Organoleptic Quality Analysis of Retort Pouch Vacuum Packaged Chicken with Different Sterilization Time

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Abstract. This research aims to determine the effect of sterilization time on the organoleptic quality of vacuum packaged rarang chicken in retort pouch. The method used in this research is an experimental method carried out in the laboratory. The experimental design used in this research was a Randomized Block Design (RAK) with one factor, namely sterilization time treatment of 3 minutes, 6 minutes, 9 minutes, 12 minutes, 15 minutes and 18 minutes. The significantly different data was further tested with HSD. Further test results showed that the sterilization time had a significant effect on the organoleptic quality of the texture and color parameters of the rarang chicken in retort pouch packaging, but had no real effect on the aroma, taste and appearance of the rarang chicken in retort pouch packaging.

Keywords: Rarang Chicken, Sterilization Time, Retort Pouch Packaging.

1 Introduction

West Nusa Tenggara, especially Lombok Island, is a destination for sport tourism and halal tourism, so it has its own attraction for tourists. Moreover, Lombok Island is the venue for MotoGP in the Mandalika Special Economic Zone (KEK), Central Lombok [1]. As a developing area, the availability of local food culinary businesses is very much needed to meet the needs of tourists while also being able to introduce the local culture of the area [2]. Several types of local culinary delights in the Lombok area that are popular among the community and tourism businesses include taliwang chicken, bebalung, plecing kangkung, urap, various satays, ares and vegetable lebui [3]. Apart from these foods, Lombok also has a special food that is no less delicious, namely chicken rarang.

Rarang chicken is a typical East Lombok culinary dish made from young chicken which is cooked by grilling and then given a spicing seasoning with a spicy and savory taste [4]. Rarang chicken has seasonings with high levels of water and oil so there is a risk of damage. Based on the results of a survey at the Rarang Chicken Restaurant MSME, it is known that Rarang chicken has a shelf life of one day after processing. Damage to oily ingredients is caused by oxidation processes and heating processes that are not in accordance with the food's needs [5]. So one way to prevent damage to fatty

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and oily ingredients is to improve processing and packaging technology. Packaging can prevent physical damage.

Rarang chicken packaging usually uses polypropylene plastic packaging. Grilled chicken packaged in polypropylene packaging can experience faster formation of free fatty acids due to the oxidation process caused by contact between the food product and oxygen [6]. Therefore, innovation with more modern technology is needed to increase the shelf life and a higher level of safety for food products, one of which is packaging technology using the canning method.

Canning basically has the principle of protecting food products from damage and spoilage. The advantage of the canning method is that it can extend shelf life and make storage easier and is more practical and efficient for traveling [7]. Canning technology is not only limited to canned packaging, but can use several types of non-canned packaging such as retort pouches, tetrapacks and glass jars [8].

Retort pouch is flexible packaging used to package ready-to-eat food with a hermetic system. Retort pouch packaging is resistant to the sterilization process and high pressure so that the product can be stored for a longer time [9]. Retort pouch packaging can be an alternative for packaging rarang chicken because it has several advantages, including being more attractive, cheaper, resistant to the sterilization process, resistant to ultraviolet light, lighter and easier to carry when traveling [10]. The requirements for a retort pouch are that it must have a high shelf life, not easily tear if punctured, easy closing technique and withstand high sterilization temperatures [11].

Sterilization is a heating process carried out to inhibit the decay process by destroying pathogenic microbes including spore-forming microbes [12]. Food products with low acid content require sterilization at high temperatures, namely between 114°C-130°C. Examples of food products with low acid levels are meat, poultry, fish and most vegetables. Based on this pH value, all types of microorganisms can grow, especially bacteria, which can cause a decrease in the shelf life of a food product [13]. Apart from that, rarang chicken is a product with a fairly high oil content, therefore it easily experiences damage such as changes in taste, slimy and rancid smell [14].

