Advances in Bioresearch
Adv. Biores., Vol 13 (6) November 2022: 178-186
©2022 Society of Education, India
Print ISSN 0976-4585; Online ISSN 2277-1573
Journal's URL:http://www.soeagra.com/abr.html
CODEN: ABRDC3
DOI: 10.15515/abr.0976-4585.13.6.178186

Advances in Bioresearch

ORIGINAL ARTICLE

A study of digestion coefficient of different food compounds and rumen fermentation in Awassi lambs fattened on concentrated rations with Alfalfa hay stalks treated with urea or the addition of molasses

Marwa SaadAbd Aoun Al-Abbassi[1] , Jamil Sarhan Lazim[2], MakkiKhalaf Hussein Aldulaimi[3]
[1] Scientific Researcher/Master Student Al-Mussaib Technical College/ Al-Furat Al-Awsat Technical University.
[2,3]Techniques of Animal Production Department / Al-Mussaib Technical College/ Al-Furat Al-Awsat Technical University.
Email: marwa.saad.tcm.68@student.atu.edu.iq; dr.sarhan@atu.edu.iq; dr.makkikhalaf@atu.edu.iq

ABSTRACT
The digestion trial started in the fifth week and fermentations trial in the tenth week (day 70)of the growth experiment, samples of rumen fluid were withdrawn from 12 Awassi lambs(3 animal\ treatment), treatments were Alfalfa hay stalks or treated with 4% urea or with the addition of 9% molasses or both together(T1,T2,T3 and T4) respectively, and the concentrated feed(17.89 of crude protein and 12.87 Mj of metabolic energy) was provided at a rate of 2.5% of the live body weight, the lambs are the same as those used in the digestion experiment, a rubber tube (Stomach tube) was used and inserted into the animal's cavity, and a machine was placed at the other end of the tube A pipette for the purpose of withdrawing an appropriate amount of liquid. Samples of rumen fluid were drawn during three different times: time (zero),before the morning feeding, and the first withdrawal is considered and after that, concentrated and roughage feed are provided (chopped Alfalfa hay stalks), then the second and third withdrawals were made after 3 hours and 6 hours of morning feeding, and all samples from rumen fluid and feces (digestion trial) were kept by freezing until analyzes were performed to estimate the digestion coefficient of different food compounds, and the current study concluded: There were no significant differences for the effect of the treatment with urea or the addition of molasses or without them to the Alfalfa hay stalks in the pH characteristic and for all times of withdrawal of rumen fluid 0, 3and 6 hours of feeding, while the concentration of ammonia nitrogen, there were highly significant differences (P<0.01) at time 0 from feeding and in favor of the lambs of the fourth group, which amounted to 62.331 mg / 100 ml compared to the other three treatments, then followed by the second group (urea treatment), which was 51.331 mg / 100 ml, which also outperformed the third and first treatments, as they recorded the lowest values, reaching 28.997 and 25.997 mg/100 ml, respectively, while there were no significant differences in the concentration of ammonia nitrogen at the time of 3 hours of feeding for all lambs of the groups, and it was noted that there were significant differences (P < 0.05) as it reached the highest in the first and third groups, then followed by the second group, while the lowest values (significant decrease) were recorded in the fourth group, and the results showed a significant superiority (P<0.05) between the averages of the four treatments for the effect of treatment with urea or adding of molasses to diets for fattening Awassi lambs in total volatile fatty acid concentrations, and he digestion coefficient of all food compounds recorded a significant superiority (P<0.01) for the treatment T4 except for ash, then followed by T2 and T3, while the lowest values were in the control treatment T1.

Keywords: Awassi lambs, Alfalfa hay stalks, Urea, Molasses,digestion coefficient, rumen fermentation.

Received 21.09.2022 Revised 09.11.2022 Accepted 30.11.2022

How to cite this article:
Marwa SaadAbd A Al-Abbassi , Jamil Sarhan L, MakkiKhalaf H A. A study of digestion coefficient of different food compounds and rumen fermentation in Awassi lambs fattened on concentrated rations with Alfalfa hay stalks treated with urea or the addition of molasses.. Adv. Biores. Vol 13 [6] November 2022. 178-186

INTRODUCTION

Awassi sheep is distinguished as the main breed in the Middle East countries, including Iraq, it constitutes more than half the number of sheep in Iraq [11], most of sheep breeders in Iraq depend on feeding them from roughage feed resulting from harvest residues and residues of some field crops as a large part of

their diet, and therefore it may affect on the production performance because of the low nutritional value of its high content of crude fiber and lignin, as well as its low energy and protein [29, 2], and concentrated feed was added only in limited quantities due to its high costs, so there was a decrease in the productivity of Awassi sheep of meat and milk compared to the specialized purebred breeds. Therefore, it became necessary to use modern methods in feeding and breeding to increase the productivity of these sheep [27], including some additives and chemical, physical and biological treatments to improve the nutritional value of roughage feed [6], and the roughage feed was treated with urea as a non-protein nitrogen compound that analyzes the bond between lignin and both cellulose and hemicellulose, making them available for microscopic digestion in the rumen, the addition of molasses was also used, which is an accidental product of the sugar industry from sugar cane to increase palatability and is rich in soluble carbohydrate and it has a nourishing and stimulating effect in the cycle of food compounds in the animal's body and as an energy source that supplies microorganisms in the rumen and activates their growth, as well as binds feed grains and limits dust that accompanies ground feed [3]. Previous studies [34] obtained weight gain for Awassi lambs when they received a level of 2% of urea in their diets, the results of Abera *et al*. [1] study also indicated that urea or a mixture of urea and molasses improved the amount of feed intake and increased the final weight of highland harage lambs.The current study aimed to know the effect of treatment Alfalfa hay stalks as poor quality roughage feed with a concentration of 4% urea or adding molasses at 9% or both on the digestion coefficient of different food compoundsand rumen fermentation of Awassi male lambs.

