Percentage of Carcasses and Commercial Cuts of Spent Layer Ducks Fed Garcinia atroviridis Leaf Meal as Feed Additive in a Smallholder Farm

Article *in* Journal of Animal Health and Production · January 2022

DOI: 10.17582/journal.jahp/2022/10.4.438.442

Dewi Urip Wahyuni
Sekolah Tinggi llmu Ekonomi

Dede Kardaya
Universitas Djuanda

Short Communication

Percentage of Carcasses and Commercial Cuts of Spent Layer Ducks Fed *Garcinia atroviridis* Leaf Meal as Feed Additive in a Smallholder Farm

Dede Kardaya*, Ayu Ratnasari, Dewi Wahyuni

Universitas Djuanda, Indonesia.

Abstract | Spent layer duck meat has a fishy aroma, harsh, and high-fat content, so it is less attractive to people in Indonesia. *Asam gelugur* (*Garcinia atroviridis*) leaves are known to reduce fat content in duck meat because it contains hydroxy citric acid. This study aimed to examine the effect of *Garcinia atroviridis* leaf meal (GALM) supplementation in fermented nonconventional diets on the percentage of spent layer duck carcasses. The study used a completely randomized design with three treatments, and 50 replicates. The treatments consisted of 50% rice bran and 50% *aking* (leftover rice) diets (R1), 0% GALM in the fermented nonconventional diets (R2), and 6% GALM in the fermented nonconventional diets (R3). The parameters were slaughter weight, carcass weight, carcass percentage, and commercial percentage (wings, breasts, thighs, and back). The R1 diet produced a higher ($p<0.05$) slaughter weight and carcass weight than R2 and R3 diets, while the percentage of wings and thighs were higher ($p<0.05$) in R2 and R3 than R1. However, R1 diet produced a higher back percentage ($p<0.05$) than R2 and R3 diets. Supplementation of 6% GALM in diets decreased slaughter weight, carcass weight, and back percentage, maintained carcass percentage, and increased commercial cut percentage (wings and thighs).

Keywords | *Asam gelugur* leaf meal, nonconventional diets, wing percentage, thigh percentages.

Received | August 14, 2022; **Accepted** | September 09, 2022; **Published** | September 25, 2022
***Correspondence** | Dede Kardaya, Universitas Djuanda, Indonesia; **Email**: dede.kardaya@unida.ac.id
Citation | Kardaya D, Ratnasari A, Wahyuni D (2022). Percentage of carcasses and commercial cuts of spent layer ducks fed *garcinia atroviridis* leaf meal as feed additive in a smallholder farm. J. Anim. Health Prod. 10(4): 438-442.
DOI | http://dx.doi.org/10.17582/journal.jahp/2022/10.4.438.442
ISSN | 2308-2801

INTRODUCTION

Ducks are one of the potential livestock that can be taken advantage of in the form of meat and eggs. Ducks have advantages over other livestock, namely having strong resistance to disease and easy maintenance. The population of ducks was 51,239,000 heads, and duck meat production in Indonesia in 2018 reached 38,044 tons (Directorate General of Livestock and Animal Health, 2019).

Feed is a crucial factor determining a livestock business success because the highest component of production cost is feed cost. Therefore, to overcome the high price of feed, nonconventional feed is needed, which is inexpensive but still has high nutritional value to meet the nutrient requirement of livestock (Mahmoud, 2022; Moemeka et al., 2022).

Spent layer duck meat has a fishy aroma, harsh, and high-fat content, so it is less attractive to people in Indonesia. Efforts to overcome the fishy aroma, though and high-fat content can be made through the provision of herbal supplements widely grown in Indonesia, (Kardaya et al., 2022) one of them is *Asam gelugur* (*Garcinia atroviridis*).

