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Percentage of carcass cuts of male Bali ducks given fermented gamal (*Gliricidia sepium*) leaf water extract in drinking water

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Abstract

Optimal carcass cutting percentage can be achieved by using feed additives. One potential natural feed additive is fermented water extract of gamal (*Gliricidia sepium*) leaves. The aim of this study was to determine the effect of adding fermented water extract of gamal (*Gliricidia sepium*) leaves to drinking water on carcass cutting percentage in male bali ducks. The 8-week experiment was conducted at the Faculty of Animal Husbandry of Udayana University in Denpasar, Bali, using a Completely Randomized Design (CRD) with four treatment levels and five replications, each consisting of five male bali ducks. Four treatments consisted of administering fermented gamal (*Gliricidia sepium*) leaf water extract at levels of 0%, 2%, 4%, and 6% in treatments H0, H1, H2, and H3. Observations of variables included the percentage of breast, back, wings, thighs, and drumstick. This study showed that the administration of fermented gamal (*Gliricidia sepium*) leaf water extract at levels of 2%, 4%, and 6% did not significantly affect the carcass fragmentation of male bali ducks. Therefore, it was concluded that the administration of fermented gamal (*Gliricidia sepium*) leaf water extract at levels of 2-6% did not affect the carcass fragmentation percentage of 8-week-old male bali ducks.

Keywords: Bali duck; Water extract; Fermented gamal leaves; Carcass cuts; Feed additive

1. Introduction

Bali ducks are a local poultry breed with potential as both meat and egg producers. As a meat-producing livestock, one important aspect to consider is the carcass components. Several factors influence carcass weight, including sex, age, fat accumulation, body size and conformation, slaughter weight, non-carcass weight, and feed quality and quantity [1]. Optimal carcass yield is determined not only by the feed provided according to the animal's nutritional needs, but also by the effective nutrient absorption process in a healthy digestive tract.

Improving nutrient absorption in the gastrointestinal system can be achieved through the use of certain feed additives. One promising natural feed additive is the fermented water extract of gamal (*Gliricidia sepium)* leaves. According to [2], feed additives can promote growth, productivity, and animal health, thus improving production efficiency. Gamal (*Gliricidia sepium)* is a plant with high potential as animal feed due to its many advantages. The nutritional content of gamal leaves includes 78.24% moisture, 7.7% ash, 23.9% CF, 25.7% CP, 40.73% nitrogen-free extract (NFE), 1.97% fat, and 60.39% total digestible nutrients (TDN). However, a drawback of gamal leaves is their low palatability due to a specific odor caused by the antinutritional compound coumarin. Other antinutritional compounds found in gamal leaves include tannins, dicoumarol, and hydrocyanic acid (HCN), although their levels are relatively low [3]. Flavonoids, alkaloids, triterpenoids, and saponins can be toxic when consumed in excessive amounts [4], but in the right dosage, they can function effectively as feed additives.

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The antinutritional compounds in gamal leaves can hinder nutrient absorption if administered in large quantities. One of the technologies that can be applied to minimize the effects of these antinutritional compounds is fermentation. The fermentation process can reduce antinutrient content, improve digestibility, and enrich bioactive compounds that are beneficial for livestock. Administering fermented gamal leaf water extract through drinking water is a practical method that facilitates the direct absorption of bioactive compounds through the digestive tract.

[5] reported that administering 5% gamal leaf in broiler feed significantly ($P<0.05$) reduced weight gain compared to administering 5% moringa leaf. [6] stated that adding 2–6% papaya leaf meal to commercial rations did not improve carcass weight or carcass percentage in bali ducks. [7] found that flavonoid compounds from Indigofera leaves significantly ($P<0.05$) affected carcass weight gain in male bali ducks when administered through drinking water at doses of 2%, 4%, and 6%. [8] Also stated that administering 5% moringa leaf water extract, which contains flavonoids, significantly increased carcass weight compared to the control treatment.

