Low fat channa spread from filled milk

Shailesh Kumar Yadav¹, Rekha Rani¹, Bhopal Singh² and DK Thompkinson¹

Abstract: There are mainly two types of spreads available in the domestic market - butter and cheese spread and both are high fat products. In present scenario, most consumers are fat conscious and hesitant to consume butter fat because of the possibility of coronary heart disease. The dairy industry is constantly looking for alternative product to create a new category of modified spread. Peanut which is rich in protein and low in cholesterol have been used to offer new options to the consumers. For preparation of filled milk channa spread, peanut milk was prepared by soaking the roasted peanut and extracting with grains water ratio of 1:8 and filtered to collect the resultant milk. Filled milk thus obtained was coagulated with 0.8% calcium lactate at coagulation temperature of 70°C. The filled milk channa was then used for preparation of acceptable quality of table spread. Sensory attributes showed that filled milk channa spread scored for colour and appearance (8.1), flavour and taste (8.22), body and texture (7.54), spreadability (8.50) and for the overall acceptability (8.25). This prepared filled milk channa spread was better than commercially available spread used as control. The resultant spread was found to contain total solids 54.74%, fat 40%, protein 4.95%, carbohydrate 2.26%, ash 5.53%, salt 2%, acidity 0.34% LA and pH 5.6. Microbiologically the standard plate count was 6x10⁶ cfu/g whereas, yeast and mold and coliform count were found to be absent.

Keywords: Filled milk channa, Filled milk channa spread, Peanut

Food companies world over have developed numerous substitutes products under the name table spreads which could take care of drawbacks associated with butter in relation to spreadability at low temperature and retention of consistency at ambient temperature. Considerable efforts have been made in India for development of fat spreads of dairy and non-dairy type using variety of ingredients like cream, vegetable oils/fats, skim milk powder, cheese, paneer, channa, chakka, buttermilk and ultra filtration (UF) retentate blended with buffalo milk and different vegetable oils. The attraction for suitable alternative to butter arises from the fact that spreads can reduce on total fat and saturated fat intake and easy spreadability at refrigerated temperature thereby adding to the convenience of usage. A fat spread is basically a product in the form of water–in-oil emulsion containing not less than 40% fat and not more than 56% moisture. It may contain permitted emulsifiers, stabilizers, flavoring agent and antioxidant in prescribed levels (FSSAI, 2011). The term “Filled” according to Hedric (1969) refers to those products in which part of the milk fat is replaced by vegetable oil. According to the federal filled milk Act (21 Code section 61 to 64) of the US, the term “Filled milk” means any milk, cream or skim milk, whether non-condensed, evaporated, concentrated, dried or desiccated, which has been blended or compounded with any fat or oil other than milk fat so that the resulting product is an imitation or resemblance of milk, cream or skim milk (Fistere, 1970 and Chandrasekhara et al., 1971). The major ingredients commonly used for fat spreads are milk fat, milk proteins, vegetable oils/fats, emulsifiers, stabilizers, salt, acidulants, colour and flavouring agents. The choice of ingredients depends on type of fat spread. Fat governs consistency, spreadability, creaminess and plasticity (Kulkarni and Ramamurthy, 1988; Lee, 2001; Kumar and Rao, 2006) whereas proteins modulate organoleptic, functional, nutritional and textural properties of spreads. Proteins help to emulsify fat and absorb water thereby providing stability to the final product. Milk protein in the form of skim milk powder (5-15% levels), whey protein concentrates (2-10% levels), buttermilk solids (15-20% levels) and UF concentrated skim milk (4-10% level), skim milk chakka (upto 40%), cow and buffalo milk channa (upto 30%) have been used by different researchers (Tiwari and ...
sachdeva,1991; Dholu et al,1994; Balasubramaniam and Kulkarni
,1999; Deshpande and Thompkinson, 2000; Reddy et al, 2001;
Deshmukh et al,2002; Kumar and Rao, 2006; Chappalwar et al,
2010 and Kumar, 2014). Their results indicate improvement in
consistency, body and texture characteristics, functional and
nutritional properties and cost effectiveness in resultant spreads.