MATERIAL AND METHODS

The period of experiment included the purchase of Alfalfa hay stalks, were treated with 4% urea and their beam with plastic, the purchase of molasses, composition, mixing and pressing of the concentrated ration, and the preparation of individual sheds from cutting and welding until the completion of chemical analyzes, during which it included actual and practical experiments to response, digestion and fermentation for the period from 29/10/2021 to 28/1/2022 to study usage of Alfalfa hay stalks treated with urea or added molasses or both in the digestion coefficient of nutrients and rumen fermentation of Awassi lambs, which was at the age of 4-5 months, with an average weight of 21.5 ± 0.5 kg, it was randomly divided into four equal groups with 5 lambs for each group. They were fed for 91 days on chopped Alfalfa hay stalks (roughage feed) and provided freely (Ad. Lib.), which was treated with urea 4% or added to it percentages of molasses 9% or both together and it, was considered as follows:

T1 = control diet, T2= chopped Alfalfa hay stalks treated with a concentration of 4% of urea, T3 = chopped Alfalfa hay stalks with added 9% molasses and T4 = chopped Alfalfa hay stalks treated with 4% urea and added to it 9% Molasses.

While concentrated feed was provided at a rate of 2.5% of the live body weight, the concentrated feed consisted of 20% yellow corn, 30% fodder flour, 32% wheat bran, 10% soybean meal, 5% oil, and 1% of each of limestone and salt and supplements (vitamins and minerals \ ruminants) and the table (1) shows the chemical analysis of the roughage feed and complete concentrated ration and the main raw materials included in its composition.

Table 1: Chemical analysis* of the roughage feed and concentrated ration and the main feed materials included in its composition (% dry matter) in lamb feeding and the calculated metabolic energy (MJ/Kg dry matter).

Feedstuffs	Dry matter	Crude Protein	Crude Fiber	Ether extract	Nitrogen Free Extract	Ash	Organic matter	Metabolized Energy***MJ/ Kg dry matter
Soybean meal	90.18	49.90	6.39	2.04	34.65	7.02	92.98	11.79
Yellow corn	89.20	10.12	2.25	4.87	80.15	2.61	97.39	14.06
Wheat bran	90.42	17.54	11.76	4.47	60.71	5.52	94.48	12.58
Fodder flour	91.14	14.04	2.46	1.79	79.57	2.14	97.86	13.50
****Concentrated Ration**	89.42	17.89	6.37	2.46	68.54	4.74	95.26	12.82
****Alfalfa hay stalks**	90.95	6.45	31.67	1.43	48.91	11.54	88.46	9.65

* Chemical analysis of feed materials based on Al-Khawaja et al. [4].

**Their analyzes were carried out in a nutrition laboratory affiliated to the Department of Animal Production / Technical College - Al-Mussaib.

***Metabolizable energy MJ/ Kg dry matter =0.012×Crude protein + 0.005 × Crude fiber + 0.031 × Ether extract +0.014×Soluble carbohydrate materials.[20].

The concentrated ration and the four experimental roughage rations (Alfalfa hay stalks or treatment with a concentration of 4% of urea or an addition of 9% of molasses or both) were analyzed in the laboratories of the Al-Mussaib Technical College \ Food and Feed Analysis Laboratory (Table 2). and the dry matter (DM) was estimated, crude protein (CP), Ether extract (EE), Ash and crude fiber (CF) according to the A.O.A.C. [8] method and the metabolic energy was extracted for the four diets according to MAFF [20] which states that the following:-ME (MJ/kg DM) = %CP×0.012+% CF×0.005+% EE×0.031+ NFE×0.014 .

Table 2: Chemical composition of the four experimental rations (% of dry matter) from rough forage after treatment and addition and its metabolized energy content (MJ/Kg D.M).

Rations	Dry matter	Crude Protein	Crude Fiber	Ether extract	Nitrogen Free Extract N.F.E	Ash	Organic matter	Metabolized energy*MJ/ Kg dry matter
T1	90.95	6.45	31.67	1.43	48.91	11.54	88.46	9.65
T2	92.33	13.86	22.58	1.49	49.13	12.94	87.06	9.15
T3	90.93	7.22	28.34	1.54	48.38	14.52	85.48	9.45
T4	90.61	12.80	29.38	1.96	40.52	15.34	84.66	8.48

