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Effects of Coconut Oil Supplementation on Growth Performance, Egg Production, and Egg Characteristics in Merawang Chickens

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ABSTRACT

Feed plays an important role in influencing the growth and reproductive performance of chickens. In recent years, the use of natural feed additives in chicken production has attracted considerable attention from both the scientific and commercial communities. Therefore, the present study aimed to investigate the effects of supplementing Merawang chickens with coconut oil on their growth performance, egg production, and egg characteristics. Subsequently, 240-day-old chicken Merawang chickens were used, divided into four treatments with four replications each. The groups consisted of a basic diet without coconut oil (T0), a basic diet with 1% coconut oil (T1), a basic diet with 2% coconut oil (T2), and a basic diet with 3% coconut oil (T3). The Merawang chickens were reared for seven months, kept in communal cages for four months according to the prescribed treatment, and then transferred to battery cages when they entered the egg-laying phase, remaining there until seven months of age. Parameters measured included body weight, body weight gain, morphometric measurements, feed efficiency, egg production, and characteristics. The results revealed that T1 and T2 significantly improved growth performance parameters compared to other treatments, especially in body weight, body weight gain, and different morphometric traits such as beak length, head height, chest width, upper thigh length, third toe length, pubic width, neck length, upper body length, back length, lower body length, and tibia circumference. The T1 and T2 also significantly affected egg production and egg characteristics of Merawang chickens compared to T0 and T3, including hen day production (HDP), egg length, egg width, and egg circumference. Consequently, it is determined that adding 1-2% of coconut oil to Merawang chickens' feed can enhance growth performance, egg production, and egg characteristics.

Keywords: Coconut oil, Egg characteristics, Egg production, Growth performance, Merawang chicken

INTRODUCTION

The poultry sector is one of the fastest-growing livestock subsectors (FAO, 2023) and plays a crucial role in providing affordable animal protein to the public (Sumiati et al., 2025). Poultry products, particularly chicken meat and eggs, are among the most accessible and affordable sources of high-quality animal protein and contribute significantly to national efforts aimed at improving nutritional status (Vlaicu et al., 2024). According to a report from the BPS-Statistics Indonesia (2025) chicken meat and egg production in Indonesia continues to increase in response to population growth as well as the government's current emphasis on the flagship Free nutritious meal program (Azi et al., 2025).

One of Indonesia's indigenous chicken breeds, originating from Bangka Belitung, with significant development potential, is the Merawang chicken, known as dual-purpose chickens producing eggs and meat (Magfira et al., 2017; Nuraini et al., 2020; Nurwansyah et al., 2024; Depison et al., 2025). The Merawang chickens have been designated as germplasm through Decree of the Minister of Agriculture of Indonesia No. 2846/Kpts./LB.4301812012, making it a potential genetic resource that needs to be preserved and developed.

One of the challenges in poultry farming is the efficient use of feed for the improvement of growth (Zampiga et al., 2021; Korver, 2023). In recent years, the use of natural feed additives such as coconut oil in poultry production has received substantial scientific and industrial attention (Alagawany et al., 2018; Elewa et al., 2023). Coconut oil is known as a source of saturated lipids, with medium-chain fatty acids (MCFAs) accounting for approximately 60% of its fatty acid composition (Bhatnagar et al., 2009). Supplementation with coconut oil significantly increased superoxide

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dismutase (SOD) activity compared to the fish oil group. Additionally, rations supplemented with coconut oil significantly reduced plasma malondialdehyde (MDA) levels compared to the fish oil diet (Attia et al., 2020). The addition of coconut oil to broiler chicken feed has been reported to improve growth performance by approximately 9.9% and lipid digestion, as well as performance parameters, particularly during coccidia infection (Wang et al., 2015).

The physiological and metabolic responses of broiler chickens differ from those of native chickens due to differences in growth rate, tissue deposition capacity, and environmental adaptation (Duah et al., 2020; Ravindran and Abdollahi, 2021; Jie et al., 2024). Broiler chickens generally have higher metabolism and feed efficiency (Alam et al., 2020). The mentioned features underscore the need for specific evaluations in native chickens, including Merawang chickens, to verify the effectiveness of coconut oil as a feed additive. Therefore, the present study aimed to evaluate the effect of coconut oil supplementation on growth performance, egg production, and egg characteristics in Merawang chickens.

