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Effect of Supplementation of BS4-Enzyme Levels in Rice-Bran Based Rations on Performance of Growing PMp Broiler Duck

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ABSTRAK

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Suplementasi enzim dalam ransum antara lain bertujuan untuk meningkatkan kecernaan gizi melalui degradasi anti-nutrisi dan serat kasar yang terdapat dalam dedak padi. Tujuan penelitian ini adalah untuk menguji efektifitas suplementasi enzim BS4 dalam ransum itik pedaging PMp berbasis dedak padi. Dua ratus dua puluh empat ekor itik PMp umur sehari dipelihara selama empat minggu dan dialokasikan secara acak ke dalam 8 perlakuan dengan 4 ulangan dan setiap ulangan terdiri dari 7 ekor itik. Ransum perlakuan dengan notasi T1 - T4 adalah ransum dengan kadar dedak padi 30%, dengan kadar enzim BS4 masing-masing 0, 50, 100, 150 Unit/kg dedak padi. Ransum perlakuan T5 - T8 adalah ransum dengan kadar 60% dedak padi,dengan kadar enzim sama dengan pada ransum perlakuan T1 – T4. Peubah yang diamati meliputi: konsumsi pakan, pertambahan bobot badan (PBB) dan FCR. Hasil penelitian menunjukkan bahwa suplementasi enzim BS4 dalam ransum berbasis dedak (30 dan 60%) berpengaruh nyata (P<0,05) terhadap konsumsi pakan dan FCR, akan tetapi tidak untuk PBB (P>0,05). Ransum perlakuan yang paling efesien mendukung pemeliharaan itik adalah ransum perlakuan T4, yang menunjukkan rataan konsumsi pakan terendah (998g/ekor) dan FCR terendah (2,64). Disimpulkan bahwa suplementasi enzim BS4 sebesar 150 Unit/kg dalam ransum berbasis dedak padi 30% merupakan kadar yang paling baik untuk mendukung pertumbuhan terbaik itik pedaging PMp selama pemeliharaan 4 minggu pertama.

Kata Kunci: Enzim BS4, Dedak Padi, Itik Pedaging PMp

ABSTRACT

Purba M, Sinurat AP. 2018. Effect of supplementation of BS4-enzyme levels in rice-bran based rations on performance of growing PMp broiler duck. JITV 23(1): 38-44. DOI: http://dx.doi.org/10.14334/jitv.v23i1.1669

The purpose of enzymes supplementation in feeds is to improve nutrient digestibility through degradation of anti-nutrition and crude fiber, which are commonly found in rice bran. The aim of the study was to see performance response of PMp broiler ducks to the supplementation of BS4-enzyme levels in rice-bran based rations. Two hundred and twenty four day-old ducks were allocated to 8 dietary treatments with 4 replicates, consisted of 7 ducks in each replicate. The composition of the feed treatments arranged as follows: T1 to T4 were rations with 30% of rice bran content with enzyme levels of 0, 50, 100, and 150 Unit/kg rice bran respectively. T5 to T8 were rations with 60% of rice bran content with the same enzyme levels as for T1 to T4 treatments. The ducklings were subjected to the treatments for the first four weeks. The variables observed were feed intake, weight gain and FCR. The results showed that the supplementation of BS4-enzymes on rice-bran based rations significantly affected (P<0.05) feed intake and FCR, but not for weight gain (P>0.05). The most effective rations for feed consumption and FCR of PMp broiler duck were obtained on T4 treatment resulting in the highest body weight gain of 998 g/bird and lowest FCR of 2,64. It was concluded that the supplementation of 150 Unit/kg of BS4 enzyme in 30% rice-bran diet was the best combination level to be implemented in feeding PMP broiler ducks for the first four weeks period.

