shake and also result into its value addition. However, there is need to standardize certain parameters involved in manufacturing ginger milk shake. It is, therefore, thought essential to evaluate the suitability of ginger juice as a flavouring agent in developing ginger milk shake. Hence, taking into account the medicinal properties of ginger, the present research project entitled “Studies on chemical quality of ginger (Zingiber officinale L.) milk shake” was undertaken with the following objectives:

• To standardize the procedure of preparing milk shake by incorporation of ginger juice
• To study chemical quality of ginger milk shake.
• To study sensory quality of ginger milk shake.

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MATERIALS AND METHODS

The present work was carried out at the Department of Animal Husbandry and Dairy Science, College of Agriculture, Dapoli (DR.BS KKV DAPOLI)- 415 712 Dist. Ratnagiri (Maharashtra) during the year 2011-12

Buffalo milk: Buffalo milk was collected from dairy farm of College of Agriculture, Dapoli.

Ingredients: Cane sugar, fresh ginger, skim milk power and stabilizer (gelatin) was purchased from local market.

Ginger Extract was prepared by procedure described by Patel et al. (2007) as per flow process diagram is given in Fig.1. The milk shake will be prepared as per the procedure given by Sharma and Gupta (1978) with slight modifications.

The detail flow process chart for preparation milk of shake is given in Fig.2.

Treatments: preparation milk shake incorporating the different levels of ginger juice. The detail treatment combination was $T_0$: no ginger juice (Control), $T_1$: addition of ginger juice @ 2.5 per cent of milk (V/V), $T_2$: addition of ginger juice @ 5 per cent of milk (V/V), $T_3$: addition of ginger juice @ 7.5 per cent of milk (V/V), $T_4$: addition of ginger juice @ 10 per cent of milk (V/V), cane sugar, skim milk powder and stabilizer was used @ 8%, 5% and 0.01% of weight of milk for all treatments respectively. Each treatment was replicated six times.

Chemical properties of milk: Chemical properties of milk shake developed by incorporating of ginger juice were determined by the standard methods. Treatment wise representative samples of buffalo milk, milk shake were subjected to the chemical evaluation as below:

Total solids: The percent of total solids was determined by Gravimetric method as per IS: IS: 1479(part II) 1961.

Fat: The fat content in milk shake was determined by Gerber method as described in IS: 1224 (Part-I), 1977.

Protein: The protein was determined by estimating the per cent nitrogen by Micro-Kjeldhal method as recommend in IS: 1479 (Part- II), 1961. The per cent nitrogen was multiplied by 6.38 to find out the protein percentage in milk shake.

Acidity: The acidity of milk shake expressed as per cent lactic acid was determined according to IS: 1479 (Part-I), 1960.

Ginger juice: The total solids, fat, protein and acidity were estimated as per procedure given in A.O.A.C. (1975).

Sensory evaluation of ginger milk shake: The milk shake was evaluated organoleptically for various quality attributes such as general appearance, consistency and flavour by a panel of ten judges. A score card as given below was prepared on the basis of 9 point hedonic scale as described in IS : 6273 (Part- II), 1971.

Statistical design and analysis: For the present investigation randomized block design was employed using five treatments and six replications. The data were tabulated and analyzed according to the statistical methods prescribed by Snedecor and Cochran (1994).

Flow chart

Ginger
↓
Washing
↓
Peeling
↓
Cutting
↓
Grinding
↓
Pressing
↓
Extraction
↓
Filtration (muslin cloth)
↓
Ginger extract/juice

Milk Shake Preparation

Fig 1: Flow chart for Preparation of Ginger Extract (Patel et al. 2007)
Flow diagram:

Buffalo whole milk
Preheating (50°C-70°C)
Addition of 5% skim milk powder (paste)
Heating (70°C)
Addition of sugar (8%) & stabilizer (0.01%)
Mixing
Filtration
Pasteurization (72°C for 30 minutes)
Cooling and ageing (10°C for 2-3 hrs.)
Addition of Ginger juice
Speed mixing (90-120 second)
Cooling (5°C)
Ready to serve

Fig 2: The milk shake was prepared as per the procedure given by Sharma and Gupta (1978) with slight modifications.

Extraction of ginger juice: Well matured, fresh ginger rhizomes were selected. Rhizomes were washed in running tap water to remove dirt and dust. For extraction of juice, rhizomes were peeled and then taken into electrically operated fruit juice maker to make juice. The juice was filtered through four fold muslin cloth. Juice obtained was used to mix at different levels during milk shake preparation.

RESULTS AND DISCUSSION

The present investigation was undertaken to evaluate chemical quality of Milk shake by incorporation with different levels of ginger juice. The results of present research work are average of six time replicated data tabulated, presented and discussed along with statistical analysis under following main heads.

