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Addition of Carrot Juice (*Daucus carota*) to the Shelf Life and Organoleptic of Turkey Meatballs

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ABSTRACT

Turkey is a type of poultry with characteristics and tastes similar to chicken meat, so turkey has the potential to be a raw material for meatballs. Carrots are also a source of natural antioxidants, the use of carrots so far has only been for vegetables and juice. Utilization in a fresh state has limitations because fresh carrots are prone to deterioration in quality. This study aims to determine the effect of adding carrot juice on the shelf life and organoleptic of turkey meatballs. This research was conducted in April 2024 at the Production Laboratory, Animal Husbandry Study Program, Faculty of Agriculture, Universitas Sumatera Utara. The design used in this study was RAL (Completely Randomized Design) with 4 treatments, namely P0 = 0 ml, P1 = 50 ml, P2 = 100 ml, P3 = 150 ml and 5 replications. The parameters used were shelf life and organoleptic color, taste, texture and aroma. The results of this study indicate that the addition of carrot juice can extend the shelf life of turkey meatballs. The best shelf life is in P3 with the addition of 150 ml of carrot juice with a shelf life of 5 days and the lowest shelf life is 1 day.

Keywords: Carrot juice, Meatballs, Organoleptic, Shelf life, Turkey

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1. Introduction

Many regions in Indonesia have local food products that are processed traditionally. Innovation in processing that continues to be carried out in terms of raw materials and processing techniques, resulting in increasingly diverse processed products [1]. The advancement of science and technology today cause meat products are processed into attractive food products. One of the processing that can increase it is meatballs [2]. Meatballs have a role in meeting the nutritional needs of the community, because of their high nutritional content and are widely favored by various groups [3]. At room temperature, the shelf life of meatballs is only one day, which often encourages some sellers to use chemicals to extend their shelf life. Meatballs have become a favorite food in various groups, but public awareness of the safety of meatballs that are suitable for consumption is still limited. Evidently, there are still many meatballs on the market that contain hazardous substances such as formalin and borax, even though both compounds are known to have negative impacts on health and should not be used as food additives.

Turkey meat has a complete amino acid profile, so it can be an alternative to beef to meet the nutritional needs of the community. Unfortunately, turkey meatballs are still not popular in Indonesia, and the proportion of ingredients and natural methods to maintain their shelf life are not widely known. In addition to its delicious

taste, turkey meat also has many benefits, such as high protein content, low fat and cholesterol, and rich in zinc, selenium, and vitamin B which support optimal muscle and brain development [4]. Currently, turkey is not very popular in Indonesia, so only a few people process it. One way to use turkey meat is to process it as the main ingredient for making meatballs because turkey has a taste and features similar to chicken meat.

One of the most widely eaten vegetables is carrots, and is known as a high source of dietary fiber. In addition, carrots are rich in natural antioxidants and β-carotene, so they can serve as a solution to overcome vitamin A deficiency. However, fresh carrots have limitations in storage because they are easily degraded. Therefore, carrots need to be processed by pureeing and filtering to obtain carrot juice which can then be mixed into the ingredients for making meatballs. Currently, the proportion of turkey meatball use and efforts to extend the shelf life of meatballs naturally are not yet known. Therefore, it is necessary to conduct research on the addition of carrot juice (*Daucus carota*) to the shelf life and organoleptics of urkey meatballs.

2. Method

This research was conducted at the Animal Production Laboratory of the Animal Husbandry Study Program, Faculty of Agriculture, University of North Sumatra, Medan. This research lasted for 1 month in March 2024. The materials used included five kilograms of turkey breast meat, seven kilograms of carrots, tapioca flour, eggs, garlic, shallots, salt, pepper, sugar, ice water, and spring onions..

2.1 Data Analysis

The experimental design used was a completely randomized design (CRD) using one factor consisting of 4 treatments and 5 replications. As a mathematical model for the experiment using a Completely Randomized Design (CRD). This study will also use an experimental research method through organoleptic testing and also on the shelf life of turkey meatballs.

2.2 Composition for Making Meatballs

Using the right components and in balanced proportions is very important to get good quality meatballs. To make meatballs, fresh turkey meat is ground and spices are added. The maximum amount of flour is 15%, salt is 2.5%, and spices are a maximum of 2% of the weight of the meat..

