

Performance of Cattle Fed with Fermented Solid Decanter as Concentrate Diet

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ABSTRACT

Palm oil sludge (POS) or solid decanter was one of palm oil mill wastes that had a potency as feed. Its protein content closed to ricebran. The high crude fiber fractions were the problem of POS regarding to its digestibility. *Pleurotus* mushroom was known as one of white rot fungi through bioconversion can degrade the fiber fraction. The aim of this research was to evaluate the performance of cattle fed with palm oil sludge (solid decanter) fermented with *P.ostreatus* as concentrate diet. Four Bali cattles were allocated in Latin Square Design 4 x 4. Each cattle was fed four diets in four periods. The diets were T0 (100 % natural grasses), T1 (60% native grass:40% rice bran), T2 (60% native grass:40% fermented solid decanter) and T3 (60% native grass:40% unfermented solid decanter). One periode took three weeks each. The body weight were measured at the beginning and at the end of each periodes. No statistically significant differences were observed in dry matter consumption. The weight gain and feed conversion of T1 (60% native grass:40% rice bran) were the highest ($P<0.05$) among treatment and no significant different of weight gain and feed conversion among other treatment (T0, T2, T3). The supplementation of concentrate based from solid (P2 and P3) did not have the negative effect on weight gain.

Keywords: performance, cattle, solid decanter, fermented, concentrate

1. INTRODUCTION

Agro-industrial byproducts could be alternative as cheap and sustainable feed for ruminants. Oil palm industry in Indonesia especially Bengkulu produces annually huge amounts of byproduct biomass available as potential animal feed, such as oil palm frond, decanter cake (DC) and palm kernel cake (PKC). These by-products represent an alternative, as they are readily available and represent sustainable feed resources for ruminants and other farm animals. Their inclusion in diets can be an effective measure in overcoming the lack of forage and also substitute the conventional concentrate diets such as rice bran. The use of oil palm byproduct biomass can reduce the cost of imported feed. Solid decanter (solid) is one of palm oil mills wastes obtained after dehydration of palm oil mill effluent (POME)[1]. Solid have a potency as a feed source. The crude protein content of solid is equal to rice bran around 11% up to 14%. The nutrient quality of solid was classified as moderate (TDN 62,5%, ME 8,37MJ/kg)[2]. The limitation for using this ingredient as feed could be attributed to its higher fibre. The crude fiber fraction content of POS were 21.15%-29.76% for crude fiber, 73 cellulose 11.42%, hemicellulose 18.77% and lignin 36.40% [3]. Therefore, one effort to overcome this problem is needed such as bioconversion with *Pleurotus ostreatus* mushroom.

Pleurotus species are considered white-rot fungi for their ability to degrade lignocellulosic residues due to their enzymatic complex. The most studied enzymes in these fungi are lignin-degrading, such as laccases, Mn-peroxidases and veratryl alcohol oxidases. These fungi have the ability to degrade cellulose, hemicellulose and other carbohydrates present in agro-industrial waste [4]. *Pleurotus ostreatus* mushroom can grow well on the substrate with quite high organic content such as solid decanter. The aim of this research was to evaluate the performance of cattle fed with fermented solid decanter as concentrate diet. The hypothesis of the present study was that inclusion of fermented solid decanter in the diet did not had a negative effect to the weight gain of cattles.

2. MATERIALS AND METHOD

This research was done at Outdoor Laboratorium Departement of Animal Science Agricultural Faculty Bengkulu University. Four male Bali cattles with similar age (\pm three years old) and body weight were used (254 \pm 33 kg). The body condition score was 5 (Moderate)

All the cattles were arranged in Latin Square Design with four diets treatment and four periodes. Each periode took three weeks. The diets were T0 (100% native grass), T1(60%native grass and 40% concentrate/ rice bran), T2(60%nativr grass and 40%fermented solid

decanter) and T3 (60% native grass and 40% non-fermented solid decanter/dried solid). All cattle were housed individually with facilities for individual feeding. Cattle were fed in amounts adequate to ensure 2% dry matter of body weight at the day. Before treatment, the cattle got the anthelmintic treatment for worm control.

