Evaluation of Metabolizable Energy and Protein Values of Sapu-Sapu Fish (*Hypostomus plecostomus*) in Mojosari Laying Duck

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ABSTRACT

The purpose of this study was to evaluate the metabolizable energy and protein values of sapu-sapu fish *(Hypostomus plecostomus)* in Mojosari duck. Ten Mojosari laying ducks were randomly allocated into two dietary treatments, and reared in individual cage (metabolic cage). The first treatment was the basal diet (30% commercial feed and 70% corn), and the second treatment was the combination of 70% basal diet and 30% sapu-sapu fish *(Hypostomus plecostomus*. Energy value was determined as apparent metabolizable energy (AME) using the method described by Farrell (1978) with some modification, and protein digestibility was determined using equation of McDonald *et al*. (1988). The results showed that the AME and protein digestibility was 2890.52 ± 34.01 kcal/kg and 64.80 ± 15.71%, respectively. It can be concluded that sapu-sapu fish *(Hypostomus plecostomus)* is possible to be appropriate used for feed ingredient of laying ducks particularly Mojosari ducks.

Key Words: Sapu-sapu fish, Metabolizable energy, Protein digestibility, Laying Mojosari duck

INTRODUCTION

Ducks are generally reared under confined system by the traditional farmer groups. Considering the ducks are mainly provided commercial feed, the high price of feed becomes the main problem for the farmers. Therefore, in order to overcome the problem, farmers attempt to use local feed ingredient that is easily obtained, highly available, and low in price. One alternative feed ingredient which is availabile throughout the year is sapu-sapu fish *(Hypostomus plecostomus)* (Asnawi, *et al*., 2011).

Sapu-sapu fish (*Hypostomus plecostomus*), a species of freshwater fish, is able to survive in polluted waters. Sapu-sapu fish is also known as catfish species and is categorized as *Siluriformes* family. This fish is not consumed by humans due to the hard scale-covered body, except on the stomach. The population of sapu-sapu fish (*Hypostomus plecostomus*) is quite high, and according to the predicted amount of daily use by the farmers in Mataram city, the fish production is estimated to be 272 kg/day, equivalent to 99.28 tons/year. Sapu-sapu fish is able to consume detritus, plant cuttings, *Chloropiceae* (Mozzoni *et al*, 2010), and woods (German, 2009) due to its enzyme properties. Such enzymes are amilolytic, laminarinase, cellulase, xylanase, mannase, chitinase, trypsin, lipase, maltase, β-glucosidase, β-xylosidase, β-mannosidase, N-acetyl-β-d-glucosaminidase, and aminopeptidase (German and Bittong 2009, and Zawadzki *et al*. 2008). The role of these enzymes is expected to have a positive impact on nutrients digestibility in ducks. In addition to the enzyme profiles, Purnamasari and Asnawi (2010) reported that sapu sapu fish (*Hypostomus plecostomus*) contains complete nutrients, such as crude protein ranged between 33.32 - 41.75%, ash between 29.58 - 38.81%, crude fat was about 13.29 - 22.97%, crude fiber was around 0.80 – 3.39% and gross energy between 4290.40 - 4881.68 kcal/kg, Ca ranged between 3.59 to 4.26, and P was 0.29% - 0.99%.

The potential possibility of sapu sapu fish whether it can be used or not for feed ingredient of ducks need to be clarified further. Nutrient values in general have not provided an overview

of the such fish potency in relation to nutritional physiology phenomenon. Information about energy (metabolizable energy) and protein availabilities of sapu-sapu fish (*Hyposyomus plecostomus*) is not enough recognized yet, while the information is very important for the preparation of poultry diet, especially ducks. The present research has been carried out to determine the availabilities of energy and protein in terms of apparent metabolizable energy and protein digestibility, respectively, of sapu-sapu fish for Mojosari laying ducks.

MATERIALS AND METHODS

Different sizes of fresh sapu-sapu fish (≤ 200 g, 200-300 g, and ≥ 300 g) were taken from the river in the city of Mataram and dried in the oven at 60ºC for 24 hours. Ten Mojosari ducks of four-month-old with a homogeneous body weight were placed in individual cages. Each cage with length, width and height of 55 x 35 x 60 cm in size was placed in a sealed chamber with sufficient ventilation. The ducks were given drinking water *ad libitum*. The method of rearing experimental animal implemented in this study was according to Farrell (1976) with some modification for duck. The experiment was set with 2 treatments, namely P0: basal diet without sapu-sapu fish, and P1: 80% basal diet + 20% sapu-sapu fish. Basal diet was composed of yellow corn, commercial diet for laying duck, and premix (Table 1) with approximately 17% protein content and 3032 kcal/kg metabolizable energy (SNI, 2006). Statistical analysis of the data was subjected to T-test using the MS Excel program.