The field digestion coefficient was studied (in vivo) for different nutrients in the fifth week of the growth experiment, as 12 lambs from the experiment were randomly used, with an average of three lambs from each treatment, to estimate the digestibility coefficient of different food compounds, which include the digestibility coefficient of dry and organic matter, crude protein, crude fiber, ether extract , soluble carbohydrates, ash and metabolite energy, and were fed in the same way and on the four diets. The quantity in taken was estimated from concentrated feed and alfalfa hay stalks in the morning and throughout the collection period. Excreta was collected only in the morning from each animal before the morning meal for a period of seven days by using special bags to collect feces placed in the back of the animal and through a small hole at the bottom of the bag,, the stool was collected in a container and then weighed with an electronic scale, then a sample was taken from it and placed in a small and clean nylon bag for the purpose of keeping it in the refrigerator and another form for estimating the dry matter directly in the laboratory, and the process was repeated on the second day and so on for seven days (Collection period) was preceded by one day that did not fall within the seven days for the purpose of accustoming the animal to the bags, and the collected samples are added with the rest of the days to the sample of the first day, then all the samples are mixed together well and a sample of 10% is taken and placed in nylon bags and kept in the freezer until the necessary analyzes are carried out.

The apparent digestion coefficient was calculated on the basis of the following general equation:

$$\text{Field Digestion Coefficient \%} = \frac{\text{The amount of the substance intake - The amount of the substance excreted}}{\text{The amount of the substance intake}} \times 100$$

Some characteristics of rumen fermentation were also studied in the tenth week (day 70) of the experiment by withdrawing samples of rumen fluid from 12 animals, at the rate of three lambs per group, which is the same one that was used in the digestion experiment by means of a rubber tube (Stomach tube) and inserted into the mouth of the animal, and a sucking machine was placed at the other end of the tube for the purpose of withdrawing an appropriate amount of rumen fluid during three different times, which are: (zero) time, that is before the morning feeding, and after 3 hours and 6 hours, respectively, of the morning feeding. After that, the rumen fluid was filtered by a piece of cloth to get rid of the solid particles, then 20 ml was taken from each sample \ time of the rumen fluid and placed in clean plastic containers, to which 400 microliters of concentrated hydrochloric acid(1 molar)was added to it in order to stop microbial activity and prevent volatilization of ammonia nitrogen, after that the samples were placed in a centrifuge (4000 revolutions \ min) for 10 minutes to get rid of all remaining impurities and sediments and obtain a liquid clear, pure color, then the samples were kept by freezing at -20°C until analyzes were performed.

The necessary analyzes were carried out, which included potential Hydrogen; pH, Ammonia nitrogen concentration (NH3-N), it was calculated using the A.O.A.C method [8] and Total Volatile Fatty Acids (TVFA's) were estimated using the Markaham apparatus based on the method of Warner [33].

RESULTS AND DISCUSSION

Table 3 shows effect of treatment alfalfa hay stalks with urea or addition of molasses or without them in the field digestion coefficient % of different food compounds, there are highly significant differences (P<0.01) in the characteristics of digestion coefficient of dry matter, organic matter, crude protein, ether extract, easily digestible carbohydrates, and metabolic energy in the three groups of lambs fed on diets treated with urea or the addition of molasses or urea and molasses together (15 lambs) compared with the lambs of the control group fed on a diet free from the addition or treatment (5 lambs), while there were no significant differences in the digestion coefficient of crude fiber and ash, and for all the lambs of the treatments,the finer details between the effects of the treatment and the addition in the treatments can be seen in table 4.

Table 3: Effect of treatment Alfalfa hay stalks with urea and addition of molasses or without them to Awassi lambs fattening rations in the field digestibility coefficient % of different food compounds (mean ± standard error).

Traits	Groups		Significant level
	Alfalfa hay stalks without treatment or addition (N=5 lambs)	Alfalfa hay stalks with treatment or addition (N=15 lambs)	
DM	B66.491 ± 1.488	A 82.239 ± 2.691	**
OM	B65.991 ± 1.479	A 82.714 ± 2.826	**
CP	B 68.547 ± 2.815	A 80.281 ± 1.631	**
CF	62.408 ± 3.143	76.817 ± 3.796	N.S
Ash	73.216 ± 1.754	79.041 ± 1.901	N.S
EE	B 67.036 ± 0.573	A 81.441 ± 2.284	**
NFE	B 66.085 ± 1.812	A 84.664 ± 3.225	**
ME	B 66.314 ± 1.333	A 83.309 ± 2.761	**

The averages with different letters within the same line differ significantly between them ** (P < 0.01),N.S: Non significant and N: Number of lambs.

Table (4) showed that there were highly significant differences (P<0.01) in the digestion coefficient of of dry matter and organic matter in favor of the lambs of the fourth group, which amounted to 90.318 and 91.273% respectively, compared to lambs of all other treatments, the lowest values were recorded in the control group, which amounted to 66.491. and 65.991% respectively, while their digestion parameters were similar in the lambs of the third group (75.151 and 74.777%) with the lambs of the second group (81.249 and 82.091%) and the first (66.491 and 65.991%) respectively, The table also showed the highly significant superiority (P<0.01) of the second group (urea treatment) over the first (control treatment), as we note that the statistical improvement in the digestion coefficient of dry matter and organic matter in the fourth and second treatment provided nitrogen content inside the animal's rumen and thus better environmental conditions for microorganisms within the animal rumen to manufacture microbial protein [14].

Table 4: Effect of treatment Alfalfa hay stalkswith urea and addition of molasses to the diets of the four treatments for fattening Awassi lambs in the field digestion coefficient % of different food compounds (mean ± standard error).

