

# EFFECT OF PRODUCT BIOPROCESS SHRIMP WASTE AS NUTRIENT CONCENTRATE IN THE RATION ON CHARACTERISTIC CARCASS NATIVE CHICKEN STARTER PERIOD

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## Abstract

Waste-product frozen shrimp processing industry is contains 43.41% crude protein, 18.25 percent crude fiber, 7.27 percent crude fat, 5.54 percent calcium, 1.31 percent phosphorus, and the gross energy 3892 kcal/kg, but also contains chitin 20:11%. One effort to convert organic material into useful new products is to use microbes through bioprocess.. Bioprocess waste-product shrimp namely nutrient concentrate, can be done through the stages deproteinated using *Bacillus licheniformis*, and demineralized with *Lactobacillus* sp. and terminated by *Saccharomyces cerevisiae* have a better protein digestibility value. The aim of the research was to evaluate characteristic of carcass native chickens to using nutrient concentrate in the ration. 150 DOC native chickens were raised in cages until eight weeks old. This experiment was conducted completely randomized design, six nutrient concentrate levels in the ration, namely R0 = basal ration without nutrient concentrate with (crude protein 15%, ME 2750 Kcal/kg), R1= ration contained 5% nutrient concentrate R2= ration contained 10% nutrient concentrate), R3= ration contained 15% nutrient concentrate, R4= ration contained 20% nutrient concentrate, and R5 = standard ration high protein without nutrient concentrate (crude protein 18%, ME 2750 kcal/kg) and repeated five times. Data were analyzed using analysis of variance and Duncan's multiple range test. Variable analyses were final body weight, percentage of carcass, cholesterol and protein content of native chicken starter period. The results showed that treatment using nutrient concentrate in the ration was significant effect on final body weight and carcass percentage, but was no significant effect on cholesterol and protein carcass native chicken. The conclusion of experiment that by giving 10% nutrient concentrate in the ration gave the best of carcass quality and gave the same response with the standard ration (ration of 18% protein content).

**Key words:** Bioprocess product, shrimp waste, nutrient concentrate, carcass

## INTRODUCTION

Native chicken as a commodity is very popular among the Indonesian society. The population was high at 261.42 million were able to donate meat amounted to 174.3 tons, or 12.4% [6]. The amount of chicken populations shows a high potential to be developed even very large chance to be developed as agribusiness commodities in line with the increased demand for protein from livestock especially poultry. Because can be used as suitable alternative to increase

the society income and important role as a nutritious food supply in the form meat and eggs.

To increase in population and production and also the business efficiency of native chicken, needs to be balanced with the provision of rations quality ingredients should be supported by well qualified [8]. Rations qualities usually are relatively expensive, so it would have an effect on the production cost. The increasing of production cost could be overcome by finding other alternative feed ingredient that have potential opportunity as the waste-product frozen shrimp processing industry. Waste product frozen shrimp processing industry content

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skin, head and tail is between 30-40% with high enough nutrient content 43.41% crude protein, 18.25 percent crude fiber, 7.27 percent crude fat, 5.54 percent calcium, 1.31 percent phosphorus, and the gross energy 3892 kcal/kg, but also contains chitin 20:11%. Although the nutrient content is good for poultry feed, however waste-product of shrimp contains limiting factor such as chitin. Chitin is a chemical compound that cannot be digested by the digestive enzymes of poultry [8]. Poultry have limitations in digesting food substances, especially those containing chitin and high crude fiber, because poultry can not produce cellulose and chitinase enzyme, so that chitin and crude fiber can bind nutrients can be digested out with feces [12].

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 deproteinized using *Bacillus licheniformis*, and demineralized with *Lactobacillus* sp.[5]. Bioprocess terminated by *Saccharomyces cerevisiae* [1]. The more nutrients are absorbed by the body, then the value of the higher digestibility, and will result final body weight ,and carcass weights will be high.

The aim of the research was to evaluate characteristic of carcass native chickens to using nutrient concentrate in the ration.

