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IMPACT OF PROTECTED METHIONINE AND LYSINE ON BODY WEIGHTS DURING PREGNANCY, LACTATION PERIODS AND SOME INDICATORS OF PRODUCTIVITY AND QUALITY OF WOOL IN AWASSI EWES

H. W. Kasim[1] O. D. Mohammed S. Y. Abdul-Rahman
Anim. Prod. Dept. College of Agric. & Forestry , University of Mosul
dr.omaralmallah@uomosul.edu.iq

ABSTRACT

To evaluate the effect of protected methionine and lysine in the weights of ewes, their lamb's and wool growth . This study was conducted for the period from 1/5/2018 until 1/5/2019 in Bayoubakht area 20 km north of Mosul, in a private farm, using 16 pregnant Awassi ewes with average body weight 49.07±0.85 and aged 2-3 years. Ewes were divided into two groups, fed with a restricted amount of 1.5 kg per ewe daily of standard ration without supplement in a control group, or ration supplemented with protected methionine 2.5g and lysine 2.5g per ewe daily in PRML group. Results were revealed that feeding with protected amino acids had no significant effects in ewes body weight during stages of pregnancy and milk production, but led to a significant ($p \leq 0.05$) increase in lambs weight in the second and third month after birth (16.60 and 18.42 kg) and total weight gain 14.11 kg as compared with Control 12.90, 14.28 kg and 9.57 kg respectively, as well as significant ($p \leq 0.05$) increase was noted in wool fleece in PRML group 2.16 kg as compared with C ontrol group 1.89 kg, also average wool tress length and fiber length was improved when ewes fed with protected methionine and lysine by a ratio of 24.02 and 21.99% respectively as compared with the control. In conclusion, supplementation of ewes ration with protected methionine and lysine during pregnancy and lactating stages improve the growth performance of lambs, wool production, and characteristics.

Keywords : protected amino acids , body weight , wool growth .
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INTRODUCTION

Providing ruminants with the appropriate needs of nutritional compounds especially energy and protein may not be easy with many influencing factors such as the availability of suitable feed materials, physiological state of the animals, quantity and type of production, and other factors. The amino acids that available for absorption in the small intestine from feed and microbial protein are sufficient for the animals growth, but they are limited to growth when the animals have a high growth rate in crossbreeding and young animals (Anonymous, 2006), this is due to the low efficiency(50-59%) of using amino acids for growth or weight gain ranging from. In this case, the protein content

[1] The research is part of the Ph.D. thesis of the first author.

in the feed should be increase preferably of rumen undegradable protein sources to provide the needs of essential amino acids but this increase in protein may be associated with increased energy need to achieve the balance between energy and protein and this may be one of the important reasons for the difference in previous studies responses to undegradable protein or amino acids supplementation (Badawy and Ramadan, 2018). Also, type of production may require special needs of amino acids that exceed than other tissues of the body such as wool which require for growth a high amount of cysteine, methionine, and tyrosine. This was very clear when we notice that cysteine reaches 10% in about 20-40% of wool fiber, and tyrosine reach 1-12% in about 10% of wool fiber, so the needs of protein for wool growth is higher than energy and since the most of the feed used in ruminant feeding contain a proportion of cysteine ranges between 2-5% (Reis , 1979 and Mac Rae *et al*, 1993), so that the addition of cysteine as a supplement to feed provide a significant increase in the growth of wool, also methionine may acts as a source of the formation of the amino acid cysteine through the metabolic pathway. The current study was carried out to evaluate the impact of ration supplementation with protected methionine and lysine on growth performance and wool production and characteristics of different physiological stages of pregnancy and lactation.

