EFFECT OF PROBIOTICS IN FERMENTED PALM KERNEL MEAL (FPKM) AND TOTAL MIXED RATION (TMR) TO IMPROVE MILK PRODUCTION IN MAFRIWAL DAIRY CATTLE OF MALAYSIA VETERINARY INSTITUTE (IVM) FARM

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ABSTRACT. A preliminary study on the effect of probiotics in fermented palm kernel meal (FPKM) and total mixed ration (TMR) to improve milk production in dairy cattle was carried out. TMR feeding enhances feed intake, improves the ecology of the rumen leading to stimulated microbial activity to digest more feed, and then finally increases productivity of the cows. Probiotics of *Bacillus* spp. was given through concentrate after a fermentation process for three days. The trial was carried out at the Dairy Unit, Veterinary Institute, Kluang, Johore. Twenty Mafriwal cows with low milk production were selected and divided into two equivalent groups. Each group consisted of 10 cows. Group A were fed with TMR. Group B received TMR and 100 grams per head/day FPKM (FPKM, probiotics *Bacillus* spp. and mollases). The cows were given TMR daily which consisted of 20 kg per head of fresh Napier grass, 5 kg per head palm kernel meal, 1 kg per head soya bean meal, 1 kg per head corn, 0.5 kg per head molasses and 0.5 kg per head of enalac. Feeding trial period was carried out for four weeks. Feed was given twice a day, morning and late afternoon, meanwhile water was given *ad-libitum*. Animals were given the same diet for seven days for an adaptation period. Milk was sampled twice a day for four weeks and were recorded accordingly. The average of daily and weekly milk production were calculated. The animals from Group B showed an improvement of milk production before trial to the fourth week from 5.2 litres/head/day to 6.99 litres/head/day i.e. 14.80% to 34.44% as compared to Group A.

Keywords: total mixed ration (TMR), fermented palm kernel meal (FPKM), probiotic, milk, dairy cows.

INTRODUCTION

Food is a major factor in determining livestock productivity apart from genetic factors and livestock management. Livestock daily nutrient requirements need to be met to ensure yields and livestock health. TMR feed, a mixture of concentrate and roughage, is typically used in the dairy industry in developed countries. The advantage of TMR feeding is to avoid eating selection and to maintain rumen fermentation. TMR feeding enhances feed intake, improves the ecology of the rumen leading to stimulated microbial activity to digest more feed which finally increases productivity of the cows.

Wachirapakorn *et al*. (1997) compared two feeding regimes (separate and TMR feeding) and found that TMR feeding increases dry matter intake (DMI) and milk production compared to separate feeding. FTMR is a simple method to potentially improve nutrient utilisation and extend the shelf life of the feed. FTMR is made by mixing roughage with concentrate feed samples used in this study which have been tested for nutrient content through proximate analysis. In dairy cows, Yuangklang *et al*. (2004) showed that FTMR increased feed intake and improved nutrient digestion. Vasupen *et al*. (2005, 2006) confirmed that FTMR improved the digestibility of dry matter (DM), organic matter (OM), fibre, and non-structural carbohydrate. In promoting the livestock industry, nutritional factors need to be taken seriously especially on ruminant farming. One of the efforts to increase dairy cattle productivity is by utilizing probiotics. Probiotics, which are currently being developed, have the potential of boosting milk production. Probiotics are substances that can alter intestinal microbes so that beneficial microbial balance can develop well (Fuller, 1992; Karpinska, 2001). Probiotics are non-digestible substances and give rise to increased bacterial activity in the colon (Roberfroid, 2000). The addition of *Bacillus* spp. probiotics to dairy cow rations can improve yield and quality of milk in the field (Supriyati, 2008). Probiotics is an additional product of live microbial feed that positively affects the livestock by maintaining the microbial balance of the digestive tract. There are several types of microbial feeds used as probiotics. The results show that some probiotics were able to increase milk yield. The addition of probiotics stimulates bacteria of the rumen which affects the increase of lactic acid resulting in the stabilisation of rumen pH. Increased microbial populations play a role in improving digestion of fibre materials to increase food intake and yield.

