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Growth Performance of Male Rabbits (*Lepus negricollis*) Fed Different Levels of Fermented Coffee Pulp

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ABSTRACT

The traditional rabbit raising resulted in very poor growth of rabbit so a study was carried out on growth performance of male rabbit fed different levels of fermented coffee pulp. A randomized block design (RBD) with five treatments and four replicates of two rabbits in each treatment was used in this experiment. The treatments were diet without coffee pulp (R0), diet with 10% unfermented coffee pulp (R1), diet with 20% unfermented coffee pulp (R2), diet with 10% fermented coffee pulp (R3), and diet with 20% fermented coffee pulp (R4). Each treatment consisted of 8 male five week old local rabbits. Variables observed were final body weight, weight gain, feed intake, water consumption, feed efficiency, dry matter, energy and protein digestibility. The results showed that rabbits given ration with 10% fermented coffee pulp (R3) revealed higher dry matter energy and protein digestibility. Further, they had the highest final body weight, weight gain and highest feed efficiency. It was concluded that the use of 10% fermented coffee pulp in the diet produced the highest performance compared to other treatments. Fermented coffee pulp at the level of 10% could be recommended to farmers for substituting rice bran in rabbits diets.

Key Words: Rabbits Growth, Coffee Pulp, Fermentation

INTRODUCTION

Rabbit has a great potential to be developed in Bali as another alternative job for farmers as well as to provide other meat resources regionally and nationally. Their meat is nutritive, litter size are large with short intervals kiddings (Lukefahr 2008). This is due to the fast growth and prolificness of the rabbit which can produce 8-10 litters per birth. Their weight can reach 2 kg at the age of 8 weeks old (Lestari et al. 2005). Chemical composition of rabbit meat has good quality in which the protein content of its meat is equivalent to the chicken meat (Ensminger et al. 1990) with fat, cholesterol and energy contents of 5.5 g, 53 g, and 137 kcal/kg, respectively (Chan et al. 1995).

The lack of farmer knowledge about rabbit nutrition cannot support rabbit production in Indonesia (Nuriyasa et al. 2013). When the rabbits were fed forage only, their production could not reach maximum (Dwiyanto et al. 1985) On the other hand, rabbit can eat waste material and they are quite efficient in extracting protein from forage (Samkol & Lukefahr 2008). Consequently, rabbit productivity can be improved by feeding a good quantity and quality of feed (Ensminger et al. 1990). The high price of concentrate feed is often an obstacle for rabbits farmers, therefore efforts are needed to look for feedstuffs with high nutrient contents but low in price. According to Mastika (2013) several wastes from agricultural industries might be useful for animal feedstuffs. Those wastes were cheap and less competitive to human needs. One of those is coffee pulps which are continuously available the whole year in Bali. Coffee pulps consisted of 85.22% dry matter, 10.47% crude protein, 0.26% crude fat, 32.36% crude fiber, and 4.14 kcal/kg gross energy (Wiguna 2007).

Nutrient content of fresh pulp can be improved by fermentation using *Aspergillus niger*. Parwati et al. (2008) found that the fermented coffee pulp using *Aspergillus niger*

could replace rice bran utilization up to 5% in the diet with no adverse effect in the performance of kampong chickens. Budiari (2009) reported fermented coffee pulp contained crude protein 9.94% to 17.81%, and crude fiber 13.05%. This research was carried out to evaluate the use of fermented coffee pulp in feed for growing rabbits.

MATERIAL AND METHODS

Fourty local male rabbits of 5 weeks old with an average body weight 258.35±1.19 g were arranged into 5 treatments and four replicates of two rabbits in each treatment. Rabbits were keep in individual cages with 70 cm length, 50 cm width, and 45 cm height. Each cage was equipped with trough for feed and drinking water. A plastic sheet for urine and faeces collection were place at the bottom of the cage

Rations were made of yellow corn, fish meal, rice bran, coconut meal, soybean meal, elephant grass, tapioca flour, coffee pulp (fresh or fermented), coconut oil, and bone meal. Diets were composed in iso energy and protein with 16% crude protein and 2500 kcal/kg metabolizable energy (ME) (NRC 1977). Diet composition and nutrients content of the diet are presented in Table 1.