Traits	Groups				Significant level
	T1	T2	T3	T4	
DM	C 66.491± 1.488	B 81.249 ± 1.993	BC 75.151± 4.820	A 90.318± 1.214	**
OM	C 65.991 ± 1.479	B 82.091 ± 1.896	BC 74.777 ± 4.747	A 91.273 ± 1.176	**
CP	B 68.547 ± 2.815	A 79.112 ± 3.351	A 77.251± 1.887	A 84.481 ± 1.742	**
CF	B 62.408± 3.143	B 72.522 ± 1.432	B 68.695 ± 6.960	A 89.233 ± 1.777	**
Ash	73.216 ± 1.754	75.711 ± 0.719	79.565 ± 5.412	81.847 ± 1.981	N.S
EE	C 67.036 ± 0.573	B 74.765 ± 0.793	B 81.211± 1.542	A 88.348 ± 3.667	**
NFE	B 66.085 ± 1.812	B 74.954 ± 1.669	A 85.077± 5.458	A 93.962 ± 1.320	**
ME	C 66.314 ± 1.333	B 82.849 ± 1.830	B 75.434 ± 4.571	A 91.643 ± 1.193	**

The averages with different letters within the same line differ significantly from each other (P < 0.01)), N.S: Non significant.**

The table also showed that there were highly significant differences (P<0.01) in digestion coefficient of crude protein, the different groups treatments and statistically similar between them(T4, T3, and T2) outperformed the control group (T1), amounting to 84.481, 77.251, and 79.112%, respectively compared with T1, which amounted to 68.547%,the reason for this may be that the two urea treatments T2 and T4 increased the nitrogen content on the one hand, T3 and T4 to which molasses was added on the other

hand, provided easily digestible energy from molasses which activated microorganisms in the rumen and their presence (urea and molasses) in the fourth group was the most efficient in reaching the protein digestion coefficient to 84.481%, which is the highest value among the treatments [7, 25, 26, 23, 24], as for the digestion coefficient of crude fiber the lambs of the fourth group also outperformed with high significant which amounted to 89.233%, over the other three groups (T3, T2, and T1) which arithmetic differences were observed between them, amounting to 68.695, 72.522, and 62.408% respectively, the increase in the digestion coefficient leads to an increase in the intake of dry matter [14], and the treatment with urea may also lead to an increase in the decomposed nitrogen in the rumen and synchronized with the release of metabolic energy and thus increasing the amount of dry matter intake compared to animals fed diets untreated with urea [35], table 4 also showed that there were no significant differences in the digestion coefficient of ash only between all groups of lambs, noting an arithmetic escalation in the digestion coefficient and it was the lowest in T1 and the highest in T4, and it was noted that there were highly significant differences ($P<0.01$) in the digestion coefficient of ether extract, the lambs of the fourth group (88.348%) outperformed on all other groups T3, T2, and T1 (81.211, 74.765, and 67.036%) respectively, and the two statistically similar treatments T3 and T2 outperformed on the control treatment T1, and a highly significant superiority ($P<0.01$) was obtained in the digestion coefficient of nitrogen free extract, as the groups T4 and T3 outperformed and amounted to 93.962 and 85.077% respectively over the lambs of groups T2 and T1 which amounted to 74.954 and 66.085% respectively, which may clearly indicate the effect of the addition of molasses (high easily digestible carbohydrates) in those two treatments (T4 and T3) compared with two treatments T2 (urea) and T1 (control).As for the digestion coefficient of metabolic energy a highly significant superiority ($P<0.01$) was observed in favor of the lambs of the T4 group, which amounted to 91.643% compared to the lambs of the T1 group, which recorded the lowest values and amounted to 66.314%, while the group T3 and T2 were similar between them amounting to 75.434 and 82.849%respectively,which were significantly superior to the control group (T1) as well. The increase in the metabolic energy may be due to the treatment with urea, which led to the breaking of the lignocellulosic bonds in the alfalfa hay stalks and helped to provide a suitable ruminal environment when adding molasses and thus raising the digestion coefficient of carbohydrate in the intake diet [5], as well as the digestion coefficient of ether extract, crude protein and crude fiber they are organic compounds, sources of metabolic energy, and that the improvement in the environmental conditions within the animal's rumen as a result of the treatment, which was accompanied by an increase in the amount of metabolic energy intake, may therefore be reflected in the rate of total and daily weight gain and feed conversion ratio [15], this improvement may be attributed to urea treatments as a result of the decomposition of the wall of the plant cell, which leads to the breaking of the bonds between lignin, cellulose and hemicellulose and liberation of lignin and making both cellulose and hemicellulose available for the digestive enzymes which secreted by microorganisms [29].

And it is clear from the results of Table 5 that there are no significant differences for the effect of the treatment with urea or the addition of molasses or without them to alfalfa hay stalks in pH characteristic and for all times of withdrawal of rumen fluid 0, 3, 6 hours of feeding when comparing the lambs of the three groups treated with the control group, as well as no statistical differences appear in table 6, details of this on the effect of the four experimental diets for fattening lambs on the pH characteristic, as no significant differences appeared between all groups of lambs and for all three withdrawal times (before or after feeding, three hours or six hours),in spite of this, the arithmetic differences are noted by the increase in acidity (pH) in the rumen in the treated groups compared to the control, as all data tend to be in a state of equilibrium between alkaline and acidity (pH = 7) before feeding and vary after feeding with the increase in acidity in the treatment groups and addition at the withdrawal times 3 and 6 hours after feeding, it was the lowest among the lambs of the fourth group (P = 6: pH = 5.820). The nature of the differences was similar between the pH concentrations of rumen fluid with the concentrations of volatile fatty acids at the time 3 hours after feeding, and the nature of that was different between them at times 0 and 6 hours from feeding, which we will discuss later in discussing the concentrations of volatile fatty acids in the rumen.

