Scientific Papers. Series D. Animal Science. Vol. LIX, 2016
ISSN 2285-5750; ISSN CD-ROM 2285-5769; ISSN Online 2393-2260; ISSN-L 2285-5750

THE UTILIZING OF PRODUCT BIOPROCESS SHRIMP WASTE AS NUTRIENT CONCENTRATE IN THE RATION ON PERFORMANCE NATIVE CHICKEN STARTER PERIOD

Tuti WIDJASTUTI[1], ABUN[1], Kiki HAETAMI[2]

[1]Faculty of Animal Husbandry, Padjadjaran University
[2]Faculty of Fisheries and Marine Science, Padjadjaran University
Jalan Raya Bandung-Sumedang Km 21, Sumedang 4536, West Java, Indonesia

Corresponding author email: tuti_widjastuti@yahoo.com

Abstract

Bioprocess product of Shrimp waste can used as a source of nutrient concentrate in dietary of native chicken. Products of steps Bioprocess through by Bacillus licheniformis continued by Lactobacillus sp., and then by Saccharomyces cereviseae have a better protein digestibility value. The aim of the research was to evaluate the performance of native chickens to using Bioprocess product of Shrimp waste (Nutrient –concentrate) in the ration. One hundred and fifty day old native chickens were raised in cages until six weeks old. This experiment was conducted completely randomized design (CRD), six nutrient concentrate levels in the ration, namely R0 = basal ration without Bioprocess product of Shrimp waste (nutrient concentrate) with (crude protein 15%, ME 2750 Kcal/kg), R1= ration contained 5% nutrient concentrate (crude protein 15%, ME 2750 Kcal/kg), R2= ration contained 10% nutrient concentrate (crude protein 15%, ME 2750 Kcal/kg), R3= ration contained 15% nutrient concentrate (crude protein 15%, ME 2750 Kcal/kg), R4= ration contained 20% nutrient concentrate (crude protein 15%, 2750 Kcal/kg ME), and R5= standard ration high protein without content Bioprocess product of Shrimp waste (crude protein 18%, ME 2750 kcal/kg) and repeated five times. Data were analyzed using analysis of variance and Duncan's multiple range test. Feed consumption, body weight gain and feed efficiency were parameters observed. The results showed that treatment using bioprocess product of shrimp waste (nutrient concentrate) in the ration was significant effect on feed consumption, body weight and feed efficiency. The best performance was achieved by ration containing 10% nutrient concentrates (ration of 15% protein content) and equal in value to the standard ration (ration of 18% protein content).

Key words: *Bioprocess product, shrimp waste, nutrient concentrate, native chicken.*

INTRODUCTION

Native chicken as commodity is very popular among the Indonesian society in urban as well as in the rural areas, because it is being used as suitable alternative to increase the society income and important role as a nutritious food supply in the form of eggs and meat. To increase in population and production and also the business efficiency of native chicken, needs to improved from traditional system into agribusiness (Zakaria, 2004). Ration is the environmental factor that can affect poultry business success, and cause to production cost more or less 60-70 percent. The increasing of production cost can be overcome by finding other alternative feed ingredients which have good quality (Dutta and Mrigen, 2009). One of the alternative feed ingredient that have potential opportunity as a complement material for fish meal is waste-product frozen shrimp processing industry (cold storage) form of the skin and the head. Waste-product frozen shrimp processing industry (cold storage) is contains 43.41% crude protein, 18.25% crude fibre, 7.27% crude fat, 5.54% calcium, 1.31% phosphorus, 3.11% lysine, 1.26% methionine and 0.51% cystine, and the gross energy 3892 kcal/kg (Abun, 2008). Factors limiting the use of waste-products as ingredients of poultry feed is the presence of chitin in the amount of about 15-20%. Chitin bind strongly with proteins, fats and minerals covalent bond ß (1-4) making it difficult to digest by enzyme digestion of poultry (Leeson and Summers, 2001). Chitin is a chemical compound that cannot be digested

by the digestive enzymes of poultry (Leeson and Summers, 2001). Poultry have limitations in digesting food substances, especially those containing chitin and high crude fibre. This is because birds cannot produce the enzyme cellulase and chitinase, so that chitin and crude fibre can bind nutrients that can be digested out with feces (Tulung, 1987). In line with the facts found from the research the compound chitin shrimp waste without treatment is quite high, namely 20.11% (Abun, 2008). One effort to convert organic material into useful new products and has better nutritional value is to use microbes through bioprocess. Bioprocess waste-product can be done through the stages deproteinated using *Bacillus licheniformis*, and demineralizated with *Lactobacillus* sp. (Bisping et al, 2005). Bioprocess terminated by *Saccharomyces cereviseae* (Abun, 2008). Bioprocess product of shrimp waste used as ingredient of dietary of native chicken are expected to be better digestibility values because the nutrients have been relegated from the bonds of chitin. Bioprocess products by *Bacillus licheniformis*, followed demineralization by *Lactobacillus* sp. were the highest crude protein content in bioprocess treatment for 2 days in the amount of 47.60%. Finally fermentation by *Saccharomyces cerevisiae* release nutrient product with the lowest crude protein content of 43.5% and the highest 48.5%. The more nutrients are absorbed by the body, then the value of the higher digestibility. It is one indicator of the high quality of the feed.

