Comparison of the nutritional content of rendang using coconut milk (cocos nucifera) and soybean juice (glycine max) with the use of old coconut water (cocos nucifera) in terms of texture and taste

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ABSTRACT

With the advent of digitalized lifestyles and a growing emphasis on healthy living, the popularity of rendang is paradoxically hampered by its time-consuming preparation and high-fat composition, making it less accessible to a broader audience. This study aims to reduce the extensive cooking time and lower the fat content of rendang by substituting coconut milk with soy milk and optimizing the use of mature coconut water, often discarded as waste, to tenderize the beef. Additionally, the research seeks to determine the optimal concentration of soy milk and mature coconut water in rendang based on evaluations of texture and taste. This study is experimental in nature. It involves three repetitions of beef rendang production with soy milk concentrations of 25%, 50%, and 100%. Each sample undergoes organoleptic testing by 30 untrained, randomly selected panelists, with evaluations conducted in triplicate on different days. Based on the results of the organoleptic tests, the sample preferred by the panelists was the soy milk-based rendang using mature coconut water at a concentration of 25%. The substitution of soy milk and the utilization of mature coconut water impacted the texture and taste of the rendang. Higher concentrations of soy milk were increasingly disliked by the panelists due to the intensified beany flavor of the soy milk.

1. INTRODUCTION

Coconut milk is a processed form of coconut in the form of extracting grated coconut, generally in the form of a white liquid after being squeezed when water is added to it which is categorized as a kind of oil-in-water emulsion.(Cahya & Susanto, 2014).Rifdi & Zhulhida (2021)in his research regarding the content of coconut milk, he wrote that coconut milk contains 1.53% carbohydrates, 35.3% fat, 3.46% protein. The process of cooking coconut milk in rendang takes a relatively long time, the most common time ranges from four to eight hours, until the coconut milk starts to dry and is completely absorbed along with the spices.(Masdison, 2018). So that rendang can be cooked more quickly, ingredients are needed that have a much lower fat content than coconut milk. Moreover, most of the fat

content of coconut milk is saturated fat, which is what people consider when they want to eat rendang. A much lower fat content can be found in soybean juice, a plant-based product that also contains lecithin. Lecithin is a colorless and clear substance. Lecithin has various applications in the food industry with the aim of increasing nutritional value, stabilizer, antioxidant, and as an emulsifier(Meliana et al., 2019).

Soybean juice is the result of processed soybeans in the form of a white liquid, with a physical appearance that at first glance is similar to cow's milk. This soybean juice is quite popular among the public because it is considered a healthy drink and provides many good benefits for the body. According toKoswara et al. (2017), soybean juice contains more complex amino acids when compared to other vegetable products and the fat contained in soybeans is cholesterol-free unsaturated fatty acids. Apart from the health benefits of soybeans, the structure of soybean juice is very similar when compared to coconut milk.

Table 1. Nutritional Comparison of 100 Grams of Soy Milk and Coconut Milk

Nutrient content	Soybean Extract	Coconut milk	Unit
Water	87.0	95.5	Grams
Calories	41.0	17.0	Calories
Proteins	3.5	0.2	Grams
Fat	2.5	0.1	Grams
Carbohydrate	5.0	3.8	Grams
Fiber	0.2	0.0	Grams
Ash	2.0	0.4	Grams
Calcium	50.0	15.0	Milligrams
Phosphor	45.0	8.0	Milligrams
Iron	0.7	0.2	Milligrams
Sodium	128.0	1.0	Milligrams
Potassium	287.9	149.0	Milligrams
Copper	0.12	0.04	Milligrams
Zinc	1.0	0.1	Milligrams
Thiamin	0.08	0.00	Milligrams
Riboflavin	0.05	0.00	Milligrams
Niacin	0.7	0.0	Milligrams
Vitamin C	2.0	1.0	Milligrams

Judging from the content and functions that coconut milk has, soybean juice also has it and is even much better, making soybean juice the potential to be applied as a substitute for coconut milk. However, by replacing coconut milk with soy milk in making rendang, it will definitely have a significant effect on the length of cooking time for rendang specifically, it will be much faster because of the lower fat content, so it will affect the level of tenderness and taste of the meat produced after cooking, so ingredients are needed. addition to help the natural meat tenderization process.

Researchers want to use old coconut water as an ingredient that can help the process of tenderizing the meat in rendang. Old coconut water can be obtained from old coconuts too. In general, only the flesh of old coconuts is used, usually processed into coconut milk, while

old coconut water itself is rarely sought after and used because the taste of old coconut water tends to turn sour. This means that old coconut water is often thrown away and not utilized optimally. The sour taste that appears in old coconut water is caused by the acetic acid content. Acetic acid is a compound that can be used as a natural meat tenderizer (Wahyuni et al., 2018). Based on the phenomenon that has been described by researchers, researchers are interested in finding out more about the comparison of the nutritional content of rendang using coconut milk (cocos nucifera) and soybean juice (Glycine max) with the use of old coconut water (cocos nucifera) in terms of texture and taste.

