Effect of Different Levels of Fast and Slow Hydrolyzed Urea on Some Blood Traits of Al-awassi Sheep

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Abstract. This experiment was applied in animal production fields (Sheikh Saad district) which located in Wasit governorate, Wasit, Iraq for sheep rearing. The experiment was started 20/1/2022- 20/4/2022, proceeded for 14 days introductory period. The aim of study was to add four different levels of fast and slow decomposition of urea in blood samples of Awassi sheep. Sixteen males of Awassi sheep aged (3-4) months have been used, with an average initial weight of (16.5-18) ± 500 g. There was a significant difference ($P \leq 0.05$) in the pH value of the rumen fluid in relation to the 0/h before the morning feeding for the third treatment, which was added to its diets: fast and slow decomposition urea (0.5%-1.5%) mg/kg dry matter was 6.60 compared with the first, second treatment and the fourth one, as it reached 6.94, 6.82 and 6.86, respectively. The results also showed that the addition of different percentages of fast and slow decomposition urea to a significant increase ($P < 0.05$) in the concentration of volatile fatty acids in the rumen at 0/h, where the fourth treatment excelled which reaching 79.12 mmol compared to the first, second and third treatment, which were 65.01 and 68.24 and 73.64 mmol, respectively. There was a significant decrease ($P<0.05$) in the concentration of ammonia nitrogen in the rumen at 0 hour, as the fourth and third treatment recorded 7.89 and 8.82, respectively, while with the first and second treatment recorded 12.51 and 11.46, respectively. In addition, there are no significant differences in the concentration of urea in the blood between the experimental treatments added to it of fast hydrolyzed urea and slow hydrolyzed urea at different levels. Finally, there were significant differences ($P \leq 0.05$) in the concentration of triglycerides in the blood for the sixth week, where the first treatment, which added 2% urea, exceeded the rate of decomposition to its diet. It reached 69.16 mg/100 ml compared with the second, third and fourth treatment. They were ranged 68.24, 67.92, and 67.99 mg, respectively.

Keywords. pH, Urea, Hydrolyzed, Awassi lambs, Diet, Blood.

1. Introduction

Ruminants have been a major role in human food production by converting fiber-rich plant resources into high quality food that humans can use (Dijkstra, 2011). Nutrition is one of the most important environmental factors that affect animal production and that affects food metabolism and growth. It is as a result of the increasing public concerns about chemical compounds that are used as food additives to feed, and in this context, safer alternatives to nutrition have been reached, including the use of urea compounds and others (Khalifa wt al., 2014). Traditional fodder, such as grain, has been become a heavy burden on animal husbandry, whether because it is a strong competitor to human food or because it is difficult to cultivate at the present time. Since the war now is not a war of weapons, but a war of water, and the scarcity of water on earth, whether it is natural from the sky, or artificial through

DOI: 10.33794/qjas.2022.135820.1082

the construction of dams by man. Animal nutrition experts, especially in Iraq, are put on a difficult task, especially since Iraq suffers from a shortage of green fodder before the water problem appears (DIFAR, 2018). One of the main goals of nutritionists when balancing diets is to provide the microorganisms in the rumen, which in turn leads to providing the animal's need for microbial protein today. New concepts are coming up by nutritionists by providing nutrients and requirements for rumen microorganisms when following a ruminant diet (Stern et al., 2006). Nitrogen is the basis that must be provided to microorganisms, as it was used through non-protein nitrogen sources (NPN) to provide ammonia to meet the requirements of microorganisms in the rumen (Mejia-Uribe et al., 2013. Urea is one of the most important additives used to improve the level of utilization of feed. It has spread widely in the past three decades, which enables it to be a good protein alternative compared to other expensive protein sources (Hamad et al. 2010, Saeed 2008). It is also one of the most important non-protein nitrogen feeds for ruminants, and optimum use of urea in feed can somewhat reduce the cost of dietary protein (Di Jin, 2018). Sixteen males of Awassi lambs aged (3-4) months have been used, with an average initial weight of (16.5-18) ± 500 g. to investigate the effect of different levels of fast and slow hydrolyzed urea on some blood traits of Al-awassi sheep.

