

Effects of Sago Waste as Local Feed Resource that Gives Cellulose Enzyme in Feed on Carcass and Organ Characteristics of Broiler Chickens

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ABSTRACT

This study aims to determine the effect of using sago waste as a local feed ingredient with cellulase enzyme addition to wards carcass and organs characteristics of broiler chickens. Broiler with chickens mix sex grouped in into five different treatment groups with 6 replications. Each replication consisted of 10 heads that were randomly distributed. The treatment used sago waste with cellulose enzyme addition of 0.75 g/kg of sago waste with usage level of 0.00%, 5.00%, 10.00%, 15.00% and 20.00% of total basal feed. The parameters observed were the characteristics of carcass and organ digestive of broiler chickens. Data were analyzed by Completely Randomized Design (CRD) with unidirectional pattern. If there was a significant mean difference between treatments, then proceed with Duncan's New Multiple Range Test (DMRT). The results showed that the addition of the sago waste with cellulose enzyme addition in feed gave a significant difference ($P < 0,05$) to broiler characteristic (slaughter weight, abdominal fat weight and abdominal fat percentage), but not significantly different to the organs digestive of broiler. The research concluded that the effect of using sago waste with enzyme cellulose addition of 0.75 g/kg were able to improve broiler carcass characteristic and more effective at the use of 15% level in broiler ration by not affecting the internal organs of broiler chickens.

Keywords: Sago Waste, Cellulose Enzyme, Broiler, Carcass and Internal Organs

INTRODUCTION

Consideration of poultry feed ingredients was not only on nutrient content but also to avoid the competition with other needs so that feed prices can be minimized. The alternative to this problem was the utilization of agricultural waste in the form of sago waste as a source of local feed. Sago waste was a waste of untreated sago (*Metroxylon Sp*) processing and was left to rot in the sago processing area resulting in environmental pollution. Constraints in the use of sago pulp as poultry feed material were a high content of crude fiber (CF) with low crude protein (CP). Zulkarnain *et.al.* (2016) stated that sago waste contained 16.01% CF, and 2.01% CP. Its fiber components were 10.62% cellulose, 1.56% hemicellulose and 1.67% lignin. Although the sago waste had a high content of CF, it still potential of being a feed source of energy of 2716 kcal/kg (Zulkarnain *et.al.*, 2016) and has 89.02% carbohydrate (Muhsafaat *et.al.*, 2015). The content of CF in sago wastewas one of the constraint factors which had implication of low digestibility and decrease broiler production because it had no fiber component breaking enzymes (Arjum and Chaudhry, 2010). Zuprizal (2006) stated that

the existence of crude fiber in the feed material causes the feed material was not digested entirely and can be used by poultry animal.

Cellulase is the dominant component of CF in sago waste, so the appropriate commercial enzyme used was cellulase enzyme. Guntoro *et.al.* (2000) stated that enzymes were generally used to reduce anti nutrient factors in animal feed, increase digestibility, and reduce environmental pollution due to livestock manure. Cellulase enzymes can play a role in catalyzing cellulose into glucose. Complex cellulose consisted of selobiohydrolase, endoglucanase and β -glucosidase enzymes which can break the β -1,4 bond in the cellulose structure. This bond breaking resulted in oligaccharides of cellulose derivative, to eventually be converted into glucose monomer. The use of cellulase enzymes in sago waste was 0.75 g/kg (Zulkarnain *et al.*, 2016). Based on the problems in the background, the purpose of this study was determining the effect of using sago waste as a source of local feed material which was given with cellulase enzyme in feed towards the characteristics of carcass and internal organ of broiler chickens.

Introduce sections three to four paragraphs in length or longer sections below a first subheading.

MATERIALS AND METHODS

This research material was one-day age of mix sex broiler chicken, CP Lohman 707 strain, cellulase enzyme, sago waste, and feed material. Feed ingredients and nutrient content used in this study was presented in Table 1 and Table 2.