Solid Decanter Cultivation with *Pleurotus ostreatus*. Fresh solid were taken from palm oil mill in Bengkulu Tengah Region. Solid were solar dried until its moisture content 10-15% and then grinded. The cultivation method of solid substrate were conducted according to [5] with slight modification. The substrate consisted of 70% of palm decanter (solid), 14% rice bran, 14% coffee husks and 2.0% CaCO₃. The clean water was added into the substrate as much as 65%-70% (v/w). All the components were composted for 24 h and then was placed into polypropylene bags as much as 400 g per bag. The bag logs were sterilized on 121°C for 30 min. After cooling, each bag was seeded with *P. ostreatus* grain spawn ($\pm 3\%$) and incubated in an incubating room at 23-28 °C and approximately 60-80% relative humidity. Each spawned bag was closed with a small sterile cotton plug inserted in the middle of its opening. All bags were placed in incubating room until fully mycelium (60 d incubation). The fully colonized substrate were solar dried and ready to use as concentrate.

Native grasses were taken from natural rangeland around the campus of University Bengkulu. The concentrate diet were offered once at 8 a.m. in the morning, and natural grasses on 12 pm. The variables observed were average daily weight gain, daily dry matter intake and feed conversion. The weight gain evaluated before and after treatment for each periode. The dry matter intake were measured daily.

Data Analysis. All statistical analyses of the data obtained were performed to analyses variances [6]. Means among treatment were compared by Duncan Multiple Range Test (DMRT). Statistical differences are expressed at $p < 0.05$.

3. RESULTS AND DISCUSSION

The effect of each treatment on performance of goats are presented in Table 1. The dry matter intake, weight gain and feed conversion by cattle during the trial are given in the Table 1. No statistically significant

differences were observed in dry matter consumption among treatment ($P > 0,05$). The effect of dietary treatments to average daily weight gain and feed conversion were significant ($P < 0,05$). The T1 (60% native grass and 40% concentrate/ rice bran) was significantly the highest in average daily weight gain and feed conversion ($P < 0,05$) while the average daily weight gain and feed conversion on T0, T2 dan T3 were not significant different ($P > 0,05$).

The result of this research showed that the daily intake of dry matter (DM) was not different ($P > 0,05$). The intakes of DM were in the range 2.0% dry matter of body weight at the day. This indicated that all the experimental diets were palatable and the animal got sufficient supply of dry matter according to standard [7]. A number of factors affected the average daily dry matter consumption of fed cattle. These included, liveweight (their required maintenance energy requirements), body condition, energy concentration of the ration, health status, and ration palatability [8]. All the cattle used in this research were in the same condition (live weight, body condition and health status).

The treatment T1, T2 and T3 were 60% native grass and 40% concentrate. The T2 and T3 comprised solid decanter (fermented and non-fermented). The T2 and T3 supposed could be possible used as replacement of rice bran since the nutrient (crude protein percentage) of solid decanter was comparable to rice bran. The average daily weight gain and the DM intake of T1 were the highest. It is presumed link to the better quality of T1 (60% native grass and 40% rice bran) than others. The feed intake and the palatability were affected by the chemical characteristic of feed [9].

The average daily weight gain and dry matter intake on T0, T2 and T3 were not significantly different ($P > 0.05$). This condition indicated that solid decanter can be used to avoid lack of feed stock (forage/grass) especially in dry season. Solid decanter (T2 dan T3) in this research increased the average daily weight gain 0,368 kg/day and 0,42 kg/day almost similar to the result of solid decanter for Madura cattle increased daily average live weight 0,450 kg/day [10]. The positive mean of average daily weight gain in this experiment showed solid decanter (fermented and non-fermented), grass and rice bran had the enough adequate of the maintenance requirement of cattle.

