Pengaruh komposisi pakan dan penambahan probiotik lactobacillus plantarum tsd-10 secara in vitro terhadap jumlah bakteri metanogen dan protozoa dalam rumen sapi

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Abstrak

Ruminants are herbivorous mammals that have special digestive tract, rumen, where digestion of cellulose and polysaccharides can be carried out by rumen microorganisms. Methanogenic bacteria in the rumen using H2 compounds results from anaerobic fermentation of carbohydrates to form methane. Methane production in the rumen is an energetically wasteful process, since the feed intake will be converted to methane and eructated as gas (Bunthoen, 2007). Rumen protozoa have a potential role in the process of digestion and breakdown of organic material. Hydrogen (H2) as one of the protozoa fermentation products are used by methanogenic bacteria to form methane. This causing methanogenic bacteria often found living attached to the surface of protozoa to keep a constant supply of hydrogen. The purpose of this study is to enumerate the number of methanogenic bacteria and protozoa with different diet and after the addition of probiotic Lactobacillus plantarum TSD-10 in vitro.
This report consist of two parts, which are (1) Effect of Feeding Composition on Total Methanogenic Bacteria and Protozoa Rumen, and (2) Influence of Probiotic Lactobacillus plantarum TSD-10 on Total Methanogenic Bacteria and Protozoa In Vitro. The research was conducted at the Laboratory of Industrial Microbiology, Research Centre of Biotechnology? Indonesian Institute of Sciences (LIPI), Cibinong Bogor, from September 2008 ? May 2009. The treatment are diet A with ratio of grass : concentrate (30 : 70) and diet B with ratio of grass : concentrate (70 : 30). The probiotic L. plantarum TSD-10 dose are 0%, 5%, 10% and 15% v/v. The number of methanogenic bacteria obtained from diet A ranges between (0,74 ? 0,89) x 107 cfu/ml, whereas in diet B ranged from (1,71 ? 2,58) x 107 cfu/ml. Methanogenic bacteria average on feed B ((2,19 ± 0,44) x 107 cfu/ml) higher than the feed A ((0,82 ± 0,07) x 107 cfu/ml).
Based on the Analysis of Variance (ANOVA), different composition of diet A and B, significantly affect the number of methanogenic bacteria (5%), with the best diet composition in suppressing the growth of methanogenic bacteria is diet A. The number of methanogenic bacteria in diet B are higher since the value of a more alkaline pH (8). According to Mirzaei-Aghsaghali et al. (2008), methanogenic bacteria are sensitive to changes in pH. Decrease in pH value will decrease the number of methanogenic bacteria and cause less methane gas produced. The low number of methanogenic bacteria on diet A, can also be caused by the ratio of acetate : propionate obtained lower than in diet B, and it also causes a lower pH of the diet A (Lana et al., 1998).
The ANOVA showed the methanogenic bacteria average between diet A and B in the morning and afternoon sampling significantly different between treatments (5%), with the best treatment in suppressing methanogenic bacteria from each sampling were diet A. Increased methanogenic bacteria after feeding may be associated with the presence of protozoa in the rumen cilliata that serves as a producer of hydrogen and bacterial attachment to methanogen. Composition diet B low in fiber and high in starch are preferred by the protozoan (Leedle and Greening, 1988). The number of protozoa obtained from the diet A ranges between (1,93 ? 3,95) x 105 cells/ml, whereas the diet B ranged from (2,81 ? 4,35) x 105 cells/ ml. Protozoa average

on diet B ((3,76 ± 0,83) x 105 cells/ml) higher than the diet A ((3,08 ± 1,04) x 105 cells/ml).
Based on the ANOVA, differences composition diet A and B, not significantly different between treatments (5%). Diet B with a higher pH value causes no influential ration of protozoa, which does not cause a decrease in the number of protozoa. The ANOVA indicate that the average range of protozoa between diet A and B are significantly different (5%) in the morning sampling, with the best treatment in suppressing the number of protozoa are diet A. The afternoon sampling, ANOVA showed that the treatment was not significantly different (5%). Protozoa observed in treatment diet A and B are families of, Ophryoscolecidae, Isotrichidae and Blepharocorythidae. Most number obtained from each diet is Ophryoscolecidae, while the less is Blepharocorythidae. This is due to Ophryoscolecidae a part of the Order Entodiniomorphida who compiled most of rumen cilliata. In the contrary, Family Isotrichidae and Blepharocorythidae are part of the order Trichostomatida which is rarely found in rumen (Ogimoto and Imai, 1981). Decreasing in the number of methanogenic bacteria in the diet B (56,8%) higher than diet A (29,8%), while the decrease in the number of protozoa in the diet B (64,9%) higher than diet A (62,7%). Diet B with a higher concentrate composition can provide a change in the pattern of rumen fermentation. These changes make the environment less suitable for methanogenic bacterial growth. One of the unfavorable change is a reduction of rumen pH values (Moss et al., 2000).
On the addition of probiotics in vitro, the ANOVA showed the range of the number of methanogenic bacteria was not significantly different (5%) on the variations of diet A and B but significantly different (5%) on the number of protozoa, with the best in suppressing the growth of protozoa are diet A. Variations doses of probiotic significantly different (5%) on the number of methanogenic bacteria and protozoa, with the best dose 5% v/v to suppress methanogenic bacteria and 15% v/v to suppress protozoa in vitro. Feed Digestibility Coefficient (FDC) shows the FDC from 27,99 ? 31,95%, while the diet B ranged from 25,85 to 31,3%. In diet A, the value FDC obtained tended to increase (8,5%) along with increasing concentration of probiotic L. plantarum TSD-10. Increasing FDC value expected to suppress the growth of methanogenic bacteria by altering the rumen fermentation pattern which results in volatile fatty acids produced. Diet A shows the value of higher acetate than propionate, because diet A high on fiber that will support the growth of the acetate-producing bacteria species, diet B rich in starch that supports the growth of propionic-producing bacteria species, and marked by increasing propionate than acetate (France and Dijkstra, 2005).