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Original Article

Effect of Dietary Levels of High Pressure Steam Native *Lablab purpureus* (L) sweet on Broiler Performance

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ABSTRACT

Lablab purpureus (L) sweet was origin planted on east java province, Indonesia. The native name is komak beans. It has high protein (30% -33%), but the inclusion is limited caused by anti-nutrition factors such as tannin, phytic acid, and anti-trypsin. Anti-nutrition substances interfere with metabolism and protein synthesis in intestinal tract. Komak beans were processed with high pressure steam (2 atm; 121 ^{0}C; 20 min) and called Komak Beans Meal (KBM). This study focused on replacing Soybeans Meal (SBM) based diet using uplift level until totally replaced with KBM. The study designated for 100 birds one-day old Cobb strain. Raising period was 5 weeks. The treatments were: Control (Basal diet); 25 % KBM replacement; 50 % KBM replacement; 75 % KBM replacement and 100 % KBM replacement. Data were analyzed using analysis of variance (ANOVA). The results showed that 25% KBM replacement was not significantly different with control and could increase 1.04 % feed consumption; 1.23 % body weights gain, 0.97 % production index and decreased feed conversion rate (0.73 %). High pressure steam KBM process had been effective in decreasing anti-nutrition effect and didn't cause abnormalities on broiler production performance. It could improve the broiler production performance at level of 25% KBM inclusion replacement.

Keywords: Komak beans, Broiler, Performances

INTRODUCTION

Komak Beans Meal (*Lablab purpureus* (L.) Sweet) is an originate plant that growth in tropical and Asian regions, this bean classificated on Leguminosae ordo, Dicotyledonae subclass, Fabaceae family, Dolichos genus (Biswas, 2012). According to Venkatachalam *et al.* (2002) the rank of nutritional value KBM was third after peanuts and soybeans. Proximate value of KBM especially on fat and fiber was lower than other beans which are widely grown in Indonesia. When it compared with SBM, the komak beans productivity was ranged (1.5 to 4 tons/hectare) higher than the average soybean production (1.3 tons/hectare).

Sri (2009) stated amino acid deficiency KBM is methionine and cystine, but lysine and tryptophan relatively high. Fiber composition is dominated by insoluble fiber, which accounted for 93-97% of the total fiber. In addition, Rika (2009) stated anti-nutrition which studied on KBM are trypsin inhibitor, phytic acid and tannins.

According to Bishoi and Khetarpaul (1994) findings water soaking within 12 hours could reduce the content of anti-nutritional substances such as saponin and trypsin inhibitor in peas, respectively 8.01% and 3.73% reduction. Also Steaming by using an autoclave (high pressure steam) for 20 minutes on the cottonseed could reduce anti-nutritional substances and tannins gossipol respectively 29.17% and 28.68% reduction. Overall physical (water soaking, grinding and cooking) process reported unaffected on amino acid content (Yu *et al.*, 1996). Abeke and Otu (2008) reported autoclaving is an effective way to processing wheat seeds and for reducing the content of anti-nutrition.

Jajat *et al.*, (2011)SBM appearance in Indonesia feed industry very depend on world market, mostly SBM is imported from South America, which mean very costly when supply restricted and demand uplift. The alternative way is elaborate the potential of native bean to reduce or replace SBM inclusion. KBM was very potential because the appearance and growing by Indonesian farmers. In term of wide range of processing expected to decrease anti-nutrition and toxins contained in KBM, therefore an effort is to detoxify anti-nutrients in KBM in this study by high pressure steaming process.

An effort of present study was to detoxify toxins in KBM by high pressure steaming process. The purpose of this study was to prove the effectiveness of processed KBM inclusion on broiler performance.

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MATERIALS AND METHODS

Feed Preparation

The processing of KBM begin with a water soaking for 1 hour, followed by autoclaving (heating with steam pressure of 2 atmosphere (atm) or 14,7 Psi (pound per square inch) at temperature of 121 ^{0}C for 20 minutes) and then dried in an oven at 60 ^{0}C for 24 hours. komak beans turning to the ground form by grinding process. Table 1 refer to SBM; Komak bean; and KBM comparison. Komak bean after processed into KBM was showed improvement on anti-nutrition content (Tannins, Phytic acid and anti-trypsin), which not higher as before. KBM nutrient also closely SBM in term of proximate analysis (Gross energy, Crude Protein, Crude Lipid, Crude Fiber and Ash). Calsium (Ca) and Phosfor (P) was higher than SBM.