Table 1. Nutrient content of each feed used in the study

Raw Material	Nutrient Content					
	Metabolism energy (kcal)	Crude protein (%)	Crude Fiber (%)	Fat (%)	Calcium (%)	Phosphor (%)
Concentrate Broiler ^{a)}	2,800,00	39.00	7.00	3.00	3.00	1.70
Corn ^{b)}	3,350,00	8.50	2.20	3.80	0.02	0.08
Rice Bran ^{b)}	2,980,00	11.90	11.40	13.00	0.07	0.21
Fish Meal ^{b)}	2,580,00	64.20	1.00	5.00	3.73	2.20
Top mix	0.00	0.00	0.00	0.00	0.00	0.00
Filler	0.00	0.00	0.00	0.00	0.00	0.00
Coconut Oil ^{c)}	8,728,00	0.00	0.00	0.00	0.00	0.00
Sago waste ^{d)}	2,610,00	2.01	12.79	0.03	0.61	0.01
cellulose enzyme	0.00	0.00	0.00	0.00	0.00	0.00

Source : ^{a)} Comfeed Jafa Feed, ^{b)} National Research Council (1994), ^{c)} Result of laboratory analysis of the University center (IUC) for Food and Nutrition Gadjah Mada University, 2007, ^{d)} Analysis result of nutritional biochemistry laboratory of animal science Gadjah Mada University, 2015

The treatment of this research were the sago waste with cellulase enzyme addition of 0.75 g/kg, then it is fed into the feed at the level of 0.00, 5.00, 10.00, 15.00 and 20.00% of the total basal feed. Broiler chickens as experimental cattle are grouped into 5 different treatments with 6 repetitions so the total plot is 30 plots. The enclosure used is a litter enclosure that is insulated with a size of 1 x 1 m and a height of 0.5 m. Each plot of cages is randomly filled with 10 tails and nourished for 5 weeks. Feed and drink were provided *ad libitum*. Prevention of *Newcastle Disease* (ND) was achieved trough vaccination using the "Medivac ND La Sota B1" vaccine were 3 days old and "Medivac ND La Sota B2" when the chickens were 21 day sold. The Vaccines are made by Medion Bandung-Indonesia. The poultry was given sugar water and anti-stress "*vita stress*" to avoid stress, especially when the poultry arrived in the

research location and their body weights were measured. The variables measured in this research were carcass characteristics (slaughter weight, carcass weight and abdominal fat weight) and organs digestive (pancreatic weight, liver weight, small intestine pH and bile weight) of broiler chickens.

Table 2. The composition of feed ingredients and nutrient content

Materials	Treatments				
	R ₁	R ₂	R ₃	R ₄	R ₅
BR Concentrate	30.00	28.50	30.00	32.80	30.65
Corn	47.00	45.00	40.00	32.50	30.00
Bran	12.00	9.00	5.50	1.50	0.00
Fish flour	8.50	10.00	10.50	10.30	11.90
Top Mix	0.20	0.20	0.20	0.40	0.50
Filler	0.50	0.50	1.00	2.50	2.40
NaCl	0.30	0.30	0.30	0.40	0.50
Coconut oil	1.50	1.50	2.50	4.60	4.05
Sago waste+ cellulase enzyme	0.00	5.00	10.00	15.00	20.00
Total	100.00	100.00	100.00	100.00	100.00
Feed Nutrient content					
Metabolism Energy (kcal/kg)	3,017.00	3,014.00	3,046.00	3,097.00	3,046.00
Crude Protein (%)	22.58	22.53	22.70	22.65	22.55
Crude Fiber (%)	4.59	4.75	4.99	5.20	5.48
Crude fat (%)	4.67	4.24	3.66	2.93	2.66
Calsium (%)	1.23	1.27	1.36	1.47	1.49
Fosfor (%)	0.76	0.76	0.78	0.81	0.81

Data were analyzed using one-way ANOVA with a completely randomized design (CRD) unidirectional pattern. If there was a significant average difference between treatments, it will be continued with Duncan's New Multiple Range Test (DMRT) (Steel and Torrie, 1993).

RESULTS AND DISCUSSION

The research results of the effect of adding sago waste with cellulase enzyme addition of 0.75g/kg towards the characteristic of carcass and internal organ of broiler chicken were presented in Table 3.

Carcass Characteristics of broiler chicken. The result of statistical analysis showed that the addition of sago waste with cellulase enzyme addition of 0.75 g/kg in feed gave significant difference ($P < 0,05$) to the carcass characteristic broiler chicken (Table 3). The weight of broiler chickens in the study was in the range of 1.594.08 to 1.756,75 g/head. A further test using DMRT showed that the slaughter weight of R1 treatment was not different from R2 but was significantly different with R3, R4 and R5. The R2 treatment was significantly different with R3 and R5 and R5 was significantly different from R4 and R5 and R4 was not different from R5. Differences in broiler chicken weight resulted in this study may be influenced by the feed nutrient quality, especially in the treatment of sago waste with cellulase enzyme addition of 15%. The positive response to broiler slaughter weight on R4 treatment was probably caused by the enzyme cellulase found in the sago waste which was able to improve the digestibility of nutrient feed.

