

THE INFLUENCE OF PHYSICAL AND FERMENTATION TREATMENT ON THE CORN COB DEGRADATION

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ABSTRACT

Fifteen percent of maize by product is corn cob. The production of corn cob in East Java and D.I Yogyakarta respectively are 1.695.673 tons/year are 84.068,68 tons/year. Because of corn cob texture is coarse and hard so the farmers is rare to use as a feed. The aim of this research was to know the influence of physical and fermentation on the degradation of corn cob. This research use a 2 x 2 factorial completely random design. First factor was a physical treatment (coarse and fine) and the second factor was an inoculums type (*Aspergillus niger* and *probion*). The measurement of degradation was by *in-sacco* technique which use an Onggole cross cattle that fistulated on the rumen. The parameters were washing loss (a), degradability of water insoluble (b) and degradation rate constant (c) that measured on dry matter (DM), crude protein (CP) and crude fiber (CF). DM degradation. a value on corn cob use *Probion* as inoculum was 25.65% higher ($P < 0.05$) than *A niger* (19.22%); b value was influence both of by physic and fermentation treatment. b value on corn cob use *A niger* as inoculum was 44.78% higher ($P < 0.05$) than *Probion* (32.53%). b value on a coarse type was 46.33% higher ($P < 0.05$) than on fine type (30,98%). CP degradation. a value on corn cob use *A niger* was 38.76% higher ($P < 0.05$) than on *Probion* inoculum (22,64%); a value on coarse type was 30.57% higher ($P < 0.05$) than on fine type (24.88%). b value on coarse fine was 24,14% higher ($P < 0.05$) than on fine type (13.93%). c value on coarse type was 2.38 hours higher ($P < 0.05$) than on fine type (0.65 hours). CF degradation. a value on corn cob use *Probion* was 24.33% higher ($P < 0.05$) than on *A niger* (-1,57%); b value on coarse type was 51.15% higher ($P < 0.05$) than on fine type (38.77%). It was concluded that corn cob nutritive value can be increased by physical treatment on coarse type combined by fermentation using *Probion*.

Key words: Corn Cob, Feed Degradation, Physical Treatment, Fermentation

INTRODUCTION

Corn is the second commodity food crop after rice. Along with increasing of corn production, the by product of corn was increasing, too. Corn by product consisted of corn stover (stalk, leaves and husk) as much as 85%, while 15% consisted of corn cob (Hettenhaus, 2002).

The used of corn stover as beef cattle feed had been published, especially at dry land in East Java, Bali and Madura Islands. The used of corn stover was combined with vitamin and mineral had positive effect on the growth of beef cattle (Anggraeny *et al.*, 2005). Corn cob is corn by product after the corn remove from the cob. The texture of corn cob is hard and coarse, so the farmer rare to use corn cob as feed directly. Besides

of the corn cob physic, unoptimal used of corn cob was caused by the nutritive value that signed by the higher of crude fibre and the lower of essential nutrient like energy, protein and mineral. The increasing of corn cob quality can be done by chemist, physic, biologist and supplementation or as complete feed (Chuzaemi, 2002). The purpose of this research was to know how far the effect of reduced particle size and biological treatments on the corn cob quality. *Aspergillus niger* can make an enzyme that can increase digestibility (Kompang *et al*, 1995). The enzymes that made by *Aspergillus niger* are cellulase, beta-glucanase, pectinase and protease (Berovic and Ostroversnik, 1997).

MATERIALS AND METHODS

This research was done at experimental cage and nutrition laboratory of Beef Cattle Research Station. This research used a 2 x 2 factorial completely random design. First factor was a physical treatment (coarse and fine) and the second factor was an inoculums type (*Aspergillus niger* and *Probion*). Each treatment of corn cob was composting during one week then it was been watering until the water content at 60 %. Inoculum was used 4 % (w/w). The fermentation of each treatment was done during 21 days. After fermentation, each treatment was dried at 45°C – 50°C during 48 hours until the weight of samples constant. Then, each treatment was grinded by Wiley mill at mess 1.

The nylon - bag technique was used to measure the rumen degradability of corn cob that treated with physical and biological treatment. The nylon bag technique used an Onggole Cross cattle that fistulated on the rumen. Samples of about 3 g of each nylon bag were incubated for periods of 0, 4, 8, 12, 24, 48 and 72 hours according to Madsen and Hveldplund (1994). After removal from the rumen, the bags were thoroughly washed and were dried to constant weight at 60°C.

The dry matter, crude protein and crude fibber of residual samples was analyzed by proximate analysis. The lost of dry matter, crude protein and crude fibber of incubation time was analyzed by Neway program (Chen, 1995). The parameters were washing loss (*a*), degradability of water insoluble (*b*) and degradation rate constant (*c*) that measured on dry matter (DM), crude protein (CP) and crude fibber (CF).

