



University of Zabol  
Graduate school  
Faculty of Agriculture  
Department of Animal Science

**The Thesis Submitted for the Degree of Master of Science  
(In the Field of Animal Nutrition Science)**

**Title:**

**Effect of lactobacillus bacterial additive and fibrolytic enzyme on *in situ* ruminal degradation and *in vitro* gas production of sorghum forage silage**

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## Abstract

In order to investigate the effect of lactobacillus bacterial additive and fibrolytic enzyme on the *in situ* ruminal degradations and *in vitro* gas production of sorghum forage silage, a factorial experiment based on completely randomized design with three replications was carried out at the animal nutrition laboratory, of Zabol university. Treatments were lactobacillus at 3 levels (0 and  $1.5 \times 10^8$  and  $3 \times 10^8$  g/kg dry matter) and fibrolytic enzyme at 3 levels (0 and 0.5 and 1 g / kg dry matter) in total with 9 treatments including treatment 1: Bacterial control with enzyme control (no additive), Treatment 2: (Bacterial control with 0.5 g enzyme), Treatment 3: (Bacterial control with 1 g enzyme), Treatment 4: ( $1.5 \times 10^8$  g bacteria with enzyme control), treatment 5: ( $1.5 \times 10^8$  g bacteria with 0.5 g enzyme), treatment 6: ( $1 \times 10^8$  g bacteria with 0.5 g enzyme), treatment 7: ( $3 \times 10^8$  g bacteria with enzyme control), treatment 8: ( $3 \times 10^8$  g bacteria with 0.5 g enzyme), treatment 9: ( $3 \times 10^8$  g bacteria with 1 g enzyme per kg dry matter) silage making and evaluated. The results showed that the highest percentage of dry matter (96.93%), sorghum silage organic matter (93.52%), crude protein percentage (9.68%), sorghum silage crude fat percentage (5.42%) and highest water-soluble carbohydrate content (9.36%) was related to the treatment 9. Also the highest percentage of ash (11.19%), percentage of insoluble fiber in acid detergent (37.41%), percentage of insoluble fiber in neutral detergent (48.88%), pH (4.79), and highest ammonia nitrogen content (14.93 mg / dl) was related to the control lactobacillus and fibrolytic enzyme treatments. The comparison of the interaction effects showed that the highest quality index (33.87) was related to the application of treatment 5. All silages were evaluated in a good and excellent range in appearance. Color index, odor, texture, and plant tissue of sorghum silage in the application of treatment 5 had the highest score (18.42) and evaluation of this treatment was very good. The highest percentage of gas production was observed in the treatment application of treatment 9 at 48, 72, and 96 hours. The highest rate of rapid degradable (a) and slow degradable (b) were related to the application of treatment 9. The combination of the two additives improved the potentially degradable fraction (a+b), which was highest with 81.90% in the treatment 9 that there were statistically significant differences between treatments. The combination of two additives had a significant degradable rate constant (c) and the highest rate of degradation was observed in the control lactobacillus and fibrolytic enzyme treatments. The highest volume of gas produced at 12, 24, 48, 72, and 96 hours were related to the treatment of treatment 9 and the highest volume of gas produced at 3 and 6 hours was related to the application of treatment 9 and at all incubation times the lowest amount of produced gas was observed in the control treatment. Based on these results, it can be concluded that the combination of lactobacillus and fibrolytic enzyme improves the nutritional value of sorghum silage.

**Keywords:** Enzyme, Lactobacillus, Sorghum forage, Nylon bag, Silage