

## Effect of Different Lysine and Energy Levels in Diets on Carcass Percentage of Three Strains of Broiler Duck

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### ABSTRACT

Sufficient nutrients such as lysine and energy in the ration is very important to promote growth and maximum performance of ducks. The purpose of this study was to evaluate the effectiveness of two types of feed formula with different lysine and energy level on carcass percentage of broiler ducks. A total of 240 day-old ducks reared for twelve weeks and were allocated into 6 treatments with 4 replications and each replication consisted of 10 ducks. The study was designed with completely randomized design (CRD) 3×2 factorial. The first factor was strain (Pekin, PMP and EPMp) of ducks and the second factor was type of feed formula (ration A and ration B). Variables measured were percentage of final body weight, carcass weight, carcass parts and percentages of the internal organs weights. The results showed that breed but not type of feed formulas significantly affected final body weight and length of colon, ( $P<0.05$ ). The percentage of weight of carcass, breast, thighs, back, wings, legs, heart, gizzard, abdominal fat, liver and intestines were not significantly ( $P>0.05$ ) affected by both type of feed formula nor breed.

**Key Words:** Feed Formula, Broiler Duck, Carcass, Lysine, Energy, Strain

### INTRODUCTION

The duck has a great potential to meet the growing demand for high quality protein in human diets. In order to meet their potential, more research is needed to establish their dietary requirements (Adeola 2006). Information on nutritional requirement of the broiler local-ducks have been obtained through the research at Indonesian Research Institute for Animal Production (IRIAP), but the numbers are still relatively small. Study on the nutritional requirement of broiler local-ducks generally refers to the nutritional requirement of Pekin duck as recommended by the NRC (1994) and Chen (1996). Small number of information on the nutritional needs of local broiler-ducks has not only happened in Indonesia but also abroad as reported by several authors (Adeola 2006; Liu & Niu 2008; Cho et al. 2014)

The nutritional requirement of protein and energy for Pekin duck from 0-2 weeks of age was 22% and 2900 kcal/kg, respectively, while at the age of 2-7 weeks was 16% and 3000 kcal/kg respectively (NRC 1994). Nutrient content of protein and energy in the diet is very important role to promote growth and maximum production in ducks. Protein and energy needs in poultry are set based on the age, type and size of the animal's body. Lysine is one of the essential amino acids. Its role is very important to support the growth of livestock. Lysine requirement of Pekin duck at the age of 0-2 weeks was 0.90%, and at the age of 2-7 weeks was 0.65% (NRC 1994). In accordance with some previous studies, Ketaren et al. (2011) recommended that the requirement of energy and lysine for maximum body weight gain and minimum feed conversion ratio of EPMp broiler ducks (a crossing of Muscovy male with white Mojosari female duck) for starter periods was 2900 kcal/kg and 1.15%, respectively, and in the finisher periods was 2700 kcal ME/kg and 0.80%, respectively. However, lysine and energy for the most optimum level for local broiler ducks still need to be evaluated to produce maximum carcass weight.

Ducks will consume an amount of energy required for the maintenance included for basal metabolism, body temperature regulation, routine activities, and normal growth (Adeola 2006). The combination of lysine and energy in the ration correlated positively with growth of ducks (Adeola 2006). Furthermore, efficient growth requires, in addition to the adequacy, balance of essential amino acids, vitamins and minerals (Adeola 2006).

Since 2007 IRIAP at Ciawi has crossed male Pekin duck with female white Mojosari duck (local duck). The crossbred was named PMp duck. Furthermore, PMp female ducks was mated with male Muscovy and the derivative was called EPMp duck. EPMp ducks was broiler type of duck. PMp duck was a dual purpose duck as for meat production and eggs production. The EPMp ducks has a rapid growth, large body size and thick muscle or flesh, with plumage color vary (mixed white and black), high carcass weight with clean and white skin (Purba & Prasetyo 2014). Pekin duck was imported broiler ducks, which has been long maintained in various regions in Indonesia. Pekin ducks has also been undergone natural selection in adapted to climatic conditions in Indonesia. Indonesian Pekin duck grew very rapid with large body size and high quality of carcass. Pingel (2011) reported that the average final body weight of Pekin ducks at the age of 7 weeks was 3287 g and the percentage of breast meat weight was 13%. Xie et al. (2014) reported that the average body weight of Pekin duck at the age of 42 days could reach 3.4 kg with the average carcass weight of 76.2%. The purpose of this study was to evaluate the effectiveness of both types of formulated ration with different lysine and energy level on the percentage of broiler carcass PMP, EPMp and Pekin ducks at the age of 12 weeks.

