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(RESEARCH ARTICLE)

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The effect of using Lemuru fish oil (*Sardinella lemuru*) in the ration on the percentage of commercial carcass pieces of Joper chickens

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Abstract

The use of lemuru fish oil as animal feed is one effort to use agro-industrial waste as animal feed.This study aims to determine the effect of the use of lemuru fish oil in rations on the percentage of commercial carcass cuts of joper native chickens. The design used was a Completely Randomized Design (CRD) with 4 treatments and 5 replications, so there were 20 experimental units. The four treatments were: P0 (ration without lemuru fish oil, control) P1 (Ration added with 2% lemuru fish oil), P2 (Ration added with 4% lemuru fish oil), P3 (Ration added with 6% lemuru fish oil). The variables observed included slaughter weight, carcass weight, carcass percentage, breast percentage, thigh percentage, wing percentage, and back percentage. The results showed that the use of lemuru fish oil in joper chicken rations in treatments P1, P2 and P3 resulted in significantly higher slaughter weight, carcass weight and thigh percentage ($P<0.05$) than P0 (control). The percentage of carcass, breast, wing and back in treatments P1, P2 and P3 was not significantly different ($P>0.05$) compared to P0. It can be concluded that the use of lemuru fish oil in Joper chicken conventional rations can increase slaughter weight, carcass weight, and thigh percentage, but does not affect the carcass, breast, wing and back percentage with the best results at 2% use.

Keywords: Conventional Ration; *Sardinella Lemuru* Fish Oil; Commercial Part; Joper Chicken

1. Introduction

In an effort to increase the production and quality of Joper native chicken meat, various efforts have been made, one of which is improving the quality of the rations given to the chickens. A quality ration can affect the growth, health, and quality of the chicken carcass, which in turn will impact the resulting carcass cuts. One ration ingredient with quality that can be used as an alternative feed is lemuru fish oil. The purpose of this study was to determine the effect of using lemuru fish oil (*Sardinella lemuru*) in the ration on the percentage of commercial carcass cuts in Joper native chickens.

Super Javanese chicken (abbreviated as Joper chicken) is a cross between a native rooster (a local Indonesian chicken) and a laying hen. Joper chickens have several advantages over regular native chickens, including faster growth and higher meat production, while retaining the distinctive flavor and texture of native chicken. Joper chickens can be harvested at 45-60 days old, with a body weight of 1.1-1.5 kg within 2 months, while regular native chickens reach 120 days. According to [1], the Director General of Livestock Production Development currently supplies native chicken meat to 5.5% of the total national chicken meat requirement, and in the next ten years, it is expected that the supply of native chicken will reach 25% of the total national chicken meat requirement. Feed requirements are approximately 2.4 kg for 1 kg of live weight, while regular native chickens require 3.4 kg of feed for every 1 kg of live weight [2].

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The results of [3] research found that the use of 3% palm oil, 3% fish oil, 3% pork oil can significantly increase duck weight and weight gain compared to rations without oil. In the study of [4] also obtained results that concluded the effect of the use of 3% pork oil on commercial carcasses of joper chickens resulted in higher slaughter weights and carcass weights than other treatments. In the study of [5] concluded that the higher slaughter weight and carcass weight affect the percentage of carcasses and vice versa with small slaughter weights and carcass weights affect the percentage of carcasses. Based on this information, this study needs to be carried out to determine the effect of providing lemuru fish oil in rations on commercial carcass cuts of joper chickens.

Lemuru oil, extracted from the lemuru fish (*Sardinella lemuru*), boasts a variety of beneficial nutritional properties. Lemuru oil is rich in omega-3 and omega-6 fatty acids, particularly Eicosapentaenoic Acid (EPA) and Docosahexaenoic Acid (DHA). As an energy source, fish oil is a high-energy feed ingredient [6], alongside corn in chicken rations. The metabolizable energy content of fish oil is 7,000-7,500 kcal/kg [7] In addition to helping meet high energy requirements, oil in poultry rations also increases appetite and reduces dustiness in "all-mash" rations.

The use of lemuru fish oil as livestock feed is one way to utilize agro-industrial waste as animal feed. The omega-3 and omega-6 content of lemuru fish oil is expected to improve the growth of Joper chickens and improve commercial carcass cuts. As ration consumption increases, it is hoped that the growth of Joper chickens will be better so that it will affect the carcass and commercial carcass cuts and the use of waste in good feed can provide feed efficiency and cost income above feed costs known as Income Over Feed Cost [8].

2. Material and methods

This research was conducted for eight weeks at Sesetan Farm, Faculty of Animal Husbandry, Udayana University, using 80-day-old Joper chickens (DOC) without sex differentiation. The chickens were purchased from PT. Sumber Unggas Hatchery, Bali Branch. Lemuru fish oil was obtained from a fish cannery located in the Pengambengan area of Jembrana. Regency, Bali Province. The ration used was a conventional ration mixed with yellow corn, rice bran, fish meal, lemuru fish oil, bread waste, mineral mix, and table salt. Drinking water was sourced from a drilled well and provided ad libitum. The nutrient content of the ration can be seen in Table 1 and Table 2.

