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The Effect of Feeding with Different Energy and Protein Content on the Carcass and Body Fat Composition of Joper Chicken in Tropical Lowland Regions

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Abstract---*The research aims to determine the carcass and body fat composition of Joper chickens fed chicken feed with different energy and protein content in tropical lowland areas. The experiment used a Completely Randomized Design (CRD) with four treatments and six replications, each experimental unit consisting of 5 Joper chickens. The treatments in this experiment were: Joper chickens which were fed with a metabolizable energy (ME) content of 2700 kcal/kg and crude protein (CP) 14% (A), ME 2800 kcal/kg and CP 15% (B), ME 2900 kcal /kg and CP16% (C), ME 3000 kcal/kg and CP 17% (D). The results of the research showed that the slaughter weight and carcass weight of Joper chickens treated with feed C were the highest, not significantly different (P>0.05) from those treated with feed D, but those treated with feed B and A were significantly (P<0.05) lower than feed C. Commercial carcass cuts and carcass physical composition were not significantly different (P>0.05) between treatments A, B, C, and D. Fad fat and gizzard fat, mesenteric fat, and abdominal fat were lowest in feed treatment A. Feed treatments B, C, and D were significantly higher (P<0.05) than feed treatment A. It can be concluded that Joper chickens were fed with an energy content of 2900 kcal/kg crude protein 16% (C), ME 3000 kcal/kg and crude protein 17% (D) higher than fed with an energy content of 2700 kcal/kg and crude protein (CP) 14% (A), energy 2800 kcal/kg and crude protein 15% (B). Feed treatment A produced the lowest body fat composition, which was significantly different (P<0.05) compared to treatments B, C, and D.*
Keywords---*body fat composition, carcass, feed energy, feed protein, fermented, Joper chicken.*

Introduction

Improving the genetic quality of native chickens has been carried out by cross-breeding female laying hens with male native (Bangkok) chickens. The result of this cross-breeding is called Joper chicken. Technological advances have made it possible to cross, select, breed, and create several native chickens. Currently, several superior native chicken strains are known, one of which is the Jowo Super (Joper) chicken. Joper chickens can be produced in large quantities with uniform weight, faster growth rate than native chickens, and have the same meat taste as native chickens.

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High carcass production in Joper chickens can be achieved by providing feed according to nutrient requirements, especially energy and protein (Nuriyasa et al., 2014). Energy and protein requirements are related to the microclimatic conditions of tropical lowland areas. Air temperature and humidity, and the cage discomfort index, are environmental factor variables that influence Joper chicken carcass production. Nuriyasa et al. (2016) stated that the level of stress affects feed consumption, energy and protein use, and carcass production. In tropical lowland areas, animals experience heat stress more often. Animals experiencing heat stress will use more metabolic energy for maintenance than animals in a comfortable condition, so that under stress conditions, animal productivity is lower.

Kaleka (2015), stated that the metabolic energy requirements for Joper chickens aged 0-8 weeks are 2900 Kcal/kg and crude protein 18%. The Indonesian National Standard (2016) states that the need for metabolized energy is 2900 kcal/kg and crude protein is 19%. Setiawan (2018), stated that Joper chickens aged 4 to 12 weeks require metabolized energy of 2800 kcal/kg and crude protein of 17.5%. Nutrient requirement standards are created in comfortable environmental conditions. Heat stress conditions in tropical lowland areas will have an impact on higher energy and protein requirements for maintenance. Heat stress conditions in Joper chickens can reduce feed consumption and increase drinking water consumption. Decreased feed consumption causes energy and protein consumption to decrease, resulting in low body weight gain and low carcass production. It is necessary to provide feed to Joper chickens with appropriate energy and crude protein content so that carcass production is high (Van Raamsdonk et al., 2007).

Materials and Methods

The experiment used a Completely Randomized Design (CRD) with four treatments and six replications, each experimental unit consisting of 5 Joper chickens. The treatments used in this research were: Joper chickens which were fed with a metabolized energy content of 2700 kcal/kg and 14% crude protein (A), metabolized energy content of 2800 kcal/kg and 15% crude protein (B), metabolized energy content of 2900 kcal/kg and crude protein 16% (C), metabolized energy content 3000 kcal/kg and crude protein 17% (D). The experiment used feed ingredients such as: yellow corn, Rice Bran, fish meal, coconut oil, mineral mix, and NaCl. Composition of feed ingredients and nutrient content (Table 1 and Table 2).

