

Application Of Bay Leves (Syzygium Polyanthum) On Broiler Meat, The Physiochemical Quality Of Meat And The Sensory Effect Of The Nugget Product

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Abstract

Chicken meat is easily damaged due to physical and chemical quality damage. Bay leaves contain flavonoid compounds that can help preserve meat, have antimicrobial properties, and have good nutrition. The aim of this study was to identify the physicochemical quality of broiler meat that had been treated with bay leaf solution during cold storage and its relationship to the sensory effects of the resulting nuggets. This study used broiler meat soaked in three concentrations of bay leaves, namely 0, 15, and 30%, and then stored in the refrigerator. Measurements of meat quality and nugget production were carried out on days 0, 2, and 4 of storage. The study used a 3x3 factorial, complete randomized design (3 concentrations of bay leaf solution and 3 storage periods). The parameters measured were the physicochemical quality of the meat (cooking loss and water holding capacity) and the sensory quality of the nuggets (level of preference). The results showed that soaking meat at a concentration of 15% bay leaf increased its water holding capacity with storage time ($P<0.01$) and increased cooking losses with storage time ($P<0.01$). The storage time of the meat had no effect on the preference level of the resulting nuggets. Soaking the meat in a bay leaf solution at a concentration of 15% increased the sensory quality of the nuggets ($P<0.01$), while storing the meat for up to 4 days in the refrigerator increased its water holding capacity and cooking shrinkage.

Keywords: Chicken Meat, Bay Leaves, Nuggets, Soaking, Refrigerator

INTRODUCTION

Broiler meat is easily damaged and changes in quality due to physical and chemical damage. Bay leaves contain flavonoid compounds that can help preserve meat, have antimicrobial properties, and have good nutrition. One of the processed meat products is chicken nuggets. However, in the process of making nuggets, they are usually mixed with chemicals such as sodium pyroborate, sodium tetraborate, and borax, which make the product more chewy and durable, making it unhealthy to consume. The addition of chemical compounds can cause cancer. Therefore, the use of spices such as bay leaves to improve the physical and organoleptic qualities of foods is useful for extending shelf life. Bay leaves have activity as a natural preservative at a concentration of 15%, which can inhibit bacteria in meat and maintain meat freshness (Sheila, 2016). Meat stored in the refrigerator for four days retains its quality. Bay leaf solution contains antioxidant and antimicrobial properties that can be applied to meat products. Overall, bay leaves can be used as a natural preservative and are able to maintain product quality (Risnajati, 2010). This research was conducted to examine the effects of soaking broiler meat in a bay leaf solution, which is then stored in the refrigerator, on its water holding capacity, cooking loss, and the level of sensory preference of the resulting nuggets.

Methodology

Materials

The materials used in this study consisted of broiler meat aged for 28 days, dark green bay leaves, and aquades water. In addition, the materials used in the processing of nuggets are tapioca flour as a binder to form the texture, wheat flour as a dye, bread flour as a coating, egg yolk as an emulsifier, and spices (salt, garlic, flavorings, and pepper) as a food flavoring.

Preparation of Bay Leaf Solution

Bay leaves are picked directly from the plant. The bay leaves selected in this study were dark green and fell after three leaves from the top. The selection of bay leaves refers (Warnida & Sukawaty, 2016). The concentrations of the bay leaf solution made were 0%, 15%, and 30%. 0% concentration was prepared by adding 100 ml of aquades water without bay leaves as a control. A concentration of 15% is made with 15 g of bay leaves in 100 mL of aquades water. A concentration of 30% is made with 30 g of bay leaves in 100 mL of aquades water. Bay leaves are weighed, washed, cut into small pieces, and then drained. Put it in an Erlenmeyer tube and add aquades water according to the concentration previously described. The mixture of bay leaves and aquades water is heated to a temperature of 90 °C for 30 minutes in a waterbath, and a thermometer is used to measure the temperature of the bay leaf solution in the waterbath. After 30 minutes, they were filtered and allowed to stand.

