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Effect of Postpartum Ewes Weight and Adding Turmeric to the Ration on Productive Performance and Lambs Growth

M. F. Al-Juwari[1*], N. M. Al-Shaar[1], O. D. Al-Mallah[1], and A. M. Saadi[2]

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ABSTRACT

Purpose: *This study was conducted to estimate the effect of adding turmeric to the diet of ewes with differing body weights on milk yield and its components, some biochemical blood characteristics, and lamb growth in Awassi sheep.*

Research Method: *Twenty Awassi ewes aged 2-4 years were distributed into two main groups according to their weight; heavy and low weight (10 ewes). They were again grouped into two secondary groups, (5 ewes) in each and fed on the standard ration with or without the addition of 7 gm of turmeric/ewe/day.*

Findings: *: The data revealed a significant ($p \leq 0.01$) increase in milk yield during the periods 30-60 and 1-60 days in ewes supplemented with turmeric; also, milk yield increased ($p \leq 0.01$) in the heavy ewes compared to the low-weight ewes. The ewes treated with turmeric and kept at a low weight were significantly superior in milk fat. Body weight change was significantly ($p \leq 0.01$) lower in low weights compared to heavy-weight ewes, and the decrease in weight was 3.31 and 6.40 kg, respectively.*

Research Limitations: *There were some practical limitations in the estimation of antioxidant activity in the blood and local turmeric due to its high cost.*

Originality/ Value *The addition of turmeric to the diet resulted in enhanced antioxidant activity; this was clear in low weight-ewes.*

Keywords: *Awassi ewes, Blood, Lamb growth, Milk yield, Turmeric*

INTRODUCTION

Sheep are bred in Iraq mainly for producing meat, milk, and wool. The production of meat and milk from Awassi sheep is low when compared to specialized indigenous breeds. Therefore, there is a need to use modern methods of nutrition programs or feed additives to enhance animal health and productivity (Schaeffer, 2001; De La Fuente *et al.*, 2006). Body weight is one of the factors that affect the productive and reproductive characteristics of ewes (Ali, 2021), and maintaining an appropriate weight for ewes at the end of the milking season is necessary to maintain reproductive efficiency and increase fertility and prolificacy during the subsequent reproductive season (Al-Sayegh and Al-Kass, 1992). In lactating animals, the stress caused by delayed uterine prolapse and the inability of ewes to take in sufficient quantities of feed to meet their nutritional needs for milk production and the common oxidative stress during the first stage of milk production, on the other hand, lead to biochemical changes in animal bodies and their products (Salinas-Rios *et al.*, 2017).

[1*]Department of Animal Production, College of Agriculture Forestry, University of Mosul, Iraq.

[2]Department of Animal Production, Technical Agricultural College, Northern Technical University, Mosul, Iraq.

muthanna.f.a@uomosul.edu.iq

https://orcid.org/0000-0002-3742-5155

Therefore, recent studies have focused on the use of feed additives in animal diets to improve the quality of animal products and raise their nutritional value (Jaguezeski *et al*., 2018a; Sultan, 2023). Therefore, the use of natural compounds in the diet has gained great importance in animal health and performance. It can improve the function and transport of nutrients in the digestive system and thus help in promoting growth, modulating the immune system, Oxidation, and controlling the harmful activity of pathogenic organisms (Citarasu, 2010; Patra *et al*., 2018). One of these compounds is turmeric (Curcuma longa), a perennial Indian herb of the Zingiberaceae family. It contains curcumin, the active substance in the roots of the plant, which has an important role as an antioxidant, anti-bacterial, anti-inflammatory, and anti-parasitic compound (Raha *et al*., 2001; Majeed *et al*., 2015). Turmeric contains important secondary metabolites such as alkaloids, phenols, flavonoids, glycosides, tannins (Okigbo *et al*., 2009), dimethoxy curcumin and bisdemethoxy curcumin (Osawa *et al*., 1995; Kiuchi *et al*., 1993). Therefore, it has been used in pharmaceutical formulations and as a food additive (Sasikumar, 2005; Gazal *et al*. 2014; Varmuzova *et al*. 2015; Liu *et al*. 2017). The antioxidant capacity of curcumin is also due to its phenolic compounds having the ability to capture free radicals (Sueth-Santiago *et al*., 2015). The current research aimed to study the response to added turmeric to the diet on milk yield and its components, some biochemical blood characteristics and lamb weights of Awassi ewes.