Table 5: Effect of treatment Alfalfa hay stalks with urea and addition of molasses or without them to Awassi lambs fattening rations in some rumen fermentations (mean ± standard error).

Traits	Groups			Significant level
	Time	Alfalfa hay stalks without treatment or addition(N=5 lambs)	Alfalfa hay stalks with treatment or addition (N=15 lambs)	
pH	P0	7.017 ± 0.206	6.991 ± 0.086	N.S
	P3	6.567 ± 0.072	6.494 ± 0.117	N.S
	P6	6.100 ± 0.254	6.028 ± 0.203	N.S
NH3–N mg/100ml	P0	B 25.997 ± 0.577	A 47.553 ± 8.442	**
	P3	24.997 ± 6.351	27.664 ± 3.555	N.S
	P6	40.997 ± 6.658	30.664 ± 2.640	N.S
TVFA's mg/100ml	P0	B 38.133 ± 6.009	A 53.133 ± 2.635	*
	P3	B 29.800 ± 2.887	A 59.800 ± 1.667	**
	P6	46.467 ± 7.265	39.800 ± 3.536	N.S

The averages with different letters within the same line differ significantly between them, **(P<0.01), * (P<0.05),N.S: Non significant and N: Number of lambs.

Table 6: Effect of treatment Alfalfa hay stalkswith urea and addition of molasses to the diets of the four treatments for fattening Awassi lambs in some rumen fermentations (mean ± standard error).

Traits	**Groups**					**p level**
	Time	T1	T2	T3	T4	
pH	P0	7.017± 0.206	6.940± 0.023	7.076 ± 0.237	6.957 ± 0.117	N.S
	P3	6.567 ± 0.072	6.560 ± 0.165	6.280 ±0.315	6.643 ± 0.052	N.S
	P6	6.100 ± 0.254	6.180 ± 0.395	6.083± 0.484	5.820 ± 0.261	N.S
NH3–N mg/100ml	P0	C 25.997 ± 0.577	B51.331±7.623	C28.997± 8.660	A62.33 ± 2.186	**
	P3	24.997 ± 6.351	26.997 ±2.517	24.664 ± 7.881	31.331 ±1.333	N.S
	P6	A 40.997 ± 6.658	AB30.6± 3.383	A38.331±3.480	B22.99 ± 1.155	*
TVFA's mg/100ml	P0	B 38.133 ± 6.009	AB54.80±2.887	AB 48.133 ± 4.410	A56.467± 6.009	*
	P3	C 29.800 ± 2.887	AB61.467± 1.667	B54.800 ± 2.887	A63.133 ± 1.667	**
	P6	46.467± 7.265	31.467± 1.667	38.133± 6.009	49.800± 5.000	N.S

The averages with different letters within the same line significantly between them, **(P<0.01),* (P<0.05), N.S: Non significant.

1-Samples were taken from three lambs\treatment\time.

2- (P0, P3 and P6) means periods,that is taking ruminal fluid samples; P0 taking rumen fluid before the morning meal, P3 taking rumen fluid three hours after the morning meal, and P6 taking fluid six hours after the morning meal.

These results agreed with the observation of Hussain and Saeed [17] that there was no significant effect of the level of urea treatment (0, 1 and 2%) on the pH values when feeding Awassi lambs fed concentrated feed of 2% of body weight and roughage feed wild reed and silage freely, and with what Sheikh et al. (2017) explained, there is no significant effect of the pH of the effect of feeding on rice straw treated with 2% urea with the addition of molasses 5% in the feeding of Corriedale sheep compared to untreated rice straw.

Table 5 also showed effect of treatmentalfalfa hay stalks with ureaor the addition of molasses or without them, presence of high significant differences (P<0.01) in rumen fermentations and in the characteristic of ammonia nitrogen concentration of rumen liquid at the time of withdrawal before feeding only among the lambs of the three groups (treatments) compared with the lambs of the control group. While Table 6 showed effect of the four experimental diets on the characteristic of ammonia nitrogen concentration, that there were high significant differences (P<0.01) also at time 0 of feeding and in favor of the lambs of the fourth group, which amounted to 62.331 mg \ 100 ml compared to the other three treatments, then it was followed by the second group (treatment urea) which was 51.331 mg\100 ml, which also significantly outperformed on the third and first treatments, as they recorded the lowest values of 28.997 and 25.997 mg\100 ml respectively, while there were no significant differences in the concentration of ammonia nitrogen at the time of 3 hours of feeding and for all the lambs of groups,

