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The effect of supplementation with monensin, garlic oil or turmeric powder on rumen pH and ammonia-N concentration responses of sheep

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Abstract

In order to manipulate rumen microbial ecosystem to reduce methane emission and ammonia nitrogen concentration, ruminant nutritionists have suggested optimizing diet formulation and using feed additives such as antibiotics. Recently, some studies have done to evaluate the potential of garlic oil and various essential oils as alternative to these antibiotics because of the risk of appearance of antibiotic residues in milk and meat and development of multi-drug bacteria. The aim of this study was to assess the effect of diets containing garlic oil (GA), turmeric powder (TU) or monensin (MO) on ruminal pH and ammonia nitrogen (NH_3-N) concentration in sheep. Four rumen cannulated Baloochi lambs were used in a 4×4 Latin square design with 4 periods (each period of 28 days). Sheep were fed a basal diet (control) or a basal diet supplemented with GA (420 mg/sheep/d), TU (20 g/sheep/d) or MO (200 mg/sheep/d). Basal diet consisted of 55% concentrate and 45% alfalfa hay and was fed once daily ad libitum. Rumen fluid samples (10 ml) were collected on day 25 before the morning feeding and every 15 minutes until 8 hours post-feeding. Samples of ruminal contents were strained through four layers of cheesecloth and pH was measured immediately using a pH meter. A volume of 10 ml of the filtrated ruminal fluid acidified with 10 ml of HCl 0.2 N, then analyzed to determined NH_3-N concentration. Data were statistically analyzed as repeated in time using SAS software. Sampling time had a significant effect on ruminal pH. Rumen pH was declined until 270 min post feeding and then increased. Maximum rumen pH was significantly ($P< 0.05$) lower in sheep fed TU (7.18) or MO (7.01) compared with those fed the control diet (7.48). Moreover, there was a significant increment in NH_3-N until 2 h post-feeding, while afterward did not alter significantly. Supplementation of the basal diet with GA, TU or MO had a significant effect on maximal rumen pH. In addition, NH_3-N was influenced by times applied. Present results indicate that both GA and TU have a potential to change rumen pH and NH_3-N responses.

Keywords: garlic oil, ruminal fermentation, turmeric powder

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Introduction

In order to manipulate ruminal microbial ecosystem to reduce methane emission and ammonia nitrogen concentration, ruminant nutritionists have suggested optimizing diet formulation and using feed additives (Calsamiglia et al., 2006). Supplementation diets with antibiotics growth promoters such as monensin and lasalocid diminish losses of energy and nitrogen. Recently, some studies have done to evaluate the potential of garlic oil as alternative to these antibiotics because of the risk of appearance of antibiotic residues in milk and meat and development of multi-drug bacteria (Busquet et al., 2005; Calsamiglia et al., 2007). However most of these researches have accomplished under in vitro condition and there is limited information about the effects of garlic oil on rumianl fermentation using in vivo experiments. The aim of this study was to assess the effects of diets containing garlic oil (GA), turmeric powder (TU) or monensin (MO) on ruminal pH and ammonia nitrogen concentration (NH_3-N) in sheep.

Materials and Methods

Four rumen cannulated Baloochi sheep were used in a 4×4 Latin square design with 4 periods (each period of 28 days). Sheep were fed a basal diet without supplementation (control), or a basal diet supplemented with GA (420 mg/sheep/d), TU (20 g/sheep/d) or MO (200 mg/sheep/d). Diets consisted of 55% concentrate and 45% dry alfalfa hay and were fed once daily ad libitum. Each period included 21 days of adaptation and 7 days of sample collection of rumianl fluid. Ruminal fluid samples (10 mL) were collected on day 25 before the feeding and every 15 minutes until 8 hours post feeding. Samples of ruminal contents were strained through four layers of cheesecloth and pH was measured using a pH meter (Metrohm 744, Switzerland). A volume of 10 ml of the filtrated ruminal fluid acidified with 10 mL of HCL 0.2 N and stored for later determination of NH_3-N concentration. Ruminal NH3-N was determined using distillation method (Kjeltec Auto 1030 Analyzer Tecator, tecator, Hoganas, Sweden).

Results and Discussion

Sampling time had a significant effect on ruminal pH in all of the treatments where, it was declined until 270 min post feeding and then increased (Figure 1). The lowest ruminal pH value was the same among the treatments However, the highest ruminal pH value was lower in sheep fed TU or MO compared with those fed the control diet. These results are consistent with the study of Chaves et al. (2008) where ruminal pH of sheep were not affected by the feeding rations supplemented with GA. Moreover, there was a significant increment in NH_3-N until 2 h post feeding while afterward did not alter significantly (Figure 2).