Tablel 1. Composition of treatment feed

Feed stuffs (%)	Treatments				
	R0	R1	R2	R3	R4
Feed stuffs component					
Yellow corn	24.00	23.00	23.00	22.00	20.50
Coconut meal	14.50	13.00	10.50	10.00	6.50
Fish meal	6.50	6.50	7.00	6.00	5.00
Tapioca flour	4.00	4.00	4.00	4.00	4.00
Soybean meal	6.50	6.55	6.10	5.50	5.15
Rice bran	15.00	12.45	10.00	16.00	16.05
Elephant grass	25.00	22.00	18.90	24.00	22.30
Non fermented coffee pulp	-	10.00	20.00	-	-
Fermented coffee pulp	-	-	-	10.00	20.00
Coconut oil	4.00	2.00	0.00	2.00	0.00
Bone meal	0.50	0.50	0.50	0.50	0.50
Total	100.00	100.00	100.00	100.00	100.00
Nutrients contents					
TDN (%)	64.83	64.85	65	64.65	64.73
ME(kcal/kg)	2506.11	2519.72	2553.34	2523.40	2554.14
Crude protein (%)	16.00	16.01	16.00	16.01	16.02
Crude fat (%)	8.21	7.01	5.40	5.86	4.14
Crude fiber (%)	12.13	12.72	13.38	11.96	12.18
Calcium (%)	0.51	0.46	0.38	0.41	0.46
Phosporus (%)	0.62	0.59	0.55	0.64	0.66

*Proximate analysis at laboratory Loka Penelitian Sapi Potong, Grati, Indonesia

Final body weight, weight gain, feed consumption, water consumption, feed conversion ratio, digestibility coefficients of dry mater, energy and protein were observed in this study. Dry matter digestibility was calculated based on the total feces collection for 7 days (Tillman et al. 1986); energy and protein digestibility were calculated based on the collection method (Prasad et al. 1996). Data were analyzed using analysis of variance and if significant treatments were found ($P<0.05$), analysis will be continued using Duncan multiple range test (Steel & Torrie 1980).

RESULTS AND DISCUSSION

Results of the experiment showed that rabbits fed ration with 10% fermented coffee pulp (R3) were significantly ($P<0.05$) higher in their final body weight and weight gain compared to those fed the other rations (Table 2). The R3 ration contained the lowest fiber content (Table 1) there for could increase digestibility coefficients of the diet and further more resulted the better growth rate of the rabbits. The same trend that the growth rate and feed efficiency with higher protein retention in the body is also reported by Nuriyasa et al. (2014). The use of *Aspergillus niger* as fermentor also reduced the tannin content of the coffee pulp by 33% and consequently increased their feed intake and availability of feed energy (Krisnan 2002). Guntoro et al. (2004) also reported that Etawah goats fed 200 g/head/day fermented feed pulp increased their daily weight gain by 52.38% during the three month periods.

Table 2. Performance of rabbits fed different levels of fermented coffee pulps

Variabel	Treatments					
	R0	R1	R2	R3	R4	SEM
Initial body weight (g)	258.38^{a}	257.88^{a}	258.25^{a}	258.50^{a}	258.75^{a}	1.28
Final body weight (g)	1769.50^{b}	1730.25^{c}	1725.38^{c}	1866.75^{a}	1739.88^{bc}	11.21
Feed consumption (g/day)	75.63^{d}	77.36^{cd}	83.61^{b}	79.19^{c}	86.19^{a}	0.64
Weight gain (g/day)	21.59^{b}	21.03^{c}	20.96^{c}	22.98^{a}	21.16^{bc}	0.16
Feed conversion ratio (FCR)	3.50^{c}	3.68^{b}	4.01^{a}	3.45^{c}	4.08^{a}	0.03
Water consumption (ml/day)	153.30^{c}	157.90^{c}	181.46^{a}	170.95^{b}	183.37^{a}	2.35

R0: Diet without coffee pulp; R1: Diet with 10% unfermented coffee pulp; R2: Diet with 20% unfermented coffee pulp; R3: Diet with 10% fermented coffee pulp; R4: Diet with 20% fermented coffee pulp. Numbers with the same superscripts in the same rows indicate non significant differences ($P>0.05$); SEM: standard error of the treatment means

Figure 1 showed that rabbit on R3 grew similar with the other treatments during the first two weeks. This probably due to the adaptation on feed containing coffee pulp. During the folowing weeks the growth of rabbits fed R3 ration was higher than the other treatments.