Key Words: BS4 Enzyme, Rice Bran, PMp Broiler Duck

INTRODUCTION

Duck meat is one of the interesting poultry products. Demand for duck meat lately seems to increase. During the last five years duck meat production in Indonesia has also increased although the percentage of the increase was still low ranging from 3-7 per cent (DGLAH 2016). Since the production of local duck meat has not been sufficient for the domestic market, the government of the Republic of Indonesia has made policy concerning importation of duck meat. The type of imported duck meat is frozen Pekin duck meat as it has high quality meat according to market in Indonesia

One of the efforts to meet the needs of duck meat, Indonesian Research Institute for Animal Production (IRIAP) has invented a new breed of broiler ducks, namely PMp ducks, obtained from crossing of male Pekin duck with female white Mojosari duck. The PMp has advantages of rapid growth, body live weight above 2 kg/bird at the age 10 weeks, and clean white carcass

color. In addition, The PMp is actually developed as broiler type, however, it has also good average egg production, reaching of 65-70% per year. The drawback of the Indonesian meat type ducks was having high FCR, ranging from 3.97 to 4.70 (Ketaren et al. 2011). Therefore it is necessary to carry out research, considering nutrition and feed technology by the use of enzymes as a supplement in duck feed.

Enzymes are organic molecules (proteins) can serve as catalysts or accelerate certain chemical reactions. Some of the benefits of using enzymes in livestock are improving growth and feed conversion ration, controlling health by preventing digestive disorders, especially in young animals (Havenaar et al. 1992). It was further reported that the use of enzymes in livestock could facilitate the digestion process of anti-nutritional factors such as trypsin, phitic acid and glucosinolate (Havenaar et al. 1992). Enzymes could improve nutrient digestibility by breaking up complex molecular structures into simpler molecular structures (e.g, from polysaccharides to monosaccharides or from proteins to amino acids (Borin et al. 2002, Hernandez et al. 2004; Kong & Adeola 2010; Rutherfurd et al. 2007).

The use of enzymes is one of the right actions because it has no negative side effects when administered in the proper dosage. Enzymes are non-toxic, natural and immediately inactive when the reaction has reached the desired point (Patterson & Burkholder 2003; Cavazzoni et al. 1998; Yeo & Kim 1997). The addition of enzymes in laying chicken and broiler chicken diets has been reported to have positive respons for poultry. Xuan et al. (2001) reported that administering 0.10-0.30% of commercial enzymes in rations, improved phosphorus digestibility, growth, and efficiency of ration use in broiler chickens. The commercial enzyme is a combination of several enzymes such as alpha-amylase, xylanase, beta-gluconase, protease, lipase, and phytase (Xuan et al. 2001). Other researchers have also reported that supplementation of phytase enzymes to the rations improved the digestibility of crude protein, P, Zn, Mg, and Cu, and increased the retention nitrogen of Ca, P, Mg, and Zn minerals (Lim et al. 2001). Simbaya et al. (1996) reported that supplementation of enzyme (phytase, carbohydrase and protease) in rations increased weight gain and the efficiency of ration on broiler chickens. It was further reported that the nutrients digestibility increased with the supplementation of the three enzymes. The addition of enzyme (protease, cellulase, and hemicellulase) was found to increase the growth and efficiency of ration (Selle et al. 2003).

Pasaribu et al. (2009) reported that the addition of BS4 enzyme could increase metabolic energy and solid-phase solidity (SHP), whereas with single commercial enzymes only increased metabolic energy. The optimum dose of BS4 enzyme addition was 13.3 ml. Enhanced SHP, when used in laying hens, replacing the use of maize up to 25%, without causing a decrease in egg production and egg quality (Sinurat et al. 2007; 2008).

Information on the supplementation of enzymes on feed of laying duck has been reported, but for the broiler type of duck was still few, especially in local ducks. Candrawati et al. (2006) reported that phylazim enzyme supplementation of 0.20% in rations containing 30% rice bran was not significantly different from rationing using 15% rice bran and without enzyme. Chandrawati et al. (2006) reported that the use of rice bran up to 30% with the addition of enzymes in broiler aging 2-6 weeks was feasible.