Bay Leaf Application in Broiler Meat

The meat is soaked in a bay leaf solution according to the treatment for 20 minutes, then drained and dried using a tissue. After being drained, put it in a plastic bag, then store it in the refrigerator according to the long storage treatment, namely 0 days, 2 days, and 4 days.

Nuggets Making

Meat is cut into small pieces and ground with ice water in a food processor after being soaked in bay leaf solution according to treatment (0%, 15%, or 30%). Then add tapioca flour, egg yolks, salt, pepper, garlic, and flavoring, then grind again for one minute. After that, put it into the dough mold that has been provided steamed for about 20 minutes and stored in the refrigerator for 24 hours. After that, it is cut into squares and dipped in flour, then covered with breadcrumbs then fried in boiling oil. The percentage of ingredients used in the basic formulation of chicken nuggets can be seen in Table 1.

Table 1 Basic Formulation of Chicken Nugget Ingredients

No.	Type of Ingredients	Percentage (%)
1	Chicken	50
2	Tapioka Flour	20
3	Water	15
4	Egg Yolk	15
5	Salt*	1,5
6	Pepper*	1,5
7	Garlic*	1,5
8	Flavoring*	1,5

Note: *) Additional Materials

Research Variable

Parameters observed in this study were pH value, emulsion stability, and nugget sensory preferences.

Water Holding Capacity (WHC)

The pressing method (press method) with a sample of 0.5 g can be used to calculate the water holding capacity (DIA). The sample is inserted between two filter papers. *Watchman 42* (AOAC, 2005). The sample is pressed between two plates with a load of 50 kg for 5 minutes using a modified tool, the *Filter Paper Press*. The filter paper was removed after 5 minutes. Then the area formed is drawn on graph paper. DIA can be calculated using the following formula:

$$\text{DIA (\%)} = \frac{D}{T} \times 100\%$$

Description:

D = Meat Area

T = Total Area

Cooking Loss

A sample of 20 g of chicken meat (sample a) is put in a plastic bag waterbath, and the air in the plastic is removed. Meat is boiled at 80 °C, put in a plastic bag in hot water for 30 minutes, and let stand for ±10 minutes. After the boiling is complete, the sample is removed and cooled. The meat is dried on the surface of the meat without pressing with filter paper or tissue, then weighed again, and the final weight is recorded from sample b.

$$\text{Cooking loss (\%)} = \frac{a-b}{a} \times 100\%$$

Description:

a = initial sample weight before cooking (g)

b = final sample weight after cooking (g)

Nuggets Favorite

The nugget preference test was carried out using a sensory scale of 1 (dislike), 2 (rather dislike), 3 (rather like), 4 (like), and 5 (very like). The assessment of the preference level of nuggets was done using trained panelists, including Hasanuddin University students who had good sensitivity and as many as 12 people (Baliga & Madaiah, 1970).

Statistic Analysis

The study used a 3x3 factorial design based on a completely randomized design (CRD) consisting of 3 replications. The data obtained were analyzed using analysis of variance according to the factorial design based on the completely randomized design (CRD) in SPSS Version 26. The treatment in this study consisted of concentrations of bay leaf solution A1 = 0%, A2 = 15%, and A3 = 30%, and storage times for meat B1 = 0 days, B2 = 2 days, and B3 = 4 days.

Results and Discussions

Water Holding Capacity (WHC)

Water holding capacity is defined as the ability of meat to retain water content during external treatments such as cutting, heating, grinding, and processing. The water's holding capacity is affected by the pH value. Water holding capacity by immersion in different concentrations of bay leaf solutions and storage times are presented in Table 2.

