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Saturated and Unsaturated Fatty Acids Contents Analysis in Nasi Padang Chicken Gulai and Nasi Kandar Chicken Curry

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ABSTRACT

Nasi Padang chicken *gulai* and Nasi Kandar chicken curry are traditional dishes made with coconut milk, thick sauce, and creamy gravy due to their lengthy processing. Chicken curry has a slightly spicy flavor, a reddish yellow sauce color, and a stronger aroma due to the addition of spices and herbs during the cooking process. This study aims to determine the saturated fatty acid and unsaturated fatty acid content in chicken *gulai* and chicken curry. The data of chicken *gulai's* and chicken curry's fatty acid was collected using Shimadzu's GC (Gas Chromatography) instrument. As this study used an experimental research design, then T-test was employed in the data analysis process. The analysis results indicated that the saturated fatty acid content of chicken gulai and chicken curry was identical, as both were prepared using the same heated coconut milk. However, for an extended period, the saturated fatty acid content of chicken *gulai* and chicken curry increased, while the unsaturated fatty acid content remained unchanged, owing to the high spice content from some ingredients used in their processing. Besides, essential oils were also found in spices.

I. Introduction

The variety of culinary styles observed throughout an archipelago reflects its diverse cultures and traditions. Thus, as one of the archipelago countries, Indonesia attempts to preserve its cultural heritage and culinary traditions, such as Nasi Padang. Nasi Padang is a dish synonymous with Minang cuisine. It consists of white rice served with numerous side dishes cooked in a creamy coconut milk sauce, such as beef rendang, various processed curry, green vegetables, and green chili sauce. Meanwhile, chicken *gulai* is one of the curry side dishes served in Nasi Padang (Soenardi, et. al, 2013).

Chicken *gulai* is a traditional dish made with coconut milk, along with a variety of herbs and spices such as shallots, turmeric, turmeric leaves, cloves, cinnamon, and other spices. The typical Padang rice chicken *gulai* has a slightly spicy flavor, a reddish yellow color, and a thick gravy. Its thick gravy is induced by the long cooking period (at least 15 minutes).

Similarly, Malaysians also process their foods using spices with a strong flavor, such as the traditional Nasi Kandar chicken curry. Nasi Kandar is a traditional Malaysian dish, particularly from Pulau Pinang, almost identical to conventional Indonesian Nasi Padang. The chicken *gulai* in Nasi Padang and chicken curry in Nasi Kandar are indistinguishable, but in Nasi Kandar, the chicken curry presents a more intense aroma due to additional spices and herbs during the cooking process. Also, these two dishes are made using long processed coconut milk (Rahayu, 2000).

The analysis of the chicken *gulai's* and chicken curry's fatty acid content is essential as it shows. Their possible harm to human health. These dishes are made using long processed coconut milk, classified as highly processed foods that possibly contains increased long-chain fatty acids (Hewlings, 2020). Further, consumption of foods with high fatty acids tends to result in different imbalances in the body (Kaur, et. al., 2007). Therefore, this study aims to determine the saturated and unsaturated fatty acid content of chicken *gulai* and chicken curry.

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II. Method

Chicken *gulai* dish saturated and unsaturated fatty acids were coded with H1, while chicken curry dish saturated and unsaturated fatty acids were coded with H2. Both chicken *gulai* and chicken curry were prepared using a number of tools such as scales, measuring cups, blenders, frying pans, and so forth. Tables 1 and 2 list the ingredients for chicken *gulai* and chicken curry.

Table 1. Chicken *Gulai's* Ingredients

No	Ingredients	Amount
1	Chicken	50 gr
2	Turmeric leaves	1 sheet
3	Lime leaves	2 sheets
4	Lemongrass	1 bar
5	Galangal	3 cm, bruised
6	Brown sugar	½ tsp
7	Tamarind	½ tsp
8	Clove	2 cloves
9	Cinnamon	3 cm
10	Coconut cream	300 ml
11	Shallot	5 pieces
12	Garlic	2 cloves
13	Candlenut	2 pieces, roasted
14	Curly red chili	7
15	Ginger	2 cm
16	Cumin	½ tsp, roasted
17	Pepper powder	½ tsp
18	Coriander	½tsp
19	Salt	1 tsp
20	Sugar	1 ½ tablespoon
21	Water	200 ml

Source: Indriati (2017)

Table 2. Chicken Curry's Ingredients

No	Ingredients	Amount
1	Chicken	50 gr
2	Water	400 ml
3	Cooking oil	3 spoon
4	Star anise	1clove
5	Cardamon	4 cloves
6	Clove	4 cloves
7	Pandan leaves	1 sheet
8	Shallot	1 onion
9	Garlic Ginger paste	1 spoon
10	Curry leaves	2 rod
11	Curry powder	2 spoons
12	Cumin powder	½ spoon
13	Anise powder	½ spoon
14	Chili powder	1 spoon
15	Tamarind	2 tsp
16	Thick coconut milk	100 ml
17	Tomatoes	1 tomato
18	Green chili	1 seed
19	Garam masala	½ spoon
20	Salt	Use sufficiently
21	Mint leaves	2 rod

Source: Faudziyah (2018)

This research consisted of two stages, namely sample preparation and sample analysis. The chicken *gulai* and chicken curry were prepared following the recipe instructions. The prepared foods were then packaged in a glass jar for the fatty acid analysis. The procedure for this study is depicted in Figure 1.

