The Effect of Adding Urea and Slow-Release Urea to Awassi Lambs Rations of Carcass Characteristics and Some Blood Serum Characteristics

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Abstract
In this experiment, 24 awassi lambs were used, aged between 3-4 months and with an average weight of 19.32±605 kg.They were distributed into four groups and fed four diets with similar basic components.The first treatment contained 1% urea, the second treatment 2% slow release urea(SRU)(Minogen), the third treatment 0.5% urea and 1% SRU and the fourth treatment 1% urea and 2% SRU.Data were statistically analyzed using a completely randmized design (CRD), the results indicated that there were no significant differences in the weights of the slaughtered animals, the percentages of dressing, the area of the ocular muscle, the phisical inventory of the three ribs, subcutaneous fat, internal and external slaughter offal weights and the weights of the carcass parts, except the weight of the shoulder and neck, which showed significant differeces($p \leq 0.05$) in their weights in favour of the second treatment compared to the other treatments, the shoulder weight and the neck weight. There were also significant differences ($p \leq 0.05$) in total fat weight and the fat-tail weight in favor of the second treatment compared to the other treatments, the total fat weight and the fat-tail weight. There were also significant differences ($p \leq 0.05$) in the concentration of urea in the blood serum in favor of the fourth treatment compared to the other treatments, the results, also significant differences appeared ($p \leq 0.05$) in the concentration of cholestrol in the blood serum in favor of third treatment compared to the other treatments, and the results, while there were no significant differences in the concentration of total protien, albumin and triglycerides in the blood serum.It was notted that there is positive effect of adding urea and menogen to the diets of awassi lambs in some carcass properties and some blood serum characteristics.

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Keywords: Urea, Menogen, Carcass, Awassi Lambs, Ocular Muscle

Introduction

Livestock plays an important role in increasing national income, by providing various animal products that the consumer needs in his daily food or in his various industries, livestock in iraq constitutes a large part of the national agricultural economy, and has a major role in meeting part of the animal protien needs (Arab Organization for Agricultural Development, 1989).Providing feed is one of the most important problems in animal production, because the feeding costs of any project constitute approximately (60-70)% of the production costs (McDonald *et al*, 2011), blanced nutrition contibutes to reducing production costs due to increased efficiency of food utilization (Montanari *et al*, 2017) [25], through scientific methods in formulating feeds and using nitrogen sources as alternatives to seeds and oilcakes, the prices of wich are very high(Hashem and Tayeb, 2023) [15], and its limited availability, the urea is the cheapest and most widly available, is one of the important sources for increasing the nutritional value of feeds that have low nutritional value(Al-hafez, 1992) [3], because the micro organisms in the rumen can

convert it into bacterial protein (Lima *et al*., 2023) [16]. Meat is a major food item, due to its high nutritional value, as it is an important source of protein and energy in the daily human diet for many peoples of the world, meat fattening projects are considered important pillars of animal production (Kempster *et al*., 1982) [19] and (Dahal, 1987), the rate of meat production is affected by many genetic and environmental factors, and this requires studying these factors and overcoming them throughgood project management and proper feeding systems (Obaid *et al*., 2021).
This study was conducted to determine the effect of adding urea and slow-release urea (SRU) on some blood serum characteristics and carcass characteristics in awassi lambs.

Materials and Methods

This study was conducted in the sheep field of the Technical Agricultural College in Mosul, 24 Awassi lambs were used, aged between 3-4 months, with an average weight of 19.32±0.605 kg, they were distributed into four groups and of 1% to the first treatment (control), minogen at a rate of 2% added to the second treatment, urea 0.5% and minogen 1% to the third treatment, and urea 1% and minogen 2% to the fourth treatment.Table(1) shows the ingredients and chemical composition of experimental diets, the feeds were provided collectively in two meals, the first at 8 am and the second at 4 pm, with water available through the experimentperiod.The experiment lasted 92 days, during wich the weights of the lambs were recorded every two weeks, blood samples were drawn from the lambs four hours after feeding, using a 10 cm^3 medical suringe from the jugular vein, as stated in (Tain *et al*., 1987), then separate the blood serum using a centrifuge at 4000 rpm for 10 minutes, after separating the filtrate, it was stored in 10cm^3 plastic tubes in the refrigerator at -20cº until blood tests were performed, the concentration of total protein, albumin, globulin, cholestrol, triglycerides and urea in the blood serum were estimated, using the ready-male analysis kit manufactured by the french combany (Merieux) according to the method (Burtis and Ashwood, 1999) [8], samples were read using a spectrophotometer (Auto-analyzer spectrophotometer RA-1000, UK).

