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Popular Article

The trend in change of saponification value during deep frying of ghee added with curry leaf (*Murraya koenigii*)

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Abstract

The results showed a reduction in the saponification value of all ghee samples during frying. The control ghee decreased from 232.18 to 220.25, the BHA-added ghee decreased from 233.29 to 223.15, and the CLE-added ghee decreased from 232.88 to 226.46. These findings suggest that adding 1% CLE effectively prevents the decrease in saponification value during frying. Previous research also reported a decrease in the saponification value of ghee during frying, which can be attributed to the conversion of fatty acids into carbonyl compounds and the subsequent decrease in free fatty acid content.

Introduction

Ghee, or clarified butterfat, is often made from cow or buffalo milk, or a combination of the two. Ghee ranks second in India's milk consumption habits behind fluid milk due to its superior frying and cooking capabilities (GAIN 2011). One of the most common culinary techniques used in both commercial and home food preparation is frying (Casal et al. 2010). Deep fat frying includes submerging food for a predetermined amount of time in heated edible oil that is above the boiling point of water (Farkas et al. 1996). The oil/fat undergoes significant changes during frying due to oxidation, polymerization, cyclization, and hydrolysis (Saguy and Dana 2003), all of which inevitably shorten the shelf life and negatively impact the final fried food's quality (Kochhar 2001).

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Natural antioxidants are preferred over the legally permissible synthetic BHA, according to recent studies on ghee (Pawar et al. 2012 and Patel et al. 2013). According to previous reports, BHA does not function as a potential antioxidant at higher temperatures, which means that oils and fats containing it frequently degrade quickly when fried (Tsaknis et al. 2002). When ghee is deep-fried, Patel et al. (2013) already demonstrated that BHA is less stable than coriander extract. In order to ascertain the potential of curry leaf extract in ghee during deep frying, the current study was conducted.

Materials and Methods

Ghee was cooled to 60°C to allow for the addition of individual antioxidants. The level of CLE added was determined through optimization trial and chosen 1 percent as optimum. A control sample without any added antioxidants was also prepared, while another sample was supplemented with 0.02% BHA, serving as a reference for comparison in the study. Using a ready-made gulabjamun dough, 100 balls of 6-7 g weight were fried in 1500 g of ghee samples at 180ºC in an AGARO - 33390 Marvel 1700-Watt Deep Fryer made of stainless steel. After every 15 minutes of deep-frying, samples were taken and physical and chemical characteristics were examined.

Saponification value

The saponification value was determined as per FSSAI Lab Manual 2, (2015). The sample was melted and filtered through filter paper to remove any impurities and the last traces of moisture. It was ensured that the sample was completely dry. The sample was thoroughly mixed, and approximately 1.5 to 2.0 grams of the dry sample were weighed into a 250 ml Erlenmeyer flask. Then, 25 ml of the alcoholic potassium hydroxide solution was pipetted into the flask. A blank determination was conducted along with the sample. The sample flasks and the blank flask related to air condensers, were kept in a water bath, and boiled gently but steadily until saponification was complete. Saponification was considered complete when there was an absence of any oily matter and the appearance of a clear solution. Typically, clarity was achieved within one hour of boiling. After the flask and condenser had cooled somewhat, the inside of the condenser was washed down with about 10 ml of hot ethyl alcohol neutral to phenolphthalein. The excess potassium hydroxide was titrated with 0.5N hydrochloric acid, using approximately 1.0 ml of phenolphthalein indicator.3.3.4.5.3 Calculation**:**

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Saponification Value $=\frac{56.1\,(B-S)N}{w}$

Were,

B = Volume in ml of standard hydrochloric acid required for the blank.

S = Volume in ml of standard hydrochloric acid required for the sample

N = Normality of the standard hydrochloric acid and

W = Weight in gm of the oil/fat taken for the test.

Result and Discussion

Table 1: Saponification value of ghee added with antioxidants

Saponification value			
Frying interval (min)	**Ghee added with**		
	Control	**BHA**	**CLE**
0	232.18	233.29	232.88
15	228.99	231.94	232.28
30	228.57	227.33	232.03
45	227.78	225.59	229.06
60	220.25	223.15	226.46

The saponification value serves as an indicator of the average molecular weight of a substance, and it demonstrates an inverse relationship with the mean molecular mass. The effects of CLE and BHA on the Saponification Value of ghee during frying were evaluated, and the results are shown in Table.3. Throughout the frying process, the saponification value of all ghee samples exhibited a reduction. For the control ghee, it decreased from 232.18 to 220.25, while for the ghee supplemented with BHA, it decreased from 233.29 to 223.15, and for the ghee added with CLE, it decreased from 232.88 to 226.46. Based on these findings, it can be concluded that the addition of 1% CLE to ghee effectively prevents the decrease in saponification value during frying. Another study conducted by

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Aleena in 2020 reported a decrease in the saponification value of ghee from 231.25 to 227.53 during the frying of paneer in ghee at 180°C. This reduction in saponification value may be attributed to the conversion of fatty acids into carbonyl compounds, resulting in a decrease in the free fatty acid content of the oils and subsequently lowering the saponification value, as explained by Ngassapa et al. in 2012.

Conclusion

In conclusion, ghee, known for its superior frying and cooking capabilities, is widely consumed in India. Frying, a common culinary technique, leads to significant changes in the oil/fat used, affecting the shelf life and quality of fried foods. Recent studies prefer natural antioxidants over synthetic ones like BHA due to their stability at higher temperatures. The current study evaluated the potential of curry leaf extract (CLE) as an antioxidant in ghee during deep frying. The saponification value, which reflects the average molecular weight, showed a reduction in all ghee samples during frying. However, the addition of 1% CLE effectively prevented this decrease, highlighting its potential as a protective agent. These findings are consistent with previous research demonstrating a decrease in saponification value during frying, attributed to the conversion of fatty acids into carbonyl compounds.

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