MATERIALS AND METHODS

Ethical approval

The Ethical Clearance Committee at the Faculty of Animal Science, Jambi University, Indonesia, approved the animal procedures for experimentation (Approval ID: Ref. 01/UN21.7/ECC/2024).

Study period and location

The present study was conducted for seven months, from July 2024 to January 2025. The Merawang were raised from day-old chicken (DOC) to four months in an experimental cage with a communal system measuring 3 m × 2 m, as many as 16 blocks, each containing 15 Merawang chickens, located in RT 03, RW 01, Mendalo Indah Village, Jaluko District, Muaro Jambi Regency, Indonesia. Furthermore, the Merawang chickens were moved to battery cages at the Faculty of Animal Husbandry, Jambi University, Indonesia, at the age of five months in preparation for the egg-laying phase, and were kept until seven months.

Experimental design

The Merawang chickens used in the present study were DOC, with an average weight of 33 g. A total of 240 Merawang DOCs were divided into four groups, each consisting of four replicates of 15 chickens. The group was arranged as follows, which included a basal diet without coconut oil (T0), a basal diet with 1% coconut oil (T1), a basal diet with 2% coconut oil (T2), and a basal diet with 3% coconut oil (T3). The type of coconut oil used is commercial KARA coconut oil (PT. Karacoco Nucifera Pratama, Indonesia), which is processed from copra and contains medium-chain fatty acids (MCFAs). Coconut oil was added to the feed according to the treatment level and age of the Merawang chickens, and the oil was mixed daily before feeding based on the treatment level. The mixed feed was thoroughly stirred before being given to the chickens. Merawang chickens were fed in the morning and evening, with *ad libitum* water. The type of feed provided was determined by their age and rearing, namely the starter phase (0-1 month) using BR-I Comfeed, the grower phase (2-4 months) using BR-II Comfeed, and the layer phase (5-7 months) using PAR-L I Comfeed (Table 1). All feed was produced by PT Japfa Comfeed Indonesia Tbk. Merawang chickens were vaccinated at four days of age with ND LaSota vaccine in the drinking water (PT Medion Farma Jaya, Indonesia). In the case of illness, the affected chickens were treated with the antibiotic Vita Tetra Chlor, also provided by PT Medion Farma Jaya, Indonesia.

Table 1. Nutritional content of feed given during the rearing of Merawang chickens

Nutritional content	BR-I Comfeed	BR-II Comfeed	PAR-L I Comfeed
Crude protein (%)	21.0-23.0	19.0-20.0	Min 17.0
Fat %	Min 5	Min 5	Min 3
Crude fiber (%)	Max 5	Max 5	Max 6
Ash (%)	Max 7	Max 7	Max 14
Calcium %	0.8-1.1	0.8-1.1	3.5-4.0
Phosphorus %	Min 0.50	Min 0.45	Min 0.45
Energy (Kcal/kg)	Min 3000	Min 3000	Min 2700
Lysin (%)	Min 1.2	Min 1.65	-
Metionin (%)	Min 0.45	Min 0.40	-
Tryptophan (%)	Min 0.19	Min 0.16	-
Threonine (%)	Min 0.75	Min 0.65	-

Growth performance, egg production, and egg characteristics

Growth parameters observed during the rearing period included initial body weight, weight gain, morphometric characteristics, feed consumption and feed conversion, mortality, and production characteristics, including egg production and egg characteristics. Body weight was measured monthly for each chicken using a digital scale, and body weight gain was calculated as the difference between pre- and post-weight. Morphometric characteristics such as beak, head, chest, upper thigh length, tibia, calf length, and upper body length were measured using a caliper and measuring tape. The measured body morphometric parameters were according to the study of Muhammad et al. (2025). Feed Conversion Ratio (FCR) is calculated as the change in feed intake (g) divided by the increase in body weight gain (g). Data on body weight, weight gain, morphometric characteristics, feed consumption and conversion, and mortality were calculated while the chickens were kept in communal cages. Data on growth performance were not collected after four months of age because they were specifically for measuring egg production and characteristics, and preventing stress that could affect egg production. Egg production and characteristics were recorded daily from the onset of laying at approximately five months of age until seven months of age. The parameters measured included hen-day egg production (HDP), egg weight, egg length, egg width, and egg circumference. Daily egg production refers to the number of eggs produced relative to the number of hens present. The percentage of chicken egg production is calculated by multiplying the number of eggs produced per day by 100. All data measurements were carried out by the research team, assisted by students from the Faculty of Animal Science, University of Jambi, Indonesia. Before the measurements, everyone was briefed to ensure a uniform data collection and measurement method. After the data was collected, a review was carried out to prevent measurement errors and maintain data accuracy.

