



The Combination of Kersen (*Muntingia calabura*) and Sirsak (*Annona muricata*L.) Leaf Extract as an Antioxidant Against Broiler Chicken Carcasses

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Abstract. Antioxidants are molecules that can slow down or prevent the oxidation process of other molecules. This study aims to determine the effect of the combination of Kersen Leaf/KL (*Muntingia calabura*) and Sirsak Leaf/SL (*Annona muricata* L.) extracts as antioxidants on Cutting Weight, Carcass Weight and Carcass Percentage of broiler chickens. This research was conducted on Jl. Mekar Jaya No 38 Medan Selayang, North Sumatra in June - August 2023. The design used in this study was a Complete Randomized Design (CRD) with 5 treatments and 5 repeats. Each repetition consists of 5 broiler chickens aged 35 days. The treatment consisted of P0 (without extract), P1 (KL extract 9%), P2 (SL extract 9%), P3 (KL extract 6% + SL extract 3%) and P4 (KL extract 3% + SL extract 6%). The parameters observed were cutting weight, carcass weight and carcass percentage. The results showed that the use of a combination of KL and SL extracts as antioxidants had a real effect on cutting weight and carcass weight with an average of 1491.67-1773.60 g/head and 1067-1267 g/head respectively. However, it did not have a real effect on carcass percentage with an average of 71.16%-72.14%. In conclusion, application of kersen leaf 6% combine with sirsak leaf 3% extract caused the best results on cutting weight and carcass weight.

Keywords: broiler antioxidant, carcass weight, carcass percentage, cutting weight, leaf extract

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1. Introduction in english

The need for animal protein in Indonesia continues to increase as the population grows, the importance of the role of this protein in meeting nutritional needs. Animal protein is essential because it contains amino acids for body growth. In contrast to beta-amylase proteins, animal proteins have optimal digestion and utilization rates [1]. The identification solution to meet the protein needs of the community is through broiler farming [2]. By optimizing broiler farming, it can be expected that increased animal protein production can make a positive contribution to meeting the nutritional needs of the Indonesian people. Broilers have a single production cycle, which allows them to produce meat in one step. After 30 days, broilers can reach a weight of 1

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kg, and after 40 days, it can reach a weight of 1.5 kg.

The most common problem in broiler production is not achieving optimal growth. To overcome this, among other things, adequate materials such as antioxidants are provided.

Antioxidant compounds play an important role in preventing the damaging effects of free radicals. The ability of antioxidant compounds to reduce the activity of free radicals and convert them into non-radical compounds is a key mechanism in fighting excessive oxidation. One of the antioxidants is kersen leaves and sirsak leaves [3]. Phytochemical test research shows that kersen contains alkaloids, triterpenoids, flavonoids, steroids, and saponins [4]. Previous research noted that kersen leaves have antioxidant activity with an IC₅₀ value of 18.214 ppm [3]. Sirsak leaves also contain bioactive substances and antioxidants, such as flavonoids, alkaloids, tannins, and saponins. These compounds have cytotoxic abilities to inhibit and reduce free radicals [5].

This study was conducted to evaluate the effect of a combination of kersen and sirsak leaf extracts as antioxidants on carcass weight as an indicator of productivity.

2. Materials and Methods

2.1. Place and Time

This research was conducted from June to August 2023 at Jalan Mekar Jaya No. 38 Sempakata Village, Medan Selayang District, North Sumatra.

2.2. Materials and Equipment

Tools

The tools used in this study include: Experimental cages measuring 75 × 75 cm with a height of 60 cm and there were about 25 plots, each cage plot was equipped with one feed bin, one drink bin, and one 10 watt lamp for lighting and manas, other equipment included cages, tarpaulins, cleaning tools such as broom sticks and brushes, Other tools include knives, coals, 100 ml measuring cups, porcelain mortar, sieves, analytical scales, ovens.

Material

The materials used in this study include: one-day-old Cobb strain broiler chickens (DOC) with approximately 125 eggs, deformed eggs, kersen leaves, sirsak leaves, seaweed, 70% ethanol, distilled *water*.

2.3. Research Methods

The data collection method used in this research is the Completely Randomized Design (CRD) method, with five treatments and five replicates for each data point. Each replicate consisted of five Broiler Chickens, making a total of 125 chickens. The following results were observed:

P0 : Drinking water without extract administration (control)

P1 : Drinking water + 9% Kersen Leaf Extract

P2 : Drinking water + 9% Sirsak Leaf Extract

P3 : Drinking water + 6% Kersen Leaf Extract + 3% Sirsak Leaf Extract

P4 : Drinking water + 3% Kersen Leaf Extract + 6% Sirsak Leaf Extract

45 ml of extract was added to 500 ml of water. Administration is done twice a day in the morning and evening for 2 hours.

