The Effect Oil Palm Fronds Fermented With Prolinas to Milk Production of Dairy Cattle

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Abstract. Palm oil frond is one of the plantation waste that can be used as animal feed especially in the dry season when green forage became rare. In 1 Ha of plantation land, around 20,000 kg of fresh palm oil frond can be obtained each year. The study aimed to determine the fermentation process between oil palm fronds with prolinas (OPFP) as substitution of corn straw in dairy cattle rations and to see how it affect to milk production of PFH dairy cows. This study used 4 of fourth lactation PFH dairy cattle. The experiments used a latin square design with 4 treatments and 4 repetition. The treatment consisted of P0: forage 55% + 45% concentrate (control), P1: forage 55% (90% corn straw + OPFP 10%) + 45% concentrate, P2: forage 55% (80% corn straw + OPFP 20%) + 45% Concentrate, P3: Forage 55% (60% corn straw + OPFP 40%) + 45% concentrate. The parameters measured were feed consumption, feed efficiency, milk production and 4% FCM milk production. Data were analyzed by SAS program. The Differences between treatments were analyzed using Duncan Multiple Range Test. The results showed that corn straw substitution treatment with fermentation of oil palm fronds with prolinas has no effect (P> 0.05) to feed efficiency and 4% FCM milk production but decreasing (P<0.05) the feed consumption and and milk production. The conclusions of this research that the substitution of fermentation of oil palm fronds with prolinas decreased milk production of dairy cattle.

1. Introduction
The animal feed is a basic problem that farmers need to seriously consider in animal farming as they cannot count on grass to feed cow at the moment. The influence of climatic changes and limited availability of land are some of the reasons that affect the green forage quality. In order to solve this challenge, we need to look for some other feeds that are available in large and sufficient quantities, throughout the whole year. One of such feed option is the palm fronds which are wastes from palm plantations.

Syarif (2010) stated that palm fronds can replace field grass up to 50% in feeding cow because it can increase the digestion of protein, neutral detergent fiber (NDF) and acid detergent fiber (ADF) in their
rumen. Also, Darlis and Syarif (2011) reported that the combination of grass and palm fronds gave increase in weight and rations efficiency when compared with only grass. And the use of palm fronds alone cannot reach 100% because these palm wastes contain other high level of lignin that limit digestion. Lignin that is binded with cellulose need to be processed first. Many research has been done such as processing fiber feed that involved chemical processing through ammonization and biological processing through fermentation. The result showed that both techniques proved to be able to improve the quality of fiber feed (Ningrat and Khasrad, 2010).

Other study stated that the addition of probiotics in the food can make microbes to grow in the rumen of the ruminant animals, thereby increasing the feed digestibility (Giger-Reverdin et al., 2004; Lesmeiter et al., 2004; Haddad et al., 2005; Elseed et al., 2007). The use of natural probiotics like Saccharomyces cerevisiae and Aspergillus oryzae was investigated by Amin (2007) by adding 50% of elephant grass and 50% of concentrates, it was discovered that it increased rumen microbial food thereby increasing the performance of dairy cows. Rita (2001) combined probiotic supplements and fish meal to the feed and it gave a significant increase in the growth of the cattle because it can supply microbial protein which can improve the nutritional status of cattle.

Mardalena et al. (2016)a, were isolated of lactic acid bacteria from fermented pineapple waste, resulted with characteristics of shiny white, round and jagged colony. After carrying out a molecular identification on the colonies, it was discovered that the fermented pineapple skin contained lactic acid bacteria, Lactobacillus plantarum and Lactobacillus pentosus. After some test conducted including positive salt coloring test which is the test of L. pantarum and L pentosus tolerance to bile salts, the fermented pineapple skin potentially became probiotic product called Prolinas (Pineapple skin probiotic). Mardalena et al (2016)b concluded that the usage of Prolinas at 5 - 7.5% level able to increase the dry matter digestibility and the total volatile fatty acid (VFA) of palm oil fronds in cow’s rumen using in vitro.

The energy requirements for lactating dairy cows are determined by weight, which is the basic need, while the need for milk production is influenced by the amount of milk secreted and the fat content of the milk (Bath et al., 1985). The nutritional needs of lactating dairy cows are closely related to body weight and the milk produced, while feed consumption is closely related to the rough fiber content of feed and due to this, feed consumption will decrease if the rough fiber content is high (Sutardi 1981).

