Global Veterinaria 8 (1): 89-92, 2012
ISSN 1992-6197

Effect of Sodium Bicarbonate and Magnesium Oxide on Performance and Carcass Characteristics of Lori-Bakhtiari Fattening Ram Lambs

[1]M. Hashemi, [2]F. Zamani, [2]M. Vatankhah and [3]S. Hossein Zadeh

[1]Department of Animal Science, Islamic Azad University, Shahrekord Branch, Shahrekord, Iran
[2]Department of Animal Science, Agriculture Faculty, Shahrekord Branch,
Islamic Azad University and Agriculture and Natural Resources Center, Shahrekord, Iran
[3]Department of Animal Science, Agriculture Faculty,
Shahrekord Branch, Islamic Azad University, Shahrekord, Iran

Abstract: The objective of this study was to evaluate the effects magnesium oxide and sodium bicarbonate in the diets of Lori-bakhtiari fattening lambs on performance and carcass characteristics. Diets were inclued: diet1(control diet), diet2 (control diet+ 0.05% magnesium oxide), diet3 (control diet+ 0.2% sodium bicarbonate). Eighteen lambs (39.91±0.98 kg initial body weight and 150 days of age) were randomly assigned to 3 treatment diets (6 lambs /treatment). Lambs were given an adaptation period of 10 days. The experiment was lasted for 75 day, at the end of the trial growth characteristics such as average daily gain (ADG), feed conversion ratio (FCR) and feed intake was analyzed and all lambs were slaughtered at the end of the trial. Experimental results showed statistically significant differences in feed conversion ratio, average daily gain and feed intake showed ($P<0.05$). The highest average daily gains (247±0.14g/d) and feed intake (146.13±1.57kg) was belonging to group receiving 0.05% magnesium oxide. Also observed FCR-lower lesser FCR (7.033±1.34) in group sodium bicarbonate. The experimental results showed statistically significant differences in carcass chemical composition (protein and fat percentage) ($p<0.05$).

Key words: Magnesium Oxide · Sodium Bicarbonate · Carcass Characteristic · Feed Intake · Fattening Ram Lambs

INTRODUCTION

Feeding high concentrate, low fiber, pelleted diets or finely chopped forage diets to ruminants decreases salivary production because less mastication is required. High concentrate diets that contain large quantities of soluble carbohydrate are rapidly fermented to volatile fatty acids in the rumen and due to a decrease in pH throughout the gastrointestinal tract [1]. High concentrate diet is known to depress rumen pH and lower fiber digestibility due to alteration of rumen microbial population [2]. Buffers are weak acids or alkalizes that pH changes can be prevented. The main action of the buffers increased pH or pH change is resistance [3, 4]. Buffers in ruminant rations are compounds that neutralize excess acid within the animal's digestive system [5]. Rumen is buffering may provide for a more constant rumen pH, which may decrease changes in dry matter intake that may either be a cause of acidosis [6].

Animals' response to dietary buffer supplementation has been variable, largely attributed to feeding regimes (particularly concentrate to forage ratio and level of intake) and types and levels of added mineral buffers [2]. Actual buffers prevented of increasing acidity but to keep are not the pH above certain limits. Sodium bicarbonate and magnesium oxide known as natural buffers [7]. Sodium bicarbonate or Bicarbonate of soda of compound a strong base (NaoH) and a weak acid (H_2CO_3) is obtained. There are several types of purity of the compound [8]. Sodium bicarbonate is a white crystalline compound that solution pH of 1 to 8.4% is. Various reports most of the sodium bicarbonate have been introduced as impressive substance in constant pH rumen and fat [7]. Magnesium carbonate or magnesium hydroxide on heating magnesium oxide obtained [9]. Magnesium oxide 54% magnesium in its composition and effective in the increase pH rumen and the fat percentage [9].

Corresponding Author: Mazaher Hashemi, Faculty of Animal Science, Islamic Azad University, Shahrekord Branch, Shahrekord, Iran.

