DETERMINATION OF ENERGY AND PROTEIN REQUIREMENTS AND THEIR RATIO IN THE RAMBON DUCKS RATION AT GROWING PERIOD

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Abstract

Rambon Ducks are local laying ducks in Indonesia which are generally raised under extensive systems. However the decline of land availability, the duck rearing systems requires change from extensive to intensive systems. This study was aimed to determine the energy and protein requirement and their balance in the Rambon ducks ration at growing period. There were two experiments in the research. First to find the value of Efficiency Utilization of Protein (EUP) and requirement of energy and protein based the calculation from Scott et al. (1982), the second experiment to find energy-protein ratio (EPR) in the ration used Completely Randomized Design. There were six different metabolizable energy/protein ratio in rations as treatments; P1 (2200 kcal/kg/12%); P2 (2200 kcal/kg/14%); P3 (2500 kcal/kg/12%); P4 (2500 kcal/kg/14%); P5 (2800 kcal/kg/14%), and P6 (2800 kcal/kg/16%). Each treatment was replicated four times. The data was analyzed using analysis of variance and the difference among treatments was analyzed by Duncan Test. The parameters measured were EUP, Energy and protein requirement, EPR, feed consumption, body weight gain and feed conversion. The result of the research show that the value of EUV of Rambon female duck at growing period is 57.76%, requirement of protein is 10,62 g/day and energy is 199.73 kcal/day, feed consumption 91.8 g/day. The conclusion that Energy-Protein Ratio in the ration 2200 kcal/kg/12% P (183.33) is enough for Rambon Ducks at growing period.

Key words: Rambon ducks, Efficiency Utilization of Protein, requirements, Energy, Protein, Energy-Protein Ratio, feed consumption, feed conversion

INTRODUCTION

Rambon Ducks from Cirebon region that many kept on the northern coast of West Java, so it has a high adaptability to the hot environment or coastal areas. Rambon ducks male body weight of about 1.4 kg and female about 1.2 kg. Male has brown shiny fur, has black feathers on the neck and head, while 70% female has brown fur (such as Java sugar), the pubic hair light brown and the color of shank is grayish black [12].

In the maintenance intensive ducks, feeding must precisely meet their nutritional requirement, especially energy and protein. Birds of all ages require adequate amounts of protein of suitable quality for maintenance, growth, reproduction, work and egg production. The Protein requirements for growth are the greatest and most critical [5]. Young birds generally have a higher requirement for protein, energy, vitamins, and minerals per unit of body weight [5]. The performance on this phase will affect to the next phase of production. To make duck production more economical, it is important to generate scientific data on the optimum levels of various nutrients in the diet necessary to meet the ducks requirement [4]. Protein consumption depend on the amount of feed intake, breeds, age, sex, body weight, phase of production, quality ration, diet forms and ways of feeding, ration energy, health and social behavior [3].

The Values of Efficiency Utilization of Protein is reflected of protein retention. Nitrogen Retention is strongly influenced by the consumption of nitrogen. The reduced nitrogen retention at certain protein levels were accompanied by low energy, likely due to a small portion of protein is used as source

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of energy. The value of Efficiency Utilization of Protein on the growing chicken/duck is only 55 percent. The protein requirement on ducks to be influenced by body size, breed, ambient temperature, the production levels and the energy in the ration. Protein requirement at growing ducks are for maintenance, tissue growth and feather growth [11].

The Efficiency Utilization of Protein value in chickens/ducks is 82 percent and may vary depending upon climatic conditions, especially ambient temperature, the fat content of the ration, ration energy levels and the balance between energy and other nutrients [15]. Another factor that is large enough influence on the amount of energy requirement for maintenance is ducks activity . If energy requirement for maintence has been reached then the excess energy that has been consumed will be used for growth and egg production

Energy and protein requirements in diet for laying ducks, is the energy between 2600 - 3000 kcal/kg and the protein of about 16-19% [11]. From various studies concluded the requirements of protein in the ration on ducks aged 3-8 weeks between 14-19 % with metabolizable energy 2700 to 2900 kcal/kg [8].

MATERIAL AND METHODS

This study consisted of two experiments. The first experiments carried out to determine the Efficiency Utilization of Protein (EUP), requirement of energy and protein per day with the formula [10]:

$$EUP = \frac{PI - (PEB - PEK)}{PI} X \ 100\ \%$$

Explanation : EUP = Efficiency Utilization of Protein (%); PI = Protein Intake from basal ration (g); PEB = The amount of excreta protein derive from basal ration (g); PEK = The amount of excreta protein derive from corrected ration (g)

