Chemical Evaluation of Low Calorie Shrikhand Prepared by Using Various Artificial Sweeteners

Ramji Lal, P.K. Upadhayay, Anoop Singh Chauhan* and Neeraj Gupta
Dept. of Animal Husbandry & Dairying
C.S. Azad University of Agriculture & Technology Kanpur, U.P. India – 208002
*Corresponding Author E-mail: aschauhan7569@gmail.com
Received: 3.09.2017 | Revised: 10.10.2017 | Accepted: 14.10.2017

ABSTRACT
This study was conducted to evaluate the chemical quality of low calorie shrikhand by using artificial sweeteners. There were three different culture Streptococcus lactis (A1), Streptococcus cremoris (A2) and Streptococcus diacetilactis (A3) used at two different incubation temperature as 30°C (B1) and 37°C (B2) for preparation of shrikhand. Four substances like, sucrose (C1) as control, saccharin (C2) and aspartame (C3) were used as sweetener in low calorie shrikhand. The chemical evaluation of various attributes like moisture, fat, protein, lactose, sucrose, ash and acidity percentage were evaluated in chemistry laboratory of Department of Animal Husbandry and Dairying, Chandra Shekhar Azad University of Agriculture and Technology Kanpur, U.P. This process was replicated three times. After the evolution, it is concluded the maximum chemical content of low calorie shrikhand was that contained streptococcus diaacetilactic culture at 37°C incubation temperature with sucrose as sweetening agent followed by aspartame and saccharine.

Key words: Chemical quality, Shrikhand, Artificial sweeteners, Low calorie.

INTRODUCTION
Shrikhand is an indigenous semi-soft, sweetish-sour, whole milk delicious and healthful dessert, particularly in western part of India and prepared from lactic fermented curd. It is made with chakka (strained yoghurt/curd) which is finely mixed with sugar and flavouring agents. It has the nutritive goodness of fermented milk products. Like dahi (curd), it is very refreshing particularly during summer months. It is popular because of its characteristics flavour, taste, palatable nature and possible therapeutic value4. To reduce the cost and enhance nutritive value of yoghurt some vegetable product has also been incorporated in the milk5.

The exact origin of Shrikhand is unknown but Western India is credited with the first historical mention of the dish. The dish is very popular in Gujarat and Rajasthan but other states like Maharashtra and Punjab do have local variations that are popular too4. Although there is no exact record of how the dish came about, the legend states that travelling herdsmen hung curd or yoghurt overnight to make it easier to carry while travelling.
The thick yoghurt that was collected the next day was mixed with sugar and nuts to make it palatable during the long journey\(^1\). At present, it occupies a better place among the confectionaries prepared in the country.

*Shrikhand* has very high nutritive characteristics flavour, taste, palatable nature and possible therapeutic value whether it is prepared from curd or yoghurt. *Shrikhand* is very refreshing Indian fermented dairy dessert particularly during summer months which improves the digestive system by strengthening immune system. Keeping all the above mentioned nutritional benefits in the mind we can say that *shrikhand* is the health food.

Since the application of intense sweeteners in indigenous dairy products is new, therefore quantitative information on the sweeteners in the dairy system is required. Considering the need of consumers for low calorie dairy products there is a considerable scope to study the effect of incorporation of fat replacers, intense sweeteners and bulking agents on the quality characteristics of shrikhand which is considered as highly calorific dairy product.