Birds

One hundred broilers were rising from 1 day old chick until 35 days. The strain was unsexed Cobb. Average weight of DOC was 37.90 $\pm$ 2.56 g and the coefficient of variability was 8 %.

Research Design

The experiment had 5 treatments and 4 replicates. Birds were divided into 20 cages, 5 Birds per cage. The treatments consists of 5 levels of SBM substitution by KBM (0 %; 25 %; 50 %; 75 %; and 100 %). bamboo cages was used for plots, The size of a cage was 1m length x 1m wide x 1m height. Litter used was from rice hulls. Each plot has feeder and water fount and lamp. Feeding method was ad-libitum. Vaccination was carried out at 2 times in raising period, ND B1 on 4 days age through eye drops and ND Lasota on 21 days age through drinking water.

The treatments were divided into 4 level SBM replacement: LB0 : control (basal diet); LB25 = 25 % KBM replacement (replace SBM); LB50 = 50 % KBM replacement (replace SBM); LB75 = 75 % KBM (replace SBM); LB100 = 100 % KBM (replace SBM).

Table 2 refers to the composition of experimental diets, which explain the replacement level on research design. Table 3 refers to proximate analysis difference among treatment. Proximate analysis on raw material and experimental diets was based on Association of Official Analytical Chemists method (Cunnif, 1995).

Research Variables

The variables of present study were the appearance of the broiler production which include: Feed Intake (FI) (g/birds), Body Weight Gain (BWG) (g/birds), Feed Conversion Rate (FCR), Index Production Score (IPS), Carcass Weight (CW) (g/birds) and Income Over Feed Cost (IOFC) (IDR).

Table 1. Comparison of KBM and SBM nutrient

Composition	Unit	SBM	Komak bean	KBM
Gross Energy	(Kkal/kg)	2150	-	2473
Crude Protein	(%)	44	-	41,88
Crude Lipid	(%)	0,98	-	1,5
Crude Fiber	(%)	6	-	2,4
Ash	(%)	5,74	-	4,3
Ca	(%)	0,29	-	0,51
P	(%)	0,65	-	0,64
Tannins	(%)	0	0,086	0,056
Phytic Acid	(%)	1,5	0,5	0,36
Anti-trypsin	mg/100g	3,9	18,45	3

Source: Analyze by Life Science Laboratory, State University of Surabaya, Indonesia.

Table 2. The composition of experimental diets (35 days)

Composition \ Treatment	LB0 (0%)	LB25 (25%)	LB50 (50%)	LB75 (75%)	LB100 (100%)
Corn (%)	60	60	60	60	60
SBM (%)	20	15	10	5	0
Fish Meal (%)	6	6	6	6	6
CG(%)	10,4	10,4	10,4	10,4	10,4
CPO (%)	1,6	1,6	1,6	1,6	1,6
Premix (%)	0,6	0,6	0,6	0,6	0,6
Mineral (%)	1,2	1,2	1,2	1,2	1,2
DL Metionin (%)	0,2	0,2	0,2	0,2	0,2
KBM (%)	0	5	10	15	20
Total	100	100	100	100	100

Table 3. Proximate analysis of broiler chicken diets

Composition \ Treatment	LB0 (0%)	LB25 (25%)	LB50 (50%)	LB75 (75%)	LB100 (100%)
Gross Energy (Kkal/Kg)	4177	4270	4512	4195	4176
Dry Matter (%)	84,48	84,51	83,88	83,9	84,29
Ash (%)	6,99	6,29	5,86	5,42	6,14
Crude Protein (%)	30,32	28,53	27,55	25,86	25,9
Crude Fat (%)	4,29	4,24	4,19	4,14	4,09
Crude Fibre (%)	3,52	3,88	4,35	4,59	5,28

Statistical Analysis

Data were analyzed with ANOVA (Steel and Torrie, 1992). The research design used completely randomized design. Differences among treatment were tested using Duncan's multiple comparison test and statistical significance was declared at P<0.05 and P<0.01.

