Studies on physical and sensory properties of soy milk blended kheer with buffalo milk


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ABSTRACT

The present investigation was undertaken with object of studying the standard procedure of preparation of kheer from buffalo milk blended with soy milk and studied for its sensory properties. Kheer was prepared from buffalo milk with constant level of sugar (8 per cent by volume of the milk) and different levels of soy milk as T<sub>2</sub> (90:10), T<sub>3</sub> (80:20) and T<sub>4</sub> (70:30) and compared with control sample T<sub>1</sub> (100:00) for its sensory properties. The sensory score for overall acceptability of soy kheer of treatments T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub> and T<sub>4</sub> were 8.53, 8.25, 8.746 and 6.40, respectively. It was observed that Kheer prepared by using 20 per cent soy milk secured highest score for overall acceptability (8.25) followed by control sample (8.53) ranked between like very much to like extremely. Blending of soy milk beyond 10 per cent in the blend scored towards lower side by panel of judges.

Key words: Buffalo milk, Cost of production, Kheer, Sensory evaluation, Soy milk.

INTRODUCTION

Kheer is a very delicious cereal based indigenous milk product. It is popular throughout the country, and enjoyed by all sections of the society, because of its good taste, higher nutritional value and relatively lowers cost. Conventionally, it is prepared by partial dehydration of whole milk in a karahi over a fire together with sugar and usually rice or semolina (De et al., 1982.). Kheer is known by different names, in different parts of the country, such as ‘Kheer’ in North Western region, ‘payasam’ in Southern region, ‘payas’ in Eastern region, ‘phirni’ in Northern region, ‘kheech in Mewar region and ‘payesh’ in Bengal. (Aneja et al., 2002) It is used as sweet dish at all ceremonial occasions and festivals and relished by all the age groups.

Traditional Indian products include several innovative blends used in the preparation of variety of milk-based delicacies. Kheer, a sweet milk-rice confection, finds mention as payasa in Buddhist- Jain literature in 400 BC.

In spite of remarkable increase in milk production, the milk and milk products are out of reach of vulnerable group, due to the high cost of milk and milk products. These situations demanded to development of the low cost substitute for milk and milk products in country and scientists have been standardized the procedure for manufacture of milk and milk products from groundnut, safflower, coconut soybean and peanut.

Soy milk is free of milk sugar (lactose) and is good choice for people who are lactose intolerant. A variety of acceptable foods can be developed from soybean to fit in the Indian diet. In soybean seeds protein content (40.00 %) and appreciable quantity of oil (20 %). The preparation of soy milk seems to be an alternative to milk. Efforts have been made to prepare low cost milk using soybean seeds.

Soy milk is an excellent source of good quality protein. Hence, looking to the nutritional and therapeutic importance of soy milk, it is proposed to utilize soy milk in the preparation of Kheer.

MATERIALS AND METHODS

Preparation of soy milk: The soy milk was prepared as per method given by Kapoor et al. (1977) and Grover et al. (1983). 250 g of soybean seeds were weighed and washed with water. After washing soak the seeds over night in water with addition of (NaHCO3 @ 0.03 %) for removal of beany flavor. Dehulling of seeds was done followed by addition of lukewarm water at ratio of 1:4 proportions and then blended in mixer. The milk was then filtered through double layered muslin cloth. Boil the milk for 2 minutes to detect its heat stability.

Blending of buffalo milk and soy milk: For preparation of Kheer following blends of buffalo milk and soy milk were studied.

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Buffalo milk was purchased from local market of Latur city (Natural Amrut Private Limited), which was standardized at 6.0 per cent fat level and was used for preparation of Kheer after pasteurization. The pure soybean seeds of variety JS-335 required for preparation of Kheer was obtained from local market of Latur city.

**Method of preparation of soy milk:**

**Flow diagram for preparation of soy milk**

1. Receiving fresh buffalo milk
2. Standardization of buffalo milk (at 6.00 per cent fat and 9 per cent SNF)
3. Buffalo milk blended with soy milk (as per treatment)
4. Heating of milk at 90°C
5. Addition of rice Basmati Sadhu rice @ 2.5% of milk
6. Condensing (1.8:1)
7. Addition of sugar (8%)
8. Kheer (2:1 conc.)
9. Cooling to room temperature
10. Storage (at 4°C)

