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EFFECT OF UREA AMONIATION, HIDROLIZED POULTRY FEATHER, CASSAVA LEAVES, AND MIXTURE OF LYSINE-ZINC-SARDINE FISH OIL ON FEED UTILIZATION IN LACTATING DAIRY COW

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Abstract

The objectives of this study were to evaluate the efficiency of urea amoniation of elephant grass, the use of hydrolyzed poultry feather as the source of S-containing amino acids, the use of cassava leaves as the source of branched-chain amino acids, and mixture of lysine, Zn-sardine fish oil as a modulator for ruminal and post ruminal detestation. The study consisted of five dietary treatments, i.e.A= 40% elephant grass (EG) + 60 % Concentrate mix (CM), B = 40% urea-ammoniated EG=60% CM, C = B+3% hidrolized poultry feather (HPF), D = C + 15 % cassava leaves, and E = D + 1.06% Mixture of Lysine-Zn-sardine fish oil. The experiment was a 5 x 5 Latin Square Design five lactating dairy cows. Digestibility of organic matter (71.69 vs 74.35%) and milk production of lactating dairy cows were significantly improved (12.36 vs 13.47 kg day^{-1}) by hydrolyzed poultry feather (P,0.05). Milk production, milk fat content, and some long chain fatty acids were significantly affected by the mixture of lysine-Zn-sardine fish oil inclusion in the diet of lactating dairy cows. Based on some metabolic parameter and production performance, E diet was superior and it could be recommended for lactating dairy cows diet.

Key words: Urea-ammoniated, Hydrolyzed poultry feather, Cassava leaves, of lysine-Zn-sardine fish oil

Introduction

The improvement of protein nutrition in dairy cattle can be done by increasing microbial protein supply and fed by-pass protein. Ammonia is the main source of nitrogen (N) in the rumen for microbial protein synthesis. Utilization of high non-protein nitrogen (NPN) diet can be because limited supply of sulfur (S). Therefore, the addition S must be considered. Hydrolyzed poultry feather (HPF) is a good source of S-containing amino acid (SAA).

Synthesis of microbial protein also need branched-chain fatty acids (BCFA), i.e. isobutyrate, 2-methylbutirate, isovalerate (Russel and Sniffen, 1984). BCFA in the rumen were the product of decarboxylation and deamination of branched-chain

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amino acids (BCAA), i.e. valine, isoleusine, and leusine. Cassava leaves can be used as a good source of BCAA (Devendra, 1979). BCAA content of cassava leaves is higher than that of HPF.

The mixture of lysine, Zn, and sardine fish oil (source polyunsaturated fatty acids/PUFA) could provide a double effect in ruminant digestion: (a) to protect lysine from rumen degradation, and (b) increasing the absorbtion of Zn and PUFA in pascarumen.

The objectives of this study were (1) to developed technology of making lysine-Zn-sardine fish oil mixture (Lys-Zn-L); (2) to increase the utilization of agro industry by-product; (3) to evaluate the utilization of urea-ammoniation of elephant grass, cassava leaves, PHF, and Lys-Zn-L in improving the production and quality of dairy cow milk.

Materials and Methods

The process of lysine-zn-sardine fish oil mix production

The process of Lysine-Zn-Sardine oil mix production was illustrated on Figure 1.

