Optimization of Coconut Butter Prepared by Incorporating Peanut Butter and Dairy Butter

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Abstract

The coconut butter was formulated by incorporating the peanut butter and dairy butter to bring out the acceptable consistency and studied about the physicochemical, sensory parameters of the developed product. Three different ratio of coconut butter: Peanut butter: Dairy butter (3:1:1, 2:1:0.5, 1:1:0.3) were optimized. The optimized butter was stabilized by adding hydrogenated palm oil, gelatin, and guar gum in 1, 1.5, 2 ratios, respectively for controlling the oil migration from the developed butter. Two sweetener were used in the mixed butter namely sugar and the combination of sugar honey in two different ratio whereas 9% and 13%, and salt was used two different ratio that is 0.9% and 1.1%. The suitable kind of sweetener, stabilizer and the level of sweetener, salt, stabilizer and ratio of mixed butter were identified using sensory evaluation (9 point hedonic scale) to yield a mixed butter which resembles as a commercial peanut butter, the self life is estimated both in room temperature (25°C) and refrigerator temperature (4°C) through peroxide value and free fatty acid value by the level of rancidity of the mixed butter.

Keywords: Coconut Butter, Optimization, Stabilizer, Mixed Butter

Introduction

Butter is a multiple emulsion consisting of fat globules, crystalline; fat in which aqueous phase dispersed in a continuous oil phase. Phase inversion in the butter making process is an extremely complex phenomenon (7). The water content of butter after phase inversion is affected by the milk composition (7,11). The maximum permitted water content of butter, 16%, is regulated by the International Standards set out by Food and Agriculture Organization of the United Nations and World Health Organization Dairy butter generally produced from the cow or buffalo milk that contains almost 100 percent fat without any protein while the peanut butter contains around 20 per cent protein 50 percent fat and also contains all other nutrients which are naturally present in the groundnut (3).

Peanut butter is the most important product of groundnuts; the groundnut is a major oil seed crop of India. Shelled peanut production in the United States was about 4.49 billion pounds (USDA-NASS, 2005). Most peanuts grown in the US are used for oil production, peanut butter, confectioneries, and snack products (13). Peanut protein contains 47-55% high quality protein with high essential amino acid content (2) it was used in many food applications (9).

Dry Coconut (copra) used as raw materials for preparation of coconut butter. The India is third largest coconut producing country in the world. In annually produces 14.37 billion nuts (National Multi-Commodity Exchange of India Limited), Copra is one of the major traditional products made from the fresh coconut. The fresh coconut contains about 52% of moisture content where it reduced to 7% for making the copra (8).

The coconut butter is incorporated with the peanut butter and dairy butter to improve the quality of the mixed butter. Copra quality was evaluated as color, taste and smell by selected assessor using rating scale method (5). However, there is no extensive information available on the preparation of coconut butter prepared from copra. Therefore, it would be of interest to study the preparation and optimization coconut butter by incorporating peanut and dairy butter and compositional quality of prepares coconut butter.

Coconut is rich in medium chain triglyceride which induced
weight loss, energetic feeding of MCTs increases thermo
genesis to a greater extent than long chain triglycerides in
rodents (1). Energy expenditure following medium chain
triglycerides based meals was also greater than for LCT
based meals in several studies on humans.

The copra is high in long-chain saturated fat are linked to
the pathogenesis of insulin resistance (10). It is worthwhile
to examine that MCFAs improve insulin-mediated glucose
metabolism. Octanoic acid stimulated glucose-mediated
insulin secretion in the perfused pancreas less than longer-
chain fatty acids (12). Coconut butter is good for diabetic
patients. It promotes the secretion of insulin, which in turn,
helps in controlling blood sugar. It stimulates the functioning
of vital glands, including, thyroid and pancreas. It possesses
amazing healing qualities. When it is applied on a wound or
skin infection, then it forms a protective layer and prevents
any further damage to the affected tissue.

Materials and Method
The dried copra, peanut and dairy butter were procured
from local shops of Puducherry, and additives like sweetener
(table sugar and honey) salt and stabilizer (guar gum, gelatin
and hydrogenated palm oil) were procured from the food
store of Puducherry.

Preparation of Butter
The dried copra (free from contamination) was selected,
the testa was removed using grater and the whole meal
was grated into small pieces. It was grinded using a blender
up to 20 minutes with the regular interval of time to avoid
over heat of the blender, after grinding for 20 minutes it
increases similar consistency as peanut butter.

