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STEAMING TECHNOLOGY RATION PRODUCT IMPLEMENTATION AT PADJADJARAN LOCAL DUCK ON THE METABOLIZABLE ENERGY, DIGESTIBLE ORGANIC MATTER AND PROTEIN RATION VALUE

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Abstract

The implementation of ration product from steam technology at Padjadjaran local ducks on the metabolizable energy, digestible organic matter and protein ration value have been done in cage experiment and poultry production laboratory, while the metabolic and digestible test at Ruminant Nutrition and Chemical Feed, Faculty of Animal Husbandry Padjadjaran University, Jatinangor, Sumedang-West Java. The objective of the research is to have the metabolic energy, organic matter digestibility and protein ration value. The experiment has been conducted by using 20 birds local ducks Padjadjaran 18 weeks which birds obtained from Batujajar people farm area, West Java. The research methods used Student's t-test with two treatments and 10 replications, where R0 = ration without steam (control), and R1 = steam ration (Steel and Torrie, 1991). The metabolizable energy of steam ration (2684.64 kcal/kg) was significantly different (P<0.05) more highly significant than without steam (2075.60 kcal/kg). The Organic digestibility matter (95.43%) was significantly different (P<0.05) more highly than without steam (90.86%). The average of protein value digestibility which come from steam ration (71.19%) was significantly different (P<0.05) more highly than without steam (64.07%)

Key words: *digestible organic matter and protein value, metabolizable energy, Padjadjaran local ducks, steaming technology*

INTRODUCTION

Ducks are waterfowl that can be managed to produce a food source which come from animal protein. Its existence in egg production donors began glowing in urban community and give a contribution meat production also. Duck or duckbill has a specific part with their beak-shape, especially when there are looking for feeding. Ducks digestives system did not have a crop valve, and consequently with any food that enters to the digestive tract system will urge the foregoing food to be issued in the excreta form. Besides that, when taking some rations and be followed drinking and then excreting, that is why thus causing inefficiencies in using of ration.

Because of that phenomenon, it is necessary to find a new effort to solve the problem that had occurred in aquaculture farm development of local laying ducks. Ration steaming is one model which have been done by using moist heat. Cooking with moist heat leads to convection of heat transfer form hot steam to the ration (Labensky and Hause, 1999) [4]. The circulating steam caused the union of feed materials, formation where the whole of ingredients melt together, and finally among the feed material fused together.

The study about steaming is done by Skoch (1981), who is cited by Behnke (2001) [2] by making a trial between pellet making with steaming pellets and dried. The results showed that steaming feeds affected the durability, increasing feed intake and digestibility. By giving vapor pressure occured in low water content of raw material will occur starch granules fragmentation and homogeneity phase is called commonly gelatinization. The increased of moisture after steaming pressurized reflected starch granules which had been gelatinized as long as more of steaming (Maache-Rezzoug *et al.* 2009) [8]. The water content of high steaming ration will made ducks easily in ingredients digestibility, and then will enhance the digestibility both of organic matter even protein.

The nutritional feed ingredients content only giving the nutrition potential illustration, while the true nutrient value was determined from ingredients digestibility value. The digestibility values gives an overview of how much nutritional value is threw away or not digested, together with feces, urine, gas and other during digestion process. Ingredients nutritional quality could be determined from the amount of nutrients that could be digested and utilized by livestock both for growth and production.

MATERIALS AND METHODS

Materials and Research Tools

The subject research is ration without steam and steam ration for 40 minutes. Twenty layers ducks were used at eighteen weeks aged. Cages were used a metabolic cages as much as 20 units, with a size 60x40x50 cm. Feed traugh, drinking water and electric light just only for lighting. The transparent plastic to accommodate the excreta. Ohaus scales with of 310 and 2,610 g capacity in 0.05 g and 0.1 g accuracy were used for weighing the rations. Aluminum box was to hold the excreta dry. Spray equipment was used to spray the excreta with 5 percent of boric acid solution. Processing equipment consist of knives, scissors, and surgery plastic as well a cleaning equipment.