As for the concentration of ammonia nitrogen at the time of 6 hours of feeding, table 6 showed that there were significant differences (P<0.05), it was highest in the third and first groups, reaching 38.331 and 40.997 mg \ 100 ml respectively, then followed by the second group, which is statistically similar with all groups for the concentrations of rumen ammonia and amounted to 30.664 mg \ 100 ml, while the lowest values (significant decrease) were recorded in the fourth group (22.997 mg\100 ml) and if they were similar to the second group statistically, in addition to that, the sources of these high concentrations of ammonia resulted from an increase in the intake of crude and digested protein (Table 4), a decrease in amino acids and an increase in the availability of free ammonia in the roughage feed treated with urea [18], the ammonia nitrogen available in the rumen will be used for microbial protein synthesis by the rumen microbes, and it is known that bacteria decomposing cellulose use ammonia for their growth [9] and were unable to grow on other nitrogen sources in the absence of ammonia [24] and that molasses and concentrated diet contain high levels of easily fermentable energy and can be used in combination with easily available NPN sources such as urea in ruminant diets, this improves the growth of rumen bacteria [31, 32],it can be concluded that the groups whose diets were treated with urea (T2 and T4) recorded the highest values of ammonia-nitrogen concentrations before feeding and quite the opposite after feeding 6 hours, which may indicate that the activity of the rumen flora in its exhausted has stabilized after the feeding time by 3 hours (non-significant differences), but its activity increased after 6 hours and this activity decreased after that until before the morning feeding to exhaust the quantities of carbohydrates easily digestible and crude fiber [21], thus increasing the digested of crude protein (Table 4),these results agreed with the findings of Al-Mamouri [5] in the presence of significant differences (P<0.05) in the concentration of ammonia nitrogen in favor of the urea-treated treatments (7.17%) at the first draw (before the morning meal) compared to the untreated treatments when feeding Awassi lambs on impurities yellow corn treated and untreated with urea, and the reason for this was explained by the impurities of corn treated with urea, which led to an increase in ammonia nitrogen in the animal's rumen in the first hours before feeding, and it agreed with the findings of Elkholy et al. [10] that there was a significant increase (P<0.05) in the concentration of ammonia nitrogen for the group of Baladirams that were fed on corn stalks treated with urea 4% and treated with urea 4% and molasses 5% at time 0 hours of feeding compared to those that it was fed on untreated corn stalks,while it did not agree with what was indicated by Lizarazo et al [19] that molasses 1.2 g/kg of body weight had no effect on the concentration of ammonia nitrogen at all sampling times 3, 6, 15 and 21 hours of feeding in the lambs, and did not agree with what was found by Vorlaphim et al. (2021) no significant superiority (P<0.05) when treating rice residue with urea at 2.5% compared with the control group in feeding of slow-growing goats for 12 weeks.

Table 5 also indicated that there were significant (P < 0.05) and highly significant (P< 0.01) increases in the total volatile fatty acid concentrations in the lamb's rumen fluid at the withdrawal times of 0 and 3 hours of feeding respectively, and it was nonsignificant at a time of 6 hours as a result of the treatment of alfalfa hay stalks with urea , molasses, or urea with molasses (T2, T3, and T4) compared with the control treatment (T1) and the details of these effects between treatments are shown in table 6,the results showed a significant superiority (P< 0.05) between the averages of the four treatments for the effect of treatment with urea or the addition of molasses to the diets of fattening Awassi lambs in the concentrations of total volatile fatty acids, the lambs of the fourth group (T4) were significantly superior (P<0.05) at time 0 of feeding, it amounted to 56.467 mg\ 100 mlover the lambs of the control group (T1), which recorded the lowest values of 38.133 mg\100 ml, while the second group (T2) and the third (T3) were similar between them, reaching 54.800 and 48.133 mg\100 ml respectively, and also with treatments T1 and T4,it was also noted from table 6 that there were high significant differences (P<0.01) in the concentrations of total volatile fatty acids at the time of 3 hours of feeding in favor of the lambs of the fourth group (T4), which amounted to 63.133 mg \ 100 ml compared with the lambs of the control group (T1), which was the lowest,it reached 29.800 mg\100 ml and was also superior on the lambs of the third group (T3) 54.800 mg\100 ml, while the second group (T2) 61.467 mg\100 ml was similar to the fourth group (T4) and the third (T3), it was not observed from Table 6 that there were any significant differences in the concentrations of total volatile fatty acids at the time of 6 hours of feeding for all lambs of the groups.The nature of the differences in the concentrations of VFA's was similar at all times (0 and 3 hours), with the superiority of the fourth treatment followed by the second and then the third treatment, while the control treatment was at its lowest level and had stabilized (not significant) at a time of 6 hours, but with a higher arithmetic value for T1 lambs,it is also noted that the time of withdrawal after three hours has resulted in increases in the values of these concentrations for all treatmentsand this is consistent with what was shown in the table in the pH values of the rumen liquid at the time of withdrawal itself, with an increase in acidityas the feeding time progressed,and that the fermentations

