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Usage of Alfalfa hay stalks treated with different levels of urea and molasses in fattening rations of Al-Naimi lambs

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Abstract

The experiment was conducted in the animal field belonging to the Department of Animal Production Techniques at the Technical College / Al-Mussaib for a period from 29/10/2021 to 21/1/2022 to study usage of Alfalfa hay stalks treated with urea and molasses in the productive performance of Al-Naimi lambs, which had initial weight of 20 ± 1 kg and at the age of 4-5 months, at a rate of 84 days, preceded by a preparatory phase for two weeks, and the lambs were randomly divided into five equal groups (5 lambs for each), and the individual feeding method was followed, as concentrated feed was provided at a rate of 2.5% of the live weight for each animal and fed on the five experimental rations,that the roughage feed Alfalfa hay stalks was given free, the first group (T1) was considered as a control without addition, (T2) and (T3) groups were treated with 4% urea with the addition of either 6% molasses or 12% molasses respectively, (T4) and (T5) groups were treated with 6% urea with the addition of either 6% molasses or 12% molasses respectively, and the results were as follows: Lambs of the fourth group (T4: 6% urea with 6% molasses) responded to fattening with a significant increase ($P<0.05$) and by 67.95% in weight gain and by 15.7% in consumption of concentrated and roughage feed compared with the control group (T1) and the other groups, which may indicate the efficiency of digestion and benefit of the diet treatment with 6% urea and 6% molasses added to free-fed Alfalfa hay stalks of Al-Naimi fattening lambs.

Keywords: Al-Naimi lambs, Alfalfa hay stalks, Urea, Molasses.

Introduction

Sheep are one of the most livestock sources in Iraq and they constitute a large part of the national agricultural income. They are spread in most parts of the world because of their ability to adapt to different environmental conditions and their need for more straightforward administrative and nutritional requirements than other agricultural animals. Awassi (Al-Naimi) sheep constitute a large part of the sheep of Iraq [1],In the present and the future, it requires expansion in the field of livestock, and therefore the search for sources of fodder that are cheap and of good nutritional value, which are

produced locally to replace traditional fodder, such as some grains and seeds, some of which are imported in hard currency and are very expensive [2], As the lack of the roughage feeds, especially green feeds during the dry season and winter, led to the tendency to use the residue of roughage feeds, such as straw to feed ruminant animals, but these residuals used do not fill the nutritional needs of ruminant animals due to their low nutritional value, as well as their digestion coefficient due to the association of lignin with cellulose and hemicellulose and the inability of the digestive enzymes which are secreted by microorganisms in the rumen in order to digest them and benefit of nutrients [3].Iraq suffers from the same problem, the available grazing areas and areas designated for the cultivation of green fodder are not commensurate with the needs and numbers of existing animals [4]. Many researchers have used urea as one of the important treatments to improve the utilization of roughage feeds, or it is added to the meals provided [5]. The usage of urea in the diet of ruminants can reduce dependence on protein concentrates that can benefit humans or animals with a simple stomach [6]. Using a feed supplement of molasses or molasses and urea in sheep nutrition has led to an increase in dry matter intake[7]. It is possible to improve the value of field residues by adding carbohydrate residues such as molasses [14],or non-protein nitrogen sources such as urea [8,9] reported a highly significant increase ($p< 0.01$) in the daily weight gain of Karadi lambs fed hay treated with urea at a rate of 7.17% sufficient for 3.3% nitrogen compared to untreated.A highly significant effect was found in the feed conversion ratio, as it reached 9.94 for karadi lambs, were fed on barley straw treated with urea compared with the other lambs fed on barely straw untreated with urea reach 12.16 for eight weeks. The study aims to improve the nutritional value of the Alfalfa hay stalks as roughage feed of poor quality because of the decrease in energy and protein due to its falling leaves, by treating it chemically with different proportions of both urea and molasses additions, and their effect on the productive performance and feed consumption of Al-Naimi male lambs.