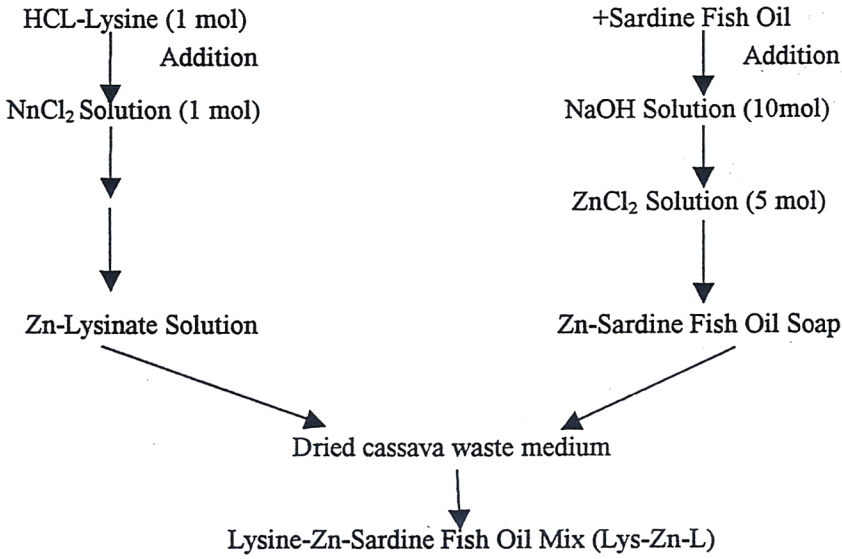

Figure 1. The process Lysine-Zn-Sardine fish oil mix production

In vivo Treatment

The in vivo experiment was conducted in a 5 x5 Latin Square design using Five FH cross breed lactating dairy cows. The dairy treatment were A = 40% elephant grass (EG) + 60% concentrate mix (CM), B = 40% urea = ammoniated EG + 60% CM, C = B + 3% hydrolyzed poultry feather (HPF), D = C + 15% cassava leaves, and E = D + 1.06% mixture lysine-Zn-sardine fish oil. Concentrate mix composed of rice bran (16.7%), dried cassava waste (33.4%), and coconut oil meal (45.6%), and supplements (4.3%). Each period composed of 2 weeks preliminary and followed by 2 weeks for data collection.

The parameters measured were: (1) milk production, (2) dry matter intake and nutrients digestibility, and (3) quality of milk.

Result and Discussion

Dry matter intake and digestibility of nutrients

Protein digestibility, digestible protein, and digestible N were increased by the use of ammoniated elephant grass (B dietary treatment). Ammoniation process in elephant grass could break the hydrogen bound in lignocellulose, and also nitrogen linkage as protein with lignin. Therefore, nitrogen become more available for rumen degradation and metabolism, and in turn could improve the nitrogen supply for pascarumen absorption. Ammoniation could also increase the NPN supply in rumen bacteria prefer to use NPN as nitrogen source for microbial protein synthesis.

Supplement of PHF (C dietary treatment) could increase the organic matter digestibility compared with A and B dietary treatment. However, this dietary treatment did not give significant effect on dry matter intake. Part of the increasing in organic matter digestibility may be caused by increasing supply of SAA in C dietary treatment. HPF contained high level of SAA (Devendra, 1979). SAA were needed in improving the growth of rumen microbial (Erwanto, 1995), an especially when high NPN diet was used. HPF was also contained more BCAA and Lysine compared with that of cassava leaves. Therefore, supplementation of HPF could meet the requirement of other limiting amino acid in ruminant. The increasing of SAA on HPF diet was also giving a positive effect on digestible protein.

Supplementation of cassava leaves in the diet (D treatment) could not improve the dry matter digestibility, compared with others treatment. However organic matter digestibility was increased compared with A and D dietary treatment. HPF in the diet improves the supply of amino acids (AA). Supplementation of cassava leaves (source of BCAA) in rumen could improve the crude fiber digestibility only.

Digestibility of dray matter and organic matter not significantly effected by the supplementation of Ly-Zn-L (E dietary treatment) compared with C and D dietary treatment. It means that pasca rumen bioprocesses not significantly improved.

However it has significant effect in organic matter digestibility compared with A and B dietary treatment.

Milk Production

Ammoniation treatment (B dietary treatment) not significantly increased the milk production. However, based on the average value milk production milk tend the increased compared with control (A dietary treatment). It was significant increased on milk dry matter by ammoniation. The increasing of milk dry matter of ammoniation diet may be caused by improving in digestibility of protein in theht diet. The balanced of amino acids in the diet could improve the protein digestibility and digestible N.