The application of sterilization to food products generally applies the principles of commercial sterilization. Commercial sterilization is a spore inactivation treatment with heat and/or other treatments sufficient to make the food free from microbes that have the ability to grow at room temperature (non-refrigerated) during distribution and storage. The main purpose of commercial sterilization is to destroy pathogenic bacterial spores including Clostridium botulinum bacterial spores [15]. The standard temperature used in commercial sterilization is 121°C because this temperature is sufficient to inhibit pathogenic bacteria and does not reduce the nutritional and organoleptic quality of packaged food [16]. The quality or characteristics of canned food products can also be determined based on the sterilization time. An inappropriate sterilization period can cause changes in the quality of a food product [17].

Sterilization of chicken satay using retorted pouch packaging at a temperature of 121°C for 45 minutes was able to produce of chicken satay microbes suitable for consumption with a shelf life of 8 weeks [18]. Sterilizing kalasan chicken at a temperature of 121°C for 15 minutes with storage for 14 days resulted in a taste, texture and aroma that the panelists liked [19]. Sterilization of Chinese boiled beef using retort pouch

packaging at a temperature of 121°C for 21 minutes with an F0 value of 10 minutes was the best treatment because no microbial growth was detected in all samples and had the best sensory evaluation which was the highest value of spice aroma, acceptable texture and chewiness overall [20].

2 Materials And Methods

The spices used in making chicken rarang are cayenne pepper, dried red chilies, large red chilies, garlic, candlenuts, shrimp paste, sugar, and salt. The spices that will be used, such as chili, garlic and candlenuts, are sorted first to obtain quality ingredients, then cleaned. Weighing the spices to be used in making chicken rarang with the raw materials free-range chicken carcass, dried red chilies (11.6%), large red chilies (21.2%), cayenne (4%), garlic (4%), candlenuts (4%), sugar (10%), salt (3.2%), shrimp paste (1.2%), flavoring (1.2%), cooking oil (30%) and water (20%). Grinding the ingredients is done using a chopper for around ±5 minutes. The ground spices are then sautéed with 30% v/w oil using a frying pan for 7 minutes until they give off an aroma when sautéed [21]. The processing of Rarang chicken is based on a modification of the "Lesehan Rarang" restaurant recipe. The raw material used is free-range chicken carcass. The selected chicken meat is still fresh and undamaged, the age of the free-range chicken is 3-4 months. The chicken that has been cleaned is placed in the oven at 180°C for 23 minutes until brownish yellow [22]. The roasted chicken is then cut into 10 pieces with a size of ± 9 cm to make it easier to fill into the packaging. Chicken that has gone through the oven and cutting process is then mixed with the prepared spices. Mixing is done before being put into the retort pouch packaging.

The process of canning rarang chicken is carried out using retort pouch packaging as follows: The rarang chicken which has been mixed with spices is then weighed as much as ±120 g, of which the weight of the chicken is ±80-100 g and the spices ±20-40 g and put into a 500 g retort pouch with dimensions of 16 x 22.5 cm and a thickness of 105 microns. When filling, the chicken and spices are still hot or hot filling (T=70-80°C). The rarang chicken that has been put into the retort pouch is then continued with the vacuum process. The sterilization process is carried out after closing the retort pouch. The temperature used for sterilization is 121°C with different time intervals, namely 3 minutes, 6 minutes, 9 minutes, 12 minutes, 15 minutes and 18 minutes. Cooling was carried out at a temperature of ±26°C for 20 minutes [23]. The design used in this research was a Randomized Block Design (RBD). The data were analyzed using analysis of variance with a significance level of 5% using Co-stat software. If there is a significant difference, a further Honest Significant Difference (HSD). The HSD test is carried out if the treatment has a significant or very significant effect. HSD is used to determine differences between treatments [24]. The parameters observed in this research are organoleptic parameters including color, aroma, taste, texture and appearance.