Table 1. Ingredient and chemical composition of basal diet

Feedstuffs	Composition (%)
Yellow corn	65
Commercial feed	34
Premix	1
Total	100
Calculated chemical composition	
Metabolizable energy (kcal/kg)	3032
Crude protein	17.345
Crude fiber	3.83
Ether extract	4.345
Calcium	3.7465
Total phosporus	0.522
Methionine	0.44
Lysine	1.05

Each treatment was repeated five times, each replication consisting of one duck were placed in a metabolic cage. Prior to feeding dietary treatment, the ducks were provided adaptation period for one week. Collection of excreta was conducted within three days. Excreta were then dried under the sun shine for a day or until its weight is constant. The sun-dried excreta were further put into an oven at 60ºC for 24 hours and weighed. A pool of three-day dried samples were milled and then analyzed for dry matter (DM), gross energy (GE), and crude protein (CP). Gross energy was measured by adiabatic bomb calorimeter, and crude protein content was analyzed by Kjeldahl method (AOAC, 1990).

Protein digestibility was calculated by the following equation (McDonald *et al*., 1988).

$$\text{Protein digestibility (\%)} = \frac{\text{Protein consumption (g) - Protein excreta (g)}}{\text{Protein consumption (g)}} \times 100$$

Apparent metabolizable energy (AME) was calculated using the equation by Farrel (1978) as follow:

$$\text{AME (Kkal/ Kg)} = \frac{(AxB) - (CxD)}{A} \times \frac{100}{DM}$$

A = Feed consumption (g)
B = Gross energy of ration (kcal/kg)
C = Total excreta weight (g)
D = Gross energy of excreta (kcal/kg)
DM = Dry matter (%)

RESULTS AND DISCUSSION

The estimated AME of sapu-sapu fish in Mojosari laying ducks was 2890.52 ± 34.01 kcal/kg (Table 2). The AME value was higher than fish meal (2753,1 kcal/kg) in Rhode Island Red cockerels (Zarel, 2006), dehydrated soluble fish meal (2.530 kcal/kg) in poultry, in general (NRC, 1994), and fish meal (12,5 Mj/kg) in crossbreed ducks (Dong., *et al*., 2005). However, it was lower than fresh and dried earth worm (between 3679,55 and 3390,66 kcal/kg) in broiler (Resnawati, 2006), dry soluble meat (3.266 kcal/kg) in white pekin ducks (Ragland *et al*. 1998), and meat and bone meal (1,781 to 3916 kkal/kg) in pekin ducks(Adedokun and Adeola, 2005).

Table 2. Estimated of metabolizable energy and protein of sapu-sapu fish *(Hyposyomus plecostomus)* in Mojosari laying ducks ration

Parameters	Experimental diet	
	Sapu-sapu	Basal diet
Feed consumption (g)	72.00 ± 4.21	78.08 ± 3.99
Energy consumption (kcal/kg)	274.931 ±260.36	273.366 ± 7.46
Total excreta (g)	18.45 ± 3.19	16.29 ± 2.19
Total energy excreta (kcal/kg)	43814.93 ± 162.95	40416.68 ± 113.72
AME (kcal/kg)	2890.52 ± 34.01	3401.18 ± 17.26
GE (kcal/kg)	4559.10	3501.10
% ME to GE ratio	63.40	97.14
Protein consumption (g/ekor)	12.42 ± 3.83	11.64 ± 2,57
Total protein exkreta	4.62 ± 2,45	4.09 ± 1,90
Protein digestibility (%)	64.80 ± 15.71	55.71 ± 9.30

Estimated protein digestibility of sapu-sapu fish (*Hypostomus plecostomus*) in Mojosari laying ducks was 64.80 ± 15.71% (Table 2). The value of protein digestibility of the present study was lower than that of the tuna waste *(Katsuwonus pelumis)* which was 74.09% in native chickens (Leke *et al*., 2012), dried soluble meat (60%) in male White Pekin ducks (Ragland *et al*. 1998), and boiled snails (81.10%) (Dharmawati, 2004). However, it was higher than shrimp waste meal (63.44%) in broiler chickens (Abun, 2008), raw snails were 49.8 % (Dharmawati, 2004). The low digestibility value of sapu-sapu fish (*Hypostomus plecostomus*) might be due its body structure which is dominated by bone so that the crude protein content (33.32 - 41.75%) is lower than fish meal (50%, Sofyan *et al*., 2001, and 48.5%, Dong *et al*., 2005), snails meal (57.71%), golden snails (46.92%), fresh rucah fish (65.5%) (Sofyan *et al*., 2001), mechanical extracted fish meal (NRC,1994).

CONCLUSION

The conclusion of this study is that sapu-sapu fish *(Hypostomus plecostomus)* is grately potential to be used as ration component for Mojosari laying ducks.

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