Table 3. Effect of added sago waste cellulase enzyme addition of 0.75 g/kg on carcass and organ characteristics in broiler age of 35 days

Parameter	Treatment				
	R1	R2	R3	R4	R5
Carcass characteristics					
SW (g)*	1,594.08 ^c ± 71.88	1,664.92 ^{bc} ± 55.06	1,734.33 ^b ± 81.27	1,756.75 ^a ± 53.97	1,749.58 ^a ± 52.07
CW (g)*	1,072.17 ^b ± 66.94	1,180.33 ^a ± 76.28	1,230.58 ^a ± 97.03	1,280.17 ^a ± 130.51	1,224.17 ^a ± 62.87
AFW (g)*	30.37 ^a ± 1.30	26.18 ^b ± 1.49	25.33 ^b ± 2.89	23.70 ^b ± 1.71	21.22 ^c ± 2.16
Organ characteristics					
PP (%) ^{ns}	0.18 ± 0.02	0.18 ± 0.01	0.20 ± 0.02	0.20 ± 0.02	0.19 ± 0.02
LP (%) ^{ns}	1.67 ± 0.11	1.63 ± 0.12	1.66 ± 0.17	1.73 ± 0.24	1.65 ± 0.14
SI pH ^{ns}	5.80 ± 0.16	5.92 ± 0.07	5.94 ± 0.08	5.90 ± 0.11	5.95 ± 0.14
BW (g) ^{ns}	2.15 ± 0.55	2.18 ± 0.45	2.37 ± 0.28	2.50 ± 0.49	2.03 ± 0.19

SW = Slaughter Weight; CW = Carcass weight; AFW = Abdominal fat weight; PP= Pancreas Percentage; LP = Liver Percentage; SI = Small Intestine; BW = Bile Weight; ^{ns} = Non significant; ^{a,b,c,d}= Different Superscripin the same row shows significant differences (P<0.05); Treatment Feed R₁ = Control Feed. R₂ = Ccontrol Feed + 5% sago waste with cellulase enzyme addition of 0.75 g/kg. R₃ = Control Feed + 10% sago waste with cellulase enzyme additionof 0.75 g/kg. R₄ = Control Feed+ 15% sago waste with cellulase enzyme additionof 0.75 g/kg.dan R₅ = Control Feed+ 20% sago waste with cellulase enzyme additionof 0.75 g/kg.

The carcass weight of 35 days old broiler chicken on all treatments ranged from 1.072,17 to 1.280,17 g/head. The weight of carcass produced in this research was still in good category based on SNI standard on medium size (1.0 to 1.2 kg/birds). Further test results using DMRT showed that carcass weight at R1 treatment was significantly different (P <0,05) to R2, R3, R4 and R5 treatment. R2 treatment did not differ significantly from the treatment of R3, R4 and R5, as well as R3 and R4 and R4 and R5. The increase of carcass weight due to the sago waste with cellulase enzyme addition was influenced by slaughter weight. Karaoglu and Durdag (2005) stated that carcass production was closely related to the live weight or the slaughter weight of the animal produced.

Abdominal fat weight was in the range of 21.22 to 30.37 g/head. The results of further DMRT test showed that the abdominal fat weight of R1 treatment was significantly different (P<0.05) with R2, R3, R4 and R5 treatment, but treatment R2 showed no significant difference with treatment R3, R4 and significantly different with R5. The R3 treatment was not significant with R4 and was significantly different with R5 (P<0.05), and R4 treatment was significantly different with R5 (P <0.05). Factors causing differences in abdominal fat of broiler livestock may be due to differences in growth rates and crude fiber content in the given feed (Table 2). Hartoyo (2015) stated that the content of crude fiber in the feed will affect the abdominal fat content of broiler chickens.