Metabolic Energy Measurement

Before the research began, all of any equipment were cleaned and disinfected. All cages were disinfected before the ducks were inserted. Every duck was place in individual cages by random. Aluminum foil is placed on bottom of cage to accommodate excreta. The procedure determination of metabolizable energy refers to the developed method by Sibbald and Morse (1983) [11].

Drink water was given in moderation and not fed for 24 hours. Steamed or not steamed ration were given 90 grams for each bird via force feeding. The excreta were accommodated by using aluminum foil boxes for 24 hours, and then were sprayed with 5 percent boric acid solution in every 2 hours. After that the excreta then were dried by sun rise. And then, the excreta were dried in the oven at $40-50^0$C temperature as long as 24 hours, and later grinded. Afterwards the energy gross value was determined by using Oxygen Bomb Calorimeter. The energy metabolizable value was measured with the formula:

$$EMn\ (kcal/kg) = \frac{(Ebp \times A) - (Je \times Ebe) - \left\{\frac{(A \times Np)}{100}\right\} - \left\{\frac{Je \times Ne}{100}\right\}}{A} \times 8.22$$

where:

EMn = metabolizable energy feedstuffs in retention nitrogen corrected (kcal/kg)
Ebp = gross feed energy (kcal/kg)
Ebe = gross energy of excreta (kcal/kg)
A = Total of feed ingredients that are consumed every ducks (g)
Je = Total of excreta (g)
Np = Nitrogen ration (%)
Ne = Nitrogen excreta (%)
8.22 = Constant energy value in retention nitrogen.

Digestibility Quality Test

The digestibility quality test was conducted to determine the experiment effect of steaming ration digestibility on nutrients value.

Research procedure

Twenty female ducks have been used for determination the energy metabolic of digestibility value in one week kept. Ten of female ducks were used for determination a ration of not steamed and ten of the other for determination a steamed ration where gave by force feeding via esophagus as much as 90 gram per bird. The faeces samples come from any ration were analyzed with Sklan and Hurwitz (1980) [10], which slaughter technique of treatment female ducks. Digested excreta ± 10 cm of ileum to avoid urine contamination. The large intestine were removed, both of the ends tried with ropes and the faecal samples of intestine were removed, then dried and the ingredients dried. Where the organic matters and protein nutrient were analyzed by proximate analytic. The indicator of lignin rations and feses was used by Van Soest Method (1979) [15]. To determine the digestibility value was used by Ranjhan (1980) [9]:

$$\text{Digestibility} = 100\% - 100\left[\frac{\%\ \text{lignin in ration}}{\%\ \text{lignin in feces}}\ x\ \frac{\%\ \text{nutrient in feses}}{\%\ \text{of nutrient in ration}}\right]$$

Variables Observed

(i)Organic Materials Digestibility

Organic matter digestibility value is calculated based on the formula:

$$\text{Organic matter digestibility} = 100\% - 100\left[\frac{\%\ \text{lignin in ration}}{\%\ \text{lignin in feces}}\ x\ \frac{\%\ \text{organik matter in feces}}{\%\ \text{organik matter in ration}}\right]$$

(ii)Protein digestibility

Protein digestibility value is calculated based on the formula:

$$\text{Protein digestibility} = 100\% - 100\left[\frac{\%\ \text{lignin in ration}}{\%\ \text{lignin in feces}}\ x\ \frac{\%\ \text{crude protein in feces}}{\%\ \text{crude protein in ration}}\right]$$

(iii)Statistic analysis

The variable treatment effects were analyzed with *Student's t-test* (Steel and Torrie, 1991) [13].

RESULTS AND DISCUSSIONS

The treatment effect on Metabolic Energy Value.

The average value of metabolizable energy content of steamed and not steamed ration are presented in Table 1 and showed that the energy metabolic value of steamed (2,684.64 kcal/kg) more higher than not steamed (2,075.60 kcal/kg) or 29.34 percent increased. *Student's t-test* indicated that steamed metabolizable energy ration is significant higher (P<0.05) than not steamed ration.