Table 2 Water holding capacity of meat by soaking concentration of bay leaf solution and time different storage

Concentration of bay leaf (%)	Storage (days)			Average
	0	2	4	
0	18,22±4,80	27,55±2,55	29,61±2,42	25,13±6,04
15	25,14±4,94	24,56±1,58	34,41±1,56	28,04±5,50
30	29,50±6,02	31,32±2,23	26,48±1,31	29,10±3,90
Average	24,29±6,72 ^A	27,81±3,48 ^B	30,17±3,81 ^B	

Note: Different superscripts on the same line show very significant differences (P<0,01)

The results in Table 2 show that the concentration of the bay leaf solution had no significant effect, storage time had a very significant effect (P<0.01), and the interaction of the two treatments had a very significant effect (P<0.01) on the water holding capacity of the meat. The average water holding capacity of the meat obtained at various bay leaf solution concentrations and storage times ranged from 18.22% to 34.41%. Soaking the meat in a bay leaf solution increases its ability to hold water. Myofibril proteins located between the actin and myosin filaments cause changes in water holding capacity. If the myofibril protein increases as a result of expansion, water is added, and vice versa, water loss occurs when the myofibril protein shrinks. Changes in the volume of myofibril proteins are influenced by the interaction forces within the protein. The addition of high concentrations of bay leaves can increase the volume of myofibril proteins that bind to the positive groups of proteins, which causes the total protein charge to become negative, resulting in repulsive forces between protein molecules (Achmad et al., 2012).

The holding capacity of meat water increased after being stored for 2 days in the refrigerator. increased water retention capacity as a result of changes in fat and protein in meat caused by proteolytic enzymes. Proteolytic enzymes cause the muscle membrane to break down, resulting in the diffusion of ions into the meat protein. Proteolytic enzymes are responsible for changes in the muscle cell membrane. Degradation of the cell membrane structure occurs enzymatically and causes the diffusion of ions into the region surrounding the protein (Triyannanto et al., 2021). When ion diffusion occurs into the meat protein, there will be a replacement of divalent ions (Mg²⁺ and Ca²⁺) with monovalent ions in the protein chain. As a result of the replacement of divalent cations, monovalent protein ions will be able to bind water, and water holding capacity can be maintained (Agustina, 2017).

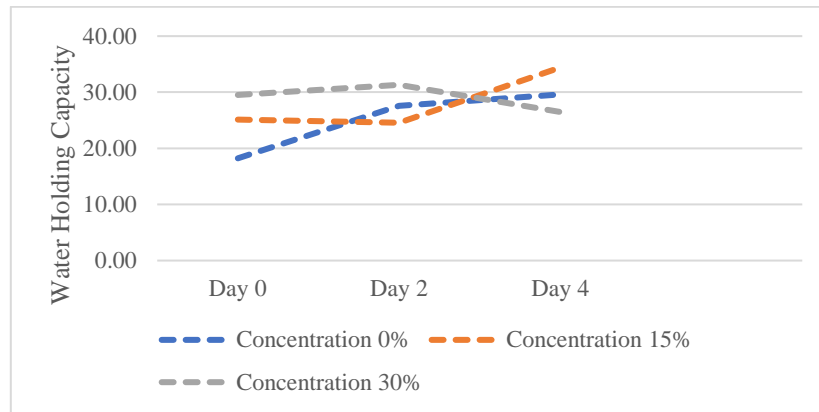


Figure 1 Water holding capacity of meat by soaking concentration of bay leaf solution and timedifferent storage

The interaction between concentrations of bay leaf solution and storage time had a very significant effect ($P < 0.01$) on water holding capacity. Meat's water-binding capacity was highest after immersion in 30% leaf concentration, decreased after 4 days of storage, and was lowest after storage without soaking (Figure 1). Protein denaturation causes a decrease in water holding capacity, causing damage and changes in the structure of muscle proteins, particularly actin and myosin. Damage to actin and myosin causes a decrease in the ability of muscle proteins to bind water (Muchtadi, 2010).

Cooking Loss

Cooking loss is the percentage of meat weight lost due to cooking. The cooking losses of meat in different concentrations of bay leaf immersion and storage time are presented in Table 3.

