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Digestibility Evaluation of Fish Meal, Rice Bran, Soya Bean Meal, Pollard on Ongole Cross Breed Cattle and Frisien Holstein Cross Breed

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Abstract

The objective this study was to evaluate feed stuff such as fish meal, rice bran, soya bean meal, and wheat pollard on Ongola and Frisien Holsten breed. Each feed stuff was replicated in 3 replication. Variable were observed in vivo, *in sacco*, and in vitro digestibility. Collected data were analyzed by independent t-test sample. Result showed dry matter and organic matter in vitro digestibility of soya bean meal on Ongole crossbreed cattle has lower than Frisien Holstein crossbreed cattle (84.54±1.15 vs 90.17±1.34, 82.53±1.20 vs 89.05±0.76) respectively, and for another feedstud were used on this research not showed significant. Degradation theory of some feed stuff on Ongole crossbreed cattle has lower than Frisien Holstein crossbreed cattle. Coeficient of digestibility on Ongole crossbreed cattle has lower than Frisien Holstein crossbreed cattle. Concluded that concentrate such as fish meal, soya bean meal, rice bran and pollard has digestibility on ongole crossbreed cattle lower than Frisien Holstein crossbreed.

Keywords: Fish meal, Rice bran, Soya bean meal, Pollard, Ongole crossbreed cattle, and Frisien Holstein crossbreed cattle

Introduction

The quality of livestock production is closely related to the quality of locally available feed, so that the use of local food resources can optimally determine maximum productivity as well. However, information on the quality of locally available feed, index value feed type of green feed livestock (e.g. reeds, grass bengal, field grass, elephant grass), voluntary feed intake of local feed for any type of ruminants is still very limited. This is due to the local composition of the nutritional value of ruminant feed used in Indonesia to date is the result of the evaluation found in European and American countries where natural conditions, feed and livestock is far different from the situation in Indonesia. So the application of the system does not provide useful information for the development and improvement planning ruminant livestock production in Indonesia.

Ruminant feed evaluation system used in Indonesia, developed in European countries with different natural conditions with Indonesia. This situation makes the system can not provide the maximum of information in order to develop the ruminant nutrition. Their basic knowledge about the characteristics of degradation allows the holding of an evaluation of the biological utility value against a foodstuff as a supplier of nutrients in cattle without having to perform testing in vivo, in vitro and *in sacco*.

Comparision digestibility evaluation testing fish meal, rice bran, soya bean meal, and white pollard on PO and PFH needed to enable farmers in the field for choosing a feedlot cattle, which could be adapted a some traditional feedstuff and converted a nutrition to be a meat.

Materials and Methods

The tools used in the experiments is equipped stables where food and drink, hanging scales, digital scales, scales Weight Rudd, desiccator, newspapers, baskets, buckets, shovels, mixers, ovens, furnace, chopper, hammer mill. in vitro tube, tube or 25 ml glass bottle, water bath temperature of 38 to 40 ° C to simulate the temperature in the rumen, magnetic stirrer, pH meter, thermometer, thermos, CO2, filters, syringes to take rumen fluid, and digital scales. cow fistula, nylon bags, pendulum weights, rope, scales, scissors, trays, rope hook, silica disk, oven, furnace, forceps and a washing machine.

Materials used are elephant grass, concentrate, crossbreed ongole cattle (PO),

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and crossbreed Friesian Holstein cattle (PFH), fish meal, rice bran, soya bean meal, and wheat pollard, rumen fluid PO cattle and PFH, grass pangola, warm water , artificial saliva or Mc. Dougall.

In vitro evaluation

The samples used 250 mg. Utomo (2010) has made modifications to the amount of use of the substrate, rumen fluid, artificial saliva, HCl and pepsin used in the determination of digestibility in vitro, which is only 50% that direkomendasika More and Barnes. Rumen fluid is used as the donor of microbes taken using previously flask filled with water at a temperature of 39 ° C until it is full. In the rumen fluid entering into the flask arranged so that outside air is not much sign. Thermos containing rumen fluid were taken to the laboratory, and immediately used for donor microbes to be inoculated in the medium. Rumen fluid is mixed with a solution of Mc. Dougall while CO2 gas fed to the mixing ratio of 1: 4 and measured the pH of about 6.7 to 7. After that 25 ml of the mixture is placed in a test tube filled sample and incubated earlier and incubated for 48 hours and shaken every 8 hours once.

Analysis of the samples will be measured digestibility dry and organic matter (Tilley and Terry, 1963). After incubation for 48 hours, filtered tubes one by one through the crucible, which already contains glasswool (which has been known to empty weight) and in vitro tube washed with hot water until no samples left behind. Distillate test of dry matter and organic matter.

