Effect of Frying Medium on The Quality of Sel-roti

Surendra Bahadur Katwal* and Dilip Subba

1Central Campus of Technology, Dharan, Tribhuvan University, Nepal

*Corresponding Author: Surendra Bahadur Katwal, Department of Food Technology, Central Campus of Technology, Dharan, Nepal
E-mail: skatwall@yahoo.co.nz

Abstract

Sel-roti is a delicious, deep-fat fried, puffed, ring shaped spongy doughnut like Nepalese indigenous food prepared from the batter of rice flour, ghee and sugar. A study was conducted to investigate the effect of frying medium on the physical, sensory and textural quality of Sel-roti. Approximately one year old rice was soaked, drained and ground in Khal-Bachcha. The flour of optimum particle size was mixed with sugar, ghee and water; allowed to stand for one hour and fried in ghee, mustard oil, soybean oil and sunflower oil separately. The prepared Sel-roti was evaluated for their fat-uptake, bulk density, sensory and textural quality. The results showed that frying medium had a significant effect on Sel-roti quality. Refined soybean oil resulted the best quality product among different frying medium studied.

Keywords: Sel-roti, riceflour, frying medium, bulk density, oil uptake, texture

Introduction

Nepal is a country of ethничal, cultural, religious and linguistic diversity. Diverse kinds of traditional foods, which the people have inherited from their ancestors, can be found in Nepal. Sel-roti (a local Nepali name) is one of the most popular delicious and energy rich indigenous products of Nepal. It is a circular ring-shaped product prepared from rice flour batter of proper consistency by frying in oil/ghee at high temperatures (Brihat Shabdakosh 2040 B.S.). The batter is prepared from rice flour, cream or ghee, sugar, and water.

Materials and Methods

Approximately one-year old 'Kanchhi Mansuli' rice (a local coarse variety) was purchased from a local rice mill of Dharan, soaked overnight in water, drained and ground to flour by using mortar and pestle made of iron (locally called Khal-Bachcha). Rice flour was separated into three different categories (course, medium and fine) based on their particle sizes using ASTM standard set of sieves(Pradeep Trading Co. Delhi). The rice flour used for Sel-roti making was prepared by blending coarse, medium and fine rice flours in the proportion of 30, 50 and 20 respectively. The different frying medium and recipe used is shown in table no 1.

For the preparation of Sel-roti, rice flour, sugar (21% by weight of rice flour) and ghee (10.5% by weight of rice flour) (purchased from Dairy Development Corporation, Nepal) were mixed. The mixture was rubbed moderately by hand for 10 minutes. Water (25±0.8 mL per 100g flour) was then added and kneaded to prepare batter. After allowing to stand for 1 h, the batter was poured by hand in ring shape in the hot refined

Table 1. Batter recipe and different frying media used for Sel-roti making.

<table>
<thead>
<tr>
<th>Frying Medium</th>
<th>Sample Code</th>
<th>Flour (g)</th>
<th>Sugar (g)</th>
<th>Ghee (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ghee</td>
<td>GH</td>
<td>250</td>
<td>52.5</td>
<td>26.25</td>
</tr>
<tr>
<td>Mustard Oil</td>
<td>MO</td>
<td>250</td>
<td>52.5</td>
<td>26.25</td>
</tr>
<tr>
<td>Sun Flower Oil</td>
<td>SFO</td>
<td>250</td>
<td>52.5</td>
<td>26.25</td>
</tr>
<tr>
<td>Soybean Oil</td>
<td>SBO</td>
<td>250</td>
<td>52.5</td>
<td>26.25</td>
</tr>
</tbody>
</table>

soybean oil (210°C) contained in Tai (a shallow iron pan) and cooked till the lower side of Sel-roti turned reddish brown color (17sec). It was then turned upside down with the help of a Jhìr, (local word for a pointed iron stick) and further cooked till the whole Sel-roti became reddish brown color (total time of 33±1sec). Then it was removed from Tai and the excess oil drained properly. The same procedure was followed for frying Sel-roti with other frying media also.
Bulk density of Sel-roti was determined by volumetric replacement method using mustard seeds of almost the same size (Nepal Standard, 2036 B.S.). A wooden box suitable for the measurement of bulk density was designed in the lab. The bulk density of Sel-roti was calculated using the following formula:

\[ \rho_s = \frac{W_s}{W_m} \times r_m \]

