Physical And Sensory Quality of Canned "Rarang" Chicken Under Sterilization Time Difference

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Abstract. Rarang chicken is one of the mainstay culinary products of West Nusa Tenggara. Canning is the choice of processing technology to extend the shelf life of products with stable quality and expand market reach. The heat adequacy for canning rarang chicken has been determined, but tests on changes in texture and a number of sensory qualities have not been carried out. Therefore, this study aimed to determine the physical and sensory quality of canned Rarang chicken which was sterilized for different lengths of time. This study used a randomized block design with a single factor experiment, namely sterilization time of 3,6,9,12,15 and 18 minutes at 121°C. The quality parameters tested were: physical quality (texture and color) and sensory quality (color, aroma, taste, and texture). Observational data were analyzed using analysis of variance (Analysis of Variance) with a significance level of 5% using Co-stat software. The results showed that the duration of sterilization affected the physical quality (texture) and sensory quality (aroma, texture, and taste) but did not affect the physical and sensory color. The 9-minute sterilization time met the physical and sensory qualities of canned Rarang chicken, both hedonic and scoring, and in accordance with the F0 value of MSME products.

Keywords: culinary, canned chicken, physical quality, sensory.

1 Introduction

Rarang chicken is one of the culinary delights of West Nusa Tenggara which has a characteristic, made from young chicken cooked by grilling then seasoned with a spicy and savory taste. Rarang chicken is one of the mainstay local menus that are in demand by domestic and foreign tourists and is offered by culinary businesses in the Mandalika SEZ [1] and [2]. Generally, culinary in NTB has been sold based on orders or direct purchases in limited quantities. In addition, because the processing technology carried out is still simple and the nature of the material is easily damaged, this limits its development.

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One effort that can be made to maintain the shelf life of food products is to apply hurdle techniques [3] such as high temperatures in the canning process which is commonly known as commercial sterilization. According to[4], sterilization is a powerful way to suppress the growth of pathogenic microbes but has the opportunity to cause a decrease in a number of nutritional components, vitamins, color components and sensory quality (flavor). [5] states that sterilization can be carried out in a canning process which can maintain the shelf life of the product for more than 6 months. Generally, products that are processed by canning are highly nutritious products with high protein and fat content based on both meat and poultry as well as from mammals such as cattle.

An important factor that must be controlled during sterilization in canning is the optimal temperature and time used [6]. The sterilization time for canned products varies depending on the product being processed. Vegetable products such as gudeg and ares are sterilized at 121 oC for 20 minutes [7]. [8] recommend sterilization of 115°C for 6 minutes in canning turkey pate. In addition, [9] heating chicken products in cans at 121°C for 15 minutes can last for two months in room temperature storage. [10] also reported that the sterilization process of canned beef kalio carried out at a temperature of 121°C with a value of F0 = 3 minutes was the most efficient process because it was sufficient to reduce 13 cycles of Clostridium botulinum logs. In addition to vegetables and beef and chicken products, sterilization is also carried out on products made from fish. [11] sterilized 121°C for 15-25 minutes to produce yellow spiced pindang fish with total microbes and total mold in accordance with SNI 2717.1:2009 standard, and able to maintain its organoleptic quality. [12] stated that the sterilization process of canned dried tuna with tuna bone meal substitution was carried out at a temperature of 120°C, for 15 minutes. [13] also stated that rawon, gandul sauce and empal gentong which were packaged in cans and sterilized at 121°C for 60 minutes showed F0 values in the range of 4.02-10.17 minutes and the panelists preferred color during 56 days of storage. MSME production of Rarang chicken has been canned and tested by the BRIN BPTBA in 2021 with an F0 value for 10 minutes; however, there has never been a physical and sensory quality test that will determine the level of consumer acceptance. Therefore, it is necessary to study the physical and sensory quality by sterilizing with different lengths of time.

2 Materials and Methods

2.1 Materials

The ingredients used in this study included free-range chickens aged 4-5 months weighing ±500 grams per head, the spices used were cayenne pepper, dry red chili, large red chili, garlic, shrimp paste, candlenut, water, sugar,salt, MSG, cooking oil, Plate Count Agar (PCA) medium, phosphate buffer solution, aquades, and 96% alcohol.