MATERIALS AND METHODS

Experimental Design and Animals

This study was conducted in a field belonging to a private breeder, which is located about 10 km south of the city of Mosul. Twenty ewes aged 2-4 years with good health and weight were selected. The ewes were distributed according to their weight and milk yield into two groups, the heavyweight group (10 ewes) with an average weight of (48.96 kg) was divided into two groups as well (5 ewes) The control group was fed without any supplement, while the second group by adding 7g turmeric to the diet /ewe/day. The group of low weights (10 ewes) with an average weight of (40.98 kg) was also divided into two groups with (5 ewes) for each group The control group was fed with the standard diet without addition, and the other was fed on the standard diet with the addition of 7 gm of turmeric /ewe/day. The ewes and their lambs were housed in semi-open pens of an area of 30 m2 and a height of 3m, containing fixed feeders.

Animal Feeding

The ewes were fed on the experimental ration for 14 days as a preliminary stage to accustom the ewes to eating it. The ration consisted of 75% concentrate 24% barley, 15.5% wheat fraction, 16% wheat bran, 17% yellow corn, 0.5% urea, 1% table salt and 1% limestone and it contained 14.9% crude protein and 2358 kcal/kg metabolic energy. The rest of the diet (25%) was coarse feed containing hay with green fodder. The feed was provided in three meals, morning, midday and evening (1.5 kg/ewe/day). In addition to that albidum provide of mineral and water were practiced throughout the study period. The ewes were weighed with their lambs at the beginning of the experiment and every two weeks until the eighth week after birth.

Milk Yield and Components

Daily milk yield (DMY) was measured after 14 days of birth and the measurements continued every two weeks until the eighth week. The lambs are isolated from their mothers at 8 PM and the measurement is taken at 8 AM (12 hours after the isolation process). The milk yield produced is multiplied by 2 to obtain the daily milk yield (ICAR, 1995). A sample of milk was taken at each milking and stored in 50 mL plastic containers. Milk components (percentage of fat, protein, lactose and solids not-fat (SNF)) were measured using the Lactoscan Milk Analyzer (Chinese origin).

Blood Measurements

Blood samples were drawn from ewes at the end of the experiment (eighth week) kept in tight plastic tubes and transferred to the laboratory. Blood serum was obtained by centrifuging the sample at 3000 r/min for 10 minutes and kept at -20 ^{0}C until measurements were taken. Total protein, cholesterol, triglycerides, creatinine and urea concentration were determined using a Spectrophotometer with ready-made solutions manufactured by the French company Biolabo.

Statistical Analysis

The data was statistically analyzed using a complete random design (CRD) using a two-factor experiment within the SAS (2018). The following mathematical model was used to analyze the data.

$$Y_{ijk} = \mu + W_i + C_j + WC_{ij} + e_{ijk} \quad (1)$$

Where:

Y_{ijk} = Observational value of ewes weight (i) and turmeric treatment (j)
μ = Overall mean of the trait studied
W_i = Effect of Ewe weight (heavy or low)
C_j = Effect of turmeric treatment (without adding or adding 7 gm of turmeric/ewe/day)
WC_{ij} = Effect of the interaction between weight of ewes and the addition of turmeric
e_{ijk} = Random error accompanying each observation

The differences between means were tested using Duncan's multiple range test (Steel and Torrie, 1984).