**Flow chart for preparation of Kheer from buffalo milk blended with soy milk**

1. Soybean seeds (250 g)
2. Seed washed with hot water
3. Soaked over night (60°C water) (NaH CO₃ @ 0.3 %)
4. Dehulling
5. Addition of lukewarm water (1:4)
6. Grinding
7. Boiled for 2 minutes
8. Filtrate through double layer muslin cloth
9. Soy milk

The product was evaluated for its sensory quality by a panel of 10 judges selected from the staff of Department of Animal Husbandry and Dairy Science, College of Agriculture, Latur, using 9 point Hedonic scale as described by Gupta (1976). The Kheer prepared from different blends of buffalo milk and soy milk were subjected to sensory evaluation for colour and appearance, flavor, consistency, body and texture and overall acceptability. The results obtained during the course of investigation were subjected to statistical analysis by using Completely Randomized Design (CRD) as described by Panse and Sukhatme (1967).

**RESULTS AND DISCUSSION**

**Sensory evaluation of Kheer:** The mean score for color and appearance of the Kheer ranged between 8.75 to 5.37. The Kheer prepared by blending 10% soy milk was ranked between like very much to like extremly. Scoring higher point i.e. 8.25 below control samples (8.75) followed by T₃ (7.37). The lowest score was observed for T₄ i.e. (5.37). This indicates that, increased in proportion of soy milk in the blend decreased the score for color and appearance of Kheer. As the proportion of soy milk in the blend increase there was increased in the intensity of dull colour (Table 1).

The intensity of dull color was increased in Kheer as part of soy milk increased might be due to the browning and caramalization of carbohydrates present in soy milk and components of soy milk. Upadhay, (2011).

It is revealed from the Table 2 that the mean score for flavour of the Kheer ranged between 8.62 to 6.50. The mean score for treatment T₁, T₂, T₃ and T₄ were 8.62, 8.25, 7.50 and 6.50, respectively. Treatment control (T₁) scored the highest score followed by T₃, T₂ and T₄. This indicates that increase in proportion of soy milk in the blend decreases the score for flavour of Kheer. As the proportion of soy milk increased there were increased in the beany flavour of Kheer.

**TABLE 1: Colour and appearance score of Kheer**

<table>
<thead>
<tr>
<th>Treatments</th>
<th>R-I</th>
<th>R-II</th>
<th>R-III</th>
<th>R-IV</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>T₁</td>
<td>9.0</td>
<td>9.0</td>
<td>8.5</td>
<td>9.0</td>
<td>8.75</td>
</tr>
<tr>
<td>T₂</td>
<td>8.5</td>
<td>8.5</td>
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<td>8.5</td>
<td>8.25</td>
</tr>
<tr>
<td>T₃</td>
<td>7.5</td>
<td>7.5</td>
<td>7.0</td>
<td>7.5</td>
<td>7.37</td>
</tr>
<tr>
<td>T₄</td>
<td>5.5</td>
<td>5.0</td>
<td>5.5</td>
<td>5.5</td>
<td>5.37</td>
</tr>
</tbody>
</table>

SE±0.13  CD @ 5 % 0.409

**TABLE 2: Flavour score of Kheer**

<table>
<thead>
<tr>
<th>Treatments</th>
<th>R-I</th>
<th>R-II</th>
<th>R-III</th>
<th>R-IV</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>T₁</td>
<td>8.5</td>
<td>8.5</td>
<td>9</td>
<td>8.5</td>
<td>8.62</td>
</tr>
<tr>
<td>T₂</td>
<td>8.5</td>
<td>8.5</td>
<td>8.0</td>
<td>8.0</td>
<td>8.25</td>
</tr>
<tr>
<td>T₃</td>
<td>7.0</td>
<td>8.0</td>
<td>8.5</td>
<td>7.5</td>
<td>7.50</td>
</tr>
<tr>
<td>T₄</td>
<td>6.5</td>
<td>6.0</td>
<td>7.5</td>
<td>6.0</td>
<td>6.50</td>
</tr>
</tbody>
</table>

SE±0.23  CD @ 5 % 0.694
which was noticed by the judges. There were significant differences between T_1, T_3 and T_4 whereas treatment T_2 and T_4 was at par with each other. The soya odour in soya foods are primarily derived from lipoxinagenase-catalyzed enzymatic oxidation or auto oxidation of linoleic and lenolic acid.

It is apparent from Table 3 that mean score for the consistency of Kheer was in the range of 8.50 to 6.87, found between moderately like and extremely like the mean consistency score of treatments T_1, T_2, T_3 and T_4 was 8.50, 8.37, 7.37 and 6.87, respectively.