(high concentrations of VFA's) were at their highest values in the rumen of the three treatments (T4, T3, and T2) than in the rumen of lambs of the control treatment (T1), which appears to have been delayed by the high concentrations of VFA's in their rumen until the time of withdrawal 6 hours after feeding, and the reason for this may be due to the rapid decomposition of the soluble carbohydrate components in molasses in addition to the concentrated diet (Osman et al., 2020), it is known that the sources of energy for the body of ruminants are the VFA's that it needs in sustainment and growth (Metabolism- Anabolism) these fermentations of the feed materials were reflected in what they provided of the basic building materials for the growth of the body tissues of the lambs and their superiority in increasing their weight (T4: 297 g \ day) compared to the weight gains of the lambs of other groups, whether those fed on the alfalfa hay stalks treated with urea(T2: 226 g\day) or by adding molasses (T3: 198 g\day) to the daily weight gains in the weights of lambs of the first control group (T1: 115 g\day).These results agreed with the observation of Sheikh et al. (2017) that there was a significant effect ($P<0.05$) for the total volatile fatty acids of the rumen liquid for the treatment of rice straw with urea 2% with the addition of molasses 5% compared with the control (untreated rice straw) for feeding Corriedale sheep, and it agreed with what Osman et al. [22] indicated that there were significant differences ($P<0.04$) in the total volatile fatty acids of groups of animals that were fed different concentrations of molasses 0, 30, 40 and 45% with crushed grain and sorghum compared to the control (free of molasses) in feeding young Nubian goats, while it did not agree with what was explained by Hussain and Saeed [17]) when feeding Awassi lambs on concentrated feed of 2% of body weight and roughage feed wild reed and silage treated with levels of urea 0, 1 and 2% that the level of urea treatment had no significant effect on the concentration of volatile fatty acids in the treatments, it also did not agree with the results of Norrapoke et al. [21] that there were no significant differences in total volatile fatty acids when feeding crossbred beef cattle on fermented cassava pulp with urea 4% and molasses 4%.

REFERENCES

1. Abera, F. ;Urge, M. and Animut, G.(2018).Feeding value of maize stovertreated with urea or urea molasses for hararghe high land sheep.The Open Agriculture Journal, Vol. 12, 84–94.
2. Al-Dulaimi, F. S. ;Shujaa, T. A. and Ibrahim, M. W. (2021). Effect of different levels of soybean meal in fattening farmer diet on Awassi lambs performance and carcass characteristics. Mesopotamia Journal of Agriculture, 49(2) 26-35.
3. Al-Hawarin, A. ; Al-Shaf, R. ; Sharaf, J. ; Abu Assaf, S. ; Saab, R. ; Atallah, B. and Mohsen, W. (2017).Feeding herds of sheep and goats and the use of available fodder alternatives in the nutrition of the breeders.Guidance leaflet.Ministry of Agriculture and Agrarian Reform, General Commission for Scientific Agricultural Research, Agricultural Scientific Research Center in As-Suwayda - Syrian Arab Republic.
4. Al-Khawaja, A. K.; Abdullah, E. and Abdel-Ahad, S. (1978). Chemical composition and nutritional value of Iraqi feed materials, a bulletin issued by the Nutrition Department - Directorate of General Livestock Wealth - Ministry of Agriculture - Iraq.
5. Al-Mamouri, T. A. M. (2022). Effect of substituting yellow corn impurities treated and untreated with urea in place of wheat bran with different ratios of roughage feed to concentrate on productive performance and rumen fluid characteristics of Awassi lambs. PhD thesis - College of Agricultural Engineering Sciences - University of Baghdad.
6. Al-Taie, O. S. and Altayeb, M. A. (2020).Effect of addition dry bread yeast *(Sacchromycescerevisiae)* and probiotic and growth carcass characteristics and some rumen and blood parameters in Awassi lambs. Mesopotamia Journal of Agriculture, 48(2), 59-67.
7. Al-Zubaidi, K. A. F. (2006). The effect of using different levels of urea and corn grains treated with molasses on the performance of Awassi lambs. Master Thesis - Technical College - Mussaib.Technical Education Authority - Iraq.
8. A.O.A.C.(2005). Association of Official Analytical Chemists). official method of analysis. 18th ed. AOAC International, Gaithersburg, Maryland, USA.
9. Bryant, M. P. (1973).Nutritional requirements of the predominant rumen cellulolytic bacteria. Fed Process Corp. 32:1809–1813.
10. Elkholy, M. El. H. ;Hassanein, El. I. ; Edrees, N. ; Eleraky. W. ;Elgamel, M. F. A. and Ibraheim, D. (2009). Nutritional aspects of recycling plants by- products and crop residues (corn stalk) in sheep. Pakistan Journal of Nutrition 8(12):1834-1841.
11. FAO (Food and Agriculture Organization) .(2017). FAOSTAT. http:// www.fao.org/ faostat /en /# data / TA.
12. Filipek, J.and Dvorak, R. (2009). Determination of the volatile fatty acid content in the rumen liquid: comparison of gas chromatography and capillary isotachophoresis. Acta Vet. Brno 78: 627-633.
13. Giraldo, L. A. ;Tejido, M. L. ; Ranilla, M. J. and Carro, M. D. (2007).Effects of exogenous cellulose supplementation on microbial growth and ruminal fermentation of a high-forage diet in Rusitec fomenters. Journal of Animal Science, 85(8), 1962- 1970.
14. Hassan, S. A.(2005). Effect of straw treatment with liquid food on intake, digestibility coefficient and weight gain rate in Awassi lambs. Iraqi Agricultural Sciences Journal. Issue 36. Vol. 4: 133-138.

