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Potency of Sapu-Sapu Fish (*Hypostomus plecostomus*) as Feed Supplement for Local Ducks

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Abstract: The objective of this study was to evaluate the potency of sapu-sapu fish (*Hypostomus plecostomus*) as feed supplement for local ducks in Mataram, West Nusa Tenggara, Indonesia. The exploration method was carried out to obtain data regarding the capture up to feeding the fish to ducks. Fresh fish directly obtain from river was dried at 60°C in the oven and then analyzed for the nutrient content. The result of study showed that sapu-sapu fish contained crude protein, lipid, crude fiber and gross energy about 37.07±3.5, 16.85±4.35 and 1.92±1.09% and 4559.1±244.37 kcal/g, respectively. It contained high level of lysine and methionine but histidine and cystine were not detected. Ca and P total content were 0.4984±0.0001 and 0.1762±0.004%. Heavy metal such as Pb, Cr and Cd were detected at 4.25±0.18 ppm, 0.28±0.000 ppm and 0.87±0.03, respectively, however Hg was not detected on whole body of fish. Sapu-sapu fish contains 4.29±0.02% albumin. It is concluded that sapu-sapu fish is a potential feed supplement for ducks because it contained high levels of nutrient required by ducks.

Key words: *Hypostomus plecostomus*, amino acid, mineral, albumin

INTRODUCTION

Ducks rearing in West Nusa Tenggara, Indonesia is generally incorporated in group farmers. Many farmers keep their ducks together in certain area and share the way they manage their farms. The main problems they encounter is high price of feed especially commercial feed. To overcome the problem, farmers use locally available and cheaper feed ingredients. One alternative feed ingredient which is available throughout the year is sapu-sapu fish (*Hypostomus plecostomus*) (Asnawi *et al*., 2011). Sapu-sapu fish is a species of freshwater fish which is able to live in polluted waters. Sapu-sapu fish is one of catfish species and belong to *Siluriformes* family which has hard scales except on the stomach. This is one reason why it is not consumed by humans. Sapu-sapu fish is a potential feed supplements for ducks feeding. The apparent metabolizable energy (AME) contents were 2890.52 kcal/g and digestible protein about 64.80% (DM basis) (Asnawi *et al*., 2014a). The use of sapu-sapu fish as feed supplement for local ducks in Mataram was initiated ten years ago. Preliminary study by Asnawi *et al.* (2014b) showed that 78.6% ducks farmers in Mataram used sapu-sapu fish as feed supplement to rice bran with the ratio 186.8 g/day vs. 201 g/day respectively, while 21, 4% farmers feed the ducks a combination of sapu-sapu fish, rice bran and concentrate with the ratio of 155.1, 158.6 and 3.9 g/day, respectively.

However, the potency of sapu sapu fish as feed ingredients for ducks need to be studied further. nformation about nutrient content of sapu-sapu fish has not widely recognized, while the information is very important in the formulating poultry diet, especially ducks rations. The objective of this study was to determine nutrient composition by proximate analysis, amino acid, mineral and albumin contents of sapu-sapu fish.

MATERIALS AND METHODS

A survey was conducted in the area where duck farmers feed sapu-sapu fish to their a ducks. The steps since farmers collect the fish in the river, processing the fish up to feeding the ducks were observed. The information regarding area of catching, catching method, the amount of the catch and the amount of given to ducks were noted. Three different sizes of fish i.e., those of 100 g, 200-300 g and over 300 g were taken as samples to be analyzed in the laboratory. Each sample was grounded mixed and then dried in an oven for three days at 60°C, then dried in an oven 105°C for 24 h to obtain dry matter weight. The gross energy content was analyzed using Adiabatic Bomb Calorimetric and crude protein content by Kjeldahl method (AOAC, 1990). Amino acid and albumin content were analyzed by HPLC and minerals content by AAS.

RESULTS AND DISCUSSION

The results of direct observation by following the activities of duck farmers in catching sapu-sapu fish is presented in Fig. 1.

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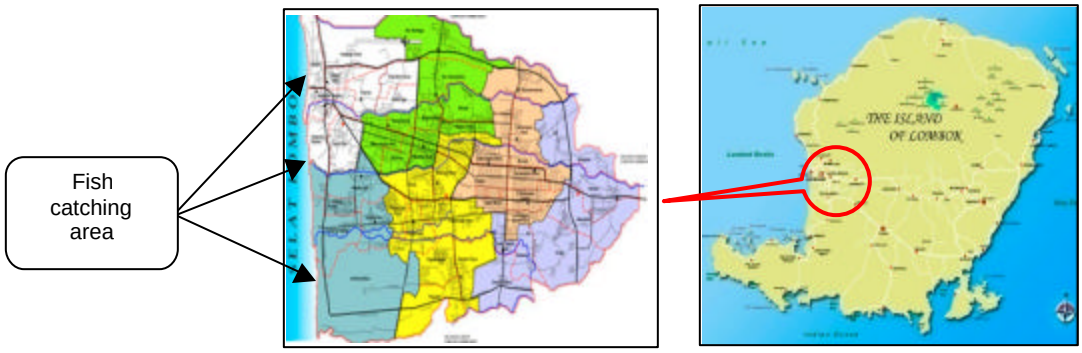

