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# THE EFFECT OF LAYERED COOKING METHODS ON THE SENSORY CHARACTERISTICS OF KAMPONG CHICKEN MEAT

**Indah Sugiharti[1], Sukarni[1], Nur Agustin Mardiana[1]*, Nur Aini Mahmudah[1], David Kurniawan[1], Aditya Wirawantoro Putra[1]**

*[1]Department Poultry Product Processing, State Community College of Putra Sang Fajar Blitar, Street dr Sutomo No. 29, Blitar City, East Java, 66133*
*Corresponding author: *nuragustin@akb.ac.id*

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**ABSTRACT**

*Kampong chicken (Gallus domesticus) possesses unique characteristics compared to commercial broilers, including more savory flavor, firmer texture, higher protein content, and lower fat levels. However, these favorable qualities are strongly influenced by the cooking method. Inappropriate cooking whether undercooked or overcooked can reduce meat palatability due to insufficient flavor development, toughness, or excessive dryness. This study aimed to evaluate the effect of the layered cooking method, which involves intermittent boiling with resting periods, on the sensory properties of kampong chicken meat. Four variations of the cooking sequence were applied, consisting A: 30-15-30'; B: 30-0-30'; C: 30-30-15'; and D: 30-15-15'. Sensory evaluation was conducted to assess color, aroma, taste, texture, and overall acceptability. The results indicated that the differences in the layered cooking method had no significant effect ($P \leq 0.05$) on any of the sensory attributes tested. These findings suggest that kampong chicken meat maintains its sensory quality regardless of variation in the layered cooking sequence within the tested range.*

## 1. Introduction

According to data from Badan Pusat Statistik (2025), the population of kampong chicken in East Java Province exceeded one million heads in 2024, positioning the province as one of the major contributors to the regional supply of kampong chicken meat. This abundant availability not only provides economic benefits for local farmers but also reflects the strong cultural and culinary significance of kampong chicken within the local community.

Kampong chicken (*Gallus domesticus*) a local Indonesian poultry breed traditionally raised under extensive and semi-intensive systems, exhibits distinct characteristics compared to commercial broilers. These include a more savory flavor, firmer texture, higher protein content, and lower fat levels, making it a healthier alternative for nutritionally aware consumers (Ozian et al., 2019; Setiadi et al., 2020; Siburian, 2021). However, these desirable attributes are highly dependent on the method of processing, particularly cooking. Improper cooking either undercooking or overcooking can negatively affect the meat's palatability, leading to either toughness and underdeveloped flavor or excessive softness and dryness due to moisture loss.

Numerous studies have highlighted the significant influence of cooking methods on the sensory quality of meat. For instance, Abidin (2011) demonstrated that pressure cooking for 45 minutes improved the sensory attributes of *Ayam Aduan* meat, including flavor, color, and texture. Similarly, a study by Aliy et al. (2022) reported that a cooking duration of 7.5 to 10 minutes yielded optimal sensory qualities in canned dakgalbi without compromising its chemical composition. A comparable finding was reported in smoked beef, where a cooking duration of 60 minutes resulted in the most desirable flavor and texture (Candra & Triyannanto, 2023). Building on these findings, this study actively explores alternative cooking techniques to optimize the sensory characteristics of kampong chicken. One technique under investigation is the layered cooking method,

which applies intermittent boiling with resting intervals. This method may help regulate heat penetration and protein denaturation, thereby improving meat tenderness, moisture retention, and flavor development. In this research, we examine the effect of layered cooking methods on the sensory properties of kampong chicken meat.

## 2. Materials and methods

### 2.1. *Biomaterials*

The experimental materials comprised kampong chicken carcasses, water, and instruments for sensory analysis, which were obtained from traditional markets in Blitar.

### 2.2. *Preparation of sample*

The cleaned carcasses of kampong chicken, prepared for cooking, were placed in a stainless-steel pot and covered with clean water until fully submerged. The boiling process was carried out on a gas stove at boiling temperature. A layered cooking method was applied, consisting of four different treatment conditions as outlined in **Table 1**.