Table 3 Cooking loss of meat by immersion concentration of bay leaf solution and time-different storage

Concentration of bay leaf (%)	Storage (days)			Average
	0	2	4	
0	25,00±5,00	36,38±3,16	35,00±5,00	32,13± 6,63 ^a
15	33,33±2,89	34,05±3,67	50,00±5,00	39,13± 8,85 ^b
30	18,33±10,41	33,38±5,86	36,67±5,77	29,46±10,76 ^a
Average	25,56±8,82	34,61±4,04	40,56±8,86	

Note: Different superscripts in the same column show very significant differences ($P < 0.01$)

The results in Table 3 show that the concentration of the bay leaf solution had a very significant effect ($P < 0.01$), storage time and the interaction of the two treatments had no significant effect on meat cooking loss. The average cooking losses of meat obtained at various concentrations of bay leaf solution ranged from 18.35% to 50.00%. The concentration of the 15% bay leaf solution was the highest, while the cooking losses for meat between the 30% treatment and without soaking were statistically the same. This is due to the higher concentration of bay leaves, which can inhibit the process of hydrolyzing fat in meat. During the cooking process, it also releases less water, which causes low cooking losses. Soaking the meat in a concentrated bay leaf solution has a significant effect on the cooking loss of meat because the compounds contained in bay leaves cannot hydrolyze meat protein. Meat cooking losses tend to increase with increased storage time (Hidayat, 2016).

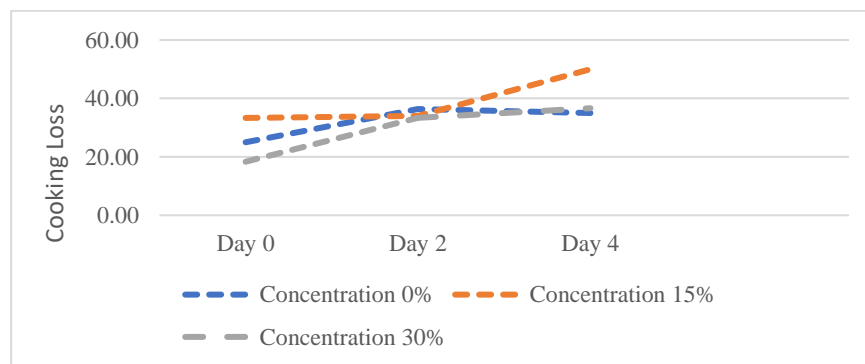


Figure 2 Cooking loss of meat by soaking concentration of bay leaf solution and timedifferent storage

The results in Table 3 show that the concentration of the bay leaf solution had a very significant effect ($P < 0.01$), storage time and the interaction of the two treatments had no significant effect on meat cooking loss. The average cooking losses of meat obtained at various concentrations of bay leaf solution ranged from 18.35% to 50.00%. The concentration of the 15% bay leaf solution was the highest, while the cooking losses for meat between the 30% treatment and without soaking were statistically the same. This is due to the higher concentration of bay leaves, which can inhibit the process of hydrolyzing fat in meat. During the cooking process, it also releases less water, which causes low cooking losses. Soaking the meat in a concentrated bay leaf solution has a significant effect on the cooking loss of meat because the compounds contained in bay leaves cannot hydrolyze meat protein. Meat cooking losses tend to increase with increased storage time (Hidayat, 2016).

Level of Preference for Nuggets

The level of preference for nuggets is the panelist's personal response about likes and dislikes and their levels using a numerical scale (Triwidayanti et al., 2017). The preference level of nuggets with the addition of bay leaf solution concentration and storage time is presented in Table 4.

Table 4 The level of preference of nuggets determined by bay leaf solution immersion concentration and different storage times

Concentration of bay leaf	Storage (Day)			Average
	0	2	4	
0	3,50±0,37 ^{Ba}	3,64±0,98 ^{Ab}	4,14±0,05 ^{Aa}	3,76±0,35 ^b
15	3,97±0,46 ^{Ba}	4,11±0,10 ^{Aa}	4,08±0,10 ^{Aa}	4,06±0,94 ^c
30	3,45±0,54 ^{Aa}	3,17±0,22 ^{Ac}	3,17±0,10 ^{Ab}	3,26±0,33 ^a
Average	3,64±0,41	3,64±0,43	3,80±0,48	

Note: Different superscripts in the same column show very significant differences ($P < 0.01$). Scale 1: dislike; scale 2: somewhat dislike; scale 3: somewhat like; scale 4: like, scale 5: really like.