Considering the fact above, this research was conducted to study about effect oil palm fronds fermented with prolinas to milk production of dairy cattle

2. Materials and Methods
2.1. Location and Time
This study was conducted in 2016 at the diary farm of Bina Maju Sejahtera farmers group Kota Karang Village, Kumpeh Ulu District, Muaro Jambi Regency and the Animal Husbandry and Nutrition Laboratory in Faculty of Animal Husbandry of Jambi University.

2.2. Cattle and Animal Feed
The cattle used in this study used 4 of fourth lactation PFH dairy cattle. The forage provided were made up of corn straw, palm oil fronds fermented with Prolinas and concentrate consisted of bran, tofu pulp and mineral mix in which the nutrient content as listed in Table 1. The feeding was calculated based on needs which are 55% forage and 45% concentrate. The palm oil fronds were cut with a chopper machine and then allowed to dry in the sunlight till the water content was around 60%. The palm oil fronds were added with 2.5% molasses and 2.5% Prolinas mixed evenly, then stored for 3 weeks in an aerobic condition.
Table 1. Content of forage feed, fermented palm oil fronds and concentrate

| Feed nutrition (%) | Feeding material treatment |
|--------------------|---------------------------|
|                    | Corn straw | FPOF* | Concentrate |
| Dry matter (%)     | 77.86      | 83.57 | 87.23       |
| Crude protein (%)  | 6.57       | 6.58  | 10.09       |
| Crude lipid (%)    | 1.17       | 2.18  | 1.41        |
| Crude fiber (%)    | 21.43      | 32.70 | 26.42       |
| Ash (%)            | 5.15       | 6.99  | 10.21       |

(*) fermented palm oil fronds

The forage and concentrate feeds were given at 06.00 a.m and 03.00 p.m and feed consumption was measured with a 100 kg scales every day at 07.00 a.m calculated from the feed given on previous day with the remaining on the following day. Milking is done twice a day, at 05.30 a.m and 02.30 p.m. Milk yield was calculated from the daily milking quantity.

The experiment was conducted via a latin square design with 4 treatments and 4 replications. The treatments consisted of: P0: 55% Forage + 45% Concentrate (control), P1: 55% Forage (90% corn straw + 10% PSFP) + 45% Concentrate. P2: 55% Forage (80% corn straw + 20% PSFP) + 45% Concentrate. P3: 55% Forage (60% corn straw + 40% PSFP) + 45% Concentrate. The collected data were analyzed using SAS and the differences between the treatment means were analyzed using Duncan’s multiple range test with confidence intervals of 5% and 1%.

Variables observed were:
1. Feed consumption (kg/d)
2. Milk production (l/d)
3. 4% FCM milk production (l): (0.4 x milk production) + 15 x milk production x milk fat production.
4. Feed efficiency (FE) (%)

\[ FE = \frac{\text{Milk production of 4% FCM}}{\text{Feed consumption (DM)}} \times 100\% \]

Table 2. The composition of feeding material and feed nutrient in the ration

| Feeding Material | Treatment |
|------------------|-----------|
|                  | P0 | P1  | P2  | P3  |
| FPOF (fermented palm oil fronds) | 0  | 5.5 | 11  | 22  |
| Forage           | 55 | 49.5| 44  | 33  |
| Concentrate      | 45 | 45  | 45  | 45  |

| Feed Nutrient (%) | 
|-------------------|
| Dry matter        | 79.14 79.45 79.76 80.39 |
| Crude protein     | 15.63 15.72 15.81 16.00 |
| Crude lipid       | 2.05 2.11 2.16 2.27     |
3. Result and Discussion

3.1. Feed consumption and feed efficiency

The results showed that the substitution of corn straw with palm oil fronds fermented with prolinas was significantly (p <0.05) reduced the feed consumption of PFH dairy cattle, as shown in Table 2.

Table 3. Feed consumption and feed efficiency of dairy cattle.

| Variable                  | Treatment |
|---------------------------|-----------|
| Feed consumption (kg)     | P0        |
|                           | P1        |
|                           | P2        |
|                           | P3        |
| Feed efficiency (%)       | 30.853    |
|                           | 29.655    |
|                           | 28.860    |
|                           | 27.188    |

P0 = forages + concentrate (control), P1 = (90% forages + 10% FPOF) + Concentrate, P2 = (80% forages + 20% FPOF) + Concentrate, P3 = (60% forages + 40% FPOF) + Concentrate. FPOF = Fermented palm oil fronds with Prolinas. The different superscript values on the same line show the difference in the 5% level.