Data analysis

Data on growth performance, egg production, and egg characteristics were analyzed using descriptive statistics. Feed consumption was calculated during rearing and analyzed overall for each group and for each bird to determine average daily and weekly consumption per bird. The effects of the treatments in the present study were assessed through one-way ANOVA to test for variance between groups. All analyses were conducted using Minitab 17 statistical software. Tukey's Multiple Range Test was employed to identify significant differences between the groups at a 5% confidence interval ($p < 0.05$).

RESULTS AND DISCUSSION

Growth performance of Merawang chickens

The average growth of chickens during four months of rearing is presented in Table 2. The analysis indicated that supplementation of chicken feed with coconut oil had a significant effect ($P < 0.05$) on the body weight of Merawang chickens from two months of age onward. The T1 diet resulted in significantly higher body weight (BW) than in the other groups (Table 2; $P < 0.05$). The increase in BW of Merawang chickens also differed significantly across treatment levels ($P < 0.05$). The body weight gain (BWG) of Merawang chickens in the present study ranged from 1308.88 ± 129.20 g to 1485.96 ± 174.20 g in the growth phase for four months (Table 2). The BWG of Merawang chickens in group T1 was almost the same as in group T2, followed by groups T3 and T0. The BW recorded in the present study is higher than that reported by Mustofa et al. (2021), who reported that the Merawang chickens raised had BW2 and BW3 of 693.11 ± 121.72 g and 1149.12 ± 192.29 g, respectively. Irmaya et al. (2021) also reported that Merawang chickens raised without coconut oil supplementation weighed approximately 1071.14 ± 161.78 g at four months of age. The use of coconut oil in feed to improve the growth performance of Merawang chickens in the present study was optimal at 1-2%. The result was confirmed by the smaller initial DOC weight in T1, averaging 31.19 ± 3.00 g/bird. Although T1 recorded the lowest initial DOC weight, T1 achieved the highest final body weight at four months (1617.15 ± 171.89 g). The inverse relationship between hatch weight and final weight suggests a strong compensatory growth response (Zubair and Leeson 1996; Hornick et al., 2000). The rapid subsequent growth observed in T1 indicates that the nutritional or environmental conditions associated with coconut oil treatment effectively optimized feed efficiency and stimulated compensatory metabolic pathways, thereby enabling the chickens to fully express their genetic growth potential. In contrast, higher concentrations (≥ 2%), as observed in group T3, could reduce growth performance. Excess energy intake can disrupt metabolic regulation and impair feed utilization efficiency. Results are confirmed by feed consumption data, which indicated that the groups T1, T2, and T3 consumed approximately the same amount of feed (Table 3). Elewa et al. (2023) further found that a diet supplemented with 1 or 1.5 ml of coconut oil per kilogram of feed significantly increased BW and BWG in broiler chickens compared to the control, likely due to the oil's bioactive compounds (Nelwan et al., 2019). Also reported that coconut oil supplementation at up to 2% increased the final body weight of super native chickens.

The addition of coconut oil to poultry feed can enhance growth through several physiological and nutritional mechanisms. Coconut oil is a source of MCFAs, such as lauric acid, which are easily digested and rapidly metabolized as an energy source, thereby increasing feed utilization efficiency and body weight gain (Bhatnagar et al., 2019). In addition to serving as an energy source, MCFAs also play a role in improving digestive tract health by enhancing intestinal morphology, thereby increasing nutrient absorption (Wang et al., 2015). The lauric acid content in coconut oil has antimicrobial and immunomodulatory properties that help suppress intestinal pathogens and improve livestock metabolic health (Zentek et al., 2013). Improved intestinal health contributes to enhanced feed conversion rate efficiency and increased growth performance. A previous study has also reported that coconut oil, as a source of MCFAs, can improve carcass composition and fatty acid profiles without compromising production performance and, under certain conditions, may enhance growth efficiency when used as a dietary fat source in poultry rations (Alagawany et al., 2018). In addition to increasing body weight, coconut oil can be used as an alternative ingredient to replace antibiotic growth promoters (AGP) in poultry feed (Pramu et al., 2019). Sundu et al., (2020) confirmed that coconut meal acts as a prebiotic feed ingredient for poultry.

