EFFECT OF COMPLETE FEED BASED ON CORN BIOMASS SILAGE ON MILK PRODUCTION AND MILK QUALITY OF DAIRY COWS

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Abstract

Corn silage is feedstuff produced by the fermentation of whole part or some part of corn plants. Corn silage had a high energy and low protein that commonly used as supplemental energy for lactating dairy cows. High carbohydrate complex like cellulose in corn silage is a good source for microbial rumen to increase volatile fatty acid (VFA) production and thus improved milk production. Aim of this study was to determine effect of complete feed based on silage of corn biomass to improve milk production and quality of dairy cows. In total of 16 dairy cows in the second parity with average body weight 567 kg were used in this experiment. Completely randomize design was used in this study with 4 treatment (R1: 60% corn biomass silage (CBS) + 40% concentrate (Con); R2: 60% CBS + 10% forage (FOR) + 30% Con; R3: 60% CBS + 20% FOR + 20% Con; R4: 60% CBS + 30% grass + 10% Con) were replicated four times. Different combination of between CBS, forage and concentrate did not effect on milk quality and milk production both of real or 4% FCM. However, it can improve milk qualities such as solid non-fat, fat, and protein percentages by 8%, 4% and 2.8%, respectively. It also can maintain of 10 – 12 kg/cow/day milk production and 11.63 – 12.75 kg/cow/day of FCM. Similar results in all treatment indicated that the complete feed in four treatments have a same nutrient qualities. In conclusion, feeding dairy cows with complete feed based on corn biomass silage can maintain milk production and improve milk qualities.

Key words: corn biomass silage, milk yield, milk qualities, dairy cows

INTRODUCTION

One of the major problems of dairy farm is low feed quality and quantity. Feed management is one of the strategies to improve health and milk production of dairy cows. Farmer need to be active on processing abundantly forage during rainy season, to meet the requirement of cow feed during summer. Bioprocess anaerobic technology such as silage in complete feed can be used to produce lasting feed for dairy cows.

Dairy cows eat forage [3], which are contains more than 18% of cellulose [4]. Feed intake of dairy cows during lactation period is 40% DMI of total or 1.5% of body weight [14]. There are three factors influence feed intake, such as (1) Neutral detergent fiber content (2) water content and (3) forage sizes (particles). Water content in the forage is about by 25-30%. Coppering forage also took an important role in prehensile and palatability. The proper sizes of forage is 5-10 cm.

Corns is high-adaptively plants, with 70% of production are uses for human and the byproduct of the corn plants can be used for animals feed. Nutrient from branch and leaves of corn plants has been moved into fruit in 80-110 days. Although the nutrient has declining, the biomass was increased and lignification has not started. Cellulose is complex glucose that can be broken by celulase enzyme. In rumen, cellulose are broken by cellulose bacteria into volatile fatty acid (VFA). VFA consist of butyrate, acetate and pyruvate. VFA in ruminant was used for energy sources and carbon.

Corn biomass is an alternative feed for animals and can be used for silage processing. Bioprocess anaerobic of silage was aimed to reduce the use of concentrate (ration)

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proportion in feed thus may be can reduce farm cost. Moreover, silage has expected to maintain forage quality and therefore improved milk production and milk qualities.

Silage process was affected by acid production to inhibit undesirable microorganism activity in anaerobe condition. Acid lactic bacteria in forage convert glucose into acid lactic. Moreover, silage process convert soluble carbohydrate into organic acid which can lower pH then preserved the forage.

Milk have three main components, such as lactose, casein and fat. Milk production has affected by species and genetic factors. Total solid or non solid fat in milk known as an indicator to measure milk qualities. Milk total solid means is around 13% with solid non-fat 9.5% [9].

Total solid of milk defined as milk without water component. Solid non-fat is milk without water and fat. High milk production affect total solid and fat percentages, because of different nutrient distribution in cows with high or low milk production. In other side, solid non-fat of milk will reach a peak at early lactation and decline after 40-60 day in milk. Solid non fat will rise gradually for six month, followed by sharp increasing in the end of lactation.

Solid non-fat of milk depend on protein content in feed. High SNF in the peak production is caused by high protein and low fat of the feed. High fat resulted in lower SNF of milk. It was hypothesized that feeding dairy cows with complete feed based on corn biomass silage is expected to improve milk production and milk qualities of dairy cows.

MATERIAL AND METHOD

A total 16 Fries Holstein Dairy Cows in the second parity with average body weight 567 kg were used in this research. Stems, leaves and fruit of corn were used to make corn silage then it were mixed with concentrate. Corn biomass were coppered with a size of 5-7 cm, before it were mixed with concentrates in various balances, there were: Silage (S) 1: 90% Corn Biomass Silage (CBS) + 10% Concentrates (Con); S2: 80% CBS + 20% Con; S3: 70% CBS + 30% Con.