2.2 Processing of Ayam Rarang

The process of processing shredded chicken in cans goes through 2 stages, namely processing shredded chicken and canning. Rarang chicken processing is carried out in the following order: the raw materials used are free-range chickens aged 4-5 months with a weight of ±500 grams per head. The selected chicken carcasses are then washed with running water and drained. Chicken meat is baked in an oven at 180°C for 23 minutes until it turns golden brown [14]. The roasted chicken is cut into ±10 parts with a weight of ±30-50 grams per piece, then put into a pan containing the spices that have been sautéed previously (the spice formulation follows the procedure for small-scale chicken producers). While the canning is done in the following order (Syah 2012): Filling shredded chicken with hot filling (70-80 ºC with a chicken weight of ± 250 grams into a can (dimensions of height = 9 cm and diameter = 7 cm). At the time of filling, it takes empty space at the top of the can (head space) ± 2 cm so that during the exhausting process there is still room for the contents of the can to expand. The exhausting process is carried out to reduce the pressure from inside the can due to expansion during heating and prevent oxidation of the food in the can. Exhausting can be done by heating the can and its contents at 80°C for 10 minutes with the can lid still open, then closing the can hermetically.

2.3 Sterilisation

The sterilization process is carried out as soon as possible after closing the can using an autoclave. The temperature used for sterilization was 121°C with different time intervals of 3, 6, 9, 12, 15, and 18 minutes. After the sterilization process, the cans were rapidly cooled at a temperature of ±26°C for ±20 minutes. Subsequently, they were stored at room temperature (20-25°C) for 14 days before further analysis.

2.4 Physical and Sensory Determination

Physical quality testing of the texture of chicken meat was carried out using the Texture Analyzer TXT 32 following the procedure [15]. Sensory quality testing on the characteristics of aroma, color, taste and texture follows the procedure (Hedonic and Scoring) (based on SNI 01-2346-2006). Hedonic assessment with a score (1=lowest like and 5=highest like), while the description of the scoring test is based on the following criteria: appearance (1=very intact – 5=very crushed), Aroma/taste (1=very unscented/feeling typical of chicken Rarang), Color (1=very dark brown – 5=very red), and texture (1=very soft – 5(very firm).

2.5 Statistic analysis

The design used in this study was a randomized block design (RAK) with a single factor experiment, namely the sterilization time of 3,6,9,12,15,18 minutes at 121°C. Each treatment was repeated 3 times to obtain 18 experimental units. Observational data were analyzed using the analysis of variance with a significance level of 5% using Co-stat software. The data that was significantly different was further tested with Tukey with SPSS 20 Software [16].

3 Results and Discussions

3.1 Texture

The texture of the canned product is very important to test. [17] stated that texture may be a very important factor to consider, because it determines the chewing/biting quality of food products. Several studies have shown that sterilization affects the texture of the product. The effect of sterilization time on the texture of canned rarang chicken can be seen in Figure 1 below:

