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Effct of Various Level of Fermented Coffee Pulp on Performance of Duroc Pig Cross Bred (*sus vitatus*) on the Age of 8 – 12 Weeks

Made Nuriyasa, S.C. Antoninho* and I.G.M Rusdianta**

****Faculty of Animal Science Udayana University, Denpasar***
*****Faculty of Agricultural, Tabanan University, Tabanan***

ABSTRACT

The aim of this study was to know the level of fermented coffee pulp a waste product of agriculture that used for Duroc pigs cross bred feed on the age of 8 – 12 weeks (starter phase). The study was conducted at Tibar Village, Bazartete District, Liquisa Regency, the Republic of Timor Leste Democracy. The study used Randomized Block Design (RBD), 4 treatments and 5 replicates in each treatment. The pigs used in the study were 20 male Durocs on the age of 8 – 12 weeks. Treatment used in the study consists of P0 (control = without fermented coffee pulp), P1, P2 and P3 were 15, 20, and 25 % fermented coffee pulp respectively. Results of the study showed that end of body live weight, feed consumption, feed conversion and dry matter digestibility and organic matter of feed with 15 % of fermented coffee skin were no significant difference (P > 0.05) than control. But, weight gain of the pigs fed with treatment P0 was higher (P < 0.05) than P1, P2 and P3. There was no difference on performance of the pigs between treatments of 15 % permented coffee pulp compare to control treatment.

Key words: fermented coffee pulp, durodc pig, performance

INTRODUCTION

Pig is an ideal animal to be developed in order to fulfill protein needs in much amount that originally from the animal in short time relatively. This is based on benefit of pig character i.e. prolific, efficient in feed conversion to produce pork, ideal slaughter weight and high carcass percentage can be reached in short time relatively. The main obstacle that face in order to develop the pig is expensive of feed cost expenditure. Its cost is high relatively. This is due to conpetitiveness of feed ingredients with human being and other animal needs.

It needs real steps to press feed cost by using waste product that available all the time. One of potencial horticulture waste products and not use yet as consentrate feed is coffee pulp. Dubey (2007) stated that one of methods to increase feed quality can be conducted with biofermentation. It is a process chemistry changes in substrate as results of microorganism enzyme works in order to produce certain product. Brata (1977) reported that fermentation result increases feed palatability, so that feed consumption is also increases. Nutrition contents of the coffee skin can be increased via fermentation process with *Aspergillus niger*. Protein of it skin can be increased from 9.94 % to 17.81 %, crude fiber decreases from18.74 % to 13.05 % (Budiari, 2014). Rathinavelu et al. (2005) explained that coffee pulp waste can substitute for 20 % commercial consentrate needs for feed that use as animals feed and to

press cost up to 30%. Guntoro (2004) recommended that level of coffee skin for pig and chicken were 10 to 15 %. Mastika et al. (2016) reported that the use of fermented coffee skin waste up to 10 % was not influence performance of Rabbit.

Base on recommendation mentioned above, the objective of the study was to know the level of fermented coffee skin used as one of feed ingredients for pig.

MATERIALS AND METHOD

Animal.

The study used Durroc pigs cross bred on the age of 8 – 12 weeks.

Location and Lenght of Study.

The study was conducted at Tibar Village, Bazartete District, Liquisa Regency, the Republic of Timor Leste.

Shelter.

The study used 20 unit individual shelters with the size of wide, length and height for 1, 1.2 and 0.80 m respectively.

Design of the study.

The study used randomized block design (RBD) with 4 treatments and 5 rerplicates (blocks).

Diet.

Ingredients were used in formula of feed in the study consists of maize, fish meal, soyben waste, rice bran, fermented coffee skin, coconut oil and bone powder. Treatments on the study were difference level of fermented coffee skin (P) i.e. feed without fermented coffee skin, and others with 15, 20, 25 and 30 % fermented coffee pulp in treatment P0, P1, P2, P3 respectively. Feed was composed in the same protein and energy contents (18 %) and (3250k cal/kg) (NRC, 2008).

Variables of the study.