Garcinia atroviridis is a tropical and subtropical annual tree originating from South Asia and Southeast Asia and mainly grows on the island of Sumatra. It has much good nutritional content, reducing fat levels because it contains active flavonoids, alkaloids, saponins, tannins, phenolics, carbohydrates, and proteins. It also contains organic acids such as ascorbic acid, malic acid, tartaric acid, pentadecanoic acid, nonadecanoic acid, dodecanoic acid, and hydroxy citric acid. Hydroxy citric acid (HCA) is a natural organic acid that has been identified as a derivative of citric acid. It is an anti-obesity compound to reduce body weight (Meera et al., 2013; Taher et al., 2017). Dietary *Garcinia atroviridis* supplementation reduced the fat content of spent layer duck meat (Kardaya et al., 2022). The leaves of Garcinia have high antioxidant activity (Abdullah et al., 2013) which can prevent cell oxidation so that the cell condition becomes better. Therefore, the use of *Garcinia atroviridis* leaf meal in this study is expected to produce a high carcass and commercial cut percentages of the spent layer duck.

MATERIALS AND METHODS

Materials

All applicable international, national, and institutional guidelines for the care and use of animals were followed (SNI 39102017; 35/Permentan/OT.140/3/2007). The research was carried out in the duck farm of the Animal Science Department, Faculty of Agriculture, Djuanda University, for 35 days. The research used 150 spent layer ducks (Mojosari – Alabio crossbred) aged 72 weeks with an average initial body weight of 1388±132 g. The diets used consisted of three different diets. Firstly, refined rice bran and *aking* (leftover rice) (R1). Secondly, nonconventional diets (Table 1) (R2). Thirdly, nonconventional diets were supplemented with *Garcinia atroviridis* leaf meal (GALM). Nutrient compositions of all experimental diets were presented in (Table 2). *Aspergillus niger* is used as a fermenter in fermenting palm kernel cake and coconut meal.

Table 1: The feed composition of nonconventional diets

Feed item	Amount (%)
Yellow corn	40
Rice bran	19
Soybean meal	4.5
Fish meal	4
Premix†	0.5
DCP	1
CaCO3	1
Fermented coconut meal	15
Fermented palm kernel cake	15
Total	100

†Composition (per kg): Vitamin A 3,300 IU, Vitamin D 360 IU, Vitamin E 100 IU, Mg 100 mg, Co 100 mg, P 340 mg, Ca 720 mg, K 650 mg, Na 90 mg, S 120 mg, Fe 7 mg, Mn 5 mg, Zn 4 mg, Cu 1 mg, I 60 mcg, Se 40 mcg, organic chromium 0.3 mg.

Table 2: Nutrient composition of the experimental diets.

Nutrient composition	R1	R2	R3
Water content (%)	11.22	11.61	9.21
Ash (%)	4.83	8.43	7.80
Extract ether (%)	8.32	2.57	3.34
Crude protein (%)	9.67	13.32	12.00
Crude fiber (%)	4.13	4.25	9.30
Nitrogen-free extract (%)	57.34	59.82	58.35
Gross energy (kcal/kg)	4,062	3,814	4,022

R1 = 50% rice bran + 50% *aking* (leftover rice), R2 = nonconventional diets, R3 = nonconventional diets + 6% *Garcinia atroviridis* leaf meal.

Methods

The study used a completely randomized design with three treatments, and 150 replicates so that a total of 150 spent layer ducks were used. The treatment consisted of three experimental diets: 50% rice bran and 50% *aking* (leftover rice) (R1); Nonconventional diets (R2), and nonconventional diets + 6% *Garcinia atroviridis* leaf meal (GALM) (R3).

The parameters consisted of slaughter weight, carcass weight, carcass percentage, and the percentage of commercial cuts (back, wings, thighs, and breast). Slaughter weight was obtained by weighing the carcass after being slaughtered. All stages of the slaughtering process followed the Islamic Sharia. Slaughtering protocols, ranging from pre-slaughtering, antemortem examination, handling ducks shortly before slaughtering without stunning, slaughtering, to the stage of post-slaughtering handling, were carried out in accordance with halal slaughtering for poultry (BSN, 2016). Carcass weight was obtained by weighing the carcasses.

The carcass was obtained by separating the head, neck, legs, and offal. Commercial cuts are obtained by cutting the thighs, wings, back, and breasts. Either carcass or each commercial cut was weighed to calculate the percentage. The following formulae used to calculate the percentage of carcass and commercial cuts.