2.3 Shelf Life of Meatballs

Meatballs in each treatment and repetition will be seen for their durability at room temperature. Meat damage can be prevented by using the right storage temperature. In research on the shelf life of turkey meatballs, the use of fungal growth as a parameter is the right method to assess food quality and safety. In addition to using carrot juice, this study will use temperature as a parameter to measure the shelf life of turkey meatballs. This study will use room temperature, which is around 18-30ºC [5].

2.4 Organoleptic

In this research organoleptic test will be conducted by non-standard panelists in accordance with SNI No. 01-2346-2006 concerning organoleptic testing instructions. The minimum number of non-standard panelists is 30 people with the requirements stated in SNI No. 01-2346-2006 concerning organoleptic testing instructions. Turkey meatball samples will be tested for taste, color, texture, and aroma of turkey meatballs that have added carrot extract and without carrot extract. The number of panelists is 40 students of the USU Animal Husbandry Study Program.

3. Discussion

3.1 Shelf Life of Meatballs

Based on the results of the highest statistical average analysis on the results of the research on the shelf life of turkey meatballs, it can be seen in table 4 that it is in the P3 treatment with an average value of 5 and the lowest treatment is in the P0 treatment with an average value of 1. Treatments P0, P1 and P2 have lower values compared to P3. The shelf life of turkey meatballs in P0, P1, and P2 is significant (P <0.01) against P3.

Table 1. Shelf life of turkey meatballs

Treatment	Replicate					Average ± SD
	I	II	III	IV	V	
P0	1	1	1	1	1	1^{a} ± 0
P1	2	2	2	2	2	2^{b} ± 0
P2	3	3	3	3	4	$3,2^{c}$ ± 0,44
P3	5	5	5	5	5	5^{d} ± 0

Note: Different superscripts indicate very significant differences between treatments. (P<0,01)

Based on the results of the variety of carrot juice additions, there was a very significant effect (P <0.01) on the parameters of the shelf life of turkey meatballs. It can be seen in Table 1, namely the results of the highest shelf life of turkey meatballs in P3 for 5 days, and the lowest shelf life was in the P0 treatment for 1 day at room temperature. Meatballs are known as processed products that are rich in nutrition, but this also makes meatballs more susceptible to damage. Based on SNI 01-3818-1995, the content of meatballs consists of 9% protein, 2% fat, 70% water and 3% ash. Meatballs do not last long because of their high nutritional value, usually only lasting 12 hours or even one day during storage at room temperature [6]. In this study, treatment with the addition of carrot juice was better than without the addition of carrot juice. Beta-carotene is a carotenoid compound, has antioxidant qualities that can help prevent cell damage caused by free radicals. In meatballs, the addition of ingredients rich in beta-carotene such as carrots can function as natural preservatives, slowing down the rancidity process caused by oxidation and the growth of microorganisms.

Bacteria can contaminate meatballs in several ways, including the ingredients and equipment used, processing, serving and storage. The fungus that grows on meatballs is thought to be contaminated by bacteria because the storage place at room temperature is not clean. When viewed from the results of the study, the fungus that grows on meatballs also has a different time span in each treatment due to the addition of carrot juice in each different treatment. The more carrot juice added, the longer the growth time of the fungus. This supports the opinion of [7], who stated that the initial number of bacteria in meat has a major effect on the speed of damage. By adding carrot juice rich in β-carotene, we can not only extend the shelf life of meatballs, but also inhibit the growth of fungi and increase the nutritional value of the product. As an antioxidant, beta-carotene protects cells from oxidative damage. and at the same time, its nutritional content can also provide additional health benefits for consumers. Research showing that the addition of carrot juice can prevent damage to meatballs is very relevant and can be applied in the practice of making meatballs to maintain food quality and safety. The addition of carrot juice is an interesting solution to increase the shelf life of meatballs naturally and healthily.

3.2 Organoleptic

3.2.1 Color

Color is one of the organoleptic test components that is very important to determine the level of consumer acceptance of processed food products [8]. Color has a major influence on the initial perception of an object, including in research involving sensory assessment. Panelists often assess color first because color is the most striking and easily recognizable element. The results of the organoleptic test of turkey meatballs on the color parameter can be seen in the Table 2 below.