Feed intake of the rabbits given treatment R4 was 86.19 g/day, while the R0, R1, R2, R3 were 12.25, 10.25, 2.99, and 8.12% lower than group R4 respectively (Table 2). Perhaps this was because of diet R4 has sweeter smell than those other four treatments. McNitt (1996) stated that of rabbit prefered feed with sweet aroma. Low crude fiber in the ration R4 caused the faster flow rate and coefficient of feed digestibility, so the digestive tract was empty more quickly, hence, more space available for additional food.

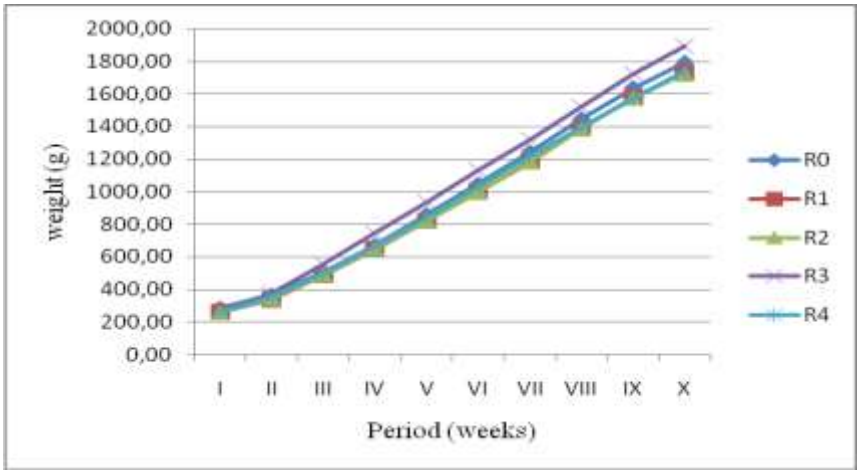

Figure 1. Growth of rabbits fed different levels of coffee pulp

Rabbit fed diet R3 had the lowest feed conversion ratio (3.45) compared to the other treatments except R0. This was because of the rabbits fed R3 ration had higher dry matter, energy and protein digestibilities compared to the other treatments (Table 3). The most efficient in the feed conversion ratio for R3 (3.45) and was lower than the results reported by Nuriyasa (2012) with an average feed conversion ratio 3.57. Different treatment given to the rabbits might be the cause of these differences. However, the result of this experiment was still on the similar range 3.0-4.0 described by McNitt (1996) and de Blass & Wiseman (1998).

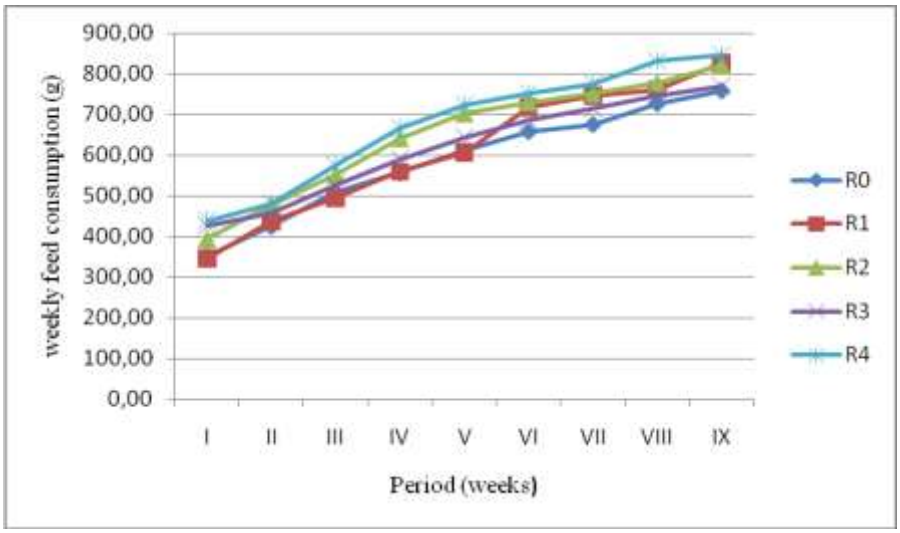

Figure 2. Weekly feed consumption of rabbits fed different levels of coffee pulp

The highest consumption of water in R4 fed rabbits was related to their higher feed consumption (Table 2). This result was in line with Tillman et al. (1986) who stated that the higher the feed consumption of the rabbits, the more the drinking water was needed. The less density diet caused more dusty and consequently the rabbit needed more water. Density of the diet for treatment R4 (21.44 g/ml) was lower than R0 (25.76 g/ml), R1 (22.60 g/ml), R2 (22.51 g/ml) dan R3 (23.38 g/ml), so that the diet R4 which was more dusty caused rabbits consumed more water. This result was supported by Nuriyasa (2012) who found that water consumption was influenced by the density of the ration.