## MATERIAL AND METHODS

The material used in the study were Pekin, PMP and EPMp ducks. The study was designed as completely randomized (CRD) of 3×2 factorial. The first factor was breed of duck (3 strains) and the second factor was type of formulated diet (2 types). The rations were: (1) formulated based on the recommendations of NRC (1994) namely ration-A; and (2) formulated based on Ketaren et al. (2011) namely ration-B. Dietary treatments of this study are presented in Table 1.

Each ration treatment was replicated by four, consisted of 10 ducklings. Total number of the ducks used in the experiments were 240 ducklings. Ducks were raised from starter up to finisher periods. Feed was given twice a day and drinking water was given *ad libitum*. At 12 weeks, the ducks were weighed to determine the final body weight, then slaughtered in the traditional way by cutting the carotid artery and jugular vein until all the blood drained out. The carcass was then dipped into a bucket filled with 60-70°C water for 40-50 seconds and then immersed in cold water before cutting for parts.

The parameters observed and measured were the final body weight, carcass weight, carcass parts and organs. Data were analyzed with procedures General Linear Model (GLM) with the assistance of the Statistical Analysis System program (SAS ver. 6:12, 1997).

**Table 1.** Composition and nutritional value of dietary treatments for the growing period of duck

Ingredients	Ration-A (starter)	Ration-B (starter)	Ration-A (finisher)	Ration-B (finisher)
	kg	kg	kg	kg
Rice bran	18.39	22.20	29.90	35.52
Corn	37.00	43.80	43.03	47.11
Soybean meal	29.00	22.00	13.50	14.10
Fish meal	6.70	3.00	4.00	2.00
Meat and bone meal	2.00	2.00	2.00	2.00
Methionine	0.18	0.15	0.14	0.17
Lysine	0.00	0.57	0.10	0.32
Premix	0.20	0.25	0.20	0.25
Crude palm oil (CPO)	5.00	4.50	5.60	0.00
Dicalcium phosphate (DCP)	0.74	0.74	0.74	0.74
Lime	0.59	0.59	0.59	0.59
Salt	0.20	0.20	0.20	0.20
Total:	100.00	100.00	100.00	100.00
Nutrient content (result of calculations)				
Crude protein (%)	22.00	19.00	16.00	16.32
Lysine (%)	0.90	1.15	0.65	0.80
Energy (kcal ME/kg)	2913.00	2917.00	3000.00	2705.00
Crude fiber (%)	3.93	4.32	5.17	5.55
Calcium (%)	1.33	1.04	1.11	0.98
Fosfor (%)	0.80	0.72	0.77	0.75

## RESULTS AND DISCUSSION

### Final body weight

There was no significant interaction between strain and diet on final body weight of the three strains of duck on two types dietary treatments (Table 2). The average final body weight of Pekin duck was significantly the highest compared to EPMp and PMp ducks ( $P < 0.05$ ). The average final body weight of Pekin duck was 3423.50 g/head, the PMp and EPMp ducks was 2159.50 and 2438 g/head respectively. Based on statistical analysis both types of diet treatment did not significantly ( $P > 0.05$ ) affect, but strain significantly ( $P < 0.05$ ) affected the final body weight.

