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# EFFECT OF ADDING PROTECTED LYSINE TO THE RATION CONTAINED SESAME MEAL AS NITROGEN SOURCE ON PRODUCTIVE AND PHYSIOLOGICAL PERFORMANCE OF AWASSI EWES

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**ABSTRACT**

Milk production has an economic interest in the light of population explosion to meet the market requirements. The present study aimed to increase milk production using lysine as a food-fortified product. The study was conducted using 36 Awassi ewes. Ewes were divided randomly into three groups; each group was 12 ewes. The second group (T2) was presented with the standard diet of 4 gm of protected lysine, while the third group (T3) was presented with the standard diet of 8 gm of protected lysine, and (T1) represented the control group. The results indicated that there was a significant increase (P≤0.05) in the weights of ewes and their newborn lambs at the end of the study, but there are no significant changes in milk production, solid-to-fat ratio, milk density, protein level and lactose percentage among the transactions at the beginning of the experiment, except for a significant decrease (P≤0.05) in the percentage of milk fat in the second group. At the end of the experiment (the third month), a significant increase in the daily milk production, milk fat, solid to-fat ratio at 8 gm of protected lysine (T3) was observed in the third treatment, while no significant changes in milk density, protein level and lactose percentage happened among the transactions. As for the results of the hormonal analysis, the results indicated a significant increase (P≤0.05) in prolactin, growth and thyroxine hormones in the two groups treated with protected lysine accompanied by a significant decrease (P≤0.05) in cortisol levels in the treated groups compared to the control group.

**KEYWORDS:** Protected lysine, Milk production, Awassi Ewe.

## INTRODUCTION

The optimal protein offers the appropriate ratio of physiologically accessible amino acids for the physiological requirements of the folk animals (MALACCO *et al.* 2022). It is challenging to forecast the various fractional contributions of rumen microbial protein and rumen undegraded protein to the pool of absorbable amino acids, intestinal absorptive efficiency, and the peripheral tissue requirements for amino acids in milk-producing ewes (LYNCH *et al.* 1991). Greater accuracy in supplying the amino acid requirements of dairy ewes may boost output, lower nitrogen excretion to the environment, or have a combined effect (TSIPLAKOU *et al.* 2020).

Free lysine degrades in the rumen; coating these amino acids is one strategy to prevent this degradation in the rumen and makes them available for absorption in the small intestine. Innovative coating methods are based on cutting-edge technology. Using this method, the maximum quantity of nutrients can avoid rumen fermentation and remain

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accessible in the small intestine (WEEKES *et al.* 2006). Lysine is a specific amino acid for milk production (NRC. 2007), which is one of the important amino acids for growth, protein synthesis and milk production. In ruminants, it is given in a protected form to fill the deficiency at the animal's ration.

Elsaadawy *et al.* (2022) confirmed that protected lysine improves the productive capacity of cows during the milk production stage. Milk protein, fat concentration, and milk production increase when protected lysine is given in cattle ration (KIM & LEE, 2021). Early lactation and mid-lactating sheep supplemented with rumen-protected lysine had favourable effects on milk production, protein content, and yield, while the results were inconsistent (AWAWDEH, 2022). In many diets for nursing ewes, including those for lambs, lysine is a limiting amino acid. Lysine, in particular, must be kept at optimal levels to enable normal fetal development and eventual ewe milk production (WANG *et al.* 2021).

To know the effect of adding the protected amino acid lysine to the diet on milk production and the proportions of milk components with hormonal control of the growth and development of the mammary glands in Awassi ewes and follow up the effect of lysine in the proportions adopted in the study on the growth and weights of newborn lambs.

## MATERIALS AND METHODS

This study was conducted in a private field in the Baybukht area north of Mosul( from February to May 2021). 36 Awassi sheep, aged 2-3 years, and weight averaging 40.8±6.652 were used. In the postpartum stage (breastfeeding), the ewes were fed daily at an average of 1.750 kg of dry matter in the second season of calving. A head in each group was given a ration of two meals a day; the experiment lasted 3 months and was randomly divided into three groups (12 ewes/group). The components of the standard diet and its chemical composition for the experimental diets were listed in Tables 1 and 2.

Experiment design: The animals were randomly distributed into 3 equal groups (12 ewes/group). The first group was considered the control, fed on the standard concentrated diet, while the protected lysine was added to the diet provided to the animal at a dose of 4 g and 8 g / ewes per day for the second and third groups, respectively. At the same time, 18 newborn lambs from the thirty-six ewes approved in the study were included with maternal ewes, including a control group and two groups treated with lysine 4 and 8 g/ lambs.