The fermented feed ingredients consisted of coconut meal and palm kernel cake as previously used by Ekaprasetyo et al. (2022). The fermentation process used the fungus *Aspergillus niger* (Purba et al., 1998). Palm kernel cake and coconut meal were weighed each as many as 1 kg and steamed using 600 ml of water until evenly mixed. Steaming was carried out for 30 minutes, then cooled. The cooled coconut meal and palm kernel cake were then inoculated with *Aspergillus niger* as much as 12.5 g per kg each and then mixed evenly with the following ingredients: Urea 3.5g, $CaCl_2$ 0.25g, KCl 0.75g, MgSO4 2g, and NaPO4 12.5g.

The mixture was then put into an airtight plastic bag to be fermented anaerobically for 72 hours. The fermented mixture was then dried and mixed with the following feed ingredients: yellow corn, fine bran, soybean meal, fish meal, premix, DCP, and CaCO3, each with a certain amount (Table 1). *Garcinia atroviridis* leaves were air-dried for four days and then oven-dried at 70°C for 2 hours. The dried *Garcinia atroviridis* leaves were then ground to produce a fine meal.

Spent layer ducks were kept in three colony cages, each measuring 4.0 m long, 1.5 m wide, and 0.8 m high. The cage floor is covered with rice husks with a thickness of 6-8 cm. The husk was replaced with a new one if the husk was wet. The provision of diets was carried out twice a day in the morning at 8.00 and in the afternoon at 16.00, and drinking water was provided *ad libitum*. The adaptation period was carried out for 7 days, followed by a feeding trial period for 35 days. At the end of the feeding period, spent layer ducks were weighed and then slaughtered according to Islamic Sharia. The fasting period was carried out for 6 hours pre-slaughtering to reduce carcass contamination and not interfere with the well-being and quality of livestock products (Xue et al., 2021).

RESULTS AND DISCUSSION

Carcass Percentage

The slaughter weights of spent layer ducks in this study ranged from 1,341±127 g to 1,548±146 g, carcass weights ranged from 736±96 g to 863±115 g, and carcass percentages ranged from 53.62±3.17% to 55.62±3.45% (Table 3). Results of the analysis of variance showed that the diet treatments affected ($p<0.05$) the slaughter weight and carcass weight but did not affect the carcass percentage of spent layer ducks.

The average slaughter weight (1,422±152 g) and carcass weight (780±113 g) of ducks fed diets supplemented with *Garcinia atroviridis* leaf flour in the recent study were higher than the slaughter weight (1,225±40 g) and carcass weight (711±41) of ducks given mangosteen skin supplements (Kusmayadi, 2020). The carcass percentage (53.62±3.17 – 55.62±3.45%) of spent layer ducks resulting from this study was quite the same as the carcass percentage (52.06 – 54.55%) of local male ducks fed diets supplemented with fermented *eceng gondok* (*Eichornia crassifes*) (Dewanti and Irham, 2013), but lower than the average carcass percentage of ducks (56.84±4.12%) fed commercial diets supplemented with liquid extracts of *Piper betle Linn* leaf and *Etlingera elatior* (Solihin et al., 2018).

Feeding refined rice bran + *aking* rice (R1) resulted in higher slaughter weight and carcass weight ($p<0.05$) than nonconventional rations (R2) or nonconventional rations supplemented with *Garcinia atroviridis* leaf meal (R3). Meanwhile, treatments R2 and R3 produce the same slaughter weight, carcass weight, and carcass percentage. The higher slaughter weight and carcass weight of spent layer ducks in treatment R1 were thought to be due to higher crude fat and energy content in treatment R1.