3 Results and Discussion

Table 1. 5% HSD Advanced Test Results Effect of Sterilization Time on Organoleptic Quality of Packaged Rarang Chicken *(Hedonically Retort Pouch).*

Sterilization time (minutes)	Average				
	Aroma	Flavor	Texture	Color	Appearance
3	3.65	3.85	3,10ab	3.95a	4.00a
6	3.95	3.70	2.85b	3.00b	3.75ab
9	3.85	4.05	3.60a	3.65a	3.80ab
12	3.80	3.90	3.45ab	3.85a	4.25a
15	4.00	3.90	3.75a	4.10a	4.15a
18	3.60	3.95	2.90b	3.10b	3.40b
BNJ	-	-	0.67	0.51	0.56

Note: - Data is the average value of 3 replications
- Numbers followed by the same letters in the same column indicate no significant difference at the 5% level

Table 2. 5% HSD Advanced Test Results Effect of Sterilization Time on Organoleptic Quality of Packaged Rarang Chicken (Scoring Retort Pouch).

Sterilization time (minutes)	Average				
	Aroma	Flavor	Texture	Color	Appearance
3	3.60	4.00	2.65ab	3.35a	2.05
6	3.85	3.85	2.60ab	3.00a	1.85
9	3.65	4.05	2.85a	3.40a	1.95
12	3.75	3.85	2.55ab	3.20a	1.80
15	3.55	3.90	2.35ab	3.15a	2.00
18	3.70	3.90	2.05b	1.85b	1.70
BNJ	-	-	0.62	0.60	-

Information:
Hedonic test : 1 = very dislike, 2 = dislike, 3 = normal, 4 = like, and 5 = really like
Scoring test:
Aroma : 1 = Very Not Typical of Rarang Chicken, 2 = Not Typical of Rarang Chicken, 3 = Somewhat Typical of Rarang Chicken, 4 = Typical of Rarang Chicken, 5 = Very Typical of Rarang Chicken
Flavor : 1 = Very Not Typical of Rarang Chicken, 2 = Not Typical of Rarang Chicken, 3 = Somewhat Typical of Rarang Chicken, 4 = Typical of Rarang Chicken, 5 = Very Typical of Rarang Chicken
Color : 1 = Very dark brown, 2 = Blackish brown, 3 = Slightly reddish brown, 4 = Red, 5 = Very red
Texture : 1 = Firm, 2 = Slightly Soft, 3 = Soft, 4 = Very Soft, 5 = Too Soft

Appearance : 1= Very Intact, 2 = Intact, 3 = Slightly Destroyed, 4 = Destroyed, 5 = Very Destroyed

3.1 Aroma

The sterilization time has no effect on the aroma of the retort packaged chicken rarang *pouches* both hedonic and scoring (see Tab. 1 and 2). Hedonic test of the aroma of chicken rarang in retort packaging *pouches* with sterilization time treatment is in the value range of 3.6-4 which means the criteria for liking. The hedonic assessment showed that the panelists liked the aroma of the rarang chicken because the scoring test results produced a value range of 3.55-3.85, which means that the rarang chicken was in the "Typical aroma of rarang chicken" criteria. The distinctive aroma of retort packaged rarang chicken *pouches* dominated by the aroma of chili. Red chilies contain the compound capsaicin, which is a class of terpenoid compounds which functions as an aromatic source. Terpenoids are volatile compounds in capsaicinoids [25]. Volatile compounds are an important factor in giving food a distinctive aroma. Volatile compounds can also be formed due to the heating process. The volatile compounds in capsaicinoids identified include esters, alcohols and terpenoids [26].