In order to accelerate the fermentation process, the mixture was added a microbial cultures in diluted molasses. The microbial dose was 0.2% in molasses solution, while the amount of molasses was 0.5% of the corn biomass. The amount of water added was 30% of the weight of the concentrate in the mixture. The ensilage process were considered completed after 14-21 days of ripening.

Completely Randomized Design (CRD) were used for experimental design, with four feed treatment. Each treatment has four replication. The dietary treatment are R1: 60% Corn Biomass Silage (CBS) + 40% Concentrate (Con); R2: 60% S1 + 10% forage (FOR) + 30% Con; R3: 60% S2 + 20% FOR + 20% Con; R4: 60% S3 + 30% FOR + 10% Con. Data was analyzed with ANOVA then continued with Duncan test.

RESULTS AND DISCUSSIONS

In the present study, feed intake was associated with composition of forage and concentrate intake. Feed intake were higher when cows fed high forage and low concentrate compared with high concentrate and low forage. This indicated that increasing consumption of the feed ration is suspected by the increasing water content of the total ration. Water content of grass/forage is higher than concentrate. Substantially, the ration was consumed by ruminants meet the requirement of dairy cows. Thus the high water content of ration will be more consumed than the lower water content.

Feed intake of various combination with corn biomass silage have shown similar results (Table 2). It means that cows in this research has a same palatability. Besides, the dry matter and nutrient contents of the rations in all treatment have not different. Tillman, et. al. [16] reported that feed intake was affected by composition of rations, amount of given ration, feed processing, animal (species, type, age and sex), indigestion, adaptation to food changes and food deficiency.

Feed intake was associated with milk production. Feed is the main factor affect milk production [3]. Variations of milk production in the tropics area depend on farm

management, feed quality, and climate [18]. The amount of forage and concentrate can affect milk production and fat percentage [12]. Feed that was given to dairy cows need to meet the requirement of maintenance, milk production, growth, and pregnancy [3].

In present study, not only feed intake but also milk production were similar among treatments (Table 2). However the ratio of feed intake and milk production is 1:1. It showed that feed efficiency were found in cows fed treatment R3, by 0.88, while the higher differ is in cows fed treatment R2 by 2.31. It means that the 0.88 kg were allocated for maintenance and the rest were changed into milk. Nevertheless, the genetic factors in this research was not corrected.

Genetic capacity of dairy cows depends on their genetic potential and varies, according to status of the cow such as parity, physiological status (e.g. lactation and pregnancy), and climate. Each animal has a maximum level at which dairy cows can utilize nutrients and metabolic fuels. DMI is limited by physical capacity [1].

Fries Hollands (FH) can produce high milk. In Indonesia, FH dairy cows can produce 2,500-5,000 liters of milk per lactation [12]. Milk production of FH in West Java for each lactation period are 4,239.5; 4,665; 5,063.5; 5,581.5; and 4,697 liters per cow for parity 1, 2, 3, 4, and 5, respectively.

Milk production of dairy cows during her productive life varies from lactation to lactation depend on management and environment [6, 7]. Milk production of dairy cow increased from the first lactation to the next lactation until the age of 6-8 years and after that it gradually decreases [3].

Milk production in one lactation period starts at one point and increases for approximately 3-6 weeks [2, 10]. Furthermore, the increase in milk production decreased slightly and reached its peak in 35-50 days after calving. In the first lactation cow can produce milk about 70.75%. In the second lactation, cow can produces 90% of milk [3].

There were no significant different on milk qualities among treatments (Table 3). Parameters for milk quality in the present study are percentages of fat, protein, mineral, sugars, and vitamins (dry matter basis). These components not only present in the milk but also are present in the blood. Those component relatively constant in blood and milk due to homeostasis, except the percentages of fat. Thus, the dry matter content of milk is not differ [2]. It is recommended by Milk Codex that the limit for dry matter content of milk is 10.8% [3] or about 11.3% (PT Indomilk).

No effect of the treatments on SNF levels in milk. However, in the present study cows fed complete feed with combination of 60% CBS + 30% forage + 10% Con (R3) had the highest level of SNF in milk numerically compared with other treatments. The minimum limit of SNF based on milk Codex is 8 percent [13]. In Indonesia, the level of SNF will affect the price of milk received by the Milk Processing Industry (IPS), as PT Indomilk in 2001 required a minimum SNF milk limit of 7.8%.

Low milk fat percentage was associated with low fiber intake. According to Hadiwiyoto [5], milk fat percentage of Fries Holstein is 2.5 - 6.0 percent. Milk fat content varies and is strongly influenced by the type of ration. Most of the fat in milk is saturated fat. Milk fat was synthesized in udder for 97-98 percent in the form of triglycerides and 2-3 percent in the form of phospholipid compounds. In general, milk fat levels of all treatments were still above the minimum fat percentage as recommended by milk codex 2.8% [13] or 3.5% (PT. Indomilk).

The percentage of milk protein is between 2.7 - 4.8%. Casein is a main component of milk protein (90 percent). Milk protein levels are relatively constant. This gives an indication that the ration provided in present study has relatively the same nutritional quality.