2. Materials and Methods

The experiment has been applied in one of the sheep breeding and fattening in (Sheikh Saad district) which located in Wasit governorate to investigate the effect of using different levels of slow and fast decomposing urea in the rumen on the productive performance and growth of Awassi lambs. In this experiment, 16 lambs of Al-Awassi males were used, in which they were fed experimental rations for 84 days, preceded by 14 days preparatory period. It has started on 1/6/2022- 4/11/2022. The concentrated feed was provided on the basis of dry matter at a rate of (4%) of body weight with the availability of wheat straw as a source of rough forage.

Table 1. The experiment treatments.

Treatment No.	Fast urea	Slow urea
T1	2%	0%
T2	1.5%	0.5%
T3	0.5%	1.5%
T4	0%	2%

2.1. Preparing Materials and Experimental Items

The raw materials that included barley, wheat bran, soybean meal, yellow corn, salt and urea were purchased from the local markets, and the slow decomposition urea was purchased from the Islamic Republic of Iran at a price of 25 dollars, weighing 50 kg.

The materials that need to be crushed and crushed were taken in one of the laboratories of (Sheikh Saad district), Wasit, Iraq. Then, the quantities were weighed according to the proportions in the ration Table (2), and then mixed in the silo located in the lab, according to the proportions of the raw materials and keeping the rations in sealed plastic drums for each ration for the purpose of analysis The chemist took samples of the raw materials table (3) and the slow decomposition urea table (4) (A.O.A.C, 2005).

Table 2. Percentages of raw materials for experimental diets (%).

Contents	T1	T2	T3	T4
barley	45	45	45	45
wheat bran	25	25	25	25
corn	15.8	15.8	15.8	15.8
bread yeast	%2	%2	%2	%2
molasses	6	6	6	6
soybean meal	5	5	5	5
fast hydrolyzed urea	2	1.5	0.5	-
slow hydrolyzed urea	-	0.5	1.5	2
salt + limestone	1	1	1	1
Total	%100	%100	%100	%100

3. Results and Discussion

3.1. pH Measurement

Table (3) shows the addition of different percentages of fast and slow decomposing urea to replace the soybean meal in measuring the pH of the rumen fluid at different times. The results indicates that there is a significant difference (P < 0.05) in the pH value of the rumen fluid in relation to the 0/h before the morning feeding of the third treatment, which was added to its diets, fast and slow decomposition urea (0.5%-1.5%) mg/kg dry matter was 6.60, while the first, second and fourth treatments, which were 6.94, 6.82, and 6.86, respectively. As for the hour 3 after the morning feeding, the pH value of the sheep of the fourth treatment decreased significantly, reaching 6.31 compared with the first treatment, which amounted 526. While the third treatment did not significantly differ with the second treatment, which amounted 6.38 and 6.32. The pH value was significantly decreased (P < 0.05) at 6 hour after feeding in sheep of the fourth treatment to which slow-release urea was added by 2% kg of dry matter, as the decrease reached 6.23, while the first, second and third treatment amounted (6.44, 6.28, 6.28). The pH is one of the most important factors that affect the growth and reproduction of microorganisms, especially the strains of fibre-degrading organisms. Consuming rough feeds leads to its increase (Jadhav et al. 2018) despite the high pH value. In most of the transactions, however, the values obtained in the experiment are considered normal. The average of pH of the rumen environment was between (5.5-7.0) for maximum growth of fiber-digesting bacteria in the rumen (Frizzo et al., 2010; Gao and Oba, 2016), which enhances digestion and pushes for increased consumption. There are several factors that affect the rise and reduce of the pH. The reason for the decrease in the pH of the rumen contents and making it within the normal range could be due to the physical and chemical properties of the molasses added to the concentrated diet (Benavides et al 1971), It was mentioned that the pH decreases as a result of adding molasses to diets containing urea. In the experiment conducted by (Araba et al. 2002; Baurhoo et al. 2014), adding molasses in different proportions to the concentrated ration of cows had no effect on the pH.