According to the findings in Table 3, soaking meat in a 15% bay leaf solution was more effective than not soaking or soaking in a 30% solution concentration ($P < 0.01$). The decrease in the level of preference for nuggets was due to the large concentration of bay leaf solution. The organoleptic test results, including color, meat aroma, bay leaf aroma, suppleness, and taste, showed the same thing, namely that the quality of the nuggets had decreased. This is what influences people's preference for nuggets. Preference is influenced by various factors, namely aroma, elasticity, and taste (Patriani et al., 2020).

The storage time did not affect the nugget's preference level ($P > 0.05$). The shelf life at refrigerator temperature can cause damage to the color and aroma of the meat, so it doesn't affect the level of preference for nuggets. The longer storage tends to reduce sensory values but is still acceptable to panelists after 2 days of storage (Dickinson, 2012)

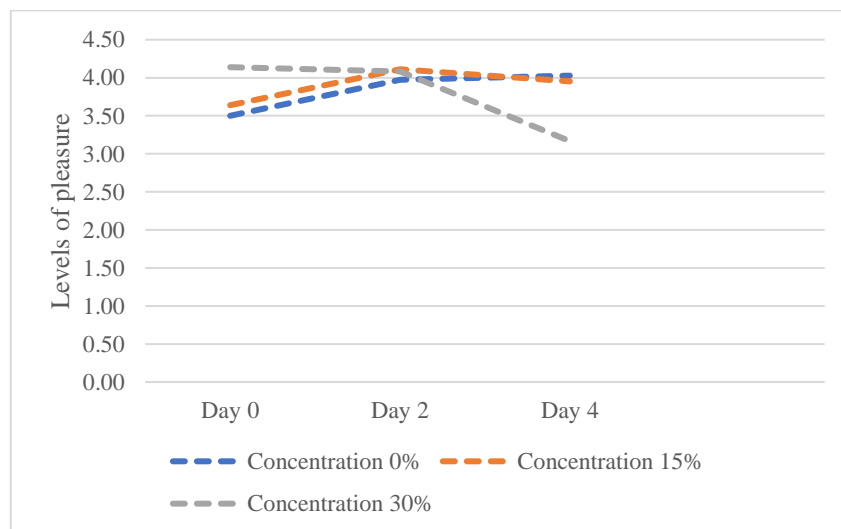


Figure 3 The preference level of nuggets is determined by immersing them in different concentrations of bay leaf solutions and storing them for different amounts of time.

The results in Table 3 show that soaking meat in 15% bay leaf solution was higher without soaking and soaking in 30% solution concentration ($P < 0.01$). The decrease in the level of preference for nuggets was due to the large concentration

of bay leaf solution. The organoleptic test results, including color, meat aroma, bay leaf aroma, suppleness, and taste, showed the same thing, namely that the quality of the nuggets had decreased. This is what influences people's preference for nuggets. Preference is influenced by various factors, namely aroma, elasticity, and taste (Tarigan, 2020).

The storage time did not affect the nugget's preference level ($P>0.05$). The shelf life at refrigerator temperature can cause damage to the color and aroma of the meat, so it doesn't affect the level of preference for nuggets. The longer storage tends to reduce sensory values but is still acceptable to panelists after 2 days of storage (Ponglabba et al., 2020).

Conclusion

Soaking meat in bay leaf solution at a concentration of 15% increased water holding capacity and cooking losses ($P<0.01$). The water holding capacity increased with increasing storage time ($P<0.01$). The preference level of nuggets from meat that was soaked in a concentration of 15% bay leaf solution was higher but lower at a concentration of 30% compared to no soaking ($P<0.01$). The length of time the meat is stored does not affect the flavor of the resulting nuggets. Soaking meat in bay leaf solution at a concentration of 15% increases the sensory preference of nuggets, while storing meat for up to 4 days in the refrigerator increases water holding capacity and cooking loss.

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