Offspring management: The newborns were cared for from birth until the end of the trial period after 90 days, as they were fed free milk from their mother for forty-five days; they were accustomed to eating concentrated feed with protected lysine and according to her mother’s (control without adding the first and second treatment groups, protected lysine was added to them by 4 g and 8 g/ lamb per day, respectively). Feeding on a

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ration in addition to breastfeeding continued until the end of the study period; immediately after birth, the newborns were weighed, then the weighing process was repeated every end of the three months of the study, at the end of the experiment, blood samples were collected from the jugular vein of the newborns for laboratory tests at the end of the experiment.

Body weight: The weight of ewes and newborns was measured at the beginning and end of the experiment to follow up on their weight gain during the study period and the effect of treatment with protected lysine using a rod scale for sheep, type SALTER of British origin.

Blood measurements: Blood samples were taken through the jugular vein at the end of the third month of the experiment, and the level of prolactin, growth and thyroxine hormones was measured.

Milk measurements: Milk samples were taken at the end of the experiment's third month. The ewes were milked daily by manual hand milking at seven in the morning after the newborns were isolated from the mothers at seven in the evening the day before. The concentration of fat, protein and lactose in the milk was measured, and the Eko – milk Analyzer estimated the level of non-fat solids and milk density. The level of the prolactin, growth and thyroxine hormone in the blood serum was estimated using a ready-made working kit equipped by the BioChech, Inc. company using the ELISA device technique according to the method of UOTILA *et al.* (1981).

The statistical analysis of the experimental data was carried out according to the completely randomized design; the significance of the differences between the coefficients was tested using Duncan's multiple range test and used the ready-made statistical analysis program (SAS, 2001). Chemical composition based on dry matter mathematically estimated by (KHAWAJA *et al.*1978)

**Table 1: Ingredients and chemical composition of the basic diet.**

| **Substance** | **Relative** |
|---|---|
| Crushed barley | **56** |
| Wheat bran | **25** |
| Sesame seed | **10** |
| Wheat Straw | **8** |
| Salt | **0.5** |
| limestone | **0.5** |

**Table 2: Chemical composition based on dry matter**

| **dry matter %** | **92.39** |
|---|---|
| crude protein% | **15.30** |
| *Metabolic energy kilocalories/kg | **2533** |

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## RESULTS AND DISCUSSION

The results in Figure 1 indicated that there was a significant increase (P≤0.05) in the weights of ewes and their newborn lambs at the end of three study months, especially at T2 (4gm of protected lysine) in comparison with T1and T3, These results agreed with the results of MATY (2021) when he studied the effect the protected lysine in fattening calves, which further confirmed that the reason for this increase in the weight of lambs might be because the protected lysine has a positive effect on increasing the amount of milk produced in the udder of newborn mothers, which reflected on an improvement in the growth of newborns and their weight gain during the lactation period, but after the lactation period and the start of accustoming newborns to eating concentrated feed.

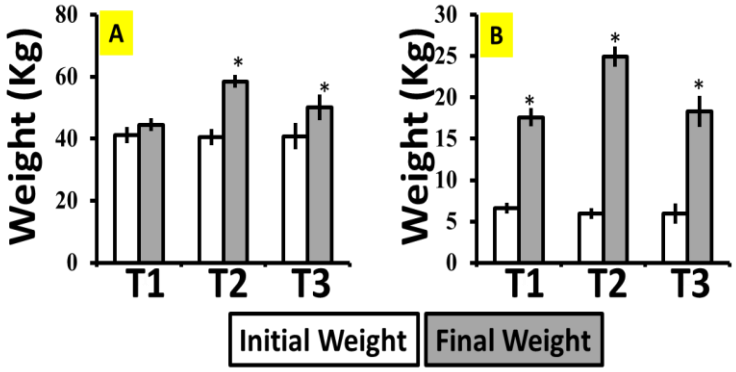


**Figure 1: Measurements of the weights of ewes (A) and newborns (B) After adding protected lysine to the diet containing sesame meal.**

T1 group (the control group), T2 group [fed on protected lysine added to ratio at (4gm/ sheep/ day)], T3 [fed on protected lysine added to ratio at (8gm/ sheep/ day)]. Data expressed as Mean±SD. *#p<0.05. * significantly higher as compared to the initial weight.

