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Investigation effect of slow release urea (SRU), with or without molasses on rumen parameters, growth performance and carcass characteristics of fattening sheep

Research worker: Mohammad Reza Mashayekhi

Abstract

This study was conducted to investigate the effects of using two non-protein nitrogen sources (common urea and slow release urea) with and without molasses, on rumen fermentation, digestibility of nutrients, performance, feed intake, behavior, carcass characteristics and histomorphometric measures of rumen, abomasum, intestine and liver of growing lambs. First experiment was conducted to investigate the effects of source and level of non-protein nitrogen, as well as the level of molasses on gas production parameters. A completely randomized design with factorial (2×2×3) arrangement of 12 treatments with 5 replications was used. Factors were two types of non-protein nitrogen sources, common urea and slow-release urea (Nitroza) each in two levels (0.8 and 1.6% of ration DM common urea and 0.9 and 1.8% of ration DM slow-release urea), and molasses at three levels (0, 10 and 20%). With the increase in molasses, increased the amount of cumulative gas production up to 24 hours of incubation, metabolisable energy, organic matter truly digested, digestibility of organic matter and short chain fatty acids observed. Cumulative gas production was not affected by non-protein nitrogen source and level. Organic matter truly digested was increased using slow-release urea in the diet. In general, the results showed that the rate of ammonia release from conventional and slow release urea in the culture medium does not have a significant effect on in vitro fermentation, but adding 20% ration DM of molasses improved the gas production parameters. Second experiment was carried out using 4 fistulated Lori male sheep (27.7 ± 0.9 kg body weight) in a 4 × 4 latin-square design with a 2×2 factorial arrangement of treatments. The aim of this study was to investigate the effects of two urea sources (common urea vs. slow release urea) with or without molasses (0% and 20% ration DM) on nutrient digestibility, nitrogen balance, rumen fermentation and production of microbial protein. In addition, an In situ experiment was conducted to characterize N disappearance of common urea and two types of slow-release urea (Nitroza and Oprigen) from polyester bags. During the experiment, fistulated lambs were fed twice daily in equal proportions, fed with four balanced rations containing 70% concentrate and 30% forage. Nutrient Digestibility, nitrogen balance, total purine derivatives and estimated microbial protein synthesis were not significantly different between treatments, although digestibility of organic matter tended to increase using molasses

in the diet (P= 0.057). The addition of molasses to the diet reduced the concentration of propionate (P = 0.016) and increased butyrate concentration (P= 0.024) in rumen fluid. The pH and ammonia nitrogen of the rumen fluid, as well as blood plasma metabolites, were not affected by the treatments. The results of nylon bag test and ion release test showed that the release and formation of ammonia from Nitroza in the rumen, is slower than common urea and faster than Optigen. Overall, the results of this experiment showed that addition of molasses or using slow-release urea does not influence feed intake, digestibility and most of the ruminal fermentation parameters and blood metabolites. Third experimentwas conducted to investigate the effects of slow-release urea (Nitroza) in comparison with common urea, with or without the addition of molasses, on performance, carcass characteristics, ruminal fermentation, and blood parameters of growing lambs. Experiment was conducted in a completely randomized design with 5 treatments including control, two sources of non-protein nitrogen, common urea (1.6%) and slow release urea (1.8%) with or without molasses (0% and 20%) and 7 replicates with use of the 35 Arabian lambs, during 105 days. Replacement of common urea with slow release urea and addition of molasses to the diet did not affect daily gain, feed conversion ratio, final weight of fattening, carcass characteristics and weight of carcass portions, meat colorimetric parameters and digestibility of nutrients. In diets containing urea, the concentration of propionate and ruminal ammonia nitrogen was higher than control diet (P <0.05). Adding molasses to the diet increased the ruminal concentration of butyrate and total volatile fatty acids relative to the control diet. In control diet, rumen pH was lower than non-protein nitrogen sources. The combination of molasses with urea, reduced levels of blood urea nitrogen (P <0.05). In general, the results of the present study showed that although the replacement of common urea with slow release urea and the addition of molasses, in the high concentrate diets, influenced some rumen fermentation and blood metabolites, but these changes were not large enough to improvement fattening performance and digestibility of nutrients compared with control group. Fourth experiment was conducted to investigate the effects of slow-release urea (Nitroza) in comparison with common urea, with or without the addition of molasses, on histomorphometric parameters and cellular changes of rumen, small intestine and liver tissues of lambs. This experiment was conducted in a completely randomized design with 5 treatments including control, two sources of non-protein nitrogen (1.6% common urea and 1.8% slow release urea) with or without molasses (0% and 20%) and 4 replicates with using of 20 Arabian lambs. Compared to common urea, the use of slow-release urea with or without molasses in the diet, except for villus height and goblet cell numbers (P<0.05), were not significantly affected other traits of ruminal, duodenum and liver tissues. The addition of molasses (20% of dietary DM) reduced crypt of liberkuhn thickness, goblet cell numbers, and coating cell height of duodenum. Also, in cellular studies, with addition of molasses, damaging effects of epithelial cells and brunner glands, and increasing diffuse lymphatic tissue, were observed. In general, there was no significant difference between non-protein nitrogen sources on gastrointestinal tissue. Because of undesirable effects of using high level of molasses on the tissue structure of digestive tract, inclusion of 20% ration dry matter molasses in high concentrate diet is not recommended.

Keywords: Growing lambs, Common urea, Slow release urea, Molasses, Performance, Microbial protein synthesis, Carcass characteristics, Histomorphometric measures.