

## Original Research Article

### Effect of Frying Medium on The Quality of *Sel-roti*

Surendra Bahadur Katawal<sup>1\*</sup> and Dilip Subba<sup>1</sup>

<sup>1</sup>Central Campus of Technology, Dharan, Tribhuvan University, Nepal

\*Corresponding Author: Surendra Bahadur Katwal, Department of Food Technology, Central Campus of Technology, Dharan, Nepal  
E-mail: skatawal@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 ethnical, 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.

Mention about *Sel-roti* can be found in ancient sacred Hindu religious books, like Puran and Swasthani Bratakatha (Anon. 2003). It is an essential item in many festivals such as Tihar (Dipawali), Maghe Sakranti; in ritual works (e.g., Pooja worship of the god called Satyanarayan) and Bratabandha; as a Kosheli and in wedding ceremony (Katawal, 2062 B.S.). *Sel-roti* is popular among all tribes and communities of almost all geographical regions of the country. It is prepared and sold in local food shops, restaurant, and open markets.

#### 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.

Frying Medium	Sample Code	Flour(g)	Sugar(g)	Ghee (g)
Ghee	GH	250	52.5	26.25
Mustard Oil	MO	250	52.5	26.25
Sun Flower Oil	SFO	250	52.5	26.25
Soybean Oil	SBO	250	52.5	26.25

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 *Jhir*, (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 of 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* ( $\text{kg/m}^3$ );  $W_s$  = weight of *Sel-roti*;  $W_m$  = weight of mustard seeds with the same volume as that of the *Sel-roti* (g); and  $r_m$  = bulk density of mustard seeds ( $\text{kg/m}^3$ ). 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:

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

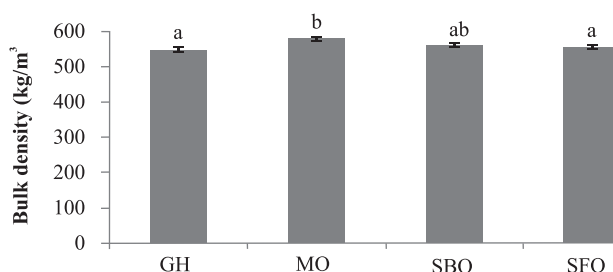
Texture and sensory quality of *Sel-roti* were evaluated by a sensory panel consisting of 5-7 trained panelists. Procedures,

training of panelists and terminological description (i.e., definition of the terms) used were according to Cardello et al., (1982), Civille 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 ( $P \leq 0.05$ ) 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.



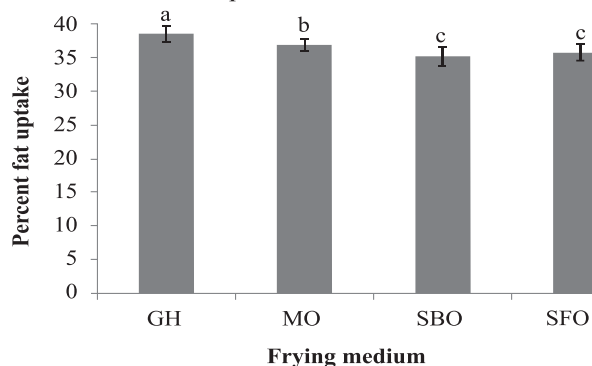
**Figure 1:** Effect of frying medium on the bulk density of *Sel-roti*. The similar alphabets above the bar diagram indicate not significant different ( $p > 0.05$ ). GH = Ghee, MO = Mustard Oil, SBO = Soybean oil, and SFO = Sunflower oil.

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.

The ANOVA and LSD for mean fat-uptake revealed that *Sel-roti* fried in ghee had significantly the highest fat content ( $p < 0.05$ ) 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.



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

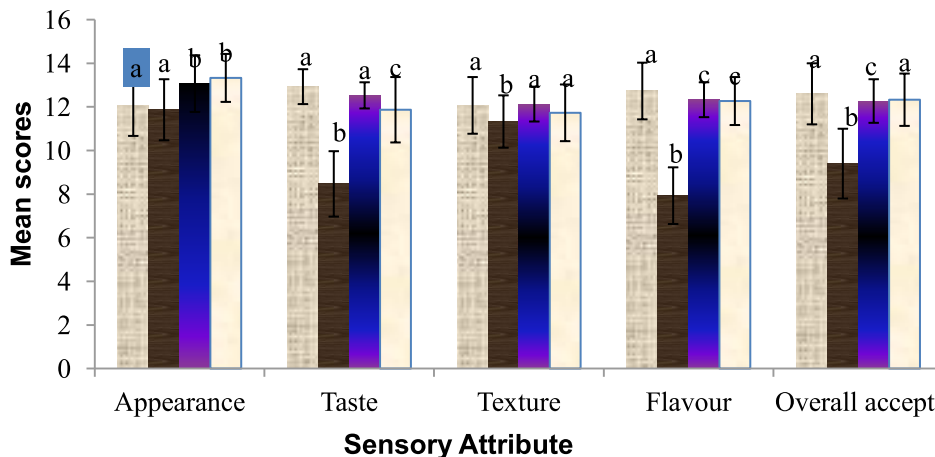
(c) **The sensory quality:** Effects of frying medium on the sensory quality of *Sel-roti* are presented in Fig. 3.

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 ( $p < 0.05$ ) 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.

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

- Anon. Swosthani B, Durga SB. Baranasi-221 001, 2003.
- AOAC Official Methods of Analysis. 18<sup>th</sup>edn. Association of Official Analytical Chemists, Washington, DC, 2005.
- Brihat Shabdakosh. B.S. Royal Nepal Academy Kamaladi Kathmandu, Nepal, 2040.
- Cardello AV, Maller O, Kapsalis JG, Segars RA, Sawyer FM, Murphy C, Moskowitz HR. Perception of Texture by Trained and Consumer Panelists. In: Sensory Evaluation of Foods, Principles and Methods. Linda BM (ed), College of Agriculture, Laguna, 1982, 54.
- Chen Z, Sagis L, Legger A, Linssen JPH, Schols HA, Voragen AGI. Evaluation of potato noodles made from three typical chinese sweet-potato starches, J Food Sci, 2002, 67, 3342-7.
- Civille GV and Liska IH. Modification and Applications to Food of the General Food's Sensory Texture Profile Technique. In: Sensory Evaluation of Foods, Principles and Methods. Linda BM (ed), College of Agriculture, Laguna, 1975, 53-61.
- Katawal, SB. Introduction to *Sel-roti*, Blast Times Daily, Dhran, Nepal, 2005.
- Lee CM and Resurrection AVA. Improved Correlation Between Sensory and Instrumental Measurement of Peanut Butter Texture, J Food Sci, 2002, 67, 1939-49.
- Mabesa LB. Sensory Evaluation of Foods: Principles and Methods. College of Agriculture, Laguna. 1986.
- Nepal Standard. Standard of White Bread. Office of the Nepal Standards, Ministry of Industry, Nepal. 1979.
- Sanchesa-Brambila GY, Lyon BG, Huang YW, Franco Santiago JR, Lyon CE, Gates KW. Sensory and Texture Quality of Canned Whelk (*Astraea undosa*) subjected to tenderizing treatments. J Food Sci, 2002, 67, 1559-63.
- Watts BM, Yumaki SL, Jeffery LE, Elias LG. Basic Sensory Methods for Food Evaluation. 1989, Ottawa, Ont. IDRC.