Table 1 Feed Nutrient Contents

Feed	Dry matter intake	Ash	Protein	Fat	Fiber	BETN	TDN
	---------- % ----------						
Forage	23.20	12.00	8.70	2.00	32.30	43.70	52.40
Corn Biomass	21.00	10.20	9.90	1.80	27.40	50.70	60.00
Concentrate	89.95	11.95	15.28	7.48	17.43	47.86	72.31
Silage-1	29.66	6.73	10.95	8.29	22.34	51.69	74.50
Silage-2	36.65	8.21	12.65	7.37	19.28	52.49	74.63
Silage-3	43.4	8.07	13.45	8.68	18.57	51.23	76.74

Table 2 Feed Intake of Corn Biomass Silage and Milk Yield of Fries Holstein Dairy Cows

Parameter	Treatment			
	R0	R1	R2	R3
	---------kg/cow/day----------			
Feed Intake (DMI)	13.94	13.24	13.70	14.07
Milk Production	10.82	12.48	12.56	11.76
Milk Production (4% FCM)	11.63	12.36	12.75	12.25

Table 3 Milk Qualities of Dairy Cows which Feeding by Corn Biomass Silage

Milk Qualities	Treatment			
	R1	R2	R3	R4
	%			
Solid Non Fat (SNF)	8.01	7.91	8.10	8.09
Fat	4.50	3.94	4.10	4.28
Protein	2.96	2.89	2.93	2.89

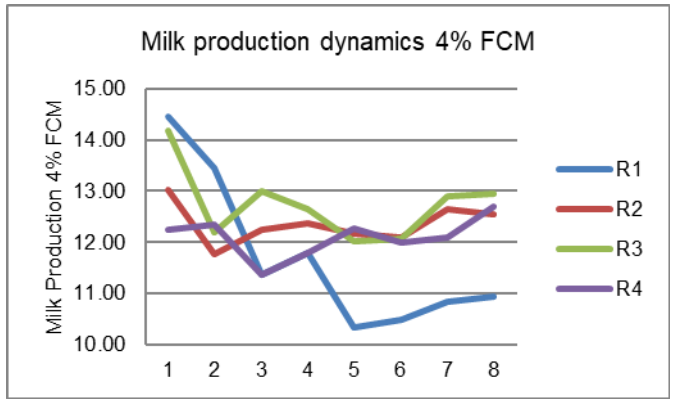
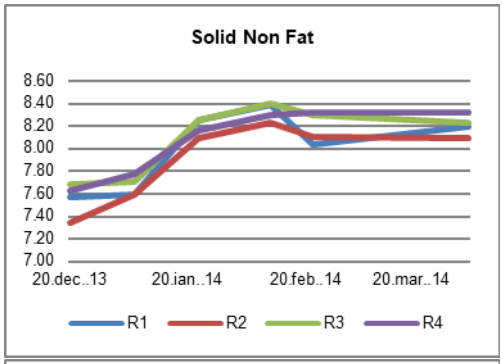
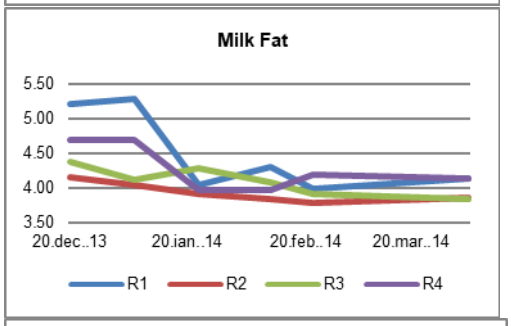
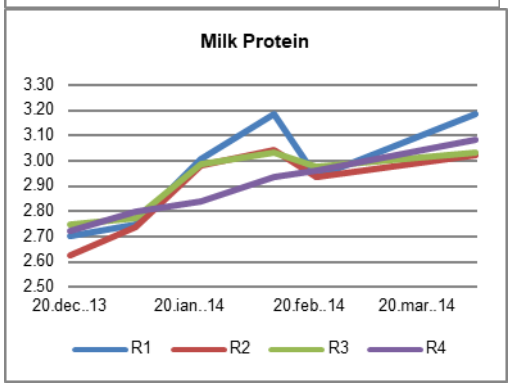


Fig. 1 Milk production dynamics 4% FCM every 10 days of observation Effect of supplementation of fermented cow milk and soybean milk with probiotics on (means±standard error). R1: 60% Corn Biomass Silage (CBS) + 40% Concentrate (Con); R2: 60% S1 + 10% forage (FOR) + 30% Con; R3: 60% S2 + 20% FOR + 20% Con; R4: 60% S3 + 30% FOR + 10% Con.







CONCLUSIONS

The use of complete feed based on corn biomass silage had good palatability. It was reflected in feed intake that was not affected by the composition of corn biomass silage. Complete feed based on corn biomass silage could increase and maintain milk production and those were corrected by 4% Fat (FCM). Corn biomass silage did not affect milk quality.

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