Table 1. Treatment arrangement

| | | | | |
|------|------|------|------|------|
| P1U3 | P3U4 | P4U1 | P4U4 | P1U2 |
| P0U2 | P4U2 | P3U2 | P4U3 | P3U1 |
| P2U2 | P0U4 | P3U3 | P0U1 | P2U5 |
| P2U3 | P1U1 | P1U3 | P4U5 | P0U5 |
| P0U3 | P2U1 | P3U5 | P2U4 | P1U4 |

2.4. Research Parameters

2.4.1. Cutting Weight (g/head)

Cutting weight refers to the weight of the meat or consumable part of the fish after processing, with weighing taking place before the fish is cooked and no more than six hours after the cooking process. The purpose of this fish preparation is to improve the quality of the fish and allow determination of the relative salinity of the fish based on its characteristics [6].

2.4.2. Carcass Weight (g/head)

Carcass weight is a method for comparing research results after the head, base of neck, legs, blood, feathers, and inner cavity contents are removed, as assessed in the SNI standard [7].

2.4.3. Carcass percentage (%)

It can be calculated as the ratio between the weight of the carcass produced and the initial weight before the process of removing these components. Carcass percentage data can be analyzed after the carcass weight (g) is weighed, then compared to the slaughter weight (g) until it reaches 100% [8] with the formula:

$$\text{Carcass Weight Percentage (\%)} = \frac{\text{carcass percentages (g)}}{\text{cutting weight (g)}} \times 100\%$$

2.5. Data Analysis

The data that has been collected for this study will be processed using a statistical method known as *Analysis of Variance* (ANOVA). If there are significant differences, the results will be further tested using *Duncan's Multiple Range Test* with a significance level of 5% to determine the best results. This method of analysis will help identify significant differences between treatment groups and evaluate the impact of administering kersen leaf and sirsak leaf extracts to broiler chickens.

3. Results and Discussion

3.1. Cutting Weight

Slaughter weight is determined by weighing the final weight of broilers after six hours of fasting. Providing drinking water must be done continuously and must be considered because slaughter weight has a negative impact on the quality of broilers. Based on the research that has been done, the slaughter weight data is obtained in “Table 1”.

Table 1. Average broiler slaughter weight (g/head)

| Treatment | Repeat | | | | | Mean \pm SD |
|-----------|---------|---------|---------|---------|---------|-----------------------------------|
| | U1 | U2 | U3 | U4 | U5 | |
| P0 | 1401,33 | 1474,33 | 1494,00 | 1630,00 | 1458,67 | ^a 1491.67 \pm 84.69 |
| P1 | 1652,00 | 1734,00 | 1671,00 | 1639,67 | 1637,67 | ^{bc} 1666.87 \pm 38.58 |
| P2 | 1703,33 | 1587,00 | 1646,00 | 1643,67 | 1642,33 | ^b 1644.47 \pm 28.54 |
| P3 | 1908,33 | 1796,00 | 1571,33 | 1790,67 | 1801,67 | ^c 1773.60 \pm 123.13 |
| P4 | 1642,33 | 1772,33 | 1638,67 | 1717,00 | 1625,33 | ^{bc} 1679.13 \pm 63.25 |

Description: Different superscripts indicate significantly different results ($P < 0.05$).

Based on “Table 1”, broilers in the P3 treatment had the maximum slaughter weight (1773.60 g), while broilers in the P0 treatment had the lowest slaughter weight (1491.67 g) during the study. Analysis of Variance (ANOVA) approach was used in statistical analysis to determine the effect of giving a mixture of kersen leaf and sirsak leaf extracts on slaughter weight. The use of a combination of kersen leaf and sirsak leaf extracts as antioxidants had a significant effect ($P < 0.05$) on broiler slaughter weight, according to the ANOVA results.

According to the Duncan test results, P3 slaughter weight showed higher sensitivity compared to the other treatments. This suggests that using a combination of 6% kersen leaf and 3% sirsak leaf is the most effective strategy to influence slaughter weight. To summarize, broiler yield was significantly higher in the P3 (6% kersen leaf extract and 3% sirsak leaf) and P1 (9% kersen leaf extract) treatments compared to the P0 control group. The treatment of sirsak leaves (P2) and the combination of 6% sirsak leaves and 3% kersen leaves (P4) both resulted in an increase in chicken slaughter weight. This is in line with the results of [9], which found that when natural antioxidants are combined, their potential antioxidant activity can be enhanced. When comparing the ratio of slaughter weight to the control, the potential of the antioxidant combination is evident. The slaughter weight results of this study when compared to research [10], the impact of sirsak leaf meal in a pellet-based diet on live weight, carcass, and abdominal fat of broiler chickens was greater, ranging from 1263g to 1644.75g. This was due to the increase in ration consumption which began to decrease at the 4%, 6%, and 8% levels due to the bitter taste derived from tannins. In a study published in 2020, [11] investigated the benefits of kersen (*Muntingia calabura*) leaves for drinking water and poultry feed. It was found that bioactive components found in kersen leaves, including flavonoids, triterpene tannins, saponins, and polyphenols, have been associated with antioxidant effects. Research findings showed that the addition of kersen leaves in various forms of fresh, flour, and extracts had varying effects on broiler and layer production. According to research [12], there may be a relationship between the final body weight of broilers and slaughter weight. In addition, this study showed that a high final weight would have a positive impact on the carcass weight and slaughter weight achieved. The final body weight of broilers,