MATERIAL AND METHODS

This study was conducted in the Bayoubakht area north of Mosul, 20 km in a private farm, using 16 pregnant local Awassi ewes average body weight (49.07±0.85) and aged 2-3 years. Ewes were divided into two groups and fed with restricted amount 1.5 kg per ewe daily of standard ration (Table 1), as well as grazing for 4-6 hours daily on artificial pasture, ewes were fed in the first group without supplement (Control) while ewes in the second group were fed with supplement protected amino acids methionine 2.5g and lysine 2.5g per ewe daily throughout the study from 1/5/2018 until 1/5/2019 which included various physiological stages (pregnancy and lactation), body weights were measured at different periods, as well as the weights of the newborn lambs at birth until weaning. Also, at the beginning of the study period ewes were sheared, the weight of the wool fleeces were recorded and a samples of wool were taken from the loin region about 10 $cm^2$of the right side between the 11^{th} and 12^{th} ribs according to (Gifford , 1989 and Taddeo *et al.,* 2000). wool samples were carefully weighed using sensitive scale, wash thoroughly with hot water 50-60 Cº using detergents for three minutes to remove dirt and dust, then washed thoroughly with water and left for 24 hours to dry, samples were washed again with gasoline for three minutes to remove the fatty materials and left to dry for 24 hours then weighed to calculate clean wool ratio, as well three tress of wool were taken randomly from each wool sample to measure their length using a ruler according to (Von bergen , 1963) fiber diameter was measured in the general company for textile industries laboratories using airflow method (Andrews *et al.*, 1987) , at the end of the study 1/5/2019, ewes were sheared again and samples were taken and analyzed using the previous

methods .The results were analyzed statistically using the complete random design (Anonymous, 2001), differences treatment mean was determined Duncan's multiple range test (1955).

Table (1) Ingredient and chemical composition of standard ration.

Ingredients	%	Chemical composition %	
Barley grain	70	Dry matter	92.43
wheat bran	21	Organic matter	93.65
Wheat straw	7	Crud protein	13.74
Urea	1	Crud fiber	9.59
Salt	0.5	Ether extract	1.72
Limestone	0.5	Metabolizable energy kcal / kg feed	2445

Chemical composition were estimated according (Anonymous 2002).
Metabolizable energy calculated from Alkhawaja *et al* (1978).

RESULTS AND DISCUSSION

Results in Table (2) revealed that there were no significant differences in the initial body weight (ewes weight at mating) between control 49.45 kg and PRML group 48.69 kg, also a non-significant differences were noticed along the three stages of pregnancy till lambing time, the average ewes body weight at lambing was 54.78 kg for control and 55.28 for PRML group. Table (2) also showed that the addition of protected methionine and lysine to ewes ration help the ewe to maintain its weight relatively during lactation periods as compared with control, ewes in the control group lost 7.43 kg (13.5%) of weight, while the ewes in PRML group lost only 3.14 kg (5.6%) along the lactation period from lambing till weaning of lambs. The addition of protected methionine and lysine in the second group may have been an appropriate source for the synthesis milk protein in mammary gland or glucose in the liver by gluconeogenesis especially during early stage of lactation, which led to decrease body tissues mobilization for support the requirements of milk production and prevent lowering body weight as it in the control group (Oldham, 1994 ; Kim *et al.*, 2001c), this result was agreed with Almallah *et al* (2018) in ewes and Almallah *et al.,* (2018) in Shami goats, they found that feeding protected protein in late gestation had no significant effect in body weight, also (Obeidat *et al* 2008 , Flores *et al.*, 2009 , Abdelrahman, 2013 and Al-Qaisi and Titi, 2014) they did not found significant improved in body weight as a result for the supplement protected methionine and lysine during lactation, but Lynch et al (1991) noted significant increase in body weight when crossbreed blackface ewes and their lambs fed with protected methionine and lysine .

Results in Table (3) showed that there is no significant differences in lambs weights at birth at the 1st month of lactation period between the control group (4.30 kg and 10.02 kg) and PRML treated group (4.36 kg and 11.83 kg) respectively. The differences in lambs weights became evident with the progress of lactation period, so that lambs weights of PRML group was significantly ($p \leq 0.05$) higher than lambs weight of control group at the end of

