Dhiraj H Kankhare, Sachin P Ramteke, Vishal S Dhumal and Awadhut V Yadav

Abstract
The present study was carried out with the objective of standardize the procedure for WPC fortified baby rasogolla. The chemical and sensory qualities of WPC incorporated rasogolla were assessed. The levels were selected as 09, 11, 13 and 15 per cent WPC for further study. The results obtained from organoleptic evaluation the treatment T2 (11% WPC) was rated best among WPC fortified baby rasogolla and was comparable to control rasogolla. The chemical composition of treatment T2 was 5.69, 12.57, 49.66, 50.25 and 0.24 per cent fat, protein, moisture, total solids and acidity, respectively.

Keywords: Channa, rasogolla, WPC, standardization, fortification

Introduction
Rasogolla is the most popular Indian sweetmeats that are valued for its characteristic texture. It is also a common milk product in India which is originated in Orissa, where it is also known by its original name, Khiramohana. Typically, a 100 gm serving of rasogolla contains 186 calories, out of which about 153 calories are in the form of carbohydrates. It also contains about 1.85 gms of fat and 4 gms of protein. Chhana contain 53.1% moisture, 24.8% fat, 17.8% protein. Whey protein is an acceptable protein source for healthy pregnant women and children provided they are not allergic to dairy proteins. It is highly soluble and very easy to digest. This is one of the reasons it is commonly used in infant formula and protein supplements for medical use. It was found to inhibit the growth of tumors more effectively than other food proteins. (Kassem, 2015) [13]. Whey protein has a biological value of 104, which is a higher score than casein, soya protein, beef and wheat gluten. WPC is rich in essential amino acids such as lysine, tryptophan, cystein and methionine. Whey proteins help to control the blood glucose levels and also provides additional beneficial for weight management which is a concern for type-2 diabetics (Shankar and Bansal, 2013) [15]. Whey protein concentrate was added in different milk products and food products like ice cream, yoghurt, beverages, dairy drinks, cheese, cookies, etc.

Whey is separated during preparation of rasogolla at that time good quality proteins passed in whey. To have benefits of whey proteins or to utilize good quality whey proteins specially for Childrens, it is decided to incorporate whey protein concentrate (WPC) for preparation of baby rasogolla.

Methodology
The fresh cow milk was procured from Research Cum Development Programme (RCDP) on Cattle, MPKV, Rahuri Dist. Ahmednagar and standardized at 3 per cent fat.

Preparation of Channa and baby Rasogolla
Experimental Channa and Rasogolla was prepared by the method as shown in Fig. 1 which was modified from the methods as reported by various scientists while control Rasogolla was prepared in the same manner.
Cow Milk (3% fat)
Heating of milk (95 °C for 5 min.)
Addition of citric acid solution (2% at 82 °C)
Draining the whey through muslin cloth
Chhana
Addition of WPC as per the treatment
Kneading for 10 min.
Small ball formation (3-4 gm)
Cooking in sugar syrup (100-106°C for 10 min.)
Soaking in sugar syrup (50% conc. For 10-12 hrs.)
Removing from sugar syrup
Ready to serve

Fig 1: Flow diagram for manufacture of WPC incorporated baby Rasogolla

Treatment detail
On the basis of 100 gm Chhana, levels of WPC in the final experimental trials were as 0 g WPC (T0), 9 g WPC (T1), 11 g WPC (T2), 13 g WPC (T3), 15 g WPC (T4). The experimental trials were subjected to sensory and chemical analysis.

Statistical analysis
The experiments were laid out in Completely Randomized Design (CRD) with four replications. (Snedecor and Cochran, 1994) [17].

Table 1: Sensory evaluation of Quarg type cheese prepared by using cow and goat milk

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Colour &amp; appearance</th>
<th>Body and Texture</th>
<th>Flavour</th>
<th>Overall acceptability</th>
</tr>
</thead>
<tbody>
<tr>
<td>T0</td>
<td>8.18</td>
<td>8.58</td>
<td>8.00</td>
<td>8.25</td>
</tr>
<tr>
<td>T1</td>
<td>8.30</td>
<td>8.40</td>
<td>8.22</td>
<td>8.30</td>
</tr>
<tr>
<td>T2</td>
<td>8.30</td>
<td>8.40</td>
<td>8.48</td>
<td>8.39</td>
</tr>
<tr>
<td>T3</td>
<td>7.95</td>
<td>8.30</td>
<td>8.38</td>
<td>8.21</td>
</tr>
<tr>
<td>T4</td>
<td>7.73</td>
<td>8.18</td>
<td>7.68</td>
<td>7.86</td>
</tr>
<tr>
<td>Mean</td>
<td>8.09</td>
<td>8.37</td>
<td>8.15</td>
<td>8.20</td>
</tr>
<tr>
<td>S.E.±</td>
<td>0.14</td>
<td>0.02</td>
<td>0.02</td>
<td>0.02</td>
</tr>
<tr>
<td>C.D. @ 5%</td>
<td>-</td>
<td>0.06</td>
<td>0.07</td>
<td>0.06</td>
</tr>
</tbody>
</table>

Values with different superscript differ significantly (P< 0.05)

Chemical analysis
Fat
It was observed that fat content is varied between the range of 5.04 to 6.11 per cent. The WPC level in rasogolla had very little effect on its fat content. Addition of WPC increases, increase in the fat content of rasogolla.