**MATERIAL AND METHODS**

**PREPARATION OF SHRIKHAND:** For preparing the *Shrikhand* buffalo milk was received from dairy from of Chandra Shekhar Azad University of Agricultural and Technology Kanpur, then suitable culture was added and the *Shrikhand* was prepared as for the flow chart given below:

**Flow Chart for Shrikhand Preparation**

1. Buffalo milk
2. Filtration
3. Standardization (6% fat and 9% S.N.F)
4. Heating (85\(^\circ\)C for 30 minutes)
5. Cooling (25-30\(^\circ\)C)
6. Inoculation (2 percent starter culture)
7. Incubation (30-37\(^\circ\)C for 10-12 hrs)
8. Cutting/Breaking the Curd
9. Drainage of Whey
10. Chakka
11. Additional of Sweeteners/filler (maltodextrin)
12. Mixing and whipping
13. Packaging and storage (5\(^\circ\)C)
There were three different culture *Streptococcus lactic* (A1), *Streptococcus cremoris* (A2) and *Streptococcus diaacetilactis* (A3) used at two different incubation temperature as 30°C (B1) and 37°C (B2) for preparation of shrikhand. Four substances like, sucrose (C1) as control, saccharin (C2) and aspartame (C3) were used as sweetener in low calorie shrikhand. The chemical evaluation of various attributes like moisture, fat, protein, lactose, sucrose, ash and acidity percentage were evaluated in chemistry laboratory of Department of Animal Husbandry and Dairying, Chandra Shekhar Azad University of Agriculture and Technology Kanpur, U.P. Moisture was determined by AOAC\(^1\) method. Fat content in the sample was estimated by the procedure given in AOAC\(^1\). The protein content was determined by Micro-Kjeldahl’s process as described in AOAC\(^1\). Lactose, Sucrose Ash and acidity content were determined by the method described in AOAC\(^1\). The data on chemical evaluation obtained during the study were subjected for analysis of variance (ANOVA) as described by Snedecor and Cochran\(^8\).

**RESULTS AND DISCUSSIONS**

**Moisture percentage**
The minimum moisture percentage of experimental low calorie *Shrikhand* was prepared by using three artificial sweeteners with three different cultures at two different incubation temperatures 39.10 percent while maximum moisture percent was 39.87 for A\(_3\)xB\(_2\)xC\(_1\) and A\(_1\)xB\(_1\)xC\(_2\), respectively. The combination that contained *streptococcus diaacetilactis* culture at 37°C incubation temperature with sucrose as sweetening agent got minimum moisture percentage and maximum moisture percentage was found to the sample that contained streptococcus lactis incubated at 30°C with sachcharine as sweetening agent. All the factors and their interactions were found to be non significant on flavour score (P>0.05) Singh et al\(^5\).

**Fat percentage**
The maximum fat percentage of experimental low calorie *Shrikhand* was prepared by using three artificial sweeteners with three different cultures at two different incubation temperatures 9.91 percent while minimum fat percent was 9.35 for A\(_3\)xB\(_2\)xC\(_1\) and A\(_1\)xB\(_1\)xC\(_2\), respectively. The combination that contained *streptococcus diaacetilactis* culture at 37°C incubation temperature with sucrose as sweetening agent got maximum fat percentage and minimum fat percentage was found to the sample that contained streptococcus lactis incubated at 30°C with sachcharine as sweetening agent. All the factors and their interactions were found to be non significant on flavour score (P>0.05) Bhogra and Mathur\(^2\).

**Protein percentage**
The maximum protein percentage of experimental low calorie *Shrikhand* was prepared by using three artificial sweeteners with three different cultures at two different incubation temperatures 5.22 percent while minimum protein percent was 5.14 for A\(_3\)xB\(_2\)xC\(_1\) and A\(_1\)xB\(_1\)xC\(_2\), respectively. The combination that contained *streptococcus diaacetilactis* culture at 37°C incubation temperature with sucrose as sweetening agent got maximum protein percentage and minimum protein percentage was found to the sample that contained streptococcus lactis incubated at 30°C with sachcharine as sweetening agent. All the factors and their interactions were found to be non significant on flavour score (P>0.05) Kumar et al\(^3\).

