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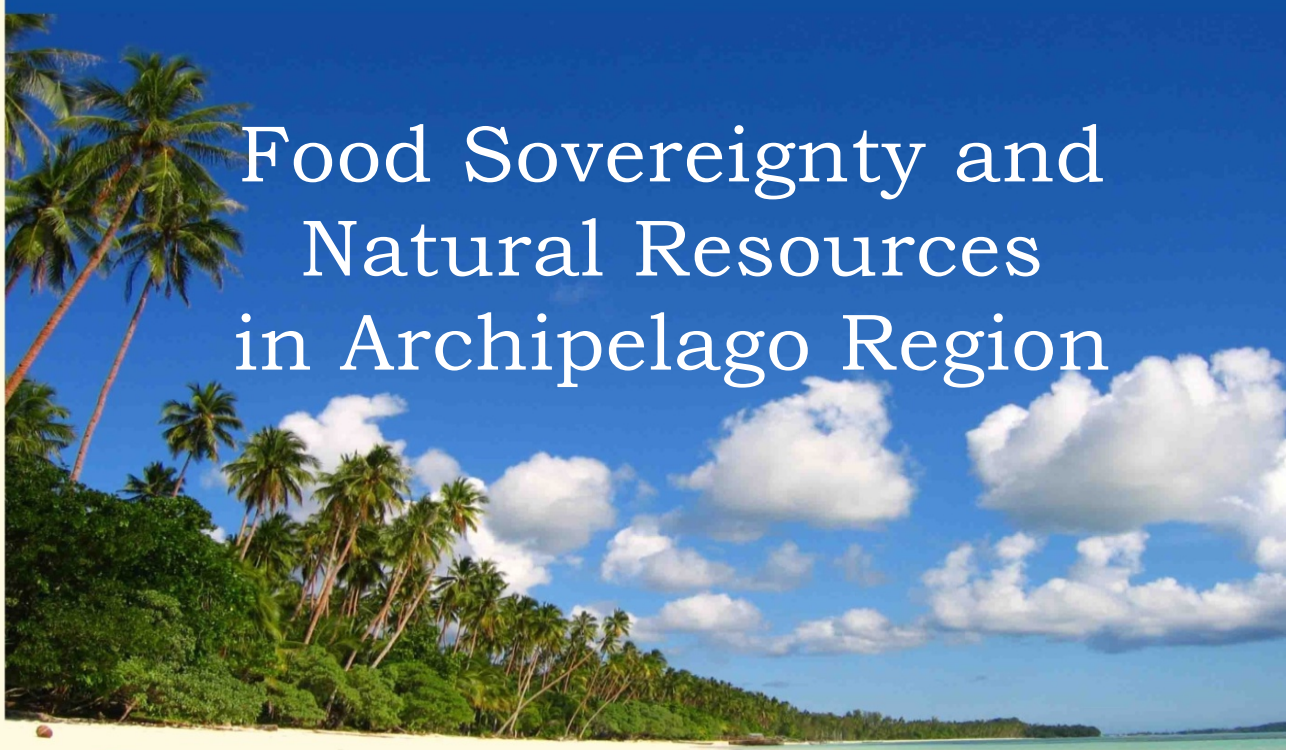

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STUDY OF RUBBER SEED MEAL (*Hevea brasiliensis*) AS FEED INGREDIENT FOR COMMON CARP FRY (*Cyprinus carpio* Linn) DIET

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Abstract

This research was conducted to study rubber seed meal (Hevea brasiliensis) as a candidate of plant protein source for common carp fry (Cyprinus carpio Linn) diet. Processed rubber seed meal (pRSM) and unprocessed (upRSM) were subjected to feed consumption. Completely randomized design with 4 treatments and 3 replicates were used in this experiment. Diet P_1 did not contain protein from pRSM. Diet P_2 and P_3 contained 50 and 75% protein from pRSM. Diet P_4 contained 50% protein from upRSM. Common carp fry measuring 2.19 ± 0.005 g was entered to 18 aquariums, 20 fish/aquarium and the feed testing diet at satiation lasted for 40 days of culture period. Diet P_1 showed the highest feed intake, which was 165.43 g and diet P_4 showed the lowest feed intake, which was 131.93 g. The result showed that common carp fry relatively digested pRSM better than upRSM. It is concluded that pRSM can be used as protein source up to 50% in common carp fry diet.