RESULTS AND DISCUSSION

Milk Production

The results of the study showed that the ewes in the group added turmeric were significantly ($p \leq 0.01$) superior in daily milk yield during the periods 30-60 (724.0 g) and 1-60 days (640.80 g) after parturition, compared to the control group, which produced 655.0 and 570.80 g, respectively (Table.1). This superiority in milk production may be attributed to the effect of curcumin in increasing the digestibility because ewes in all groups fed equal quantity of feed or to the role of curcumin in decreasing somatic cell, this result also obtained by Hashemzadeh-Cigari *et al*. (2014). In addition to its antioxidant, anti-inflammatory, and antibacterial activity against some types of bacteria, it reduces the common oxidative stress in lactating animals (Jungbauer and Medjakovic, 2012; Fu *et al*., 2014). This leads to an improvement in the health status of the ewes in general and the mammary gland in particular, thus improving their milk yield (Marti *et al*., 2013). These results are in agreement with the findings of Jaguezeski *et al*. (2018a) in their study on Lacaune sheep, who observed that adding 80 mg of curcumin /ewe/day led to a significant increase in milk production. However, it does not agree with El-Gohary *et al*. (2012) in their study of Zaraibi goats who found no significant differences in milk yield when adding 100 mg of curcumin or turmeric powder /kg BW of goats. As shown in Table,1 the significant superior ($p \leq 0.01$) in the milk yield during the period of 1-30, 30-60, and 1-60 days after parturition of a group of ewes with heavy weight as its value reached 641.20, 852.60 and 746.60 g, respectively, compared to low weight ewes whose milk yield reached 408.40, 526.40 and 465.0 g, respectively. These results are in agreement with the findings of Sultan and Al-Hamdani (2019), Sultan (2019), and Al-Qasimi *et al*., (2020) on the superiority of heavy-weight ewes in their milk yield. Berry *et al*. (2007) and Van der Linden *et al*. (2009) noted a positive correlation between the weight of the ewe and its production of milk, and this was attributed to the high amount of energy consumed by heavy-weight ewes, which leads to the synthesis of greater quantities of milk (Godfrey *et al*., 1997), in addition to the large size of the udder for these ewes.

The effect of interaction between the weight of the ewe and the addition of turmeric on milk yield was more evident in the low-weight ewes. The milk yield of low-weight ewes added with turmeric was significantly ($p \leq 0.01$) higher 501.20, 577.60 and 535.20 g compared to the control 315.60, 475.20 and 394.80 g during the productive phase 1-30, 30-60 and 1-60 days after parturition, respectively.

According to the data, the addition of turmeric to the diet improved the milk yield significantly however, it did not cause significant differences between high-weight ewes, despite their superiority over low-weight ewes in all stages of lactation.

Milk Components

According to Table 2, there is a significant superiority ($p \leq 0.05$) in the fat percentage in the milk of ewes treated with turmeric compared to untreated ewes, which amounted to 4.08% and 3.39%, respectively, during the period from 1-30 days of treatment. The difference was continued significantly in favor of the treated ewes during the second month, (30-60 days) and the percentage was 4.62% and 3.57% for treated and untreated ewes, respectively. This superiority may be attributed to the effect of curcumin in increasing the ability to digest, which can raise the levels of short-chain fatty acids in the rumen and thus increase milk fat (Tekippe *et al*., 2013). It is also believed that the effect of curcumin on certain bacteria can change the formation of fatty acids in milk this is because curcumin largely interacts with the lipophilic bacterial

