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STUDY OF THE GROWTH AND CARCASS COMPOSITION OF AWASSI LAMBS FED WITH ADDING PROTECTED METHIONINE

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ABSTRACT

This study was conducted in the animal field of animal production department at college of agriculture and forestry-Mosul university to investigate the effect of added protected methionine in Awassi lambs performance and some blood parameters, using 10 Awassi lambs average body weight 33.18 ± 0.52 kg and aged 8-9 months, lambs were divided into two groups, first group was control fed on standard ration without additive while second group fed with additive 5 g/lamb/day of protected methionine. Results were indicated that feed intake was higher in additive group 1113 g/lamb/day as compared control 1006 g/lamb daily, final body weight and empty body weight were significantly higher ($p \leq 0.05$) in additive group 48.00 and 44.77 kg as compared control 46.10 and 41.65 kg, also carcass weight was higher ($p \leq 0.05$) to 27.17 kg in second group as compared control 24.88 kg, added the protected methionine to the feed intake led to significant increase ($p \leq 0.05$) in total fat weight 5.02 kg as compared control 4.17 kg. Results of blood parameters showed that feeding with protected methionine led to significant ($p \leq 0.05$) increase in serum glucose 83.33 mg/dl and urea 8.70 mmol/l as compared with feeding without additive in control group which were 66.00 mg/dl and 6.93 mmol/l.

Keywords: Protected amino acid, performance

Introduction

Most protein intake is digested in the rumen to produce amino acids as an intermediate compounds which then are used either to synthesis microbial protein or will be transformed into a ketone acids and ammonia, theses end products are then enters into a different metabolic pathways (Zadeh *et al.,* 2013), this may reduce the efficiency utilization of the essential amino acids (Abbasi *et al.,* 2019), and animal performance (Hasan and Hasan, 2009) due that it is advised in modern feeding programs to use an abundant amount of ruminal digestive protein which shall result in using much more amino acids in synthesis microbial protein, excess amino acids in this feed program will be absorbed by the small intestine to provide more amounts of essential amino acids which play a major role in the productive and physiological performance during specific periods (Kaufman *et al.,* 2018; Savari *et al.,* 2018). Methionine is considered one of most important essential amino acids, due to its great role in the metabolic pathways, such as play as a donor of methyl group, starting point in the formation and building of protein within the living cells and the metabolism of fat in the liver(Sun *et al.,* 2016, Wingfield, 2018), most of feedstuffs used in animal feeding like barley, yellow corn and soybean meal are low in their content of methionine (NRC, 2001), methionine percentage in the microbial protein formed in the rumen is 2% which is a little higher than its percentage in the body tissue which is estimated to be 1.8 % (MacRae *et al.,* 1993). So many studies have used a lot of different sources of rumen undegradable protein to provide more amounts of protected amino acids like methionine, lysine and arginine. The previous studies which tracked the effect of adding protected methionine to animal rations had varied in their results.The current study was proposed to evaluate the effect of added protected methionine to the feed intake on growth, carcass characteristics and some blood parameters in local Awassi lambs.

Material and Methods

This study was conducted in the animal field of the college of Agriculture and Forestry – University of Mosul-Iraq, in the period from 1/7/2019 to 1/10/2019. Ten Awassi lambs were used, there ages were 8-9 months, and average body weights 33.18 ± 0.52, lambs were divided into two groups, first group was f ed on standard ration without additive (control) while the second group fed with additive 5 gm/lamb/day of protected methionine (MetaSmart, manufactured by Kemin company, Poland), lambs in both groups were fed ad-libitum two times daily, the first meal was given at 8:00 am while the second meal was given at 4:00 pm, lambs had provided with clean water and mineral salt blocks throughout the period of study, blood samples were taken at the last week of study from the Jugular vein, Serum was separated using centrifuge at (3000r /min) for 20 minutes, serum samples were analyzed to estimate lipid profile, total blood protein, glucose and urea by (Biolab kit, France) using spectrophotometer. At the end of the study lambs were fasted for 12 hours then slaughtered, hot carcass, carcass edible parts and fats weights were recorded, also weight of full and empty digestive tract was recorded to measure dressing percentage based on empty body weight. Carcasses was split into two halves, eye-muscle area and

subcutaneous fat were measured from the left side of the carcass between the two ribs 12th and 13th according (Yarali and Yilmaz 2014). Data were statistically analyzed by computer using complete randomized design with general linear model (SAS, 2001) and the significance of differences between means was determined by (Duncan, 1955).