Fig. 1: Location of sapu-sapu fish catching in Mataram

The highest results obtained was in the downstream area of the watershed because the region possesses a high population. Its live in small stream about two meters wide and 0.4-0.5 m deep with silted (Martins *et al*., 2012) and can be used to monitor acute effects of metallic pollutant spills in freshwater (Normann *et al*., 2008). Sapu-sapu fish is not consumed by humans because it is usually live in river that has been polluted with heavy metals (Purnamasari *et al*., 2011).

The populations of sapu-sapu fish is quite high. If it is predicted by the amount of its use on a daily basis by farmers in Mataram, the fish population is estimated to be 272 kg/day, equivalent to 99.28 tons/year.

Sapu-sapu fish were captured using gill nets. Fish being caught were milled using a grinding machine. After crushed, they were given to the ducks. The process of collection and processing of sapu-sapu fish as duck feed is presented in Fig. 2.

Proximate analysis and gross energy content of sapu-sapu fish: The results of proximate analysis of sapu-sapu fish are presented in Table 1.

The results of study showed that the crude protein content of sapu-sapu fish is 37.07% and it is higher than the snakehead fish *(Channa striata)* extract: 16.2%, catfish: 17%, gold fish: 16%, anchovies: 10% and tuna: 13.7% (Mustafa *et al*., 2012), shrimp waste: 35.5% (Dong *et al*., 2005), But lower than fish meal (48.5%) (Dong *et al*., 2005), fish meal (60%) (Leeson and Summer, 2005), 40-45% of local fish meal (Suci, 2013), ancoveta fish meal (65%), fish meal hearing (72%) and menhaden fish meal (61%) (Scott *et al*., 1982). In comparison with the other fish species, it is still low because the fish has a body structure that is covered by skin scales containing high mineral. Results of analysis of gross energy obtained are high (4559.10 kcal/ g). This value is in the range of gross energy meat meal which is about 3493 to 4732 kcal (Adedokun and Adeola, 2005).

Amino acid content of sapu-sapu fish: The sapu-sapu fish contained high levels of lysine (2.946%), methionine (0.79%) higher than the requirements as specified in Indonesian standard of feed for laying ducks is 0.8% for lysine and 0.35% for methionine. Amino acid content of sapu-sapu fish is generally higher than catfish, if compared with reports by Santoso (2009), egg white (Carvallo, 1998) and fish meal (NRC, 1994). This indicates that sapu-sapu fish is a potential source of protein for ducks feeding. High methionine content will have an impact on egg production, while high lysine will affect the growth of ducks. One disadvantage of this fish was that, it does not contain histidine and cystine in the body. This condition can be resolved by diversifying the duck feed with materials containing histidine, while cystine can be synthesized from methionine (Anggorodi, 1985). The results of amino acid analysis of sapu-sapu fish are presented in Table 2.

Table 1: Nutrient composition of sapu-sapu fish (Fresh weight basis)

Nutrition composition	Average	Sd
Dray matter (%)	27.85	1.18
Ash (%)	33.25	3.99
Lipid (%)	16.85	4.35
Crude fiber (%)	1.92	1.09
Crude protein (%)	37.07	3.50
Gross energy (kcal/g)	4559.1	244.37

Mineral contain in sapu-sapu fish: Some important minerals contained in the whole body of the sapu-sapu fish are presented in Table 3.

The results showed that sapu-sapu fish has a high mineral content, because its body has hard skin coating and a big head with a hard bone. The content of Ca and P is higher than fish meal (NRC, 1994), therefore sapu-sapu fish is a good source of minerals for egg shell formation.

Heavy metal contained in sapu-sapu fish: Heavy metal is a general term used to describe a group of metallic elements that are most dangerous when it is consumed. According to Palar (1994), in general all heavy metal can be pollutants that would be poisonous

Table 2: Amino acid composition of sapu-sapu fish (%)

Essential amino acid	Average	SD	Non essential amino acid	Average	SD
Histidine	Not detected	Not detected	Alanine	1.626	0.115
Arginine	2.081	0.295	Aspartic acid	1.759	0.275
Threonin	1.080	0.130	Glutamic acid	3.112	0.336
Cystine	Not detected	Not detected	Glycine	4.114	0.551
Tyrosine	0.659	0.107	Serine	0.865	0.118
Valine	1.282	0.113	Proline	0.611	0.089
Methionine	0.790	0.151			
Lysine	2.496	0.157			
Isoleucine	1.051	0.139			
Leucine	1.587	0.171			
Phenilalanine	0.914	0.126			