Where \( \rho_s \) = bulk density of Sel-roti (kg/m³); \( W_s \) = weight of Sel-roti; \( W_m \) = weight of mustard seeds with the same volume as that of the Sel-roti (g); and \( \rho_m \) = bulk density of mustard seeds (kg/m³). Three measurements were made. Moisture content of Sel-roti was determined following AOAC official method 920.36 (AOAC, 2005). Fat content of Sel-roti was determined as per AOAC official method 920.39 (AOAC, 2005) and calculated as follows:

\[ \text{Percent oil uptake} = \frac{\text{Percent Fat Content}}{100-(\% \text{ Moisture Content} + \% \text{Fat})} \times 100 \]

Texture and sensory quality of Sel-roti were evaluated by a sensory panel consisting of 5-7 trained panelists. Procedures, training of panclists and terminological description (i.e., definition of the terms) used were according to Cardello et al., (1982), Civile and Liska (1975), Mabesa (1986), Watts et al. (1989), Lee and Resurrection (2002) and Sanchez-Brambilla et al., (2002). The test was conducted in panel booths with sufficient light (day light complemented with tube light). Line scales with intensity value 0 (none) to 15 (high) were used to record the panelists’ responses to each attribute (Sanchez-Brambilla et al., 2002; Chen et al., 2002). Sel-roti samples were presented to the panelists in paper plates coded with 3-digit random number. The order of samples by treatment was completely randomized. Warm water was provided to the panelists between the tests for mouth rinsing. Sensory analysis was performed in triplicates.

The sensory test data were analyzed by GenStat Discovery Edition 3 (GenStat release 7.22 DE) and Excel 2003. Analysis of variance (ANOVA) was performed to determine the effect of frying medium on physical properties, sensory and textural attributes of Sel-roti, while the least significant difference (LSD) test was used to detect significant differences (\( \text{P} \leq 0.05 \)) among the means.

Results and Discussion

(a) The bulk density: The bulk density of Sel-roti fried in Ghee GH, mustard oil (MO), Soybean Oil (SBO) and Sunflower oil (SFO) are presented in Fig. 1.

![Figure 1](image1.png)

**Figure 1:** Effect of frying medium on the bulk density of Sel-roti. The similar alphabets above the bar diagram indicate not significant different (\( \text{p} > 0.05 \)). GH = Ghee, MO = Mustard Oil, SBO = Soybean oil, and SFO = Sunflower oil.

The ANOVA and LSD of mean scores revealed that though the bulk density of sample GH was lower but it was not significantly different from those of samples SBO and SFO. Sample GH was significantly different from sample MO. Higher bulk density of sample MO meant less puffy than others.

(b) The fat uptake: The percent fat uptake of Sel-roti as affected by the frying medium is presented in Figure 2.

![Figure 2](image2.png)

**Figure 2:** Effect of frying medium on the fat uptake of Sel-roti. The similar alphabets above the bar diagram indicate not significantly different (\( \text{p} > 0.05 \)). GH = Ghee, MO = Mustard Oil, SBO = Soybean oil, and SFO = Sunflower oil.

The ANOVA and LSD for mean fat uptake revealed that Sel-roti fried in ghee had significantly the highest fat content (\( \text{p} < 0.05 \)) than those of other samples. Fat uptake by samples SBO and SFO were similar, but the values were significantly lower than that of sample MO.

(c) The sensory quality: Effects of frying medium on the sensory quality of Sel-roti are presented in Fig. 3.

