Sensory and Nutritional Composition of Retort-pouched Rabbit Meat Rendang

Celine Chua Miao Chiun[1], Hatijah Basri[1*], Zulikram Ramli[2]

[1]Faculty of Applied Sciences and Technology,
Universiti Tun Hussein Onn Malaysia (Pagoh Campus)
84600 Pagoh, Muar, Johor, MALAYSIA

[2]Koperasi Komuniti Hybrid Selatan, Kg Sri Jaya,
84900 Tangkak, Johor, MALAYSIA

*Corresponding Author Designation

Abstract Rabbits are classified into eight genera in the Leporidae family and are found all over the globe. In recent years, convenient food such as ready-to-eat food product which was packed into a retort pouch was popular in the market. Thus, by developing the rabbit meat which is packed in a retort pouch, the consumer's time in meal preparation can be reduced and is convenient to eat without additional preparation. The objectives of this study were to formulate, evaluate consumer acceptance, and determine physicochemical properties and nutritional composition of the accepted product. The consumer acceptance was evaluated based on descriptive and affective tests with four product formulations tested which is first sample coded with 450, second sample coded with 520, third sample coded with 680 and fourth sample coded with 680. The physicochemical properties on moisture content, colour and pH were highlighted, meanwhile nutritional composition on protein, fat, ash, mineral, carbohydrates and energy content were determined. The formulation of sample coded with 450 was highly accepted in descriptive and affective tests with 4.7 and 8.15 mean scores, respectively. The nutritional composition of rendang rabbit meat was 25.7g/100g in protein content, 13.7g/100g in fat content, 5.5g/100g in ash content, 1.09mg/100g in iron content, 465mg/100g in potassium content, 743mg/100g in sodium content and 370mg/100g in phosphorus content indicated that it has high protein content and ash content and has low fat content. While the moisture content was 50.5g/100g, indicated it has low moisture content after the long hours of rendang cooking process. The result of L* values $= \mathbf{30.14 \pm 0.40}$, a* values $= 7.10 \pm 0.48$ and b* values $= \mathbf{20.14 \pm 0.27}$ and pH values of 5.68 showed that it has acceptable eating quality by panellists.

Keywords: Retort-Pouched, Rendang, Rabbit Meat

1. Introduction

Rabbits are herbivorous animals which eat plant-based food such as grass or leaves. Rabbits are always been perceived as a pet animal more than a wild or exotic meat. The rabbit meat production in Malaysia is less than 10 tonnes per annum, and there was no records of export or imports of rabbit meat [1]. The production of rabbit meat in Malaysia is considered less compared to chicken meat and beef meat, which is a main meat sources consumed by Malaysians. In Malaysia, the rabbit meat is sold from farm only. The reason that rabbit meat is not sold at an industrial level is because rabbits are considered as pets, which makes most people resistant to the idea of eating them.

In recent years, convenient food such as ready-to-eat food product which was packed into a retort pouch was popular in the market. For the retailer, there are benefits such as saving storage space compared with tin can [2]. Therefore, in this study, the production of ready-to-eat rendang rabbit meat was developed and packed in a retort pouch, so it can provide convenience for consumer as the retort pouch has a lightweight making it easier to carry compared to cans and glass.

Usually, rendang is using beef meat as main ingredients. In this study, the rabbit meat was used as main ingredients in the rendang recipe. Rabbit meat is white meat which has low fat content in 9.2g/100g and high protein content in 21.2g/100g [3]. Beef meat is red meat which may cause heart disease because it is high in fat and cholesterol. It is also recommended for youngsters and the elderly to consume because it is a healthy meat with an excellent source of proteins and has a tender and juicy texture [4]. For Malaysians, Rendang is a traditional dish for Malay peoples in Malaysia and often served with rice during Hari Raya Aidilfitri. Rendang derives from the Malay language where 'randang,' 'marandang' and 'merendang' denote a cooking technique which is cooked slowly for a long period of time [5]. Commonly, blended ingredients such as red chillies, onions, ginger, turmeric, garlic and coconut milk are added when cooking rendang [6]. Therefore, the purpose of this study is to determine the sensory properties, nutritional composition and physiochemical analysis of the most accepted recipe of rendang rabbit meat in four formulations.