Table 3: Composition of macro and micro minerals of sapu-sapu fish

Minerals	Average	SD
Ca (%)	0.50	0.00
P total (%)	0.18	0.00
Na (%)	1.53	0.01
Cl (ppm)	130,174.6	993.93
Mg (%)	0.22	0.00
K (%)	0.13	0.00
S (ppm)	275.67	0.57
Fe (ppm)	100.13	0.025
Zn (ppm)	304.63	0.016
Cu (ppm)	189.31	0.024

Table 4: Composition of heavy metals Cu, Hg, Pb, Cr and Cod in sapu-sapu fish

Heavy metals	Sapu-sapu fish*	Indonesian standard**	BPOM*** (mg/kg)
Hg (ppm)	Not detected	0.5	0.5
Pb (ppm)	4.25±0.18	0.4	2.0
Cr (ppm)	0.28±0.000	-	-
Cd (ppm)	0.87±0.03	0.1	-

for a living body such as Hg (mercury), Cr (chromium), Pb (timbale) and Cd (cadmium). Cadmium and vanadium are categorized because they have a detrimental effect, but not classified as highly toxic elements such as timbale, arsenic and beryllium. Dangerous heavy metals which often pollute the environment are mercury, timbale, arsenic, cadmium and nickel. These metals can accumulate in body of organisms and remains in the body for a long period as toxins. Darmono (1995) reported that some of the metals are essential, for example, calcium (Ca) and magnesium (Mg) are useful for the formation of the cuticle or scales on a fish or shrimp. Heavy metals such as copper (Cu), zinc (Zn) and manganese (Mn) are very useful in the formation of hemocyanin in blood and enzymatic systems in the aquatic animals. There are some heavy metals including micro elements that do not have a biological function and even very dangerous and cause toxicity in living organisms, such as timbal (Pb), mercury (Hg), arsenic (As) and cadmium (Cd).

The results showed that Hg was not found in the fishbody. But other heavy metal was found such as Pb 4.25±0.18, Cr 0.28±0.000 and Cd 0.87±0.03 ppm, the amount above the threshold level as recommended by BPOM. The thresholds metal content of the fish to be safe for consumption is 0.5 ppm Hg, Pb 0.4 ppm to 0.4 ppm and 0.1 for Cd (SNI, 2006). There is no regulations governing the content of Cr in fish. Decision of the Director General of Drug and Food Control No. 03 725/B/SK/VII/89, stated the maximum limit of metal contamination in food are only for As, Pb, Cu, Zn, Sn and Hg.

High content of heavy metals in sapu sapu fish might be caused by their living in the river flows polluted by town waste. Darmono (1995) reported the power of heavy metal toxicity to living organisms. It depends on the species, location, age (life cycle phase), durability (detoxification) and the ability of individuals to escape from the effects of pollution. Existing heavy metals in sapu-sapu fish are not entirely deposited in eggs and meat of duck. Purnamasari and Asnawi (2011) reported, the content of heavy metals Cu (ppm) in eggs and duck meat after given sapu-sapu fish was 7.692±2.158 and 14.523±6.48 in average. While the content of Pb in the eggs and meat is 0.936±1.557 and 0.373±0211 ppm respectively. It was still below the threshold recommended by Director General of Drug and Food Control Indonesia (1989) which is 0.5 ppm for Hg, 0.4 ppm for Pb and 0.1 ppm for Cd.

Albumin content of sapu-sapu fish: Albumin is an antioxidant to counteract function for the free radicals from the environment (Hankins, 2006), while Andreeva (2009) reported, levels of albumin in the blood of fish varies according to the degree of adaptability to water salinity. Albumin plays an important role in maintaining homeostasis in the body and affects the cell membrane osmotic pressure. Albumin is produced by the liver about 9-12 g/day; it has many functions included maintaining intravascular osmotic pressure, substrate transport food, wards off free radicals. Albumin is useful in forming new cells in the tissue and accelerate healing after surgery, burns and during illness. Another benefit of albumin is able to avoid swollen lungs and kidney failure and as a carrier of blood clotting (Hankins, 2006). The average content of albumin for sapu-sapu fish in this study was 4.29+0.02. It is higher than the levels of

Fig. 2: Processing sapu-sapu fish as ducks feeds

albumin in snakehead fish extract which was 2.17±0.14 g/100 mL (Mustafa *et al*., 2012), but lower than the results obtained by Suprayitno (2003) accounted for 6.7% for catfish males and 8.2% for females. High levels of albumin in sapu-sapu fish is comparable with snakehead fish because sapu-sapu fish is living in polluted waters deeper than the catfish.

Sapu-sapu fish is one close relative of catfish (*Clarias gariepinus*) and snakehead fish (*Channa strata*) that are in the category of *Siluriformes* (Anonymous, 2012). Catfish (*Clarias gariepinus*) and snakehead fish (*Channa strata*) have long been known to be very beneficial as traditional and modern medicine. The main substances that are useful in these fish are Albumin (Suprayitno, 2003; Mustafa *et al*., 2012). It is concluded that sapu-sapu fish is a potential feed supplement for duck feeding

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