Materials and Methods

The experiment was conducted in the animal field belonging to the Department of Animal Production Techniques at the Technical College / Al-Mussaib for more than eight months, starting on 08/08/2021 and ending on 1/6/2022 .The period included the purchase of Alfalfa hay stalks, their treatment with urea and their beam with plastic, the purchase of molasses,the 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 respond for the period from 29/10/2021 to 21/1/2022 to study usage of Alfalfa hay stalks treated with urea and addition of molasses in the productive performance of Al-Naimi lambs, The animals occupied a half-shaded barn to shelter the lambs, and it was divided into 25 cages(Pen), each cage having an area of 1.75 x 1.25 m, and they followed the method of individual feeding .Each cage was equipped with two feeders, one for placing concentrated feed and the other for roughage feed, and clean drinking water was provided in a third container. Also, mineral salt moulds were placed inside the

roughage feed troughs, and the lambs were randomly divided into the five treatments being numbered them in a sequence of 20-45; before that, 25 Naimi lambs were selected from a herd of more than 500 heads and were free of diseases and deformities, which were chosen according to their phenotypic characteristics, breed and homogeneity of weights from the city of Mosul. At the age of 4-5 months, with an average weight of 20 ± 1 kg, it was randomly divided into five equal groups with five lambs for each group and weighed for three consecutive days in the morning after cutting off the fodder for 12 hours, to stabilize the initial weight. Then, they were fed on the five experimental diets for two weeks as a preparatory period to familiarize them with the experiment diets. Before taking and recording the data, the barns were cleaned of excreta every morning, and the lambs received veterinary health care under the supervision of veterinarians. They were fed for 84 days on chopped Alfalfa hay stalks (roughage feed) and provided Freely (ad. Lib.), which was treated with urea 4 and 6% and added to it percentages of molasses 6 and 12%, and it was considered as follows:
The first treatment (T1) = control diet, chopped Alfalfa hay stalks without treatment with urea or adding molasses.

The second treatment (T2) was chopped Alfalfa hay stalks treated with a concentration of 4% of urea with added 6% Molasses.
The third treatment (T3) = chopped Alfalfa hay stalks treated with a concentration of 4% with added 12% molasses.
Fourth treatment (T4) = chopped Alfalfa hay stalks treated with 6% urea and added 6% Molasses.
Fifth treatment (T5) = chopped Alfalfa hay stalks treated with 6% urea and added 12% Molasses.

Concentrated feed was provided on two daily meals, the first at seven in the morning and at four in the afternoon, at a rate of 2.5% of the live body weight and the quantities provided are adjusted weekly based on the new weight for each animal, and the weights of the consumed quantities of feed (concentrated and roughage) are recorded daily after weighing the residual of the previous day on the morning of the second day and before providing the new feed meal, to calculate the daily consumer from it, and the animals were weighed weekly at six o'clock in the morning after preventing feed from her for 12 hours, 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 it's crude protein was 17.89 and metabolized energy was 12.82 MJ\Kg dry matter, 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 N.F.E	Ash	Organic matter	Metabolized Energy*** MJ/Kg dry matter
Soyabean 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**[10].

**** Their analysis 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 protien + 0.005 × Crude fiber + 0.031 × Ether extract +0.014×Soluble carbohydrate materials (NFE)[11].**

The concentrated ration and the five experimental roughage rations (Alfalfa hay stalks or treatment with a concentration of 4 or 6% of urea with the addition of 6 or 12% of molasses) 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 [12] method and the metabolic energy was extracted for the five diets according to[11] which states that the following:-

$$ME\ (MJ/kg\ DM) = \%CP\times0.012+\%CF\times0.005+\%EE\times0.031+NFE\times0.014\ .$$

Table (2): Chemical composition of the five 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	11.06	28.27	1.48	50.55	8.64	91.36	10.28
T3	91	9.8	29.74	1.17	50.84	8.45	91.55	10.14
T4	92	13.27	27.31	1.37	50.05	8	92	10.39
T5	90	13.75	25.42	1.57	50.73	8.53	91.47	10.51

And some production characteristics were studied, and the amount of feed consumed from concentrated,roughage and total feed, total and daily weight gain, and feed conversion ratio.

Results and Discussion

Table 3 shows highly significant increases (P<0.01) for the effect of treatment treated with urea and the addition of molasses compared with without them to the Alfalfa hay stalks in the traits of roughage feed consumed and feed conversion ratio by groups of lambs in the experiment and in favor of the four groups treated with urea and the addition of molasses (20 lambs) compared with the control treatment without treatment and addition (5 lambs), while there were no significant differences in the concentrated and total feed consume, the details of which are clarified by Table 4, which shows the total consumption of dry matter from roughage, concentrated, total feed and feed conversion ratio.

Table (3): Effect of treatment Alfalfa hay stalks with urea and adding molasses or without them to Al-Naimi lambs fattening rations in the rates of dry matter consumption from roughage, concentrated and total feed (kg/lamb) and feed conversion ratio (mean ± standard error).