Table 2. Growth performance of Merawang chickens fed feed supplemented with coconut oil for four months

Treatment (Mean ± Stdev) / Body weight (g/bird)	T0	T1	T2	T3
DOC	35.83 ± 1.68	31.19 ± 3.00	32.32 ± 3.62	34.28 ± 3.12
BW 1 month	386.26 ± 47.23	306.62 ± 57.07	302.53 ± 62.66	289.10 ± 56.40
BW 2 month	744.74 ± 129.40^{b}	847.10 ± 173.80^{a}	810.40 ± 193.80^{ab}	793.64 ± 152.01^{ab}
BW 3 month	1241.74 ± 111.05^{ab}	1332.66 ± 141.01^{a}	1294.24 ± 113.52^{ab}	1221.76 ± 139.21^{b}
BW 4 month	1344.71 ± 130.63^{b}	1617.15 ± 171.89^{a}	1512.61 ± 166.74^{ab}	1448.02 ± 125.58^{ab}
BWG	1308.88 ± 129.20^{b}	1585.96 ± 174.20^{a}	1480.29 ± 194.10^{a}	1413.74 ± 151.70^{ab}

$^{a,\,b}$ Different superscript letters in the same row indicated significant differences ($p < 0.05$), Stdev: Standard deviation, DOC: Day old chicken, BW: Body weight, BWG: Body weight gain from DOC to four months, T0: Diet without coconut oil, T1: Diet with 1% coconut oil, T2: Diet with 2% coconut oil, T3: Diet with 3% coconut oil

Table 3. Feeding efficiency during the four-month grower phase of Merawang chickens fed feed supplemented with coconut oil for four months

Treatment (Mean ± Stdev) / Parameter	T0	T1	T2	T3
Total feed intake (kg/group)	226.85 ± 1.76	245.23 ± 1.54	239.30 ± 1.45	240.48 ± 1.59
Feed intake in weeks (kg/group)	3.54 ± 0.01^{b}	3.83 ± 0.02^{a}	3.69 ± 0.01^{ab}	3.77 ± 0.03^{ab}
Feed intake in day (g/group)	1962.69 ± 202.70^{b}	2287.13 ± 181.30^{a}	2260.63 ± 184.10^{ab}	2240.46 ± 177.30^{ab}
Total feed intake (g/bird)	3780.97 ± 330.60^{b}	4087.26 ± 395.68^{a}	3988.46 ± 390.22^{ab}	4004.76 ± 389.23^{ab}
Feed intake in week (g/bird)	236.31 ± 17.89	255.45 ± 20.32	246.15 ± 19.13	251.54 ± 21.42
Feed intake in day (g/bird)	33.75 ± 0.22	36.49 ± 0.29	35.16 ± 0.26	35.93 ± 0.30
Feed conversion ratio (FCR)	2.88 ± 0.15	2.75 ± 0.19	2.66 ± 0.23	2.84 ± 0.21
Mortality (%)	3.33	5.00	3.33	5.00

$^{a,\,b}$ Different superscript letters in the same row indicated significant differences ($p < 0.05$), Stdev: Standard deviation, T0: Diet without coconut oil, T1: Diet with 1% coconut oil, T2: Diet with 2% coconut oil, T3: Diet with 3% coconut oil