The objective of this study therefore was to observe the effect of probiotics in fermented palm kernel meal and TMR on milk production of dairy cattle in a local farm. The trial was carried out at the Dairy Unit, Veterinary Institute, Kluang, Johore.

MATERIALS AND METHODS

Animals

The study was conducted on Mafriwal dairy cattle at the Veterinary Institute, Kluang, Johore. Twenty dairy cows with low milk production between 5.2-5.8 litres/day were selected and divided into two groups. Each group consisted of 10 dairy cows.

Feeding Regime

Total Mixed Ration (TMR)

TMR consisted of Napier grass, palm kernel meal, broken corn, soya bean meal, enalac and mineral. Each animal was given 20 kg/head/day of Napier grass, 5 kg/head/day of PKM, 1 kg/head/day of broken corn, 1 kg/head/day of soya bean meal, 0.5 kg/head/day of enalac and 0.5 kg/head/day of minerals. Preparation of TMR is as shown in Figure 1. TMR samples used in this study were tested for nutrient content by proximate analysis.

Figure 1. Preparation of Total Mixed Ration (TMR)

Figure 2. Dairy cows were fed with Total Mixed Ration (TMR)

Figure 3. Preparation of palm kernel meal, probiotics and molasses for fermentation process

Figure 4. Palm kernel meal, probiotics and mollases being compressed prior to fermentation

Figure 5. Barrels with fermented palm kernel meal (FPKM) were opened after three days of fermentation process.

Fermented Palm Kernel Meal (FPKM)

FPKM consisted of 80 kg of palm kernel meal, 14 kg of molasses and 1000 grams of probiotics of *Bacillus* spp. Palm kernel meal (PKM), mollases and probiotics of *Bacillus* spp. were mixed and put into the barrel. (Figure 3). PKM, mollases and probiotics of *Bacillus* spp. were compressed and the barrel was closed for three days of fermentation. (Figure 4). After three days of fermentation, the barrel covers were opened (Figure 5). Fermented palm kernel meal were then packed into plastic bags, weighing one kg/ pack. Feed samples used in this study were also tested for nutrient content by proximate analysis. The content of dry matter, crude protein, crude fat, crude fibre, total of ash, calcium, phosphorus and metabolic energy were tested to evaluate the quality of nutrition fed to the animal accordingly (Method of Test for Animal Feeds and Feedstuff, 1971).

Experimental Design

Animals from Group A were fed with TMR as a control group (Figure 2). Group B were given TMR and 100 grams FPKM. Each group was given TMR as basic feed. Each animal was given 20 kg/head/day of Napier grass, 5 kg/head/day of PKM, 1 kg/ head/day of broken corn, 1 kg/head/day of soya bean meal, 0.5 kg/head/day of enalac and 0.5 kg/head/day of mineral. Water was available at all times. Feed samples used in this study were tested for nutrient content by proximate analysis. Feed ingredients of the experimental diets are shown in Table 1. Dietary adaptation of feed was implemented for seven days. The study was carried out for 4 weeks. The cows were milked twice a day (0600 and 1400h). Milk yield was measured daily. The daily and weekly averages of milk production were calculated accordingly.

RESULTS

Nutrient content of TMR and FPKM

TMR and FPKM samples used in this study were tested for dry matter, crude protein, crude fat, crude fibre, total of ash, calcium, phosphorus and metabolic energy to evaluate the quality of nutrition fed to the animals under study (Method of Test for Animal Feeds and Feedstuff, 1971). The nutrient content of FPKM mixed with *Bacillus* spp. and TMR given to the animals in this study are shown in Table 1. The nutrient content supplied in these feed formulations were considered to be sufficient for the average milk yield of 5 litres/day. (Hj Md Yusoff *et al.*)

Milk production

In Table 2, Group A showed that the average milk production was slightly increased in the first week (6.01 litres/head) and second week (6.40 litres/head) but decreased at the third week (6.24 litres/head) and the fourth week (6.14 litres/head). While for animals in Group B, the average milk production showed a constant increase from the first week (5.97 litres/head) up to the fourth week (6.99 litres/head).