Table 2. Mean of organoleptic test results for the color of turkey meatballs

Treatment	Rerplicate					Average ± SD
	I	II	II	IV	V	
P0	4,5	4,3	4,1	4,5	4,9	$4,46^{tn}$ ± 0,29
P1	4,7	3,9	4,4	4,2	4,5	$4,34^{tn}$ ± 0,30
P2	4,4	3,8	4,5	3,6	4,5	$4,16^{tn}$ ± 0,42
P3	3,5	4,5	4,3	3,6	4,3	$4,04^{tn}$ ± 0,45

Note: No different superscript indicates no significant difference between treatments (P>0,05)

Based on the results of the highest statistical average analysis of the results of the turkey meatball color research, it can be seen in Table 2 in the P0 treatment with an average value of 4.46 and the lowest treatment was in the P3 treatment with an average value of 4.04. Treatments P0, P1, and P2 have higher values compared to P3 which is lower. The color of the turkey meatballs in P0 was not significantly different (P>0.05) from treatments P1, P2 and P3.

Based on the analysis of the variety of organoleptic tests on turkey meatballs, there was no significant effect (P>0.05) on the color test parameters of the meatballs. The value of turkey meatballs in each treatment ranged from 4.16-4.34 (gray). The meatballs that are preferred by the public are grayish, not too dark and not pale, because using meatball dough flour makes the color of the meatballs brighter [9]. The color of processed meatballs is influenced by myoglobin. Myoglobin is a protein that binds oxygen in muscles and the higher the concentration of myoglobin, the redder the color of the meat. However, during the cooking process, myoglobin undergoes oxidation which turns the meat gray [10]. The color of each treatment in this study was still at a normal and attractive color. Who explained that chicken meat is generally faded white. Stated that carrots contain red, yellow and orange carotenoid pigments, which can be used as natural dyes with high nutritional

value [11]. In addition, the addition of carrots will increase vitamin A in the product. This study concluded that the content of carotenoid pigments that give color to carrots does not affect turkey meatballs.

3.2.2 Taste

Taste is one of the main aspects in organoleptic testing, because it greatly influences consumer assessment of a product. Taste is the interaction between the characteristics of aroma, taste and texture which is the whole processed product that can be evaluated. In this study, taste is the second parameter assessed by the panelists. How to test the taste of turkey meatballs, take and taste enough, the panelists are given drinking water to remove the taste. Then continue with the test on other samples. Table 3 below shows the results of the organoleptic test of turkey meatballs on the taste parameter.

Table 3. Mean of organoleptic test results for the flavor of turkey meatballs

Treatment	Replicate					Average ± SD
	I	II	II	IV	V	
P0	4,7	4,5	4,3	3,9	4,0	$4,28^{tn}$ ± 0,33
P1	4,2	4,0	4,2	4,2	4,0	$4,12^{tn}$ ± 0,10
P2	3,8	3,5	4,3	3,6	4,4	$3,92^{tn}$ ± 0,40
P3	3,7	3,4	4,0	3,6	4,0	$3,78^{tn}$ ± 0,26

Note: No different superscript indicates no significant difference between treatments. (P>0,05)

Based on the results of the highest statistical average analysis of the results of the turkey meatball taste research, it can be seen in Table 3 that the P0 treatment had an average value of 4.28 and the lowest average treatment was in the P3 treatment with an average value of 3.78. Treatments P0, P1, and P2 had higher scores compared to P3. The taste of turkey meatballs in P0 was not significantly different (P>0.05) from treatments P1, P2 and P3. Based on the analysis of variance, the organoleptic test of turkey meatballs had no significant effect (P>0.05) on the parameters of the turkey meatball taste test. The meatball value in each treatment ranged from 3.92-4.12 (meaty taste). The taste in each treatment in this study was still within the normal range. Consumers choose or reject a food product based on its taste. If it doesn't taste good, the panelists will reject the product [12].

Turkey meat has a high protein content, causing the dominant taste to be savory. Because the carrot taste is a bit bland, the carrot taste is not dominant in P1, P2, and P3. In P0, the meat taste is the most dominant because there is no addition of carrot juice, so the meat taste is more dominant3.2.3 Perception of Product Organoleptic Consumer perception of the organoleptic of Chicken Nugget products includes taste, texture, aroma, and product shape. The organoleptic of a product affects the assessment of consumer purchases and satisfaction.

3.2.3 Texture

Texture can be observed from the physical and shape of a product. This texture is also related to the hardness or softness of a food product which determines the quality of food. The results of the organoleptic test of turkey meatballs on the texture parameter can be seen in Table 4 below.

