

Effect of fermented leucaena (*Leucaena leucocephala*) leaf water extract supplementation in drinking water on broiler carcass characteristics

I.G.L.O. Cakra ¹, I M. Nuriyasa ^{1,*}, N. W. Siti ¹, N. G. A. P. D. V. Sari ² and A.A.A.S. Trisnadewi ³

¹ Animal Nutrition Laboratory, Faculty of Animal Science, Udayana University, Denpasar, Bali, Indonesia.

² Master's Program in Animal Science, Faculty of Animal Science, Udayana University, Denpasar, Bali, Indonesia.

³ Forage Crops Laboratory, Faculty of Animal Science, Udayana University, Denpasar, Bali, Indonesia.

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Abstract

This study aimed to determine the broiler carcass yield from the addition of fermented lamtoro (*Leucaena leucocephala*) leaf extract to drinking water. The study used a Completely Randomized Design (CRD) consisting of 4 treatments and 5 replications, each replication consisting of 4 broiler chickens. The treatments in the study were drinking water without fermented lamtoro leaf water extract (P0), 2% fermented lamtoro leaf water extract in drinking water (P1), 4% fermented lamtoro leaf water extract in drinking water (P2), and 6% fermented lamtoro leaf water extract in drinking water (P3). The variables observed were carcass, commercial carcass cuts, and physical composition of broiler breast. The results showed that the slaughter weight and carcass weight of broilers in treatments P1, P2, and P3 were higher ($P<0.05$) than treatment P0. The carcass percentage was not significantly different ($P>0.05$) between treatments. Commercial cuts of broiler carcasses in treatments P1, P2, and P3 were better ($P<0.05$) than treatment P0. The percentage of meat and fat from broiler breasts in treatments P1, P2, and P3 was higher ($P<0.05$) while the percentage of broiler breastbone was lower ($P<0.05$) than treatment P0. It can be concluded that treatments P1, P2, and P3 produced better carcasses, commercial carcass cuts, and physical composition of broiler breasts than treatment P0.

Keywords: Broilers; Fermented Lamtoro Leaves; Carcasses; Commercial Broiler Carcass Cuts

1. Introduction

Kebutuhan protein hewani masyarakat dari tahun ke tahun semakin meningkat seiring dengan perubahan pola konsumsi masyarakat dan pertambahan jumlah penduduk. Masyarakat Indonesia dominan menyukai daging broiler yang harganya terjangkau dan mudah untuk didapatkan, selain itu juga memiliki kandungan gizi protein hewani yang bagus untuk menunjang pertumbuhan [1].

Feed is a primary need in the livestock production process. According to [2], feed costs are the highest element in livestock businesses, accounting for 70% of production costs. Commercial feed uses antibiotics as growth stimulants. In 2018, Indonesia officially banned the use of antibiotics in livestock feed. [3] stated that the use of antibiotics in feed has the potential to store chemical residues from antibiotics found in animal food products. Antibiotic residues consumed by consumers can lead to bacterial resistance in the body. A solution to increase livestock productivity requires alternative natural antibiotics that can be sourced from plants as a substitute for chemical antibiotics, one of which is the lamtoro plant (*Leucaena leucocephala*). *Leucaena leucaena* leaves contain a high protein content of 15-38% [4], and contain phytochemicals such as phenols, flavonoids, alkaloids, saponins, and other phenolic compounds that can act as antibacterials and antioxidants for livestock [5]. The phytochemical compounds in leucaena leucaena leaves have

* Corresponding author: I Made Nuriyasa.

antibacterial properties, reducing the number of pathogenic bacteria (*Escherichia coli* and Coliform), thereby increasing bacillus bacteria, which can aid nutrient absorption in the digestive tract [6].

The fermentation process with EM-4 can convert complex compounds such as crude fiber into simpler compounds to increase the nutritional value of feed ingredients [7]. Research results [8] stated that the addition of fermented soursop leaf extract to drinking water at 2% can increase carcass weight and reduce fat content in the body of free-range chickens. [9] stated that the addition of indigofera leaf extract to drinking water at levels of 2%, 4%, and 6% can increase slaughter weight and carcass percentage.

Due to the limited data on the use of fermented lamtoro leaf water extract through drinking water, it is necessary to conduct research on the addition of fermented lamtoro leaf water extract using EM-4 through drinking water to broiler carcasses.

2. Material and methods

2.1. Material

The study used 200 unsexed Day Old Chicken (DOC) Broiler strain CP 707 from PT. Charoen Pokphand Indonesia Tbk. The research was conducted at Sasetan Farm, Faculty of Animal Husbandry, Udayana University, using a well-controlled battery cage. The feed used commercial feed CP511 Bravo from PT. Charoen Pokphand Tbk with a metabolizable energy content of 2900 kcal/kg and 20% crude protein. Leucaena leaves were made into aqueous extract of leucaena leaves, then fermented using EM-4 for 7 days. Based on the analysis results from the Udayana University Laboratory, the phytochemical content of fermented leucaena leaves aqueous extract contained an antioxidant capacity of 345.01 mgGAE/L; phenol 67.70 mg/100g; flavonoid 31.95 mg/100g, and tannin 17.61 mg/100g.