1. End body weight (kg)

Data of end body weight was calculated by formula as follows:

EBW –IBW

Information: EBW = end body weight

IBW = initial body weight

2. Feed consumption

Feed consumption was calculated by total amount of feed consumption for 7 days minus its total rest for 7 days. A formula used to calculate the dray matter digestibility was as follows:

Feed consumption (kg/head) = feed consumption for 7 days (kg) – the rest of the feed for 7 days (kg)

3. Feed Conversion Ratio (FCR)

Data feed conversion ratio (FCR) was obtained from total amount of feed consumption (kg) divided with weight gain (kg) during a certain periods. Its formula was as follows:

$$FCR = \frac{\text{Total amount of feed consumption (kg)}}{\text{Weight gain (kg)}}$$

4. Dray matter digestibility (DMD)

Koefesian dray matter digestibility was calculated base on total collection method (Tillman et al., 1998). Faeces were collected for 7 days, then dray up under sun sine in airy and furthermore it kept in an oven with a temperature of 60^{o}C for 24 hours. A formula used to calculate the dray matter digestibility was as follows:

$$DMD = \frac{(A - B)}{A} \times 100\ \%$$

Information:

DMD : dry matter digestibility of feed (%)

A : dry matter consumption (g)

B : dry matter of faeces (g)

5. Organic matter digestibility (OMD)

Organic matter consumption minus organik matter of faeces then devided with organic matter consumption times 100% is organic matter digestibility. Organic matter digestibility that would be calculated i.e. protein, energy, fat and dry matter. Measurement of organic matter digestibility was based on formula of Tillman et al. (1998) as follows:

$$OMD = \frac{\text{Sum of organic matter consumption (g) – sum of organic matter in faeces (g)}}{\text{Sum of organic matter consumption (g)}} \times 100\%$$

Data analysis

Results data that were obtained in the study were analyzed with Analysis of Variance (Costat Program, 1999). If there is significant difference among treatments it would be continued with Duncan multiple range test (Steel and Torrie, 1986).

RESULTS AND DISCUSION

End body weght of the pigs with treatment P0 was 20.07 kg but, others with treatment P1 and treatment P2 were 22.92 % and 25.52 % lower and statistically were no significant difference ($P > 0.05$). Treatment P3 was 41.23% lower ($P < 0.05$) than P0. The highest of end body weight occourred on treatment P0 (20.07 kg) while on treatments P1, P2 and P3 were 15.47, 14.80 and 11.80 kg respectively and those were significant difference ($P < 0.05$) than P0 (Table 1).

Table 1. Effect of Treatments Ferpormance of Duroc Pig Cross Bred

Variable	Treatment				SEM
	Po	P_1	P_2	P_3	
End Body Weight (Kg)	20,07^{a}	15,47^{ab}	14,95^{ab}	11,79^{b}	0,81
Feed Consumption (g)	736,44^{a}	698,93^{ab}	579,66^{bc}	518,65^{c}	5,35
Weight Gain (g)	195,12^{a}	110,00^{b}	101,42^{b}	55,93^{b}	2,39
Feed Conversion (FCR)	4,48^{a}	6,82^{ab}	7,82^{ab}	10,50^{b}	0,13

Information :

1) Po : Feed without additional of fermented coffee pulp
   P_1 : Feed without additional of 15% fermented coffee pulp
   P_2 : Feed without additional of 20% fermented coffee pulp
   P_3 : Feed without additional of 25% fermented coffee pulp
2) The same superscript in the same rows means no significant (P>0,05)
3) SEM : Standart Error of Tratment Means.

Apparantly the pigs fed fermented coffee skin was significantly decreases end body weight. It was affected by feed consumption and nutrients absorbed in the body of the pigs. The more nutrients absorbed, the higher body weight can be reached due to the development of body tissues and fat of the pigs (Tillman et al., 1998). Table 1 showed that feed consumption of the pigs on treatment P0 was the highest, this caused energy and protein consumption as main component to build body component of the pigs was also higher. The lowest feed conversion ratio on the animals fed treatment P0 was possible to form the best body tissues. Result of this study was the same to opinion of Xiangmei (2008) who stated that energy and protein ratio is very important to pay more attention to reach optimal productivity. Protein insuficientcy causes amount of amino acids consumption decrease, so that the formation of meat tissues is less. Others also causes differences of end body weight of the pigs i.e. lower protein contents of P1, P2 and P3 than P0. According to Malheiros et al. (2003) that the lower the protein contents, the lower the growth rate and feed consumption if compare to feed containts medium and higher than those.