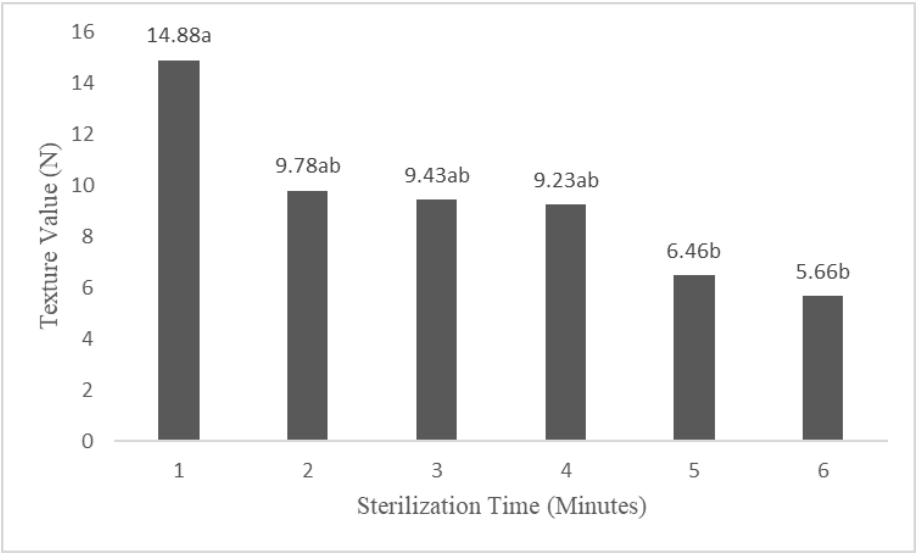

Fig. 1. Graph of Effect of Sterilization Time on Texture Value Canned Rarang Chicken

Figure 1 shows that the length of sterilization affects the texture of canned rarang chicken. Sterilization for 3 to 12 minutes did not affect the texture of chicken meat, but it did affect when the sterilization time was increased to 18 minutes. The figure shows that the lower the texture value, the more tender the sterilized chicken meat will be. This is in line with [18] who reported that the texture of canned chicken curry also decreased during the sterilization process. The softened texture is thought to be caused by protein denaturation as described by [19] [20] and [21] which stated that when heated collagen protein denatured and dissolved collagen tissue, ruptured muscle cells. , shrinkage of the sacromere, widening of the extracellular space and intracellular space and the appearance of aggregate protein granules in the extracellular space. The decrease in the level of hardness due to prolonged heating will break the protein bonds in the connective tissue so that the meat muscles become softer / softer. This is evidenced by the decrease in protein content in shredded chicken during sterilization with different lengths of time [22].

3.2 Sensory Quality

Hedonic sensory quality testing and scoring were carried out on the appearance, color, aroma, texture and taste of canned rarang chicken that had been stored for 14 days. Sensory testing is done to see consumer acceptance. The quality data of canned chicken is listed in table 1 below:

Table 1. Sensory Quality Test Results of Canned Rarang Chicken with several sterilization long treatment

Sterili-zation (Minutes)	Appearance		Color		Aroma		Texture		Taste	
	H	S	H	S	H	S	H	S	H	S
3	4.20	1.90	4.20	3.35	4.10^{a}	3.90^{a}	3.95	3.75	4.10^{ab}	3.85^{a}
6	3.90	1.95	3.75	3.00	3.75^{a}	3.60^{ab}	4.20	4.15	3.80^{ab}	3.75^{a}
9	4.05	2.00	4.00	3.35	2.90^{b}	2.95^{a}	3.85	3.85	3.40^{b}	3.00^{b}
12	3.85	2.05	3.80	2.95	3.75^{a}	3.75^{a}	4.10	4.15	3.80^{ab}	3.75^{a}
15	3.90	2.20	4.05	3.35	4.00^{a}	3.90^{a}	4.00	3.95	4.15^{a}	3.95^{a}
18	4.25	1.95	4.20	3.40	4.20^{a}	4.15^{a}	4.30	4.30	4.20^{a}	4.10^{a}
HSD 5%					0,69	0,67			0,74	0,63

Appearance

The appearance of the ingredients determines the attractiveness of consumers to the product and is one indicator to determine the freshness of the product. Table 1 shows that the time of sterilization (3 to 18 minutes) did not affect the panelists' acceptance of the appearance of canned rarang chicken. Based on the level of hedonic assessment of the appearance of canned rarang chicken, on average the panelists gave an appearance rating of +/- 4 with the criteria of liking. This is in line with the scoring assessment that the appearance of rarang chickens is not different from the initial condition before canning with intact / not crushed condition (score value 2 = intact). Sterilization up to 18 minutes at a temperature of 121ºC, does not change the texture. It is possible that the texture of the sterilized product will change/decrease with longer sterilization. In line with the results of [23] that sterilization at different temperatures up to 121ºC for 28 minutes does not change the physical appearance of warm.