Table 4. Mean of organoleptic test results for texture of turkey meatballs

Treatment	Replicate					Average ± SD
	I	II	II	IV	V	
P0	4,4	4,6	4,6	4,3	4,4	$4,46^{a}$ ± 0,13
P1	3,7	3,4	3,6	3,5	3,1	$3,46^{b}$ ± 0,23
P2	2,9	2,9	2,5	2,7	2,8	$2,76^{c}$ ± 0,16
P3	2,3	2,1	2,0	2,6	2,4	$2,28^{d}$ ± 0,27

Note: Different superscripts indicate significant differences between treatments (P<0,05)

Based on the results of the highest statistical average analysis of the results of the turkey meatball texture study, it can be seen in Table 4 that the P0 treatment had an average value of 4.46 and the lowest treatment was the P3 treatment with an average value of 2.28. Treatments P0, P1 and P2 had higher values compared to P3. The texture of turkey meatballs in P0, P1 and P2 was significant (P <0.05) against P3. The water content of carrots, which affects the level of meatball elasticity, reduces the panelists' preference for organoleptic texture. The more carrot juice added, the less comfortable the meatballs were. The amount of water in food greatly affects the softness, texture, and juiciness [13]. Based on the results of various organoleptic tests of

turkey meatballs, it had a significant effect (P <0.05) on the parameters of the turkey meatball texture test. It can be seen in the table above that the lowest texture value is in P3 which is 2.28 (not chewy) and the highest texture value is in P0 which is 4.46 (chewy). Based on the results of the Mann Whitney further test in Appendix 4, it shows that P3 has a softer texture compared to the results of other treatments. The soft texture of a product is influenced by the processing method, storage method, and ingredients contained in the product itself.

3.2.4 Aroma

Aroma is one of the important aspects of organoleptic quality that affects how consumers receive a product. A good aroma can increase the appeal of a product, while a less pleasant aroma can affect consumer interest. Aroma is one of the things that can be observed by the sense of smell. In this study, aroma was the fourth parameter assessed by the panelists.

Table 4. Mean of organoleptic test results for aroma of turkey meatballs

Treatment	Replicate					Average ± SD
	I	II	II	IV	V	
P0	4,5	4,2	4,6	4,1	4,3	$4,48^{tn}$ ± 0,20
P1	4,8	4,4	4,2	4,6	4,4	$4,34^{tn}$ ± 0,22
P2	3,9	3,9	4,6	4,5	4,5	$3,28^{tn}$ ± 0,34
P3	3,7	4,4	4,6	4,4	4,3	$4,28^{tn}$ ± 0,34

Note: Different superscripts indicate no significant difference between treatments. (P>0,05)

Based on the analysis of the highest statistical average in the results of the study, the aroma of turkey meatballs was found in the P0 treatment with an average value of 4.48 and the lowest average treatment was found in the P3 treatment with an average value of 4.28. Treatments P0, P1, and P3 had higher values compared to P2. The aroma of turkey meatballs in P0 was not significantly different (P>0.05) from treatments P1, P2 and P3.The results of the analysis of the variance of the organoleptic test of turkey meatballs had no significant effect (P>0.05) on the parameters of the aroma test of turkey meatballs. The aroma value in this study ranged from 3.28-4.48 (meaty flavor). The aroma of carrot juice was not smelled Because not too much carrot juice was used, the aroma was not smelled. The aroma that emerged was only the typical aroma of meat.

The results of the study showed that carrot juice in turkey meatballs did not affect the aroma. The addition of carrot juice to turkey meatballs did not affect the aroma of the product is an interesting finding. Aroma is indeed an important aspect in assessing food quality, but its assessment can be very subjective [14]. Factors such as individual preferences, culture, and previous experiences can influence how a person perceives and assesses the aroma of food. Therefore, although the study showed no significant changes in aroma, it is important to consider that consumer perceptions can still vary. To gain a more comprehensive understanding, it may be useful to conduct further analysis using more standardized sensory methods or involving trained panelists. This can provide deeper insight into the aroma aspect and how it contributes to the overall quality of the product.

4. Conclusion

The addition of carrot juice can extend the shelf life but is less effective on the organoleptic of turkey meatballs. The best shelf lifeThe results of the study showed that adding carrot juice can extend the storage time of turkey meatballs. Therefore, further researchers must conduct further research on the chemical test of turkey meatballs, namely at P3 with the addition of 150 ml of carrot juice with a storage period of 5 days.

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