Table 1: Mean ± Effect of body weight and turmeric on milk yield of ewes

Treatment		Milk yield (g)		
		1-30 day	30-60 day	1-60 day
Turmeric effect		N.S	**	**
Without turmeric (control)		487.40±75.49	655.00±90.00 b	570.80±60.95 b
7g of turmeric addition		562.20±53.22	724.00±63.84 a	640.80±37.77 a
Weight effect		**	**	**
Heavy weight		641.20±47.77 a	852.60±27.36 a	746.60±16.68 a
Low weight		408.40±59.57 b	526.40±76.03 b	465.00±27.07 b
Interaction effect		**	**	**
Without turmeric	Heavy weight	659.20±93.09 a	834.80±55.66 a	746.80±29.37 a
	Low weight	315.60±47.11 c	475.20±131.13 c	394.80±19.14 c
7g of turmeric addition	Heavy weight	623.20±37.93 ab	870.40±10.63 a	746.40±19.73 a
	Low weight	501.20±97.19 b	577.60±86.65 b	535.20±21.36 b

*Different letters within the same column are significantly different, **: P≤0.01, N.S Non-Significant*

cell wall (Jaguezeski *et al*., 2018a). Jaguezeski *et al*. (2018b) observed an increase in milk fat in favor of ewes treated with 60 mg curcumin/ewe/day compared to untreated ewes, but it was not significant. The results of the current study did not agree with the results of Jaguezeski *et al*. (2018a) who found a significant decrease in the fat percentage in milk when adding 80 mg of Curcumin/ewe/day. El-Gohari *et al*. (2012) did not find any significant differences in milk fat when turmeric powder was added to the diet of Zaraibi goat.

A highly significant effect in milk fat percentage ($p \leq 0.01$) was observed for ewe weight and in favor of ewes with low weight during the period 30-60 days after parturition, where the fat percentage was 4.05 and 4.14% for ewes with heavy and low weight, respectively (Table, 2). Perhaps the high-fat percentage in the milk of low-weight ewes is due to the low milk yield of these ewes, as there is a negative genetic correlation between milk yield and fat percentage (Al-Juwari, 2011). Dario and Carnicella (2004) supported this finding, which found that the percentage of fat increased in the milk of ewes with low weights and decreased in the milk of ewes with heavy weights, although the difference was not significant. On the contrary, Sultan (2019) noticed the superiority of heavy-weight ewes in the proportion of milk fat in the second and fourth weeks, while no significant differences were found in the sixth and eighth weeks after parturition. On the other hand, Sultan and Mohammed (2019), and Al-Qasimi *et al*. (2020) did not observe any significant effect of ewe weight on fat percentage of milk.

It was evident (Table 2) that there is a significant effect ($p \leq 0.05$) of interaction between ewe weight and adding turmeric to the diet on the percentage of milk fat. The highest differences in milk fat% between low-weight ewes treated and untreated with turmeric were 4.30% and 3.14%, respectively, during 1-30 days after parturition. In addition, highly significant differences ($p \leq 0.01$) were recorded between all groups during 30-60 days after parturition, with the highest being 4.80% for treated low-weight ewes and the lowest by 3.48% for untreated low-weight ewes.

The results of the statistical analysis of the effect of ewes' weight and adding turmeric to the diet and the interaction between them in the percentage of protein, lactose and solids not-fat in milk (Tables, 3, 4 and 5) were insignificant. These results are in agreement with those of El-Gohary *et al*. (2012), Jaguezeski *et al*. (2018a), and Jaguezeski *et al*. (2018 b) in the non-significance effect of adding curcumin or turmeric powder to the diet on the percentage of protein, lactose and solids non-fat in milk.

These results were also in agreement with the findings of Sultan (2019), Sultan and Mohammed (2019), Al-Qasimi *et al*. (2020) in the absence of significant differences in protein percentage in the milk of ewes with heavy and low weights, and this was attributed to the fact that the energy needs may have been available for all treatments. While Al-Noori *et al*. (2014) found a significant effect of ewe weight on the protein percentage of milk. The results of the current study agreed with what was obtained by Al-Noori *et al*. (2014) about the non-significant effect of ewe weight on lactose percentage in milk. This may be because milk lactose is one of the most stable components of milk, as it is responsible for balancing the osmotic pressure in the mammary gland (Sultan and Al-Hamdani, 2019). Our results also agreed with what was found by Sultan (2019), who noted no significant