2. METHODOLOGY

This research was conducted at the Laboratory of the Tourism Faculty, Ciputra University, Surabaya, using an experimental method. The materials used include beef, soybean juice, old coconut and its water, red chilies, shallots, garlic, ginger, galangal, nutmeg, black pepper, cloves, cardamom, cumin, lime leaves, turmeric leaves, lemongrass, and cinnamon. The equipment employed consists of a wok, wooden spatula, blender, knife, digital scale, measuring cup, bowl, cutting board, refrigerator, tablespoon, strainer, stove, saucepan, camera, stationery, and work table. The experiment involved processing soybeans into soybean juice, which was then used in the preparation of beef rendang, with old coconut water applied to tenderize the beef before cooking. The study tested different concentrations of soybean juice at 25 percent, 50 percent, and 100 percent to determine their effects. The sample codes for the experiment were designated as follows: R101 to R104 for the first repetition ranging from 0 percent to 100 percent soybean juice, R201 to R204 for the second repetition, and R301 to R304 for the third repetition, with 0 percent serving as the control recipe in each set.

Soybean juice is made by soaking soybeans for four hours, removing their skins, and grinding them until smooth. Cold water is added in a one-to-one ratio, and the mixture is boiled at 90 degrees Celsius for 10 minutes to produce the soybean juice. The seasoning is prepared by grinding red chilies, shallots, garlic, ginger, galangal, nutmeg, black pepper, cloves, cardamom, and cumin. To make beef rendang, the soybean juice is mixed with coconut milk and the ground spices, then cooked at 90 degrees Celsius for 90 minutes. Separately, the beef is boiled in old coconut water at the same temperature and duration. Once cooked, the beef is added to the soybean juice mixture along with lime leaves, turmeric leaves, lemongrass, and cinnamon, then gently stirred every five minutes to prevent burning.

Table 2. Ingredients for Making Soybean Beef Rendang Using Old Coconut Water

Material	0%	25%	50%	100%	Unit
Beef	500	500	500	500	Grams
Coconut milk	1500	1125	750	0	Milliliters
Soybean Extract	0	225	600	1350	Milliliters
Old Coconut Water	0	150	150	150	Milliliters
Red chili pepper	125	125	125	125	Grams
Red onion	50	50	50	50	Grams
Garlic	50	50	50	50	Grams
Ginger	10	10	10	10	Grams
Galangal	15	15	15	15	Grams
Nutmeg	1	1	1	1	Fruit
Black pepper	5	5	5	5	Fruit
Clove	1.5	1.5	1.5	1.5	Fruit
Cardamom	2	2	2	2	Seed
Caraway	7.5	7.5	7.5	7.5	Fruit
Lime leaves	2.5	2.5	2.5	2.5	Sheet
Turmeric Leaves	1	1	1	1	Sheet
Lemongrass	1	1	1	1	Stem
Cinnamon	1	1	1	1	Fruit

Organoleptic Test

Organoleptic testing is a test of food ingredients based on likes and desires for a product(Gusnadi et al., 2021). The organoleptic test in this study was carried out on 30 random untrained panelists with three repetitions. Panelists rated four samples with three repetitions in terms of texture and taste. Panelists will fill out a questionnaire given on a hedonic scale with a score of 1-4 with 1 representing very dislike, 2 not like, 3 like, and 4 very like.

Data Analysis

The organoleptic test results were tested using ANOVA analysis to determine the effect of substitution on panelists in providing assessments of texture and taste parameters. The results of repeated analysis are declared consistent if the results are more than 0.05, while the concentration is declared significant if the value is less than 0.05. Analysis of the results of the ANOVA test will reveal the product with the best concentration which will be selected by the researcher.

3. RESULTS AND DISCUSSION

Figure 1. Final Result of Soybean Juice

Soybean juice in this study used a recipe for the ratio of soybean juice to water 1: which is mentioned inKoswara et al. (2017)The use of water in making soybean juice is 1:10 with water.The 1:1 recipe produces soybean juice with a thick texture that is not too runny and has a delicious soybean taste.

Figure 2. Final Results of the First Four Repetition Samples

Figure 3. Final results of the Four Samples from the Second Repetition

Figure 4. Final Results of the Four Samples from the Third Repetition

Figure 2, Figure 3, and Figure 4 show the final results of the three repetitions of beef rendang products with concentrations of 25%, 50%, and 100% along with the control. The texture of beef rendang substituted with soybean juice and the use of old coconut water is soft. The longer the meat is boiled using coconut water, the softer the resulting texture, in other words, the higher the concentration of substitutes, the lower the level of tenderness of the meat produced. The taste produced by substituting soybean juice for meat rendang using old coconut water is savory and tends to be sweeter, the higher the concentration, the sweeter the resulting taste and the stronger the soybean flavor. This is in line with research byMinantyo et al. (2021)who conducted research on the use of soybean flour obtained a product with a sweet and not sour taste. Control beef rendang has a soft texture and savory taste.