However, existing literature is highly scanty with regard to usage
of protein component from sources other than milk proteins in
manufacture of low fat table spreads. Peanut or groundnut is a
major source of high quality vegetable protein, rich in essential
amino acids, minerals and vitamins having high nutritional value
and good digestibility. Scope therefore exist to exploit usage of
peanut as a source of protein that may impart necessary textural
and nutritional quality to the resultant table spread and be cost
effective.

Fresh cream (Fat: 40%) was obtained from student training dairy,
SHIATS, Allahabad. Peanut, cumin seed (Zeera)- roasted and
converted into powder, refined Peanut oil (Brand: Ginni, India),
Everest brand Black paper powder, Refined iodized salt, (Vibrant
global salt Pvt. Ltd.), Turmeric powder (Type A, Food Grade,
Shubham Goldiee masale- Kanpur), spray dried skim milk powder
(Brand:Anik) were purchased from local market. Soya Lecithin
was used as emulsifier. Food grade Lactic acid and sodium
benzoate were used.

Peanut milk was prepared as per the method described by Paul et
al. (2011). It was heated to 70 °C to which 0.8% solution of calcium
lactate was added, as coagulant, with constant stirring until
complete coagulation occurs. The resultant whey was allowed
to drain through muslin cloth for 15-20 minutes and channa was
collected for further use.

The Peanut milk was heated in karahi, over an open fire to 70 °C.
The milk was slowly stirred by a laddle during heating to avoid
burning. When temperature of milk reached 70 °C then coagulation
with 0.8% solution of calcium lactate was added to the milk slowly
with stirring till the complete coagulation took place. After
coagulation the stirring was stopped and contents were poured
over a piece of clean muslin cloth for straining of whey. After
drainage of whey chhana was collected.

Table spread: Pre-calculated amount of filled milk channa and
skim milk powder was used for preparation of aqueous phase, to
provide necessary protein content for table spread. The mixture
was blended at 40 °C, to form a fine paste, pasteurized and cooled.
The oil phase consisted of milk fat (60%) and refined peanut oil
(40%). Emulsification of two phases was done at 40 °C in a blender
to which required level of emulsifier and natural flavouring agent
(Ground black pepper and cumin seed (zeera) in ratio of 1:1) were
added and finally pH of resultant emulsion (table spread) was
adjusted to 5.6 using food grade lactic acid. The mixture was
pasteurized and hot filled in pre-sterilized screw cap containers
and allowed to cool before storage.

A 9-point Hedonic scale (9 for ‘liked extremely’ and 1 for ‘disliked
extremely’) was used for the sensory evaluation of the channa
spread by a trained panel of judges selected based on the
discriminative test of sensory evaluation. They evaluated the
product for colour and appearance, flavor and taste, body and
texture, spreadability and overall acceptability.

Moisture, fat and ash content as well as titratable acidity of the
filled milk channa spread was estimated as per the method
The pH of the spread was measured by digital pH meter (Sanctury,
India), carbohydrate content (difference method), protein content
by Kjeldhal method (Perfect India). Standard plate count (SPC),
colliform, yeast and mold counts per the method suggested by

The prepared spread was subjected to gross composition and
sensory evaluation through the panel of judges for various
sensory attributes using commercially available spread as control
(Table 1). The results obtained for various sensory qualities of
control and filled milk channa spreads along with F value as
obtained through ANOVA are presented in Table 1.

The average sensory score pertaining to colour and appearance
of experimental spread is presented in Table1. Which indicates
that highest score for colour and appearance of control sample
was 8.70, whereas, the experimental sample obtained the score of
8.1(Liked very much). The colour and appearance (CA) score of
experimental sample was slightly lower than the control sample.
This could have been due to tiresome colour of peanut milk that
lacks bright shine to white colour obtained from dairy based
spread. The lower score of colour and appearance of experimental
spread could be overcome by addition of food grade coloring
material to the filled milk channa spread. Further, statistical
analysis indicates that the calculated F value (36) was lower than
tabulated F value (161.45) at 5% level of significance; therefore
the difference was non-significant between samples.