The average final body weight of Pekin ducks were higher when compared with EPMp and PMp ducks as it was expected due to the genetic factors. Pekin ducks have genetically quite fast growth, larger body size than the other two types of ducks. The rapid growth in Pekin ducks have also been reported by other authors (Adeola 2006; Pingel 2011). It was reported that the genetic trait possessed by Pekin duck was inseparable from the selection process that has been done intensively for many years. In line with Adeola (2006) and Pingel (2011), other researchers also stated that genetic factors and nutrient content of the feed influenced the performance and carcass quality of Pekin duck (Xie et al. 2014; Dozier et al. 2008 )

**Table 2.** The average final body weight of three strains of duck with ration treatment on 12 weeks old (g/head)

Strain	Ration-A <sup>1)</sup> (g/head $\pm$ SE <sup>2)</sup> )	Ration-B (g/head $\pm$ SE)	Average (g/head)
Pekin	3250 $\pm$ 109.15	3597 $\pm$ 109.15	3423.50 <sup>a</sup>
PMp	2072 $\pm$ 109.15	2247 $\pm$ 109.15	2159.50 <sup>c</sup>
EPMP	2456 $\pm$ 109.15	2420 $\pm$ 109.15	2438.00 <sup>b</sup>
Average	2592.71 <sup>a3)</sup>	2754.69 <sup>a</sup>	

<sup>1)</sup> Ration-A finisher, lysine: 0.65%, energy: 3000 kcal ME/kg Ration-B finisher, lysine: 0.80%, energy: 2705 kcalME/kg)

<sup>2)</sup> SE (*Standard error*)

<sup>3)</sup> Different superscript in the same column or the same row differs significantly (P<0.05)

The results also showed that the average final body weight of EPMP ducks was higher compared with PMp ducks. This could happen because EPMP ducks inherited the genetic trait that came from combination of Pekin and Muscovy ducks which both had a fairly large body size. Muscovy in addition to having a heavier body weight, the proportion of meat was considerably high so that such traits have been passed down to EPMP duck. Purba & Prasetyo (2014) reported that the average final body weight of EPMP duck on diet containing lysine 0.95%, with dietary energy of 2700 kcal ME/kg and crude fibers content of 6 and 9% respectively was 2446.67 and 2429.33 g/duck, which was almost similar to this study findings. The average final body weight of PMP ducks seemed to be lower than the other types of ducks. It was also highly correlated with body size and proportions of white Mojosari ducks, which was lighter. Baeza et al. (2012) reported that the final body weight of mule duck of 10 weeks of age was 3760 g/duck under dietary protein and dietary energy of 16% and 2895 kcal ME/kg, respectively.

### Carcass weight percentage

The effect of the interaction between breed and dietary treatments was not statistically significant (P>0.05). The average percentage of carcass weight of the three strains of duck under two dietary treatments is listed in Table 3. The average percentage of carcass weight of the three strains of duck was relatively similar. The average carcass weight of Pekin duck was 66.52% while the PMP and EPMP duck 63.43 and 63.45%, respectively. Although the average carcass weight of Pekin ducks seem higher, but based on the results of statistical analysis administration both types of rations, feed treatment and strains did not significantly (P>0.05) effect on the percentage of carcass weight. The average carcass weight of Pekin ducks in this study resembles the results of Omojola (2007). The average carcass weight of Pekin ducks at 10 weeks aged were 66.67% (male) and 68.78% (female) respectively. Furthermore, the average carcass weight of Pekin duck male and female did not differ significantly (Omojola 2007).

**Table 3.** The average carcass weight percentage of three strains of duck under dietary treatment at the age of 12 weeks

Strain	Ration-A (% $\pm$ SE)	Ration-B (% $\pm$ SE)	Average (%)
Pekin	64.54 $\pm$ 0.94	68.49 $\pm$ 0.94	66.52 <sup>a</sup>
PMp	62.93 $\pm$ 0.94	63.93 $\pm$ 0.94	63.43 <sup>a</sup>
EPMp	64.68 $\pm$ 0.94	62.22 $\pm$ 0.94	63.45 <sup>a</sup>
Average	64.05 <sup>a</sup>	64.88 <sup>a</sup>	