2.   Materials and Method

2.1 Rendang rabbit meat formulation

The ingredients used to make rendang rabbit meat were obtained from a local chef according to a traditional rendang recipe which was suitable for Malaysian's taste. For sensory test, there were four formulations with first sample coded with 450, second sample coded with 520, third sample coded with 680 and fourth sample coded with 780. The following ingredients that being used were fixed for four formulations: 1kg rabbit meat, 600g coconut milk, 92g cooking oil, 12g candlenuts, 36g garlic, 250g onions, 50g ginger, 50g galngal, 50g fresh turmeric, 3g ground coriander, 3g cumin seeds, 5g sugar, 4g cinnamon sticks, 2g star anise, 60g lemongrass, 3g kaffir lime leaves, 2g asam keping, 2g turmeric leaves, and 45g kerisik. The amount of red chillies or dried chillies, salt, chili paste and tamarind paste has different amounts due to differentiate on sensory attributes on scoresheet of saltiness, spiciness, redness and flavour. First sample coded with 450 used 300g red chillies, second sample coded with 520 used 300g dried chillies, third sample coded with 680 used 200g dried chllies and fourth sample coded with 780 used 400g dried chillies. The amount of salt used in first sample coded with 450, second sample coded with 520, third sample coded with 680 and fourth sample coded with 780 was 17g, 51g, 102g and 34g respectively. Chili paste and tamarind does not add in first sample coded with 450. The amount of chili paste used in second sample coded with 520, third sample coded with 680 and fourth sample coded with 780 was 60g, 15g and 30g respectively while the amount of tamarind paste used in second sample coded with 520, third sample coded with 680 and fourth sample coded with 780 was 30g, 45g, and 15g respectively.

2.2 Sensory analysis

A scoresheet of 5-point hedonic scale ranges from 5 which represented for like a lot and 1 which represented for dislike a lot was used to evaluate the acceptance based on saltiness, tenderness of meat, spiciness, redness, flavour and overall acceptance of the sample in sensory evaluation for descriptive test. The test was done by 10 trained panelists of final year of Bachelor's Degree Food Technology students from FAST, UTHM Campus Pagoh. A scoresheet of 9-point hedonic scale ranges from 9 which represented for like extremely and 1 which represented for dislike extremely was used to evaluate the acceptance based on saltiness, tenderness of meat, spiciness, redness, flavour and overall acceptance of the sample in sensory evaluation for affective test. 40 untrained panelists with different gender, age stages, and races was involved in the affective test. The best sample which has higher overall acceptance was packed in a retort pouch and was characterized for physiochemical analysis and nutritional composition.

2.3 Retort processing

A retort pouch with a size of 16cm x 13cm were used as a packaging material for the most accepted recipe for rendang rabbit meat through sensory evaluation and were sealed by a impulse sealer (Type: PFS-450). For retort process, the autoclave machine (HV-85, Hirayama, Japan) was used. The retort temperature was set at 121 °C with 20 minutes and mode = solid for thermal processing purposes. After retort process, the retort pouches were stored in a cool dry place at ambient temperature (30 ± 2 °C) for further physiochemical analysis and nutritional composition test.

2.4 Nutritional composition

According to (AOAC 981.10), Kjeldahl method was carried out to determine the crude protein in meat. The method that was used to determine the fat content was by using Soxhlet extraction method according to (AOAC 960.39). The ash content was determined by using dry ashing method. The mineral content such as iron, potassium, sodium and phosphorus was analysed by using ICP-OES method (Inductively coupled plasma-optical emission spectrometry). The total carbohydrate content was calculated by subtracting protein, fat, ash and moisture from 100%. To determine the energy content of the sample, the total content of protein, fats and carbohydrates were converted into energy in different quantities. Then, the total energy content of the sample was obtained by sum up all the values.

2.5 Physicochemical analyses

The physicochemical properties for rendang rabbit meat were analysed and determined based on the moisture content, colour and pH. The moisture content in the sample was analysed by moisture analyzer (A&D MX-50). Colorimeter (MiniScan EZ, USA) was used to analyze the colour of the sample. About 3ml of the sample was put into a beaker measured by pH meter (Eutech pH 700, India) to determine the pH value.