**Lactose percentage**
The maximum lactose percentage of experimental low calorie *Shrikhand* was prepared by using three artificial sweeteners with three different cultures at two different incubation temperatures 4.42 percent while minimum lactose percent was 4.35 for A\(_3\)xB\(_2\)xC\(_1\) and A\(_1\)xB\(_1\)xC\(_2\), respectively. The combination that contained *streptococcus diaacetilactis* culture at 37°C incubation temperature with sucrose as sweetening agent got maximum lactose percentage and minimum lactose percentage was found to the sample that contained streptococcus lactis incubated at 30°C with sachcharine as sweetening agent. All the factors and their interactions were found to be non significant on flavour score (P>0.05) Singh et al\(^5\).
interactions were found to be non significant on flavour score (P>0.05) Singh et al6.

**Sucrose percentage**

The result of the investigation in the respect of sucrose attributes on account of various treatments in the control treatment 40% sugar has been found which was based on addition of sugar in reaming combinations sucrose has been found to nil (zero) due to addition of artificial sweeteners in as a components of sweetening agent these sweeteners are calorie free due to trace amount of carbohydrate Kumar et al3.

**Ash percentage**

The maximum ash percentage of experimental low calorie Shrikhand was prepared by using three artificial sweeteners with three different cultures at two different incubation temperatures 0.52 percent while minimum ash percent was 0.50 for AxB2xC1 and AxB1xC2, respectively. The ash percentage ranges 0.50-0.52 among all the combinations. All the factors and their interactions were found to be non significant on flavour score (P>0.05) Bhogra and Mathur5.

**Titrable acidity**

The maximum titrable acidity percentage of experimental low calorie Shrikhand was prepared by using three artificial sweeteners with three different cultures at two different incubation temperatures 0.83 percent while minimum titrable acidity percent was 0.79 for AxB2xC1 and AxB1xC3, respectively. The titrable acidity ranges 0.79-0.83 percent among all combinations. All the factors and their interactions were found to be non significant on flavour score (P>0.05) Singh et al6.

## Total solids

The maximum total solids percentage of experimental low calorie Shrikhand was prepared by using three artificial sweeteners with three different cultures at two different incubation temperatures 60.90 percent while minimum total solids percent was 60.13 for AxB2xC1 and AxB1xC3, respectively. The combination that contained streptococcus diaacetilactic culture at 37°C incubation temperature with sucrose as sweetening agent got maximum total solids percentage and minimum total solids percentage was found to the sample that contained streptococcus lactic incubated at 30°C with sachcharine as sweetening agent. All the factors and their interactions were found to be non significant on flavour score (P>0.05) Singh et al6.