Daily average milk production for 4 weeks study for Group B which showed a

Table 1. Nutrient content of the experimental diet based on Dry matter (%)

	TMR	FPKM
Dry matter %	36.2	46.5
Crude protein %	17.3	16.8
Crude fat %	4.9	2.4
Crude Fibre %	23.1	18.2
Total of ash %	6.8	10.1
Calcium %	0.59	0.66
Phosphorus %	0.51	0.63
Energy MJ/kg	9.41	8.79

TMR = Napier grass, palm kernel meal, soya bean meal, broken corn, enalac and mineral. FPKM = Palm kernel meal, probiotics and molasses.

Table 2. Average milk yield in four (4) weeks of experiment

LACTATION TIME	GROUP A (TMR)	GROUP B (TMR + FPKM)
Number of Animal (n)	10	10
Average milk before trial (l)	5.80	5.2
Average milk in the first week (l)	6.01± 0.46	5.97 ± 0.38
Average milk in the second week (l)	6.40 ± 0.46	6.11 ± 0.31
Average milk in the third week (l)	6.24 ± 0.15	6.73 ± 0.06
Average milk in the fourth week (l)	6.14 ± 0.40	6.99 ± 0.17
Percentage increase in milk production	3.62 % to 5.86 %	14.80% to 34.44%

*stdev are in parenthesis. Group A: Dairy cows fed with TMR. Group B: Dairy cows fed with TMR and 100 gram FPKM

higher average milk production compared to Group A .

The weekly average milk production from prior to trial period to the fourth week for Group B showed an increase from 5.2 litres/day to 6.99 litres/day, that is, 14.80% to 34.44%. For Group A the weekly average milk production was from 5.8 litres to 6.14 litres/day (Figure 7), that is, 3.62% to 5.86% (Table 2).

DISCUSSION

This study has shown that the probiotics in FPKM and TMR used, have the capacity to give a positive effect on improving local milk yield based on a small scale dairy cattle production. Animals fed with TMR showed that the average milk production has increased in the first week (6.01 litres/head) and second week (6.4 litres/head). However there was a decrease in the third

Figure 6. Daily average milk production (litre/head) in four weeks.