with the highest average of 61.35 g/head in P3 and the lowest average of 52.69 g/head in P0, explains why P3 (combination of 6% kersen leaf extract and 3% sirsak leaf extract) resulted in a significant increase in slaughter weight.

Previous studies have also shown that the amount of feed consumed impacts the final weight and growth rate of broilers, as feed accumulation is essentially what drives their growth [13]. Therefore, increased feed consumption has the potential to positively impact the growth and final weight of broilers. P3 has the largest average feed consumption of 90.36 grams which may be due to the provision of kersen and sirsak leaves in the P3 treatment. This is consistent with the study of [13], which found that adding 6% kersen leaf extract to the ration could increase its value by 35.62 g/kg, while [14] observed that broiler body weight could be increased by using sirsak leaf meal, with an average increase from 954 g/head (control) to 1,266 g/head (10 g sirsak leaf meal). These results showed that, compared to the other treatments, P3 and P4, which combined kersen leaf and sirsak leaf, had the highest weight averages.

When using a single herbal ingredient to improve livestock performance, it is generally less effective than combining multiple herbal ingredients at the right dosage and complementing each other [15]. Therefore, it can be argued that using a mixture of herbal compounds rather than just one alone can result in higher effectiveness. [16] stated that the complementary nature of biocative compounds found in herbs, especially when combined, can increase the body weight of livestock, which in turn can increase the carcass weight of broilers.

3.2. Carcass Weight

Carcass weight refers to the weight of the chicken from the headless area to the base of the neck, legs to the knee, without feathers, blood, and internal cavity contents. The carcass cutting process is done by taking 3 chickens from each plot. "Table 2" below illustrates the results of measuring the carcass weight of broiler chickens after various treatments, namely P0, P1, P2, P3, and P4, along with five replicates of each.

Table 2. Average carcass weight of broiler chickens (g/head)

| Treatment | Repeat | | | | | Mean \pm SD |
|-----------|---------|---------|---------|---------|---------|-----------------------------------|
| | U1 | U2 | U3 | U4 | U5 | |
| P0 | 1012,00 | 1049,67 | 1055,67 | 1172,00 | 1045,67 | ^a 1067.00 \pm 61.10 |
| P1 | 1180,00 | 1228,00 | 1196,00 | 1183,67 | 1204,00 | ^{bc} 1198.33 \pm 17.29 |
| P2 | 1204,00 | 1176,00 | 1166,33 | 1168,00 | 1179,67 | ^b 1178.80 \pm 6.37 |
| P3 | 1350,33 | 1288,67 | 1117,67 | 1295,33 | 1283,00 | ^c 1267.00 \pm 87.70 |
| P4 | 1161,00 | 1254,00 | 1166,33 | 1220,33 | 1172,33 | ^{bc} 1194.80 \pm 40.66 |

Description: Different superscripts indicate significant differences ($P < 0.05$)

"Table 2" shows the results of broiler carcass weight after various treatments (P0, P1, P2, P3, and P4). The P0 treatment, which was the control group given only drinking water, showed an average carcass weight of about 1067.00 grams per bird. In P1, with the administration of 9% kersen leaves, there was a significant increase in the average carcass weight to about 1198.33 grams per

head. While P2, with 9% sirsak leaves, also resulted in an increase in carcass weight to about 1178.80 grams per head.

The results of analysis of variance (ANOVA) showed that the use of a combination of kersen and sirsak leaf extracts as antioxidants had a significant effect ($P < 0.05$) on the carcass weight of broilers. When viewed from the average carcass weight, this study showed a greater number compared to research [10] which examined the effect of giving sirsak leaf flour in the form of pellets on live weight, carcass weight, and abdominal fat of broiler chickens. The average carcass weight in the study varied from 855.50g to 1161.75g. This difference can be attributed to the decrease in live weight in the study [10] in the 4%, 6%, and 8% treatments as a result of the harsh tannin flavor that reduced feed intake.