Color

Color is an important characteristic of food because it can influence consumer preferences for the food. One of the physical properties that has changed due to high temperature processing is color [18] [17] also stated that the color of chicken/poultry meat products is influenced by many factors including the level of heating provided during processing. Based on table 1, the sterilization time has no effect on the color of canned rarang chicken either by hedonic testing or scoring. The average hedonic color assessment is 4 (likes) with a score of 3 (slightly brownish red). The preference value that tends to remain constant from the panelists for canned rang rang chicken is thought to be because there is no color change when compared to before canning. Panelists are quite familiar with the culinary of rarang chicken. The brownish red color that appears on the product is due to the large number of large red chilies and dried red chilies in the formulation of chicken rarang seasoning. The color of chicken meat in all sterilization treatments was not significantly different from sensory observations. The absence of color change is also in line with the results of research [23] that gudeg did not change color with sterilization at 121 ^{o}C for 28 minutes. [18] also stated that the color of canned chicken curry is the most resistant parameter from changes due to the effect of sterilization time.

Scent

The aroma of foodstuffs will determine the delicacy of foodstuffs [24] [17] stated that aroma is an important attribute in consumer acceptance of food products. The aroma of poultry meat is formed during cooking from sugar, protein, fat, thermal oxidation and thiamine degradation. [25] stated that cooking can increase the formation of flavour/aroma and taste components. [26] and [7] add that each high temperature processing process has advantages and disadvantages, and among all processing processes, high temperature heating/cooking (sterilization) has the potential to cause quality damage, including the highest aroma. However, although heating with 121 ^{o}C sterilization for 3-18 minutes has an effect on the aroma of canned rarang chicken (Figure 1), in general the panelists gave the same assessment, namely liking the criteria for the distinctive aroma of rarang chicken. So it can be said that cooking with this technique up to 18 minutes does not cause significant damage to the aroma.

Texture

Texture is one of the parameters in the organoleptic assessment of products, because texture can be used as an indicator of freshness. Figure 1 shows that the length of time sterilization treatment has no effect on the sensory assessment of the texture of canned Rarang chicken. The panelists considered that all the textures of rarang chicken were the same, namely hedonic likes and soft ratings for the scoring value. According to [27], sterilization can cause changes/damage to quality components. Protein

degradation can cause denaturation and softening of the tissue so that the texture can become softer. However, the perception of texture is also determined by the panelists, among others, by gender and habits. It is assumed that the trained panelists used in the test can still accept the textures of all products from various sterilization treatments and cannot see the difference. This is different from the texture data in Table 1. which explains that the length of sterilization affects the texture. The longer the sterilization, the higher the tissue damage so that the texture of the product becomes softer.

Taste

Taste is a very important parameter for consumer acceptance, because taste is the main parameter chosen by consumers in accepting a new product. Based on table 1, the sterilization time affects the level of preference for the taste of canned rarang chicken. Although the sensory assessment of taste was significantly different, in general all panelists liked chicken with a distinctive taste of chicken rarang. Cooking up to 18 minutes has not caused a significant change in the taste of rarang chicken. It is suspected that it takes a longer sterilization process to cause a change in taste. [17] stated that cooking with high pressure for a long time will cause the loss of a number of flavor-forming components. It is suspected that cooking up to 18 minutes has not been able to influence the perception of panelists' acceptance of sensory quality, including taste. This is in line with [23], that the best sensor for canned gudeg can be obtained with a longer sterilization time of 20 minutes at 121^{o}C.

4 Conclusions and Recommendations

The duration of sterilization affects the physical texture and sensory quality (aroma and taste) but does not affect the sensory assessment of the appearance, aroma and color of canned Rarang chicken either by hedonic or scoring. Sterilization for 9 minutes meets the adequacy of the length of cooking time by canning to produce canned rarang chicken with physical/textural properties that are not different from the minimum sterilization time of 3 minutes with sensory quality that is preferred by consumers with an assessment of intact appearance, brownish red color, soft texture, taste. and the distinctive aroma of rarang chicken. The quality characteristics obtained are in line with the adequacy of heat (F0 = 10 minutes) for shredded chicken produced by SMEs.

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