Effect of fed complete feed plus on quality and milk production of dairy cow[1]

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ABSTRACT: Ratio of forages and concentrate used in dairy ration affects the quality and quantity of milk production. Concentrate is used for supporting the requirement of milk production and keep the total solid (TS) in it's minimal amount. Forages are used for keep the milk fat in the minimal amount. The use of complete feed for practical reason or as problem-solver of lack of feed during the dry season tends to reduce milk fat. The use of soluble fiber feedstuffs in complete feed was expected to maintain milk yield without reducing fat contents, and TS. This research used Friesian Holstein crossbred. Six two-month lactating cows with average milk production of 12 litre/head/d which were divided into two feeding treatment: conventional feed (PKvn) and complete feed (PKpl). Experimental design used in this research was cross over design, where in the first period three cows in the first group were fed by PKvn and the second group by PKpl. In the second period, first group were offered PKpl and another group by PKvn. Each period was done in six weeks, including the adaptation period. Data collection consist of feed intake, chemical composition of feed, milk production and quality. The results of this research showed that there were no differences between PKvn and PKpl on milk production (7.649 vs 7.247 litre/d), milk fat (3.29 vs 3.24%), and TS (11.12 vs 11.15%), but significant differences were shown ($P< 0.05$) on the specific gravity (1.025 vs 1.027). It can be concluded that: cassava pomace and corn cobs can be used as fiber source for complete feed of dairy cow, ofering complete feed to dairy cows does not give any negative effect on production and quality of milk, gave positive effect on specific gravity of milk.

Key word: Friesian Holstein crossbred, milk production, milk quality, complete feed

INTRODUCTION

As general, the quality of forages in the tropics are lower than that of in the sub-tropic. In order to fulfill nutrient requirements, the high milk yielded of cows need more concentrate intake. Meanwhile the high number of concentrate in dairy cows will low the fat content of milk. The Ratio of forage and concentrate in diet of dairy cows is highly influence the quantity and quality of milk yield. The use of concentrate is to enhance the milk yield and to maintain the minimum total dry matter without fat (total solid non fat), while forages are to maintain the minimum of fat content according to standard requirement. Some researches showed that there are significant correlation between fibrous feed and the particle size with the milk fat. High fiber feed had a longer retention time in the rumen resulting volatile fatty acids (VFA) with more acetic acid yield to be used as milk fat precursor.

Feeding basal diet and concentrates can be done either separately or simultaneously. Basal diets in fresh or dry form, while the concentrate is given either dry or mixed with water. Aside the form of complete feed is the kind of inclusive nutrient in the diet for certain physiological states of animals. Complete feed was made to accomplish maintenance and production of animals without any other addition except the water (Hartadi *et al*., 1980), all feedstuff were mix, both forages and concentrates in one formed (Ensminger and Olentine,

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1978). The use of complete feed is for practical or to overcome the lack of feed during dry season which to reduce milk fat. The use of digestible fiber source in complete feed is expected to persist the milk yield without lowering fat contents, total dry matter or total solid non fat and solid non fat (SNF).

MATERIALS AND METHODS

Six dairy cows of Friesian Holstein offspring with the middle-yield category (produce 12 liter/day) and after peak production, were used. Animals were divided into two groups of treatments. First group received forage and concentrate with ratio of 60 : 40 as conventional feed (PKvn) and the second group received 100% of Complete feed plus (PKpl). The experiment was conducted in two periods. In period 1, three animals were received PKvn and the other three were given PKpl. In period 2, the previous animals which fed by PKvn, were received PKpl, meanwhile the previous animals which received PKpl, were given PKvn. Each period was conducted in 6 weeks including adaptation (Table 1). The calculation of milk yield per lactation period was done by procedure of Yaap (1955) which stated that the lactating period was generally in 10 months. Therefore it can be made the percentage from first month to 10th month as follows: 13, 13, 12, 12, 10, 10, 9, 8, 7, and 6%. The average yields was counted from one period of lactation (liter) which divided by time of lactating period (305 days). The diets formulated adjusting to the requirements table of lactating cow (NRC, 2001). The scheme of experiment was shown in Table 1. Meanwhile the composition of nutrient contents was illustrated in Appendix 1.

Tablel 1. The scheme of feeding in experiment

Period	Feeding treaments	
I	PKvn in group 1 (three cows)	PKpl in group 2 (three cows)
II	PKpl in group 2 (three cows)	PKvn in group 1 (three cows)

The experiment was done by using the repeating measurement design or cross over design (Astuti, 1981; Gomez and Gomez, 1984). In each period, the treatments (PKvn and PKpl) using three cows, so the replicates in each treatment was six animals.