3.2. Volatile of Fatty Acids in the Rumen

Volatile fatty acids are the main source of energy in ruminants and are the final product of the microbial fermentation process in the rumen (Jayanegar et al., 2006). Table (3) shows the concentration of volatile of fatty acids in the rumen fluid of Awassi sheep for the studied treatments during different times when adding different levels of fast and slow urea to the concentrated feed provided to the animal. The results showed that there were significant differences (P < 0.05) when adding different percentages of fast and slow decomposition urea lead to a significant increase (P < 0.05) in the concentration of volatile of fatty acids in the rumen at 0/h, where the fourth treatment significantly increased, which reaching 79.12, while the first, second and the third were 65.01, 68.24 and 73.64, respectively. The results note that the concentrations of volatile of fatty acids in the 0/h begin to rise upward, that is, the percentage of volatile fatty acids increased. This is evidence of the decomposition of substances in the rumen fluid and the effectiveness of microorganisms. The rise in the proportion of fatty acids after 3 hours of eating food as evidence of the synchronization between the decomposing urea and the liberation of Volatile fatty acids and increase the effectiveness of microorganisms. The fourth treatment that added to its concentrated diet 2% slow decomposition urea achieved the highest concentration of volatile fatty acids in the animal's rumen, which reaching 84.84, compared with the first, the second treatment, which reached 70.73 and 73.69, respectively. However, after 6 hours of morning feeding, the results reorded a decrease in the percentage of volatile fatty acids in the rumen for all treatments, which may indicate the liberation of an excess of nitrogen and that these acids have been utilized to form microbial protein. Volatile of fatty acids are the final product of microbial fermentation of the rumen It represents the power supply for ruminants (Van Soest, 1994). As a result of the increase in rumen fermentation, which leads to an increase in the concentration of volatile fatty acids (Boucher et al. 2007).

3.3. The Concentration of Ammonia Nitrogen in the Rumen

The results indicate the effect of adding different levels of fast and slow decomposing urea on rumen ammonia nitrogen, as the results showed a significant decrease (P < 0.05) in the concentration of

DOI: 10.33794/qjas.2022.135820.1082

ammonia nitrogen in the rumen at 0 h (Table 3). The fourth and third treatments have been recorded 7.89 and 8.82 mg / 100 ml, respectively, compared with the first and second treatment, which recorded 12.51 and 11.46 mg / 100 ml, respectively. The results also showed at 3/h after the morning feeding that there was a significant interaction (P < 0.05) between the fourth and third treatments, which amounted to 10.52 and 11.45mg/ 100 ml, respectively. The highest concentration of ammonia in the animal's rumen was achieved in the first treatment 15.14 mg / 100 ml. For the 6 h after feeding, the results have been showed a significant decrease (P < 0.05) in the concentration of ammonia nitrogen for the fourth treatment, as it reached 9.29 mg/100 ml while the first, the second, and third treatment have been reached 13.91, 12.86 and 10.22, respectively. Devendra (2007) indicates that ammonia nitrogen in the rumen is the main source of nitrogen for the purpose of microbial protein synthesis. The recent studies have been confirmed that the peak of ammonia nitrogen is one hour after feeding when non-protein nitrogen sources are provided with the feed, while for true protein sources this occurs peak is about 3-5 hours after feeding (Calomeni et al., 2015; Geron et al., 2016). In addition, the interaction between urea level and samples withdrawal time did not affect the concentration of volatile fatty acids, ammonia nitrogen concentration and pH (Boucher et al. 2007). Many researchers have been mentioned a correlation between the concentration of volatile fatty acids in the rumen and the concentration of ammonia nitrogen (Griswold et al., 2003; Reynal and Broderick, 2005).

Table 3. Effect of adding different percentages of fast and slow decomposition urea on rumen fluid characteristics for different treatments (means ± SD).