The data presented in Table 1 shows that the flavour and taste
score obtained by control sample was 8.16 whereas, filled milk
channa spread obtained a score of 8.22 (Liked very much). The
data indicates that the Filled milk channa spread is slightly better
as compared to control sample. This could have been due to
addition of black pepper and cumin seed as flavouring material
used during preparation of experimental spread. The statistical
analysis indicates that there exist a non-significant difference
between the scores as the calculated F value (9.00) was lower
than the tabulated F value (161.45) at 5% level of significance;
therefore, the difference was non-significant between samples.
Our data is in line with the report of Deshpande and Thompkinson
(2001) and Kharb and Thompkinson (2007) who also have used
these natural flavouring compounds providing better flavor and taste to the resultant table spread. Incorporation of spices such as pepper, clove, cinnamon and their combinations in the form of powder or extract to paneer base spread at 1 or 1.5% level respectively resulted in better flavour scores (Kumar and Rao, 2006).

Table 1 shows that the score obtained for body and texture of control sample was 7.72, whereas, the spread using filled milk channa obtained a score of 7.54. The slight difference in body and texture scores could have been due to higher total fat content of control sample that may have contributed towards smoother body as against experimental sample containing nearly half the fat content as compared to control sample. However, the ANOVA indicates that there exist a non-significant difference between the scores as calculated F value (0.32), was lower than the tabulated F value (161.45) at 5% level of significance; therefore, the difference was non-significant between samples. The lower score of experimental spread is also due to presence of lower fat content. Further, the presence of vegetable protein may have resulted in slightly coarse texture of the resultant spread. A Table spread with good body and texture was prepared by Deshpande (1998) using a fat blend containing 70% groundnut oil and 30% milk fat. Filled paneer spread developed by Kumar and Rao (2006), where in milk fat was replaced with vegetable oils (Soy, Corn and Sunflower) at 25% level was acceptable with improved body and texture and spreadability.

Spreadability of filled milk channa spread: The data presented in Table 1 represent that the spreadability score obtained by control sample was 7.73, whereas, the filled milk channa spread obtained a score of 8.5. However, the ANOVA indicates that there exist a non-significant difference between the scores as the calculated F value (16.43) was lower than tabulated F value (161.45) at 5% level of significance; therefore, the difference was non-significant between samples. This difference in spreadability score could have been due to slightly higher moisture and presence of poly unsaturated fatty acid (PUFA) rich vegetable oil as a component of total fat content of filled milk channa spread that may have contributed to better spreadability as against the control sample. Kharb and Thompkinson (2007) also reported that admixture of poly unsaturated fatty acid (PUFA) rich vegetable oil improves the texture and spreadablity attributes of resultant spread stored at refrigerated temperature. Kulkarni and Rama Murthy (1988) replaced 30% of milk fat in butter with sunflower oil and found improvement in spreadability at low temperature.

The above Table 1 shows that the highest score for overall acceptability of control sample was 8.05, whereas, the experimental sample obtained the score of 8.28 (Liked very much). The overall acceptability score of experimental sample was slightly higher than control sample. This could have been due to flavour and

Table 1 Average scores and F values for various sensory parameters of Filled milk channa spread

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Control</th>
<th>Experimental</th>
<th>Cal. F</th>
<th>TAB</th>
<th>F (5%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colour and appearance</td>
<td>8.70</td>
<td>8.10</td>
<td>36</td>
<td>161.45**</td>
<td></td>
</tr>
<tr>
<td>Flavour and taste</td>
<td>8.16</td>
<td>8.22</td>
<td>9</td>
<td>161.45**</td>
<td></td>
</tr>
<tr>
<td>Body and Texture</td>
<td>7.72</td>
<td>7.54</td>
<td>0.32</td>
<td>161.45**</td>
<td></td>
</tr>
<tr>
<td>Spreadability</td>
<td>7.73</td>
<td>8.50</td>
<td>16.42</td>
<td>161.45**</td>
<td></td>
</tr>
<tr>
<td>Overall acceptability</td>
<td>8.05</td>
<td>8.28</td>
<td>9.82</td>
<td>161.45**</td>
<td></td>
</tr>
</tbody>
</table>