Keywords: *common carp fry, Cyprinus carpio L., rubber seed meal, processed, unprocessed.*

INTRODUCTION

Common carp *Cyprinus carpio* Linn is one type of freshwater fish and is cultivated a lot by farmers in Indonesia. Common carp's production data in 2005 were 216.920 tons and the number increased to 446.800 tons in 2009 from container cultivation in the fishponds, cages, reservoirs and rice fields (DKP 2009). In cultivating freshwater fish, the diet cost greatly affects the cost of production. The diet is the component that determines the technical coefficients of cultivation (feed efficiency the most, growth ratio and survival rate). The diet cost occupies the highest production cost among aquaculture activities, which is 70-89% out of total production cost (Suprayudi 2010).

The main protein source in the diet was fish meal and soybean meal. Protein of fish meal was 60-70% and has a good digestibility of 80-90% (Lovell 1989) and according to Halver (1972), soybean meal has a protein of 40 to 50.3%. Currently, the price of fish meal is increasing from US$ 1.200/tons to US$ 2.000/tons. In addition, the other feeding ingredients such as meat and bone meal have to realize the price (Indradjaja 2010).

The 2 to 2.5 times increase of feed ingredient price indirectly increases the price of the diet. But the price of farmed fish themselves, particularly freshwater fish, does not increase. Therefore, in order to benefit fish farmers, the price of diet need to be maintained and kept pressed and it is necessary to find local alternative feed ingredient with low prices, generous availability and does not compete with humans. The one candidate was rubber seed meal (RSM).

RSM comes from the most widely planted plant in Indonesia. Indonesia has the most extensive rubber plantations in the world, that is 3.3 million Ha (Apriyantono 2007). According to Hariyono (1996), 1 Ha of land can produce between 0.8 to 1.2 tons rubber seed per year. Thus, rubber seed production can be up to 2.7 to 4.1 million tons. In general, the utilization of vegetable protein had the law until 1-2 of essential amino acids.

The purpose of this research was examining processed rubber seed meal (pRSM) as the most important feed ingredient using local basic materials principle for common carp fry (*Cyprinus carpio* Linn) diet.

MATERIALS AND METHODS

Time and Place: This experiment was conducted from October until December 2010, located in Field and Teaching Farm Laboratory Faculty of Fisheries and Marine Sciences, Bogor Agriculture University.

Fish Tested: The fish tested were common carp fry *Cyprinus carpio* L. with the size 3-5 cm. 600 fish (more than the needed) tested measuring about 2.19 ± 0.005 g. The fish were Majalaya common carp spawn yielded in Field and Teaching Farm Laboratory Faculty of Fisheries and Marine Sciences, Bogor Agriculture University.

Preparation of Rubber Seeds Feed Ingredient: The feed basic material diet was 200 kg of rubber seed that comes from the village of Cottage Desk, District Mestong, Muara Jambi Regency, Jambi Province. After dehydrated, the rubber fruit seeds were solved and taken into further processed into becoming flour. The process of lipid reduction to 15% was done using hydraulic press and then the feed was extracted by soaking them in hexane solution for 1 day and 1 night.

Tabel 1. Chemical composition of upRSM and pRSM

Composition	Unprocessed RSM (upRSM)	Processed RSM (pRSM)
Protein (%)	21,87	33,82
Lipid (%)	49,30	15,07
Crude Fiber (%)	3,19	15,03
Ash (%)	3,14	5,06
Water (%)	1,50	11,00
BETN (%)	21,00	20,02

Source: Primary data are processed (2010)

Test Feed: This experiment used 4 treatments in the feed test: (1) Diet P_1 did not contain protein from pRSM. Diet P_2 and P_3 contained 50 and 75% protein from pRSM. Diet P_4 contained 50% protein from upRSM. Before the feed was made, the basic materials had to proximate and amino acid was analyzed using AOAC method.

Tabel 2. The treatment test feed (%)

Feed Ingredients	Treatments			
	P_1	P_2	P_3	P_4
Rubber Seed Meal	0	41.40	62.09	64.01
Oilcake	28.45	10.20	3.00	28.00
Soy Bean Meal Oilcake	67.25	44.10	30.61	3.69
Other Vegetable Ingredient	4.30	4.30	4.30	4.30
Premix				
Total	**100**	**100**	**100**	**100**
Cyanide	0	0.45	0.67	1.16
Proximate Analisys				
Water	4.72	5.00	5.11	3.37
Protein	31.82	30.84	30.80	29.58
Lipid	8.12	10.82	11.86	31.90
Ash	7.75	7.30	7.43	6.34
Crude fiber	6.58	8.63	9.55	4.37
BETN	41.01	37.41	35.25	24.44
Total	**100**	**100**	**100**	**100**

Note: Energy of protein, fat and carbohydrate respectively 5.6, 9.4 and 4.1 kcal.

Experimental Design: This experiment used 4 treatments and 3 replications in completely randomized design.