Traits	Alfalfa hay stalks without treatment or addition (5 lambs)	Alfalfa hay stalks with treatment and addition (20 lambs)	Significant level
roughage feed consumed (Kg)	B 15.53 ± 0.160	A 20.02 ± 0.846	**
Concentrated feed consumed (Kg)	46.62 ± 3.567	49.53 ± 0.948	N.S
Total feed consumed (Kg)	62.15 ± 3.525	69.56 ± 1.53	N.S

Feed conversion ratio (Kg feed/Kg weight gain)	B 9.007 ± 2.573	A 4.11 ± 0.152	**

The averages with different letters within the same line differ significantly between Them (P < 0.01), N.S :Not significant.**

The results showed that there were significant differences (P<0.05) between the five treatments for the effect of urea treatment and the addition of molasses to the diets for fattening Al-Naimi lambs in all the studied traits except for concentrated feed,the lambs of the fourth treatment (T4: which was from chopped Alfalfa hay stalks treated with urea at a concentration of 6% with the addition of molasses 6%) were significantly superior in their consumption rate of roughage feed (21.98 kg \ lamb), which was provided freely (Ad libitum) on other treatments (T1: control, T3 and T5 urea treatment and the addition of molasses),then followed by T2 (21.5 kg \ lamb) and T5(19.41 kg \ lamb) and T3 (17.2 kg \ lamb), which were significantly similar to each other with T4 and T2, which outperformed the control treatment T1 as well. the reason for this may be due to the effect of the chemical treatment with urea and the addition of molasses together in T4 and the rates specified above , improved from quantities consumption of roughage feed, since urea was a source of non-protein nitrogen , as 80% of the microbial protein production in the rumen is used for growth and reproduction [13]. The urea helped break the bonds between cellulose and hemicellulose,and molasses with a sweet taste as a source of carbohydrates and works to increase the palatability, consequently leading to balance (Synchronization) between the source of nitrogen and energy. While there were no significant differences in the concentrated feed consumed between all the treatments, and it was noted that there were significant differences (p< 0.05) in favor of the lambs of T4(71.91 kg \ lamb), T5 (71.85 kg \ lamb) and T2 (70.79 kg \ lamb), which outperformed other treatments in terms of the total feed consumed. T3 and T1 treatment formed the lowest values, and they were (63.86 and 62.16 kg \ lamb), respectively.

Table (4): Effect of treatment of Alfalfa hay stalks with urea and adding molasses to the diets of the five treatments for fattening Al-Naimi lambs in the rates of dry matter consumption from roughage, concentrated and total feed (kg/lamb) and feed conversion ratio (mean ± standard error)

Traits	Groups					Significant level
	T1	T2	T3	T4	T5	
Roughage feed consumed(Kg)	C 15.53 ± 0.160	A 21.5 ± 1.026	C 17.2 ± 2.698	A 21.98 ±1.944	B 19.41 ± 0.788	*
Concentrated feed consumed(Kg)	46.62 ± 3.576	49.29 ± 0.606	46.48 ± 2.942	49.92 ± 1.449	52.44 ± 1.484	**N.S**

Total feed consumed(Kg)	B 62.15 ± 3.525	A 70.79 ± 1.077	B 63. 86 ± 2.185	A 71.91 ±3.077	A 71.85 ±1.659	*
Feed conversion ratio (Kg feed/Kg weight gain)	A 9.007 ± 2.573	B 3.59 ± 0.123	B 4.54 ± 0.690	B 4.23 ± 0.693	B 4.06 ±0.159	*

The averages with different letters within the same line differ significantly from each other* (P < 0.05), N.S :Not significant.