Studied traits		**Treatments**					
		T1 2% fast urea	**T2 1.5% fast+0.5% slow urea**	**T3 0.5% fast+1.5% slow urea**	**T4 2% slow urea**	**P-value**	**Sig.**
pH	0 hour	6.945± 0.017A	6.820± 0.013 B	6.600± 0.008 C	6.862± 0.010 B	0.0001	**
	3 hour	6.525± 0.221 A	6.382± 0.008 B	6.322± 0.010 B	6.317± 0.027 B	0.0001	**
	6 hour	6.445± 0.017 A	6.280± 0.018 B	6.280± 0.008 B	6.230± 0.012 B	0.0001	**
fatty acids volatiles	0 hour	65.017± 0.245 C	68.242± 0.274 C	73.647± 2.112B	79.120± 0.634 A	0.0001	**
	3 hour	70.737± 0.245 C	73.962± 0.274 C	79.367± 2.112 B	84.840± 0.634 A	0.0001	**
	6 hour	67.557± 0.245 C	70.782± 0.274 C	76.187± 2.112 B	81.660± 0.634 A	0.0001	**
ammonia nitrogen	0 hour	12.512± 0.454 A	11.467± 0.678 A	8.827± 0.546 B	7.897± 0.289 B	0.0001	**
	3 hour	15.142± 0.454 A	14.097± 0.678 A	11.457± 0.546 B	10.527± 0.289 B	0.0001	**
	6 hour	13.912± 0.454 A	12.867± 0.678 A	10.227± 0.546 B	9.297± 0.289 B	0.0001	**

*The results were analyzed at (P < 0.05).
** indicate high significant differences at 0.05

Conclusion

The study was concluded that the addition of different percentages of fast and slow decomposition urea to a significant increase (P < 0.05) in the concentration of volatile fatty acids in the rumen at 0/h, where the fourth treatment excelled which reaching 79.12 mmol compared to the first, second and third treatment, which were 65.01 and 68.24 and 73.64 mmol, respectively. There was a significant decrease (P<0.05) in the concentration of ammonia nitrogen in the rumen at 0 hour, as the fourth and third treatment recorded 7.89 and 8.82, respectively, while with the first and second treatment recorded 12.51 and 11.46, respectively.

References

[1] Araba, A., F. M. Byers, and F. Guessous. 2002. Patterns of rumen fermentation in bulls fed barley/molasses diets. Animal Feed and Science and Technology, 97: 53–64. https://doi.org/10.1016/s0377-8401(01)00357-1

DOI: 10.33794/qjas.2022.135820.1082

[2] Benavides, M. C, and J. Rodriguez. 1971. Salivary secretion and its contribution to ruminal fluid flow in animals fed on liquid molasses/based diets. Rev. Revista Cubana de Ciencia Agricola, 5: 31-40.

[3] Baurhoo, B, and A. Mustafa. 2014. Effects of molasses supplementation on performance of lactating cows fed high-alfalfa silage diets. Journal of Dairy Science, 97: 1072-1076. https://doi.org/10.3168/jds.2013-6989

[4] Boucher, S. E., R. S. Ordway, N. L. Whitehouse, F. P. Lundy, P. J. Kononoff, and C. G. Schwab. 2007. Effect of incremental urea supplementation of a conventional corn silage-based diet on ruminal ammonia concentration and synthesis of microbial protein. J. Dairy Sci. 90:5619–5633. https://doi.org/10.3168/jds.2007-0012

[5] Calomeni, G.D., Gardinal, R., Venturelli, B.C., deFreitas Júnior, J.E., Vendramini, T.H.A., Takiya, C.S., Souza, H.Nde, Rennó, F.P., (2015). Effects of polymer-coated slow-release urea on performance, ruminal fermentation, and blood metabolites in dairy cows. R. Bras. Zootec. 44, 327–334. https://doi.org/10.1590/s1806-92902015000900004

[6] Devendra, C.(2007). Perspectives on animal production systems in Asia. Livest. Sci. 10:7-20.

[7] Khalifa, E. I., Hassanien, H. A., Mohamed, A. H., and Hussein, A. M. (2014). Effects of using Yucca schidigera powder as feed additive on productive and reproductive efficiency of Zaraibi dairy goats. Egyptian Journal of Sheep and Goat Sciences, 65(1798), 1-27.https://doi.org/10.12816/0016610

[8] Dijkstra, J. (2011). Effects of nutritional strategies on simulated nitrogen excretion and m ethane emission in dairy cattle.