## MATERIAL AND METHODS

One hundred and fifty DOC 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 DOC. The ration consisted of yellow corn meal, fish meal, rice bran meal, soy-bean meal, nutrient concentrate meal, CaCO<sub>3</sub> and bone meal, in 15 percent protein, 2750 Kcal/Kg of metabolism energy and 18 percent protein, 2750 Kcal/kg metabolism energy.

The nutrient concentrate was made in Faculty of Animal Husbandry, Universitas Padjadjaran. The formula rations were :

- R0 Basal Ration without contained nutrient concentrate (15% crude protein, 2750 Kcal/kg ME)
- R1 Ration contained 5% nutrient concentrate (15% crude protein, 2750 Kcal/kg ME)
- R2 Ration contained 10% nutrient concentrate (15% crude protein, 2750 Kcal/kg ME)
- R3 Ration contained 15% nutrient concentrate (15% crude protein, 2750 Kcal/kg ME)
- R4 Ration contained 20% nutrient concentrate (15% crude protein, 2750 Kcal/kg ME)
- R5 Standard Ration without contained nutrient concentrate (18% crude protein, 2750 Kcal/kg ME)

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 [11].

The parameters were final body weight, carcass percentage, cholesterol and protein content meat of native chicken starter period.

Table 1 The Nutrient and Metabolism 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  | 0.780 | 0.71  | 0.73  | 0.75  |
| ME (Kcal/kg)      | 2755    | 2770  | 2781  | 2792  | 2838  | 2781  |

**RESULTS AND DISCUSSIONS**

Effect of product bioprocess shrimp waste as nutrient concentrate in the ration on

the final body weight, percentage of carcass, cholesterol and protein content meat native chicken are showed in Table 2.

Table 2 Final Body Weight, Carcass Percentage, Cholesterol and Protein Content Meat Native Chicken

| Variable               | R0        | R1       | R2       | R3        | R4       | R5       |
|------------------------|-----------|----------|----------|-----------|----------|----------|
| Final Body Weight (g)  | 288.52 bc | 322.04 a | 309.32 a | 286.04 bc | 268.80 c | 332.88 a |
| Carcass (%)            | 33.02 a   | 34.32 b  | 35.15 b  | 32.98 a   | 30.08 c  | 37.72 b  |
| Cholesterol (mg/100ml) | 95.60 a   | 92.40 a  | 89.00 bc | 89.3 0 bc | 86.80 a  | 92.80 a  |
| Protein Content (%)    | 21.86 a   | 22.82 a  | 22.83 a  | 22.01 a   | 22.86 a  | 23.46 a  |

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

### The Effect of Product Bioprocess Shrimp Waste as Nutrient Concentrate in Ration on Final Body Weight

The average of final body weight of each treatment is shown in Table 2. The average of final body weight that highest R3 treatment (332.88 g) and the Lowest was R 4 (268.80 g). The Body weight is low, because chicken is the starter phase is still in a period of growth. The results variance analysis showed that by addition of product bioprocess shrimp as nutrient concentrate in the ration has significant effect ( $P < 0.05$ ) on final body weight. By adding the nutrient concentrate until 10 percent (R2) in the ration of native chicken still gave a good result and gave the same response with the standard ration R5 (ration of 18% protein content). The research was parallel on feed and protein consumption those were no significant different ( $P > 0.05$ ) among the treatment. Its mean that the nutrient concentrate product from 5 - 20% in the ration still have palatable, but have limitedness on final body weight. 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. Degradation product of protein-chitin binding by *Bacillus licheniformis* must be followed by *Lactobacillus* sp. to release mineral from chitin. Finally fermentation of shrimp waste product by *Saccharomyces cerevisiae* release nutrient product with the lowest crude protein content of 43.5% and highest 48.5% [2]. The end step of bioprocess with *Saccharomyces*

*cerevisiae* can improved the quality of fermented products and added protein witch converted from sugar and chitin in product degradation by *Bacillus* sp., and then lactic acid fermented with *Lactobacillus* sp. [7] suggest that microbes forming acidic conditions, such as *Lactobacillus* sp. resulted in the formation of the complex salt.