Rice bran generally contains high fiber that is not easy to digest. It contains high fiber, protein and energy, stored in the cell wall in the form of cellulose and hemi cellulose, which is difficult to digest by poultry. The use of rice bran with a high proportion by the farmers in the field has been going on even though the duck production yield is very low. Rice bran besides containing high fiber it is also containing anti-nutrients such as phytic acid. The anti-nutrients can bind proteins, starches and minerals so that their presence in the diet can inhibit the digestibility of proteins, starches and minerals. Gallinger et al. (2004) suggest that the use of rice bran in poultry feed should not exceed 20% because it contained high crude fiber. These conditions can inhibit the digestion process, feed absorption so that it can disrupt the growth of ducks. All the obstacles are expected to be overcome by the addition of enzymes in the feed. The purpose of this paper was to determine the effect of supplementation of various levels of BS4-enzyme based on high level (30 and 60%) of rice bran on diet to the performance of PMp broiler duck.

MATERIALS AND METHODS

The material used was PMp broiler ducks obtained from crossing of male Pekin duck through artificial insemination (AI) with female Mojosari duck (one of new IRIAP's duck strain). The whole process of keeping the parent ducks was conducted according to standard operational research of IRIAP. PMp ducklings were then allocated randomly in 32 wire cages, equipped with feed and drinking water. The ducklings were reared from the age of 0 to 4 weeks. The data were then analysed using completely randomized design (CRD) 2 x 4 pattern. The first factor was two levels of rice bran of 30 and 60%, the second factor were four BS4-enzyme levels of 0, 50, 100, and 150 Unit/kg rice bran. So, there were eight treatments, each treatment had four replicates, each replicate consisted of seven ducks. The enzyme used were BS4-enzyme, which was produced in IRIAP by utilizing coconut cake, mineral

mixture and mocrobe of *Eupenicillium javanicum* (Pasaribu et al. 2009; Sinurat et al. 2016). The dietary treatments followed:

T1, diet + 30% rice bran + 0 Unit BS4-enzyme/kg
T2, diet + 30% rice bran + 50 Unit BS4-enzyme/kg
T3, diet + 30% rice bran + 100 Unit BS4-enzyme/kg
T4, diet + 30% rice bran + 150 Unit BS4-enzyme/kg
T5, diet + 60% rice bran + 0 Unit BS4-enzyme/kg
T6, diet + 60% rice bran + 50 Unit BS4-enzyme/kg
T7, diet + 60% rice bran + 100 Unit BS-enzyme/kg
T8, diet + 60% rice bran + 150 Unit BS4-enzyme/kg

The nutrient content of rations was formulated based on nutritional requirement for duck following the recommendations of NRC (1994), Chen (1996), and Ketaren et al. (2010). The treatment rations were prepared iso protein and iso energy. The rations, which were provided at the age of 1 to 7 days was a commercial starter ration. Provision of the treatment ration with enzyme supplementation and high bran content was carried out since duck entered the age of one week. Materials and the composition of the treatment are presented in Table 1. Feed was given twice a day in the morning and afternoon, while drinking water was provided *ad libitum*. The variables measured were feed intake, body weight gain, and feed conversion ratio (FCR). Ducks were weighed once a week to obtain body weight data as well as consumption and feed efficiency. Data were analyzed by using the procedure of General Linear Model (GLM) applying Statistical Analysis System (SAS, ver. 6.12, 1997).