The main objective of this research is to examine the effect of giving fermented gamal (*Gliricidia sepium*) leaf extract to drinking water on the percentage composition of male bali duck carcasses.

2. Materials and methods

2.1. Materials

The research trial was conducted at the Faculty of Animal Husbandry, Udayana University, in Denpasar, Bali, Indonesia, and the study was conducted for eight weeks. The animals used were male bali ducks, housed in a "colony battery" cage system equipped with feed and drinking water containers. The equipment used in this study included buckets, measuring cups, knives, digital scales, sieves for filtering gamal leaf residue, and writing tools. The feed used is commercial feed 511 bravo. The gamal leaves used were fresh and clean, collected from the area surrounding the Faculty of Animal Husbandry, Udayana University. Feeding was conducted *ad libitum*, with the feed and gamal leaf extract first fermented**.**

2.2. Methods

The male bali ducks used in the study were male bali ducks with an average body weight of 47 g (±0.24 g) and 100-day-old ducklings. A completely randomized design (CRD) was used in the study, consisting of four treatment levels and five replications, with each replication consisting of five day-old ducklings. The treatment groups were given fermented gamal leaf extract at 0% (H0), 2% (H1), 4% (H2), and 6% (H3) concentrations in drinking water.

At 8 weeks of age, male bali ducks are fasted before being slaughtered. The slaughtering process involves severing the jugular vein and carotid artery, located between the skull and the first cervical vertebra. The duck's entrails are then removed, and the carcass is separated into thighs, drumstick, breasts, wings, and backs.

The variables observed were the percentage of thigh, breast, wing, drumstick, and back.

2.3. Preparation Process of Fermented *Gamal* Leaf Water Extract

Gamal leaves were first wilted to reduce the antinutritional compounds they contain. The leaves were then watered at a ratio of 1:1, blended until smooth, and filtered to remove any remaining leaf residue. The resulting water extract was fermented.

After the fermentation process was complete, the fermented gamal leaf extract was mixed with drinking water and administered to male bali ducks according to the treatment groups:

- H0: without the fermented gamal leaf extract
- H1: 20 ml of the fermented gamal leaf extract mixed with 980 ml of water
- H2: 40 ml of the fermented gamal leaf extract mixed with 960 ml of water
- H3: 60 ml of the fermented gamal leaf extract mixed with 940 ml of water

2.4. Data Analysis

Analysis of variance (ANOVA) was the method used to analyze this study. The analysis was then continued using Duncan's Multiple Range Test (DMRT) if the obtained mean showed a significant effect ($P<0.05$) [9].

3. Results and discussion

Table 1 displays the percentage of carcass cuts of 8-week-old male bali ducks fed with fermented gamal leaf water extract in their drinking water. These results showed no statistically significant differences (P>0.05) across the four treatments, with the percentage of carcass cuts of male bali ducks fed with fermented gamal leaf water extract ranging from 26.23% to 26.96%. This may be due to the fermented gamal leaf water extract given in drinking water only functioning as a natural feed additive that supports digestive tract health, so it does not have much effect on breast muscle development.

Additionally, all treatment groups were given the same feed, namely the commercial CP 511 B ration, which contains balanced and high-quality nutrients. As a result, breast carcass growth did not differ among treatments. This finding is consistent with [10], who reported that gliricidia leaf meal had no significant effect on breast growth in quails. Researchers [11] stated that the growth of pathogenic bacteria in the digestive tract can be inhibited by flavonoids, a type of phytochemical compound.