Tabel 1 Ration ingredient conventional composition

Conventional Composition (%)	**Treatment**			
	P0	**P1**	**P2**	**P3**
Yellow corn	47.30	41.60	36.00	28.00
Rice bran	10.70	15.20	20.80	27.30
Fish meal	22.40	22.50	22.20	22.00
Sardinella lemuru fish oil	0.00	2.00	4.00	6.00
Bread waste	18.90	18.00	16.30	16.00
Mineral mix	0.45	0.45	0.45	0.45
Table salt	0.25	0.25	0.25	0.25
Total	100	100	100	100

Note: Treatment:
P0: Ration without lemuru fish oil (control)
P1: Ration supplemented with 2% lemuru fish oil
P2: Ration supplemented with 4% lemuru fish oil
P3: Ration supplemented with 6% lemuru fish oil

Tabel 2 Nutrient content in rations

Nutrient	Treatments				Standard
	P0	P1	P2	P3	
ME (KCal/Kg)	2903	2920	2922	2911	2900
CP (%)	18.01	18.10	18.10	18.07	18-19
Fat (%)	5.72	6.08	6.54	7.05	4-5
Fiber (%)	2.79	3.21	3.73	4.34	4-5
Ca (%)	0.64	0.65	0.64	0.64	0.90
P (%)	0.48	0.49	0.49	0.49	0.40

Note: Standard nutritional requirements for Joper chickens aged 0-8 weeks (SNI. 2013)

2.1. Experimental design and randomization

The design used was a Completely Randomized Design (CRD) consisting of four treatments and five replications. Each replication consisted of four Joper chickens. Observed variables included: slaughter weight. carcass weight. carcass percentage. and carcass cut percentage (breast. thigh. wing. and back). This research uses four types of treatments and five repetitions so that there were 20 experimental units. Each experimental unit used 4 joper chickens (Day Old Chicks). with homogeneous body weight. So the number of joper chickens to be used was 80. The four treatments were P0 (ration without lemuru fish oil (control). P1 (ration plus 2% lemuru fish oil). P2 (ration plus 4% lemuru fish oil) P3 (ration plus 6% lemuru fish oil). Chicken randomization was carried out by weighing 100 chickens to determine the average weight and standard deviation. The DOCs used in this study were chickens with an average body weight of 42.06 ± 2.103 g.

2.2. Observed Variables

Carcass weight (g/head) is obtained by subtracting the slaughter weight from the weight of blood. feathers. head. feet and internal organs. Measuring carcass weight and commercial carcass cuts using a digital scale. The method for calculating carcass weight and commercial carcass cuts is as follows:

2.2.1. Chicken Chest Percentage

The chest percentage is obtained by weighing the chest weight. then calculated using the formula:

$$\text{Chest Percentage (\%)} = \frac{\text{ChestWeight (g)}}{Carcass\ weight\ (g)} \times 100\%$$

2.2.2. Chicken Wing Percentage

The wing percentage is obtained by calculating the wing weight. then calculated using the formula:

$$Wing\ Percentage\ (\%) = \frac{Wing\ Weight\ (g)}{Carcass\ weight\ (g)} \times 100\%$$

2.2.3. Chicken Thigh percentage

The lower thigh percentage is obtained by weighing the lower thigh. then calculated using the formula:

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

2.3. Chicken backs Percentage

The back percentage is obtained by weighing the back weight. then calculated using the formula:

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

2.4. Data analysis

The data from this study were analyzed using analysis of variance/ANOVA and if there was a significant difference between the treatments (P<0.05). then the analysis was continued using Duncan's multiple range test.

3. Results and discussion

Research data and the result on the effect of using lemuru fish oil (*Sardinella lemuru*) in rations as much as 0% (P0). 2% (P1). 4% (P2). and 6% (P3) on carcass weight and percentage of commercial carcass cuts (breast. thigh. wings and back) of Joper chickens can be seen in Table 3.

The average carcass weight of Joper chickens in the P0 (control) treatment was 231.20g Carcass weight in treatment P1 was not significantly (P>0.05) higher than P0 by 7.87% and P2 was significantly (P<0.05) higher than P0 by 17.21% while P3 was not significantly (P>0.05) lower than P0 by 4.33%. Furthermore. P2 was not significantly (P>0.05) higher than P1 by 8.66% and P3 was not significantly (P>0.05) lower than P1 by 11.31%. Treatment P3 compared to P2 was lower by 18.38% and statistically significantly different (P<0.05). This result reflects that the provision of lemuru fish oil at a level of 4% is most effective in increasing carcass weight due to the availability of energy from lemuru fish oil which can cause more protein to be utilized for body tissue synthesis. which has implications for increasing carcass weight. [9] emphasized that fat supplementation can improve the efficiency of energy use in broilers. while [4] stated that variations in the type of oil in poultry rations can affect carcass weight. According to research by [1]). fish oil can increase the absorption of vitamins A. D. E. and K. distribute essential fatty acids throughout the body. and increase the efficiency of feed use. thus significantly affecting carcass weight.