In sacco evaluation

Bags/sacco made of nylon material for rumen incubation. Pockets were incubated in the rumen has a porosity of 46 stitched on three sides with plastic welding with the dimensions of the 6 × 11 cm. Seseuai nylon bag is marked with the number of feed, incubation time and replication then roasted at a temperature of 55ºC for 1 hour and weighed empty weight. Nylon pouch for rumen incubation weighed empty weight is filled with a sample to be tested, 3 grams to 5 grams for forage and concentrate and then the bag was tied tip of the bag.

Nylon bags filled sample linked with a rope on a ring made of chrome plated iron, then incubated in the rumen sebelun morning feed is distributed. Number of nylon bags per measurement point adapted to the purpose of measurement, should be taken into account the possibility of individual variations and variations in the incubation period. Samples were taken in accordance with the time of incubation, immediately washed with cold tap water slowly before continuing washing using the washing machine for 6 minutes and the water flowing. If washing with a washing machine is not executed then the nylon bags after incubation frozen at -15ºC. Washing required to remove food particles or microbes that attach to the residue or nylon pouch. Further drying at a temperature of 60 ° C for 48 hours and the residue was weighed and analyzed dry matter (DM) and organic matter (BO).

In vivo evaluation

Observation enclosure is cleaned of residual feed and feces, then the PO and PFH cattle were weighed and counted the required amount of feed (feed intake). Cattle given feed elephant grass (Pennisetum purpureum) were cut with a chopper and concentrate. Feed given as much as 3% of body weight, while water provided ad libitum. Feed given between 08.00 to 09.00 and 15.00 to 16.00.

Collections were made during the in vivo analysis include collection of leftover food and feces. Food remains collected and counted every day, and then take as much as approximately 300 grams of a sample to be proximate analysis. Faeces issued collected and weighed every day, and this will be mixed with urine, then homogenized with a mixer (dikomposit). Faecal samples taken as many as 100 grams of sample to be proximate analysis. How sampling feces done by feces collected is weighed and then taken 100 grams after it dried in the sun, after all the feces collected, the stool is inserted into a newspaper that has been weighed and then put in the oven 55 ° C until the weight is constant then milled after the analysis proximate. After analyzing the proximate calculated value of digestible dry (BKT) and organic matter (BOT).

Statistic analysis

The data obtained were analyzed using independent sample t-test (Astuti, 1980). All calculations were performed statistical analysis with the help of personal computer software Statistical Product and Service Solution (SPSS) version 16.0 (Saleh, 2005).

Results and Discussion

In vitro **evaluation**

Based on observations and calculations during the trial against the digestibility of dry matter (DMD) and digestibility organic matter (OMD) against some of the feed material used during the experiment, the data showed dry matter digestibility (DMD) and digestibility of organic matter (OMD) presented in Table 1.

High digestibility of DM on ruminants showed high nutrient that is digested by rumen microbes (Anitasari, 2010). Factors affecting in vitro digestibility of which is mixing feed, rumen fluid, temperature control, timing variations, and methods of analysis (Yunus, 1997).

The highest digestibility organic material contained in the soybean meal that is equal to 85.787%, and the lowest in feed materials fish meal amounted to 40.99%. Organic matter digestibility describe the availability of nutrients from feed and shows nutrients that can be utilized by livestock. Dry matter digestibility can affect on organic matter digestibility (Tillman et al., 1998). Provision of a concentrate containing a high crude protein activates rumen microbial thus increasing the number of proteolytic bacteria and rising deamination resulting in an increased value of the organic matter digestibility (Jayanegara et al., 2006).

Table 1. Dry matter and organic matter digestibility

Feed stuff	Ongole cross breed cattle (%)		Frisien Holstein cross breed cattle (%)	
	Dry matter digestibility	Organic matter digestibility	Dry matter digestibility	Organic matter digestibility
Fish meal [ns]	26.28±11.13	43.59 ±8.63	45.89±33.67	40.99±2.75
Rice bran [ns]	48.62±1.92	47.08±1.32	49.49±3.13	46.83±3.46
Soya bean meal*	84.54 ± 1.15	82.53±1.20	90.17±1.34	89.05±0.76
Pollard [ns]	61.63 ±3.32	57.90±2.94	54.64±23.22	53.24±24.38

* Indicate significant difference (P<0.05))

[ns] non significant (P>0.05)

Results of the experiment showed results closer to data from the literature. Low dry matter digestibility was influenced from a wide variety of nutrient content of various feed ingredients therein. According Anggorodi (1995) factors affecting the digestibility of dry matter is the temperature. speed of travel through the digestive tract. the physical form of the feed. and the effect of comparison with other substances from the feed material. Added by Tilman et al.. (1998) which states that the factors affecting the digestibility of a feed ingredient is the chemical composition of materials. preparation of feed (cutting. grinding. cooking. etc.). the age of the cattle. and the number of ration.