The same superscripts in the same column or row are not significantly different ( $P>0.05$ )

Carcass weight is very important role as one of the main products in poultry. Carcass weight tended to increase in line with the increasing of the age. Carcass weight could also be influenced by the type, size and genetic factors (Jaturasitha et al. 2004; Omojola 2007). Environmental factors, feed and stress conditions before slaughtering could also affect the quality of poultry carcasses (Given 2005; Liu & Niu 2008). Body size broiler of Pekin ducks, Muscovy ducks and other meat type ducks was usually larger than that of the egg type ducks. Another factor that is influencing the poultry carcass quality is fiber content of the feed. Purba & Prasetyo (2014) reported that there was a decrease in the average carcass weight of meat type ducks with increasing crude fiber content in the feed. Feeding with high crude fiber (9%) to EPMp duck reduced carcass weight at age of 12 weeks (Purba & Prasetyo 2014).

### Breast meat weight percentage

The average percentage of breast meat of the three strains of duck given dietary treatments are presented in Table 4. Based on the results of statistical analysis, both types of rations and strain did not significantly ( $P>0.05$ ) effected on the percentage weight of duck breast meat. Results of analysis of variance also showed that interaction between rations treatment with the strain did not effected ( $P>0.05$ ) on the weight of duck breast meat.

**Table 4.** The average breast meat weight percentage of three strains of duck under dietary treatment at the age of 12 weeks

Strain	Ration-A (% $\pm$ SE)	Ration-B (% $\pm$ SE)	Average (%)
Pekin	21.51 $\pm$ 0.43	21.68 $\pm$ 0.43	21.59 <sup>a</sup>
PMp	18.89 $\pm$ 0.42	18.98 $\pm$ 0.43	18.94 <sup>a</sup>
EPMp	20.52 $\pm$ 0.43	17.79 $\pm$ 0.43	19.16 <sup>a</sup>
Average	2151 <sup>a</sup>	2168 <sup>a</sup>	

The same superscript in the same column or row are not significantly different ( $P>0.05$ )

Breast meat in poultry is one part of the carcass it is important because it has a high proportion of meat besides higher economic value (Omojola 2004; 2007; Purba & Prasetyo 2014). Omojola (2007) reported that the average percentage of breast meat weight of males and females aged 10 weeks of Pekin duck were 14.65 and 18.74% respectively. The average weight of breast meat obtained in this study was higher than in Omojola's (2007). The different was obviously due to the slaughter age. Feed nutrient content factors, especially in the form of the amino acid lysine can also affect the weight of the breast meat

of poultry. Lysine requirement to produce high breast meat weight on broiler was higher than for growth (Corzo et al. 2006; Sterling et al. 2006). The optimum requirement of lysine level in the feed to support growth and weight of breast meat in broiler chickens were 0.87 and 0.90% and the EM of 3200 kcal/kg (Dozier et al. 2008). The results of this study indicated that the use of ration-B was comparably effective relative to the ration-A to produce a higher breast meat of strains of ducks. The nutrient content 0.90% of lysine and the EM 2705 kcal/kg were considered optimum to support the growth and breast meat yield of the three strains of ducks.

### Thigh meat percentage

The average percentage weight of thigh meat from the three strain of ducks were given the two feed treatments listed in Table 5. The average percentage weight thigh meat of EPMp duck was 14.41% while the PMP and Pekin ducks were 13.93 and 12.61% respectively. Based on the statistical analysis, both of feed treatments and duck strain did not significantly ( $P>0.05$ ) affected on the percentage of weight thigh meat ducks. Results analysis of variance also showed that interaction between both types of feed treatment with strains did not significantly ( $P>0.05$ ) affected to the percentage of weight of thigh meat ducks.