The unshelled peanuts was taken and roasted in a medium
temperature for 2 minutes in low flame. The outer skin of
the peanuts used to be removed by applying winnowing
method and the white pearl peanuts was grinded in a
blender for 5 minutes to form a pasty consistency.

Optimization of Butter, Sweeter, Stabilizer
The freshly prepared peanut butter and commercial dairy
butter was incorporated in the melted coconut butter, the
coconut butter, peanut butter and dairy butter were mixed in
develop three different ratio 3:1:1(CB:PB:DB), 2:10.5(CB:PB:DB),
and 1:1:0.3(CB:PB:DB), were the coconut butter will be melted
at 40 °C in microwave oven maintained for 10 minutes after
adding the peanut and dairy butter under stirring condition,
to ensure complete melting and homogenization of all
three butter. After cooling at room temperature, the ratio
of mixed butter was optimized through sensory evaluation.

Optimization of Sweetener and Salt
The Mixed butter which was selected through the sensory
evaluation was taken for the further optimization of
sweetener, and salt. The two different sweetener (sugar
and sugar+honey) was taken in different the ratio from
9% to 15% in which only 9% and 13 % were taken for final
optimization because there is no more changes from 9
to12% whereas more than 13 % to 15% dominate the flavor
of the mixed butter, the salt was optimized in two different
percentage 0.9% and 1.1%. this sweetener and salt were
finalized through the sensory evaluation.

Optimization of Stabilizer
The stabilizer is used to prevent the oil migration at room
temperature and also to improve the shelf life of the
mixed butter by controlling the level of rancidity. The three
different stabilizer (guar gum, gelatin and hydrogenated
palm oil) was taken in three different quantity (1%,1.5%
and 2%(w/w). The suitable stabilizer with adequate level
was finalized through the sensory evaluation.

Sensory Evaluation of Optimized Butter
An acceptability test was carried out with the mixed butter
samples by 10- untrained panelist consisting students
of the Department of Food Science and Technology,
Pondicherry University. Panelists were non smokers and
regular consumed coconuts and peanuts. Panelists were
instructed to consume the sample with a piece of bread and
rinse mouth with warm water (room temperature) between
sample evaluations. Approximately 3 g of butter were placed
in small plastic containers and coded. Panelists were served
samples in a time after 2 hours of their meals. Panelists
used a nine point hedonic structured scale where 9 was
extremely like and 1 was extremely dislike for the overall
acceptability of mixed butter samples (6). The suitable
ratio of mixed butter, suitable stabilizer, sweetener and
the level of sweetener, stabilizer and salt was analyzed
under this method.

Nutrient Analysis of the Mixed Butter
The Carbohydrate were analyzed using Anthon method,
Protein Kjeldal method (AOAC,1995), Fat is estimated using
Shoxlet method (AOAC,1995) for the coconut butter, peanut
butter, dairy butter and mixed butter.

Results and Discussion
Optimization of Mixed Butter
Table-1 shows the highly accepted ratio of the mixed butter
which was analyzed through sensory evaluation by the
panelist. the selected three different ratios were taken for
analysis 3:1:1 (Coconut butter: Peanut butter :Dairy butter),
2:1:0.5 (Coconut butter: Peanut butter :Dairy butter), and
1:1:0.3 (Coconut butter: Peanut butter :Dairy butter) where
taken for analyses the ratio, 3:1:1, which was increased
the hardness and reduced the spreadability of the mixed
butter. Where as in the case of 2:1:0.5 which the amount
of coconut butter is double than the amount of peanut
butter, showed the poor spreadability than 1:1:0.3 ratio. Finally, the ratio of 1:1:0.3 in which the amount of coconut butter and peanut butter in same this mixed butter showed the highest spreadability and smooth in nature which was finalized by 70% of the panelist through sensory evaluation and shown in figure 1,2.

Figure 1. Flow chart for the Preparation of Mixed Butter

Table 1. Optimizing the ratio of Mixed Butter

<table>
<thead>
<tr>
<th>Amount of butter</th>
<th>Ratio of the butter</th>
<th>Sensory characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coconut butter (CB)</td>
<td>Peanut butter (PB)</td>
<td>Dairy butter (DB)</td>
</tr>
<tr>
<td>15g</td>
<td>5g</td>
<td>5g</td>
</tr>
<tr>
<td>20g</td>
<td>10g</td>
<td>5g</td>
</tr>
<tr>
<td>15g</td>
<td>15g</td>
<td>3g</td>
</tr>
</tbody>
</table>