15. Hassan, S. A. and Mohamed, Susan, M. N. (2009). Response of Karadi lambs to feeding straw treated and untreated with urea with two levels of insoluble nitrogen in the rumen. Jordanian Journal of Agricultural Sciences. Vol. 5, Issue 1, pp.: 98-110.
16. Hassan, S. A.; Hashem, A. J. and Al-Samarrai, W. H. (2008).The effect of physical and chemical treatment of palm fronds and barley straw on its chemical composition, laboratory digestion coefficient, concentration of phenolic compounds, and the number of anaerobic bacteria. Jordanian Journal of Agricultural Sciences. Issue 3 - Vol. 4: 289-297.
17. Hussian,H. M. and Saeed, A. A. (2019). Effect of ensiling and urea treatment on nutritive value of wild reed *(Phragmites communis)* in Awassi lambs feeding 3- ruminal fermentation characteristics. Journal of University of Babylon for Pure and Applied Sciences,Vol.(27), No.(2): 2019.
18. Khadr, N.E.A.(1990).Effect of non protein nitrogenous supplements on digestibility of low quality roughages in goats. M.Sc. Thesis, Fac. Vet.Med. Moshtohor, Zagazing Univ. Egypt.
19. Lizarazo, A. C. ; Mendoza,G.D. ; Kú, J. ; Melgoza, L.M. and Crosby, M.(2014). Effects of slow-release urea and molasses on ruminal metabolism of lambs fed with low- quality tropical forage.Small Ruminant Research 116 (2014) 28– 31.www.elsevier.com/locate/smallrumres.
20. MAFF. (1975). Ministry of Agric. Fisheries and Food dept. of Agric. and fisheries for Scotl and energy allowances and feed systems . for ruminants. Technical Bulletin ,33.First published.
21. Norrapoke, T. ;Pongjongmit, T. and Foiklang, S. (2022).Effect of urea and molasses fermented cassava pulp on rumen fermentation, microbial population and microbial protein synthesis in beef cattle. Journal of Applied Animal Research,Vol. 50,No.1, 187-191.
22. Osman, O. A. ;Elkhair, N. M. and Abdoun, K. A. (2020).Effects of dietary supplementation with different concentration of molasses on growth performance, blood metabolites and rumen fermentation indices of Nubian goats.BMC Veterinary Research. 16(411), P:1-12.
23. Palmonari, A. ;Cavallini, D.; Sniffen, C. J. ; Fernandes, L. ; Holder, P. ; Fagioli, L. ; Fusaro, I. ; Biagi, G. ; Formigoni, A. and Mammi,L.(2020). Short communication: Characterization of molasses chemical composition.Journal of Dairy Science Vol. (103) No.(7):6244-6249.
24. Russell, J. B. ; Muck. R.E. and Weimer, P. J. (2009).Quantitative analysis of cellulose degradation and growth of cellulolytic bacteria in the rumen. FEMS MicrobiolLett. 67:183–197.
25. Senthilkumar, S. ;Suganya, T. ; Deepa, K. ; Muralidharan, J. and Sasikala, K. (2016).Supplementation of molasses in livestock feed.International Journal of Science, Environment and Technology, Vol. 5, No 3, P: 1243 – 1250.
26. Sheikh, G. G, ; Ganai, A. M. ; Sheikh, F. A. ; Bhat, S. A. ; Masood, D. ; Mir. S. ; Ahmed, I. and Bhat, M. A. (2017). Effect of feeding urea molasses treated rice straw along with fibrolytic enzymes on the performance of Corriedale Sheep. Journal of Entomology and Zoology Studies. 5(6): 2626-2630.
27. Taha V. J. (2015).Effect of supplemented tannin on silage quality and animal performance. Ph.D. Dissertation, Harper Adams University, Newport, Shropshire, UK.
28. Tawfiq, J. A. and Al-Attar, S. A. H. (2014).Dietetics. University House for printing, publishing and translation. Ministry of Higher Education and Scientific Research. Baghdad University.1st edition.
29. Tufail, T. ;Saeed, F. ; Imran, M. ; Arshad, M. U. ; Anjum, F. M. ; Afzaal, M. and Hussain, S. (2018).Biochemical characterization of wheat straw cell wall with special reference to bioactive profile.International journal of food properties, 21(1), 1303-1310.
30. Vorlaphim, T. ;Paengkoum, P. ; Purba, R. A. P. ; Yuangklang, C. ; Paengkoum, S. and Schonewille, J. T. (2021). Treatment of rice stubble with *Pleurotusostreatus* and urea improves the growth performance in slow-growing goats. Animals, 11(4), 1053.
31. Wanapat, M. and Kang, S. (2013a). World buffalo production: challenges in meat and milk production, and mitigation of methane emission. Buffalo Bull. 32(SPEC. 1):1–21.
32. Wanapat, M. and Kang, S. (2013b). Enriching the nutritive value of cassava as feed to increase ruminant productivity. J NutrEcol Food Res. 1:262–269.
33. Warner, A. S.(1964). Production of volatile fatty acid in the rumen methods of measurements. Nutrition Abstract Review 34 : 339-343.
34. Wedah, H.A. ; Al-Yasseri, A. J. ; Al-Samaraae, W. H. and Jassim, A. S. (2020).Effect of urea on some productive and physiological traits of Awassi lambs. European Journal of Molecular & Clinical Medicine. Vol. 7, Issue 08, P 4004-4009.
35. Wilke, P. I. (1992).Effect of nitrogen supplementation on the utilization of sodium hydroxide treated corn stover by dairy goats. Small Ruminant Research.9:167- 171.