The high level of gross energy in the R1 ration came from the high content of crude fat and nitrogen-free extract (70.76%) contained in *aking* rice (Riyadi and Anggraini, 2010). Spent layer ducks consumed high crude fat, and high gross energy can potentially reserve energy in their body tissues as body fat depots. The slaughter weight was influenced by the age of slaughter (Matitaputty et al., 2011) and the nutritional content of the feed, including the energy and protein balance of diets (Purba and Ketaren, 2011). Meanwhile, the same slaughter and carcass weight in R2 and R3 treatments, was thought to be due to the low crude fat content and nitrogen-free extract (Wahyuni et al., 2020) and the potential of hydroxy citric acid contained in *Garcinia atroviridis* leaves in controlling body weight (Taher et al., 2017).

Commercial Cut Percentages

The wing percentage of spent layer ducks in this study ranged from 13.49±1.96% to 16.19±1.17%, with an average of 15.17±1.57% (Table 4). Thigh percentage ranged from 21.11±2.08% – 23.87±1.01%, with an average of 22.64±1.73%. Breast percentages ranged from 24.54±2.4% to 25.72±3.03%, with an average of 25.15±2.41%. Back percentage of spent layer ducks ranged from 34.55±2.18 – 38.93±4.42% with the average 36.26±2.96%.

The wing percentage of spent layer ducks in this study was in line with the wing percentage (15.67%) of ducks reported by Sale et al. (2017), who supplemented 5% betel leaf meal into their diets. This percentage of wings was the lowest value among the three other types of commercial cuts. The wing was a locomotion tool that required high energy to move it, so the fat content of diets was used to move the wing so that the fat deposit in the wing tissue was limited. This condition was presumed to be the reason or cause of the low ($p<0.05$) percentage of wings in the R1 diet compared to R2 and R3 diets.

The thigh percentage of the recent study (21.11±2.08 – 23.87±1.01%) was like the thigh percentage (22.89±0.52 – 23.53±2.10%) of local duck-fed *beluntas* (*Pluchea indica (L.) Less*) as feed additive (Lestari et al., 2018). Spent layer ducks consuming a mixed diet of refined rice bran and *aking* (R1) produced a lower thigh percentage ($p<0.05$) than spent layer ducks consuming nonconventional diets (R2 and R3). This condition was related to the function

Table 3: Slaughter weight, carcass weight, and carcass percentage of spent layer ducks fed experimental diets.

Treatments	Parameters		
	Slaughter weight (g)	Carcass weight (g)	Carcass percentage
R1	1,548.00±146.23[b]	862.60±115.53[b]	55.62±3.45
R2	1,376.50±181.50[a]	740.90±126.84[a]	53.62±3.17
R3	1,341.50±127.45[a]	736.00±95.91[a]	54.72±2.35
Average	1,422±151.72	779.83±112.76	54.65±2.99

Different superscript within similar column indicates significant difference (P<0.05). R1 = 50% rice bran + 50% *aking* (leftover rice), R2 = nonconventional diets, R3 = nonconventional diets + 6% *Garcinia atroviridis* leaf meal.

Table 4: Percentage of commercial cuts of spent layer ducks fed experimental diets.

Treatments	Parameters			
	Wing (%)	Thigh (%)	Breast (%)	Back (%)
R1	13.49±1.96[a]	21.11±2.08[a]	25.72±3.03	38.93±4.42[b]
R2	16.19±1.17[b]	23.87±1.01[b]	25.19±1.80	34.55±2.18[a]
R3	15.83±1.59[b]	22.94±2.11[b]	24.54±2.42	35.31±2.28[a]
Average	15.17±1.57	22.64±1.73	25.15±2.41	36.26±2.96

Different superscript within similar column indicates significant difference (P<0.05). R1 = 50% rice bran + 50% *aking* (leftover rice), R2 = nonconventional diets, R3 = nonconventional diets + 6% *Garcinia atroviridis* leaf meal.

of the thigh as a means of locomotion in live ducks. The thigh was one of the carcass parts consisting of meat and bone (Ramdani et al., 2016). Fat accumulation in the locomotion was minimal because the locomotion required instantaneous energy, so there was no fat conversion in the locomotion organ. The large percentage of bone influenced the small amount of meat deposited in the tight.