Table 1 : Components and chemical composition of standard ration.

Feedstuffs	Percentage
ground barley grain	70
wheat bran	18
soybean meal	7
wheat straw	3.5
Urea	0.5
Salt	0.5
Limestone	0.5
Chemical analysis % of dry matter	
Dry matter	91.36
Organic matter	90.70
Crud protein	14.39
Ether extract	2.32
Crud fiber	7.96
Metabolizable energy Mj / kg	10.46

Chemical composition were measured laboratory according (AOAC, 2000), energy was calculated according (Al-Khawaja *et al.,* 1978)

Results and Discussion

Results from Table 2 showed that final and empty body weights were significantly higher (P≤ 0.05) in the second group which was treated by adding 5 g/lamb/day of protected methionine which was 4.8 ± 0.06 and 44.77 ± 0.73 kg respectively in comparison with the first group (control) which was 46.10 ± 0.36 and 41.67 ± 0.43 kg respectively, While no significant differences were found between the groups in average total gain 13.62 ± 0.53 and 14.12 ± 0.76 kg and daily gain 151.00 ± 5.90 and 156.80 ± 5.31 g, it was observed that adding protected methionine led to an increase in feed intake to 1.113 kg/day compared to the control group 1.006 kg/day and was correlated with a decrease in feed conversion efficiency in the second group 7.10 kg feed per kg weight gain as compared with control group 6.65 kg feed/ kg weight gain, as this increase in feed intake was exploited in increase fat deposition in the body as shown in Table 4. These results was agree with the results of Alharthi *et al.,* were showed an increase in final weight of calves when protected amino acid methionine was added to the ration of their mothers, but these results did not agree with the results found by Abdulrahman was concluded that feeding Awassi lambs on methionine 5 g/lamb daily led to a significant increase in average total weight gain, Obeidat *et al.,* Rodriguz-Gurerro *et al.* and Prado *et al.,* were mentioned that feeding lambs on a ration with added protected methionine did not lead to significant differences in final average weight, daily weight gain and feed conversion efficiency.

Results in Table 3 indicate a significant increase (p≤ 0.05) in hot carcass weight 27.17 ± 0.53 kg in second group compared with first group (control) 24.88 ± 0.80 kg, Dressing percentage was higher but not significantly in the second group 56.65 ± 1.26 and 60.69 ± 1.91 % relative to the weight before slaughtering or empty body weight compared to the first group(control) 54.04 ± 1.95 and 58.80 ± 0.218 respectively, this is due to the significant increase in hot carcass weight. Subcutaneous fat was nearest between the two groups 0.72 ± 0.03 and 0.77 ± 0.05 cm, eye muscle area lowered in second group to 16.68 ± 0.67 cm^2 compared with18.58 ± 0.48 cm^2 in control group but these differences did not reach to significance this may be due to the higher fat deposit which inversely correlation with the eye muscle area (Jacob and Calnan 2018, Rodrigues-Guerrero). Pardo *et al.,* noted that protected methionine had no significant effect on hot carcass weight lambs, Boraei *et al.* found insignificant improve in hot carcass weight and dressing percentage in growing buffalo calves fed with different levels of protected methionine, Abdulrahman (2) clarified that feeding awassi lambs with protected methionine led to a significant increase in subcutaneous fat thickness but not in dressing percentage, while Obeidat *et al.,* (16) did not find significant effect when adding different percentages of protected methionine on carcass weight, dressing percentage, subcutaneous fat thickness and eye muscle area.