Chemical analysis of buffalo milk: The fresh buffalo milk was analyzed for its chemical composition. The results are tabulated in Table 1.

The figures tabulated in Table 1 revealed that the buffalo milk used in present investigation was of good quality. It is clear from these average figures that total solids, fats, protein, and acidity within the limit of legal standards for milk in Maharashtra state are as prescribed by PFA rules, 1976 cited by De (2008).

Chemical analysis of ginger juice: The average chemical composition of ginger juice used in the present study is presented in Table 2.

The average total solids, fat, protein and acidity of ginger juice was observed as 12.38%, 1.17%, 1.32% and 0.19% respectively. The results are well comparable with the figures reported by Pruthi (1980) Pinto (2004) and Nath et al. (2005) reported total soluble solids as 4.3% and acidity 0.13% in ginger juice.

Chemical analysis of milk shake: The proximate analysis of milk shake prepared by using different levels of ginger
Table 1: Average chemical analysis of buffalo milk (%).

<table>
<thead>
<tr>
<th>Constituents</th>
<th>Fat</th>
<th>Total solids</th>
<th>Acidity</th>
<th>Protein</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>6.46</td>
<td>15.73</td>
<td>0.14</td>
<td>3.82</td>
</tr>
</tbody>
</table>

Table 2: Chemical analysis of ginger juice (%)

<table>
<thead>
<tr>
<th>Chemical Parameter</th>
<th>Fat</th>
<th>Total solids</th>
<th>Acidity</th>
<th>Protein</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>1.17</td>
<td>12.38</td>
<td>0.19</td>
<td>1.52</td>
</tr>
</tbody>
</table>

Table 3: Effect of different levels of ginger juice on chemical quality of milk shake (per cent).

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Chemical Parameter</th>
<th>Fat</th>
<th>Total solids</th>
<th>Acidity</th>
<th>Protein</th>
</tr>
</thead>
<tbody>
<tr>
<td>T&lt;sub&gt;0&lt;/sub&gt;</td>
<td>6.67&lt;sub&gt;c&lt;/sub&gt;</td>
<td>26.71&lt;sub&gt;c&lt;/sub&gt;</td>
<td>0.162&lt;sub&gt;a&lt;/sub&gt;</td>
<td>5.76&lt;sub&gt;b&lt;/sub&gt;</td>
<td></td>
</tr>
<tr>
<td>T&lt;sub&gt;1&lt;/sub&gt;</td>
<td>6.37&lt;sub&gt;c&lt;/sub&gt;</td>
<td>26.68&lt;sub&gt;c&lt;/sub&gt;</td>
<td>0.179&lt;sub&gt;b&lt;/sub&gt;</td>
<td>5.58&lt;sub&gt;b&lt;/sub&gt;</td>
<td></td>
</tr>
<tr>
<td>T&lt;sub&gt;2&lt;/sub&gt;</td>
<td>6.25&lt;sub&gt;bc&lt;/sub&gt;</td>
<td>25.87&lt;sub&gt;bc&lt;/sub&gt;</td>
<td>0.204&lt;sub&gt;b&lt;/sub&gt;</td>
<td>5.58&lt;sub&gt;b&lt;/sub&gt;</td>
<td></td>
</tr>
<tr>
<td>T&lt;sub&gt;3&lt;/sub&gt;</td>
<td>5.93&lt;sub&gt;ab&lt;/sub&gt;</td>
<td>24.93&lt;sub&gt;bc&lt;/sub&gt;</td>
<td>0.212&lt;sub&gt;c&lt;/sub&gt;</td>
<td>5.41&lt;sub&gt;b&lt;/sub&gt;</td>
<td></td>
</tr>
<tr>
<td>T&lt;sub&gt;4&lt;/sub&gt;</td>
<td>5.60&lt;sub&gt;a&lt;/sub&gt;</td>
<td>21.90&lt;sub&gt;a&lt;/sub&gt;</td>
<td>0.215&lt;sub&gt;d&lt;/sub&gt;</td>
<td>4.50&lt;sub&gt;a&lt;/sub&gt;</td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>6.16</td>
<td>25.21</td>
<td>0.19</td>
<td>5.37</td>
<td></td>
</tr>
<tr>
<td>SEm±</td>
<td>0.10239</td>
<td>0.277</td>
<td>0.00115</td>
<td>0.08916</td>
<td></td>
</tr>
<tr>
<td>CD</td>
<td>0.4108 **</td>
<td>1.113**</td>
<td>0.00461 **</td>
<td>0.3577 **</td>
<td></td>
</tr>
</tbody>
</table>

**= significant at 1% level significance

Table 4: Effect of different levels of ginger juice on sensory characteristics of milk shake.