### Table: chemical findings of srikhand -

<table>
<thead>
<tr>
<th>Combinations</th>
<th>Moisture</th>
<th>Fat</th>
<th>Protein</th>
<th>Lactose</th>
<th>Sucrose</th>
<th>Ash</th>
<th>Titrable acidity</th>
<th>Total solids</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1B1C1</td>
<td>39.25</td>
<td>9.88</td>
<td>5.18</td>
<td>4.38</td>
<td>40</td>
<td>0.51</td>
<td>0.8</td>
<td>60.75</td>
</tr>
<tr>
<td>A1B1C2</td>
<td>39.87</td>
<td>9.35</td>
<td>5.14</td>
<td>4.35</td>
<td>0</td>
<td>0.51</td>
<td>0.8</td>
<td>60.13</td>
</tr>
<tr>
<td>A1B1C3</td>
<td>39.79</td>
<td>9.37</td>
<td>5.16</td>
<td>4.37</td>
<td>0</td>
<td>0.51</td>
<td>0.8</td>
<td>60.21</td>
</tr>
<tr>
<td>A1B2C1</td>
<td>39.18</td>
<td>9.9</td>
<td>5.2</td>
<td>4.4</td>
<td>40</td>
<td>0.52</td>
<td>0.8</td>
<td>60.82</td>
</tr>
<tr>
<td>A1B2C2</td>
<td>39.28</td>
<td>9.87</td>
<td>5.16</td>
<td>4.37</td>
<td>0</td>
<td>0.52</td>
<td>0.8</td>
<td>60.72</td>
</tr>
<tr>
<td>A1B2C3</td>
<td>39.23</td>
<td>9.89</td>
<td>5.18</td>
<td>4.39</td>
<td>0</td>
<td>0.52</td>
<td>0.79</td>
<td>60.77</td>
</tr>
<tr>
<td>A2B1C1</td>
<td>39.27</td>
<td>9.87</td>
<td>5.17</td>
<td>4.37</td>
<td>40</td>
<td>0.5</td>
<td>0.8</td>
<td>60.73</td>
</tr>
<tr>
<td>A2B1C2</td>
<td>39.37</td>
<td>9.84</td>
<td>5.13</td>
<td>4.34</td>
<td>0</td>
<td>0.5</td>
<td>0.8</td>
<td>60.63</td>
</tr>
<tr>
<td>A2B1C3</td>
<td>39.31</td>
<td>9.86</td>
<td>5.15</td>
<td>4.36</td>
<td>0</td>
<td>0.5</td>
<td>0.8</td>
<td>60.69</td>
</tr>
<tr>
<td>A2B2C1</td>
<td>39.21</td>
<td>9.89</td>
<td>5.19</td>
<td>4.39</td>
<td>40</td>
<td>0.5</td>
<td>0.8</td>
<td>60.79</td>
</tr>
<tr>
<td>A2B2C2</td>
<td>39.31</td>
<td>9.86</td>
<td>5.15</td>
<td>4.36</td>
<td>0</td>
<td>0.5</td>
<td>0.8</td>
<td>60.69</td>
</tr>
<tr>
<td>A2B2C3</td>
<td>39.24</td>
<td>9.88</td>
<td>5.17</td>
<td>4.38</td>
<td>0</td>
<td>0.52</td>
<td>0.81</td>
<td>60.76</td>
</tr>
<tr>
<td>A3B1C1</td>
<td>39.15</td>
<td>9.89</td>
<td>5.2</td>
<td>4.4</td>
<td>40</td>
<td>0.52</td>
<td>0.84</td>
<td>60.85</td>
</tr>
<tr>
<td>A3B1C2</td>
<td>39.26</td>
<td>9.86</td>
<td>5.16</td>
<td>4.37</td>
<td>0</td>
<td>0.52</td>
<td>0.83</td>
<td>60.74</td>
</tr>
<tr>
<td>A3B1C3</td>
<td>39.21</td>
<td>9.88</td>
<td>5.18</td>
<td>4.39</td>
<td>0</td>
<td>0.52</td>
<td>0.82</td>
<td>60.79</td>
</tr>
<tr>
<td>A3B2C1</td>
<td>39.1</td>
<td>9.91</td>
<td>5.22</td>
<td>4.42</td>
<td>40</td>
<td>0.52</td>
<td>0.83</td>
<td>60.9</td>
</tr>
<tr>
<td>A3B2C2</td>
<td>39.2</td>
<td>9.88</td>
<td>5.18</td>
<td>4.39</td>
<td>0</td>
<td>0.52</td>
<td>0.83</td>
<td>60.8</td>
</tr>
<tr>
<td>A3B2C3</td>
<td>39.14</td>
<td>9.9</td>
<td>5.2</td>
<td>4.41</td>
<td>0</td>
<td>0.52</td>
<td>0.83</td>
<td>60.86</td>
</tr>
</tbody>
</table>
CONCLUSIONS
The study of this investigation revealed that the maximum chemical content of low calorie shrikhand was containing streptococcus diaacetilactic culture fallowed by Streptococcus cremoris and Streptococcus lactic. The favourable incubation temperature was 37°C followed by 30°C and the sucrose as sweetening agent preferred over aspartame and saccharine. After the evolution, it is concluded the maximum chemical content of low calorie shrikhand was that contained Streptococcus diaacetilactic culture at 37°C incubation temperature with sucrose as sweetening agent fallowed by aspartame and saccharine.

REFERENCES