2nd and 3rd month of lactation (16.60 kg and 18.42 kg) as compared control group (12.90 kg and 14.28 kg), as well as the total weights gain in PRML group 14.11 kg was significantly ($p \leq 0.05$) higher than control 9.57 kg. the reason for this increase in lambs weights may not related to milk yield of ewes because it was close in the two groups 422 and 455 g/day respectively (Kasim *et al* 2019) but may be due to the presence of lambs with their dams and fed with protected amino acids . It can be noted that methionine and lysine are considered to be amino acids specific for growth in growing lambs (Matras *et al* , 1999), this result may agree with Lynch *et al.*, (1991) they found significant improve in lambs fed with their dams with protected methionine and lysine, Flores *et al.,* (2009) illustrated that feeding Sanin goat kids with protected methionine for 30 days had no significant also, Abdelrahman (2013) and Al-Qaisi and Titi (2014) noted that Shami goats kids weight were not affected significantly when fed with protected methionine a compared control.

In regard to wool growth result in the table (4) revealed that there is no significant differences in fleece weight and characteristics in control group at the beginning 1/5/2018 and the end of the experiment 1/5/2019, meanwhile there is a significant ($p \leq 0.05$) differences in the diameter if wool fiber at the end of experiment (31.22 micron) as compared with the beginning of the experiment (28.13 micron) at the PRML treated group. when we compared between the results of the control and PRML treated groups at the end of experiment (1/5/2019), the result of table (5) reveled that PRML treatment improve most of the wool characteristics and the improvement reached to the significant ($p \leq 0.05$) in fleece weight (2.16 kg) as compared control (1.89 kg). his results were consistent with the findings of (Reis, 1991, Stephenson *et al*. 1990, Goetzee *et al*. 1995 and Hynd *et al*., 2015) they indicated that methionine had an important role in improving wool production, Wyrostek *et al*., (2019) they indicated that the feeding merino ewes by adding zinc-methionine led to a significant improvement in the length of the wool tress and the diameter of the fiber, this is what also got by Ramadan *et al*., (2017) when they fed ewes with protected methionine, while the result was not consistent with the results obtained by Baldwin *et al*., (1995) they did not found significant effect for the addition protected methionine in wool growth and fiber length in Dorset ewes.

Table(2): Effect of protected methionine and lysine in ewes weight .

parameters	Control group	PRML group
Initial weight kg	49.45 ± 1.05	48.69 ± 1.41
weight in early pregnancy kg	54.71 ± 1.69	53.37 ± 2.12
weight in mid pregnancy kg	59.28 ± 1.58	56.28 ± 2.63
weight in late pregnancy kg	63.21 ± 2.06	64.42 ± 3.37
weight at lambing kg	54.78 ± 2.54	55.28 ± 1.77
weight in early lactation kg	48.42 ± 2.40	52.21 ± 3.47
weight in mid lactation kg	49.14 ± 2.08	52.14 ± 2.71
weight in late lactation kg	47.35 ± 3.07	52.14 ± 2.84

Control group: ewes fed without supplement
PRML group : ewes fed with protected methionine and lysine

Table (3): Effect of protected methionine and lysine in lambs weight.

Parameters	Control group	PRML group
Weight at lambing kg	4.30 ± 0.10	4.36 ± 0.42
Weight in 1st month kg	10.02 ± 0.80	11.83 ± 1.11
Weight in 2nd month kg	12.90 ± 1.29 b	16.60 ± 1.50 a
Weight in 3rd month kg	14.28 ± 1.22 b	18.42 ± 1.47 a
Total gain kg	9.57 ± 1.21 b	14.11 ± 1.27 a

Control group: ewes fed without supplement
PRML group : ewes fed with protected methionine and lysine
Different letter in the same row differ significantly ($P \leq 0.05$).

Table(4): Effect of protected methionine and lysine in wool growth and characteristics in beginning and end experiment .

Parameters	Control group		PRML group	
	1/5/2018	1/5/2019	1/5/2018	1/5/2019
Fleece weight kg	1.84 ± 0.06	1.89 ± 0.08	1.93 ± 0.20	2.16 ± 0.07
Length of wool tress cm	10.11 ± 0.25	9.24 ± 0.61	10.68 ± 0.40	11.46 ± 2.49
clean wool %	69.18 ± 2.52	76.68 ± 4.08	65.89 ±2.98	75.18 ± 2.13
Length of fiber cm	17.21 ± 0.74	15.32 ± 1.02	17.62 ± 0.67	18.69 ± 3.94
Diameter of fiber (micron)	29.12 ± 0.87	31.05 ± 0.98	28.13 ± 0.71 b	31.22 ± 1.05 a

Control group: ewes fed without supplement
PRML group : ewes fed with protected methionine and lysine
Different letter in the same row differ significantly ($P \leq 0.05$).