**Table 5.** The average thigh meat weight of three strains of ducks under dietary treatments at the age of 12 weeks

Strain	Formula-A (% $\pm$ SE)	Formula-B (% $\pm$ SE)	Average (%)
Pekin	12.31 $\pm$ 0.24	12.91 $\pm$ 0.24	12.61 <sup>a</sup>
PMP	13.89 $\pm$ 0.24	13.96 $\pm$ 0.24	13.93 <sup>a</sup>
EPMp	14.40 $\pm$ 0.24	14.41 $\pm$ 0.24	14.41 <sup>a</sup>
Average	13.53 <sup>a</sup>	13.76 <sup>a</sup>	

The same superscripts in the same column or row are not significantly different ( $P>0.05$ ); Ration-A, lysine: 0.65%, energy: 3000 kcal ME/kg Ration-B, lysine: 0.80%, energy: 2705 kcalME/kg; SE: Standard error

The average percentage thigh meat of EPMp duck obtained in this study resembles the results of previous studies. The average weight of thigh meat of Pekin duck males and females of 10 weeks of age according to Omojola (2007) were 9.24 and 10.41% respectively.

### Back meat percentage

The average percentage weight of backs meat of the three strains of ducks under two types of dietary treatments were listed in Table 6. The average percentage of weight back meat of Pekin duck was 19.11% while the PMP and EPMp ducks were 20.79 and 20.51% respectively. Based on the analysis statistically the two types of rations given did not significantly ( $P>0.05$ ) affected to the percentage of weight of the back meat as well as the strains of ducks. There also showed that interaction between formulas treatment with strain did not affect ( $P>0.05$ ) the percentage of weight the back meat.

Weights of backs in poultry can be influenced by many factors including genetic factors, types and sexes. Omojola (2007) reported that the average weight of broiler Pekin ducks was higher (9.91%) compared to types Rouen broiler ducks.

**Table 6.** The average back meat weight percentage of three strains of duck dietary treatments at the age of 12 weeks

Strain	Ration-A (% $\pm$ SE)	Ration-B (% $\pm$ SE)	Average (%)
Pekin	18.53 $\pm$ 0.31	19.68 $\pm$ 0.31	19.11 <sup>a</sup>
PMp	20.89 $\pm$ 0.31	20.69 $\pm$ 0.31	20.79 <sup>a</sup>
EPMp	20.32 $\pm$ 0.31	20.69 $\pm$ 0.31	20.51 <sup>a</sup>
Average	19.91 <sup>a</sup>	20.36 <sup>a</sup>	

The same superscripts in the same column or row are not significantly different ( $P>0.05$ ); Ration-A, lysine: 0.65%, energy: 3000 kcal ME/kg Ration-B, lysine: 0.80%, energy: 2705 kcalME/kg; SE: Standard error

Purba & Prasetyo (2014) reported that the average percentage of weight back of EPMp ducks reared for 12 weeks aged ranged from 17.30 to 18.12%. This was likely to happen due to crude fiber content in the feed. Coarse fiber content level as reported by Purba & Prasetyo (2014) was higher, reaching 9% while the crude fiber content in this study under 6%. Backs meat on ducks was one of important parts of the carcass than of meat thigh and chest. The results of this study showed that the effectiveness of ration-B was relatively the same as with the ration-A to produce the optimal weight of back meat in all three strains of broiler ducks observed.

### Wings meat percentage

The average percentage weight of wings meat of three strains of ducks under dietary treatment are presented in Table 7. The average percentage weight of duck wings from of the three strains of ducks were 10.68, 8.84 and 9.47% respectively. Based on the results of statistical analysis, both types of ration and strains did not significantly ( $P>0.05$ ) affect the percentage weight of wings meat.