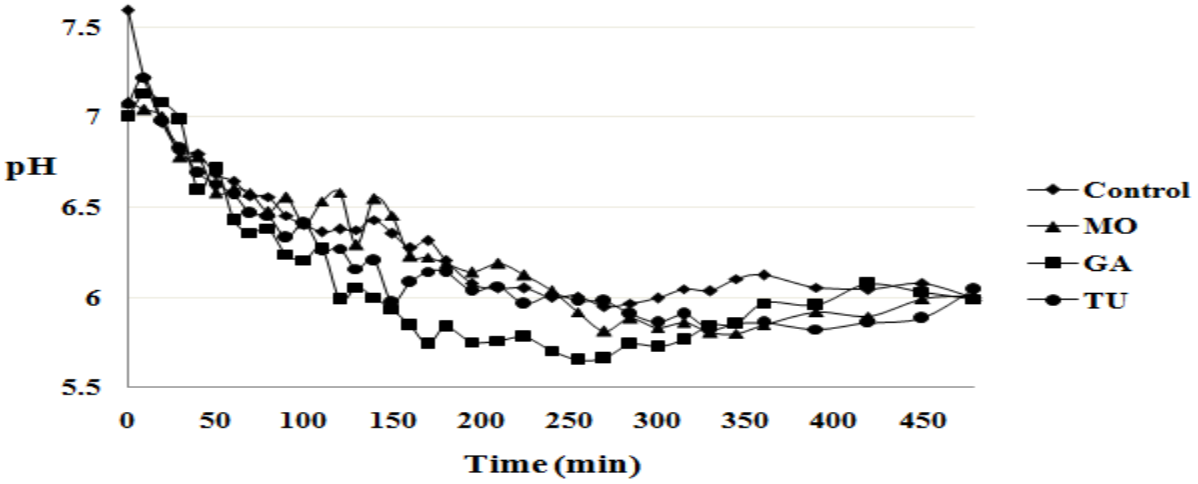

Figure 1. Trend of rumianl pH in sheep fed diets containing monensin (MO), garlic oil (GA) or turmeric powder (TU).

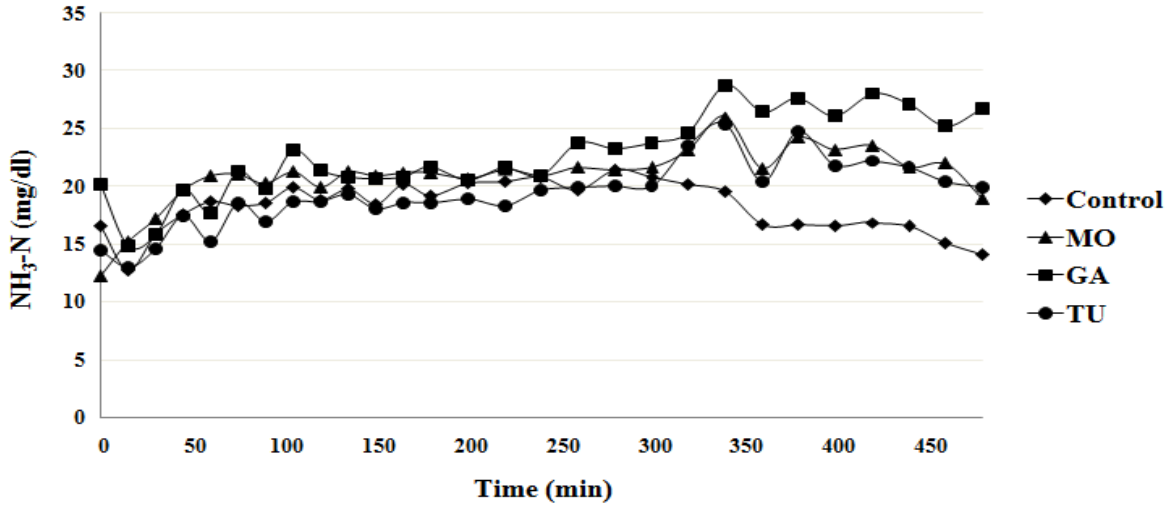

Figure 2. Trend of rumianl NH_3-N in sheep fed diets containing monensin (MO), garlic oil (GA) or turmeric powder (TU).

Conclusion

Supplementation of the basal diet with GA, TU or MO had significant effect on maximal rumen pH. In addition, NH_3-N was influenced by times applied. Present results indicate that both GA and TU have a potential to change some of the rumen responses. However, it is a need to evaluate the effects under in vivo experiment using higher concentration of these additives.

References

Busquet, M., S. Calsamiglia, A. Ferret, M. D. Carro, and C. Kamel. 2005. Effect of garlic oil and four of its compounds on rumen microbial fermentation. J. Dairy Sci. 88:4393–4404.

Calsamiglia, S., L. Castillejos, and M. Busquet. 2006. Alternatives to antimicrobial growth promoters in cattle. Pages 129–167 in Recent Advances in Animal Nutrition. P. C. Garnsworthy, and J. Wiseman, ed. Nottingham University Press, Nottingham, UK.

Calsamiglia, S., M. Busquet, P. W. Cardozo, L. Castillejos, and A. Ferret. 2007. Invited Review: Essential Oils as Modifiers of Rumen Microbial Fermentation. J. Dairy Sci. 90:2580–2595.

Chaves, A.V., K. Stanford, M. E. R. Dugan, L. L. Gibson, T.A. McAllister, F. Van Herk, and C. Benchaar. 2008b. Effects of cinnamaldehyde, garlic and juniper berry essential oils on rumen fermentation, blood metabolites, growth performance, and carcass characteristics of growing lambs. Livest. Sci. 117:215–224.