The average breast percentage in this study was lower than the average breast percentage (25.04±1.57 – 25.59±1.89%) of local ducks fed *beluntas* (*Pluchea indica (L.) Less*) leaf meal (Lestari et al., 2018). The study showed no significant difference (p> 0.05) among the treatment. It was presumably because the breast grew more slowly than the rest of the body (Maruyama et al., 2001) and reached maximal breast muscle growth (Chartrin et al., 2007).

The back percentage of spent layer ducks in this study was higher than that of ducks (31.65±2.89%) fed commercial diets with betel leaf liquid supplements (Solihin et al., 2018). They obtained the back percentage of spent layer duck backs of 32.59±3.43% with *Garcinia atroviridis* leaf meal supplements. Feeding R1 diets resulted in a higher back percentage (p<0.05) than R2 and R3 diets. It is presumably because the back is not a locomotion tool, so fat deposition is possible on the back. Because the nutritional content of nitrogen-free extracts (NFE) contains in rice bran and *aking* (R1) is high, 42% and 70.76%, respectively (Riyadi and Anggraini, 2010), which has the potential to store energy in the form of fat deposits in the back. Dorsal carcasses contained more bone tissue and less muscle tissue (Ramdani et al., 2016).

CONCLUSION

The study concludes that supplementing 6% *Garcinia atroviridis* in fermented nonconventional diets of spent layer ducks reduces slaughter weight, carcass weight, and back percentage maintains carcass percentage, and increases wings and thighs percentages as part of a commercial cut.

ACKNOWLEDGEMENT

We thank the Directorate of Resources, Directorate General of Higher Education, Ministry of Education, Culture, Research and Technology for funding this research through the PTUPT Grants scheme Number: 010/SP2H/RT-MONO/LL4/2021.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

AUTHOR'S CONTRIBUTIONS

Ayu Ratnasari worked on collecting authentic data, investigation, and project administration. Dewi Wahyuni worked on investigation and data analysis. Dede Kardaya worked on designing the concept, methodology, supervision, and validation.

REFERENCES

Abdullah AR, Bakhari NA, Osman H (2013). Study on the relationship of the phenolic, flavonoid, and tannin content to the antioxidant activity of Garcinia atroviridis. Universal J. Appl. Sci., 1(3): 95-100. https://doi.org/10.13189/ujas.2013.010304

Chartrin P, Bernadet MD, Guy G, Mourot J, Hocquette JF, Rideau N, Duclos MJ, Baéza E (2007). Do age and feeding levels have comparable effects on fat deposition in breast muscle of mule ducks? Animal., 1(1): 113-123. https://doi.org/10.1017/S1751731107658029.

Dewanti R, Irham M (2013). The effect of fermented *Eichornia crassipes* supplementation in the diet on the percentage of carcass, non-carcass and abdominal fat of eight week old local male duck. Bulet, Peternakan., 37(1): 19-25. https://doi.org/10.21059/buletinpeternak.v37i1.1955

Directorate General of Livestock and Animal Health (2019). Livest. Anim. Health Statis. 2019.

Ekaprasetyo F, Kardaya D, Dihansih E (2022). Performance of male Tegal duck grower phase given gelugur acid leaves (*Garcinia atroviridis*) in non-conventional fermented rations. J. Peternakan Nusantara. 8 (1): 39-46.

Kardaya D, Wahyuni, D, Dihansih E (2022). Physical and chemical qualities of spent layer duck meat fed diets supplemented with *Garcinia atroviridis* leaf meal. J. Anim. Health Prod. 10(3): 347-351. http://dx.doi.org/10.17582/journal.jahp/2022/10.3.347.351.

Kusmayadi A (2020). Effect of Addition of Wasted Bread Flour Combined with Mangosteen Peel Flour as a Substitute for Corn on Percentage of Cihateup Duck Carcasses. J. Ternak, 11(1): 8-12. https://doi.org/10.30736/jy.v11i1.66

Lestari FEP, Jakaria J, Rukmiasih R (2015). Sensory and fatty acids characteristics of Cihateup duck meats, Alabio and Cross-bred. J. Sains Terapan, 5(1): 17-25. https://doi.org/10.29244/jstsv.5.1.17-25.