2.2. Methods

The experiment used a Completely Randomized Design (CRD) with four treatments and five replications, each experimental unit consisting of 10 broilers. The treatments in the experiment were drinking water without fermented lamtoro leaf water extract (P0); drinking water with 2% fermented lamtoro leaf water extract (P1); drinking water with 4% fermented lamtoro leaf water extract (P2); drinking water with 6% fermented lamtoro leaf water extract (P3). The observed variables included: slaughter weight, carcass weight, carcass percentage, commercial carcass cuts, and physical composition of the carcass chest. The research data obtained were analyzed using the Variety Test. If there was a significant difference ($P < 0.05$) between treatments, the analysis was continued with the Duncan Test [10].

3. Results and discussion

3.1. Broiler carcass

The slaughter weight of broilers that did not receive additional fermented lamtoro leaf water extract in drinking water (P0) was 1449.00 g, while the slaughter weight of broilers that received additional 2% lamtoro leaf water extract in drinking water (P1), additional 4% lamtoro leaf water extract in drinking water (P2), additional 6% lamtoro leaf water extract in drinking water (P3), was 7.07%; 7.79% and 8.42% higher ($P < 0.05$) than the P0 treatment (Table 1). The addition of fermented lamtoro leaf water extract to drinking water caused a higher slaughter weight because fermented lamtoro leaf water extract contains phytochemical compounds including phenols, tannins, flavonoids, and antioxidants that act as antibacterials in the digestive tract [8]. Antibacterials can suppress the growth of pathogenic bacteria in the intestines, thus making the feed consumed more efficient and increasing nutrient absorption into the body through the intestinal villi, which is indicated by an increase in slaughter weight. [11] stated that EM-4 solution contains *Lactobacillus bulgaricus* and *Streptococcus thermophilus* bacterial strains that play a role in lowering the pH of the digestive tract, thereby suppressing the growth of pathogenic bacteria and improving digestion. The results of this study, in line with the opinion of [12], indicate that adding probiotics to drinking water can increase the slaughter weight of broilers.

Treatment P0 produced a carcass weight of 1008.80 g, while treatments P1, P2, and P3 produced carcass weights 9.72%, 11.64%, and 12.55% higher than treatment P0. The addition of fermented lamtoro leaf extract to drinking water resulted in higher carcass weight, due to the higher growth rate of broilers, resulting in higher slaughter weight and carcass weight. The results of this study are in accordance with the research of [13].

Table 1 Effect of additional lamtoro leaf water extract on broiler carcasses

Variable	Treatment ¹⁾				SEM ²⁾
	P0	P1	P2	P3	
Slaughter weight (g)	1449.00 ^b	1553.20 ^a	1562.00 ^a	1571.00 ^{a3)}	10.77
Carcass weight (g)	1008.80 ^b	1109.40 ^a	1126.20 ^a	1135.40 ^a	3.65
Carcass percentage (%)	69.61 ^a	71.43 ^a	72.11 ^a	72.36 ^a	0.87
Percentage of breast to carcass (%)	38.01 ^c	39.36 ^b	39.27 ^b	40.39 ^a	0.50
Percentage of back from carcass (%)	17.61 ^a	16.52 ^a	17.93 ^a	17.57 ^a	0.45
Percentage of wings from carcass (%)	12.90 ^a	12.81 ^a	12.67 ^a	12.40 ^a	0.68
Percentage of Thigh from carcass (%)	16.41 ^a	15.36 ^a	15.49 ^a	15.19 ^a	0.73
Percentage of drumstick from carcass (%)	15.07 ^a	15.95 ^a	14.64 ^a	14.45 ^a	0.44

Description:

- Drinking water treatments were:
 - P0: Drinking water without fermented lamtoro leaf water extract
 - P1: Drinking water with 2% fermented lamtoro leaf water extract
 - P2: Drinking water with 4% fermented lamtoro leaf water extract
 - P3: Drinking water with 6% fermented lamtoro leaf water extract
- SEM: Standard Error of Treatment Means
- Values with different letters in the same row indicate significant differences ($P < 0.05$)

The percentage of broiler carcass in treatment P0 was 69.61% while the percentage of carcass in treatments P1, P2 and P3 was 2.61%; 3.59% and 3.95% higher ($P > 0.05$) than treatment P0. The percentage of carcass in treatments P1, P2 and P3 was not significantly different from treatment P0 because the higher carcass weight in treatments P1, P2 and P3 was produced by broilers that had a higher slaughter weight, so it did not affect the percentage of carcass, in accordance with the opinion of [14].

The percentage of broiler breast in treatment P0 was 38.01%, while in treatments P1, P2, and P3 it was 3.55%; 3.31% and 6.26% higher ($P < 0.05$) than P0. This is because the phytochemical content of lamtoro leaves and probiotics in the digestive tract causes higher nutrient absorption efficiency in the digestive tract or a lower FCR value. [15] argue that the lower the FCR value, the more efficient the use of feed to produce meat. The flavonoid compound content in fermented lamtoro leaf water extract can act as an antioxidant in the broiler's body to ward off free radicals, thereby reducing cell and muscle tissue damage. The results of research by [16] administering probiotics can increase the carcass cut of the broiler breast. According to [17], the broiler breast cut has the most carcass components and muscles that are quite high so that it has the highest average percentage compared to other carcass cuts.

