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Utilization of Skipjack Tuna (*Katsuwonus pelamis L.*) Gill in Diet as a Sourceof Protein on Carcass Quality of Broiler Chickens

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ABSTRACT: In the prospect of skipjack tuna (*Katsuwonus pelamis L.)* fish that abundant in Sulawesi Ocean, using as a protein source for chicken diets, a study was carried out to determine the effect of skipjack tuna gill meal (STGM) on carcass percentage, abdominal fat percentage and mortality. Five dietary treatments containing 0, 3, 6, 9,and 12% levels (factor A) substituted to fish meal and three methods of processing containing sun dried, steamed, boiled processing (factor B) were fed to 225 broiler chickens according to factorial design constructed from completely randomized design with three replication. Treatments were administrated during 35 days and feed and water were provided *ad libitum.*Result showed that dietary skipjack tuna gill meal up to 12% exert no significant difference (P>0.05) compared to control on carcass percentage, abdominal fat percentage and mortality, and methods of processing exert no significant effect (P>0.05) too on carcass percentage, abdominal fat percentage and mortality. There was no signinificant interaction (P>0.05) between levels and methods. It can be concluded that skipjack tuna meal can be substituted to fish meal up to 12%.

Keywords: Skipjack Tuna Meal, Fish Meal, Carcass Quality

INTRODUCTION

In recent year, poultry nutritionists have aimed theirresearchs towards the use of non-traditional feedstuffs in partial or total replacement of the conventionalingredients. Agro-industrial by products are being evaluated to access their nutritive potential to support poultry productivity. Fish meal is a conventional animal protein source when added to the diet increases poultryproduction cost (Islam, 1993). Research has confirmed that fishmeal is a useful protein source for poultry (Machin *et al.,* 1990). However, there are a number of unfavorable characteristics, which present limiting factors in fishmeal usage (Mikulec *et al.,* 2004). Moreover,poultry is a competitor of human being in respect of dry fish consumption.Effort of reducing production cost from feed needs to find alternative feed materials of relatively same nutritive value as the fish meal

There are many non-conventional feeds and by-products could be utilized effectively to improve the supply of local poultry feeds. Fish by-products are the most important by-products available at reasonable prices. These fish by-products have the potential as high protein supplements for poultry. One of them is skipjack tuna gills as animal-derived protein source of poultry feed. The gill of skipjack tuna as protein source will decay if it is not processed due to containing good components for bacterial growth. Skipjack gill is also a living habitat for bacteria beside intestine and skin. For these reasons, the skipjack gill could be utilized as bird feed through processing techniques. Processing to make gill meal can be done through a) sun drying, b) steaming, and c) boiling. The important factor needed to be considered in fish processing is drying temperature. In semi-conventional or conventional processing of the skipjack gill often occurs the protein

denaturation due to over-heating. The animal protein in the ration should be less or equal to one-third the total protein of the ration. The animal protein about one-fourth the total ration protein could still give good performance of the broiler growth rate. Carcass is part of the body after the cut and discarded chicken feathers, abdominal fat, organs, legs, head, neck and blood, except the lungs and kidneys (Rizal, 2006). According to Lesson (2000), nutrients in diet were the factors that affect the carcass weight. Percentage of carcass weight is calculated by dividing the carcass weight multipliedby 100% live (Rizal, 2006). The objective of this study wasto evaluate the effect of different administration levels of the skipjack gill meal as fish meal substitute in the ration on the carcass percentage and abdominal fat percentage.

MATERIALS AND METHODS

Two-hundreds and twenty-five Arbor Acres CP 707-strained broiler chicks were use in this study with initial mean weight of 44.50 g and coefficient of variant5.23 %. These chicks were randomly placed in 45 units of cages, each of which had 5 individuals of broiler chicks. The composition of diets were 15 kinds of rations as treatments, i.e 5 administration levels of skipjack gill meal, 3, 6, 9 and 12%, and 3 processing methods, sun-drying, steaming, and boiling with 3 replications. All rations were made in 22 % of protein and metabolizable energy of 3200 Kcal/kg according to NRC (1994). The nutrients of skipjack tuna gill meal and the composition of feedstuffs and nutrients in diet were shown in Table 1 and Table 2.

Tabel 1. Nutrients in skipjack tuna gill meal (STGM)

Nutrients	STGM sun-dried	STGM-steamed	STGM-boiled
Water (%)	10.80	10.65	10.95
Crude protein (%)	42.56	41.71	40.67
Crude fat (%)	7.39	7.10	6.67
Crude fiber (%)	0.28	0.32	0.12
NFE	6.08	6.27	7.69
Ash (%)	32.89	33.95	33.90
Ca (%)	10.27	10.39	10.88
P (%)	6.36	6.12	7.52
Gross energy (Kcal/kg	4760	4150	4060

Notes: STGM = skipjack tuna gill meal

This study used Factorial Completely Randomized Design (5 x 3). Factor (A) was 5 administration level of skipjack gill meal, and factor (B) was 3 gill processing methods. The chicks were divided into 15 groups treatments, each of which consisted of 3 cages as replication and each cage kept 5 individuals. Data obtained was analyzed using analysis of variance (Steel and Torrie, 1980).

Parameters measured for carcass quality were carcass percentage and abdominal fat percentage. All data generated were subjected to the analysis of variance technique according to factorial completely randomized design.