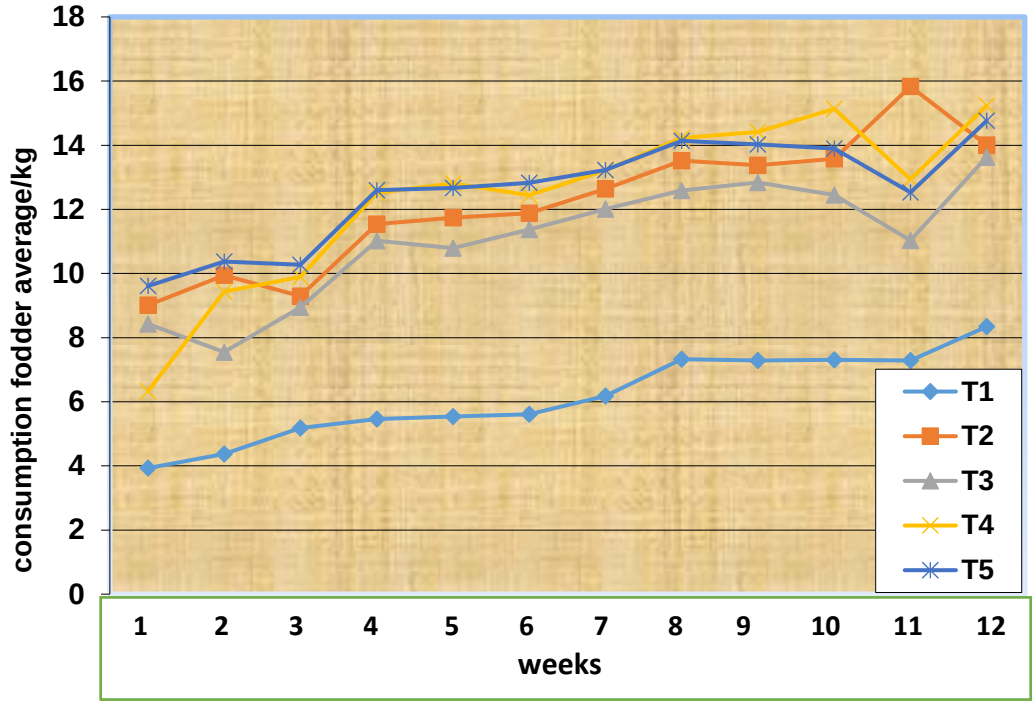

Figure (1): The average weekly feed intake for each treatment in the experiment

As for the traits of feed conversion ratio in lambs, Table 4 shows that there were significant differences (P<0.05) in the feed conversion ratio between the averages among the lambs of the experimental treatments. The lambs of the T5, T4, T3 and T2 treatments, whose treated roughage feed was treated with 4 or 6 % urea with the addition of 6 or 12% molasses, and it was 4.06 and 4. 23 and 4.54 and 3.59 kg of dry matter from the total feed to obtain one kg increase in live weight, respectively, and it was the best among the lambs of T2 (3.59 Kg feed\ Kg weight gain) compared to lambs of the control group (T1: free of treatment and addition) and its value was 9.007 kg of dry matter\ kg weight gain. These results may indicate the efficiency of nutrition and its additives because their values ranged between 3.59 and 9.007, and those percentages that are significantly superior are excellent compared with what was found by [14] as feed conversion ratio of Awassi sheep and their breeds such as Al-Naimi their values

ranged between 5.5 -10.5. These results were in agreement with the findings of [15],when they added urea and molasses to wheat straw, it led to a significant increase (P<0.05) in dry matter and organic matter intake compared to the control diet when feeding Awassi rams. Also, these results are similar to what [16] reported that there are highly significant differences (P< 0.01) in the total intake of dry matter and feed conversion ratio when treatment corn stover (corn residue) with urea 4% or urea 4% with the addition of molasses 10% in feeding Hararg highland sheep, it seems that the improvement in the feed conversion ratio is related to the balanced concentration of nutrients in these treatments and the consequent increase in live weight and thus better feed conversion ratio, as the high levels of energy and protein in these rations led to an improvement daily weight gain and feed conversion ratio [17]. these results agreed with [9] that there is highly significant increase (p< 0.01) in total daily intake of all the different nutrients of the complete different ration (straw ration with concentrated) and feed conversion ratio in Karadi lambs which fed on straw treated with urea 7.17% compared with the untreated, and that the highly significant increase in feed conversion ratio may be due to the improvement the environmental conditions inside the rumen as a result of treatment and it is expected that it was associated with a significant increase in the number of anaerobic bacteria and an increase in the amount of metabolic energy intake, which was reflected in the total daily weight gain and feed conversion ratio ,it may have obtained increase in the number of bacteria which cause by urea supplementation (a protein source for microorganisms) and molasses (a fermentable energy source) and thus a higher intake by increase the digestibility of organic matter and dry matter.(see the graph no.1,shows the weekly consumed the total feed(Kg) by the five treatments)

The results of Table 5 show highly significant differences (P<0.01) for the effect of treatment with urea and the addition of molasses or without it to the Alfalfa hay stalks in the traits of the final weight and the total and daily weight gain (kg) for groups of lambs in the experiment and in favour of the four groups treated with urea and the addition of molasses compared with the control group (without treatment or addition). Moreover, the daily weight gain of Awassi sheep and their breeds, such as Al-Naimi, ranges between 161 to 267 gm, according to age [18], and it is considered the essential goal for the breeder to obtain the highest profit.