The aim of this experiment is to get the optimal percentage of Bioprocess product of Shrimp waste as nutrient concentrate in the ration that produce the best to feed consumption, body weight gain and feed efficiency.

MATERIALS AND METHODS

One hundred and fifty native chickens were raised in cages until 6 weeks old, with the average of body weight was 27.83 grams (coefficient variance 7.57%). The birds kept in cage system, as much as 30 cages, and each cage consisted of 5 chickens. The ration consisted of yellow corn meal, fish meal, rice bran meal, soy-bean meal, nutrient concentrate meal, $CaCo_3$ and bone meal, in 15% protein, 2750 Kcal/kg of metabolizable energy and 18% protein, 2750 Kcal/kg metabolizable energy. The nutrient concentrate was made in Faculty of Animal Husbandry, Universitas Padjadjaran. The formula rations were :

R_0 Basal Ration without contained nutrient concentrate (15% crude protein, 2750 Kcal/kg ME)

R_1 Ration contained 5% nutrient concentrate (15% crude protein, 2750 Kcal/kg ME)

R_2 Ration contained 10% nutrient concentrate (15% crude protein, 2750 Kcal/kg ME)

R_3 Ration contained 15% nutrient concentrate (15% crude protein, 2750 Kcal/kg ME)

R_4 Ration contained 20% nutrient concentrate (15% crude protein, 2750 Kcal/kg ME)

R_5 Standard Ration without contained nutrient concentrate (18% crude protein, 2750 Kcal/kg ME)

Table 1. Composition of the formula rations (%)

Ingredients	Ration					
	R0	R1	R1	R3	R4	R5
Fish Meal	8.00	6.50	3.75	1.25	0.00	9.25
Nutrient concentrate	0.00	5.00	10.00	15.00	20.00	0.00
Yellow corn meal	58.00	58.00	58.00	58.00	60.00	56.00
Soy-bean meal	4.75	2.50	2.25	1.50	0.00	12.00
Rice bran meal	28.00	26.75	24.75	23.00	18.00	21.50
$CaCo_3$	0.50	0.50	0.50	0.50	0.50	0.50
Bone meal.	0.75	0.75	0.75	0.75	0.75	0.75

Completely Randomized Design (CRD) was used with 6 treatments, and each treatment was replicated 5 times. The data were analyzed by using Analysis of variance and if there are any significant effect then followed by *Duncan's multiple range* test (Steel and Torrie, 1989). The analyzed variables were feed consumption, body weight gain and feed efficiency.

Table 2. The nutrient and metabolizable energy content of ration

Ingredients	Rations					
	R0	R1	R2	R3	R4	R5
Crude Protein (%)	15.08	15.03	15.05	15.03	15.18	18.04
Crude Fat (%)	6.66	6.70	6.54	6.43	6.09	5.92
Crude Fiber (%)	4.89	4.97	5.08	5.69	5.92	4.51
Calcium (%)	1.05	1.27	1.39	1.54	2.03	1.16
Phosphorus (%)	0.58	0.65	0.68	0.72	0.84	0.63
Lysine (%)	0.97	0.95	0.90	0.86	0.86	1.21
Methionine (%)	0.35	0.38	0.40	0.42	0.45	0.40
Met + cystine (%)	0.67	0.69	0.70	0.71	0.73	0.75
ME (Kcal/kg)	2755	2770	2781	2792	2838	2781

Table 3. The average of feed consumption, body weight gain and feed efficiency native chicken

Variable	R0	R1	R2	R3	R4	R5
Feed Consumption(g)	591.92 **a**	557.62 **a**	642.22 **a**	558.52 **a**	560.68 **a**	618.18 **a**
Body weight gain (g)	261.60 **bc**	293.92 **a**	281.40 **a**	257.92 **bc**	240.76 **c**	305.00 **a**
Feed Efficiency (%)	39.13 **bc**	43.97 **a**	42.09 **a**	38.58 **bc**	36.01 **c**	45.62 **a**

Note: The Similar superscript in the same row no significant difference (P>0.05)

RESULTS AND DISCUSSIONS

The effect of dietary treatment on feed consumption, body weight and feed efficiency of native chicken starter period, is shown in Table 3

Feed Consumption

Feed consumption per chicks in each treatment during starter period shown in Table 3. From the Table 3, it can see an average feed consumption varying from 557.62 to 642.22 gram during starter period. The results of analysis of variance showed that using product bioprocess shrimp waste (nutrient concentrate) in the ration non significance (P>0.05) on feed consumption.

This means the use of nutrient concentrate products does not decrease feed consumption compared to a standard or control diet (R0 and R5). Its mean that the nutrient concentrate product from 5 – 20% in the ration still have palatable, but have limitedness on body weight gain and feed efficiency achievement.

In fermentation, microorganisms synthesize enzymes that can degrade the polymer into the substrate into simpler molecules, making them easier to digest.

Fermented products will have high quality such as high levels of digestibility and flavour and better texture.