Table 1: Ingredients and chemical composition of experimental diets

Feed material	T1 1% Urea 0% SRU	T2 0% Urea 2% SRU	T3 0.5% Urea 1% SRU	T4 1% Urea 2% SRU
Barley	57	56	56.5	55
Wheat bran	20	20	20	20
Yellow corn	10	10	10	10
Wheat straw	10	10	10	10
Urea	1	0	0.5	1
SRU(Minogen)	0	2	1	2
Salt	1	1	1	1
Limestone	1	1	1	1

Chemical Composition

DM	90.31	90.20	90.62	90.42
OM	94.17	94.12	94.30	94.23
CP	17.12	17.20	17.18	17.16
Metabolic energy K.cal/kg feed	2.470	2.466	2.454	2.439

Protein and energy were calculated on the basis of dry matter according to Al-Khawaja *et al*., 1978 [6].

Animal Slaughter

After the end of the experimental period, the lambs were deprived of food for 12 hours, the weights of the lambs were recorded immediately before slaughter and these weights were considered final, 12 lambs, three from each treatment, were slaughtered in a regular slaughterhouse, after slaughtering, the hot weight of the carcass was recorded, including the kidneys and their fat according to (Field *et al*., 1963) [14], and the weight of the internal and external slaughter parts and products was also recorded, as well as the weight of the full digestive system to determine the empty body weight to know the net percentage based on the empty weight, the tail-fat was cut and the carcass was cut into two halves, and the left half was cut into main and secondary pieces according to (Dahal, 1987) and (Cuthbertson *et al*., 1972) [10], the thickness of the subcutaneous fat also measured on the 12th rib above the ocular muscle using the (Digital Varniar).
The area of the ocular muscle was measured at the 12th rib of the left side by outlining the muscle boundaries on transparent wax paper and graphite pen, the area was measured using a planimeter device for measuring irregular areas according to the method of (Riley *et al*., 1966). After that, the physical inventory of the carcass was carried out, by separating the three ribs (9-10-11), wich were weighed and frozen at -20cº, the fozen pieces were left successively at oom temperature and a sharp knife was used to separate the muscle, fat and bone tissues from each other, then the three tissues were weighted individually using sensitive balance, with a sensitivity of 1 gm, the percentage of each tissue was calculated.The data were analyzed using a completely randomized design(CRD) as stated in Al-zubaidy and Al-Falahy(2016) [7] and the mathematical model was used:

$$Yij=M+ti+eij$$

Where:
Yij= view value of the studied attribute.
M= Average value.
ti=The effect of treatment represents the effect of urea and SRU.
eij=Random experimental error value.

Duncan's multiple range test (Duncan, 1955) [13] was used to determine the significant differences between the means, the statistical analysis and comparision between the means were conducted using the statistical program SAS (2012) [34].

Results and Discussion

The results in Table (2) did not indicate any differences in the rate of feed consumption provided to the lambs, and the results were close between the four treatments, the results were not statistically analyzed because the feeding was collective for the lambs of each treatment and the amount of feed consumed daily was (1.500, 1.518, 1.540, 1498) kg/head/day, the total amount of feed consumed amounted to (828.00, 837.93, 850.08, 826.89)kg, these results agreed with the results of Mazinani *et al*., (2021) and differed with the results of Al-Jandil(2022) [4].

The results in the same table also indicated that the lowest feed conversion efficiency was in the second treatment, wich amounted to (6.78) kg feed/kg live weight, compared to tho other treatments, which amounted to (7.46, 7.49, 7.65) kg feed/kg live weight, no differences were found between the four transactions, these results agreed with the four transactions, these results agreed with the results of Manju *et al*., (2022) [21] and differed with the results of Santos *et al*., (2022).

Table (2) also did not show any significant differences in the final weight, total weight gain rate, and daily gain amoung the experimental parameters, the result of the final weight (38.08, 39.68, 38.01, 37.50) kg, the total weight gain (18.48, 20.58, 18.87, 18.00) kg, and the daily gain (200.86, 223.69, 205.10, 195.65) gm/day, these results agreed with the results of saro *et al*., (2023) [32] and differed with the results of Ali and Alqutbi (2022) [2].