Table 3. Recapitulation of Organoleptic Test Results for Beef Rendang

Test	Texture	Flavor
Control - 0 Grams (0%)	2.53 ± 0.89^{c}	3.10 ± 0.89^{a}
Boiled Coconut Water - 225ml + 150ml (25%)	3.37 ± 0.64^{a}	3.30 ± 0.80^{a}
Boiled Coconut Water - 600ml + 150ml (50%)	2.96 ± 0.80^{b}	2.61 ± 0.90^{b}
Boiled Coconut Water - 1350ml + 150ml (100%)	2.62 ± 0.66^{c}	2.11 ± 0.89^{c}

Table 3 shows the results of the data recapitulation obtained from the ANOVA test. At the end of the number there is a letter in the form of a rank indicating the ranking of the product that has been organoleptically tested. The ranks (^{a},^{b},^{c}) are the first, second and third ranks respectively. Based on Table 3, it can be seen that substitution with a composition of 25% has superior results compared to other compositions. Substitution with a composition of 25% has the highest average value of all parameters. 50% substitution was in second place and 100% substitution was the composition that the panelists disliked the most. The concentration given affects the taste produced, the higher the concentration, the stronger the taste of the soybean juice produced can be seen from the panelists' liking scores which are lower at higher

concentrations. This means that the panelists don't like the taste of soybean juice which is too strong. The resulting texture is influenced by old coconut water which is used as a natural tenderizing agent for meat. The longer the cooking time with meat that has been boiled in old coconut water, the softer the texture will be.

Based on the organoleptic test results seen from each parameter, there is one superior product that is liked by the panelists, namely beef rendang substituted for soybean juice using old coconut water with a concentration of 25%. Control meat rendang has a similar level of preference to meat rendang substituted with soybean juice using old coconut water with a concentration of 25%. The difference is seen to be much different in the texture parameters which shows that meat rendang substituted with soybean juice using old coconut water has a higher liking value. . Based on the results of the discussion, the researchers chose a product with 25% substitution as a substitute for coconut milk in making rendang dading which will be marketed.

Table 4. Data from Organoleptic Tests using ANOVA

Source	Sig Texture.	Sig taste.
Repetition	0.781	0.975
Concentration	< 0.001	< 0.001

Based on Table 4, repetition shows that the results are not significant, meaning that the product produced during three repetitions is consistent. On the other hand, different concentrations, namely 25%, 50% and 100%, produce significantly different textures and flavors. This influences the results given by panelists regarding texture and taste assessments. This is in line with the statementNurjanah et al. (2022)who in his research concluded that different volumes of coconut milk had no real effect on color, aroma and taste. Using a little coconut milk affects the cooking time which can affect the texture of the beef rendang. This is in line with research conducted byPandit et al. (2021)which states that time has a real effect on organoleptics, especially texture parameters, the researchers used old coconut water as a natural tenderizing agent which had been used in previous research conducted byWulang et al. (2024).Otolowo et al. (2022)in his research stated that the use of soy milk or soy juice substitutes above 50% in mixed samples resulted in the lowest preference, so that the statements from previous research that have been mentioned are in line with the product chosen by the researcher. The samples chosen by the researchers were samples with codes R102, R202, and R302 or 25% substitution of soybean juice.

Table 5. Content Test Results of Control Samples and 25% Samples

Measurand	Control Meat Rendang	Beef Rendang Substituted with Soybean Juice by Utilizing Old Coconut Water	Units
Calories	227	210	kcal/100g
Carbohydrates	11.5	11	%
Crude Protein	19.2	20.3	%
Total Ash	3.34	2.68	%
Total Fat	11.6	9.48	%
Water Content	54.4	56.5	%

Based on Table 5, the results of the proximate content test were obtained with results showing that the total calories per 100 grams of meat rendang substituted with soybean juice using old coconut water was 210 kcal, lower than the control rendang which reached 227 kcal, the same thing also happened with the content. Carbohydrate meat rendang substituted with soybean juice using mature coconut water was not much different with a content value of 11% and control rendang was 11.5%. The protein in beef rendang substituted with soybean juice using mature coconut water reached 20.3%, higher than control rendang at 19.2%. The fat content of beef rendang substituted with soybean juice using old coconut water is quite significantly different at 9.48% compared to control rendang of 11.6%. The water content of the control rendang was lower at 54.4% and the meat rendang substituted with soybean juice using old coconut water was 56.5%.

4. CONCLUSION

The results of the research show that soybean juice using old coconut water can be used as a substitute for coconut milk in making beef rendang. Concentration has a significant effect on the resulting samples. The meat rendang sample most liked by the panelists was meat rendang substituted with soybean juice using mature coconut water with a concentration of 25%. Beef rendang substituted with soybean juice using old coconut water has a soft texture and a savory taste that tends to be sweet. Meat rendang substituted with soybean juice using mature coconut water has lower fat, carbohydrate and calorie content and higher protein content than control beef rendang.

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