**Table 7.** The average wings meat percentage of the three strains of duck under dietary treatment at the age of 12 weeks

Strains	Ration-A (% $\pm$ SE)	Ration-B (% $\pm$ SE)	Average (%)
Pekin	9.76 $\pm$ 0.23	9.18 $\pm$ 0.23	9.47 <sup>a</sup>
PMp	8.95 $\pm$ 0.23	8.73 $\pm$ 0.23	8.84 <sup>a</sup>
EPMp	10.74 $\pm$ 0.23 <sup>a</sup>	10.61 $\pm$ 0.23 <sup>a</sup>	10.68 <sup>a</sup>
Average	9.82 <sup>a</sup>	9.51 <sup>a</sup>	

The same superscripts in the same column or row are not significantly different ( $P>0.05$ ); Ration-A, lysine: 0.65%, energy: 3000 kcal ME/kg Ration-B, lysine: 0.80%, energy: 2705 kcalME/kg; SE: Standard error

Results of analysis of variance also showed that there was no significant effect ( $P>0.05$ ) of strains of ducks and dietary treatments on the weight of wings meat. The

results of this study illustrated that the effectiveness of the ration-B was the same as of rations-A to generate the optimum wings weight of the three strains of broiler ducks. The weight of the wings meat on poultry also is an important part of the carcass and preferred by most people. The percentage weight of wing meat produced in this research was lower when compared with results of Purba & Prasetyo (2014) who reported that the average percentage of EPMp wings meat at 12 weeks old was about 11.05 to 11.73%. The weight of wing can be affected by various factors including breed and sex (Omojola 2007).

### Heart percentage

The average percentage weight of heart of the three strains of ducks under two types of rations is presented in Table 8. It was not statistically significant ( $P>0.05$ ) the average percentage weight of duck heart. The average percentage weight of heart of EPMp duck was 0.79%, while the PMp and Pekin ducks were 0.64 and 0.51% respectively. Heart organ is a vital organ for every living creature, including the ducks. Results of statistical analysis also showed that there was not significant interaction ( $P>0.05$ ) between ration and strains on the heart weight.

**Table 8.** The average heart weight percentage of the three strains of duck under dietary treatment, at the age of 12 weeks

Strain	Ration-A (% $\pm$ SE)	Ration-B (% $\pm$ SE)	Average (%)
Pekin	0.51 $\pm$ 0.03	0.50 $\pm$ 0.03	0.51 <sup>a</sup>
PMp	0.69 $\pm$ 0.03	0.58 $\pm$ 0.03	0.64 <sup>a</sup>
EPMp	0.82 $\pm$ 0.03	0.75 $\pm$ 0.03	0.79 <sup>a</sup>
Average	0.68 <sup>a</sup>	0.61 <sup>a</sup>	

The same superscripts in the same column or row are not significantly different ( $P>0.05$ ); Ration-A, lysine: 0.65%, energy: 3000 kcal ME/kg Ration-B, lysine: 0.80%, energy: 2705 kcalME/kg); SE: Standard error

Purba & Prasetyo (2014) reported that the average weight of heart of EPMp ducks with fed diet with high fiber at 12 weeks old was about 0.77 to 0.80%, which was relatively similar to the results of this study. The study also illustrates that the effectiveness of the ration-B relatively the same as the ration-A to produce weight of the three strains of duck heart. It also gives an indication that different lysine supplement and energy in both formulas did not affect to the weight percentage of ducks heart.

### Gizzard percentage

The average percentage weight of ducks gizzard under two types of rations at the age of 12 weeks are presented in Table 9. The average percentage weight of gizzard of the three strains of ducks was relatively similar. The average percentage weight of gizzard of EPMp ducks was 3.21%, while PMP and Pekin ducks had percentage of weight of gizzard was 3.16 and 3.05% respectively. Based on the statistical analysis results, both type of rations and the strains did not significantly ( $P>0.05$ ) affect the weight of gizzard.



**Table 9.** The average gizzard weight percentage of the three strains of duck under dietary treatment

Strain	Formula-A (% $\pm$ SE)	Formula-B (% $\pm$ SE)	Average (%)
Pekin	3.31 $\pm$ 0.09	2.78 $\pm$ 0.09	3.05 <sup>a</sup>
PMp	3.15 $\pm$ 0.09	3.17 $\pm$ 0.09	3.16 <sup>a</sup>
EPMp	3.03 $\pm$ 0.09	3.38 $\pm$ 0.09	3.21 <sup>a</sup>
Average	3.16 <sup>a</sup>	3.11 <sup>a</sup>	

