JWPR
Journal of World's Poultry Research

J. World's Poult. Res. 4(3): 60-63, 2014

Original Article

Evaluation Protein Digestibility, Metabolic Energy of Autoclaved Komak Beans (*Lablab purpureus L sweet*) on Broiler

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Received: Jul 26 2014
Accepted: Aug 29 2014

ABSTRACT

This research was aimed to evaluate protein digestibility and metabolic energy of autoclaved komak beans on broilers. The material used consisted of basal feed, komak bean, local soybean, imported soybean, twenty thirty-seven-day broilers, and metabolic henhouse. The methods in the research implemented completely randomized design with five treatments and four replications (Lablab Purpureus or LP0: basal diet; LP1: 15% local soybean; LP2: 15% imported soybean; LP3: 15% komak beans; LP4: 15% autoclaved of komak beans). The variables observed in this research were the protein digestibility, Nitrogen retention, Apparent Metabolic Energy, and Apparent Metabolic Energy corrected Nitrogen. The results showed that protein digestibility, nitrogen retention, AME and AMEN of autoclaved komak beans were not significant (P>0.05) on 37 days old broilers. It concluded that the protein digestibility, nitrogen retention, AME and AMEn in autoclaved komak beans had the same effectiveness as soybean.

Key words: Autoclave, Broiler, *Lablab purpureus*, Metabolic Energy, Protein Digestibility

INTRODUCTION

The use of soybean meal as a protein source feed ingredients in poultry feed industry still can not be replaced with other feed ingredients because it has a high protein content. Soybean meal accounted for 25-50% of feed protein needs, in its use as a broiler feed formulation was 10-18% of the total broiler feed formulation. Based on Standard National Indonesia (1996), which is 40-46%, whereas the use of soybean meal as feed ingredients have several problems were related to the availability and price of soybean meal. In terms of availability, soybean meal up to now still dependent import of poultry farms so that business activities cannot be separated from imported feed ingredients, thus will result in deterioration of poultry farm, because the price of meal soybean imports depends on the dollar exchange rate fluctuations (Haliza *et al*., 2010).

Based on the existing constraints, it was necessary to feed a raw material alternative protein sources. Komak beans (*Lablab purpureus L sweet*) was one of the original Indonesian local feed material that have the potential to replace the use of soybean meal as a protein source of feed material. Productivity of komak beans is higher than soybeans, which range from 1.5-4 tons in a hectare, while the average for soybean production is only 1.3 tons in a hectare (Suharjanto, 2010). Protein content ranged from 22.4 to 31.3%, fat content 1% and carbohydrate content of 46 to 63.3% as well as contain of anti-nutrient which includes tannins, phytic acid and trypsin inhibitor and study of (Osman, 2007).

Osman (2007) reported that processing can reduce the anti-nutrient content of komak bean. Frying can reduce the phytic acid content 60.69%, Autoclave (52.29%); germination (48.94%); steaming (44.85%) and soaking (21.19%). Boiling can reduce the phytic acid content (2.8%) (Ramakrishna, 2008).

Yulia (2005) reported that the activity of trypsin inhibitor be lost on heating at a temperature of 120 °C for 20 minutes in an autoclave. The heating was accompanied by pressure to break ties and reduce the content of trypsine inhibitors to the grain by 86-88% (Ramakrishna, 2008).

Based on the above explanation, it can be said that komak bean (*Lablab purpureus L sweet*) have potential as an alternative source of protein feed ingredients for broilers (Osman, 2007). Processing can reduce the anti-nutrient content of komak bean, so it was necessary to evaluate protein digestibility, metabolic energy of autoclaved komak beans (*Lablab purpureus L sweet*) on broiler.

MATERIAL AND METHODS

Feed Processing

Komak beans processed by soaked with a water for 1 hour then autoclaved with pressure 2 atmosphere (ATM) or 14,7 Psi (Pound per square inch) at temperature 121 $^{\circ C}$ for 20 minutes and then dried at 60 $^{\circ C}$ with the oven for 24 hours.

To cite this paper: Ayuning Tyas DW, Sjofjan O and Eka Radiati L. 2014. Evaluation Protein Digestibility, Metabolic Energy of Autoclaved Komak Beans (*Lablab purpureus L sweet*) on Broiler. *J. World's Poult. Res.* 4(3): 60-63.
Journal homepage: http://jwpr.science-line.com/

Livestock and material

The research used of 20 broilers at aged 37 days. Broilers maintained in metabolic cages to feeding according to the study treatment. Broilers were placed in forty metabolic cages where each cage contained one broiler, separated by single metabolic cages to separate between treatments.

Research design

The experimental was a Completely Randomized Design (CRD) with 5 treatments and 4 replications, where each replication contained one broiler. The treatments consist of Basal diet (LP0); Basal diet + 15% local soybean (LP1); Basal diet + 15% import soybean (LP2); Basal diet + 15% komak bean (LP3); Basal diet + 15% autoclaved of komak bean (LP4). Measurement of protein digestibility and metabolic energy used comparisons between the treatment of basal diet and feed treatment was 85: 15. The composition and proximate analysis of basal diet showed in Table 1.

The values of protein digestibility and metabolic energy were measured by the method of total collection excreta. Measurement began with a period of adaptation of feed treatment for 2 days. After 2 days of adaptation, on the last day of adaptation period excreta plastic container placed after 6 hours. Furthermore recording the data of feed consumption, feeding was ad libitum.