Protein requirement in growing Ducks need for maintenance, tissue growth and feather growth. Protein needs for maintenance each day can be calculated by multiplying the weight of ducks in grams by 0.0016 and dividing by the EUP, whereas for feather growth is by multiplying the percentage of feather (0.07) with body weight in grams. The results are multiplied by the percentage of feather protein (0.82) and then divided by the EUP. Similarly to the growing protein requirement is by multiplying the daily body weight gain (g) with tissue proteins (0.18) divided by the EUP. The total requirement of protein for Rambon growing ducks can be calculated by summing the three things mentioned above [10]. For other data in the calculation were obtained from previous studies. As for the determination of protein requirement in ration, using the formula:

$$\frac{\text{Requirement of the protein (g)}}{\text{Feed intake per day (g)}} X\ 100\ \%$$

To determine the metabolizable energy requirement for growing ducks per day by using: Energy for maintenance + Energy for activity + + energy for tissue (body weight gain). Energy for poultry activities in cage system is 37 % of the energy for maintenance. Energy requirement calculations using formula [10]:

$$(83xBW\ (kg)^{0.70}/0.82) + 37\%\ (83xBB\ (kg)^{0.70}/0.82) + (PCx4 + LTx9xPBB)$$

Explanation: BB= ducks body weight (kg); 83 = konstanta produksi panas basal untuk itik; 0,82= Efficiency utilization of dietary energy; PC = ducks body protein contain
FC = ducks body fat contain; WG= body weight gain (g)

The Second experiments to know energy-protein ratio at the ration. The experiment tested several rations with has different protein-energy ratio. This experiment used 60 two weeks old female Rambon ducks and rearing until the age of 8 weeks. Completely Randomized Design (CRD) was used in this experiment with 6 treatments, and each treatment is repeated for times. The levels energy-protein treatmemt are P1 = 2200/12 , P2 = 2200/14; P3 = 2500/12; P4 = 2500/14; P5 = 2800/14; P6 = 2800/16 kcal / %. To determine the influence of the treatments, the data was analyzed using analysis of variance and the difference among treatments was analyzed by Duncan Test. The parameters measured were feed consumption, body weight gain and feed conversion.

RESULTS AND DISCUSSIONS

To support the calculation of Efficiency Utilization of Protein (EUP) and the requirement of protein and energy per day of Rambon ducks need the data from preliminary research. The preliminary research show that the female Rambon ducks at 8 weeks of age datas are final body weight = 1077.09 g ; weight gain = 824.29g; weight gain/day = 19.75g; carcass protein = 18.45 %; feather protein = 84.69 %; feather weight = 6.54% from body weight; body fat = 13.86%; feed intake/day = 91.80 g.

The Results of the first experiment are Endogenous protein/day = 2.09 g; Endogenous Nitrogen/day = 334.67 mg; Endogenous N/day/kg body weight = 310.72 mg. This value is higher than Endogenous N of local muscovy ducks that only 191.26 mg/kg body weight [16] and higher than the Endogenous N of chickens that 250 mg/kg body weight [15]. Ducks has high Endogenous N because of the Rambon duck behavior was very nervous, while muscovy ducks has very calm behavior. N Endogenous in the feces comes from saliva, digestive enzymes, bile and epithelial cells are shed and will increase when the rations contained antinutrition factors such as antitrypsin, tannin and crude fiber (Tamminga et al., 1995). N Endogenous it is difficult to measure and one of the measurement is to provide feed without protein.

EUP calculation results in growing Rambon ducks at the age of 2-8 week is 57.76%. This result is higher than the EUP value of grower-develover Pekin duck that is 55% [11], also lower than the EUP value of muscovy ducks that is 58.85% [16], but closer to the EUP value of Sentul chicken in the growth phase that is 57.61% [14]. Both EUP value and supporting data obtained in the preliminary study, it can be calculated minimum protein requirement in ducks. The requirement of Rambon ducks in growth period (at 2-8 weeks of age) is 10.62 g/day, so by averaging 91.80 g feed intake/day, the minimum protein content in rations is 11.56% and is rounded to 12%. Protein requirement of duck female Rambon per day smaller than the requirement of the Pekin ducks during the growth that is 14 grams per day and feed consumption 160 grams /day, so the minimum protein content of the ration for Pekin Ducks growth is about 8.75%. This value is lower than the minimum ration protein content of Rambon duck ration that is 12%.

The calculation results of minimum energy requirement in Rambon ducks at growth period (at 2-8 weeks of age) was 199.73 kcal/day with 91.80 grams of feed intake per day, the requirement for energy in the ration to Rambon ducks at growth period is 2175.68 kcal/kg are rounded to 2200 kcal/kg.

In the second experiment female ducks were given 6 kinds of diets with various energy- protein ratio that were P1 = 2200/12 , P2 = 2200/14 ; P3 = 2500/12 ; P4 = 2500/14 ; P5 = 2800/14 and P6 = 2800/16 kcal / %. Results of the study the effect of the treatments of Rambon female ducks performan in growth period at 2-8 weeks of age can be seen in Table 2.