Table 1. Dry matter consumption and daily weight gain of cattle

Items	Treatments			
	T0	T1	T2	T3
Dry matter consumption, g/day	5120 \pm 0.188	5291 \pm 0.904	4779 \pm 0.517	4611 \pm 0.455
Average daily weight gain, kg/d	0.508 \pm 0.108 ^a	0.842 \pm 0.251 ^b	0.368 \pm 0.06 ^a	0.420 \pm 0.105 ^a
Feed Conversion	10.10 \pm 0.02 ^b	6.28 \pm 0.03 ^a	11.02 \pm 0.01 ^b	10.98 \pm 0.02 ^b

Note: Different superscripts in same row indicate significantly different ($P < 0.05$)

Feed conversion of T1 was significantly the lowest ($P>0,05$). This suggested that T1 gave better feed efficiency than others. There were no significant different between T2 and T3 for feed conversion. The fermentation treatment on solid decanter supposed not optimally improve the feed conversion of solid yet. This condition probably regard to its digestibility. Digestibility of nutrient is one indicator to measure feed quality because it reflects the level of nutrients availability for livestock. The fermented solid decanter had no significant effect to dry matter digestibility invitro. Fermentation did not enhance the digestibility of palm oil sludge [11].

4. CONCLUSION

Fermented and non-fermented solid decanter can be used as concentrate feed to avoid lack of feed stock (forage/grasses) with positive effect to weight gain of cattles.

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REFERENCES

- [1] W. Seephueak, W. Ngampongsai, P. Chanjula, 'Effects of palm oil sludge in concentrate on nutrient utilization and rumen ecology of thai native cattle fed with hay', Songklanakarin, *Jurnal Sci. Technol.* Vol. 33. No.3. 2011. Accessed: June 26, 2018. [Online]. Available: <http://rdo.psu.ac.th/sjstweb/journal/33-3/0125-3395-33-3-271-280.pdf>
- [2] W.H. Kum, M.W. Zahari, 'Utilization of oil palm by-products as ruminant feed in Malaysia', *Journal of Oil Palm Research*, vol. 23. 2011. Accessed: June. 26, 2018. [Online]. Available : <http://jopr.mpob.gov.my/wp-content/uploads/2013/09/jopr23aug2011-wong1.pdf>
- [3] Lekito, M.N., 'Analisis kandungan nutrisi lumpur minyak sawit (Palm Oil Sludge) asal pabrik pengolahan di Kecamatan Prafi Kabupaten Manokwari Propinsi Papua', *Jurnal Peternakan dan Lingkungan*, vol. 8, no.1, pp. 59 -62, 2002.
- [4] M.T. Tellez, R. Diaz, C. Sánchez, and G.D. Godinez. 2013. Hydrolytic enzymes produced by *Pleurotus* species . *African Journal of Microbiology Research*, vol. 7, no. 4. 2013. Accessed: February 20, 2013. [Online]. Available: <https://www.cabdirect.org/cabdirect/abstract/20133104406>
- [5] I. Badarina, D. Evvyernie, T. Toharmat, E.N. Herliyana, L.K. Darusman, 'Nutritive value of coffee husk fermented with *Pleurotus ostreatus* as ruminant feed', *Media Peternakan*, vol.36, no.1, pp.58-63. 2013.
- [6] R.G.D. Steel, J.H. Torrie, 'Principles and Procedures of Statistics 2ed', *Mc. Graw-Hill Book Co. Inc.*, New-York, 2003.
- [7] National Research Council, 'Nutrient Requirements of Beef Cattle: Seventh Revised Edition: Update 2000', The National Academies Press, Washington DC, 200
- [8] J.F Sarah. 2012. Feed consumption and liveweight gain. Accessed. September 13, 2020. [Online], Available: <http://futurebeef.com.au>
- [9] R. Baumont, 'Palatability and feeding behavior in ruminant: A. Review', *Ann. Zootech*, vol. 45, pp.385-400, 1996.
- [10] B.N. Utomo, E. Widjaja, 'Processing of palm oil solid waste as nutrient content for ruminant feedsources', *Jurnal Litbang Pertanian*, vol. 23, no.1, pp.22-28, 2004.
- [11] I. Badarina, E. Sulistyowati, 'Characteristic of rumen fermentability and *in vitro* Digestibility of palm oil sludge (Solid) treated with *Pleurotus* Fungi', *Integrated Cattle and Oil Palm Production (ICOP) Conference*, Jakarta, pp .168-173. Badan Pengkajian dan Penerapan Teknologi (BPPT). 2019