Table 1: Ingredients (dry matter basis) and chemical composition of the experimental rations

Ingredients	%
Wheat	14
Barley	33.8
Corn	3
Soybean meal	3.1
Cotton seed meal	3.8
Wheat bran	33
Rice bran	4
Enzymatic	1.6
Mineral and vitamin per mix[1]	2
NACL	0.3
Ca	0.80
P	0.6
Chemical composition (%)	
Crude protein	14.16
Neutral detergent fiber	41.2
Acid detergent fiber	20.6
Ash	6.3
Metabolizable Energy[2] (Mcal/kg)	2.6

[1]Supplies per kg of feed: 4.9 mg of Zn, 4.05 mg of Mn,0.45 mg of Cu, 0.075 mg of I, 0.1 mg of Se, 2.500 IU Vitamin A,400 mg of Vitamin D, 2.5 IU
Vitamin E
[2]Calculated metabolized energy

MATERIAL AND METHODS

In this experiment, 18 Lori-Bakhtiari fattening lambs were randomly selected with weighting average of 39.91±0.98 kg and divided into three treatments with six repeats and fattened for 75 days. These lambs, before putting in individual boxes, were conserved without water and feed for 12 hours. The experimental diet was regulated basis of common diets in order to supply the requirements on the NRC 1998 standard tables. Rations were isocaloric (2.6 Mk/kg metabolizable energy) and isonitrogenous (14.16% CP). Rations were included: diet 1(control diet), diet 2(control diet + 0.05% Magnesium Oxide) and diet

3(control diet + 0.2% Sodium Bicarbonate). The animal were fed with diets include of 40% forage and 60% concentrate. The components of experimental diet have been showed in table 1. The adaptation period was conducted for 10 day post-transition of lambs to individual boxes and with initiation of period; the nutritious diets of experimental different groups after preparation were given to lambs as Asfed in tree periods AM, midday and PM. The leftover feed was weighted in each time post-collection. The lambs were weighted in order to determinate their average daily gain by considering of 12 hours fasting in each 20 days. After finishing the fattening period, in order to investigate the effect of different nutritious diets on the carcass characteristics, all lambs were slaughtered according to Islamic slaughtering method and their carcass were analyzed similar to Farid method [10]. After skinning the animals, alimentary system was detached and then were weighted the contents of rumen and alimentary system and the empty weight of body was calculated. Thereafter, skin, head and feet, alimentary system, liver, lung, heart, spleen, kidney, testis, abdominal fat and fresh carcass were separately weighted and all non-carcass components were transferred to fridge as plastic packages inside specific box following the specify of the animal number. Percentage of meat protein and fat meat measured in laboratory by micro Kejldahl kjeltec1030 model and Soxhlet soxtec1043 model. The collected data were analyzed by SAS statistical software [11] and their means difference was compared with level 0.05% Duncan multi-ranges test and also t-test.

RESULTS AND DISCUSSION

Average Initial Weight, End Weight and Average Daily Gain (ADG): The least square means (LSM) of traits such as initial weight, end weight and average daily gain, are shown in Table 2. The experimental results showed significant differences among treatments for initial weight does not show($p>0.05$). Highest and lowest average initial weight, respectively related to group receiving 0.2% sodium bicarbonate (40.3 ± 0.86 kg) and control group (39.31±0.74 kg). The experimental results revealed statistically significant differences in end weight and average daily gain treatments show ($p<0.05$). In the treatments group that received 0.05% magnesium oxide the highest end weight (58.35±0.83 kg) during the fattening period. The reason can be the high feed intake in group receiving magnesium oxide considered. Sen *et al*. [12] in evaluation effect of dietary sodium bicarbonate supplementation on carcass and meat quality of high concentrate fed lambs to result that pre-slaughter weight was higher in sodium bicarbonate supplemented groups than in the control group. Maximum daily weight gain (247 g/d) was related to received magnesium oxide that statistically significant difference with other treatments ($p<0.05$). Although there was no any significant different among daily gain of the control group and sodium bicarbonate ($p>0.05$).That with researches conducted by bodas [13] Is compatibility. Santra [2] in evaluation effect of dietary sodium bicarbonate supplementation on fermentation characteristics and ciliate protozoa

Table 2: The average comparison of growth traits affected by experiments

Treatments	N	The initial weight(kg)	The final weight(kg)	Average Daily Gain (g)
Control	6	39.31 ± 0.74[a]	52.46 ± 0.28[c]	199 ± 0.07[b]
Magnesium Oxide	6	40.03 ± 1.37[a]	58.35 ± 0.83[a]	247 ± 0.14[a]
Sodium Bicarbonate	6	40.38 ± 0.86[a]	55.41 ± 1.31[b]	206 ± 0.01[b]

In each column. The numbers without same letters have significant difference (p>0.05).