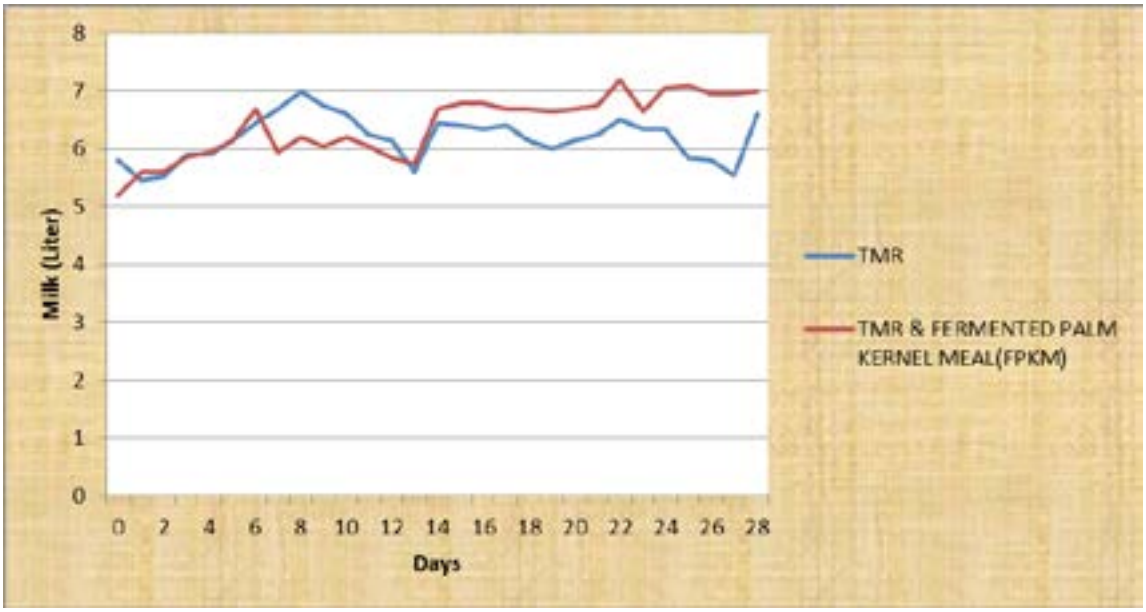
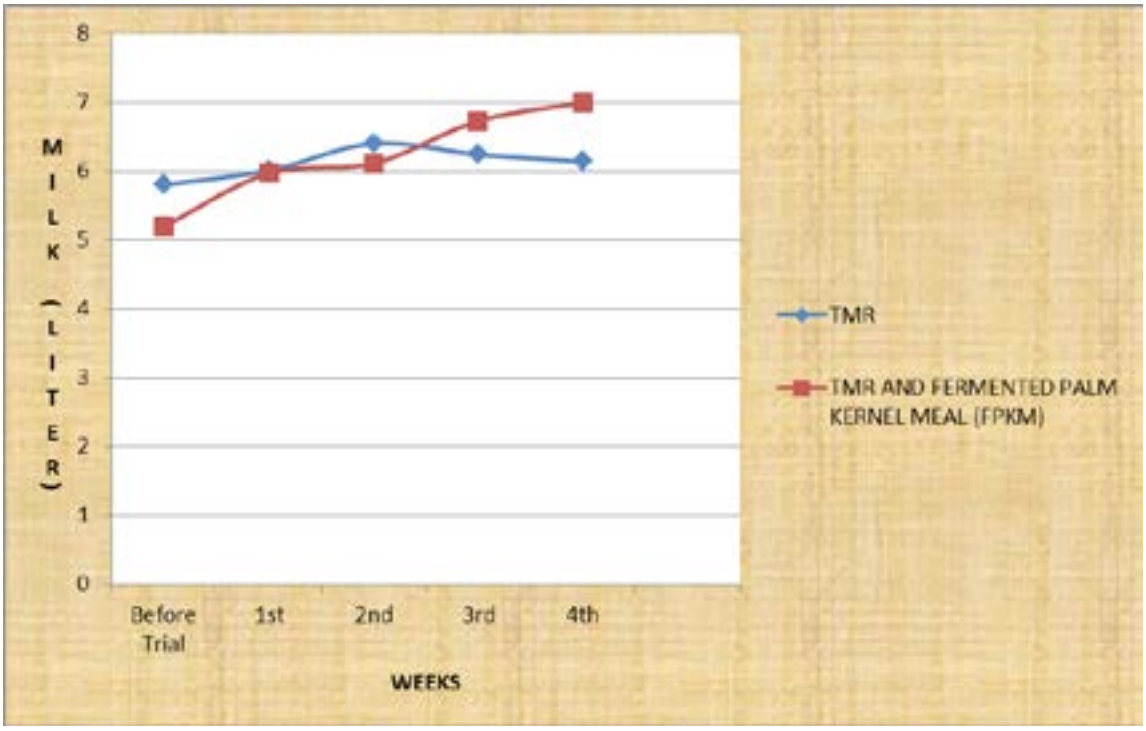


Figure 7. Weekly average milk production (litre/head) in four weeks.



week (6.24 litres/head) and the fourth week (6.14 litres/head). Animals fed with TMR and 100 gm FPKM, showed a constant increase in the first week (5.97 litres/head) up to the fourth week (6.99 litres/head). This finding is consistent with Wachirapakorn *et al.* (1997), studies of two feeding regimes (separate and TMR feeding) which found that TMR feeding increased dry matter intake (DMI) and milk production as compared to separate feeding. Based on these experimental data, the addition of probiotics *Bacillus* spp. in FPKM and TMR has the potential to increase milk production of dairy cattle on the low to a certain performance that needs to be confirmed, as the role of probiotics is to stimulate rumen bacteria which affects the increase of lactic acid resulting in the stabilisation of rumen pH.

CONCLUSION

Based on this preliminary finding, it is suggested for further studies, from different aspects on the effects of probiotics on milk production, to be carried out, especially the determination of optimum concentration and other detailed data on the use of these products on dairy cows under local climates.

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