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the 50th Anniversary of the Faculty of Animal Science
University of Andalas, Padang West Sumatera
Grand Inna Muara Hotel, Padang 24-25 September 2013

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Abstract

The Objective of this study was utilisation of lactic acid bacteria as inoculant for improvement and utilisation of total mixture forages (TMF) as good and complete ration in establishing of green livestock production. Value Km Analysis of Lactobacillus Plantarum, L. Bulgaricus and L. Casei in define medium with glucose limitation was done. The lowest Km of those microbes with glucose utilisation as carbon sources then is used as inoculant for total mixture forages (TMF-SILAGE). Three kind of different molasses (0.2%, 0.6% and 1.0%) were added at TMF-SILAGE with L.Plantarum as inoculant at 14 and 21 days incubation. The result of study showed that Km of those microbes as follow: L.plantarum 0.2 g/100 ml, L.bulgaricus 3.6 g/100ml and L.casei 71.7 g/100ml. The lowest pH of TMF-SILAGE with L.Plantarum as inoculant was obtained at 0.6% molasses addition 4.8 (14 days incubation) and 4.51 (21 days incubation). While at 21 days incubation the highest lactate content of TMF-SILAGE L.Plantarum as inoculant was obtained at 0.6% molasses addition was 1031 mg/100 g and at 1.0% molasses addition was 1210 mg/100 g. The Acetate content TMF-SILAGE L.Plantarum as inoculant at 21 days incubation was obtained as follow 4.06 (0.2% molasses addition), 3.83 (0.6% molasses addition) and 3.73 (1.0% molasses addition). The conclusion of this study was the lowest pH and the highest lactate content of TMF-SILAGE with L.Plantarum as inoculant was obtained either 0.6% and 1.0% molasses addition.

Key word: lactic acid bacteria, Km and Total Mixture Forage-SILAGE

INTRODUCTION

Intensification of livestock production has been done by utilisation of high input, while it produces by products that caused problem of environment. High utilisation of feed additive such as anti-biotic or synthetic one in livestock production will give improper condition either will be accumulated in their body or be excreted trough faces and urine.

Silage is the end product of fermenting a high moisture crop (40-80% water) and storing the product is called ensiling. Ensiling fodder has been around a long time and now contributes over 50% of the nutrients for beef and dairy cattle production. The process requires consideration of a wide variety of factors including plant growth, harvest, storage and feeding practices. Feed conservation by ensilage should be conducted in all countries especially for ruminant production. Lactic acid bacteria (LAB) as inoculant have benefit in silage production. They produce lactic acid in decreasing their pH and some important organic acid like bacteriocin and other. Therefore silage production need a culture...
that potential for lactic acid production as well as other organic production to improve animal performance, especially for immunity condition.

Ruminant animal like sheep should be fed the highest quality ensiled forages and grains possible for maximum meat production since fermented feeds can exceed 50% of the total dry-matter ration.

By product of food production is abundant, to optimisation of their utilisation; those by product were fed in mixture composition. It is necessary for application of those as silage feed.

The objective of present study was utilisation of lactic acid bacteria as inoculant for improvement and utilisation of total mixture forage (TMF) as good and complete ration in establishing of green livestock production particularly for sheep production.

MATERIAL AND METHODS

Inoculation of LAB at Agar Medium

*Lactobacillus plantarum, Lactobacillus bulgaricus,* and *Lactobacillus casei* were inoculated at agar medium using MRS broth and agar (Doncheva et al., 2002; Fenster et al., 2003; Parente et al., 2010) and incubated at 30°C for L. *plantarum* (Ratnakomala et al., 2006; Parente et al., 2010), while incubated at 37°C for *L. bulgaricus* and *L. casei* (Doncheva et al., 2002; Fenster et al., 2003).

Inoculation of LAB at Liquid Medium

LABs at agar medium were inoculated at liquid MRS broth, at 37°C incubation for 12 hour.

Analysis of Km

First LABs were growth at liquid MRS broth, and then were inoculated at defined medium with glucose as carbon sources. This analysis used 6 kind of medium with different of glucose addition as follow 0,1; 0,2; 0,4; 0,6; 0,8; and 1%. Each medium has 3 replications. LAB were inoculated at those medium and monitored of optical density at 660 nm every hour.

Analysis of pH

Every medium of LAB was determined pH at beginning and the end of incubation Analysis of lactic acid, acetic acid, propionic acid and butyric acid.

Medium sample of LABs were centrifuged at 10,000 rpm and supernatant sample were determined of lactic acid using method of Baker and Summerson (Hawk et al., 1954).

Total Mixture Forage (TMF) Silage

TMF Silage was composing of mixture grasses and legume with 12% crude protein content. TMF then was inoculated with LAB for 14 and 21 days with different molasses addition as carbon sources. Molasses addition based on Km analysis. Since Km of *L. Plantarum* bacteria was the lowest compare to others, TMF silage was used *L. Plantarum*. After 14 and 21 days fermentation, that silage was determined for pH, lactic acid, acetic acid, propionic acid and butyric acid. Aerobisitas test of TMF silage was done at 3 and 6 days after harvesting of silage.

RESULT AND DISCUSSION

Based on the data of growth rate as response to different glucose content in medium as carbon sources, it can be determined the value of Km for *L. Plantarum, L. Bulgaricus* and *L. Casei*. The Km value of those bacteria as follow: *L. Plantarum* is 0,2 g/100 ml, *Bulgaricus* is 0,36 g/100ml and *L. Casei* is 6,96
g/100ml. While this study found that the highest production of lactate (mg/100 g) was produced at L. Plantarum 164,53, and follow by L. Casei 152,27 and L. Bulgaricus 133,33. However the lowest pH was founded at L. Casei, and follow by L. Plantarum and L. Bulgaricu, the value of pH as follow: 3.68, 3.96 and 4.10 respectfully. Therefore the most affinity between LAB and glucose utilization as energy sources was showed by L. Plantarum. According to Wahyudiat al (2012) said that L. Plantarum FG1 has been known well as homo-fermentative LAB species, rod-shaped, isolated from plant that has important role in silage preparation. While Cai et al. (1998, 1999a, 1999b) cited by Wahyudi (2012), showed that LAB homo-fermentatif inoculants could improve silage quality. The LAB was used as inoculant for next experiment of silage fermentation. The lowest km value of glucose means that microbe can utilise efficiently glucose as carbon sources compare with others.

The result of TMFS with L. Plantarum as inoculant of LAB at 14 days incubation showed that lowest pH value was 1% molasses addition treatment (pH 4.76 and 4.91). However, at 21 days incubation, TMFS with the same LAB showed that the best result of the pH were Acheived at 0.6% and 1.0% molasses addition, the pH value as follow 4.14 dan 4.88 (for 0.6% molasses addition) serta 4.76 and 4.91 (1.0% molasses addition), while lactate content of those TMFS with differen incubation was fluctuat.

CONCLUSION
Km value of L. Plantarum was the lowest compare to other LAB, it means that L. Plantarum utilize glucose as Carbon and energy sources most effectively compare other. The best value pH was founded at 1.0% molasses addition at 14 days incubation, but at 21 days incubation lowest pH was achieved at 0.6% and 1.0% molasses addition.

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REFERENCES


