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Effects of Feeding Fermented Sago Dregs (*Metroxylon* Sp) With Addition of Critical Amino Acid on Blood Cholesterol and Egg Cholesterol Levels of Layers

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ABSTRACT

Aim of the research was to investigate the effects of feeding fermented sago dregs with the addition of critical amino acid in Lemuru fish oil base-diet on the levels of blood cholesterol level and egg cholesterol. Research design used was completely randomized design. Fifty layers were distributed into five treatments groups. The treatments were five different levels of fermented sago dregs on diet (0%, 7.5%, and 10% plus 5% and 10% of critical amino acid on diet). The research was conducted for 8 weeks, located in Commercial Zone Animal Laboratory, Animal Science Department, Faculty of Agriculture, University of Bengkulu. The collected data were analyzed by using analysis of variance; any significant differences would be further tested by using Duncan Multiple Range Test (DMRT). Results showed that feeding fermented sago dregs with the addition of critical amino acid in Lemuru fish oil base-diet had a highly significant effect ($P<0.01$) on blood cholesterol level of layers. Moreover, it decreased layers' blood cholesterol level up to 39.94%. Similarly, it also highly significantly affected Low Density Lipoprotein (LDL) level and egg cholesterol level ($P<0.01$). In conclusion, feeding fermented sago dregs with the addition of critical amino acid very significantly affected blood cholesterol level, triglyserid, blood LDL and egg cholesterol level; however, it did not significantly affect blood HDL level in layers.

Key words : fermented sago dregs, layers, blood cholesterol, egg cholesterol, LDL, HDL, triglyseride.

II. Introduction

Sago dregs are highly potential sago processing waste products. According to Haryanto and Philipus (1992), there is an 851.260 hectare sago plantation in Indonesia, with five thousand tons sago dregs out of 210 thousand tons are produced every year. The abundance of sago dregs has not been widely utilized as poultry diet; as its high level of crude fibre and low nutrition content. Yusmi (1987) mentioned that sago dregs can be used as broiler's diet up to 17% because of its crude protein content (3.29%) and high crude fibre content (18.5%). Other nutritional values show that it has a reasonably high non-nitrogenous extracts (72.59%); which is a good energy source of poultry, 0.07% of crude fat content and 4.65% ash.

Fermentation technology is an alternative method in processing food as it is able to increase nutritional value of food (Winarno *et al.*, 1980). Moreover, Refinita (1990) revealed that fermentation process produces variety of enzymes and is able to alter pH level, as well as the food odour and taste. Wahmadi (1989) mentioned that fermentation prolongs time storage and a better odour and taste than its fresh products.

Aspergillus niger is an aerobic yeast which produces several enzymes such as amylase, gluco-amylase, cellulose, endoglucose, gluco-oxydase pectinase, pectinesterase, pectinliase and polygalacturonnase. A solid substrate fermentation using Aspergilus niger decreases crude fibre content because there are enzymes in cellulose. A decrease in crude fibre content could increase digestibility. Fermentation is also able to increase protein level of food.

In order to increase chemical characteristics quality of poultry products; most importantly its unsaturated fatty acid and cholesterol level, fish oil is a solution. It is evident that feeding Lemuru fish oil is able to increase meat fatty acid content such EFA and DHA (Fenita, 2002; Fenita, 2005; Supadmo 1997) as well as omega 3content of yolk (Scheider and Froning, 1996; Meluzi *et al.*, 1997; Sudibya, 1998; Baucells *et al.*, 2000; Gonzales and Leeson, 2000; Fenita, 2005).

Nutritional values of fermented sago dregs are 10.56% of crude protein, 12.7% of crude protein, 67.47% of non-nitrogenous extracts, 0.45% of calcium and 0.26% of P (Nuraini *et al.*, 2002). A study on local chicken shows that feeding 15% of fermented sago dregs did not decrease feed consumption, weight gain, live body weight and carcass percentage (Rizal *et al.*, 2005). However, Biyatmoko (2002) found that feeding 7.5% of fermented sago dregs are the optimum level to reach the highest weight gain. The fermented sago dregs are not widely utilized for its low level of critical amino acid such as metionin and lysine. Amino acid contents of fermented sago dregs are metionin 0.42%, lysine 0.40%, arginin 0.40%, isoleusin 0.28%, valin 0.36%, histidin 0.42%, and treonin 0.30% (Nuraini et al., 2002). Rizal *et al.* (2005) and Biyatmoko (2002) mentioned that feeding metionin and lysine have been

nutritional values of fermented sago dregs; however, the production performance.