The P3 treatment (combined 6% kersen leaves and 3% sirsak leaves) resulted in a significant increase in carcass weight, reaching approximately 1267.00 grams per head, compared to the control group. The P4 treatment (combined 6% sirsak leaves and 3% kersen leaves) also increased carcass weight, although perhaps with a less marked difference than P3. These results indicate the potential positive effect of P3 and P4 on increasing carcass weight in broiler chickens. The results also showed a close relationship between carcass weight and slaughter weight, where the P3 treatment showed the highest carcass weight and also the highest slaughter weight. This finding is in line with the opinion of [17], which states that carcass weight is influenced by slaughter weight, where an increase in slaughter weight goes hand in hand with an increase in carcass weight, so that the proportion of meat in the carcass becomes greater.

Research conducted by [11] showed that the productivity of broilers and layers was affected by kersen leaves in different ways. In contrast, a study conducted by [18] showed that adding 3.0% sirsak leaf extract to drinking water can improve protein and energy use efficiency in broiler diets-even equivalent to administering tetracycline antibiotics. Thus, our results contribute to the body of evidence supporting the beneficial effects of both kersen leaf and sirsak leaf extracts on broiler chickens, both in terms of increased carcass weight and feed efficiency. This implies that they can serve as good substitutes for antibiotic growth promoters (AGPs) in broiler diets.

3.3. Carcass Percentage

The percentage of carcasses in broiler chickens reflects the impact of kersen leaf extract and sirsak leaf extract on the utilizable meat part of the total weight of chickens in different treatment groups. The calculation of carcass percentage is done by weighing the carcass weight (g), then the result is divided by the slaughter weight (g) and multiplied by 100%. "Table 3" below displays the measurement results of broiler carcass percentage after being given various treatments, namely P0, P1, P2, P3, and P4, as well as the 1st to 5th replicates.

Based on the carcass percentage analysis, it can be seen that the highest percentage was found in P0 (without extract), which amounted to 72.14%, while the lowest percentage was found in P4 (3% kersen leaf extract + 6% sirsak leaf extract), which amounted to 71.16%. In contrast to the

results of research [19] which reported the average carcass percentage ranged from 68.46% to 71.67%, the average carcass percentage in this study was higher. The provision of sirsak and kersen leaf extracts as antioxidants had no significant effect on carcass percentage ($P>0.05$), according to the results of analysis of variance (ANOVA). This is because there are a number of weights that are not related to carcasses such as offal and feathers, which means there is little difference between carcass weight and slaughter weight.

Table 3. Broiler carcass percentage (%)

| Treatment | Repeat | | | | | Mean \pm SD |
|-----------|--------|-------|-------|-------|-------|--------------------------------|
| | U1 | U2 | U3 | U4 | U5 | |
| P0 | 73,58 | 71,39 | 70,98 | 72,44 | 72,30 | ^{un} 72.14 \pm 1.01 |
| P1 | 71,46 | 70,82 | 71,63 | 72,20 | 73,61 | ^{un} 71.94 \pm 1.04 |
| P2 | 70,84 | 74,05 | 70,86 | 71,09 | 71,85 | ^{un} 71.74 \pm 1.45 |
| P3 | 70,68 | 72,24 | 71,10 | 72,38 | 71,18 | ^{un} 71.52 \pm 0.75 |
| P4 | 70,71 | 70,59 | 71,16 | 71,22 | 72,10 | ^{un} 71.16 \pm 0.59 |

Description: the results obtained are not significantly different

In P0, the carcass percentage reached the highest value of 72.14%, while the lowest fat content also occurred in P0 with a percentage of 1.33%. [20] stated that carcass percentage is influenced by how much body parts are removed, such as head, neck, legs, offal, feathers, and blood. [21] also stated that fat and offal are additional factors that are not taken into account in the carcass percentage. A high fat content usually results in a low carcass percentage. [22] found that although the final body weights achieved were identical, carcass percentages varied between 65% and 75% of live weight. Conditions that cause carcass components to expand in proportion to body weight will result in similar carcass percentages. [25] found no evidence of a significant effect of sirsak leaf extract (1.5% - 3%) on carcass weight, carcass percentage, or slaughter weight in broiler chickens. These results could be due to a variety of factors, including variation in extract dose, use of a single ingredient, method of administration, or differences in the chicken population used in the study.

4. Conclusion

4.1. Conclusion

The slaughter weight and carcass weight of broiler chickens increased significantly when kersen leaf and sirsak leaf extracts were used as antioxidants, but the carcass percentage did not increase significantly. Treatment by drinking water plus 6% kersen leaf extract plus 3% sirsak leaf extract was the most effective treatment.

4.2. Suggestion

Based on the findings of this study, further research is needed to confirm the efficacy of kersen leaf and sirsak leaf extracts combined as antioxidants at different doses and using other animals as comparisons.

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