Results of this study showed that effect of treatments to feed consumption on the animals with treatment P0 was 736.44 g, while on the animal treatment P1 was 5.09 % lower and no significant difference (P > 0.05) than P0. Treatment P2 and P3 were 21.29 % and 29.57 % lower (P > 0.05) than the P0. The highest feed consumption occured on the pigs with treatment P0 i.e. 736.44 g but, the others, P1, P2 and P3 were 698.93, 579.66 and 518.65 g respectively. Tillman (1998) stated that the consumption is a basic/special factor for basic live, production and reproduction. There was a relationship between digestibility and feed consumption. The more degradation of feed consumption occurred, the more space available for it in stomuch. NRC (1977) stated that factor affects to feed consumption are feed palatability, temperature, moisture, animal health, genetic, feed processing and water availability. Furthermore Sihombing (1997) said that factors affects feed consumption are

feed and feeding trials, feed taste, environment condition or shelter temperature, drinking water availability, amount and animal health. It can be seen that the use of fermented caffee skin for 15 % in animal feed resulted no significant difference ($P > 0.05$) than none permented one. But, on the level of 20 % and 25 % were significantly ($P < 0.05$) decreased feed consumption of the animals. It can be said that the study results match with recommendation of Guntoro et al. (2004) that levels of coffee skin powder can be used for 10 – 15 % to feed pig and chicken. This was proved with gave fermented coffee pulp more than 20 – 25 % of it in the animals feed that caused decreased of the animals performance i.e feed consumption and weight gain were slower than others due to low quality and palatability of feed because the increasion of feed fermented coffee pulp levels. According to Cunha (1977), palatability is an important factor to ascertain consumption level that depend on smell, taste, texture and temperature. Same opinion is also stated by Sutardi (1997) that general factor affects consumption is feed palatability. Other factors that affects quality and palatability of feed are coffee skin waste which was used in the study had difference nutrient contents compare to nutrient contents of fermented coffee skin generally. In the study, consentration of crude protein, gross energy, carbohydrate and fat of waste of coffee skin were 14.12%, 2826 kcal/kg, 53,83 % and 1.2 % respectively (results of analysis proximate of Food Microbiology Laboratory Faculty of Agriculture Udayana University, Bali). But, according to Budiari (2009) that nutrition contents of fermented coffee skin in this case i.e. crude protein, , gross energy, fat, crude fiber, calsiun and phosphor were 17.81 %, 3938 kcal/kg, 1.06 %, 13.05 %, 0.76 % and 0.62 % respectively. The differences of feed quality of fermented coffee skin was suspected due to difference location where the coffee was planted, type of coffee plantation, age of waste coffee skin that was used in coffee seed processes.

Results of the study showed effect of treatment P0 to the pigs particularly weight gain was 195.12 g, while others i.e. P1, P2, and P3 were 43.62, 48.23 and 71,33% respectively lower ($P < 0.05$) than P0 but, among treatments P1, P2, and P3 there were no significant difference ($P > 0.05$).The highest weight gain for 195.12 g was reached by the pigs of treatment P0; mean while P1, P2, and P3 only 110.00, 101.42 and 55.93 g respectively. It shows that the use of fermented coffee skin in treatment P1, P2, and P3 results low weight gain of the pigs ($P > 0.05$) than P0 (without fermented coffee skin). The difference was due to treatment with fermented coffee skin had low nutrition contents particularly protein and energy, so it results level of feed consumption and weight gain lower than treatment without fermented coffee skin. According to Blakely at al. (1998), level of feed consumption affects to growth rate and end body weight, because the formation of weight, shape and body composition as an accumulation of feed consumption in the animal's body. Furthermore, Edwards (2007) reported that growth graphic is determine by feed consumption level. If level of feed consumption is high, growth is also high, and if feed insufficient occurs, growth retardation occurs.

Feed conversion is much affected by level of feed consumption and weight gain of the pigs. High value of feed conversion showed less efficient in using feed to form pork or meat, and vice versa. The lower value of feed consumption showed that feed materials showed that the feed is very efficient to changed into meat. Results of the study showed that the value of feed conversion on the pigs wuth treatment P0 was 4.48 and others i.e. P1 and P2 was 48.88 % and 74.55 % higher but, no significant difference ($P > 0.05$) than P0. Feed conversion value P3 was 10.50, it's the highest and significant difference ($P < 0.05$) than P0 and P1. Low feed conversion value of 4.48 occured on the pigs with treatment P0 then it's followed by P1, P2

and P3 i.e. 6.67, 7.82 and 10.50 respectively. Feed consumption and end body weight on treatment P1 and P2 on the study were no significant difference (P > 0.05) (Table 1), so feed conversion of the pigs with fermented coffee skin for 15 % showed no significant difference to the animal without fermented coffee skin. Feed conversion in the study was obtain higher compare to Budaarsa (2012) who found it between 3.5 – 3.7. Highly feed conversion in the study due to difference age of the animals used in the study, feed quality and difference environment. According to English et al. (2008), factors affects feed consumption are genetic, age, body weight, level of feed consumption, weight gain, palatability and hormons. High and low feed conversion can be influenced by amount of nutrition contents (Rajhan, 1977). Furthermore, Basuki (2002) stated that factor affects feed conversion was feed consumption and weight gain. This weight gain is a reflexion of how nutrients and balances of amino acids produced positive impact for animals.