Table 1 Percentage of carcass cuts in 8-week-old male bali ducks administered fermented gamal (*Gliricidia sepium)* leaf water extract in drinking water

Variable	Treatment[1)]				SEM[3)]
	H0	H1	H2	H3	
Carcass weight (g)	709.00[a2)]	743.00[a]	725.00[a]	720.00[a]	15.43
Breast (%)	26.49[a]	26.94[a]	26.23[a]	26.96[a]	1.13
Back (%)	29.73[a]	29.80[a]	29.43[a]	29.61[a]	0.73
Wing (%)	17.35[a]	16.23[a]	16.88[a]	17.72[a]	0.50
Thigh (%)	14.38[a]	15.43[a]	13.36[a]	14.73[a]	0.73
Drumstick (%)	12.03[a]	11.58[a]	13.77[a]	11.97[a]	0.73

Note: H0 = 0% fermented gamal leaf extract; H1 = 2%; H2 = 4%; H3 = 6%; Values with the same letter in the same row are not significantly different (P>0.05); Standard Error of the treatment means (SEM)

Table 1 shows the results of the percentage of male bali ducks' backs in treatment H0, which was 29.73%, while treatment H1 was 0.23% higher, but not significantly (P>0.05). Similarly, treatments H2 and H3 were 1% and 0.40% lower, respectively, compared to H0, and the results were not significantly different (P>0.05). This indicates that bali ducks' backs contain a large proportion of bone and relatively little muscle, making them unlikely to grow significantly despite increased nutrient absorption. [12] stated that the back is primarily composed of bone, and thus, the percentage is largely influenced by bone weight. [13] reported similar findings, noting that the addition of fermented water hyacinth to feed did not affect the percentage of backbones in local ducks, with an average of around 24.71%. Moreover, the dose of bioactive compounds (such as saponins and flavonoids) in the fermented gamal extract was likely insufficient to stimulate muscle growth in the back.

Table 1 shows the results of the wing percentage in the H3 treatment, showing an insignificant increase (P>0.05) of 2.11% compared to the control treatment (H0) while the H1 and H2 treatments were respectively 6.45% and 2.70% lower compared to H0, although the difference was not significant (P>0.05). Wings are dominated by bone with relatively small muscle mass, making them less responsive to improved nutrient absorption. [13] stated that wings and backs are not primary areas for muscle deposition; instead, nutrients during growth periods are directed toward areas of muscle deposition. This is supported by [14], who stated that wing carcass growth remains relatively constant up to 12 weeks of age, resulting in similar wing weights. Thus, the addition of feed additives in drinking water has not significantly increased the proportion of wing cuts in ducks.

The percentage of thighs in treatments H1 and H3 were respectively 7.30% and 2.43% higher than in treatment H0, but not significant (P>0.05) (Table 1). Meanwhile, treatment H2 showed a decrease of 7.09% which was not significant compared to group H0. For the drumstick in treatments H1 and H3, respectively, it was 3.74% and 0.49% lower than treatment H0 (P>0.05), while treatment H2 was 14.46% higher than treatment H0, although not significant (P>0.05). This indicates that the flavonoid content in the fermented gamal extract was not sufficient to significantly affect thigh or drumstick carcass development. This is likely because the thighs are part of the limbs, which have a high proportion of bone structure, leading to relatively less muscle mass [15]. According to [16], thigh cut percentages tend to decrease

as bone growth slows and muscle growth increases. [17] Also stated that when other carcass parts, such as the breast, increase, the relative percentage of the thigh decreases. Flavonoid compounds such as tannins can form indigestible complexes in poultry [18], which may explain the lack of significant effects from fermented gamal leaf extract. This is supported by [19], who found that the thigh muscle in poultry may have reached its maximum growth potential, resulting in no significant differences in thigh percentage.

4. Conclusion

The conclusion from this study is that administering 2-6% fermented gamal leaf water extract to drinking water did not affect carcass cut percentage in 8-week-old male bali ducks.

Compliance with ethical standards

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Disclosure of conflict of interest

In this research, the authors declare that there are no conflicts of interest.

Statement of ethical approval

This research was ethically reviewed and approved by the Faculty of Veterinary Medicine Ethics Committee, Udayana University.

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