Table 3 The effect of using lumuru fish oil on commercial cuts of Joper chicken carcasses

Variable	Treatments[1]				SEM[2]
	P0	P1	P2	P3	
Carcass weight (g/chicken)	231.20b	249.40ab	271.00a	221.20b	9.79
Chest Percentage (%/chicken)	22.97a	22.57a	21.24a	21.87a	1.11
Thigh Percentage (%/chicken)	32.60b	34.97a	32.49b	33.48ab	0.63
Wing Percentage (%/chicken)	17.47a	15.90a	18.32a	19.75a	1.48
Back Percentage (%/chicken)	26.96a	26.56a	27.95a	24.90a	1.40

Notes: [1] Treatments were: P0= Joper give not mixture of lemuru fish oil;
P1= Joper given 2% mixture of lemuru fish oil;
P2= Joper given 4% mixture of lemuru fish oil;
P3 Joper given 6% mixture of lemuru fish oil; [2]
SEM= Standard Error of the Treatment Means; Values with the same letter in the same row indicate no significant difference (P>0.05).

The average percentage of Joper chicken breast in treatment P0 (control) was 22.97%. while in treatments P1. P2 and P3 it was not significantly (P>0.05) lower than P0. respectively. at 1.74%; 7.53% and 4.79%. In the commercial cut variable. the percentage of breast did not show a significant difference (P>0.05) between treatments. indicating that fish oil did not have a strong enough effect on the development of chest muscles. [11] stated that breast cut is more influenced by genetic and racial factors than by variations in limited energy nutrition.

The average thigh percentage of Joper chickens in the P0 (control) treatment was 32.60%. The thigh percentage in the P1 treatment was significantly (P<0.05) higher than P0 by 7.27%; while P2 and P3 were not significantly (P>0.05) lower than P0 by 0.34% and 2.70%. respectively. Furthermore. the thigh percentage in the P2 treatment was significantly (P<0.05) lower than P1 by 7.09%. and P3 was not significantly (P>0.05) lower than P1 by 4.26%. The thigh percentage in the P3 treatment was not significantly (P>0.05) higher than P2 by 2.96%. This increase in the thigh area indicates that fish oil. at optimal levels. can support posterior muscle growth in Joper chickens. This is consistent with [12] and [13]. who reported that fish oil supplementation can affect the proportions of certain carcass cuts. These results indicate that adding fish oil at a 2% level can increase the proportion of thighs. a highly economically valuable part. This increase may be attributed to the energy utilization of fish oil. which supports thigh muscle tissue growth.

The average percentage of Joper chicken wings in treatment P0 (control) was 17.47%. The percentage of Joper chicken wings in treatment P1 was lower than P0 by 8.99%. while treatments P2 and P3 were higher than P0 (control). by 4.87%

and 13.05%. respectively. but statistically the difference was not significant (P>0.05). Chicken wing cuts are dominated by bone tissue and have limited potential in meat production so that mineral content such as calcium and phosphorus has a greater influence on the percentage of wings [14]. The lack of meat in the wings is caused by the rapid growth of feathers in native chickens. Moran and Orr [15] stated that most of the protein is used for feather growth in chickens during the growth period. so that the high growth rate will reduce the percentage of wings.

The average percentage of backs of Joper chickens in the control treatment (P0) was 26.96%. The percentage of backs in Treatments P1 and P3 was not significantly (P>0.05) lower than P0 at 1.48% and 7.64%. respectively. while in treatment P2 it was not significantly (P>0.05) higher than the control at 3.67%. The percentage of backbone in Joper chickens fed lemuru fish oil in the ration tended to be lower than in P0. except for P2. This is because the cells making up the backbone are predominantly bone. which grows as the animal grows [16]. This opinion is supported by Putra [17]. who stated that during the growth process. the backbone is predominantly bone with only a small amount of muscle (meat). The high percentage of backbone in the P2 treatment reflects poor carcass quality in that treatment due to the bone predominance.

4. Conclusion

From the research results. it can be concluded that the use of lemuru fish oil in the ration can increase the slaughter weight. carcass weight and percentage of commercial carcass cuts in the thigh section. but does not affect the percentage of carcass and commercial carcass cuts in the chest. wings and back sections with the best results at 2% use.

Compliance with ethical standards

Disclosure of conflict of interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

Statement of ethical approval

Based on the research results. it is recommended for breeders to use 2% fish oil in the ration formulation for Joper chickens aged 0-8 weeks in search of efficient commercial cuts and the use of 4% fish oil if looking for more optimal slaughter and carcass weights and the need for further research on other types of livestock.

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