The same superscript in the same column or row are not significantly different ( $P>0.05$ ); Ration-A lysine: 0.65%, energy: 3000 kcal ME/kg Ration-B, lysine: 0.80%, energy: 2705 kcalME/kg); SE: Standard error

Results showed that was not any significant interaction between strains with both types of ration ( $P>0.05$ ) affecting percentage weight of duck gizzard. Gizzard weights can be influenced by various factors such as the fiber content in the feed. Purba & Prasetyo (2014) reported that feeding fiber of 9% ( $P<0.05$ ) increased gizzard weights compared with feeding without coarse fibers. The study indicated that both ration (ration-A and ration-B) had the same effectiveness on gizzard weight for all strains of ducks.

### Abdominal fat

The average percentage weight of abdominal fat of the three strains of duck under two dietary treatment is presented in Table 10. That they are not significant different. Abdominal fat levels in poultry can be influenced by various factors such as age and feed. Abdominal fat content will increase along with increasing the age. Nutrient content of feed can also affect the levels of abdominal fat in ducks.

**Table 10.** The abdominal fat weight percentage of the three strains of duck under dietary treatment

Strain	Formula-A (% $\pm$ SE)	Formula-B (% $\pm$ SE)	Average (%)
Pekin	0.58 $\pm$ 0.14	1.30 $\pm$ 0.14	0.94 <sup>a</sup>
PMp	1.39 $\pm$ 0.14	1.54 $\pm$ 0.14	1.47 <sup>a</sup>
EPMp	0.46 $\pm$ 0.14	0.81 $\pm$ 0.14	0.64 <sup>a</sup>
Average	0.81 <sup>a</sup>	1.22 <sup>a</sup>	

The same superscripts in the same column or row are not significantly different ( $P>0.05$ ); Ration-A lysine: 0.65%, energy: 3000 kcal ME/kg Ration-B, lysine: 0.80%, energy: 2705 kcalME/kg); SE: Standard error

Adeola (2006) said that giving feed containing high energy can affect abdominal fat accumulation. Feeding containing EM 2700 to 3000 kcal/kg in this study appears to be acceptable accordance with abdominal fat content. Purba & Prasetyo (2014) stated that there is a pattern of decreased levels of abdominal fat in EPMp ducks for 12 weeks age of gestation by administration of crude fiber from 6% to 9% in the ration. Based on the statistical analysis both of types of ration and strain did not significantly ( $P>0.05$ ) effected on the weight of abdominal fat.

Results of the analysis of variance, showed that the interaction of strain and ration treatments did not significant ( $P>0.05$ ) affect the weight of abdominal fat.

### Liver weight percentage

Average percentage weight of liver of the three strains under two dietary treatments was shown in Table 11. The percentage average weight of the liver of the three types of duck relatively the same.

**Table 11.** The average liver weight percentage of three strains of duck under dietary treatment

Strain	Formula-A (% $\pm$ SE)	Formula-B (% $\pm$ SE)	Strain (%)
Pekin	2.94 $\pm$ 0.16	2.30 $\pm$ 0.16	2.62 <sup>a</sup>
PMp	1.87 $\pm$ 0.16	2.24 $\pm$ 0.16	2.06 <sup>a</sup>
EPMp	2.16 $\pm$ 0.16	2.74 $\pm$ 0.16	2.45 <sup>a</sup>
Strain	2.33 <sup>a</sup>	2.43 <sup>a</sup>	

The same superscripts in the same column or row are not significantly different ( $P>0.05$ ); Ration-A lysine: 0.65%, energy: 3000 kcal ME/kg Ration-B, lysine: 0.80%, energy: 2705 kcalME/kg); SE: Standard error

Based on the results statistical analysis types formula ration treatment and strain ducks did not significantly ( $P>0.05$ ) affect the weight of the liver. Based on the analysis of variance also showed that interaction between the two types of ration and strain did not significantly ( $P>0.05$ ) affect the weight of the liver. The study indicated that the effectiveness of formula-B treatment was relatively same with formula-A treatments. Nutrient content of formula-B was considered already meet the nutritional needs of the three strains of ducks.