Table 3: The average comparison of weight warm carcass, cold carcass, feed intake and feed conversation ratio

Treatments	N	Warm carcass	Cold carcass	Feed intake	Feed conversation ratio
Control	6	26.06 ± 0.87[c]	25.03 ± 1.18[c]	141.06 ± 0.28[a]	9.43 ± 0.28[a]
Magnesium Oxide	6	30.38 ± 0.63[a]	29.36 ± 0.53[a]	146.13 ± 1.57[a]	7.83 ± 0.52[b]
Sodium Bicarbonate	6	28.71 ±1.34[b]	27.76 ± 1.29[b]	108.64 ±19.13[b]	7.03 ± 1.34[b]

In each column. The numbers without same letters have significant difference (p>0.05).

Table 4: Comparison means of square for percentage of Carcass chemical composition

Treatments	N	Moisture%	Protein%	Fat%
Control	6	51.55±1.03[a]	16.01±0.52[b]	30.51±1.28[a]
Magnesium Oxide	6	52.40±0.49[a]	17.30±0.64[a]	27.93±0.68[c]
Sodium Bicarbonate	6	52.26±0.54[a]	17.0±0.48[a]	29.10±0.58[b]

In each column. The numbers without same letters have significant difference (p>0.05).

population in rumen of lambs to showed that average daily gain were higher lambs supplemented with sodium bicarbonate that with present experiments do not match can cause high levels of sodium bicarbonate in the test Santa said.

Warm and Cold Carcass Weight, Feed Intake and Feed Conversion Ratio (FCR): Warm and cold carcass weight, Feed intake and feed conversion ratio are shown in table 3. Warm and cold carcass weight in magnesium oxide group was higher than other experimental treatments and the difference is statistically significant (p<0.05). Also after the magnesium oxide, the highest warm and cold carcass weight related to the group receiving 0.2% sodium bicarbonate. Kawasa *et al*. [14] in evaluated effects of sodium bicarbonate and yeast on performance and carcass characteristics of light-weight lambs feed finishing diets to result that cold and warm carcass weights were not different among treatments. Also, Bras *et al*. [15] showed that the effect buffers on carcass characteristics were not significant and The mean values were 50.4% for warm carcass weight. The amount of feed intake each of the treatments are shown in Table 3. Differnt treatments had a significant effect on feed intake (p<0.05). So that the highest mean feed intake (146.13±1.57kg) is related to the group receiving magnesium oxide, because the magnesium oxide with alkalized rumen environment of low rumen pH. In high pH digestible nutrients increase and subsequent feed intake increase. Linda *et al*. [1] in their experiment found that feeding 0.18% magnesium oxide dry matter intake increases. Also, the difference between mean feed intake control group and 0.05% magnesium oxide not signi ficant(p>0.05).The lowest mean feed intake is related to the group receiving 0.2% sodium bicarbonate, the reason it can be low percentage of sodium bicarbonate in diet. These results were similar to that reported by bodas *et al*. [13]. According to nicholson and cunningham [16] and Wais [17] reportes 2 to 6% sodium bicarbonate in beef cattle feed intake and weight gain improves but lassiter [19] and person [18] in their experiments to conclude that an increase sodium bicarbonate over3% diets in beef cattle diets to improve performance. The evaluation effect experimental treatments on feed conversion ratio statistically significant differences was observed (p<0.05). Lowest and favorable feed conversion ratio (7.33±1.34) belonged to the group receiving sodium bicarbonate. The experimental result statistically significant differences in FCR between sodium bicarbonate group and group receiving magnesium oxide no showed (p>0.05).

Carcass Chemical Composition: Moisture meat, protein meat and fat meat percentage are shown in table 4. The percentage of protein and fat of meat had significant effects in groups (p<0.05). Higher and

lower percentages of moisture and protein meat are related to 0.05% magnesium oxide and control groups, respectively. Furthermore percentage of moisture meat were not significant effects in groups ($p>0.05$). Lower and higher fat meat percentage related to 0.05% magnesium oxide consumer group and control group, respectively.

CONCLUSION

The addition of magnesium oxide to the concentrate at a level of 0.05% improves average daily gain, feed intake, the final weight of Lori-Bakhtiari fattening lambs. Also the use of sodium bicarbonate at a level 0.2% improves of FCR.