Table 2: Mean ± Effect of ewe weight and turmeric on fat percentage on milk

Treatment		%Fat in milk	
		1-30 day	30-60 day
Turmeric effect		*	**
Without turmeric (control)		3.39±0.22 b	3.57±0.12 b
7g of turmeric addition		4.08±0.23 a	4.62±0.22 a
Weight effect		N.S	**
Heavy weight		3.76±0.21	4.05±0.20 b
Low weight		3.72±0.29	4.14±0.29 a
Interaction effect		*	**
Without turmeric	Heavy weight	3.65±0.36 ab	3.66±0.22 c
	Low weight	3.14±0.24 b	3.48±0.13 d
7g of turmeric addition	Heavy weight	3.86±0.23 ab	4.45±0.23 b
	Low weight	4.30±0.40 a	4.80±0.39 a

Different letters within the same column are significantly different, **: *P≤0.01, N.S Non-Significant*

Table 3: Mean ± Effect of ewe weight and turmeric on fat percentage on milk

Treatment		%Protein in milk	
		1-30 day	30-60 day
Turmeric effect		N.S	N.S
Without turmeric (control)		4.94±0.06	4.94±0.07
7g of turmeric addition		4.92±0.12	4.90±0.12
Weight effect		N.S	N.S
Heavy weight		4.93±0.08	4.91±0.08
Low weight		4.93±0.10	4.93±0.11
Interaction effect		N.S	N.S
Without turmeric	Heavy weight	4.95±0.11	4.94±0.13
	Low weight	4.93±0.09	4.95±0.07
7g of turmeric addition	Heavy weight	4.91±0.14	4.89±0.10
	Low weight	4.94±0.20	4.91±0.23

N.S Non-Significant

effect of ewe weight on the percentage of solids non-fat in milk in all weeks in the study except for the second week after parturition, which was significant. It did not agree with what was mentioned by Sultan and Mohammed (2019), who found a significant effect of ewes weights on the percentage of solids non-fat in milk.

Biochemical Blood Traits of Ewes

The results related to blood parameters (Table 6) showed that there were no significant differences between groups of ewes in the concentration of total protein, creatinine, cholesterol, triglycerides and urea in the blood serum of the ewes under study, which resulted from the effect of ewes weights and the addition of turmeric to the diet and the interaction between them in these components. These results agreed with the findings of Jaguezeski *et al*. (2018a), who did not find a significant effect of adding turmeric to the diet on the concentration of cholesterol, triglycerides and urea in the serum of ewes. Also in agreement with the results of El-Gohary *et al*. (2012), Habeeb and El-Tarabany (2012) in their study on Zaraibi goat dose in no significant differences in creatinine concentration in serum blood due to the effect of adding turmeric to the diet. While the results of this study did not agree with what was found by Jaguezeski *et al*. (2018a), Molosse *et al*. (2019), and Sultan (2023) who noticed a significant effect of adding turmeric to the diet on the concentration of total protein, creatinine and urea in sheep blood serum. Regarding the effect of ewes weights on blood components, the results of this study agreed with the findings of Abdel-Lattif and Al-Muhja (2021), who did not find a significant effect of the weight of ewes on the concentration of total protein in the blood of Awassi ewes. Baranowski *et al*. (2000) that body weight has a significant effect on the concentration of total protein

Table 4: Mean ± Effect of ewes weight and turmeric in lactose percentage on milk

Treatment		%Lactose in milk	
		1-30 day	30-60 day
Turmeric effect		N.S	N.S
Without turmeric (control)		4.61±0.07	4.68±0.06
7g of turmeric addition		4.56±0.08	4.64±0.12
Weight effect		N.S	N.S
Heavy weight		4.57±0.08	4.65±0.07
Low weight		4.61±0.08	4.67±0.11
Interaction effect		N.S	N.S
Without turmeric	Heavy weight	4.60±0.13	4.67±0.12
	Low weight	4.63±0.07	4.69±0.06
7g of turmeric addition	Heavy weight	4.54±0.10	4.63±0.10
	Low weight	4.59±0.15	4.65±0.22