Average of three replicates, ** = Non-significant

Table 2 Composition of channa based dairy spread and filled milk channa spread

<table>
<thead>
<tr>
<th>Constituents</th>
<th>Channa based dairy spread (%)</th>
<th>Filled milk channa spread (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fat</td>
<td>-</td>
<td>40.00</td>
</tr>
<tr>
<td>Protein</td>
<td>11.39</td>
<td>4.95</td>
</tr>
<tr>
<td>Ash</td>
<td>5.16</td>
<td>5.53</td>
</tr>
<tr>
<td>Carbohydrate</td>
<td>-</td>
<td>2.26</td>
</tr>
<tr>
<td>Salt</td>
<td>2.00</td>
<td>2.00</td>
</tr>
<tr>
<td>Total solids</td>
<td>43.83</td>
<td>54.74</td>
</tr>
<tr>
<td>Acidity</td>
<td>-</td>
<td>0.34</td>
</tr>
<tr>
<td>pH</td>
<td>-</td>
<td>5.60</td>
</tr>
</tbody>
</table>

Microbiological analysis

| Coliform                 | Nil                           | Nil                          |
| SPC                      | 3.83                          | 6.0x10³                     |
| Yeast and Mould          | Nil                           | Nil                          |
| Reference                | Keertana and Narayanan (2016) |                              |
taste and good spreadability of filled milk channa spread. However, the ANOVA, indicates that there exist a non-significant difference between the scores as calculated F value (9.82) was lower than tabulated F value (161.45) at 5% level of significance; therefore, the difference was non-significant between samples. Kumar (2014) reported that when, milk fat was replaced with soy oil at 25% level the resulted spread had better sensory characteristics with a maximum overall acceptability score of 81.90 as compared to control (87.63).

Based on comparable scores of experimental and commercial brand of low fat table spread it may be concluded that experimental spread showed better spreadability and overall acceptability. Addition of natural herbal additives helped to improve the flavour and taste of filled milk channa based spread. However, the colour and appearance of peanut channa based spread scored slightly lower than commercial brand, This can be improved by addition of natural coloring compounds.

The gross chemical composition of filled milk channa spread along with channa based dairy spread is given in Table 2. Tewari et al. (1991) prepared chhana/paneer spread from cow (Fat: 3.0% and SNF: 9.0%) and buffalo milk (Fat: 3.3 % and SNF: 10.0%), respectively. They observed that cow milk chhana/paneer spread contained 62.5% moisture, 15.9% fat, 17.5% protein, 2.2% lactose, 1.9% ash and pH while buffalo milk chhana/paneer spread contained 63.8% moisture, 15.4% fat, 16.2% protein, 2.4% lactose, 2.2% ash and pH 5.0. The microbiological quality of filled milk channa spread was found to have SPC $6.0 \times 10^3$ whereas, yeast and mold count and coliform count was found to be nil.

Conclusions

Peanut which is rich in protein and low in cholesterol have been used to offer new options to the consumers. An acceptable quality of Filled milk channa could be made using 0.8% calcium lactate as coagulant at 70°C. The acceptability scores for various sensory parameter of filled milk channa spread were as follows: colour and appearance (8.1), flavour and taste (8.22), body and texture (7.54), spreadability (8.50), and for the overall acceptability (8.25). The experimental spread was found to be comparable to commercially available spread, as control, in terms of flavor, spreadability and overall acceptability. The prepared Filled milk channa spread was analyzed and found to contain, TS 54.74%, fat 40%, protein 4.95%, carbohydrate 2.26%, ash 5.53%, salt 2%, acidity 0.34% LA and pH 5.6. The microbial flora of filled milk channa spread was found to be, SPC $6 \times 10^3$cfu/g, yeast & mold and coliform were found absent. The product meets FSSAI (2011) standards.

Acknowledgements

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