Tabel 2: Effect of urea and slow-releas urea on feed consumption rate, feed conversion efficiency and weight gain.

Attributes	T1 1%Urea 0%SRU	T2 0%Urea 2%SRU	T3 0.5% Urea 1%SRU	T4 1%Urea 2%SRU
Daily feed consumption kg	1.500	1.518	1.540	1.498
Total feed consumption kg	828.00	837.93	850.08	826.89
Food conversion efficiency kg feed/kg weight	7.46	6.78	7.49	7.65
Intial weight kg	19.60±0.590	19.10±0.675	19.14±0.615	19.50±0.540
Final weight kg	38.08±1.02	39.68±1.32	38.01±0.98	37.50±1.62
Total weight gain kg	18.48±0.590	20.58±0.817	18.87±0.934	18.00±0.831
Daily weight gain gm/day	200.86±0.045	223.69±0.118	205.10±0.036	195.65±0.19

Tabel (3) indicated that there were no significant differences in the hot carcass weight, cold carcass weight, hot weight netting percentage, and cold weight netting percentage, the results for the hot weight were(19.67, 20.75, 19.35, 18.40) kg, cold carcass weight (18.90, 19.85, 18.65, 18.40) kg, the percentage of net weight for hot weight (51.65, 52.29, 50.90, 51.33)% and the percentage of net cold weight was (49.63, 50.25, 49.06, 49.40)%, these results agreed with the results of Mazza (2023) and differed with the results of Manarelli *et al*., (2019) [20].

Tabel 3: Effect of urea and slow-release urea on carcass weights and dressing percentage

Attributes	T1 1% Urea 0%SRU	T2 0%Urea 2%SRU	T3 0.5%Urea 1%SRU	T4 1%Urea 2%SRU
Live weight kg	38.08±1.35	39.68±1.30	38.01±0.94	37.50±0.94
Hot carcass weight kg	19.67±0.86	20.75±0.88	19.35±0.99	19.25±0.74
Hot weight ratio %	51.65±1.01	52.29±0.83	50.90±0.91	51.33±0.82
Cold carcass weight kg	18.90±0.93	19.85±0.64	18.65±1.05	18.40±0.73
Cold weight ratio %	49.63±1.23	50.25±0.95	49.06±0.89	49.40±0.67

The results of table (4) showed no significant differences in the weigt of the three ribs, phisical inventory and ocular muscle area between the experimental treatments, the weight of the three ribs was(0.849, 0.792, 0.870, 0.784) kg and the highest weight was in the second treatment, the results of the physical inventory of muscle (38.76, 40.03, 39.45, 38.92)%, fat (33.86, 34.51, 33.94, 33.78)% and bone(24.55, 23.89, 24.31, 24.11)%, we note that the highest percentage of muscle (meat) and fat were in the second treatment, and the highest percentage of bone was in the first treatment, these results were agreed with the results of Saro (2019) and did not agree with the results of Al-Dahal(2021) [1], table(4) also showed that there were no significant differences in the area of the ocular muscle between the four experimental treatments, and the results were(13.37, 13.65, 13.41, 14.03) cm², these results agreed with the results of Tayeb *et al*., (2022) and differed with Al-Dahal (2021) [1].

The results in table(5) indicated the emergence of significant differences ($p \leq 0.05$) in the weight of total fat, the weight of the tail-fat, the weight of kidney fat in favor of the second treatment compared to the other treatments, the total fat weight was (4.507, 5.501, 4.004, 4.343)kg, tail-fat weight was (3.45, 4.09, 2.85, 3.19)kg, the mesenteric fat weight was (0.785, 1.130, 0.916, 0.895)kg and the kidney fat weight was (0.165, 0.192, 0.173, 0.098)kg.

Table 4: Effect of urea and slow-release urea on the physical inventory and the area of ocular muscle.