Treatment P1 produced a broiler back percentage of 16.52%, while treatments P0, P2 and P3 produced back percentages of 6.59%; 8.53% and 6.34% higher ($P > 0.05$) than treatment P1. The percentage of broiler wings in treatment P3 was 12.40% while treatments P2, P1 and P0 produced wing percentages of 2.18%; 3.31% and 4.03% higher ($P > 0.05$) than treatment P3. This is because the back and wing parts of the broiler carcass are composed of the majority of bones, where bones are components that grow early so they are a priority in nutrient distribution so that treatments P3, P2, P1 and P0 do not affect the percentage of backs and wings of broilers. This opinion is supported by the results of research [14].

Percentage of Thigh from carcass pada perlakuan P0 adalah 16,41% sedangkan pada perlakuan P1, P2 dan P3 adalah 6,40%; 5,61% dan 7,3% lebih rendah ($P > 0,05$) daripada perlakuan P0. Percentage of drumstick from carcass pada perlakuan P2 adalah 15,95% sedangkan pada perlakuan P0, P1 dan P3 adalah 5,52%; 8,21% dan 9,40% lebih rendah ($P > 0,05$) dibandingkan perlakuan P2. The percentage of thigh from carcass and drumstick from carcass in the additional treatment of fermented lamtoro leaf extract through drinking water at levels of 2-6% did not differ between treatments. This indicates that the phytochemicals of lamtoro leaves and probiotics in the digestive tract have not been

able to affect the percentage of thigh from carcass and the percentage of drumstick from carcass. The results of this study are consistent with the study of [18] who used carrot leaf extract in drinking water did not have a significant effect on the percentage of thigh from carcass. The same results were also obtained by [19] who used betel leaf extract was not able to provide a significant effect on the percentage of drumstick from carcass.

3.2. Physical composition of the breast part of broiler carcasses.

The percentage of meat from the breast of the broiler carcass in the P0 treatment was the lowest at 71.13%, while in the P1, P2 and P3 treatments it was 9.38%; 9.70% and 9.24% higher ($P<0.05$) than the P0 treatment (Table 2). This is because the phytochemical content in lamtoro leaves and probiotics in the broiler digestive tract can increase nutrient absorption in the small intestine so that the amount of nutrients for the formation of carcass meat components is higher, in accordance with research [14]. The P0 treatment resulted in a bone percentage from the breast of the broiler carcass of 22.54% while the P1, P2 and P3 treatments resulted in a bone percentage from the breast of the broiler carcass of 21.65%; 23.20% and 25.02% lower ($P<0.05$) than the P0 treatment. The percentage of fat from the breast part of the broiler carcass in treatment P0 was the highest, namely 6.33%, while treatments P1, P2 and P3 produced a percentage of fat from the breast part of the broiler carcass of 28.44%; 26.22% and 14.90% lower ($P<0.05$) than treatment P0.

Table 2 The effect of adding fermented lamtoro leaf extract to drinking water on the physical composition of the breast part of broiler carcasses.

Variable	Treatment				SEM
	P0	P1	P2	P3	
Daging Dada (%)	71.13 ^b	77.8 ^a	78.03 ^a	77.70 ^a	1.15
Tulang Dada (%)	22.54 ^a	17.66 ^b	17.31 ^b	16.90 ^b	0.45
Lemak Dada(%)	6.33 ^a	4.53 ^b	4.67 ^b	5.40 ^b	0.57

Description:

- Drinking water treatments were:
- P0: Drinking water without fermented lamtoro leaf water extract
- P1: Drinking water with 2% fermented lamtoro leaf water extract
- P2: Drinking water with 4% fermented lamtoro leaf water extract
- P3: Drinking water with 6% fermented lamtoro leaf water extract
- SEM: Standard Error of Treatment Means
- Values with different letters in the same row indicate significant differences ($P<0.05$)

The additional treatment of fermented lamtoro leaf extract through drinking water in broilers causes the percentage of bone and fat from the breast of the broiler carcass to be lower than the treatment without the addition of fermented lamtoro leaf extract. This condition is caused by the percentage of meat from the breast of the broiler carcass in the additional treatment of fermented lamtoro leaf extract through drinking water being significantly higher than the treatment without the addition of fermented lamtoro leaf extract, so that the percentage of bone and fat from the breast of the broiler carcass is lower than the treatment without the addition of fermented lamtoro leaf extract.

4. Conclusion

It can be concluded that the addition of lamtoro leaf extract through drinking water in broilers at a level of 2-4% can increase the carcass, the breast part of the broiler carcass, and the meat composition breast part of the broiler carcass.

Compliance with ethical standards

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Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of ethical approval

This research was approved by the Research Ethics Commission from the Faculty of Animal Husbandry and the Faculty of Veterinary Medicine, Udayana University.

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