N.S Non-Significant

Table 5: Mean ± Effect of ewes weight and turmeric in S.N.F percentage in milk

Treatment		%S.N.F in milk	
		1-30 day	30-60 day
Turmeric effect		N.S	N.S
Without turmeric (control)		10.43±0.14	10.44±0.14
7g of turmeric addition		10.24±0.24	10.33±0.26
Weight effect		N.S	N.S
Heavy weight		10.41±0.18	10.37±0.17
Low weight		10.26±0.21	10.40±0.25
Interaction effect		N.S	N.S
Without turmeric	Heavy weight	10.46±0.23	10.43±0.27
	Low weight	10.41±0.19	10.45±0.14
7g of turmeric addition	Heavy weight	10.36±0.31	10.31±0.23
	Low weight	10.12±0.39	10.36±0.50

N.S Non-Significant

in the blood, as the total protein in the blood increases with the increase in body weight in Romney marsh sheep. Our results also agreed with what was found by Jalilian and Moeini (2013), who showed that there was no significant effect of body condition on cholesterol concentration in ewes blood serum.

Weights of Ewes

It is evident from Table, 7 that there was no significant effect of adding turmeric to the diet on the weights of ewes despite the presence of simple arithmetic differences. Decreasing the body weight during the milk yield period was less for ewes treated with turmeric (4.22 kg) compared with untreated ewes (5.50 kg). But it was not significant. The results of this study agreed with the results of El-Gohary *et al*. (2012) in the absence of significant differences in body weight during the three months of lactation when adding turmeric to the diet. However, these were not agreed with those of Molosse *et al*. (2019), Al-Zabaie and Sultan (2020), Marcon *et al*. (2021), and Sultan (2022), who observed that adding turmeric or curcumin to lamb diets resulted in a significant increase in body weights. The results of Table, 7 indicate the importance of the effect of body weight on the weights of ewes during the milking stage, as the amount of change in the weights of heavy and low weight ewes was 6.40 and 3.31 kg, at a ratio of 13.07% and 8.07%, respectively. This shows that low-weight ewes lose weight by a lesser percentage compared to heavy-weight ewes, and this may be due to the significant increase in milk yield for heavy-weight ewes, which appeared in the results of this study. The results of the interaction between the weights of ewes and the addition of turmeric to the diet showed that the largest decrease in the ewes weights during the study period was for the group of heavy ewes without addition, which amounted to 7.62 kg. The lowest was 3.25 kg for the group of low-weight ewes to which turmeric was added (Table, 7) and the percentage of decrease in weights of ewes was 15.40% and 7.77% for both groups, respectively.

Table 6: Mean ± Effect of ewes weight and turmeric in Chemical components of ewes blood

Treatment		Protein (g/dl)	Creatinine (mg/dl)	Cholesterol (mg/dl)	Triglyceride (mg/dl)	Urea (mg /dl)
Turmeric effect		N.S	N.S	N.S	N.S	N.S
without turmeric		5.32±0.11	0.89±0.04	63.68±3.57	82.96±8.61	50.07±1.78
7g of turmeric		5.31±0.12	0.88±0.03	62.35±5.79	84.08±6.04	49.89±2.91
Weight effect		N.S	N.S	N.S	N.S	N.S
Heavyweight		5.40±0.14	0.86±0.02	62.78±5.22	82.59±6.86	48.62±2.05
Low weight		5.23±0.06	0.91±0.04	63.25±4.37	84.45±7.97	51.34±2.65
Interaction effect		N.S	N.S	N.S	N.S	N.S
Without turmeric	Heavy weight	5.48±0.19	0.86±0.02	65.40±4.92	81.74±13.76	49.16±2.46
	Low weight	5.16±0.04	0.92±0.07	61.96±5.63	84.18±11.98	50.98±2.80
7g of turmeric	Heavy weight	5.32±0.22	0.86±0.04	60.16±9.75	83.44±4.69	48.08±3.56
	Low weight	5.30±0.12	0.90±0.04	64.54±7.32	84.72±11.92	51.70±4.88