RESULTS AND DISCUSSION

Dry Matter Degradation

All the *a* value of dry matter on each treatment was classified as forage. The *a* value of dry matter forage was 16, 93% - 30,78% (Chuzaemi, 2000), but some tree legume (*Gliricidia*) have high a value of dry matter (43,68%). Biological treatment with *Probion* and *Aspergillus niger* have significant effect ($P < 0,05$) on *a* value of corn cob. The *a* value on *Probion* treatment was higher (21,15%) than on *A niger* (14,72%). Physical treatment has no significant effect on *a* value of dry matter *in sacco* degradation of corn cob. Biological and physical treatments have significant effect ($P < 0,05$) on *b* value. The *b* value on *Probion* treatment was higher (36,05%) than on *A niger* (23,80%). The *b* value on coarse type was higher (37,60%) than on fine type (22,5%). Biological and physical treatments have no significant effect on *c* value.

Probiotic contain cellulolytic bacteria from rumen so that it more active to degrade material in corn cob than *A niger*. *A niger* produce amilase, glukosa oksidase, pektinase, fitase, amiloglukosidase, alfa amylase, beta milase, amiloglukosidase, xylanase, sellulase (Bangbengaard, 1977). Reduced particle size can decrease rumination and digestibility, increase rate of flow particle feed and increase intake. At coarse type, the feed particle was longer in mean retention time than in fine type so that the b value at coarse type higher than on fine type.

Table 1. The effect of physical and biological treatment on in-sacco degradation value of dry matter of corn cob.

Physical Treatment	a (%)			b (%)			c (%/ hours)		
	Probiotic	<i>A niger</i>	Average	Probiotic	<i>A niger</i>	Average	Probiotic	<i>A niger</i>	Average
Coarse	22.03	18.70	20.37	33.67	41.53	37.60 ^b	0.20	0.54	0.0282
Fine	20.27	10.73	15.50	13.93	30.57	22.25 ^a	0.36	0.55	0.0543
Average	21.15 ^b	14.72 ^a		36.05 ^b	23.80 ^a		0.038	0.045	

Table 2. The effect of physical and biological treatment on in sacco degradation value of crude protein of corn cob.

Physical Treatment	a (%)			b (%)			c (%/hour)		
	Probiotic	<i>A niger</i>	Average	Probiotic	<i>A niger</i>	Average	Probiotic	<i>A niger</i>	Average
Coarse	24.36	36.77	30.57 ^b	23.43	24.83	24.14 ^b	2.32	2.45	2.38 ^b
Fine	14.97	34.80	24.88 ^a	14.57	13.30	13.93 ^a	0.06	0.07	0.07 ^a
Average	19.67 ^a	35.78 ^b		19.00	19.07		1.19	1.26	

Table 3. The effect of physical and biological treatment on in sacco degradation value of crude protein of corn cob.

Physical Treatment	a			b			c		
	Probiotic	<i>A niger</i>	Average	Probiotic	<i>A niger</i>	Average	Probiotic	<i>A niger</i>	Average
Coarse	24.50	0.37	12.43	47.40	54.90	51.15 ^b	0.025	0.031	0.028
Fine	24.17	-3.5	10.33	44.13	33.40	38.77 ^a	0.16	0.078	0.118
Average	24.33 ^b	-1.57 ^a		45.77	44.15		0.092	0.054	

Crude Protein Degradation

Biological and physical treatments have significant effect ($P < 0,05$) on a value. The a value on *A niger* treatment was higher (35,78%) than on Probiotic treatment (19,67%). The b value on coarse type was higher (30,57%) than on fine type (24,88%). Physical treatment has significant effect on b value. The b value on coarse type was higher (24,14%) than on fine type (13,93%). Biological treatment has no significant effect on b value. Physical treatment has significant effect on c value in sacco degradation of corn cob. The c value on coarse type was higher (2,38%) than on fine type (0,07%). Biological treatment has no significant effect on c value. *A niger* was a microorganism as single cell protein so fermentation that the used of it as fermentation agent cause high a value (Gunawan and Sundari, 2003).

Crude Fiber Degradation

Physical treatment has no significant effect on a and c value. Biological treatment has significant effect ($P < 0,05$) on a value but not on b and c value. The a

value on Probion treatment was higher (24,33%) than on *A niger* treatment (-1,57%). The b value on coarse type was higher (51,15%) than on fine type (38,77%).

Probion contain cellulolytic bacteria from rumen so that it more active to degrade crude material in corn cob than *A niger*. *A niger* produce amilase, glukosa oksidase, pektinase, fitase, amiloglukosidase, alfa amylase, beta milase, amiloglukosidase, xylanase, sellulase (Bangbengaard, 1977). Reduced particle size can decrease rumination and digestibility, increase rate of flow particle feed and increase intake. At coarse type, the feed particle was longer in mean retention time than in fine type so that the b value at coarse type higher than on fine type.

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