Digestibility of dry matter feed in R3 fed rabbits were higher than the other treatments including the control. This was due to the lowest content of its crude fiber (Table 1).

Therefore the R3 fed rabbits consumed more feed than the other group of treatments. Tillman et al. (1986) reported that the digestibility of the ration was influenced by the composition and the constituents of the diet and on the physical form of feed. Nuriyasa (2012) reported that an average dry matter digestibility of feed for local male rabbits was 68.52%, and between 60-65% according to Parigi & Xiccato (1998)

The R3 fed rabbit had the highest energy digestibility (67.87%) which were 2.20, 3.61, 3.36 and 2.80% higher than R0, R1, R2 and R4 respectively (Table 3). This was due to the lower crude fiber content of the R3 diet. Prasad et al. (1996) stated Chinchilla rabbit have energy digestibility ranged 66.17-77.79%.

Table 3. Diet digestibility of the rabbits fed different levels of unfermented and fermented coffee pulp

Variabel	Treatment					
	R0	R1	R2	R3	R4	SEM
Dry matter digestibility (%)	58.29^{c}	57.13^{d}	58.41^{c}	59.84^{a}	59.28^{b}	0.15
Energy digestibility (%)	66.37^{b}	65.42^{c}	65.59^{c}	67.87^{a}	65.97^{bc}	0.20
Protein digestibility (%)	86.64^{a}	84.18^{c}	83.54^{c}	85.85^{b}	86.19^{ab}	0.46

R0: Diet without coffee pulp. R1: Diet with 10% unfermented coffee pulp. R2: Diet with 20% unfermented coffee pulp. R3: Diet with 10% fermented coffee pulp. R4: Diet with 20% fermented coffee pulp. The same superscripts in the same rows indicated non significantly differences (P>0.05). SEM: Standard error of the treatment means

Protein digestibility of feed by rabbits given treatment R0 was 86.64%, and this value was not significantly different compared to R4, but 2.84%, 3.58% and 0.91% higher than R1, R2 dan R3 (Tabel 3). This showed rabbits feed R0 most efficiently used the protein for growth and it can be seen from its lower FCR (Table 2). Average digestibility in this study was 85.28%. This figure is higher than the report of Nuriyasa (2012). It may be caused by differences in the physical form of feed and feedstuffs used. Tillman et al. (1986) stated that protein digestibility is affected by animal species. It might be concluded that physical form and composition of feeds affected the digestibility.

CONCLUSION

The use of 10% fermented coffee pulp in the rabbit diet significantly improved the weight gain and digestibility of dry matter, energy and consequently increased final body weight of rabbit. Farmers could be advised to use the fermented coffee pulp in rabbit diet at the maximum level of 10% in the total diet.

REFERENCES

Budiari NLG. 2009. Potensi dan pemanfaatan pohon dadem sebagai pakan ternak sapi pada musim kemarau. Bul Teknologi dan Informasi Pertanian. 22:10-12.

Chan W, Brown JSM, Lee DH, Buss. 1995. Meat, poultry and game. London (UK): The Royal Society of Chemistry.

De Blass C, Wiseman J. 1998. The Nutrition of the Rabbit. University of Nottingham. Nottingham (UK): CABI Publishing. p. 39-55.

Diwyanto K, Sunarlin R, Sitorus P. 1985. Pengaruh persilangan terhadap karkas dan preferensi daging kelinci panggang. J Ilmu Peternakan. 1:427-430.

Ensminger ME, Oldfield JE, Heinemann W. 1990. Feed Nutrition. 2nd ed. Clovis (USA): Ensminger Publishing Co.

Guntoro S, Rai Yasa M, Rubiyo Suyasa IN. 2004. Prosiding Seminar Nasional Sistem Integrasi Tanaman-Ternak. Denpasar 20-22 Juli 2004. Pusat Penelitian dan Pengembangan Peternakan bekerjasama dengan Balai Pengkajian Teknologi pertanian (BPTP) Bali dan Crop-Animal Systems Reseach Network (CASREN). p. 389-395.