There were significant differences for consistency score between T_1 and T_2 over T_3 and T_4 whereas T_2 was not significantly differ from control.Treatment T_1 and T_2 was at par with each other but significantly differ from T_3 and T_4, indicate that increased proportion of soy milk affected on consistency of experimental Kheer. This might be due to different types of protein and carbohydrates contain in soy milk than buffalo milk which affect on consistency of Kheer.

It is observed from the Table 4 that the mean score for body and texture of the Kheer ranged between 8.25 to 6.87 per cent. It was lowest in T_4 (6.87) and highest in T_1 (8.25).

<table>
<thead>
<tr>
<th>Treatments</th>
<th>R-I</th>
<th>R-II</th>
<th>R-III</th>
<th>R-IV</th>
<th>Mean</th>
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</thead>
<tbody>
<tr>
<td>T_1</td>
<td>8.5</td>
<td>9.0</td>
<td>8.5</td>
<td>8.0</td>
<td>8.50^*</td>
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<td>T_2</td>
<td>8.5</td>
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<td>8.5</td>
<td>8.5</td>
<td>8.37^*</td>
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<td>T_3</td>
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<td>7.0</td>
<td>8.0</td>
<td>7.37^b</td>
</tr>
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<td>T_4</td>
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<td>7.0</td>
<td>7.0</td>
<td>6.87^b</td>
</tr>
</tbody>
</table>

The mean score for treatment T_1, T_2, T_3 and T_4 were 8.25, 8.12, 7.62 and 6.87, respectively. It is clear from mean value that treatment T_1 (control) scored the highest score followed by T_2, T_3 and T_4. This indicated that increase in proportion of soy milk in the blend decreased the score for body and texture of the Kheer. There were significant differences between T_1 & T_4, T_2 & T_4, T_3 & T_4 whereas, non-significant difference was observed between T_1 & T_2.

**Sensory quality of Kheer:** From the Table 5 it can be seen that the score of overall acceptability for treatment T_1, T_2, T_3, and T_4 were 8.53, 8.25, 7.46 and 6.40 respectively. Treatment T_1 had highest score followed by T_3, T_4 and T_2. There were significant differences in the scores of treatment T_1 & T_4, T_1 & T_3, T_1 & T_2, T_2 & T_3, T_2 & T_4 whereas, treatment T_1 & T_2 at par with each other.

Chaudhary, (2006) was also notifying the result which was showing same trend for Kheer as found in this study for overall acceptability. She was found the average score from 95.14 to 76.38 in the Kheer prepared from soy milk and cow milk that means the cow milk Kheer had maximum acceptability out of 100 score. T_1 got 95.14 and T_4 got 76.38 out of 100 which show that the increased in the proportion of the soy milk decreased the overall acceptability of Kheer due to increasing in the beany flavor.

All the sensory parameters (colour and appearance, flavor, consistency, body & texture, and overall acceptability) were scored more than acceptable points up to extremely like except treatment T_4 for colour and appearance, which was prepared by using 30% soy milk. It indicates that up to 30% soy milk might be success for Kheer preparation, if we can improve the colour and appearance by any means. But in our study treatment T_1 and T_2 were scored maximum in all sensory reports were considered as acceptable Kheer and used for further study.

**CONCLUSION**

Based on above results it may be concluded that soy milk was very well utilized for preparation of Kheer. In our study treatment T_2 (90:10) was scored maximum in all sensory reports were considered as acceptable Kheer and used for further study.

**ACKNOWLEDGEMENT**

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<table>
<thead>
<tr>
<th>Treatments</th>
<th>Colour and appearance</th>
<th>Flavour</th>
<th>Consistency</th>
<th>Body and texture</th>
<th>Overall acceptability</th>
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<tr>
<td>T_0</td>
<td>8.75</td>
<td>7.62</td>
<td>7.50</td>
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<td>8.53^*</td>
</tr>
<tr>
<td>T_1</td>
<td>8.25</td>
<td>8.25</td>
<td>8.37</td>
<td>8.12</td>
<td>8.25^*</td>
</tr>
<tr>
<td>T_2</td>
<td>7.37</td>
<td>7.50</td>
<td>7.37</td>
<td>7.62</td>
<td>7.46^*</td>
</tr>
<tr>
<td>T_3</td>
<td>5.37</td>
<td>6.5</td>
<td>6.87</td>
<td>6.87</td>
<td>6.40^*</td>
</tr>
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</table>

SE ±0.19 CD at 5% 0.588
REFERENCES