Table 2 Effect of Energy-Protein Ratio in the ration On Female Rambon Ducks Performan In growth Period at 2-8 Weeks of Age

Performance	Treatments					
	P1	P2	P3	P4	P5	P6
	---------- Gram ----------					
Feed Consumption	5617.63[a]	5430.63[ab]	5050.38[c]	5162.63[bc]	5246.00[b]	5102.63[c]
Body weight gain	946.50	842.50	854.75	983.88	929.88	950.88
Feed Conversion	5.98	6.56	5.93	5.26	5.72	5.41
Protein Consumption	16.05[b]	15.52[b]	16.83[b]	17.21[b]	17.49[b]	19.44[a]
Energy Consumption	294.26[b]	284.46[b]	300.62[b]	307.30[b]	349.73[a]	340.18[a]

Keterangan :
P1 : ME 2200 kkal/kg; P 12 % P4 : ME 2500 kkal/kg; P 14 %
P2 : ME 2200 kkal/kg; P 14 % P5 : ME 2800 kkal/kg; P 14 %
P3 : ME 2500 kkal/kg; P 12 % P6 : ME 2800 kkal/kg; P 16 %

Analysis of variance results show that the treatments of protein-energy ratio significantly affect to feed intake (P <0.05). At Duncan test showed that feed consumption of P1 treatment (2200/12) is not significantly different from P2 (2200/14), but significantly higher than the other treatments.This happens because the treatment P1 and P2 has lower energy content compared with other treatments, so the ducks are trying to meet its energy requirement by consuming rations more. Although feed consumption is high, but when calculated the amount of energy consumption is still lower. The energy content in rations will determine feed intake [15], because the birds consume the ration first of all is to meet energy requirement [7]. Feed consumption is no different between treatment P3 (2500/12), P4 (2500/14) and P6 (2800/16), P3 and P4 treatment does have the same energy content, so that the feed consumption is relatively the same, while the P6 despite high energy content, but also high enough protein content (16%), so that high feed consumption is required to metabolism of protein that need a high energy.

Analysis of variance results shows that the treatment of energy-protein ratio is not significantly effect on body weight gain (P>0.05). This shows that the difference of energy-protein ratio in treatment still meet the requirement of the ducks to normal grow, although the P5 and P6 energy consumption is significantly higher than other treatments. This is because the ration P5 and P6 contain high energy. This is in line with the opinion of [1] that said the poultry given high-energy rations, especially the broiler chickens and meat ducks, tend to consume the ration above of their requirement, so that his body fat. Table 2. Shows that energy intake at P1 (294.26 kcal/day); P2 (284.46 kcal/day); P3 (300.62 kcal/day); P4 (307.30 kcal/day); P5 (349.73 kcal/day); P6 (340.18 kcal/day). This is evidently that all treatments still meet the energy requirement in line with Tuti Widjastuti et.al. (2014) said that the minimum energy requirement in Rambon Ducks growth at 2-8 weeks old is 199.73 kcal/day and [10] said that energy requirement of the growing ducks is 177-204 kcal/day. [4] said that a majority of investigations indicate energy requirement for ducks after 2 or 3weeks of age is 239,kcal/day The energy consumption in this trial has been excessive, so we recommend laying ducks breed in grower period should be given limited rations. This is in line with Olver [11] that giving limited ration in early time to Peking ducks at 3 weeks until 20 weeks of age, give the results are better egg production in layer period than those given limited rations at the age of 7 weeks until 20 weeks.

Table 2. shows that protein intake at P1 (16.05 g/day); P2 (15.52 g/day); P3 (16.833 g/day); P4 (17.21 g/day); P5 (17.49 g/day); and P6 (19.44 g/day). This is evidently that all treatments still meet the protein requirement in line with [14] said that the minimum protein requirement in Rambon Ducks growth at 2-8 weeks old is 10.62 g/day. [4] said that a majority of investigations indicate protein requirement for ducks after 2 or 3weeks of age is 11.5 – 13.9 g/day. The excess of protein discharged through urine.

Feed conversion is the ratio between the amount of ration consumed by the body weight gain in a certain period [9]. Feed Conversion is influenced by several factors such as body weight, protein ration, ambient temperature and animal health [2]. Analysis of variance results shows that the treatment of energy-protein ratio is not significant effect on feed conversion (P > 0.05). This occurs because the amount of weight gain followed the magnitude of feed consumption, its mean that tend to increase feed consumption followed by increased body weight too, so the comparison is relatively not different. The efficiency value of all the ration is an equal. [13] said that If the rations consumed little but produce the same weight, feed conversion will result in a small number and very profitable. This indicates that the ration has the high quality and digestibility, then there is a positive correlation between the growth rate, feed intake and feed conversion. The feed conversion reflects the physiological effects in utilizing the nutrient elements.

CONCLUSIONS

1. The value of Efficiency Utilization of Protein of Rambon female ducks at growing period is 57.76%, the requirement of protein is 10.62 g/day and energy is 199.73 kkal/day, feed consumption 91.8 g/day.

2. The treatments (energy-protein ratio) had significant effect on feed consumption, but had no significant effect on body weight gain and feed conversion. The energy-protein ratio in the ration 2200 kcal/kg/12% P (183.33) is enough for Rambon Ducks at growing period.

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