Table 1
Composition of Treatment Feed Ingredients

Feed ingredients (%)	Treatment			
	A	B	C	D
Yellow Corn	45	45.4	45	46
Rice Bran	30.6	27.9	26.8	22.1
Fish meal	11.7	14	16	18.7
Coconut oil	1	2.7	4.4	5.5
Tapioca flour	11	9.3	7.1	7
Mineral Mix	0.45	0.45	0.45	0.45
NaCl	0.25	0.25	0.25	0.25
Total	100	100	100	100

Table 2
Nutrient Content of Treatment Feed

Feed Nutrients	Treatment			
	A	B	C	D
Metabolic Energy (Kcal/kg)	2705,75	2802.47	2903.92	3003.88[1)]
Crude Protein (%)	14.07	15.09	16.01	17.02[1)]
Fat (%)	7.05	6.992	9.25	6.63[2)]
Crude Fiber (%)	4.89	4.56	4.06	3.89[1)]
Ca (%)	0.42	0.47	1.07	0.55[2)]
P (%)	0.33	0.38	0.6	0.43[2)]

1): Proximate analysis at the Animal Nutrition Laboratory, Faculty of Animal Husbandry, Udayana University
2): Calculations based on SNI (2016)

Slaughter weight is the weight of the Joper chicken before it is slaughtered. Carcass weight is the result of weighing the chicken after slaughtering and removing feathers, internal organs, and separating the head, neck, and legs. Carcass percentage is a comparison of carcass weight with live weight multiplied by 100%. The physical composition of the carcass is obtained by separating the bones, meat, and subcutaneous fat, including the skin from the carcass. Pad fat is obtained from weighing the fat under the skin around the stomach. Visceral fat is obtained from weighing the fat around the gizzard and the layer of fat that attaches between the abdominal muscles and the intestines (Campbell-Platt, 1994).

Result and Discussion

The slaughter weight of Joper chickens fed feed with a metabolizable energy content of 2700 kcal/kg and 14% crude protein (A) was the lowest (640.06 g), while the feed treatment with a metabolizable energy content of 2800 kcal/kg and 15% crude protein (B) resulted in 5.32% higher slaughter weight (P>0.05). Feed treatment with a metabolizable energy content of 2900 kcal/kg and 16% crude protein (C) and feed treatment with a metabolizable energy content of 3000 kcal/kg and 17% crude protein (D) produced slaughter weights of 29.03% and 26.42% significantly higher, respectively higher (P<0.05) compared to treatment A (Table 3). Feed treatment A produced a carcass weight of 382.72 g; treatment B produced a carcass weight 3.08% higher but not significantly different (P>0.05). The carcass weight of Joper chickens that received feed treatments C and D produced carcass weights respectively 25.41% and 23.60% higher (P<0.05) compared to treatment A. Feed treatments A, B, C, and D produced higher percentages of carcass 59.79% each, 58.51%, 58.08%, and 58.46% which were not statistically significantly different (P>0.05).

Table 3
The Effect of Feed with Different Energy and Protein Content on Joper Chicken Carcasses

Variable	Treatment				SEM
	A	B	C	D	
Slaughter Weight (g)	640.06[a]	674.15[a]	826.43[b]	809.18[b]	25.43
Carcass Weight (g)	382.72[a]	394.49[a]	479.96[b]	473.05[b]	15.23
Carcass Percentage (%)	59.79[a]	58.51[a]	58.08[a]	58.46[a]	2.03
Carcass Commercial					
Chest (%)	27.21[a]	25.85[a]	26.28[a]	26.67[a]	1.87
Thigh (%)	31.30[a]	32.46[a]	32.52[a]	3.,62[a]	1.43
Wing (%)	19.01[a]	19.22[a]	19.89[a]	19.15[a]	1.04
Waist (%)	22.48[a]	22.47[a]	21.31[a]	22.56[a]	1.57
Carcass Physical Composition					
Bone (%)	37.38[a]	35.93[a]	35.39[a]	35.47[a]	1.87
Fat (%)	15.41[a]	16.41[a]	16.53[a]	17.02[a]	1.09
Meat (%)	47.21[a]	47.66[a]	48.08[a]	47.51[a]	2.06

1) A: Joper chickens that are fed with a metabolizable energy content of 2700 kcal/kg and crude protein 14%, B: metabolizable energy content 2800 kcal/kg and crude protein 15% C: metabolisable energy content 2900 kcal/kg and crude protein 16%, D: content metabolized energy 3000 kcal/kg and crude protein 17%
2) The same superscript on the same line indicates that the difference is not significant (P>0.05), and different superscripts on the same row indicate significant differences (P<0.05)
3) *SEM: Standard Error of The Treatment Means*