Tabel 2. Diets and nutrients in diets

Ingredients	Diets												
	K0	j1	j2	j3	j4	k1	k2	k3	k4	R1	R2	R3	R4
	%												
Corn	55.95	55.95	55.72	54.7	54.14	55.4	54.8	54.4	54.25	55.8	54.78	54.15	53.6
Rice bran	6	6	5.75	5.05	5.1	5.55	5.05	5	5	6.05	6.05	6	4
Soybean cake	17	17	17	17.8	17.25	17	17	17	17.5	16.5	17	17	18
Coconut cake	3	3	2.5	2.5	2.5	3	3	2.5	2	2.5	2.5	2.5	3
Fish meal	12	12	9.98	7.97	5.96	10	8.07	6.1	4.15	10.1	6.25	6.25	4.33
STGM sun-dried	0	0	3	6	9	0	0	0	0	0	0	0	0
STGM-steamed	0	0	0	0	0	3	6	9	12	0	0	0	0
STGM-boiled	0	0	0	0	0	0	0	0	0	3	9	9	12
Coconut oil	5	5	5	5	5	5	5	5	5	5	5	5	5
Grit	1	1	1	1	1	1	1	1	0.05	1	0.01	0.05	0.05
Top Mix	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Total	100	100	100	100	100	100	100	100	100	100	100	100	100
Nutrients:													
Protein (%)	22.41	22.26	22.42	22.1	22.04	22.3	22.2	22	22.17	22.1	22.18	22.13	22.4
ME (Kcal/kg)	3200	3204	3202	3201	3202	3202	3204	3204	3230	3202	3201	3213	3223
Ca(%)	1.3	1.48	1.66	1.84	2.03	1.49	1.67	1.86	1.76	1.51	1.71	1.62	1.82
P(%)	0.47	0.6	0.73	0.86	1	0.59	0.72	0.84	0.95	0.63	0.8	0.96	1.13

Notes: Jo= Control diet, J1=3% STGM sun-dried, J2= 6 % STGM sun-dried, J3= 9% STGM sun-dried, J4= 12 % STGM sun-dried, K1= 3% STGM-steamed, K2= 6 % STGM-steamed, K3= 9% STGM-steamed, K4= 12 % STGM steamed, R1= 3% STGM-boiled, R2= 6 % STGM-boiled, R3= 9% STGM boiled, R4= 12 % STGM-boiled.

RESULTS AND DISCUSSION

Carcass Percentage. The percentage of carcass based on the administration level and processing method of the skipjack gill meal is presented in Table 3.

Tabel 3. Effect og skipjack tuna gill meal on carcass quality of broilers

Variables	Processing Methods	administration level of the skipjack gill meal				
		R0	R1	R2	R3	R4
Carcass (%)	Sun-dried	74.56	73.40	74.30	74.07	73.59
	Steamed	74.19	74.03	74.18	74.31	74.44
	Boiled	74.39	72.11	72.87	73.16	74.01
Abdominal Fat (%)	Sun-dried	2.04	1.89	1.99	1.93	1.87
	Steamed	1.85	1.94	1.93	1.95	1.93
	Boiled	2.02	2.00	1.86	1.83	1.83

Result showed that the skipjack gill meal administration level and processing method interaction did not give significant effect ($P > 0.05$) on the carcass percentage of the broiler. Aliyani (2002) stated that weight of live of broiler was affected by feed consumption, feed quality, and activity of broiler. Carcass percentage values recorded in ranged 73.18 to 74.38% This result

agrees with Bell and Weaver (2002) that carcass of 1520 g/body weight is 65.5 %.Shanin and Abdul ElAzeem (2005) suggested that chicken carcasses fed with ahigh content of fiber, both with high or low protein contenthave the proportion of carcass weight with higher bone thanthe chickens fed with a low content of fiber, both with contenthigh or low protein.

Abdominal fat percentage. Abdominal fat percentage of the broilers based on administration level and processing method of skipjack gill during this study is given in Table 3. Result showed that gill meal administration level and processing method interaction, administration level, and processing method did not significantly affected (P>0.05) abdominal fat percentage of broilers. Average of abdominal fat percentage was in common range, 1.87 to 1.97%. North (1984) stated that the abdominal fat content of the broiler should not be higher than 4%. It reflected that the use of the administration level and the processing methods in this study produces the abdominal fat lower than 4 %, meaning that the abdominal fat of the broiler is the normal range.

In the fat developing process, the body fat is produced from carbohydrate, protein, food fat, after the carbohydrate is absorbed in glucose form and glycogenic glucose is changed to glucose and then transferred to the liver to be stored as glycogen, while some fat enters the circulatory system through lymphatic system and can directly stored in the tissue. Since each certain cell possesses the highest limit of protein storage, excessive amino acid will be degraded to be energy source and will stored as body fat. Non-significantly different abdominal fat could result from that the energy and protein content in the ration is the same despite similar energy consumption. Abdominal fat could also rise if high energy level is given (North and Bell, 1990). This study used the ration of 22% protein and metabolizable energy of 3200 Kcal/kg. Beside for major living need, the excessive energy is then stored in fat form occurring in the body cavity and attaching to the organs. Resnawati (2004) stated that the percent of abdominal fat at 5 weeks old ranged from 1.5 to 2.11%. The broilers used in the study had the same age and lived in the same environment. The skipjack (*Katsuwonus pelamis L*) gill waste through steaming processing method and administration of 12% as a replacement of anchovy meal protein in the ration gave good response to the percent of carcass weight and abdominal fat.

CONCLUSION

This study concluded that skipjack tuna gill meal can replace up to 12% of fish meal in broilerdiets without affecting carcass quality ofbroiler meat and it would be economically profitable toinclude STGM in feed mixtures for broiler production aspart of their balanced diet.

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