The mean sensory scores for appearance between samples GH and MO, and between SBO and SFO were not significantly different, but the mean scores of the later two samples were significantly higher (\( \text{p} < 0.05 \)) than those of the former. The taste preference scores of Sel-roti fried in ghee and soybean oil were similar, but they were significantly higher than those fried in mustard and sunflower oils. Sel-roti fried in mustard oil had the lowest taste preference of all the frying media used. Mustard oil resulted the lowest texture score of all the frying media, while Sel-roti fried in ghee and soybean oil had the highest flavor
score, while those fried in soybean and sunflower oils had similar flavor scores. Poor flavor preference was found for Sel-roti fried in mustard oil. The overall preference scores of ghee- and sunflower oil-fried Sel-roti did not differ, but they were significantly higher than those of mustard oil- and soybean oil-fried ones.

Although Sel-roti fried in ghee got higher taste and flavor scores than that fried in sunflower oil, ghee is more expensive and less available than soybean and sunflower oils. The Sel-roti fried in soybean and sunflower oils were comparable with respect to appearance, texture and flavor attributes. Soybean oil is believed to be nutritionally better than sunflower oil because of its linolenic and linoleic acid contents (essential fatty acids) (Gunstone, 2004). Hence, soybean oil could be used for the preparation of a good quality Sel-roti.

![Figure 3: Mean sensory scores of Sel-roti as affected by frying medium.](image)

The similar alphabets above the bar diagram indicate non significant different (p>0.05). GH = Ghee, MO = Mustard Oil, SBO = Soybean oil, and SFO = Sunflower oil.

(d) The texture profile: The mean sensory scores for texture of Sel-roti fried in different media are given in Table 2. The ANOVA and LSD of mean scores for different textural attributes showed that Sel-roti fried in ghee, mustard oil, soybean oil and sunflower oil were not different with respect to their smoothness, stickiness and chewiness. Sel-roti fried in sunflower oil had the lowest hardness score of all the frying media used, whereas those fried in ghee, mustard and soybean had similar hardness scores. The fracturability of Sel-roti fried in ghee was higher to those fried in soybean and sunflower oils, but it was similar to that fried in mustard oil.

The cohesiveness scores of Sel-roti fried in ghee, soybean oil and sunflower oil were similar, but the scores were significantly lower compared to mustard oil fried Sel-roti. Similar results were also found in case of oily mouth feel of Sel-roti.

| Table 2: The mean scores for texture attributes of Sel-roti as affected by frying medium. |
|-----------------------------------------------|----------------|----------------|----------------|----------------|
| Parameter          | GH  | MO  | SBO | SFO  |
| Smoothness         | 8.13±1.5 | 8.13±1.4 | 8.27±1.5 | 8.47±1.4 |
| Hardness           | 7.80±1.3<sup>a</sup> | 7.13±1.2<sup>a</sup> | 7.13±1.1<sup>a</sup> | 6.93±1.2 |
| Fracturability     | 8.47±1.2<sup>a</sup> | 7.67±1.4<sup>ab</sup> | 7.60±1.3<sup>b</sup> | 6.87±1.0<sup>b</sup> |
| Cohesiveness       | 6.00±1.3<sup>a</sup> | 7.13±1.5<sup>b</sup> | 6.20±1.2<sup>a</sup> | 6.20±1.2<sup>a</sup> |
| Stickiness         | 6.06±1.1 | 6.53±1.2 | 6.47±1.3 | 6.47±1.0 |
| Oily mouth feel    | 8.93±1.5<sup>a</sup> | 10.53±1.6<sup>b</sup> | 8.93±1.3<sup>a</sup> | 8.53±1.4<sup>a</sup> |
| Chewiness          | 15.00±3.0 | 16.00±4.0 | 15.00±4.0 | 15.00±3.0 |

N=18(6x3). Mean sensory score ± standard deviation, the similar superscript in a row indicate non significant difference (p>0.050). GH = ghee (animal), MO = Mustard oil, SBO = Soybean Oil, SFO = Sunflower Oil.

Conclusion

Sel-roti is a popular food item in religious, festivals and ritual processes not only in Nepal, but also in countries where Nepalese reside. Rice, sugar and frying medium are major ingredients of Sel-roti. Experiment showed that frying medium has a significant effect on the quality of Sel-roti. Based on the physico-chemical properties of the Sel-roti so evaluated, refined soya bean oil was found to be the best of all the frying media studied.
References


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