Mahmoud YMM (2022). Effect of supplementation of dried chicory (cichorium intybus l.) Herb leaves in diets of growing kids on their growth performance, blood parameters and hematological profile. J. Anim. Health Prod. 10(3): 320-329.

Maruyama K, Vinyard B, Akbar MK, Shafer DJ, Turk CM (2001). Growth curve analyses in selected duck lines. Brit. Poult. Sci., 42(5): 574-582. https://doi.org/10.1080/00071660120088380

Matitaputty PR, Noor RR, Hardjosworo PS, Wijaya CH (2011). Performance, carcass percentages and heterosis values, Alabio and Cihateup line and crossbreeding on eight-week-old. Indonesian J. Anim. Vet. Sci. 16(2): 90-97. https://doi.org/10.14334/jitv.v16i2.638.

Meera A, Prakash SJ, Prakash SO (2013). Garcinia Indica for Metabolic Syndrome-a Review. Int. J. Exper. Pharmacol. 3(2):57-60. https://www.ijepjournal.com/zip.php?file=File_Folder/57-60.pdf HYPERLINK "https://www.ijepjournal.com/zip.php?file=File_Folder/57-60.pdf&id=84&quat=3"&

Moemeka AM, Sorhue UG, Omeje SI, Bratte L, Onainor R, Oghenesuvwe O (2022). Effect of replacing maize with boiled sweet potato on performance characteristics and expression of insulin-like growth factor-1 gene in pigs. J. Anim. Health Prod. 10(3): 293-302.

Purba M, Ketaren PP (2011). Feed consumption and feed conversion ratio of eight weeks old male local ducks treated with santoquin and vitamin E supplement. Indonesian J. Anim. Vet. Sci. 16(4): 280-287. https://doi.org/10.14334/jitv.v16i4.624.

Ramdani I, Kardaya D, Anggraeni A (2016). The Effect Of Substitution Of Commercial Feed With Flour Coconut Pulp To Slaughter Weight And Carcass Weight Chicken. J. Peternakan Nusantara. 2(1). https://doi.org/10.30997/jpnu.v2i1.323.

Riyadi T, Anggraini H (2010). Penetapan Kadar Karbohidrat Pada Nasi Aking yang Dikonsumsi Masyarakat Desa Singorojo Kabupaten Kendal. Prosiding Seminar Nasional. Jurnal Unimus. Semarang.

Sale M, Handarini R, Dihansih E (2017). The percentage of carcass parts of male local ducks given betel leaf solution included in ration. J. Peternakan Nusantara., 3(1): 41–48. https://doi.org/10.30997/jpnu.v3i1.852.

Solihin, Handarini R, Dihansih E (2018). Percentages of carcass and its parts of male local ducks fed *Piper betle* leaf and torch ginger flower solution included in commercial ration. J. Peternakan Nusantara. 4(1): 33-40. https://doi.org/10.30997/jpnu.v4i1.1510.

Purba T, Hamid H, Sinurat A (1998). Solid state fermentation of palm kernel meal by using Aspergillus niger. Indonesian J. Anim. Vet. Sci. 3(3): 165-170. https://doi.org/10.14334/jitv.v3i3.112.

Taher M, Hamidon H, Susanti D, Zakaria ZA (2017). Garcinia atroviridis–A review on phytochemicals and pharmacological properties. Marmara Pharmaceut. J., 21(1): 38-47. https://doi.org/10.12991/marupj.259879.

Wahyuni D, Dihansih E, Kardaya D (2020). Performance of rejected duck that fed fermented non conventional and commercial fed ration containing flour leaves of gelugur acid. J. Pertanian., 11(1): 9-1. https://doi.org/10.30997/jp.v11i1.2674.

Xue G, Cheng S, Yin J, Zhang R, Su Y, Li X, Bao J (2021). Influence of pre-slaughter fasting time on weight loss, meat quality and carcass contamination in broilers. Anim. Biosci., 34(6): 1070-1077. https://doi.org/10.5713/ajas.20.0560.