The current study results agreed with SINGH *et al.* (2015) and agreed with LOPES *et al.* (2019), suggesting that the response of increasing body weight was due to lysine, the reason for this increase in the weights of ewes and their newborn lambs might occur as a result of dietary protein supplementation, which is thought to be helpful. Rumen, a non-degradable protein, has increased animal performance (TANDON *et al.* 2008). Except for the non-significant decrease in milk fat ratio in the first month at T2 in comparison with T1 and T3, the results (Figures 2 and 3) indicated that there were no significant differences between the treatments at the beginning to end of the experiment in milk production, solid to fat ratio, milk density, protein level and lactose percentage among the transactions. While at 3$^{rd}$ month of milk production, the milk fat ratio and solid to fat increased significantly (P≤0.05) in T3 compared with T1 and T2.

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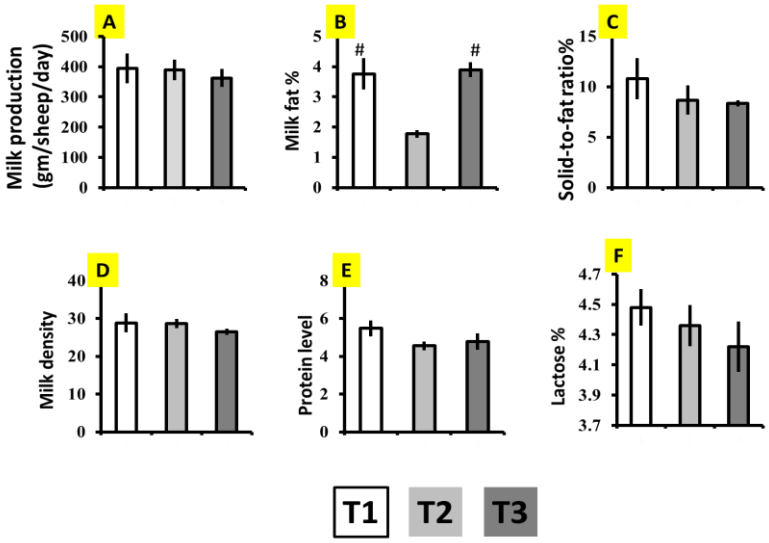


**Figure 2: Measurements of the milk production parameters of Ewes after adding protected lysine (For one month) to the diet containing sesame meal.**

T1 group (the control group), T2 group [fed on protected lysine added to ratio at (4gm/ sheep/ day)], T3 [fed on protected lysine added to ratio at (8gm/ sheep/ day)]. Data expressed as Mean±SD. *#p<0.05. * significantly higher as compared to other groups. #significantly higher as compared to the T2 group.

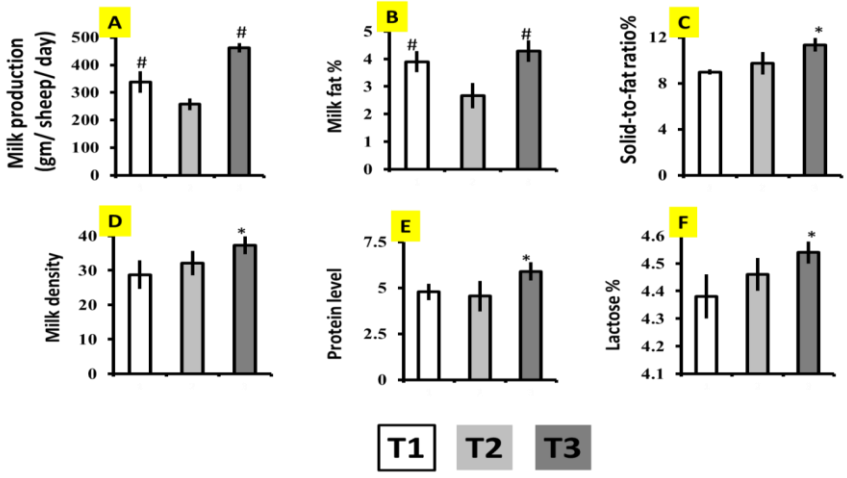


**Figure 3. Measurements of the milk production parameters of Ewes after adding protected lysine (For 3months) to the diet containing sesame meal.**

T1 group (the control group), T2 group [fed on protected lysine added to ratio at (4gm/ sheep/ day)], T3 [fed on protected lysine added to ratio at (8gm/ sheep/ day)]. Data

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expressed as Mean±SD. *#p<0.05. * significantly higher as compared to other groups. #significantly higher as compared to the T2 group.