This indicates that the product up to 20% in the diet does not cause smell, flavour, colour and texture that is not favoured by the chickens, so causing a decrease in feed palatability.

According North and Bell (2004), palatability is a major factor affecting consumption and palatability ration depend on texture, smell and taste, although taste not an important role in the poultry.

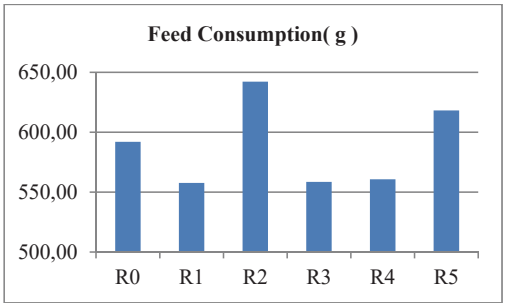

Figure 1. The average of feed consumption

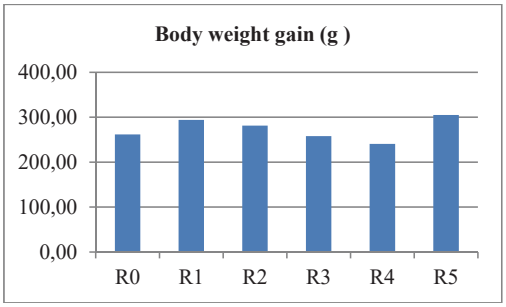

Figure 2. The average of body weight gain (g)

Daily Weight Gain

With Duncan's multiple range test on daily weight gain between the treatment use of nutrient concentrate products in the ration of 10% (15% crude protein) resulted in body weight gain similar to the standard ration which has a high protein content (18% crude protein). Adding the nutrient concentrate product meal until 10 percent in the ration native chicken still gave a good result.

This is because the bacterial species *Bacillus licheniformis* capable of producing *protease* and *chitinase* in relatively high amounts and acidic conditions created by *Lactobacillus* sp. mineral shed attached to the protein that has been unravelled. Further fermentation with *Saccharomyces cerevisiae* helps improve digestion with *carbohydrase* and *protease* enzymes it produces (Alam et al; 1996; Rahayu et al., 2004).

Bioprocess with microbes other than to break the bonds of polysaccharides also able to convert inorganic minerals into organic minerals that can improve metabolic processes and increased growth. By adding from 15 – 20% nutrient concentrate product in the ration, there was a tendency that body weight gain going to decreased ($P<0.05$). In treatment R3 and R4, the fibre content higher 5.69 % (R3) and 5.92% much more of basal and standard ration.

The higher fibre in ration will reduce feed consumption and intake energy is used in addition to make body balance. So the addition of 15 – 20% of nutrient concentrate product in the ration gave significant effect on body weight gain.

Lesson and Summer (2001) has told that if one of the ingredients in ration has high fibre, it will suppress performance of the chicken.

Feed Efficiency

In Table 3 can be seen that lowest of feed efficiency on native chicken which receiving 20 percent nutrient concentrate product in the ration R4 (36.01%), and the highest was R5, ration without nutrient concentrate product (45.62%).

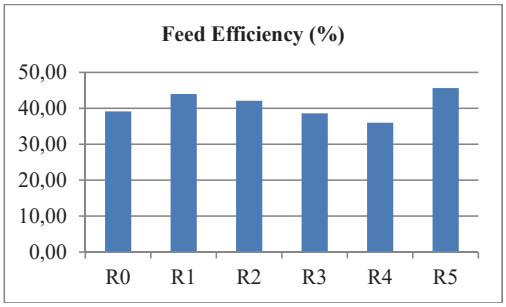

Figure 3. The average of feed efficiency

The results of variance analysis showed that the treatment by using of nutrient concentrate product gave significantly affected on feed efficiency. Leeson and Summers (2001) stated that the efficiency of the ration shows the efficiency of the use of feed to produce weight gain. Duncan results showed that the feed efficiency treatment of R1, R2 and R5 had similar and significantly higher than treatment R3, R4 and R0. Using the nutrient concentrate product 5 – 10% in ration can still support the good results in the feed efficiency. Bioprocess product of shrimp waste (nutrient concentrate) used as ingredient of dietary of native chicken are expected to be better digestibility values because the nutrients have been relegated from the bonds of chitin. By giving 15 – 20% nutrient concentrate product in the ration (R3 and R4) value feed efficiency become decreased, because ration R3 and R 4 received

much more chitin with used more product of shrimp waste in ration, so the crop and small intestine had extra work and more energy is used in addition to the balance of the body. According Leeson and Summers reported that a high efficiency value ration describe the less rations necessary to increase the weight per unit of weight, so the higher feed efficiency rate means better quality rations. Cheeke (2005) states that the value of feed efficiency can be used to measure the productivity of livestock.

CONCLUSIONS

The research showed that product bioprocess shrimp waste can be used as nutrient concentrates in the preparation of native chicken rations and by adding nutrient concentrate until 10% in the ration (ration with 15% protein) can still support the good results on the feed consumption, daily body gain and feed efficiency and equal in value to the standard ration (ration of 18% protein content) of native chicken starter period.

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