Supplementation of PHF in diet would improve the SAA supply, i.e. methionine, cystine, andcysteine, so that rumen and pascarumen optimalization could be achieved. SAA have positive effect on milk production. Supplementation of HPF (C dietary treatment) could increase the milk production ($P<0.05$) compared with A and B dietary treatment. The increasing in milk production of C was 22% compared with that of A dietary treatment. Milk protein production was also increased by supplementation of HPF. Protein from HPF may more available and absorbed by digestive tract and deposit to milk.

Based on the average value, milk production of the cassava leaves supplementation (D dietary treatment) was higher compared with that of A and B dietary treatment. However, milk production of D dietary treatment was significantly lower than that of C and E dietary treatment. The decreasing in milk production of D dietary treatment compared with C and E dietary treatment may be caused by the level of cassava leaves supplementation was too high. The level of cassava leaves in this diet was 15% of dry matter, so that it could reduce the energy supply in the diet compared with the A, B, C dietary treatments.

The highes level of milk production was achieved by E dietary treatment (Lys-Zn-L mix supplementation).the improvement of milk production in that diet could be was about 28% compared with that of A dietary treatment. Supplementation of lys-Zn-l miz could improve the metabolism in rumen and pascarumen, and will in turn support the milk production.

The E dietary treatment gave the highest of dry matter, solid non fat, and crude protein in milk. The mixture of Lysine, Zn, and sardine fish oil (source polyunsaturated fatty acids/PUFA) could prove a double effect in ruminant. Digestion: (a) fish oil could protect lysine from rumen degradation, so that by-pass to pascarumen; and (B) increasing the absorption of Zn and PUFA in pascarumen. Lysine is one of the most limiting amino acids on the diet ruminant (Richardson and Hosfield, 1978). The supplementation of lysine could increase the balance of amino acids, so that the absorption of amino acids could improve the milk production.

Table 1. Treatment effect on the feed intake, digestibility, milk production and quality on lactation dairy cows

Item	Treatment means				
	A	B	C	D	E
Dry matter intake, kg/head/day	11.72	11.82	11.31	12.10	11.62
Digestibility, %					
Dry Matter (DM)	74.49	74.98	74.15	74.98	74.22
Organic Matter (OM)	70.50[a]	71.60[a]	74.35[b]	73.23[b]	73.11[b]
Crude Protein	82.71[a]	87.50[b]	88.50[b]	88.97[b]	87.91[b]
Crude Fiber	68.33[a]	68.62.[a]	68.47[a]	75.08[b]	75.03[b]
Crude Protein Intake, kg/head/day	0.53	0.78	0.81	0.73	0.67
N Digestible, kg/head/day	0.054[a]	0.094[c]	0.101[c]	0.087[c]	0.082[c]
Protein Digestible, kg/head/day	0.33[a]	0.59[c]	0.63d	0.55d	0.51d
Milk Production 4% FCM, kg/head/day	11.05a	12.36a	13.47b	12.71b	14.18b
Protein Production, kg/head/day	0.30a	0.32a	0.37b	0.33a	0.38b
Fat Production, kg/head/day	0.35a	0.44a	0.56b	0.44a	0.60b
Milk Dry Matter, %	10.47a	11.67b	11.58b	11.06a	11.70b
Solid Non Fat (SNF), %	7.43a	7.61a	7.56a	7.66b	7.88b
Milk Fat Content, %	3.18a	3.60a	4.14b	3.49a	4.22b
Milk Protein Content, %	2.73	2.58	2.71	2.63	2.68
Specific gravity	1.025a	1.026b	1.026b	1.026b	1.027c

Mean in the same row with different superscript differ at least at P <0.05

Conclusion

The urea-ammoniated elephant grass could slightly improve the milk production and quality in the dairy cows. Hydrolyzed poultry feather could increase dry matter and organic matter digestibility and also milk production and quality. The use of cassava leaves could improve the crude fiber digestibility; however it has not significant effect on milk production.

The mixture of lysine-zn-sardine fish oil has significant effect on improving milk production, milk dry matter, and milk solid non fat. Based on those parameters, it could be recommended that E dietary treatment was the best diet.

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