### Intestinal weight percentage

The average percentage weight of the intestines of 12 weeks old three strains of ducks and two types of ration are presented in Table 12. Based on the results of statistical analysis showed that both the dietary treatments and strains ducks did not significantly ( $P>0.05$ ) affect the intestine weights. Further results of analysis also showed that there was no significant interaction effect of strains and dietary treatments ( $P>0.05$ ).

The study showed that the effectiveness of the ration-B was relatively same with ration-A because the average weight of the intestine produced relatively similar in the three strains of ducks. The results also indicated that the content of lysine and metabolizable energy of the ration-B met the nutritional requirement for all strains of ducks.

**Table 12.** The average intestinal weight percentage of the three strains of duck under dietary treatment

Strain	Formula-A (% $\pm$ SE)	Formula-B (% $\pm$ SE)	Average (%)
Pekin	4.53 $\pm$ 0.11	3.95 $\pm$ 0.11	4.24 <sup>a</sup>
PMp	4.13 $\pm$ 0.11	4.45 $\pm$ 0.11	4.29 <sup>a</sup>
EPMp	3.36 $\pm$ 0.11	4.25 $\pm$ 0.11	3.80 <sup>a</sup>
Average	4.00 <sup>a</sup>	4.22 <sup>a</sup>	

The same superscripts in the same column or row are not significantly different ( $P>0.05$ ); Ration-A lysine: 0.65%, energy: 3000 kcal ME/kg Ration-B, lysine: 0.80%, energy: 2705 kcalME/kg; SE: Standard error

### Intestinal length

The average intestines length of the three strains of ducks were given of two types feed treatment are listed in Table 13. Based on statistical analysis, ration treatment did not significantly ( $P>0.05$ ) effected on intestinal length of ducks, but strain significantly effected ( $P<0.05$ ). Results the analysis of variance also showed that interaction between the strain and the type of ration treatment significantly ( $P<0.05$ ) effected on intestinal length ducks.

The highest average length of the colon of Pekin ducks could be influenced by the size of the duck's body. Body size of Pekin duck was greater than the other two types of ducks. Other factors influenced the length of colon was genetic factors.

**Table 13.** The average of intestinal length of the three strains of duck under dietary treatment

Strain	Formula-A (cm $\pm$ SE)	Formula-B (cm $\pm$ SE)	Average (cm)
Pekin	238.19 $\pm$ 23.33	231.38 $\pm$ 14.86	250.63 <sup>a</sup>
PMp	178.56 $\pm$ 16.30	190.50 $\pm$ 20.05	184.53 <sup>b</sup>
EPMp	182.75 $\pm$ 12.33	184.50 $\pm$ 24.31	183.63 <sup>b</sup>
Average	199.83 <sup>a</sup>	246.79 <sup>a</sup>	

Different superscripts in the same column significantly different ( $P<0.05$ ); Ration-A lysine: 0.65%, energy: 3000 kcal ME/kg Ration-B, lysine: 0.80%, energy: 2705 kcalME/kg; SE: Standard error

Genetically, Pekin duck has a length of intestine that was longer than the other two types of ducks. Purba & Prasetyo (2014) stated that the content of crude fiber in ration also did not significantly ( $P>0.05$ ) affect the length of the colon. Purba & Prasetyo (2014) also reported that a diet containing 0.95% lysine and EM 2700 kcal/kg in diet and high crude fiber (6 and 9%) did not significantly ( $P>0.05$ ) affect the intestinal length of EPMp ducks at 12 weeks of age. The study indicated that the effectiveness of ration-B was relatively similar to ration-A in length of colon in all strains of ducks.

### CONCLUSION

This study concluded that both types of ration that (ration-A and ration-B) with different lysine and energy content had the same advantage to maintain final body weight,

carcass and carcass cuts weight of the three strains of duck. However, final body weight and intestinal length of Pekin duck were significantly higher than those of PMP and EPMp ducks.

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