Data measured were: feed intake, chemical composition of feed and milk yield. The milk yield was sampled to determine conventionally milk quality as of specific gravity, total solid, total solid non fat and fat contents. Feed sample was grouped for analyzing dry matter, organic matter, crude protein, and crude fiber. Feed refusal was take in the morning at the following day and weighing and being sampled as much as 200 gram and grouped for each period for determining DM, OM and protein (Harris,1970; Nahm, 1992).

RESULTS AND DISCUSSIONS

Chemical Composition of Feed

Results on proximate analysis of feed composition are shown in Tabel 2.

Tablel 2. Chemical composition of dry matter (DM), organic matter (OM), crude protein (CP), crude fiber (CF), ether extract (EE), and nitrogen free extract (NFE) of feed stuff and grass (% DM basis)

Feedstuff	DM	OM	CP	CF	EE	NFE
Complete feed	87.65	86.26	14.42	17.30	2.30	52.24
Convensional concentrate	88.88	89.03	14.58	13.36	4.64	56.45
Grass	18.00	80.36	9.22	20.33	2.34	48.47

Source: Results from Animal nutrition Technology Laboratory, Animal husbandry faculty of UGM

Animal Condition

Six animals used in this experiment were in good health although one cow was infected by mastitis (udder mumps). However, it was cured and become health. Animals were then divided into two group of feeding. (conventional feed/PKvn and complete feed/PKpl). The feeding was continued and followed the design. However, as long as two weeks one animal which received complete feed was loss in intake and finally died. The animal was indicated by indigestive problems. The reason of the problems presumably caused by feed accumulation in digestive tract (reticulum), so the feed can't move pass trough the digestive tract. Although the complete feed consisted of crude fiber not too high (17.30%) (Table 2) but the particle size is medium (not rough but not too fine). Then, stimulation on rumen wall was diminish and the rumen movement was low, resulting in impede of regurgitation and influence remastication. However, feed in reticulum which not fine wasn't able to pass trough the hole between reticulum and omasum (*reticuluo-omasal orifice*), so there was a jammed, stuck and hard in reticulum. Based on this happened, in treatment of PKpl was added by fresh grass as much as 6 kg/day in order to stimulate rumen movement for regurgitation activity and remastication.

Feed Intake

As mention before, regarding to enhance rumen activity, complete feed given should be added by grass. Therefore, calculation of dry matter feed intake was based on conventional concentrate, complete feed and grass although the grass given was very few. Data of total feed intake was shown in Table 3.

Tabel 3. DM intake (kg) on cows fed conventrional feed (PKnv) and complete feed plus (PKpl)

	Diet						Rata-rata ns
	PKnv			PKpl			
Period	H	K	J	H	PKpl	J	
PI	4.357	6.212	10.569	0.798	11.833	12.631	
	3.966	5.324	9.291	0.798	11.676	12.474	10.859
	4.894	4.437	9.331				
PII	5.054	3.645	8.699	0.867	9.083	9.951	
	4.562	3.591	8.154	0.856	8.623	9.479	
				0.856	8.747	9.603	9.177
Average ns			9.209		9.992	10.828	

Feed intake on cows fed PKnv and PKpl was not differ (9.209 vs 10.828 kg/day). This indicated that complete feed can be received by animals although some modification should be adhered in the providing.

Milk Yield

The average of milk production of cows which received PKvn and PKpl need to be converted to one lactating period based on Yaap (1955), then it determined in daily yield. The average of milk production per cow was in Table 4.

Table 4. Average milk yield (l/d) of cow fed PKvn and PKpl

	Diet		Average ns
Period	PKvn	PKpl	
	10.251	6.450	
I	7.784	5.237	7.208
	6.319		
	8.098	10.085	
II	5.793	6.950	7.688
		7.514	
Average ns	7.649	7.247	

Results showed there is no significant difference on milk yield between two groups which was 7.649 vs 7.247 liter per day, respectively. This indicated that complete feed can be used for dairy cows without disturbing the production.

Milk Quality

The data of conventional milk quality including dry matter or total solid, dry matter without fat or solid non fat, and dan fat was shown in Table 5, meanwhile the data of protein content and spesific gravity was in Tabel 6.