The use of cow's rumen fluid PFH/PO and veal. fish meal have a percentage in vitro digestibility of the lowest followed by fine bran. pollard. and soybean meal. which has the highest digestibility. The percentage of fourth KcBO KcBK and feed ingredients with cow's rumen fluid and PFH PO do not differ much. It can be caused by a type of cattle farming and PFH who have a genetic similarity. which is a hybrid PFH cow Friesian cows and PO so that it has the same ability to consume dry matter (Rianto et al.. 2007).

***In sacco* evaluation**

Based on the calculation at the time of trial against DM and OM digestibility some feed ingredients. data showed the average (%) loss of organic matter are shown in Table 2 and 3.

Table 2. *In sacco* degradability on Ongole cross breed cattle

Time incubation (hours)	Fish meal)		Rice bran		Pollard		Soya bean meal	
	DM	OM	DM	OM	DM	OM	DM	OM
0	23.89	27.18	33.79	32.86	36.73	37.19	30.04	34.69
2	26.54	28.34	38.24	53.04	49.59	49.51	47.95	44.39
4	28.99	29.45	41.93	59.37	58.26	57.86	60.38	52.20
8	33.32	31.58	47.57	61.98	68.04	67.33	74.97	63.52
16	36.99	33.56	51.47	62.23	72.5	71.67	81.99	70.84
24	45.00	38.76	57.33	62.26	75.86	74.99	87.77	80.61
48	52.90	46.47	59.92	62.26	76.2	75.35	88.48	83.96

Table 3. *In sacco* degradability on Frisien Holstein cross breed cattle

Time incubation (hours)	Fish meal)		Rice bran		Pollard		Soya bean meal	
	DM	OM	DM	OM		DM	OM	DM
0	25.14	29.3	31.58	34.47	35.82	36.37	33.11	35.69
2	26.42	36.15	35.48	55.13	50.85	49.58	51.78	83.77
4	27.65	41.64	38.76	62.15	60.31	58.42	64.57	88.17
8	29.96	49.59	43.87	65.34	69.99	68.29	79.35	88.62
16	32.08	54.71	47.48	65.71	73.82	72.7	86.28	88.62
24	37.47	61.49	53.14	65.75	76.16	75.96	91.79	88.62
48	44.93	63.79	55.88	65.76	76.32	76.28	92.42	88.62

Trend on table 2 and 3 showed that DM degradability of fish meal and rice bran on PO on top than PFH. However, in contrary fact of its OM degradability on PFH on top than PO. It could be explained by fraction a on the table 4 about ruminal fermentation of fish meal and rice bran. Overall, degradability of feedstuff on ruminal PO more than PFH. Genetic factor to adapted a feed stuff in Indonesia, then supported a microbial diversity PO might be diverse than PFH, expecially to cellulose microbes.

According to Hadi et al. (2011). retention time in the rumen that the longer it will lead to increased contacts between feed the rumen microbes. it will allow greater rumen microbial activity to degrade the feed. The linkage can both reduce the value of the degradation rate of potentially degradable fraction. Potential difference soluble fraction and the degradation rate of potentially degradable fraction is affected by the nutrient composition of the feed. long live feed in the rumen and are also available substrate for microbial activity in degrading the feed in the rumen. Rumen fermentation kinetics data are presented in Table 4.

Table 4. Ruminal fermentation kinetics ongole cross breed cattle and Frisien Holstein cross breed cattle

Feed stuff	Variabel	Ongole cross breed cattle		Frisien Holstein cross breed cattle	
		DM	OM	DM	OM
Fish meal	a(%)	25.14	27.18	23.89	29.3
	b(%)	31.16	34.58	33.72	34.67
	c (per hours)	0.021	0.017	0.041	0.111
	DT (%)	8.078	7.63	27.37	45.01
	a+b(%)	56.3	61.76	57.61	63.97
Rice bran	a(%)	31.58	32.86	33.79	34.47
	b(%)	24.7	29.4	26.45	31.29
	c (per hours)	0.086	0.581	0.092	0.54
	DT (%)	31.58	32.86	33.79	34.47
	a+b(%)	56.28	62.26	60.24	65.76
Pollard	a(%)	35.82	37.19	36.73	36.37
	b(%)	40.5	38.16	39.48	39.91
	c (per hours)	0.232	0.195	0.197	0.201
	DT (%)	35.82	37.19	36.73	36.37
	a+b(%)	76.32	75.35	76.21	76.28
Soya bean meal	a(%)	33.11	34.69	30.04	35.69
	b(%)	59.31	49.54	58.45	52.93
	c (per hours)	0.189	0.109	0.183	1.195
	DT (%)	33.11	34.69	30.04	35.69
	a+b(%)	92.42	84.23	88.49	88.62