Protein
It was revealed from the results that the influence of WPC on protein content of rasogolla was statistically significant. The mean values of protein content of treatment T0, T1, T2, T3 and T4 were 5.16, 11.37, 12.57, 13.76 and 14.94 per cent, respectively. The protein content of rasogolla increased with incorporation of WPC from treatment T1 to T4. The highest value was reported for treatment T4 (14.94 per cent) which contain highest WPC. Lowest value observed for T0 (5.16 per cent) which contain no WPC.

Moisture
The moisture content of rasogolla decreased with incorporation of WPC from treatment T1 to T4. The lowest value was reported for treatment T4 (47.98 per cent) which contain highest WPC, highest value observed for T0 (54.50 per cent) which contain no WPC. Majorly WPC 80 contain about 96.06 per cent total solids and remaining are moisture i.e. only 3-4 per cent means WPC is a dried byproduct and

Result and Discussion
Sensory evaluation
The samples of the ‘WPC fortified baby Rasogolla’ were subjected to sensory evaluation for colour and appearance, body and texture, flavor and overall acceptability by adopting 9 point Hedonic scale. The score given by the judges are tabulated in Table 1.

Colour and appearance
It was observed that the rasogolla with 9 and 11 per cent WPC showed slight yellowish colour with clear and clean appearance which was liked very much by the judges.

Body and texture
The highest score was obtained by the control rasogolla (8.58) followed by the rasogolla with 9 per cent WPC (8.40) and 11 per cent WPC (8.40) means the treatment T1 and T2 are at par with each other. It seems that WPC provided adhesive and binding action up to 13% level of its addition. There after its impact as binding material might have eroded. At 15% level of addition, it affected on ball formation which resulted in breaking of balls during cooking.

Flavour
The score obtained for the flavour was significant. The sensory score for the flavour ranged 7.68 to 8.48. The highest score obtained by the T2 (8.48) and lowest by the Treatment T4 (7.68).

Overall acceptability
Rasogolla prepared by using 11 per cent WPC (T2) scored highest points (8.39) followed by treatment T3 (8.21) i.e. 13 per cent WPC, T1 (8.30) i.e. 9 per cent and T0 (8.25) i.e. control. Lowest score was recorded for T4 (7.86) i.e. rasogolla prepared with 15 per cent WPC. On the basis of results we can affirmatively state that amongst the different levels of WPC, T2 (11% WPC) treatment was found to be more acceptable by the judges.
because of that, as per increasing WPC levels in Chhana, the moisture content was decreasing in the final product.

**Total solid**
The total solid content of WPC fortified baby rasogolla ranges between 49.08 to 51.64 per cent and noted the significant difference between the treatments. The increasing trend in total solid of rasogolla was observed with increase in WPC levels. This might be due to high total solid (96.06 per cent) content in WPC 80.

**Acidity**
The acidity of the experimental treatments was ranged between 0.21 to 0.26 per cent of lactic acid. The increasing trend in acidity of rasogolla was observed due to addition of WPC.

### Table 2: Chemical analysis of baby Rasogolla

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Fat (%)</th>
<th>Protein (%)</th>
<th>Moisture (%)</th>
<th>T.S. (%)</th>
<th>Acidity (% L.A.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T₀</td>
<td>5.04</td>
<td>5.16</td>
<td>54.50</td>
<td>45.33</td>
<td>0.21</td>
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<tr>
<td>T₁</td>
<td>5.69</td>
<td>11.37</td>
<td>50.67</td>
<td>49.08</td>
<td>0.23</td>
</tr>
<tr>
<td>T₂</td>
<td>5.83</td>
<td>12.57</td>
<td>49.66</td>
<td>50.25</td>
<td>0.24</td>
</tr>
<tr>
<td>T₃</td>
<td>5.97</td>
<td>13.76</td>
<td>48.72</td>
<td>51.01</td>
<td>0.26</td>
</tr>
<tr>
<td>T₄</td>
<td>6.11</td>
<td>14.94</td>
<td>47.98</td>
<td>51.64</td>
<td>0.26</td>
</tr>
<tr>
<td>Mean</td>
<td>5.8</td>
<td>11.56</td>
<td>50.30</td>
<td>49.46</td>
<td>0.24</td>
</tr>
<tr>
<td>S.E.+</td>
<td>0.01</td>
<td>0.01</td>
<td>0.11</td>
<td>0.125</td>
<td>0.004</td>
</tr>
<tr>
<td>C.D. @ 5%</td>
<td>0.02</td>
<td>0.05</td>
<td>0.32</td>
<td>0.372</td>
<td>0.012</td>
</tr>
</tbody>
</table>

Values with different superscript differ significantly (P< 0.05)

**Conclusion**
The WPC 80 could be used to prepare baby rasogolla. The present investigation demonstrated that WPC acts as binding force and helps in improving body and textural attributes of rasogolla only up to certain limit. Its addition beyond certain point may exert adverse effects. The optimum level for fortification of WPC in baby rasogolla was found to be 11 per cent.

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**References**