Table 5. The content of total solid, solid non fat, and protein (%) of milk of cows fed PKvn and PKpl

Variablel	Period	Diet		Average
		PKvn	PKpl	
Total solid	I	10.61	11.61	11.43
		11.10	12.69	
		11.13		
	II	11.03	10.04	10.84
		11.72	10.75	
			10.64	
	Average[ns]	11.12	11.15	
Solid Non Fat	I	7.56	8.51	8.36
		7.89	9.69	
		8.13		
	II	7.61	7.68	7.54
		7.95	7.08	
			7.34	
	Average[ns]	7.83	8.06	
fat	I	3.05	3.10	3.07
		3.20	3.00	
		3.00		
	II	3.42	3.14	3.46
		3.77	3.67	
			3.30	
	Average[ns]	3.29	3.24	

Table 6. Weight degree and fat content of milk PFH cows fed PKvn and PKpl

Variable	Period	Diet		Average
		PKvn	PKpl	
Spesific gravity	I	1.024	1.026	1.025[x]
		1.025	1.027	
		1.024		
	II	1.027	1.026	1.027[y]
		1.027	1.026	
			1.026	
	Average	1.025[a]	1.026[b]	
Protein	I	2.28	2.33	2.50
		2.48	2.84	
		2.55		
	II	2.74	2.54	2.77
		2.99	2.52	
			3.04	
	Average[ns]	2.61	2.65	

[ab] Differ superscript in same rows showed different (P<0.05)
[xy] Different superscript in the same column showed high different (P<0.01)

Results showed that there was no significant difference between two groups of total solid (11.12 vs 11.15%), solid non fat (8.36 vs 7.54%) and fat (3.29 vs 3.24%)**.** This caused by feed which made fit to the standard for lactating cows requirements (NRC, 2001). The diet composition was shown in Appendix 1.

Milk quality was conventionally determined by fat content, total dry matter or total solid (TS), total DM without fat or solid non fat (SNF) and weight degree (BJ). According to Sudono and Sutardi (1969) milk cows had BJ minimal 1.027 at temperature of 27.5^{o}C and fat content 2.8%, meanwhile the Ditjen Peternakan,1993, *cited.* Sutarno (2003), indicated that BJ of milk was minimal 1.028, fat content of 2.80%, TS of 10.80%, and SNF of 8.00%. The content of milk protein was minimal 2.7% (BSN, 2005).

Results showed that weight degree (BJ) of treatments was 1.025 and 1.026, respectively. This findings were lower than those on standard (1.027) and presumably animals were lack of minerals. Fat content of two treatments (3.29 and 3.24%) was higher than that of the standard (2.80%). This condition is relate to fibre content in PKvn and PKpl which was good enough. Moreover, the TS content of treatments (11.12 and 11.15%) was higher than the standard (10.80%).

Milk-protein content of PKvn and PKpl which was 2.61 and 2.65% was below standard (2.70%), but higher than that of the result of Utomo *et al.* (2007); where in their research resulted in milk protein content of 2.07% for cattle which fed corn stover and 2.29% for cows fed the basal diet of rumen content silage (by-product) from abattoir.

Appendix 1. Ration farmula and prediction the nutrients composition (%DM)

A. complete feed

No	Feed ingredient	%	Kg	CP (%)	TDN (%)	DM (%)
1	Soybean seed	5.50	0.55	2.75	3.85	86
2	Soybean meal	8.80	0.88	2.97	5.28	86
4	Palm cernel meal	13.75	1.38	2.75	9.63	86
5	Rice bran	10.45	1.05	1.45	8.47	86
6	Wheat polard	7.70	0.77	1.14	5.36	86
7	Cassava pomace	7.70	0.77	0.22	7.01	86
9	Mineral	0.55	0.06	0.03	0.00	100
10	Salt	0.55	0.06	0.03	0.00	100
11	corn cobs	33.00	3.30	0.97	18.50	86
12	Arenga pinnata waste	2.00	0.20	0.26	5.20	80
13	Pennisetum purpurium	10.00	1.00	0.10	0.60	18
	Total	100.00	10.00	12.67	63.90	

B. Conventional feed

No	Feed ingredient	%	kg	CP, %	TDN, %	DM, %
1	Soybean meal	4.4	0.44	2.16	3.84	86
2	Copra meal	0	0	0	0	86
3	Palm cernal meal	10	1	2	7	86
4	Rice bran	14.4	1.44	1.73	10.08	86
5	Wheat polard	8	0.8	1.21	5.70	86
6	Cassava pomace	2	0.2	0.06	1.95	86
7	Urea	0	0	0	0	100
8	Mineral	0.6	0.06	0	0	100
9	Salt	0.6	0.06	0	0	100
10	Pennisetum purpurium	60.0	6	5.40	33	18
11	Total	100.00	10.00	12.56	61.57	

CONCLUSIONS

Cassava pomace and corn cobs can be used as fibre source in complete feed processing for dairy cows. The use of corn cobs as fiber source in complete feed was not useful if the particle size was medium, this due to caused indigestive problems. complete feed was not give negative impact of milk yield and quality, even increase the weight degree of milk.

Further research is needed to asses another source of fiber source aside cassava pomace and corn cobs.

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