The control treatment (P0) was significantly higher (P <0.05) than P1, P2 and P3. The decreasing in feed consumption is effect of the high fiber content in dairy cattle ration. PSPF is a palm oil fronds feed which is fermented with prolinas was not yet able to reduce the rough fiber content significantly. As shown in Table 2, prolinas that contain L. plantarum bacteria was not able to reduce the rough fiber, thereby lowering the digestibility and decrease feed consumption. This study used of prolinas at a level of 2.5% / kg and which is not in accordance with the results from the study conducted by Mardalena et al. (2016) that reported at level of 5 - 7.5%. Asmarasari and Zain (2012) stated that the application of probiotic in dairy cattle feed must pay attention to the right method and quantity in order to have optimal utilization.

Wahyudi (2006) stated that rough fiber is the main feed given by farmers to their dairy cattle. Rough fiber is precursor of milk fat, but if it is not well digested, it can reduce feed consumption, thereby cattle will not obtain optimal energy. He further stated that the increasing of the fermentation process or the microbial activity in the rumen is one of the factor that can increase the consumption rate, thereby giving the ruminants more nutrients and energy. A stable rumen ecological condition will increase rumen fermentation process, feed digestibility and fasten feed content to leave rumen so cattle consume more feed. More feed consumed will lead to more energy received and then resulted to higher productivity.

The substitution of corn straw with palm oil fronds fermented with prolinas did not affect (p>0.05) to the feed efficiency of PFH dairy cattle. Maulfair et al. (2011), feed efficiency is a simple measurement to determine relative ability of cows to convert food nutrients into milk or milk components. Additional benefit to improve the cow ration efficiency is that there will be fewer nutrients to be excreted in the feces, which means that ration efficiency has both economic and environmental effects.

3.2. Milk production

During lactation, mammary gland requires glucose especially for the formation of milk sugar known as lactose. The amount of lactose synthesized will determine the amount of daily milk production. The concentration of lactose in milk is relatively constant in which water will be produced and added by secretory cells which makes the lactose content to be around 4.5%. Milk production is strongly influenced by the amount of glucose that is determined by propionate production in the rumen (Wahyudi, 2006).
The study showed that the substitution of corn straw with palm oil fronds with prolinas reduced milk production (P>0.5) but did not affect (P >0.05) to 4% FCM milk production. The control treatment (P0) was higher (P <0.05) than P2 and P3 treatment to milk production of dairy cattle. The decrease in milk production is caused by the decrease in feed consumption and the acetic acid level higher than propionic level in the rumen. During the fermentation process in the rumen, in vitro treatment of the fermented palm oil fronds lead to higher levels of acetic acid than propionic acid (Mardalena et al., 2016), which has more potential to increase the quality of milk fat compared to increase the milk production. Thomas and Martin (1988) stated that the production composition of milk by a dairy cattle depends on feed consumption and this shows the influence of energy consumption and protein supply.

Table 4. Milk production and 4% FCM milk production of dairy cattle

| Variable                  | Treatment |
|---------------------------|-----------|
|                           | P0        | P1        | P2        | P3        |
| Milk production (l/d)     | 3.98a     | 3.70a     | 3.59ab    | 3.29b     |
| 4% FCM milk production (l) | 3.93      | 3.52      | 3.63      | 3.57      |

P0 = forages + concentrate (control), P1 = (90% forages + 10% FPOF) + Concentrate, P2 = (80% forages+ 20% FPOF) + Concentrate, P3 = (60% forages + 40% FPOF) + Concentrate. FPOF = Fermented palm oil fronds with Prolinas. The different superscript values on the same line show the difference in the 5% level.

Mutamimah et al. (2013) stated that acetic acid and butyric acid will enter bloodstream to go to liver and transformed into fatty acids, then go into the udder secretion cells for the synthesis of milk fat. Propionic acid tends to be used for synthesizing milk lactose, thereby affecting the value of dry ingredients without milk fat. Propionic acid will enter liver, then transformed into glucose as milk lactose precursors (Prawirokusumo, 1993).

Supriyati et al. (2007) reported that the giving of fruits and vegetables fermented with Aspergillus niger can increase dairy cattle milk production to 3.91 l/d compared to control (14.47 l/d vs 10.56 l/d). Nikkhah et al. (2004) stated that the addition of 3 to 12g of S. cerevisiae in dairy cattle feed containing lucerne hay, corn leaf silage and concentrate, did not increase milk production.

4. Conclusion
In conclusion, the substitution of corn straw with palm oil fronds fermented with probiotic of pineapple skin (Prolinas) tends to reduce milk production.

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