REFERENCES

1. Linda, G., E. James and W. James, 1985. Effect of Supplementing Equivalent Cation Amounts from NaCl, MgO, $NaHCO_3$ and $CaCO_3$ on Nutrient Utilization and Acid-Base Status of Growing Dorset Lambs Fed High Concentrate Diets. J Anim. Sci., 60: 307-315.
2. Santra, A., O.H. Chaturvedi, M.K. Tripathi, R. Kumer and S.A. Karim, 2003. Effect of dietary Sodium bicarbonate supplementation on fermentation characteristics and ciliate protozoa population in rumen of lamb. Small Ruminant Research, 47: 203-212.
3. Mutsvang, W.A., 1992. The effect of dietary inclusion of yeast Culture (yea-Sac) on patterns of rumen fermentation, food intake and growth of intensively fed bulls, Anim. Prod., 55: 35-40.
4. Rogers, J.A., C.L. Davis and J.H. Clark, 1982. Alteration of rumen fermentation, milk fat Synthesis and nutrients utilization, with mineral salts. J. Dairy Sci., 65: 573-586.
5. Moharrery, A., 2007. The Determination of Buffering Capacity of some ruminants, feed stuffs and their Cumulating Effects on TMR Ration. American Journal of Animal and Veterinary Sciences, 2: 72-78.
6. Crawford, G.I., C.D. Keeler, J.J. Wagner, C.R. Ereckson, G.E. Crumbiest and M.B. Nunner, 2003. Effects of calcium magnesium carbonate and roughage level on feedlot performance, ruminal metabolism and site and extent of digestion in steers fed high-grain diets. J. Anim. Sci., 86: 2998-3013.
7. Erdman, R.A., 1988. Dietary buffering requirements of lactating dairy cow: A review. J. Dairy Sci., 71: 32-46.
8. Sedighi, G. and A. Amin pour, 1988. Nutrition therapy. Cardio Vascular diseas. Chapter 9. The fourth turn. Teran, Join Stock Company, pp: 228-253.
9. Omidiyan, H., A. Poorjavadi, M.J. Zohoriyan, M. Madani esfahani and M. Nad Ali, 2007. Chemical industries, chemical process industries shryv. Center for Academic Publication. Tehran, 370: 14-15.
10. Farid, A., 1991. Slaughter and carcass characteristics of three fat-tailed sheep breed and their crosses with Corriedal and Targhee rams. Small Rumin. Res., 5: 255-71.
11. SAS., 2002. SAS user's Guide. Rev. G. 04 Institute, cary, NC.
12. Sen., A.R., A. Santra and S.A. Karim, 2006. Effect of dietary sodium bicarbonate supplementation on carcass and meat quality of high concentrate fed lambs. Small Ruminant Research, 65: 122-127.
13. Bodas, R., P. Frutos, F.J. Giraldez, G. Hervas and S. Lopez, 2009. Effect of sodium bicarbonate supplementation on feed intake, digestibility, digesta kinetics and nitrogen balance and ruminal fermentation in young fattening lambs. Spanish journal of Agricultural research, 7: 330-341.
14. kawasa, J.R., R. Garcia-castillob, F. Garza-Carza-Cazaresa and H. Fimbres, 2007. Effects of sodium bicarbonate and yeast on productive performance and carcass characteristics of light-weight lambs fed finishing diets, 2: 149-156.
15. Bras, R., Zootec, 2010. Performance and carcass characteristics of feedlot lambs fed high grain diets with buffer compounds.Version, 39: 1516-3598.
16. Nicholson, J.W.G. and H.M. Cuningham, 1961. The addition of buffers to ruminant rations. I. Effect on weight gains, efficiency of gains and consumption of rations with and without roughage. Can. J. Anim. Sci., 41: 134.
17. Waise, M.B., T.N. Blumer, H.B. Craig and E.R. Barrick. 1965. Influence of rumen buffering agents and hay on performance and carcass characteristics of steers fed all-cocenterate rations. J. Anim. Sci., 24: 83.
18. Preston, T.R., F.G. Whitelaw, N.A. MacLeod and E.B. Charleson, 1962. The effect of sodium bicarbonate in all-concentrate diets for early-weaned calves. Anim. Prod., 4: 299. (Abst).
19. Lassiter, J.W. and V. Alligood, 1967. Consumption of sodium bicarbonate in water by steers fed varid all concentrate diets. J. Anim. Sci., 26: 1459.