Sensory characteristics on the basis of 9 point hedonic scale

**Optimization of Sweeteners and Salt**

Table 2, shows that two different sweeteners (sugar and sugar+honey) were used to provide sweet taste, the sweetener was used in different quantity from 9 to 15% in which only 9 and 13% ratio was used for further optimization because there is no any significant changes in taste from the 10-12% and the sweetener more 13% spoil the flavor and the acceptability of the butter since 9% and 13%(w/w) ratio of sweeteners was optimized with two different percentage of salt (0.9% and 1.1%). Among the sweeteners the combination of sugar and honey was less in sweet compared with the sugar. The 13% sugar with the 0.9% salt was accepted by 70% of panelist which show in the figure 3.
Figure 2. Optimizing the ratio of Mixed Butter
(Sample-1 is 3:1:1 (CB:PB:DB), sample-2 is 2:1:0.5 (CB:PB:DB), sample-3 is 1:1:0.3 CB:PB:DB)

Figure 3. Optimization of Mixed Butter for different Sweeteners and Salt

Table 2. Optimization of Mixed Butter for different Sweeteners and Salt

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Percentage (w/w) of Sweetener and salt</th>
<th>Texture</th>
<th>Color</th>
<th>Flavor</th>
<th>Taste</th>
<th>Mouth feel</th>
<th>Overall acceptance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>9% Sugar with 0.9% salt</td>
<td>7.6</td>
<td>7.6</td>
<td>7.1</td>
<td>6.7</td>
<td>7.3</td>
<td>7.3</td>
</tr>
<tr>
<td>2</td>
<td>9% Sugar with 1.1% salt</td>
<td>6.1</td>
<td>6.6</td>
<td>6.3</td>
<td>5.8</td>
<td>6.1</td>
<td>6.2</td>
</tr>
<tr>
<td>3</td>
<td>13% Sugar with 0.9% salt</td>
<td>7.7</td>
<td>8.1</td>
<td>7.6</td>
<td>7.3</td>
<td>7.8</td>
<td>7.6</td>
</tr>
<tr>
<td>4</td>
<td>13% Sugar with 1.1% salt</td>
<td>6.3</td>
<td>6.6</td>
<td>7.3</td>
<td>6</td>
<td>6.1</td>
<td>6.6</td>
</tr>
<tr>
<td>5</td>
<td>9% (Sugar + honey) with 0.9% salt</td>
<td>7</td>
<td>6.6</td>
<td>7.3</td>
<td>7.1</td>
<td>7.1</td>
<td>7.2</td>
</tr>
<tr>
<td>6</td>
<td>9% (Sugar + honey) with 1.1% salt</td>
<td>6.6</td>
<td>6.1</td>
<td>6.2</td>
<td>6</td>
<td>6.1</td>
<td>6</td>
</tr>
<tr>
<td>7</td>
<td>13% (Sugar + honey) with 0.9% salt</td>
<td>7.1</td>
<td>7.5</td>
<td>6.7</td>
<td>6.6</td>
<td>6.8</td>
<td>6.7</td>
</tr>
<tr>
<td>8</td>
<td>13% (Sugar + honey) with 1.1% salt</td>
<td>6.2</td>
<td>6.5</td>
<td>6</td>
<td>5.6</td>
<td>6.6</td>
<td>6</td>
</tr>
</tbody>
</table>

Sensory characteristics on the basis of 9 point hedonic scale
(a-sugar 9% salt 0.9%, b-sugar 9% salt1.1%, c-sugar13% salt0.9%, d- sugar13% salt1.1%, e- sugar honey 9% salt 0.9%, f-sugar+honey 9% salt 1.1%, f-sugar+honey 13% salt9% and h- sugar honey 13% salt 1.1%)
Optimization of Stabilizer

Table 3 shown the optimization of three different stabilizers (guar gum, gelatin and hydrogenated palm oil) in three different quantity (1%, 1.5% and 2%) were the total nine sample is keep under the refrigerator to check for the oil migration capacity of the mixed butter in the case of gelatin in all three different percentage (1%, 1.5% and 2%) it is not suitable for the butter were this gelatin get stick into the mouth which cause the poor mouth feel even its not control the oil migration ,whereas in the case of hydrogenated palm oil which was mixed in three different percentage (1%, 1.5%, 2%) have no control over the oil migration and increase the fat content of the butter. The guar gum in three different percentage (1%, 1.5% and 2%), showed the good result for preventing the oil migration from mixed butter, out of these the 1.5% was show highest capacity to prevent oil migration comparatively the 1% and 2% guar gum. The 2% of guar gum was increased the hardness of butter while the 1% of guar gum was unable to prevent oil migration in mixed butter. Therefore, the 1.5% of guar gum was selected as acceptable stabilizer through the sensory evaluation on the basis of major six physical parameters such as texture, color, flavor, acceptability, mouth feel and overall acceptability. Which shown in the figure 4.