3.2 Flavor

The sterilization time did not have a significantly different effect on the taste of the retort packaged rarang chicken pouches generated both hedonic and scoring (see Tab. 1 and 2). This is because based on the long sterilization scoring test, it produces a value range of 3.85-4.05 for the taste of Rarang chicken, which means it is in the "Typical taste of Rarang chicken" criteria. The distinctive taste of chicken rarang caused the panelists to give a hedonic test assessment in the range of 3.7-4, which means the criteria for liking. Rarang chicken has a more dominant chili flavor so it tends to be a little spicy. Taste perception is greatly influenced by the sensitivity of the tongue and other factors such as temperature, concentration and other taste components [27]. Apart from that, taste is also formed from a combination of food ingredients.

3.3 Texture

The relationship between the effect of sterilization time on the texture (hedonics and scoring) of rarang chicken packaged in retort pouches (see Tab. 1 and 2). The sterilization time has a significantly different effect on the texture of retort packaged rarang chicken *pouches*. This is because during the sterilization treatment, the texture produced by the rarang chicken becomes harder or tougher with the time given. Sterilization of kalasan chicken has a significant influence on the resulting texture. The texture of kalasan chicken by giving it a high temperature causes the hardness value to be even higher (tough) [19]. Hedonic test of the texture of retort packaged rarang chicken *pouches* with long sterilization treatment, the value is in the range of 2.85 – 3.75, which means the criteria are somewhat favorable. The panelists' liking for the texture of the chicken rarang was due to the scoring test value resulting in a value range of 2.05-2.85

with the criteria "rather soft-tender". The longer the sterilization time is given, the texture of the chicken produced tends to decrease so that it is in the criteria of being slightly soft. This is supported by observational data from texture tests using a fruit hardness tester as shown in Table 15, which shows that sterilization causes the chicken to retort in packaging *pouches* has an increasingly higher hardness value (hard) along with the length of time the sterilization is carried out. Increase in hardness is thought to be due to structural changes caused by denaturation of myofibril proteins due to heat, causing sarcoplasmic fluid to come out and resulting in water loss from muscle tissue [28].

3.4 Color

The relationship between the effect of sterilization time on the color (hedonic and scoring) of retort pouch packaged rarang chicken (see Tab. 1 and 2). Based on the table, it can be seen that the sterilization time affects the color of the retort packaged rarang chicken pouches resulting, both hedonic and scoring. The difference in the assessment of the color of the rarang chicken by the panelists was due to changes in the color of the pigment in the material during sterilization. Pigments have the property of being easily degraded when subjected to heat treatment so that long periods of sterilization will cause the color of the rarang chicken to change. Hedonic test of retort packaged rarang chicken pouches with sterilization time treatment, the value is in the range of 3-4.1, which means the criteria are somewhat favorable. The panelists' level of preference was due to the results of the scoring test on the color of the Rarang chicken which resulted in a value range of 1.85-3.4, which means blackish brown – brownish red. Sterilization over a longer period of time causes the color of the rarang chicken to become darker. The longer time used at high temperatures, the greater the risk of the color changing to a darker color [29]. There is denaturation of myoglobin due to heating, which forms hemi chromogen globin and causes the product to become brownish [8].

3.5 Appearance

The relationship between the effect of sterilization time on the color (hedonic and scoring) of retort pouch packaged rarang chicken can be seen in Tables 1 and 2. Based on this table, it can be seen that the sterilization time has a significantly different effect on the panelists' level of preference (hedonic) but not significantly different on scoring. chicken rarang retort pouch packaging. This is because the scoring appearance of rarang chicken is in the range of 1.7-2.05 with intact criteria. The integrity of the chicken produced causes the chicken meat to look very dense, which causes the panelists' levels of preference to vary. Apart from the complete appearance, the panelists' benchmark in looking at the appearance of the retort pouch packaged chicken rarang is color.

4 Conclusion

Based on the results of observations and discussion descriptions which are limited to the scope of this research, the conclusion is that a sterilization time of 9 minutes is

sufficient to produce vacuum packaged rarang chicken in a retort pouch with the best organoleptic quality (aroma, taste, color, texture and appearance) which is still accepted by the panelists.

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