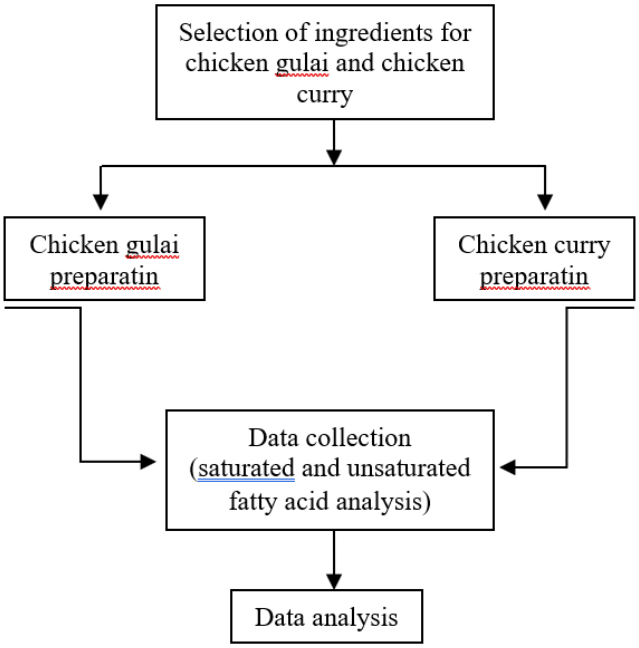

Fig. 1. Research Procedure

The data of chicken *gulai's* and chicken curry's fatty acid was collected using Shimadzu's GC (Gas Chromatography) instrument, BF3 (Boron trifluoride) solution, n-hexane (p.a) solution, and anhydrous Na2SO4 solution. Further, the obtained data were statistically analyzed using the T-test.

III. Results and Discussion

A. Content of Saturated and Unsaturated Fatty Acids in Chicken Gulai and Chicken Curry

1) Saturated Fatty Acid

The obtained saturated fatty acid content of chicken curry and chicken curry were analyzed using the T-test analysis through SPSS. The results showed the significance values (2-tailed) ranged from 0.897 to 0.05, indicating no difference between saturated fatty acids in chicken *gulai* and chicken curry. Figures 2 illustrate the saturated fatty acid content in chicken *gulai* and chicken curry.

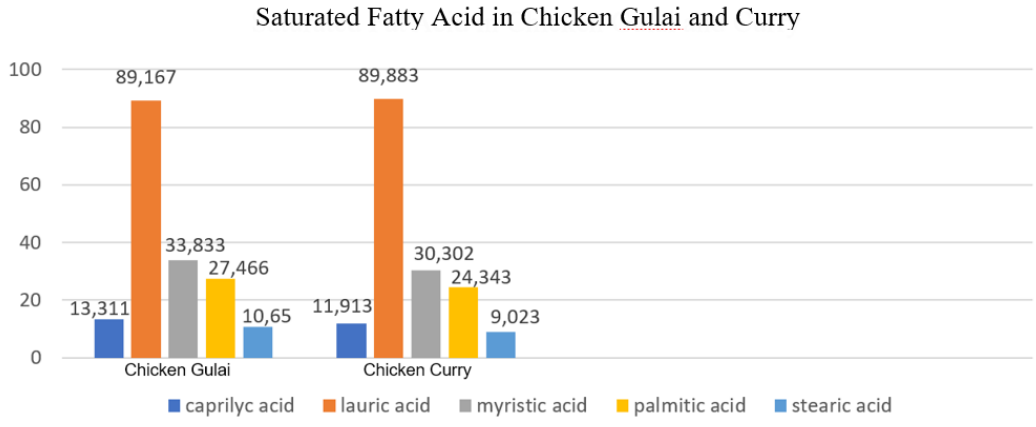

Fig. 2. Saturated Fatty Acid Content in Chicken *Gulai* and Chicken Curry

Chicken *gulai* and curry contained five different types of saturated fatty acids, with lauric acid observed to be the most dominant saturated fatty acid. Lauric acid ($C_{12}H_{24}O_2$) is a naturally occurring saturated fatty acid commonly observed in vegetable fats and oils, most notably in coconut oil. It acts as an antiviral and antibacterial agent (Sandhya, Talukdar, & Ph.d., 2016). Within the human body,

lauric acid is converted to monolaurin compounds that have antiprotozoal, antibacterial, and antiviral properties and are currently being developed as an HIV antiviral (Widianingrum et. al., 2019).