Krisnan R. 2002. Pengaruh pemberian ransum mengandung ampas teh (*Camellia sinensis*) produk fermentasi *Aspergillus niger* terhadap pertambahan bobot badan dan efisiensi protein pada ayam broiler. [Skripsi]. Sumedang (Indonesia): Universitas Padjadjaran.

Lestari CMS, Wahyuni HI, Susandari L. 2005. Budidaya kelinci menggunakan pakan industri pertanian dan bahan pakan inkonvensional. Potensi dan Peluang Pengembangan Usaha Kelinci. Bandung 30 September 2005. Bogor (Indonesia): Pusat Penelitian dan Pengembangan Peternakan dan Fakultas Peternakan Universitas Padjadjaran. p. 55-60.

Lukefahr S. 2008. Role of organic rabbit farming for poverty alleviation. Proceedings MEKARN Rabbit Conference Organic Rabbit Production of Meat Rabbits in Texas. College Station (USA): Texas Agriculture Extension Service. Texas A&M.

Mastika IM. 2013. Potensi pertanian dan industri pertanian serta pemanfaatannya untuk makanan ternak. Denpasar (USA): Penerbit Universitas Udayana.

McNitt JI, Nephi NM, Lukefahr SD, Cheeke PR. 1996. Rabbit Production. Prairie Village (USA): Interstate Publishers, Inc.p. 78-109.

Nuriyasa M. 2012. Respon biologi serta pendugaan kebutuhan energi dan protein ternak kelinci kondisi lingkungan berbeda di daerah dataran rendah tropis. [Disertasi]. [Denpasar (Indonesia)]: Program Pasca Sarjana Universitas Udayana.

Nuriyasa M, Mastika IM, Puger IW, Puspany E, Wirawan IW. 2013. Performance kelinci lokal (*Lepus nigricollis*) yang diberi ransum dengan kandungan energi berbeda. Majalah Ilmiah Peternakan. 16:12-15.

Nuriyasa IM, Mastika IM, Mahardika GD, Kaqsa IW, Aryani IGAG. 2014. Energy and protein retention of local rabbit housed in different cages. J Biol Chem Res. 31:800-807.

NRC. 1977. Nutrient requirement of rabbits. Washington DC (USA): National Academy of Sciences.

Pand B, Xiccato RG. 1998. Energy metabolism and requirements. In: The nutrition of the rabbit. De Blas C, Wiseman J, editors. New York (USA): CABI Publishing. p. 103-132.

Parwati IA, Sudaratmaja IGAK, Trisnawati NW, Suratmini P, Suyasa N, Sumanjaya W, Budiari LG, Pardi. 2008. Laporan Akhir Primatani Lahan Kering Dataran Tinggi, Iklim Basah, Desa Menanga, Kec. Kintamani, Kab. Bangli. Balai Pengkajian Pertanian (BPTP) Bali. 67 p.

Prasad R, Karim, SA, Patnayak BC. 1996. Growth performance of rabbits maintained on diets with varying levels of energy and protein. World Rabbit Sci. 4:75-78.

Samkol P, Lukefahr SD. 2008. A challenging role for organic rabbit production toward proverty alleviation in South Easth Asia. In: Xiccato G, Trocino A, Lukefahr SD, editors. Proceedings of the 9th World Rabbit Conggress, June 10-13, 2008 Verona, Italy. Brescia (Italy): Fondazione Iniziative Zooprofilattiche e Zootecniche.

Steel RGD, Torrie JH. 1980. Prinsip dan Prosedur Statistika. Suatu Pendekatan Biometrik, Edisi kedua. Diterjemahkan oleh Sumantri. Jakarta (Indonesia): Gramedia.

Tillman AD, Hartadi H, Reksohardiprodja S, Soekamto L. 1986. Ilmu Makanan Ternak Dasar. Yogyakarta (Indonesia): Gadjah Mada University Press.

Wiguna IWAA. 2007. Pengolahan menjadi pakan dan pupuk organik. Disampaikan dalam Pelatihan Kelompok Tani Ternak di Kabupaten Tabanan pada Tanggal 21-23 Nopember 2007. Denpasar (Indonesia): Balai Pengkajian Teknologi Pertanian Bali.