Table (5): Effect of treatment Alfalfa hay stalks with urea and adding molasses or without them to Al-Naimi lambs fattening rations in the final weight (kg) and the total and daily weight gains (mean ± standard error)

Traits	Alfalfa hay stalks without treatment or addition (5 lambs)	Alfalfa hay stalks with treatment or addition (20 lambs)	Significant level
Initial weight(kg)	20.5 ± 0.5	20.97 ± 1.29	**N.S**
Final weight(kg)	B 29.30 ± 1.40	A 34.13 ± 0.42	**

Total weight gain(kg)	B 8.80 ± 1.86	A 13.05 ± 0.45	**
Daily weight gain(kg)	B 0.104 ± 0.02	A 0.154 ± 0.01	**

The averages with different letters within the same line differ significantly between them, **(P<0.01), N.S: Not significant.

Table 6, shows the details of this, as it showed the initial weight of the lambs and the effect of the five experimental diets on the final weight and the total and daily weight gain (kg), and we note the convergence of the rates of the initial weights of the groups of lambs, as no significant differences appeared between the five groups, and this indicates the homogeneity in the initial weights among the groups of lambs under study at the beginning of the experiment, also the table showed the effect of treatment Alfalfa hay stalks with treated urea and adding molasses in the rate of final body weight and the rate of total and daily gains (kg), as the results showed highly significant differences (P<0.01) in the final weight and total and daily increases in favor of the fourth group lambs T4 (35.40, 14.78 and 0.175 kg, respectively) compared with control treatment T1 which recorded the lowest values (29.30, 8.80 and 0.104 kg, respectively).Also, T5 and T2 were similar (34.45 and 34.25 kg, respectively), which were similar to T4 and T3 (35.40 and 32.45 kg, respectively). As for the total weight gain, T5 and T2, which amounted to (12.91 and 12.87 kg, respectively) also outperformed the control treatment T1 (8.80 kg), and T3 (11.65 kg) was similar to T5, T4, T2 and T1. In terms of daily weight gain, T5 and T2 (0.153 and 0.153 kg, respectively) also outperformed the control treatment T1 (0.104 kg), while T3, which was (0.134 kg), was similar to T5, T4, T2 and T1.

These results agreed with [19] that there was a highly significant increase (P <0.0001) in final weight and daily gain in a group fed with addition of 40% molasses compared to other groups when feeding young Nubian goats due to increased palatability of molasses, our results also agreed with what was found by [20] that there is a highly significant (P<0.01) in the daily and total weight gain in favor of urea treatment (7.17%) compared with the untreated when replacing treated and untreated yellow corn impurities instead of wheat bran in feeding of Awassi lambs, and agreed with what [21] obtained from a highly significant increase (P<0.01) in the daily weight gain and final weight, it also agreed with [22] where significant differences (p< 0.05) where found in the total and daily weight gains of goats fed on corn residue treated with urea compared with the untreated T1,while it did not agree with [23] as there was no significant difference in the daily gain, total gain and final weight gain.

Table (6): Effect of treatment of Alfalfa hay stalks with urea and adding molasses to the diets of the five treatments for fattening Al-Naimi lambs in the final weight (kg) and the total and daily weight gains (mean ± standard error)

Traits	Groups					Significant level
	T1	T2	T3	T4	T5	
Initial weight (kg)	20.5 ± 0.500	21 ± 0.731	20.8± 0.463	20.62 ± 0.578	21.1 ±0.871	N.S
Final weight (kg)	C 29.30 ± 1.400	AB 34.25 ± 0.490	B 32.45 ± 1.070	A 35.40 ± 0.530	A 34.45 ±0.780	**
Total weight gain (kg)	C 8.80 ± 1.860	AB 12.87 ±0.700	B 11.65± 0.960	A 14.78 ± 0.700	AB12.91 ±0.870	**
Daily weight gain (kg)	B 0.104± 0.020	A 0.153 ± 0.008	AB 0.134 ± 0.010	A 0.175 ± 0.010	A 0.153 ±0.010	**

The averages with different letters within the same line differ significantly between them, **(P<0.01), N.S: Not significant.

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