Results of the study on digestibility variable were presented in Table 2 as follows:

Table 2. Effect of Treatment to Digestiblelity

Variable	Treatment				SEM
	Po	P_1	P_2	P_3	
Dry Matter Digistability	$65,45_a$	$65,41_a$	$65,33_a$	$64,85_a$	0,12
Energy Digistability	$66,81_a$	$65,12_{ab}$	$62,88_b$	$62,27_b$	0,10
protein Digistability	$64,43_a$	$64,14_{ab}$	$63,40_{bc}$	$62,46_c$	0,03
Fat Digistability	$68,56_a$	$68,25_a$	$67,82_a$	$66,67_b$	0,35

Information :

1) Po : Feed without additional of fermented coffee pulp
   P_1 : Feed without additional of 15% fermented coffee pulp
   P_2 : Feed without additional of 20% fermented coffee pulp
   P_3 : Feed without additional of 25% fermented coffee pulp
2) The same superscript in the same rows means no significant (P>0,05)
3) SEM : Standart Error of Tratment Means.

Results of the study showed that dry matter digestiblelity percentage of the pigs with treatment P0 was 65.45% and the others i.e. P1, P2, and P3 were 0.06, 0.81, and 0.92 % lower (P >0.05) compare to P0. The dry matter digestiblelity percentage of P0 was the highest (65.45 %) compare to the others (P1, P2 and P3 were 65.41, 65.33 and 64.85 % respectively) (Table 2). Those were due to feed consumption levels on the pigs with treatment P0 was higher than other treatments, because its quality is better than feed permented coffee skin. According to Zain (1999) that difference feed consumption level affects digestibility, so that its also causes difference digestibility. Furthermore, Tillman et al. (1998) reported that dry matter digestibility is affected by feed ingredients and their physical form.

Results of the study showed that energy metabolized on the pigs with treatment P0 was 66.81%, and the P1 was 2.53 % lower (P.> 0.05) than P0. Treatment P2 and P3 were 5.88 % and 6.80 % lower and significant difference (P < 0.05) than P0. The highest percentage of energy metabolized of 66.81 % was riched by treatment P0, then followed by P1 (65.12 %), P2 (62.88 %) and the lowest was P3 (62.27 %) as shown in Table 2. High value of energy

metabolized of P0 due to high percentage of its fat digestibility. This was caused by fat content in P0 was higher than other treatments. According to Putra and Ardana (2015) fat is contain high energy as source of energy to subsidize carbohydrate and provide essential fat i.e. linoleic that needs by the pigs.

Results of the study showed that digestibility of protein percentage on the animals with treatment P0 was 64.43 %, while P1 was 0.45 % lower but, it was no significant difference (P > 0.05). Treatment P1 and P2 were 1.60 % and 3.10 % lower (P < 0.05) than P0. The highest percentage digestability of protein for 64.43 % was riched by P0, then P1 (64.14 %), P2 (63.40%), and the lowest was P3 (62.46 %) as shown in Table 2. Those differences due to protein contents of P0 and P1 were higher than P2 and P3. High or low of protein digestability is dipend on protein contents of feed materials and how much protein enters to digestive system (Tillman. 1998). Crude protein digestability also can be affected by dry matter digestability where increases of dry matter consumption will increase protein consumption too. Sihombing (1997) stated that protein consumption tend to increase parallel with dry matter consumption.

In general, results of the study showed that evarage fat digestability (%) of the pigs fed treatment P0 was 68.56 %. The animals with treatment P1, P2 and P3 were 0.45, 1.08 and 2.76 % lower respectively, and stastically treatment P0, P1 and P2 were no significant (P > . 0.05). Treatment P3 significant difference (P < 0.05) than P1, P2 and P3. The use of fermented coffee skin in diet up to 25 % was significantly decrease fat digestability due to enrgy and fat in feed of P3 was lower than others. Factor which could affects it were digestability, speedy, feed flows along tractus digestivus, physical formed or size of materials that composed the feed, chemistry composition and effect of additional other feed (Anggorodi, 1994).

CONCLUSSION

This study has ahown that the use of permented coffee pulp with the level of 15 % or none permented produced equal performance of Duroc pig cross bred.

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