### 2.3. *Research Design*

This study employed a single independent variable, namely layered cooking method, which was applied in four treatment levels, as detailed below:

**Table 1.** Variation of Layered Cooking Treatments

| Sample | Layered Cooking Treatments | Description |
|---|---|---|
| A | 30-15-30’ | boiling for 30 minutes, resting for 15 minutes, followed by another 30 minutes of boiling |
| B | 30-0-30’ | boiling for 30 minutes, then immediately continue boiling for another 30 minutes without resting |
| C | 30-30-15’ | boiling for 30 minutes, resting for 30 minutes, and then boiling for 15 minutes |
| D | 30-15-15’ | boiling for 30 minutes, resting for 15 minutes, followed by a final 15-minute boil |

### 2.4 *Sensory assessment*

Sensory evaluation was conducted using 30 semi-trained panelists who assessed the attributes of color, aroma, taste, texture, and overall appearance. A 5-point hedonic scale was used, where a score of 1 indicated "dislike very much" and a score of 5 indicated "like very much."

### 2.5 *Data Analysis Method*

Hedonic sensory data were analyzed using one-way analysis of variance (ANOVA). Statistical significance was determined at a confidence level of 95% ($\alpha = 0.05$). When significant differences among treatments were detected, Tukey’s multiple comparison test was applied to identify differences between treatment means.

## 3. Results and discussions

### 3.1. *Color*

Color serves as a crucial indicator in meat quality evaluation, as it significantly influences consumers' initial perception regarding product freshness (Apriantini et al., 2020).

Based on the sensory evaluation results presented in **Table 2**, the average scores for the color attribute ranged from 3.46 ± 0.88 to 3.79 ± 0.82. Statistical analysis indicated that the variation of layered cooking method did not a significant effect ($P \leq 0.05$) on the final color of the product. This suggests that changes in the cooking sequence or time layerings did not substantially alter the visual appearance of the meat product. This finding is consistent with the study conducted by Adam & Abugroun (2015), which reported that different cooking methods had no significant impact on the color, aroma and taste of meat products.

Among the treatments, the highest panelist preference score for color was observed in treatment C (3.79 ± 0.82), followed by D (3.61 ± 0.97), A (3.57 ± 0.88), and B (3.46 ± 0.88). The cooking process induces the denaturation of myoglobin and other muscle proteins, which typically begins at temperatures between 55°C and 65°C (Kovaleva et al., 2021). Denaturation alters the oxygen-binding ability of myoglobin, resulting in visible changes in meat color commonly turning brown or gray (Izzah et al., 2024).

### *3.2. Aroma*

Aroma constitutes a critical sensory parameter that significantly influences initial attractiveness and flavor perception of food products (Rangkuti et al., 2024). Olfactory perception derives from volatile compounds released from food within the oral cavity through the posterior nasal cavity (Gunawan et al., 2024).

The aroma attribute ranged from 3.21 ± 1.03 to 3.54 ± 1.06. Statistical analysis indicated that the variation of layered cooking method did not a significant effect ($P \leq 0.05$) on the final aroma of the product. This finding remains consistent with the study conducted by Adam & Abugroun (2015), which reported that different cooking methods had no significant impact on the color, aroma and taste of meat products.

In this study, the cooking process employed no spice seasonings, resulting in the dominant aroma originating from the natural kampong chicken meat characteristics. Chicken meat aroma emerges from volatile compounds including hydrocarbons, aldehydes, ketones, alcohols, and sulfur-containing compounds (Wang et al., 2024). The panelists exhibited the highest preference scores for aroma in treatment D (3.54±1.06), followed consecutively by treatment C (3.39±1.06), treatment B (3.36±1.06), and treatment A (3.21±1.03).

### *3.3 Taste*

Taste is a complex sensory perception involving five basic qualities (sweet, salty, sour, bitter, and umami) along with additional sensations such as juiciness, savoriness, or blandness (Yin et al., 2017). The primary organ responsible for taste perception is the tongue, which detects non-volatile compounds in food through taste receptors and transmits signals to the brain for interpretation (Keast & Costanzo, 2015). In native chicken meat products, taste is largely influenced by the quality of raw materials and the cooking process.

The average scores for the taste attribute ranged from 3.71 ± 1.01 to 4.07 ± 1.00 (**Table 2)**. Statistical analysis indicated that the variation of layered cooking method did not a significant effect ($P \leq 0.05$) on the final taste of the product. This finding is consistent with the study conducted by Adam & Abugroun (2015), which reported that different cooking methods had no significant impact on the color, aroma and taste of meat products.