Feed consumption and conversion

The cumulative feed consumption during the four-month grower phase was significantly affected ($P < 0.05$) by coconut oil supplementation. The highest feed consumption was observed in the T1 group, with an average of 4,087.26 ± 395.68 g/head, while the lowest was in the T0 group (Table 3), and FCR did not differ significantly between groups ($P > 0.05$). The control group had the highest FCR (2.88 ± 0.15), indicating less efficient feed utilization. Conversely, the 2% coconut oil group had the lowest FCR (2.66 ± 0.23), representing the best feed efficiency. The variation in FCR values is highly dependent on genetics, the environment, and other factors (Li et al., 2024). A lower FCR value indicates more efficient feed conversion to weight gain (Jie et al., 2024; Shi et al., 2024). The FCR value of Merawangarab chickens raised on commercial feed had an average value of 3.3-3.8 (Darwati et al., 2022), while Nuraini et al., (2020) reported that the FCR of Merawang chickens fed palm kernel meal had an average value of 1.83 over four months of rearing. Furthermore, the FCR value in broiler chickens is 1.43-2.38 (Khatibjoo et al., 2018; Berger et al., 2021). The FCR value in the current study is relatively similar to those reported for both local and broiler chickens. Coconut oil is a source of energy and contains fat-soluble vitamins A, D, E, and K, as well as provitamin A, which can facilitate metabolism (Effendi et al., 2012). The addition of coconut oil can improve feed palatability, aid digestion, growth, and health in livestock (Mat et al., 2022). In addition, supplementation with Virgin Coconut Oil (VCO) residues positively affects broiler chickens' carcass yield and reduces abdominal fat content (Hasanah and Rugayah, 2022).

Morphometric measurements

Coconut oil supplementation significantly affected the morphometric measurements of Merawang chickens ($P < 0.05$). The affected measurements included beak length and width, head height, chest width and length, upper thigh length, third toe length, pubis width, neck length, upper body length, back length, lower body length, and tibia circumference (Table 4). The morphometric measurement data were consistent with the body weight and body weight gain values shown in Table 2. The results revealed that T1 has almost the same effect as T2 and had significantly higher morphometric measurements ($P < 0.05$) than T0 and T3, especially for chest width, upper thigh length, third toe length, pubis width, back length, and lower body length. Other morphometric traits were generally higher in T2, followed by T3. The beak length of Merawang chickens ranged from 21.70 ± 1.58 mm to 23.41 ± 1.47 mm. Chest width and length ranged from 70.89 ± 3.98 mm to 75.15 ± 5.37 mm and 125.80 ± 11.60 mm to 133.00 ± 8.97 mm, respectively. Femur length varied from 83.35 ± 8.06 mm to 91.93 ± 8.95 mm, while third toe length ranged from 60.48 ± 6.32 mm to 64.67 ± 5.73 mm. Pubis width ranged from 11.89 ± 1.63 mm to 13.54 ± 2.51 mm, and upper body length ranged from 33.15 ± 2.70 cm to 35.01 ± 2.76 cm. Back length ranged from 183.40 ± 18.10 mm to 218.30 ± 19.70 mm, lower body length ranged from 184.20 ± 17.90 mm to 198.50 ± 17.90 mm, and tibia circumference ranged from 12.37 ± 0.99 cm to 13.28 ± 0.86 cm.

Morphometric characteristics can be used as predictors of body size. Irmaya et al. (2021) reported that chest width (CW), chest length (CL), back length (BL), tibia length (TL), and wing length (WL) were the highest eigenvectors in the body size equation of local Indonesian chickens. Chest size is an important indicator of meat development and can be used to assess meat quality, as a substantial proportion of the muscle mass contributing to carcass yield is located in the breast region (Lisnahan et al., 2017). Muscle growth directly affects chest width, chest circumference, and body weight, while bone growth affects overall body length and weight. The average chest width of Merawang chickens in the present study was comparable to that of KUB, Sentul, and Arab chickens, as reported by Depison et al. (2020). After three months of rearing on BR-I feed without coconut oil supplementation, the chest lengths were 121.21 mm, 113.29 mm, and 105.42 mm, respectively.