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Sensory Parameters( Using 9 point hedonic scale ).</th>
<th>Overall Acceptability</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>General appearance</td>
<td>Flavour</td>
</tr>
<tr>
<td>T&lt;sub&gt;0&lt;/sub&gt;</td>
<td>7.51</td>
<td>5</td>
</tr>
<tr>
<td>T&lt;sub&gt;1&lt;/sub&gt;</td>
<td>7.64</td>
<td>3</td>
</tr>
<tr>
<td>T&lt;sub&gt;2&lt;/sub&gt;</td>
<td>8.05</td>
<td>1</td>
</tr>
<tr>
<td>T&lt;sub&gt;3&lt;/sub&gt;</td>
<td>7.68</td>
<td>2</td>
</tr>
<tr>
<td>T&lt;sub&gt;4&lt;/sub&gt;</td>
<td>7.54</td>
<td>4</td>
</tr>
<tr>
<td>Cal x&lt;sup&gt;2&lt;/sup&gt; =</td>
<td>13.67</td>
<td>4.167</td>
</tr>
<tr>
<td>Table x&lt;sup&gt;2&lt;/sup&gt; =</td>
<td>9.49</td>
<td>9.49</td>
</tr>
</tbody>
</table>

juice was carried out for fat, protein, acidity and total solids. The results and statistical analysis are furnished in Table 3.

**Total solids:** The observations in respect of total solids content in milk shake are given in Table 3.

The perusal of Table 3 indicates that the total solids content in plain milk shake was found to be 26.71 per cent. The total solids content of milk shake showed decreasing trend with the increase in the level of ginger juice due to low total solids content in ginger juice. It was lowest at 10% per cent level (21.90 per cent) The total solids content in milk shake due to different levels of ginger juice differed significantly (P<0.01). The treatment T<sub>4</sub> (10% ginger juice) was significantly different from rest of the treatments. Sharma and Gupta (1978), Varpe (1992) and Kshirsagar (1996) found 17.00 per cent, 26.557 per cent and 24.320 per cent total solids, respectively in plain milk shake, which are more or less comparable with the results obtained in present study.

**Fat:** The observations in respect of fat content of milk shake are given in Table 3. The data revealed that average fat content of milk shake was 6.16 per cent. It is seen that fat content was the highest in plain milk shake (6.67 per cent) which may be due to the fact that no ginger juice was added in this treatment. The juice had very low content of fat. From the table, it can be seen that as the level of ginger juice increased, the fat content decreased significantly (P<0.01). Milk shake of control group has the highest fat content but on par with T<sub>1</sub> (2.5% ginger juice) and T<sub>2</sub> (5% ginger juice treatments). The results obtained are in agreement with those of Sharma and Gupta (1978), Varpe (1992) and Kshirsagar (1996). They reported 4.0, 3.366 and 2.212 per cent fat for plain milk shake.

**Acidity:** The data on titratable acidity of milk shake are presented in Table 3.
The results from Table 3 indicated that the average acidity of milk shake irrespective treatments and replications was 0.19 per cent. The acidity of milk shake showed increasing trend with an increase in the level of ginger juice. The highest acidity was observed at 10 per cent ginger milk shake i.e. T₄ (0.215 per cent.) whereas the lowest was observed in control i.e. T₀ (0.162 per cent). All the treatments differed significantly from each other.

The results of acidity of plain milk shake are very well comparable with those of Varpe (1992) and Kshirsagar (1996). The statistical analysis of the data indicates that the acidity increased significantly with the increase in the level of ginger juice in milk shake.

**Sensory characteristics of ginger milk shake**

The proximate analysis of Milk shake prepared by using different levels of Ginger juice was carried out for general appearance, flavour, Consistency and overall acceptability. The results and statistical analysis are furnished in Table 4.

Most accepted treatment T₂ i.e addition of ginger juice 5 per cent which rank first is presented and tabulated in Table 4.

**CONCLUSION**

From the results of the present investigation, it may be concluded that ginger juice could be successfully utilized for preparation of milk shake. Addition of different level ginger juice in milk shake Control, 2.5 per cent, 5 per cent, 7.5 per cent, and 10 per cent of milk (V/V). The different chemical properties are determined. It is concluded that increase in level of ginger juice significantly decreased in Total solid, fat, Protein and increased in acidity of milk shake. According to sensory evaluation most accepted treatment(T₂) has contained 6.25, 25.87, 0.204 and 5.58 per cent fat, Total solid, acidity and protein respectively.

**REFERENCES**


Department of Animal Husbndry and Dairying Marathwada Agricultural University Parbhani, India.


GOI (2015-16) (source : Department of animal husbandry dairy and fisheris ministry of GOL.)