Data were collected for 3 days, on the last day of data collection, the feed was taken and after 6 hours was taking excreta, each excreta that have accommodated sprayed with a solution of boric acid with a ratio of 1: 10 for binding nitrogen excreta then dried for measured dry matter, crude protein and gross energy excreta.

Research variables

The variables of this research consist of protein digestibility (%), Nitrogen retention (g), Apparent Metabolic Energy (AME) (Kcal/kg), and Apparent Metabolic Energy corrected nitrogen (AMEn) (Kcal/kg).

Table 1. Composition and nutrient analysis of the basal diet

Ingredient	(%)
Corn	60.00
Bran	10.00
Meat Bone Meal	9.00
Corn Gluten Meal	15.60
Palm oil	2.40
Premix	0.90
Mineral	1.80
DL-Methionine	0.30
Proximate analysis	
Nutrient	**Basal diet**
Dry Matter (%)	86.76
Crude Protein (%)	20.77
Crude Lipid (%)	5.13
Crude Fiber (%)	5.16
ASH (%)	8.15
Metabolic Energy (%)	3148.00

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

Table 2 refers to the results of this study. Autoclaved komak beans (LP4) had highest the result on protein digestibility (69.05±3.16); and nitrogen retention (6.24± 0.69). Import soybean (LP2) had highest on AME (3160±11); and AMEn (3160±11). In addition, statistical analysis results of the treatments on protein digestibility, nitrogen retention, AME and AMEn was not significantly different ($P>0.05$).

Table 2. Data of protein digestibility, nitrogen retention, AME and AMEn on Broilers

Variable	Treatment				
	LP0	**LP1**	**LP2**	**LP3**	**LP4**
Protein digestibility (%)	66.9±3.05	65.8±2.42	64.3±1.96	64.03±1.78	69.05±3.16
Nitrogen retention (g)	6.09±0.38	5.01±0.30	4.40±0.55	4.36±0,98	6.24±0.69
AME (Kcal/kg)	3124±16	3105±152	3160±11	2702±175	2093±35.7
AMEn (Kcal/kg)	3124±16	3105±152	3160±11	2702±175	2093±35.7

AME = Apparent Metabolic Energy; AMEn = Apparent Metabolic Energy corrected nitrogen

DISCUSSION

The use of soybeans without processing on non-ruminant caused low growth, decreased feed intake, decreased protein digestibility, pancreatic hypertrophy and deficiency of sulfur-containing amino acids (Liener and Kakade, 1980; Yulianti, 2005). Komak bean contain of antinutrition trypsin inhibitor, tannin and phytic acid based on Osman (2007). Tannins could reduce the digestibility of nutrients in broilers (Rusdi, 2006). Phytic acid can bind to the protein, so that it becomes difficult to digest protein in the gastrointestinal tract of broilers, exactly in the small intestine caused by the nature of phytic acid which is very difficult at all to dissolve (Kornegay, 2000).

The protein digestibility content on autoclaved komak bean were highest compared to another treatment, because trypsine inhibitor content was reduced, where trypsin inhibitor was a kind of protein which inhibit the activity of enzymes trypsin on the body and are highly unstable against heating (Santoso, 2005). Yulia (2005) reported that the activity of trypsin inhibitor be lost on heating at a temperature of 120 °C for 20 minutes in an autoclave. The heating was accompanied by pressure to break ties and reduce the content of trypsine inhibitors to the grain by 86-88% (Ramakrishna, 2008). Osman (2007) reported trypsine inhibitor content of *Lablab purpureus L sweet* at 25.46 g/mg and autoclaved of purpureus L sweet 25.10 g/mg, whereas the content of soybeans trypsine inhibitors based on research conducted by Wiryawan and Dingle (2005) of 28.96 g/mg. The protein in soybeans is structured so that the low digestibility (Ramdhan, 2012).

The digestibility of feed protein in determining retention of nitrogen content has a positive correlation to the protein digestibility of feed by Mc Donald (1995). Protein digestibility content of autoclaved komak bean was highest caused nitrogen retention in this treatment also the highest. The total nitrogen was not secreted in the excreta obtained from the difference between the total nitrogen in feed intake by the total of nitrogen in the excreta without considering of endogenous nitrogen derived from uric acid nitrogen, bacteria and debris intestinal mucosa was nitrogen retention (Djunaidi and Natsir, 2003).

Lower energy metabolic on autoclaved komak beans caused the value of low energy digestibility associated with low content of mono-and disaccharide and high carbohydrate content such as α-galactosidase, resistant starch, and other polysaccharides that are insoluble by Anita (2009). The amount of gross energy in feed and the content of non-starch polysaccharides which were included in the coarse fiber fraction can affect the value of metabolic energy (Elvina, 2008). The AME content of autoclaved komak bean were lower compared to komak bean. Processed with autoclave caused reduce of nutrition component on komak bean could be the reason.

The AME content and N retention have an influence on AMEn content. Determining of metabolic energy needs to be done correction on total nitrogen retention, this is because the animal has the ability to take advantage of a very varied in gross energy (Mc Donald, 1995). Based on these possibilities, it used in the calculation of metabolizable energy calculation method based on nitrogen balance. The AMEn content of autoclaved komak bean were lower compared with komak beans cause processed of autoclave can reduce nutrition composition of komak beans.

CONCLUSION

Autoclaved of komak bean can decrease anti-nutrition. The protein digestibility, nitrogen retention, AME and AMEn in autoclaved komak bean were as effectiveness as soybean. Based on this research, suggested the autoclaved komak beans can be used as an alternative feedstuff protein source on broilers. The future research, suggested processing komak beans use autoclave combined with different processing.

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