Table 4. Morphometric measurements of Merawang chickens fed feed supplemented with coconut oil for four months

Parameter \ Treatment (Mean ± Stdev)	T0	T1	T2	T3
Beak length (mm)	22.94 ± 2.87^{ab}	23.41 ± 1.47^{a}	22.05 ± 1.42^{ab}	21.7 ± 1.58^{b}
Beak width (mm)	12.63 ± 1.13^{b}	13.84 ± 0.93^{a}	14.03 ± 1.20^{a}	13.63 ± 1.46^{a}
Head height (mm)	36.09 ± 1.76^{b}	37.49 ± 2.26^{a}	37.46 ± 2.28^{a}	37.4 ± 1.91^{a}
Head length (mm)	64.61 ± 5.44	67.00 ± 4.03	67.03 ± 5.40	64.86 ± 5.88
Chest width (mm)	72.15 ± 6.36^{ab}	75.15 ± 5.37^{a}	74.72 ± 7.63^{a}	70.89 ± 3.98^{b}
Chest length (mm)	125.80 ± 11.60^{b}	132.20 ± 9.00^{a}	133.00 ± 8.97^{a}	131.2 ± 13.20^{ab}
Upper thigh length (mm)	83.35 ± 8.06^{b}	91.93 ± 8.95^{a}	87.73 ± 7.46^{ab}	87.34 ± 6.97^{b}
Tibia length (mm)	143.40 ± 13.60	138.80 ± 13.80	141.70 ± 14.50	144.2 ± 10.10
Shank length (mm)	84.17 ± 7.48	90.19 ± 9.84	94.45 ± 9.48	89.45 ± 8.72
Third toe length (mm)	60.48 ± 6.32^{b}	64.67 ± 5.73^{a}	62.87 ± 6.44^{ab}	63.75 ± 5.19^{ab}
Pubis width (mm)	11.89 ± 1.63^{b}	13.54 ± 2.05^{a}	12.77 ± 1.50^{ab}	13.15 ± 2.51^{a}
Head circumference (cm)	11.75 ± 0.71	12.06 ± 1.26	12.29 ± 0.87	11.9 ± 0.83
Neck circumference (cm)	9.03 ± 0.86	9.41 ± 0.93	9.25 ± 0.95	9.207 ± 0.96
Neck length (mm)	109.10 ± 9.82^{b}	109.00 ± 5.23^{b}	116.00 ± 8.20^{a}	112.2 ± 7.13^{ab}
Upper body length (cm)	35.01 ± 2.76^{a}	33.15 ± 2.70^{b}	34.28 ± 2.95^{ab}	33.78 ± 2.25^{ab}
Back length (mm)	183.40 ± 18.10^{c}	218.30 ± 19.70^{a}	214.30 ± 20.10^{a}	185.2 ± 17.70^{b}
Wing length (mm)	273.60 ± 16.70	267.50 ± 24.30	266.70 ± 22.00	268.5 ± 16.50
Chest circumference (cm)	29.02 ± 2.74	29.62 ± 2.70	29.97 ± 2.66	29.17 ± 2.49
Lower body length (mm)	184.60 ± 17.90^{ab}	198.50 ± 17.90^{a}	197.50 ± 18.40^{a}	184.20 ± 17.6^{ab}
Tibia circumference (cm)	13.28 ± 0.86^{a}	12.68 ± 0.97^{ab}	12.79 ± 1.80^{ab}	12.37 ± 0.99^{ab}
Shank circumference (cm)	4.92 ± 0.45	5.018 ± 0.46	5.05 ± 0.49	4.911 ± 0.38
Body height (cm)	32.10 ± 3.15	30.59 ± 2.46	31.70 ± 3.23	31.81 ± 2.74

[a, b, c] Different superscript letters in the same row indicated significant differences (p < 0.05), Stdev: Standard deviation, T0: Diet without coconut oil, T1: Diet with 1% coconut oil, T2: Diet with 2% coconut oil, T3: Diet with 3% coconut oil

Mortality rate

Coconut oil supplementation did not significantly affect mortality (P > 0.05), which remained low, ranging from 3.33% to 5.00% (Table 3). The overall mortality rate across all groups during the rearing period was 4.16%, indicating effective management practices. Chickens' mortality in the current study generally occurred around one month of age due to the adaptation phase. Most deaths occurred during the early stages, consistent with general expectations. High mortality rates usually indicate poor health or inadequate nutrition (Fitro et al., 2018). The Merawang chickens in the present study were vaccinated with the ND LaSota vaccine at four days of age. Vaccination and medication play an essential role in controlling many poultry diseases and improving chicken health (Bodman-Harris et al., 2024).