The highest taste preference score was recorded in treatment A (4.07 ± 1.00), followed by treatments C (4.00 ± 1.01), D (3.79 ± 1.02), and B (3.71 ± 1.01). Flavor formation in meat during thermal treatment is predominantly regulated by two fundamental biochemical pathways. The Maillard reaction constitutes the primary mechanism for basic meat flavor development through amino acid-reducing sugar interactions under high-temperature conditions. This thermally-induced process generates an array of volatile and non-volatile compounds responsible for the quintessential umami characteristics of cooked meat products. Simultaneously, intramuscular lipids undergo heat-catalyzed oxidation and degradation reactions, producing species-specific flavor precursors. These lipid oxidation processes yield various aldehydes, ketones, and carbonyl derivatives that establish the distinct organoleptic profiles differentiating meat varieties (Zhan et al., 2025).

### *3.4 Texture*

Food texture plays a crucial role in shaping consumer preferences regarding product quality. This includes specific textural attributes of meat, such as hardness, elasticity, cohesiveness, and chewiness, which collectively influence the overall sensory experience and acceptance of the product (Wijono & Estiasih, 2021).

The taste attribute scores ranged from 3.36 ± 0.66 to 3.43 ± 0.66 (**Table 2**). Statistical analysis indicated that the variation of layered cooking method did not a significant effect ($P \leq 0.05$) on the final texture of the product. The panelists exhibited the highest preference scores for texture in treatment A (3.43±0.66), followed consecutively by treatment B (3.39±0.66), treatment D (3.39±0.67), and treatment C (3.36±0.66). Extended cooking processes progressively soften meat texture. This phenomenon occurs because heating induces protein denaturation that triggers cell membrane disruption, muscle fiber contraction, and connective tissue structural modifications (Furuta et al., 2022; Ježek et al., 2019). ollagen within connective tissues undergoes shrinkage and partial dissolution into soft gelatin, thereby enhancing meat tenderness. Conversely, myofibrillar proteins experience hardening during cooking processes, which can increase texture firmness. Consequently, meat tenderness demonstrates significant dependence on collagen content and properties within connective tissues (Kim et al., 2025).

### *3.5 Overall Appearance*

Overall appearance reflects the panelists' comprehensive final assessment of the product, encompassing perceptions of color, aroma, texture, and taste attributes. Appearance frequently serves as the primary criterion consumers employ to evaluate product quality and significantly influences food consumption and purchasing decisions (Carneiro et al., 2022).

The overall appearance attribute ranged from 3.57 ± 0.74 to 3.81 ± 0.74 (**Table 2**). Statistical analysis indicated that the variation of layered cooking method did not a significant effect (P ≤ 0.05) on the final overall appearance of the product. This finding is line with Farahat (2024), stated that the cooking method does not affect the appearance of meat. Meanwhile, the highest panelist preference score for overall appearance was recorded in treatment C (3.81 ± 0.74), followed by treatments D (3.71 ± 0.75), B (3.64 ± 0.75), and A (3.57 ± 0.74).

**Table 2.** The result of sensory evaluation

| Parameters | A | B | C | D |
|---|---|---|---|---|
| Color | 3.57±0.88a | 3.46±0.88a | 3.79±0.82a | 3.61±0.97a |
| Aroma | 3.21±1.03a | 3.36±1.06a | 3.39±1.06a | 3.54±1.06a |
| Taste | 4.07±1.00a | 3.71±1.01a | 4.00±1.01a | 3.79±1.02a |
| Texture | 3.43±0.66a | 3.39±0.66a | 3.36±0.66a | 3.39±0.67a |
| Overall Appearance | 3.57±0.74a | 3.64±0.75a | 3.81±0.74a | 3.71±0.75a |

Expressed values were mean±SD (n = 3); a same rows containing means with the same superscript letters are not significantly different (p < 0.05).

## 4. Conclusions

Variations in layered cooking methods did not significantly influence the sensory attributes of kampong chicken meat, including color, aroma, taste, texture, and overall appearance (P ≤ 0.05). All treatments achieved moderate to high hedonic scores, indicating good consumer acceptability. This suggests that the layered cooking approach provides a stable cooking strategy capable of preserving the intrinsic sensory qualities of kampong chicken meat. Although no statistically significant differences were observed, certain treatments showed higher preference trends for specific attributes, implying potential optimization opportunities depending on targeted sensory characteristics. Therefore, layered cooking may be considered a flexible and reliable method for kampong chicken processing without compromising sensory quality.

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