Attributes	T1 1%Urea 0%SRU	T2 0%Urea 2%SRU	T3 0.5%Urea 1%SRU	T4 1%Urea 2%SRU
Weight of the three ribs kg	0.849±0.112	0.792±0.120	0.870±0.151	0.784±0.073
Muscle(meat) percentage %	38.76±1.087	40.03±0.795	39.45±1.031	38.92±1.251
Fat percentage %	33.86±1.013	34.51±1.214	33.94±1.210	33.78±0.933
Bone percentage %	24.55±2.011	23.89±1.415	24.31±1.630	24.11±1.439
Area of ocular muscle %	13.37±1.03	13.65±0.94	13.41±0.71	14.03±1.12

Table (5) also showed the emergence of significant differences ($p \leq 0.05$) in the weight of heart fat in favor of the fourth treatment, and the results were (0.117, 0.089, 0.067, 0.160) kg, the results agreed with results of Pereira *et al*., (2018) [27] and did not agree with Campos *et al*., (2019) [9].

Also the table(5) showed, that there were no significant differences in the thickness of subcutaneous fat, and the resultes were (2.75, 3.00, 3.25, 3.57)mm, these results agreed with Jawad *et al*., (2020) and differed with Santos *et al*., (2021) [31].

Table 5: Effect of urea and slow-release urea on the weights of separated fat, total fat, and subcutaneous fat thickness.

Attributes	T1 1%Urea 0%SRU	T2 0%Urea 2%SRU	T3 0.5%Urea 1%SRU	T4 1%Urea 2%SRU
Tail fat weight kg	3.45 AB±0.246	4.09 A±0.122	2.85 B±0.173	3.19 AB±0.139
Mensenteric fat weight kg	0.785 C±0.126	1.130 A±0.117	0.916 B±0.142	0.895 B±0.087
Heart fat weight kg	0.117 AB±0.031	0.089 B±0.012	0.067 B±0.028	0.160 A±0.072
Kidney fat weight kg	0.165 AB±0.026	0.192 A±0.017	0.173 AB±0.023	0.098 B±0.016
Total fat weight kg	4.507 B±0.210	5.501 A±0.315	4.004 BC±0.217	4.343 B±0.213
Subcutaneous fat mm	2.75±0.165	3.00±0.233	3.25±0.230	3.57±0.115

Different letters horizontally indicate significant differences at the probability level($p \leq 0.05$).

The Table (6) shows no significant differences in the weights of some main and secondary cuts of the carcass between different treatments, the leg weight was (3.075, 2.950, 2.890, 2.925) kg, loin weight (0.850, 0.925, 0.870, 0.890) kg, rack weight (2.250, 2.100, 1.890, 1.995) kg, flank weight (0.675, 0.700, 0.685, 0.690) kg and shank weight (0.530, 0.550, 0.485, 0.465) kg, while significant differences ($p \leq 0.05$) appeared in shoulder weight and neck weight in favor of the second treatment compared to the other treatments, and the results for shoulder weight reached (1.550, 1.750, 1.410, 1.465) kg and neck weight (0.815, 1.150, 0.800, 0.785) kg, these results agreed with Vicente *et al*., (2022) [37] and differed with Campos *et al*., (2019) [9].

Table 6: Effect of urea and slow-release urea on the weights of main and secondary pieces

Attributes	T1 1%Urea 0%SRU	T2 0%Urea 2%SRU	T3 0.5%Urea 1%SRU	T4 1%Urea 2%SRU
Leg weight kg	3.075±0.026	2.950±0.133	2.890±0.112	2.925±0.078
Shoulder weight kg	1.550 AB±0.102	1.750 A±0.062	1.410 B±0.055	1.465 B±0.094
Loin weight kg	0.850±0.054	0.925±0.043	0.870±0.037	0.890±0.058
Rack weight kg	2.250±0.054	2.100±0.082	1.980±0.164	1.995±0.098
Flank weight kg	0.675±0.081	0.700±0.065	0.685±0.034	0.690±0.027
Shank weight kg	0.530±0.042	0.550±0.026	0.485±0.068	0.465±0.037
Neck weight kg	0.815 B±0.072	1.150 A±0.043	0.800 B±0.081	0.785 B±0.067

Different Letters Horizontally Indicate Significant Differences at the Probability Level ($p \leq 0.05$).

Table (7) indicated that there were no significant differences in some of the edible carcass products between the four treatments, the heart weight was (0.170, 0.178, 0.181, 0.192) kg, the liver weight was (0.429, 0.560, 0.544, 0.517) kg, the kidney weight was (0.152, 0.146, 0.158, 0.164) kg, the testicle weight was (0.237, 0.221, 0.219, 0.227) kg, and the lung weight was (0.465, 0.515, 0.449, 0.462) kg, the results agreed with Dayani *et al*., (2011) [12] and did not agree with Al-Dahal (2021) [1].