It can affect the degradation *in sacco* is the feed particle size. porosity size nylon bag. the bag surface area. and the location of the bag in the rumen. Degradation *in sacco* (degradation of theory) of the literature is presented in Table 5.

The experimental results show that the greater digestibility value over time that the longer the greater the value of digestibility of feed ingredients for a longer time so that it can be digested more. Factors that influence the *in sacco* digestibility is a potential difference soluble fraction and the degradation rate of potentially degradable fraction is affected by the nutrient composition of feed. long live feed in the rumen and are also available substrate for microbial activity in degrading the feed in the rumen.

Non structural carbohydrate content in the fine bran gives effect to the loss of organic matter measured *in sacco*. According Harfiah (2005). that the washing process greatly affect the loss of feed particles. due to their feed ingredients readily soluble in water and as a result of the washing process itself. The presence of rumen microbes in the bag during the incubation period can also serve as a source of error in determining the digestibility of feed use *in sacco* technique.

Feed containing sufficient protein can promote the growth of rumen microorganisms which can ultimately increase the degradation rate of the feed (Siregar. 1994). Ruminants need a source of protein derived from rumen microbial protein. While the production of microbial protein is different every time. it is influenced by the type of feed given (Siregar. 1994). Anti-nutritive factors can affect the loss of organic matter. it is associated with the reaction of anti-nutrients in inhibiting the metabolism of microorganisms in the process of using a substrate.

***In vivo* evaluation**

Based on the results of experiments that have been done on digestibility in vivo. can be obtained observation data and calculation Consumption Dry (BK). Organic Matter (BO). coefficient of digestibility Materials Dry (KcBK). coefficient of digestibility of Organic Materials (KcBO). in cattle crossbreed onggole (PO) and the Peranakan Holstein Frisian (PFH) is presented in table 6.

Table 6. *In vivo* digestibility

Parameters	Ongole cross breed cattle	Frisien Holstein cross breed cattle
Dry matter digestibility (Kg)	20.60	59.01
Coeffisient dry matter digestibility (%)	32.29	59.13
Organic matter digestibility (Kg)	36.23	61.53
Coeffisient organic matter digestibility (%)	36.18	61.58

The experimental results showed PO cattle have amounted to 20.60 Kg BKT. KcBK amounted to 32.29%. amounting to 36.23 Kg BOT and KcBO amounted to 36.18%. while cattle BKT PFH has amounted to 59.01 Kg. KcBK at 59.13 %. BOT amounted to 61.53 Kg. and KcBO amounted to 61.58%. According to Van Soest (1994). that the factors affecting the digestibility of feed ingredients are animal species. the age of cattle. feed treatment. levels of coarse fiber and lignin. the influence of the association feed. nutrient deficiency. feed composition. the physical form of feed. feed level. frequency of feeding and drinking. plant age and length of stay in the rumen. According Endrawati et al. (2010). PO cows fed grass and concentrate has KcBK and KcBO row by 65.36 ± 2.19% and 67.10 ± 2.15%. This indicates that the cow KcBO PO KcBK and lower in the experiment. Rianto et al. (2007) adds that the PO cattle and cows PFH fed elephant grass. pulp. and cassava have KcBK amounted to 72.99% and 72.20%.

Dry matter digestibility coefficient (KcBK) Onggole Peranakan cows and Holstein Frisian is approximately 32.41% and 58.90%. while organic matter digestibility coefficient (KcBO) Cows Peranakan Onggole and Frisien Holstein is approximately 36.09% and 61.61%. According to Tillman et al.. (1998). states that the addition of 1% crude fiber will cause a decline in organic matter digestibility of about 0.7 to 1% in ruminant livestock unit. McDonald et al (2002) suggest that the digestibility of the feed is affected by the chemical composition of the feed. and the fraction of fibrous feed tremendous effect on digestibility.

Conclusion

In sacco rumen degradability of PO higher than PFH. However, *In vitro* digestibility some feedstuff on PFH higher than PO. This research was suggested to be continued for research microbial population on rumen of PO and PFH to be answer a how could be different resulted comparison rumen degradability and *in vitro* digestibility of PO and PFH.

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