Egg production and egg characteristics of Merawang chickens

Coconut oil supplementation significantly affects the production and characteristics of Merawang chicken eggs (P < 0.05). Treatment T1 indicated higher levels of egg production and characteristics compared to other groups (Table 5). In the present study, Merawang chickens started laying eggs at five months of age. Egg production levels were calculated using Hen Day Production, or daily egg production, which is the percentage of egg production in a group of chickens each day. The results indicated that the hen day production of the crossbred chickens was significantly different (P < 0.05), with the highest hen day production being T1. The weight of Merawang chicken eggs in the present study ranged from 36.35 ± 3.44 g (the lowest) to 37.17 ± 3.67 g (the highest). Widayanti et al. (2019) reported the average HDP values of Merawang chickens and their crosses, namely, the lowest (34.92 ± 34.35%) and the highest (80.16 ± 27.74%), with the lowest average egg weight of 39.20 ± 2.81 g and the highest of 48.34 ± 3.86 g. The HDP value in the current study was higher than that reported by Widayanti et al. (2019), but the egg weight was lower. Egg production is generally influenced by adult body weight and feed intake (Akmal et al., 2019). Genetic factors largely determine the quality of local chickens (Sumantri et al., 2020). Crossbreeding programs have produced local chicken strains that exhibit superior performance compared with purebred chickens in terms of egg production, hatchability, egg shape, and body weight (Zelleke et al., 2005; El-Ghar et al., 2010). The egg-laying capacity and genetic quality of local chickens continue to increase through strict breeding and selection programs. Two types of Local chickens are kept: medium and heavy, with a production capacity ranging from 144 to 177 eggs per chicken (Yaman et al., 2008).

Table 5. Production and characteristics of eggs from Merawang chickens fed feed supplemented with coconut oil for four months

Parameter \ Treatment (Mean ± Stdev)	T0	T1	T2	T3
HDP (%)	79.86 ± 4.61[b]	82.10 ± 4.31[a]	81.71 ± 5.23[ab]	80.10 ± 4.89[b]
Egg weight (g)	36.35 ± 3.44[a]	37.17 ± 3.67[a]	36.97 ± 3.65[a]	36.35 ± 3.44[a]
Egg length (mm)	47.04 ± 1.96[b]	47.78 ± 2.08[a]	47.14 ± 2.01[ab]	47.21 ± 2.23[ab]
Egg width (mm)	36.60 ± 1.44[b]	36.85 ± 1.46[b]	37.28±1.37[a]	36.56 ± 1.31[b]
Egg circumference (mm)	11.57 ± 0.43[b]	11.73 ± 0.44 [a]	11.83 ± 0.39[a]	11.58 ± 0.37[b]

[a, b] Different superscript letters in the same row indicated significant differences (p < 0.05), Stdev: Standard deviation, HDP: Hen day production, T0: Diet without coconut oil, T1: Diet with 1% coconut oil, T2: Diet with 2% coconut oil, T3: Diet with 3% coconut oil

CONCLUSION

In conclusion, feed supplementation with 1-2% coconut oil has been shown to increase body weight, weight gain, egg production, and egg characteristics. The effect of coconut oil on body weight is significant from two months of age, and higher supplementation levels can reduce growth and egg production. The limitation of the present study focuses on quantitative characteristics such as body weight, morphometric traits, and physical egg characteristics. Further studies are needed to determine the quality of the eggs and carcasses produced.

DECLARATIONS

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Authors' contributions

Ratna Sholatia Harahap and Depison contributed to the conceptualization of the study and project administration. Ratna Sholatia Harahap was responsible for formal analysis and writing the original draft of the manuscript. Ratna Sholatia Harahap, Sarwo Edy Wibowo, and Winni Liani Daulay handled the investigation and validation of the study data. Ratna Sholatia Harahap, Eko Wiyanto, and Nurhayati took charge of resources and visualization. Depison, Gushairiyanto, and Nurhayati provided supervision and methodology support. Finally, Ratna Sholatia Harahap and Depison were involved in data curation and funding acquisition. All authors read and approved the final edition of the manuscript for publication.

Competing interests

The authors declare no conflicts of interest.

Ethical considerations

The authors confirm that this manuscript is original and is not under consideration for publication elsewhere. All authors have reviewed ethical issues, including consent for publication, misconduct, data fabrication, and redundancy. The authors used Grammarly solely to improve the language quality of the article.

Availability of data

The data supporting this study's findings are available upon request from the corresponding author.

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