Because of steamed ration, the nutrient composition changed, and because of this made higher the digestibility. At the end, made very close between the energy metabolizable with the ration digestibility (Mc. Donald *et al*, 1978) [6]. And besides that, the nutrient had big effect to the digestibility, because high of crude fiber cannot digestible by the bird (Wahju, 1997) [16].

Table 1. Metabolic Energy Mean Value

Replication	Not Steam Ration (kcal/kg)	Steam Ration (kcal/kg)
1	2,082.97	2,686.45
2	2,052.00	2,680.01
3	2,090.05	2,678.00
4	2,061.92	2,686.86
5	2,077.84	2,683.37
6	2,076.75	2,680.92
7	2,079.16	2,689.72
8	2,082.52	2,685.90
9	2,068.25	2,689.60
10	2,084.56	2,685.60
Total	20,756.02	26,846.43
Average	2,075.60	2,684.64

So, steaming is able to make increase the energy metabolizable for improving cellulose and hemicellulose solubility or degradation of substance exemption of lignin and silica (Murni *et al*, 2008) [7].

The Effect of Organic Compound Digestibility. The digestibility of organic compound is closely with the dry matter, because the dry ingredients are organic matter that consist of crude protein, lipid, and crude fiber and Free Nitrogen Extracted. The average organic matter digestibility calculation measurements are presented in Table 2.

The statistical test results of *student t-test* showed that steamed organic matter digestibility is more higher (P<0.05) than not steamed ration. The increased of dry matter digestibility lead the rise of organic matter and vice versa (Syaro, *et al*., 2005) [12]. High and low digestibility of feed ingredients give a meaning about how much nutrients feed contains in a form that could be digested in the gastrointestinal tract (D'Mello, 2004) [3]. The digestibility factors affecting in feed material, because of temperature, speed of ration goes through digestive tract, physical of ration, and ration composition (Anggorodi, 1984) [1].

Table 2. The Organic Materials Average of Ration Digestibility

Replication	Not Steam Ration (kcal/kg)	Steam Ration (kcal/kg)
1	90.76	95.45
2	90.65	95.89
3	91.20	94.93
4	90.86	95.79
5	90.98	95.57
6	90.78	95.05
7	90.69	95.54
8	91.21	95.47
9	90.72	94.97
10	90.78	95.65
Total	908.63	954.31
Average	90.86	95.43

And also because material ration of chemical composition, crude protein digestibility, feed preparation, type of livestock and feed amount (Tillman, *et al*., 1998) [14].

The Effect of Protein Digestibility Treatment. The average value of crude protein ration digestibility about steamed and not steamed are presented in Table 3. The average value of steamed crude protein ration digestibility 71.19 percent is higher than not steamed just 64.07 percent or 11.11 percent increased.

Table 3. The Average of Protein Digestibility

Replication	Not Steam Ration (kcal/kg)	Steam Ration (kcal/kg)
1	63.82	70.85
2	63.87	70.94
3	64.52	71.58
4	63.92	70.92
5	64.43	71.59
6	64.26	71.22
7	63.78	71.05
8	64.34	70.90
9	64.09	71.43
10	63.72	71.39
Total	640.75	711.87
Average	64.07	71.19

Statistical analysis showed that crude protein digestibility values is different and significantly higher ($P<0.05$) than not steamed. The physical processing technology ration by steaming caused gelatinization during steaming process, thus makes water absorption increased, the ration become more softer, and caused the nutrient digestibility of diet such proteins and carbohydrate also increased. Steaming process is able to destroy cellulose, hemicellulose and lignin bonds, that is why their chemical composition unchanged. Protein and carbohydrate digestibility improved and give a signal that steaming ration product is absorbed more nutrient content of the ration (Murni *et al*., 2008). The specific characters of protein and amino acids which come from a variety of materials with good heating process give very easily digest, while when more steaming would made the digestibility of the feed reduce (Lesson and Summers, 2001) [5].

CONCLUSIONS

Based on the results of research and discussion, it can be concluded that by steaming ration makes the quality of feed increased and significant effects on metabolic energy, organic matter and crude protein digestibility.

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