Table 4 showed the effect of adding methionine to the ration of Awassi lambs on carcass fat, Tail Fat weight increased significantly (P≤ 0.05) as it reached 4.34kg when compared with the control group, and this led to a significant (P≤ 0.05) increase in total carcass fat 5.02 kg compared with control which was 4.17kg, while no significant differences were observed between both groups in the weight of mesenteric fat weight 0.48, 0.49 kg, kidney fat 0.18, 0.15 kg and heart fat 0.07, 0.07 kg respectively, total fat percentage of the carcass increased 18.66% compared to control which was 17.05% but not significant. Studies were showed that protected methionine had an important role in the fat synthesis as it works in increase the formation of cholesterol through effecting the secretion of glucagon (Bobe *et al.,* 2003a) and level of blood glucose as a result of insulin decrease, and this was achieved in this study (table 6). These results may not agree with the results obtained by Obeidat *et al.,* they did not significant effect in carcass fat when adding methionine to the rations of Awassi lambs.

Results in Table 5 were indicated a significant increase (P≤ 0.05) in the weight of testis 0.38 kg and a significant decrease in kidneys 0.11 kg when lambs fed with addition protected methionine 5 g/lamb/day compared to control 0.290 kg and 0,15 kg respectively, but there were no significant differences in the weights of spleen 0.08 and 0.08 kg, Heart 0.22 and 0.22 kg, Liver 0.67 and 0.61 kg, Lungs 0.72 and 0.65 kg and weights of all edible parts 2.142, 2,048 kg respectively. Abdulrahman showed that by adding 5gm/head/day of protected methionine to the rations of Awassi lambs did not significantly affect in the weights of liver and kidneys but significantly increase the weights of the Heart, Spleen and Lungs, while Obeidat *et al.,* founds no significant differences in the weights of edible parts when adding different percentages of protected methionine to the rations.

The results from Table 6 showed increased in the concentrations of total protein 7.30 g/100 dl and Albumin 4,46 g/100 dl in additive group as compared to the control group 6.73, 3.86 g/ 100 dl respectively, while globulin concentrations were nearest 2.87, 2.83 g/100 dl respectively, blood glucose significantly increased (P≤ 0.05) when the protected methionine was added to the ration of Awassi lambs as it reached 83.33 mg/100 dl compared to the control 66.00 mg/100 dl, also urea was higher (P≤ 0.05) in the

second group 8.70 mmol/L compared with the control 6.93 mmol/L, significant differences were observed in the concentrations of : cholesterol 82.00 and 83.33 mg/100 dl, triglycerides 52.33 and 56.33 mg/100 dl, high density lipoprotein 34.66 and 39.33 mg/100ml, Low density lipoprotein 14.00 and 15.66 mg/100 dl and very low density lipoprotein 10.00 and 11.00 mg/100ml respectively, although there is a trend to be higher in additive group as compared control group. From the result of blood glucose and urea it seems that there was an excess of amino acids or high availability of amino acids which was used in the formation of glucose and urea in the blood. also the increment in glucose concentration in additive group may be useful in formation fat because methionine is considered to be a donor of methyl group that stimulate cholesterol synthesis and this may indicate that the animals in this study were in a good state and did not suffer from shortage of essential amino acids. This results were agreed with results obtained by Movalia *et al.* and Rodriguz-Gurerro *et al.* they are noted a significant increase in the concentrations of blood glucose and urea when adding protected amino acids to the rations, so that Boraei *et al.* founds that feeding different levels of protected methionine caused to significant increase in blood total protein, albumin, and globulin with exception urea concentration was not significant, Abdulrahaman observed significant increase in serum cholesterol but not in glucose when Awassi lambs fed with protected methionine as compared control, Abdulrahaman had no significant effect in serum glucose, cholesterol, albumin and total protein in Shami kids fed with supplement protected methionine than control. but these results did not agree with those obtained by, Singh *et al.* they did not find significant dereferences in the concentrations of blood glucose and urea as a result of added protected methionine in rations.

In conclusion when protected methionine is added to the ration of Awassi lambs aged 8-9 months had no significant effect in daily and total gain this may be related to the shift feed intake towered increase fat metabolites in serum, fat deposition in the body and carcass total fat which led to lower feed conversion ratio, also heat stress may cause a decrease in feed intake and daily gain as compared to the average of Awassi strain.