Table 1. The composition and nutrient content of the dietary treatments

Ingredients	Feed treatments							
	T1	T2	T3	T4	T5	T6	T7	T8
Rice bran, (%)	30.00	30.00	30.00	30.00	60.00	60.00	60.00	60.00
Corn, (%)	34.60	34.60	34.60	34.60	6.21	6.21	6.21	6.21
Soybean meal, (%)	22.06	22.06	22.06	22.06	16.53	16.53	16.53	16.53
Fish meal, (%)	5.88	5.88	5.88	5.88	8.53	8.53	8.53	8.53
Methionin, (%)	0.15	0.15	0.15	0.15	0.12	0.12	0.12	0.12
Lysine, (%)	0.42	0.42	0.42	0.42	0.45	0.45	0.45	0.45
Premix, (%)	0.40	0.40	0.40	0.40	0.05	0.05	0.05	0.05
Crude palm oil, (%)	5.50	5.50	5.50	5.50	7.95	7.95	7.95	7.95
Dicalcium posphate, (%)	0.55	0.55	0.55	0.55	0.10	0.10	0.10	0.10
Lime stone, (%)	0.15	0.15	0.15	0.15	0.03	0.03	0.03	0.03
Salt (%)	0.29	0.29	0.29	0.29	0.03	0.03	0.03	0.03
Total	100	100	100	100	100	100	100	100
BS4 Enzyme (Unit/kg)	**0**	**50**	**100**	**150**	**0**	**50**	**100**	**150**
Nutrient content (% dry matter)*								
Protein, (%)	19.29	19.29	19.29	19.29	19.02	19.02	19.02	19.02
Energy, (kkalME/kg)	2933	2933	2933	2933	2896	2896	2896	2896
Crude fiber, (%)	5.21	5.21	5.21	5.21	8.64	8.64	8.64	8.64
Methionine, (%)	0.33	0.33	0.33	0.33	0.31	0.31	0.31	0.31
Lysine, (%)	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05
Calcium, (%)	0.87	0.87	0.87	0.87	0.97	0.97	0.97	0.97
Phosfor, (%)	0.71	0.71	0.71	0.71	0.90	0.90	0.90	0.90

*) The nutrient content based on calculation; ME (Metabolisable energy)

RESULTS AND DISCUSSION

Feed consumption

The average feed consumption of PMp broiler duck fed with rations based on two levels of rice bran (30 and 60%) and supplemented with BS4 enzyme is presented in Table 2. There was no significant (P>0.05) interaction between supplementation of BS4-enzyme and rice bran. Feed consumption was affected (P<0.05) by supplementation of BS4-enzyme but not by the rice bran levels (P> 0.05). Supplementation of BS4-enzyme with doses of 150 Unit/kg and 30% of r ice bran in ration resulted in the lowest feed intake compared to other treatments. The average feed consumption of ducklings in the T4 treatment was 998 g/4 week/duckling. The result of this study was in line with the report of Simbaya et al. (1996), Xuan et al. (2001) and Shelle et al. (2003).

The average feed consumption resulted appeared to be decreasing along with the increasing BS4-enzyme level in all the treatment rations. The average feed consumption with T4 treatment ration (150 Unit BS4-enzyme/kg in 30% rice bran ration) decreased by 14.7% of control rations, whereas in T2 and T3 treatment decreased by 0.68 and 0.85%. The decrease in consumption of ration contained 60% bran, was almost equal to the decrease consumption in T2 and T3 treatment (30% of rice bran). The results illustrated that the higher dose of BS4-enzyme supplemented to the ration, the more ability the ducklings to change the complex molecular structure into a simple form and simplify the process of feed digestion.

Havenaar et al. (1992) stated that the use of enzymes in animals could eliminate various anti-nutritional factors present in the diet such as trypsin, phitic acid and glucosinolate and facilitate the digestion process in poultry. Digestion process was increased by the availability of enzyme causing the increase in nutrients availability and absorption of the nutrient consumed by PMp ducks. Selle et al. (2003) stated that the addition of enzymes (protease, cellulase, and hemicellulase) in animal feeds, improved feed efficiency by increasing growth in broiler chickens. Table 2 also shows that the average feed consumption with addition of BS4-enzyme (150 Unit/kg) was significantly improved (P<0.05) duckling performance compared the other treatments. The study indicated that supplementation of BS4-enzyme by a dose of 150 Unit/kg in 30% rice bran the diet, was the best combination levels to decrese broiler duck feed consumption during the first four weeks of age.