N.S Non-Significant

Table 7: Mean ± Effect of ewes weight and turmeric addition in body weight gain of ewes

Treatment		Ewes' weight		
		Initial weight	Final weight	Change in weight
Turmeric effect		N.S	N.S	N.S
Without turmeric		44.83±2.36	39.33±1.58a	5.50±1.29
7g of turmeric		45.11±1.57	40.90±1.37	4.22±0.66
Weight effect		**	**	**
Heavy weight		48.96±2.05 a	42.55±1.34 a	6.40±1.06 a
Low weight		40.98±1.29 b	37.68±1.18 b	3.31±0.57 b
Interaction effect		**	*	**
Without turmeric	Heavy weight	49.48±4.03 a	41.86±2.05 ab	7.62±2.01 a
	Low weight	40.18±2.40 b	36.81±1.95 c	3.38±0.53 b
7g of turmeric	Heavy weight	48.44±1.58 a	43.25±1.92 a	5.19±0.55 ab
	Low weight	41.79±1.74 b	38.56±1.44 bc	3.25±1.09 b

*Different letters within the same column are significantly different, **:P≤0.01, :P≤0.01, N.S Non-Significant*

Table 8: Mean ± Effect of ewes weight and turmeric addition in body weight gain of lambs

Treatment		Lambs' weight		
		Initial weight	Final weight	Total weight gain
Turmeric effect		N.S	N.S	N.S
Without turmeric		6.76±0.78	18.14±1.42	11.37±0.77
7g of turmeric		6.54±0.88	17.89±1.06	11.34±0.47
Weight effect		N.S	N.S	N.S
Heavy weight		7.29±0.69	19.46±0.96	12.16±0.60
Low weight		6.01±0.90	16.56±1.33	10.56±0.56
Interaction effect		N.S	N.S	N.S
Without turmeric	Heavy weight	7.71±0.65	20.20±1.56	12.48±0.97
	Low weight	5.81±1.36	16.08±2.15	10.27±1.04
7g of turmeric	Heavy weight	6.88±1.27	18.73±1.19	11.84±0.77
	Low weight	6.20±1.35	17.05±1.82	10.84±0.53

N.S Non-Significant

Weights and Weight Gain of Lambs

It is evident from Table, 8 that adding turmeric to the diet and Ewe weights didn't show a significant effect on the initial, final weight and total weight gain of lambs, although there were arithmetic differences in favor of lambs born from heavy-weight mothers,

even though, it did not rise to the level of significance (Table, 8). These results agreed with what was found by Shaker *et al*. (2002) on the insignificance of the effect of ewes' weights on the weights of their lambs at birth and weaning. However, it does not agree with what was obtained by Taskin *et al*. (2012), Aktaş and Doğan (2014), Aktaş *et al*. (2015), Raoof and Balisany (2016), Sultan (2019) who noticed significant differences in the weights of lambs at birth and weaning and the weight gain of lambs according to the weights of ewes. The results of (Table, 8) indicate that there was no significant effect of the interaction between the ewes weights and the addition of turmeric to the diet in the characteristics of the initial weight, final weight and total weight gain of lambs until the eighth week after birth.

CONCLUSION

We concluded from the study that the ewes weights have a significant effect on milk yield. In the early stages of lactation, supplements containing antioxidants such as turmeric may enhance milk production and milk fat. The low-weight ewe exhibits more response in milk yield and component to the antioxidant supplement than the heavy-weight ewe.

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Conflict of Interest

The authors declare that there is no conflict of interest.

Data Availability Statement

The authors declare that there is no conflict of interest.

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