Nutrient Analysis of the Mixed Butter

The Nutritional content of the mixed butter were compared in the table 4.

Table 3. Optimization of Butter for different Stabilizers

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Stabilizer</th>
<th>Amount of stabilizer (w/w)</th>
<th>Texture</th>
<th>Color</th>
<th>Flavor</th>
<th>Taste</th>
<th>Mouth feel</th>
<th>Overall acceptance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Hydrogenated palm oil</td>
<td>1%</td>
<td>6.4</td>
<td>7.4</td>
<td>7.4</td>
<td>6.2</td>
<td>6.8</td>
<td>6.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.5%</td>
<td>6.6</td>
<td>6.2</td>
<td>7.2</td>
<td>6.8</td>
<td>6.4</td>
<td>6.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2%</td>
<td>7.2</td>
<td>7.4</td>
<td>6.6</td>
<td>6.2</td>
<td>6.0</td>
<td>6.2</td>
</tr>
<tr>
<td>2</td>
<td>Gelatin</td>
<td>1%</td>
<td>6.4</td>
<td>7.2</td>
<td>6.4</td>
<td>8.0</td>
<td>6.8</td>
<td>6.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.5%</td>
<td>5.4</td>
<td>5.8</td>
<td>6.4</td>
<td>6.2</td>
<td>6.0</td>
<td>6.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2%</td>
<td>5.8</td>
<td>5.6</td>
<td>6.8</td>
<td>6.4</td>
<td>6.2</td>
<td>6.4</td>
</tr>
<tr>
<td>3</td>
<td>Guar gum</td>
<td>1%</td>
<td>6.4</td>
<td>6.6</td>
<td>7.2</td>
<td>7.4</td>
<td>7.6</td>
<td>7.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.5%</td>
<td>8.2</td>
<td>7.8</td>
<td>7.6</td>
<td>8.2</td>
<td>8.4</td>
<td>8.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2%</td>
<td>7.8</td>
<td>6.4</td>
<td>7.4</td>
<td>6.2</td>
<td>7.4</td>
<td>7.2</td>
</tr>
</tbody>
</table>

Sensory characteristics on the basis of 9 point hedonic scale

Figure 4. Optimization of Butter for different Stabilizers
Table 4. Nutrition Content of the Butter

<table>
<thead>
<tr>
<th>Nutrients</th>
<th>Coconut butter</th>
<th>Peanut butter</th>
<th>Dairy butter</th>
<th>Developed butter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture (% w/w)</td>
<td>3.4</td>
<td>2.8</td>
<td>14</td>
<td>4.7</td>
</tr>
<tr>
<td>Carbohydrate (g/100g)</td>
<td>13.1</td>
<td>21.4</td>
<td>ND</td>
<td>13.4</td>
</tr>
<tr>
<td>Protein (g/100g)</td>
<td>6.5</td>
<td>34.9</td>
<td>ND</td>
<td>17.03</td>
</tr>
<tr>
<td>Fat g/100g</td>
<td>64.68</td>
<td>41.39</td>
<td>74.51</td>
<td>50.2</td>
</tr>
</tbody>
</table>

ND- Not Detected

Conclusion
The complete coconut butter is not have enough spreadability, so this butter was incorporated with peanut butter and dairy butter in three different combinations. The Appropriate ratio was found out through the sensory evaluation the mixed butter at the ratio of 1:1:0.3 has good texture which equal to the commercial peanut butter this butter rich in fat (medium chain fatty acid) and protein because of equal amount of peanut butter added in this mixed butter, the two different sweetener at two different level were used, the appropriate level was find out through the sensory evaluation, the panelist feel sugar is a suitable sweetener at the level of 13% and guar gum is an acceptable stabilizer for this mixed butter at the level of 1.5% all this parameters was analyzed through the 9 point hedonic scale. The optimized butter has high self-life since the coconut has anti-fungal and anti-bacterial activity peroxide value is zero and the free fatty acid show very low oleic acid level <0.5 it shows the mixed butter is free from rancidity even after one month.

Conflict of Interest: None

Reference

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