The increase in milk components in the groups treated with protected lysine is because lysine is one of the acids that determine milk's quantitative and qualitative features (KIM and LEE, 2021). These results agreed with (LANDI *et al.* 2021), who indicated that giving lysine in the ration of ewes causes an increase in milk production and improving in milk's chemical components, while the results did not agree with what was found by Mavrommatis *et al.* (2021), who noted that giving protected lysine alone to cows caused a decrease in milk production compared to when given with protected methionine or given protected methionine alone. All lambs finished the experiment without experiencing any health issues. Lysine enhanced nitrogen retention in developing lambs (35 kg) fed a corn-based diet (69% of Dry Matter) when dietary crude protein was marginal (13%) to the advised needs (NRC.1985); (OKE *et al.* 1986).

The results (Figure 4) indicated a significant increase (P≤0.05) in prolactin hormone levels in coefficients T2 and T3 compared to the T1 group. The high level of the prolactin hormone in the aggregates treated with protected lysine can be attributed to lysine binding to liver somatotropic receptors and mammary prolactin receptors, which thus increased the effectiveness and levels of the prolactin hormone.

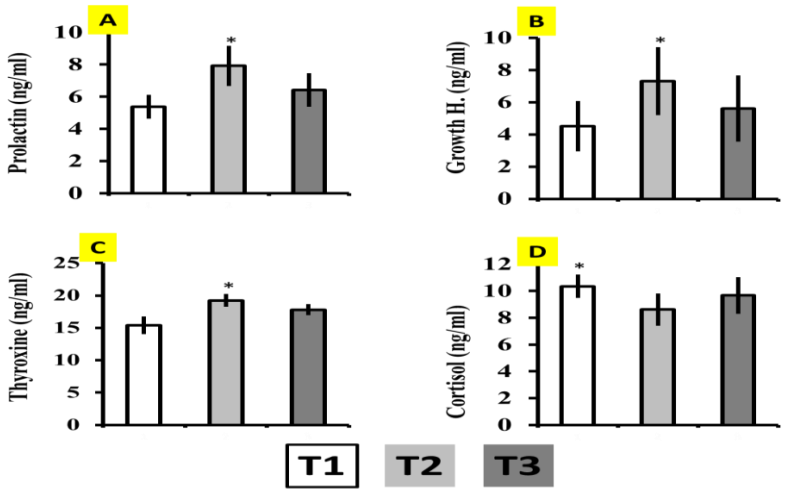


**Figure 4: Measurements of the endocrine parameters of Ewes after adding protected lysine to the diet containing sesame meal.**

T1 group (the control group), T2 group [fed on protected lysine added to ratio at (4gm/ sheep/ day)], T3 [fed on protected lysine added to ratio at (8gm/ sheep/ day)]. Data expressed as Mean±SD. *p<0.05. * significantly higher as compared to other groups.

Lysine is one of the most effective and essential amino acids in increasing the growth hormone levels in the blood serum (KONG *et al.* 2021). Then, the increase in growth hormone levels in the serum of ewes treated with protected lysine may explain by the

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mention by WANG *et al.* (2017) that growth hormone, insulin, and insulin-like growth factor-1 may all be synthesized and secreted by the body through the regulatory action of lysine, which encourages the release of endocrine hormones. As for the effective effect of protected lysine in reducing the levels of the hormone cortisone in the blood of treated ewes, it is consistent with what he stated NESSE (1999) pointed out that by blocking long-term anxiety, prolonged lysine supplementation decreased plasma cortisol in animals without directly affecting the adrenal gland. In a one-week trial of 50 healthy individuals, 2.64 grams of lysine per day significantly decreased stress-induced anxiety and cortisol levels (SMRIGA *et al.* 2007).

The increases in thyroxine hormone levels in the two groups treated with protected lysine compared to the control group agreed with what was stated. HASSAN & ABDUL-NOOR (2021) concluded that feeding male lambs with 5gm of lysine raises the concentration of growth hormones and thyroxine in the blood. Low levels of L-lysine can impair the work of one of the most important glands in the body, the thyroid gland and its effective and proven ability to treat thyroid diseases (HALLEN *et al.* 2013). Thyroid activity changed when animals were fed dietary lysine at suboptimal or excessive levels for only one day (ELWAKEEL *et al.* 2018).

## CONCLUSION

According to the results obtained from the study, we may conclude that the addition of protected lysine by the concentrations mentioned in the study has led to a significant improvement in the weights of ewes and their newborns, as well as an improvement in the quantity and quality of milk produced from them. These productivity parameters were in harmony with the obvious improvement in hormones associated with being overweight and with increased milk production.

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