Gastrointestinal Organ broiler. The results of statistical analysis showed that the addition of sago waste with cellulase enzyme addition of 0.75 g/kg in the feed gave no significant difference to the digestive organ characteristics of broiler chickens. The results of this study indicate that the feed treatment of sago dregs added with cellulase enzyme from 5.00% to 20.00% gives the same response to the digestion performance of broiler chickens at all treatments. Hanim (2014) stated that xylanase enzyme supplementation for feed at level of 2.25 g/kg also did not give a significant response to the broiler internal organ. The result of broiler chicken pancreas percentage was in the range 0.18 to 0.20%. The existence of insignificant differences between treatments in this study was probably due to the work of the pancreas to secrete enzymes in digesting feed nutrient on all treatments was equal. It was also influenced by the absence of increased secretion activity in the small intestine so it did not increase the size of the pancreas (Wang et.al., 2005).

The percentage of broiler liver weight ranged from 1.63 to 1.73% and was not influenced by the addition of sago waste with cellulase enzyme addition in this study. This was because the nutrient content of the feed was in good condition and not influenced by

anti-nutrient substances. Similarly, pH of the small intestine of broiler chickens range produced was in the range of 5.80 to 5.95. The pH of the small intestine obtained clearly stated that the degradation of crude fiber components by cellulase enzymes run outside the gastrointestinal tract, whereas cellulase enzymes effectively work at pH 5 with a temperature of 60° C, while broilers have a normal body temperature of approximately 40° C. While the bile weight obtained was in the range of 2.03 to 2.50 g/head. The bile consisted of bile liquid with a composition of bile salts, bile pigment, cholesterol, lecithin, fat and various inorganic salts. Based on the composition, it can be assumed that there was no difference between the treatment of bile weight in this study due to liver activity in producing and secreting bile run well for all treatments.

CONCLUSIONS

The use of sago waste as feed ingredients which was added with cellulase enzyme 0.75 g/kg can improve the carcass characteristics of broiler chickens and more effectively used at the level of 15% in broiler chicken rations by not affecting the internal organ characteristics of broiler chickens used in this study.

REFERENCES

- Arjum, M.S., and A. S. Chaudhry. 2010. Using enzymes and organic acids in broiler diets. *J. of Poult. Sci.* 47:97-105.
- Hanim, C. 2014. Peningkatan produksi xilanase melalui mutagenesis bakteri xilanolitik serta aplikasinya pada ayam pedaging. Disertasi. Sekolah Pascasarjana. Universitas Gadjah Mada. Yogyakarta.
- Hartoyo, B. 2015. Pemanfaatan hasil fermentasi bungkil inti dan lumpur sawit dengan isolat mikrobial asal akar bambu sebagai sumber energi pakan ayam broiler. Disertasi. Program Pascasarjana. Fakultas Peternakan Universitas Gadjah Mada. Yogyakarta.
- Muhsafaat L.O., H.A. Sukria., dan Suryahadi, 2015. Kualitas protein dan komposisi asam amino ampas sago hasil fermentasi *Aspergillus niger* dengan penambahan urea dan zeolit. *J. Ilmu Pertanian Indonesia.* 20: 124-130.
- Nahashon, S. N., N Adefope, Ameyenu and D. Wright. 2005. Effects of dietary metabolisable energy and crude protein concentrations on growth performance and carcass characteristic of French guinea broiler. *Poult. Sci.* 84: 337 – 334
- NRC. 1994. *Nutrient Requirements of Poultry.* 9th ed. National Academy of Science, Washington DC.
- Steel, R.G.D. dan J.H. Torrie, 1993. *Prinsip dan Prosedur Statistik. Suatu Pendekatan Biometrik.* Penerjemah : Sumantri B., Penerbit PT. Gramedia Pustaka Sarana. Jakarta.
- Wang, Z. R., S. Y. Qiao, W. Q. Lu and S. F. Li. 2005. Effects of enzyme supplementation on performance, nutrient digestibility, gastrointestinal morphology and volatile fatty acid profiles in the hindgut of broiler feed wheat-based diets. *Poult. Sci.* 84: 875 – 881.
- Zulkarnain, D, Zuprizal, Wihandoyo, Supadmo. 2016. Effect of Cellulase Supplementation on *in vitro* Digestibility and Energy, Crude Fiber and Cellulose Content of Sago Palm (*Metroxylon* sp.) Waste as Broiler Chicken Feed. *Pak. J. Nutr.* 15: 997-1002.

The 7th International Seminar on Tropical Animal Production
Contribution of Livestock Production on Food Sovereignty in Tropical Countries
September 12-14, Yogyakarta, Indonesia

Zuprizal, 2006. Nutrisi Unggas. Jurusan Nutrisi dan Makanan Ternak. Fakultas Peternakan.
Universitas Gadjah Mada. Yogyakarta.