Table (5): Effect of protected methionine and lysine in wool growth and characteristics.

parameters	Control group	PRML group
Fleece weight kg	1.89 ± 0.10 b	2.16 ± 0.07 a
Length of wool tress cm	9.24 ± 0.61	11.46 ± 2.49
clean wool %	76.68 ± 4.08	75.18 ± 2.13
Length of fiber cm	15.32 ± 1.02	18.69 ± 3.94
Diameter of fiber (micron)	31.05 ± 0.98	31.22 ± 1.05

Control group: ewes fed without supplement
PRML group : ewes fed with protected methionine and lysine
Different letter in the same row differ significantly ($P \leq 0.05$).

In conclusion, the RPML supplementation succeed in maintaining ewes weights during lactation period which require high levels of amino acids, also it help in weaning a heavier lambs, PRML treatment also improve the fleece weight and wool fiber diameter due to the important role of methionine as a source of for cysteine which is very important and critical for wool growth**.**

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تاثير الميثيونين واللايسين المحمي في اوزان النعاج خلال مرحلتي الحمل والرضاعة وبعض المؤشرات الانتاجية والنوعية للصوف في النعاج العواسية

حنان وليد قاسم[1] عمر ضياء الملاح[2] صائب يونس عبدالرحمن[3]
[1، 2 ، 3]قسم الانتاج الحيواني ، كلية الزراعة والغابات ، جامعة الموصل ، العراق

الخلاصة

لتقييم تأثير الميثيونين واللايسين المحميين في وزن النعاج والحملان ونمو الصوف ، أجريت هذه الدراسة للفترة من 2018/5/1 حتى 2019/5/1 في منطقة بايبوخت 20 كم شمال الموصل ، في مزرعة اهلية خاصة. باستخدام 16 نعجة حوامل متوسط وزن الجسم 49.07 ± 0.85 واعمارها تراوحت بين 2–3 سنوات. تم تقسيم النعاج إلى مجموعتين وتم تغذيتها بكمية محدودة من 1.5 كغم لكل نعجة يوميًا من العليقة القياسية بدون مكمل غذائي في مجموعة السيطرة ، أو بإضافة الميثيونين المحمي 2.5 غم ولايسين محمي 2.5 غم لكل نعجة في مجموعة الاحماض الامينية المحمية. أوضحت النتائج أن التغذية بالأحماض الأمينية المحمية لم يكن لها تأثير معنوي على وزن النعاج خلال مراحل الحمل وإنتاج الحليب ، لكنها أدت إلى زيادة معنوية ($p \leq 0.05$) في وزن الحملان في الشهرين الثاني والثالث بعد الولادة 16.60 و 18.42 كجم والزيادة الكلية بالوزن 14.11 كغم بالمقارنة مع مجموعة السيطرة 12.90 و 14.28 كغم و 9.57 كجم على التوالي ، لوحظت زيادة كبيرة ($p \leq 0.05$) في وزن الصوف في مجموعة الاضافة بالحماض الامينية 2.16 كغم مقارنة مع مجموعة السيطرة 1.89 كجم ، كما تم تحسين متوسط طول خصلة الصوف وطول الألياف عند تغذية النعاج بالميثيونين واللايسين المحميين بنسبة 24.02 و 21.99٪ على التوالي مقارنة بمجموعة السيطرة. ، يتضح من النتائج ان تجهيز النعاج بالميثيونين واللايسين المحميين أثناء الحمل والرضاعة يحسن أداء نمو الحملان وإنتاج الصوف وخصائصه.

الكلمات الدالة : أحماض امينية محمية ، وزن الجسم ، نمو الصوف .

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