3. Results and Discussion

As shown in Table 3.1, the total of 4.7 mean score was resulted from the overall acceptance for the sample coded with 450 and was the highest mean score among of all four samples. The second highest was sample coded with 780 with the total of 4.1 mean score. However, sample coded with 520 and 680 were less preferable by panellists with the mean score of 3.4 and 3.2 respectively. To conclude the result, sample coded with 450 and 780 were selected and tested in affective test. In affective test, the overall acceptance for the sample coded with 450 was higher compared to sample coded with 780 with the total of 8.15 mean score as shown in Table 3.2. Sample coded with 780 had a total of 7.45 mean score. To conclude the result, mostly panellists love low sodium food such as sample coded with 450 as it had

lower salt composition and acceptable flavour, thus it was suitable to became the final product for development of rendang rabbit meat.

Table 3.1 Mean scores for each sensory attributes in descriptive test.

Attributes	450	520	680	780
Saltiness	4.1	3.2	2.8	3.9
Tenderness of meat	4.7	4.3	4.1	4.6
Spiciness	3.9	3.6	3.2	4.4
Redness	4.2	4.5	3.3	3.6
Flavour	4.3	3.5	3.1	3.9
Overall acceptance	4.7	3.4	3.2	4.1

Table 3.2 Mean scores for each sensory attributes in affective test.

Attributes	450	780
Saltiness	7.53	6.75
Tenderness of meat	7.55	7.25
Spiciness	7.33	7.50
Redness	7.05	7.38
Flavour	7.73	7.13
Overall acceptance	8.15	7.45

Table 3.3 shows the nutritional compositions for sample coded with 450 of rendang rabbit meat. Rabbit meat had a high level of proteins with essential amino acids [7]. Consumers frequently favour rabbit meat because it has high-quality protein that is more easily digestible than other meats like beef [7]. Rabbit meat had a low level of fat content as reported by Nistor *et al.* (2013) which showed that the fat content of rabbit was 9.2g/100g compared to the fat content of beef meat which was 19.6g/100g [3]. The fat content found in rendang rabbit meat may be slightly higher as the use of coconut milk and cooking oil in rendang also contributes to the increase in fat content. The result above is found similar to Rini *et al.* (2016) as reported that ash content of rendang meat was 5.13% which was the highest compared to fresh meat and kalio meat with ash content of 4.22% and 4.63% respectively [8]. In mineral content, rabbit meat had low iron content but high in sodium, potassium and phosphorus content. Low amount of 4.6g/100g of carbohydrates was included in the rendang rabbit meat. Carbohydrates was the main source of calories for the human body [9]. High energy content depends primarily on rabbit meat's high protein content, which accounts for 80% of the energy value [10].

Table 3.4 shows the physiochemical properties for sample coded with 450 of rendang rabbit meat. Based on the result, it showed that moisture content of rendang rabbit meat was low, which was 50.5g/100g. One of the factors that affects how long food products will last is the moisture content; the

lower the moisture content, the slower the growth of microorganisms and allowing food products to stay longer. The colour profile analysis showed that the rendang rabbit meat has low level of lightness, redness and yellowness. The value of pH 5.68 was found in rendang rabbit meat. It was reported that the beef rendang had pH value about 5.60 [11]. pH value of 5.68 was suitable to consumed as it had a tender texture and brighter colour which can increase consumer's appealing.

Table 3.3 Nutritional composition for sample coded with 450

Sample	Result
Protein (g/100g)	25.7
Fat (g/100g)	13.7
Ash (g/100g)	5.5
Mineral (mg/100g)	Iron-1.09
	Potassium-465
	Sodium-743
	Phosphorus-370
Carbohydrate	4.6
Energy	244.5

Table 3.4 Physiochemical properties for sample coded with 450

Sample	Result
Moisture content (g/100g)	50.5
Colour	$L^* = 30.14 \pm 0.40$
	$a^* = 7.10 \pm 0.48$
	$b^* = 20.14 \pm 0.27$
pH value	5.68 ± 0.18

4. Conclusion

Rabbit meat had high protein content and low fat content. The outcome of the affective test indicates that the product was highly acceptable for the sample coded with 450 by untrained panellists. The recommendation for the future research is deep study on the shelf life and stability of the product such as microbiological analysis and water activity for at least 6 months. To improve the stability of the products, it is possible to research the ideal preservative agent.

Acknowledgement

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