Based on the background literature, the present study was aimed to the effects of feeding fermented sago dregs (Metroxylon sp) with amino acid in Lemuru fish oil (*Sardinella longiceps*) cholesterol, blood triglycerides, low density lipoprotein (HDL) and egg cholesterol level of layers.

2. Materials and methods

Research design used was completely randomized design. Fifty layers five treatments groups. The treatments were five different sago dregs on diet (0%, 7.5%, and 10% plus 50% and 100% amino acid on diet). The research was conducted for 8 weeks, Commercial Zone Animal Laboratory, Animal Science Department, Agriculture, University of Bengkulu. Blood samples were collected treatment group. The collected data were analyzed by using analysis any significant differences would be further tested by using Multiple Range Test (DMRT).

The making of sago dregs

A trunk of suckering palm (*Metroxylon* sp) is peeled just before the appearance of its terminal inflorescence. Its carbohydrate content is then at its highest level in order to produce seeds. The marrow of the stem is laboriously chopped out as finely as possible and its starch then separated from the cellulose.

The cellulose (dreg) is then sun dried for approximately three days which is filtered to obtain the finest cellulose. Aspergillus niger and fine sago dregs (*Metroxylon sp*) are soaked into 50ml water and covered with fiber glass to be fermented for three days

2.2.1 Experimental diet

The experimental diet was based on iso-energy and iso-protein (17% of protein and ± 2800kcal/k of energy. The materials are listed on table 1.

The materials of the experimental diet.

	ME (kcal/kg)	CP (%)	CF (%)	Fat (%)	Ca (%)	P (%)	Lyn (mg)	Meth (mg)	Trip (mg)
	2903.6	10.56	12.75	0	0.45	0.26	0	0	0
	1630	12	12	13	0.11	1.2	0.26	0.59	0.12
	3430	8.7	2	3.9	0.02	0.3	0.26	0.20	0.06
	2800	31.67	9.83	6.37	10.87	1.28	3.18	1.08	0.49
	0	0	0	0	3.8	0	3	3	0
	0	0	0	0	32.5	10	0	0	0
	8400	0	0	0	0	0	0	0	0

Chemical analysis of IPB laboratory (2006), c: Nuraini (2002), d: concentrate lable, e: Top mix lable, f: mineral mix lable.

Different Levels of Fermented Sago Dregs (*Metroxylon* sp) and Amino Acid Plus Lemuru Fish Oil (*Sardinella longiceps*).

Treatment groups	Fermented sago dregs	Amino acid (AA)	Lemuru Fish Oil
Control (P0)	0	0	0
Diet 1 (P1)	7.5	50% X AA control	3%
Diet 2 (P2)	7.5	100% X AA control	3%
Diet 3 (P3)	10	50% X AA control	3%
Diet 4 (P4)	10	100% X AA control	3%

Nutritional Composition and Contents of the Experimental Diet

Diet	P0	P1	P2	P3	P4
Fermented sago dregs	0	7.5	7.5	10	10
Rice bran	10	4	4	4	4
Corn	47.5	43	43	43	43
Layer concentrate	37.5	37.5	37.5	37.5	37.5
Topmix	2	2	2	2	2
Mineral mix	3	3	3	3	3
Lemuru fish Oil	0	3	3	3	3
Total	**100**	**100**	**100**	**100**	**100**
Nutrient content (%)					
Crude Protein (%)	17.21	16.89	16.89	16.94	16.94
ME (Kcal/kg)	2842.25	2807.87	2807.87	2794.71	2794.71
Ca (%)	5.84	5.98	5.98	6.25	6.25
P (%)	5.15	5.17	5.17	5.18	5.18
Lysin (%)	1.04	0.98	0.98	0.98	0.98
Methionin (%)	0.56	0.61	0.61	0.61	0.61
Triptopan (%)	0.22	0.21	0.21	0.21	0.21

Addition of Amino Acid (50% and 100%) on diet

	P0	P1	P2	P3	P4
	809	1213.5	1618	1213.5	1618
	501	751.5	1002	751.5	1002
	181	271.5	362	271.5	362

Bill and William (2002)

Amino Acid Supplementation (chicken/day)

	Recommended	P0	P1	P2	P3	P4
	809	633.75	1037.91	1442.41	10337.48	1441.08
	501	431.13	675.74	926.24	675.05	925.05
	181	152.97	244.71	335.21	244.89	335.09

Quantities observed were blood cholesterol level, blood triglyceride, LDL, HDL and egg cholesterol.

Results and Discussion

Results showed that feeding fermented Sago dregs (Metroxylon sp) with the addition of critical amino acid had highly significant effects on blood cholesterol ($P<0.01$); which is decreasing very significantly ; DMRT analysis showed that P0 was not significantly different from P1, P2, and P3 ($P>0.01$); however, it was highly significantly different from P4 ($P<0.01$) which was 123.625 for P0 and 92.945 for P4.