Body weight gain

The average weight gain of PMp broiler ducks fed rations contained two levels of rice bran (30 or 60%) supplemented with BS4-enzyme up to 4 weeks of age is presnted in Table 3. BS4-enzyme supplementation to rations contained two levels of rice bran up to 4 weeks of age did not significantly increase (P>0.05) body live weight gain of the PMp broiler duck.

Tabel 2. The average feed consumption of PMp boiler ducks fed rations contained 30 or 60% rice bran supplementation with various levels of BS4-enzymes up to 4 weeks of age

Rice bran levels	Enzyme levels (Unit/kg rice bran)				Average
	0	50	100	150	
30%	1170±53.88*[a]	1162±68.00[a]	1160±64.00[a]	998±22.60[b]	1123
60%	1164±23.50[a]	1161±23.36[a]	1160±24.00[a]	1160±24.00[a]	1161
Average	1167[a]	1161[a]	1160[a]	1079[b]	

Values in the same column with different superscript are significantly difference (P<0.05)
*) Standard error

Table 3. The average body live weight gain of PMp boiler ducks fed rations contained 30 or 60% rice bran supplementation with various levels of BS4-enzymes up to 4 weeks of age

Rice bran level	Enzymes level (Unit/kg rice bran)				Average
	0	50	100	150	
30%	733.00±24.81*	712.75±27.99	714±21.27	785.50±14.62	736.25
60%	724.00±23.01	727.25±43.77	715±32.68	695.25±33.21	715.50
Average	728.50	720.00	714.68	740.38	

*) Standard error

Sinurat et al. (2007) reported that the addition of BS4-enzyme in laying hens did not effect (P>0.05), body live weight gain, although egg production, egg weight and feed efficiency increased (P<0.05). Sinurat et al. (2016) concluded that supplementation of BS4-enzyme in laying hens diet did not influence body weight, feed intake, mortalities, egg weight and egg shell thickness. However it was further reported that supplementation BS4-enzyme in the diet contained palm kernell cake (PKC), improved the egg yolk color score but no effect on maize or rice bran diets (Sinurat et al. 2016). Tirajoh et al. (2010) has also reported that the addition of phytase enzyme to the ration containing 30% rice bran up to 6 weeks of broiler chicken did not significantly affect live body weight gain (P> 0.05).

Kochcer (2003) and Olukosi et al. (2007) had also reported that the addition of xylanase, amylase and protease enzymes in the feed did not significantly (P>0.05) affect body live weight gain of broiler up to 21 days of age. Other research results as reported by West et al. (2007) showed that the addition of xylanase and ß-glucanase enzyme in corn and soybean meal did not significantly influence to the body weight of broiler chickens.

The average body live weight gain of PMp ducks ranged from 695.25 to 785.50 g/bird up to 4 weeks of age. Sinurat et al. (2007) reported that the addition of BS4 enzyme in laying hens did not effect (P>0.05), but increased egg production, egg weight and feed efficiency. Sinurat et al. (2016) concluded that supplementation of BS4-enzyme in the laying hens diet did not influence the body live weight change, feed intake, mortalities, egg weight and egg shell thickness. However it was further reported that supplementation BS4 enzyme into the diet improved the egg yolk color score of chicken fed the PKC diet but not affected when fed maize or rice bran diet (Sinurat et al. 2016). Tirajoh et al. (2010) has also reported that the addition of phytase enzyme to the ration containing 30% rice bran to 6 weeks old of broiler chicken did not significantly affect body weight (P>0.05).

The results showed that the highest body weight gain was found in T4 treatment (785.50 g/bird) increased by 7.16% compared to the control ration, while the lowest was found in the T8 treatment of T8 (695.25 g/bird), which was decreasing by 3.97% of control rations. In Table 3 appears that supplementation of 150 Unit BS4-enzyme/kg in ration containing 30% rice rice bran, increased body live weight gain of the duckling. In contrast to the results achieved in rations containing 60% of rice bran, although the BS4 enzyme level was raised up to 150 Unit/kg the body live weight gain of the duck was even decreased. Table 3 shows that except for the T6 treatment (50 Unit BS4 enzymes/kg), the increase in body weight of PMp duck under T7 treatment (100 Unit/kg) and T8 (150 Unit/kg) was lower compared than the control ration (T5). The study was in line with Gallinger et al. (2004) who stated that the body weight gain of broiler chicken decreased along with the increase of rice bran rate by 30 and 40%, causing the decrease about 3.6 and 8% respectively compared to control ration. When viewed from aspect of the effectiveness, the addition of BS4-enzyme at a dose of 150 Unit /kg in 30% rice bran diet was considered adequate to support the increased body weight gain of PMp broiler duck up to 4 weeks of age.