By adding from 15 - 20% nutrient concentrate product in the ration, there was a tendency that Final body weight going to decreased ( $P < 0.05$ ), however gave the same response with the basal ration R0 (ration of 15% protein content). Products of steps bioprocess through by *Bacillus licheniformis* continued with *Lactobacillus* sp. and *Saccharomyces cerevisiae*, respectively for two day produces the best products (Nutrient-concentrate) and had a protein digestibility of high about 70%, so still have palatable, but have limitedness on final body weight.

### The Effect of Product Bioprocess Shrimp Waste as Nutrient Concentrate in Ration on Carcass Percentage

The carcass percentage were variations, from the lowest (R4 = 30.08%) to the highest (37.72). Analysis of variance showed that addition of product bioprocess shrimp as Nutrient concentrate in the ration has significant effect ( $P < 0.05$ ) on carcass percentage. Duncan results showed that the carcass percentage treatment of R1, R2 and R5 had similar and significantly higher than treatment R3, R4 and R0. Its mean that the nutrient concentrate product from 5 - 10% in the ration can still support the good results in

the carcass percentage. Bioprocess product of shrimp waste (Nutrient concentrate) used as ingredient of dietary of native chicken are expected to be better digestibility values (72.91%), according to [2]. By giving 15 - 20% nutrient concentrate in the ration (R3 and R4) carcass percentage 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.

### The Effect of Product Bioprocess Shrimp Waste as Nutrient Concentrate in Ration on Meat Cholesterol Level

The average of meat cholesterol levels were showed at Table 3. The meat cholesterol levels were variation, where R4 treatment is the lowest (86.8 mg/100 ml) and R<sub>5</sub> the highest (92.8 mg/100ml). The treatment adding 10 - 20 percent product of shrimp waste in the ration, make tendency the level of meat cholesterol content going to decrease.

The range cholesterol content in broiler blood on 21 - 42 days old, 133.06 - 154.39 mg/100g [4]. Comparing with other research, so the level of native chicken meat cholesterol which coming from this research still in the normal range. The results variance analysis showed that by addition of product bioprocess shrimp as nutrient concentrate in the ration has significant effect ( $P < 0.05$ ) on meat cholesterol. The research object of native chicken still on development period, but with addition 5–20 product bioprocess shrimp as nutrient concentrate in the ration there is a tendency to decrease the meat cholesterol. This indicates that the product of steps Bioprocess though by *Bacillus licheniformis* and continued by *Lactobacillus sp.* and then by *Saccharomyces cerevisiae* have a better protein digestibility value so can work to decrease meat cholesterol. This is because the bacterial species *Bacillus licheniformis* capable of producing protease and chitinase in relatively high amounts [3; 9], Acidic conditions created by *Lactobacillus sp.* dissolving mineral that is bound to protein that has been unraveled. Further fermentation with *Saccharomyces cerevisiae* helps improve digestion with carbohydrase and protease

enzymes it produces, so the absorption of cholesterol will also decrease.

### The Effect of Product Bioprocess Shrimp Waste as Nutrient Concentrate in Ration on Meat Protein Level

Level of meat protein per chicks in each treatment during starter period shown in Table 3. From the Table 3, it can see an average level of meat protein varying from 21.46 to 23.46 percent during starter period. The results of analysis of variance showed that using Product Bioprocess Shrimp Waste as Nutrient Concentrate in the ration non significance ( $P > 0.05$ ) on protein meat level. This means the use of nutrient concentrate products does not decrease protein meat compared to a standard or control diet (R0 and R5).

Products of steps Bioprocess through by *Bacillus licheniformis* continued by *Lactobacillus sp.*, and then by *Saccharomyces cerevisiae* have a better protein digestibility value. Further fermentation with *Saccharomyces cerevisiae* help improve digestion with carbohydrase and protease enzymes it produces [2]. Therefore, the more nutrients are absorbed by the body, thus the protein content of meat the same.

### CONCLUSION

The research showed that product bioprocess shrimp waste can be used as nutrient concentrates in the preparation of native chicken rations and that by giving 10% nutrient concentrate in the ration gave the best of carcass quality and gave the same response with the standard ration (ration of 18% protein content).

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