Fenita (2005) mentioned that a high level of blood cholesterol is correlating to deposit fat accumulation which results in fat and ester deposit on arterial wall. Control group is found to have a higher blood cholesterol than P4 treatment group.

A decrease in blood cholesterol was because of feeding Lemuru fish oil (*Sardinella longiceps*) which is rich of unsaturated fatty acid and having Omega 3 (Sudibia, 2003). A similar finding is reported by Abidin (Fenita 2005) that feeding Lemuru fish oil (*Sardinella longisceps*) and a variety of fish oil has resulted in an increase in meat omega 3 which is beneficial to decrease blood cholesterol and triglyceride.

Table 6. Effects of feeding fermented sago dregs (*Metroxylon sp*) and critical amino acid plus Lemuru fish oil (*Sardinella longiceps*) on blood cholesterol, triglyceride, HDL, LDL and egg cholesterol.

Treatments	Blood cholesterol	Triglyceride	HDL	LDL	Egg cholesterol
P0	123.63 ^{a}	113.76^{a}	36.34^{c}	64.53 ^{a}	135.82 ^{a}
P1	111.49^{a}	106.90^{ab}	36.91 ^{ab}	53.19 ^{ab}	124.13 ^{ab}
P2	109.47^{a}	97.33^{ab}	38.38 ^{ab}	51.63 ^{ab}	114.58 ^{ab}
P3	107.55^{a}	98.76^{ab}	38.77 ^{a}	49.03 ^{b}	112.02 ^{ab}
P4	92.94^{b}	89.10^{b}	39.97 ^{a}	35.15 ^{c}	106.28 ^{c}

fermented sago dregs +1.5 X recommended amino acid + 3% Lemuru fish oil , P2 : 7.5% fermented sago dregs +2 X recommended amino acid + 3% Lemuru fish oil , P3 : 10% fermented sago dregs +1.5 X recommended amino acid + 3% Lemuru fish oil , P4 : 10% fermented sago dregs +2 X recommended amino acid + 3% Lemuru fish oil. Bars with different letters indicate the group mean is significantly different (P<0.05).

A measurement on blood triglyceride showed that the there was a significant difference between control and treated groups. A DMRT test showed that feeding fermented sago dregs (*Metroxylon sp*) and critical amino acid on diet did not significantly different between P0 and P1, P2 and P3; however, there was a significant different between P0, P4 treatment group. Sukamto (2005) revelad that Lemuru fish oil (*Sardinella longiceps*) has Omega 3 content that is beneficial to decrease cholesterol level and blood triglyceride. It is concluded from this research that feeding Lemuru fish oil (*Sardinella longiceps*) is able to decrease cholesterol level.

It is evident that an increase in fermented sago dregs (*Maetroxylon* sp) level with addition of critical amino acid plus Lemuru fish oil (*Sardinella longiceps*) had a positive effect on HDL level which is decreasing it.

A DMRT test showed that feeding fermented sago dregs (*Metroxylon sp*) and critical amino acid on diet did not significantly different between P0 and P1; however, there was a significant different between P0, P1 and P2, P3 and P4 treatment groups. In general, feeding 10% of fermented sago dregs (*Metroxylon* sp) and 100% critical amino acid increased blood HDL of layers.

Analysis of variance of the collected data showed that feeding fermented sago dregs (*Metroxylon* sp) with addition of critical amino acid on Lemuru fish oil (*sardinella Longiceps*) base-diet had a significant effect on blood LDL of layers. Further statistics analysis showed that P4 was significantly different from P1, P2 and P3 (P<0.01); however, it had a lower level of LDL than P0. Blood LDL decreased as the level of fermented sago dregs (*Metroxylon sp*), critical amino acid and Lemuru fish oil (*Sardinella longiceps*) increased. A supporting result is reported by Fenita (2002) : Fenita (2005). He found that omega 3 of fish oil decreases biochemical parameters as risk factors of aterosklerosis such as cholesterol, LDL and triglyceride. Lemuru fish oil (*Sardinella longiceps*) is an important supplement to decrease blood LDL level of layers.

Egg cholesterol of layers on P4 treatment group was significantly different from P1, P2, and P3 (P<0.01); however, it had a lower egg cholesterol level than P4.

4. Conclusion

In conclusion, the higher level of fermented sago dregs (*Metroxylon sp*), critical amino acid and Lemuru fish oil (*Sardinella longiceps*) may decrease egg cholesterol of layers; therefore, feeding fermeneted sago dregs

critical amino acid and Lemuru fish oil (*Sardinella longiceps*) result in a production of non-cholesterol eggs.

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