Feed Conversion Ratio (FCR)

The average FCR of PMp broiler duck with under rice bran based rations (30% or 60%) supplemented with various levels of BS4-enzyme are described in Table 4. Based on the results of the analysis of the varians, the influence of the interaction between the various levels of BS4-enzyme with both rice bran levels in feed treatment was not significant (P>0.05). The BS4-enzyme supplementation in to 30% rice bran diet had significant effect (P<0.05) on FCR, but did not in 60% rice bran diet. BS4-enzyme supplementation with a dose of 150 Unit/kg in 30% rice bran rations, resulted in the lowest FCR compared to other treatments. The average FCR produced on the T4 treatment was 2.64. Sinurat et al. (2007) reported that the FCR of laying chicken was decreasing along with the addition of BS4-enzyme in the ration. Other research also have been reported by Tirajoh et al. (2010), who stated that the efficiency of broiler chicken up to the age of 6 weeks increased by the addition of phytase enzyme into the ration.

Table 4. The average feed conversion ratio (FCR) of PMp broiler ducks fed rations contained 30 or 60% rice bran supplementation with various levels of BS4-enzymes up to 4 weeks of age

Rice bran levels	Enzyme levels (Unit/kg rice bran)				Average
	0	50	100	150	
30 %	3.17±0.07*[a]	3.23±0.14[a]	3.19±0.08[a]	2.64±0.13[b]	3.05
60 %	3.08±0.09[a]	3.07±0.18[a]	3.16±0.28[a]	3.22±0.35[a]	3.13
Average	3.13	3.15	3.17	2.93	

Values in the same column with the different superscript are significantly difference (P<0.05)
*) Standard error

The FCR value in duck farming business is very important considering that ducks consume a lot of feed. Ducks are very rare to stop consuming feeds as long as necessary nutritional requirements are not yet fulfilled. Therefore it is important to know the quality and nutritional content of any feedstuffs that will be given to ducks. Cowieson (2010) recommended that one of the strategies to improve nutritional content of feed include energy content, was enzymes supplementation with enzymes. Addition of enzymes was lowering feed consumption as well as feed costs. Similar to Cowieson (2010), other researchers also reported that the addition of enzymes into the diet increased the nutritional content of proteins and amino acids and its digestibility (Zanell et al. 1999; D'Alfonso 2005; Cowieson & Ravindran 2008). The low FCR resulted in T4 treatments, illustrated the role of BS-4 enzyme in digestion of crude fiber and anti-nutrient substances. It also helped nutrients absorption more effective than other treatments. The supplementaton of BS4-enzyme at a dose of 150 Unit/kg in diet containing of 30% rice bran was most effective to produce low FCR in PMp broiler duck up to 4 weeks of age. The study was in line to the reports of Simbaya et al. (1996), Xuan et al. (2001) and Shelle et al. (2003) who stated that the efficiency of feed consumption has increased along with the enzyme supplementation in broiler rations. The results showed that the addition of BS4-enzyme in ration containing rice bran by 30% could improve feed efficiency in PMp duck up to 4 weeks of age.

CONCLUSION

The supplementation of BS4-enzyme in rice bran based diet was effectively to enhance performance of PMp broiler duck up to weeks of age. Supplementation of 150 Unit BS4-enzymes/kg rice bran in ration containing 30% of rice bran, effectively increased feed efficiency of PMp broiler ducks up to 4 weeks of age.

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