Fish Culture: The culture used were 18 aquarium units measuring 50x40x30 cm with water volume of 40 L/aquarium and stocking density of 20 fish/aquarium. The frequency of feed given at satiation was 3 times a day, at 7.00 am, 12.00 am and 17.00 pm for 40 days culture period. The amount of feed given was calculated by weighing the feed in the morning and the remaining feed in the afternoon. To maintain water quality, we had to take the faeces in the morning and evening. During the culture period, the value of water quality including water temperature ranged between 26-27^{o}C, pH 7, dissolved oxygen 4.75 to 4.95 mg/L and ammonia-N (NH3-N) from 0.93 to 1.34 mg/L.

Evaluated Parameters: The parameters evaluated included feed intake and feed efficiency.

Chemical Analysis: The water content was measured by the method of heating in the oven (105-110^{o}C) for 4 hours. Proteins were analyzed by Kjedahl method, lipid were analyzed by extraction method using a Soxlet, ash by heating in a furnace (400-600^{o}C), crude fiber measured by solubility in acid and strong base and heating. Amino acids were measured according to AOAC (1984).

Statistic Analysis: Data were analyzed using Analysis of Variance (ANOVA) followed by Duncan's test with 95% confidence interval (α = 0.05) used in SAS program (Mattjik and Sumertajaya 2006).

RESULTS

Growth performance test data on common carp fry are shown in Table 3. The highest value of feed intake was from of P_1 treatment which was 165.43 g and the lowest was in P_4 treatment which was 131.93 g. The feed efficiency value of P_1 and P_2 treatment were not significantly different ($p > 0.05$) ranged from 81.72% to 84.57% and the lowest score was from the P_4 treatment which was 65.24%.

Table 3. Feed intake and feed efficiency on common carp fry

Parameters	Treatments			
	P_1	P_2	P_3	P_4
Feed intake (g)	165,43±0,34^{a}	163,54±0,25^{a}	157,50±0,17^{b}	131,93±0,46^{c}
Feed efficiency (%)	81,72±3,88^{a}	84,57±0,44^{a}	67,62±2,80^{b}	65,24±1,53^{b}

Note: Values listed are mean ± standard deviation. The letter behind a different standard deviations in the same row indicate significant differences ($p < 0.05$).

DISCCUSION

The difference of total feed intake in every treatment showed the differences in feed palatability. Palatability or feed response was influenced by several factors that feed condition covered such as form, size, color, taste and aroma. Palatability is also closely related to attractiveness which is caused by free amino acids which will in turn affect the intake (acceptability) of several amino acids (taurine, glycine, argynine, alanine), betaine, nucleotides, and organic acids (Guillaume *et al*. 2001; Grey *et al.* 2009) for using enhanced protein as an energy source and finally increasing feed protein efficiency (Hara 1993).

Table 4. Constituent amino acids in the fish body and feed treatment (%)

Asam Amino	Fish Bofy*	Treatments			
		P_1	P_2	P_3	P_4
Histidine	0,80	0,66	0,58	0,58	0,45
Arginine	1,60	1,68	1,64	1,68	1,26
Threonine	1,50	0,59	0,48	0,51	0,45
Valine	1,40	1,09	0,75	0,99	0,73
Metionine	1,20	1,25	1,26	1,30	0,91
Isoleusine	0,90	0,86	0,58	0,75	0,52
Leusine	1,30	2,87	2,32	2,50	2,27
Fenilalanine	2,50	1,39	1,33	1,40	1,19
Lisine	2,20	1,79	1,81	1,85	1,78

Source: Primary data are processed (2010)
* Wilson dan Cowel (1985)

Essential amino acids for growth are the raw material for forming enzymes, hormones and antioxidants. Imbalance amino acid in the diets will result in stunted growth. According to Tilman et al. (1998), the amino acid methionine is an essential amino acid required and the main barrier for growth, tissue metabolism and reproduction. The lack of the amino acid methionine in the diet resulted in a decrease in the diets consumption. The low methionine amino acid had an effect on the availability of the amino acid cysteine because the amino acid methionine was required to provide sulfur for the synthesis of cysteine. The lack of these amino acids also caused a decrease in the acceptability and palatability of the feed fish (Halver 1989; Kissil et al. 2000). Certain nutrition retention in fish body during specified period was usually used to evaluate availability and sour balance amino and the availability of several other essensial nutrient elements.

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pRSM could be digested better than upRSM. The results showed that the pRSM could replace soybean meal flour as a major source of

vegetable protein and could be used up to 50% of the total protein diet on common carp (*Cyprinus carpio* Linn) fry.

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