[9] Mejia-Uribe, L. A., J. L. Borquez., A. Z. M. Salem., I. A. Dominguez-Vara and M. Gonzalez-Ronquille (2013). Short communicaton. Effects of adding different protein and carbohydrates sources on chemical compo- sition and in vitro gas production of corn stover silage. Spanish J. Agric. Res. 11 (2), 427-430. https://doi.org/10.5424/sjar/2013112-3547

[10] Difar, H.S. (2018). Effect of using lignocellulytic microorganisms isolated from ruminants animals to improve the nutritive value of low quality roughages. PhD. Baghdad University. Iraq.

[11] Stern, M.D., A. Bachand S. Calsamiglia. (2006).February. New concepts in protein nutrition of ruminants. In 21st Annual Southwest.

[12] Saeed, A. A. and F. A. Latif. (2008a).Effect of ensiling and level of supplementation with concentrate on the voluntary intake and digestibility of wheat straw by Arabi lambs. AL-Qadisiya J. Vet. Med. Sci. 7 (1):42-50.

[13] Hamed, M. R., S. N. Abed – Elazeem., A. M. Aiad., S. A. Mohamed and N. A. Soliman. (2010). Replacement value of urea treated corn with cobs for concentrated feed mixture in pregnant ewes rations. J. American Sci. 6 (6):166-178.

[14] Di Jin, Shengguo Zhao, Nan Zheng, Yves Beckers, Jiaqi Wang.2018.

[15] Jayanegara, A., Tjakradidjaja,A.S., and Sutardi, T. (2006). Fermentability and in vitro digestion of agro-industrial waste rations supplemented with inorganic and organic chromium. Med. Pet. 29:54-62.

[16] Jadhav, R. V., Kannan, A., Bhar, R., Sharma, O. P., Gulati, A., Rajkumar, K., and Verma, M. R. (2018). Effect of tea (Camellia sinensis) seed saponins on in vitro rumen fermentation, methane production and true digestibility at different forage to concentrate ratios. Journal of Applied Animal Research, 46(1), 118-124.https://doi.org/10.1080/09712119.2016.1270823

[17] Frizzo, L. S., Sotto, L. P., Zbrun, M. V., Bertozzi, E., Sequeira, G., Armesto ,R. R. and Rosmini,M. R. (2010). Lactic acid bacteria to improve growth performance in young calves fed milk replacer and spray-dried whey powder. Anim. Feed Sci. Technol. 157:159-167. https://doi.org/10.1016/j.anifeedsci.2010.03.005

[18] Gao, X. and Oba, M. (2016). Effect of increasing dietary nonfiber carbohydrate with starch, sucrose, or lactose on rumen fermentation and productivity of lactating dairy cows. J. Dairy Sci. 99:1–10. https://doi.org/10.3168/jds.2015-9871

[19] Geron, L.J.V., de Aguiar, S.C., Carvalho, H.T.J., Juo, D.G., Silva, P.A., Neto, S.L.E., Coelho, M.C.K., Garcia, J., Diniz, C.L., Paula, H.J.E., (2016). Efect of slow release urea in sheep feed on intake, nutrient digestibility, and ruminal parameters. Semina: Ci. Agr. 37, 2793–2806. https://doi.org/10.5433/1679-0359.2016v37n4supl1p2793

[20] Griswold, K.E., G.A. Apgar., J. Bouton and J. L. Firkins. (2003). Effects of urea infusion and ruminal degradable protein concentration on microbial growth, digestibility, and fermentation in continuous culture. J. Anim. Sci. 81:329–336.https://doi.org/10.2527/2003.811329x

[21] Van Soest, P. J. (1994). Nutritional ecology of the ruminant: Ithaca, NY: Cornell University Press.

[22] Reynal, S. M. and G. A. Broderick (2005). Effect of dietary level of rumen- degraded protein on production and nitrogen metabolism in lactating dairy cows. J. Dairy Sci. 88: 4045–4064. https://doi.org/10.3168/jds.s0022-0302(05)73090-3