Joper chickens that received feed treatment A and B produced a lower carcass weight compared to feed treatment C and D. Joper chickens that received feed treatment A and B consumed less feed, so energy and protein consumption were lower than Joper chickens given feed C and D. Energy and protein are the main components of body tissue. Joper chickens that were given treatment A and B consumed less energy and protein than Joper chickens that received treatment C and D, which resulted in lower growth in Joper chickens treated A and B, so that the slaughter weight and carcass weight produced by Joper chickens were lower than feed treatments C and D. The percentage of Joper chicken carcasses that received feed treatments A, B, C and D showed no significant difference. This condition is caused by a higher carcass weight in feed treatments C and D compared to feed treatments A and B, resulting from a higher slaughter weight in treatments C and D. This opinion is by the opinion of Nuriyasa et al

(2023). The results of the research showed that the carcass percentage ranged from 58.08% to 59.79%. Siswantoro et al. (2023), stated that the ideal carcass percentage is around 58-67% of live weight.

Feed treatments with different energy and protein contents did not have a significant effect on carcass commerciality. The research results showed that the percentages of chest, thighs, wings and back were 26.50%, 31.98%, % and 22.21% respectively. The commercial carcass yields were not significantly different, indicating that differences in feed consumption did not cause differences in nutrient distribution in the bodies of Joper chickens (Amerah et al., 2007).

The physical composition of the carcass, which includes the percentage of meat, bone, and fat of male Joper chickens, does not differ between treatments A, B, C, and D. This is due to the higher physical composition of the carcass (meat, bone, and skin) resulting from the weight of the carcass. higher. This causes the percentage of physical composition of the carcass produced to be no different between treatments. This opinion is by what was reported by Yadnya et al. (2016), that the physical percentage of the carcass is not significantly different because the physical composition of the carcass increases in direct proportion to the increase in carcass weight.

The pad fat of Joper chickens that received feed treatment A was 5.68 grams, while feed treatments B, C, and D produced pad fat 65.85%, 92.08%, and 91.37% higher, which is statistically significantly different (P<0.05), as in Table 4.

Table 4
Effect of Feed with Different Energy and Protein Content on Body Fat Composition of Joper Chickens

Variable	Treatment				SEM
	A	B	C	D	
Pad Fat Weight (g)	5.68 [b]	9.42 [a]	10.91[a]	10.87[a]	0.12
Weight of gizzard fat (g)	1.16 [b]	1.34 [a]	1.82 [a]	1.83 [a]	0.06
Mesenteric Fat Weight (g)	1.74 [b]	2.42 [a]	2.81 [a]	2.89 [a]	0.07
Abdominal Fat Weight (g)	8.55 [c]	13.18 [b]	15.54 [a]	15.59 [a]	0.21

1) A: Joper chickens that are fed with a metabolizable energy content of 2700 kcal/kg and crude protein 14%, B: metabolizable energy content 2800 kcal/kg and crude protein 15% C: metabolisable energy content 2900 kcal/kg and crude protein 16%, D: content metabolized energy 3000 kcal/kg and crude protein 17%
2) The same superscript on the same line indicates that the difference is not significant (P>0.05), and different superscripts on the same row indicate significant differences (P<0.05)
3) *SEM: Standard Error of The Treatment Means*

The lowest weight of gizzard fat was produced by Joper chickens that received feed treatment A, namely 1.16 grams. Feed treatments B, C, and D produced a gizzard weight of 15.52%, 56.89%, and 57.76% higher (P<0.05) compared to feed treatment A. Feed treatment A produced a mesenteric fat weight of 1.74 grams, while feed treatments B, C, and D were 28.74%, 62.57%, and 66.09% higher (P<0.05) than treatment A. Abdominal fat in treatment A was 8.55 grams, while in treatments B, C, and D each it was 54.15%, 81.75% and 82.34% higher than treatment A.

The abdominal fat component is a combination of pad fat, gizzard fat, and mesenteric fat. Body fat components can be used as a reference for predicting fat components in carcasses. The higher the body fat component, the higher the carcass fat. Nuriyasa et al. (2018), stated that livestock consume energy to meet basic life energy needs, and excess energy consumption from basic life needs will be used for growth. Putra et al. (2020) stated that the formation of abdominal fat occurs due to excess energy consumed. In general, the energy produced comes from the breakdown of carbohydrates in feed. Treatments B, C, and D have a higher body fat component than treatment A. This is because the feed in treatments B, C, and D is more palatable, so feed consumption is higher compared to feed in treatment A. Higher consumption means a greater chance of storage. excess energy in the form of body fat.

Conclusion

It can be concluded that Joper chicken carcasses that received feed treatment with a metabolic energy content of 3000 kcal/kg, 17% crude protein, and 2900 kcal/kg metabolic energy, 16% crude protein produced carcasses and body fat components that were higher than the metabolic energy content of 2800 kcal. /kg, 15% crude protein and 15% energy. metabolized 2700 kcal/kg, crude protein 14%.

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