Myristic acid was the second-highest saturated fatty acid. Myristic Acid ($C_{14}H_{28}O_2$) is a hydrophobic saturated fatty acid, so it is highly soluble in alcohol and has low solubility in water (McSweeney & McNamara, 2022). Similar to vegetable fatty acids, myristic acid is an emollient or moisturizing active substance (Lin et. al., 2018). The third highest saturated fatty acid was palmitic acid ($C_{16}H_{32}O_2$). It is long-chain saturated fatty acids with a melting point of 64^{o}C. Due to its higher melting point, palmitic acid is more resistant to oxidation (rancidity) than other fatty acids (Håversen et. al., 2009).

Caprylic acid was the fourth saturated fatty acid (Altinoz et. al., 2020). Caprylic acid ($C_8H_{16}O_2$) is a saturated fatty acid found in coconut and palm oils (Altinoz et. al., 2020). The last observed saturated fatty acid was stearic acid ($C_{18}H_{36}O_2$), a fatty acid generally found in animals and plants (Shen et. al., 2014). The molecular weight of stearic acid is 289.48 g/mol (Hudaya & Wiratama, 2014).

Saturated fatty acids in chicken *gulai* and chicken curry dishes are derived from lengthy processed materials. Around 0.36-0.15 percent of saturated fatty acid is formed during the heating process at 35-60^o C temperature, with the highest amount of saturated fatty acid produced at 35-40^o C (Prieto Vidal et al., 2018) because the optimal temperature for lipase activity ranges between 30-40^o C. A study reported that coconut milk heated to 37^{o}C contains more saturated fatty acids than coconut milk left at room temperature (Qazuini & Saloko, 2008) .

2) Unsaturated Fatty Acid

Figure 3 shows the unsaturated fatty acids in chicken *gulai* and chicken curry. The T-test results showed the significance value (2-tailed) between 0.638 to 0.05, signifying no average difference between unsaturated fatty acids in chicken *gulai* and chicken curry.

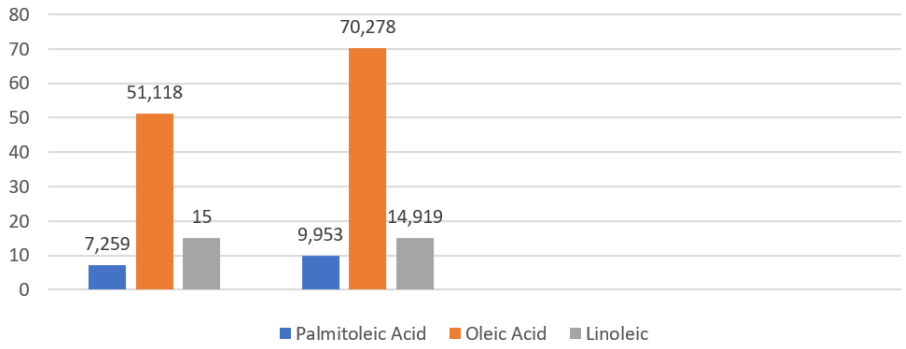

Fig. 3.The Unsaturated Fatty Acid Content of Chicken Gulai and Chicken Curry

Chicken curry and *gulai* contain a high concentration of unsaturated fatty acids. Three unsaturated fatty acids were observed to generate the highest yield, namely oleic acid ($C_{18}H_{34}O_2$), omega-9 unsaturated fatty acid, and natural component of fat derived from either vegetable oil (Medeiros-de-Moraes et al., 2018) or animal fat (Oh et. al., 2019). Oleic acid can soften and moisturize the skin. Therefore, special vegetable oils containing high oleic acid, such as sunflower oil, have been produced and commercially available. The second-highest unsaturated fatty acid was linoleic acid. Linoleic acid ($C_{18}H_{30}O_2$) is an unsaturated fatty acid that contains omega-6 fatty acids (Innes & Calder, 2018). This Linoleic acid is derived from plant's glycosides and has become a crucial fatty acid for mammals. Linoleic acid has a molecular weight of 280.45 g/mol (Hudaya & Wiratama, 2014).

Palmitoleic acid is the third-highest unsaturated fatty acid (Park & Bell, 2004). This fatty acid ($C_{16}H_{30}O_2$) is popular for its numerous health benefits, such as decreasing the risk of Non-Alcoholic Fatty Liver Disease (NAFLD) by inhibiting lipogenesis in the liver (Frigolet & Gutiérrez-Aguilar, 2017). Besides, palmitoleic acid also plays a role in cardiovascular disease by lowering triglyceride and LDL cholesterol levels, while increasing HDL cholesterol levels in the blood (Paillard et al., 2008).

IV. Conclusion

This study concludes that the saturated fatty acid content of chicken *gulai* and chicken curry is identically high, as both dishes are prepared using long heated coconut milk. Meanwhile, the unsaturated fatty acids content in chicken *gulai* and chicken curry are also similar. A similar unsaturated fatty acid is induced by the large number of spices containing essential oil used during food preparation.

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