Table 2 : Effect of protected methionine in lambs growth and feed conversion ratio.

Traits	First group (control)	Second group (additive)
Initial weight. Kg	32.50 ± 0.82	33.85 ± 0.57
Final weight. kg	46.10 ± 0.36 B	48.00 ± 0.68 A
Empty Body weight. kg	41.67 ± 0.34 B	44.77 ± 0.73 A
Total gain. Kg	13.62 ± 0.53	14.12 ± 0.76
Daily gain g/day	151.00 ± 5.90	156.80 ± 5.31
F.C. R. kg feed/ kg gain	6.65 ± 0.26	7.10 ± 0.34
Feed Intake kg/day	1.006	1.113

Values in the same raw with different superscripts differ ($p<0.05$).
F.C.R.= feed conversion ratio.

Table 3 : Effect of protected methionine in some carcass traits.

Traits	First group (control)	Second group (additive)
Hot Carcass kg.	24.88 ± 0.80 B	27.17 ± 0.53 A
Dressing Percentage % (Hot carcass weight)	54.04 ± 1.95	56.65 ± 1.26
Dressing Percentage % (Empty body weight)	59.80 ± 2.18	60.69 ± 0.91
Fat thickness cm	0.72 ± 0.05	0.77 ± 0.03
Eye muscle area cm^2	18.58 ± 0.48	16.68 ± 0.67

Values in the same raw with different superscripts differ ($p<0.05$).

Table 4 : Effect of protected methionine in carcass fats.

Traits	First group (control)	Second group (additive)
Tail Fat kg.	3.14 ± 0.24 B	4.34 ± 0.03 A
Mesenteric Fat kg	0.48 ± 0.04	0.49 ± 0.01
Kidney fat kg	0.18 ± 0.01	0.15 ± 0.01
Heart Fat kg	0.07 ± 0.00	0.07 ± 0.01
Total fats kg.	4.17 ±0.27 B	5.02 ± 0.05 A
Total Fat of Carcass %	17.05 ± 0.44	18.66 ± 0.44

Values in the same raw with different superscripts differ ($p<0.05$).

Table 5 : Effect of protected methionine in edible carcass parts.

Traits	First group (control)	Second group (additive)
Testes weight kg.	0.29 ± 0.02 B	0.38 ± 0.02 A
Kidneys weight kg.	0.15 ± 0.00 A	0.11 ± 0.00 B
Spleen weight kg.	0.08 ± 0.00	0.08 ± 0.00
Heart weight kg.	0.24 ± 0.00	0.22 ± 0.01
Liver weight kg.	0.67 ± 0.02	0.61 ± 0.02
Lungs weight kg.	0.72 ± 0.07	0.65 ± 0.04
Total edible parts weight. kg.	2.142 ± 0.09	2.048 ± 0.04

Values in the same raw with different superscripts differ ($p<0.05$).

Table 6 : Effect of protected methionine in serum metabolites.

Traits	First group (control)	Second group (additive)
Total Protein g/dl	6.73 ± 0.12	7.30 ± 0.17
Albumin g/dl	3.86 ± 0.37	4.46 ± 0.12
Globulin g/dl	2.87 ± 0.42	2.83 ± 0.23
Glucose mg/dl	66.00 ± 3.05 B	83.33 ± 3.33 A
Urea mmol/dl	6.93 ± 0.31 B	8.70 ± 0.26 A
Cholesterol mg/dl	82.00 ± 6.24	83.33 ± 4.91
Triglyceride mg/dl	52.33 ± 3.17	56.33 ± 1.85
High density lipoprotein mg/dl	34.66 ± 1.45	39.33 ± 0.88
Low density lipoprotein mg/dl	14.00 ± 1.52	15.66 ± 1.20
Very low density lipoprotein mg/dl	10.00 ± 0.57	11.00 ± 1.00

Values in the same raw with different superscripts differ ($p<0.05$).

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