RESULTS

The results of present study showed in table 4. S tatistical analysis showed that the use of KBM on all ov er rate of inclusion levels had a very significant effect (p<0.05) on FI; BWG; FCR; CW; IPS and IOFC. The cl ose result in term of SBM performance output on statist ically results was 25 % inclusion level of KBM. The de crease in FI during study was occurred on above 25% o f KBM replacement level. FI decreasing compared with control was in LB50 (-5.42%); LB75 (- 5.53%) and LB 100 (-6.12%), negative means lower than control. Lowe r FI could affect the nutrient absorption. It's figure on t he BWG (p<0.05); FCR (p<0.05); CW (p<0.05); IPS (p <0.05) and IOFC (p<0.05).

DISCUSSION

FI had a opposite result with the level KBM replacement in diets, it is because of KBM has anti-nutrition. Wahyu (2008) stated a symptom seen due to the presence of tannins is slow growth, poor appetite due to the bitter taste of tannin. Added by Santono *et al*. (2001) tannins in the diet can lead to a sense of less palatable, it's caused by the interaction of tannins with salivary proteins and glycoproteins in the mouth that will affect feed intake. According to Kumar *et al*. (2005) high levels of tannins are considered to have an adverse effect on the nutritional value and can be toxic to the liver, because the tannins can bind to the protein, specific amino acids, and minerals phosphorus, causing a decrease in feed intake. Takuo Okuda and Hideyuki Ito (2011) states that the characteristic tannins properties to precipitate proteins and tannins also have mode of action that construct a strong bond with protein cross-linking generates molecules. Tannins will be binding protein feed in the digestive tract and cause the feed to be difficult digested by digestive indigenous enzymes.

Laihad (2000) stated FCR was influenced by the quality of the feed and broilers ability to change feed into meat because the less amount of feed needed to produce weight gain in a given period of time. Added by Ravindran *et al*. (2006) the tannins appearance in ration could be reduce dry matter intake, decreased body weight gain, feed efficiency and protein digestibility. The ability of tannins to binding protein in the intestine causes a decrease in the digestibility and mal-absorption of protein.

Low FI resulted in body weight gain due to reduced nutrient intake, especially energy and protein (Leeson and Summers, 2005). Tannins could be able to reducing the value of nitrogen utilization, poor nitrogen utilization on intestinal tract means less protein absorption, conduct in line with result of poor body weight and light CW (Tangendjaja *et al*., 1992).

In term of poor FI and lower BWG is a factor that causes the IOFC, the results of this study indicated that the use KBM as ingredients on feed at a level of 25% will provide in line advantage compared with SBM based (control).

IPS result compared with control diet (LB0) was decreasing, but in level of 25 % KBM replacement still close enough with control diet. IPS is a tool to describe about the efficient based value of production because calculate FCR, initial boy weight and mortality (Fadillan, 2005).

Table 4. Effect of KBM replacement in diet on broiler performance

Parameter	Unit	Level				
		LB0 (control)	LB25 (25 % KBM)	LB50 (50 % KBM)	LB75 (75 % KBM)	LB100 (100 % KBM)
FI	g/birds	2440^a	2465^a	2308^b	2305^b	2290^b
BWG	g/birds	1447^a	1464^a	1246^b	1210^b	1211^b
FCR		$1,69^a$	$1,68^a$	$1,85^b$	$1,91^b$	$1,91^b$
CW	g/birds	1001^c	953^b	832^a	855^a	829^a
IPS		246^b	248^b	193^a	189^a	172^a
IOFC	IDR/birds	5527^c	4356^b	3203^a	3161^a	3113^a

Attn: Means with different superscript in line are very significantly different (P<0.05).

CONCLUSION

Processed komak beans into KBM with high pressure steam was successful decreased anti-nutrition content. The use of KBM as alternative ingredients to substitute SBM on inclusion in broiler feed at 25% usage level showed the best result, improve the appearance of broiler production which include feed intake, body weight gain, FCR, carcass weight, IOFC and the Index of Production.

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