Table 7: Effect of urea and slow-release urea on edible carcass prouducts.0.082

Attributes	T1 1% Urea 0%SRU	T2 0%Urea 2%SRU	T3 0.5%Urea 1%SRU	T4 1%Urea 2%SRU
Heart weight kg	0.170±0.035	0.178±0.042	0.181±0.031	0.192±0.052
Liver weight kg	0.429±0.043	0.560±0.030	0.544±0.041	0.517±0.076
Kidney weight kg	0.152±0.037	0.146±0.034	0.158±0.028	0.164±0.046
Testicle weight kg	0.237±0.092	0.221±0.083	0.219±0.061	0.227±0.041
Lungs weight kg	0.465±0.030	0.515±0.092	0.449±0.044	0.462±0.061

The results in Table (8) showed no significant differences in the non edible carcass products between the different experimental treatments, the weight of the full rumen was (2.620, 2.585, 2.645, 3.055) kg, the weight of the empty rumen was (1.230, 1.221, 1.197, 1.185) kg, the weight of the head was (1.795, 1.830, 1.912, 1.800) kg, the weight of the feet was (0.932, 0.927, 0.890, 0.911) kg, and the weight of the skin was (3.850, 4.075, 4.129, 3.980) kg, these results agreed with Rozanski *et al*., (2017) [29] and disagreed with Campos *et al*., (2019) [9].

Table 8: Effect of urea and slow-elease urea on inedible carcass

Attributes	T1 1% Urea 0%SRU	T2 0%Urea 2%SRU	T3 0.5%Urea 1%SRU	T4 1%Urea 2%SRU
Full rumen weight kg	2.260±0.086	2.585±0.163	2.645±0.235	3.055±0.113
Empty rumen weight kg	1.230±0.127	1.221±0.163	1.197±0.146	1.185±0.139
Head weight kg	1.795±0.121	1.830±0.147	1.912±0.114	1.800±0.151
Feet weight kg	0.932±0.057	0.927±0.072	0.890±0.034	0.911±0.052
Skin weight kg	3.850±0.217	4.075±0.320	4.129±0.251	3.980±0.231

Table(9) showed in its results that there were no significant differences in the concentration of total protien, albumin and triglycerides in the blood serum between the four treatments, the results of total protien (7.13, 7.27, 7.43.7.49)gm/100ml, albumin (3.52, 3.49, 3.56, 3.42) gm/100ml and triglycerides (37.93, 39.33, 38.28, 43.86) mg/100ml, these results agreed with Hashem and Tayeb (2023) [15] while they did not agree with Melo *et al*., (2021) [24]. Table (9) also showed significant differences ($p \leq 0.05$) in the concentration of urea in the blood serumin favor of the fourth treatment compaed to the other treatments and the results reached (36.17, 44, 03, 43.50, 48.70)mg/100 ml, these results agreed with the results of Saro *et al*., (2023) [32] and differed from the results of Singer (2024) [35], table(9) also showed the emergence of significant differences ($p \leq 0.05$) in the concentation of cholestrol in the blood serum in favor of the third treatment compared to the different experimental treatments, and the results reached (60.87, 63.92, 79.93, 72.23) mg/100ml, these results agreed with the results of Safavi and Chaji (2022) and did not agree with the results of Al-Khafaf (2024) [5].

Attributes	T1 1%Urea 0%SRU	T2 0%Urea 2%SRU	T3 0.5%Urea 1%SRU	T4 1%Urea 2%SRU
Total protein gm/100ml	7.13±0.120	7.27±0.135	7.43±0.172	7.49±0.131
Albumin gm/100ml	3.52±0.049	3.49±0.082	3.56±0.097	3.42±0.089
Urea mg/100ml	36.17 B±1.052	44.03 AB±1.251	43.50 AB±1.057	48.70 A±1.305
Cholestrol mg/100ml	60.87 B±3.18	63.92 B±2.39	79.93 A±2.91	72.23 AB±3.14
Triglycerides mg/100ml	37.93±0.92	39.33±1.25	38.28±1.23	43.86±1.29

Different letters horizontally indicate significant differences at the probability level ($p \leq 0.05$).

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