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Effect of Shearing Wool and the Hot Months of the Year on some Production Characteristics in Turkish Awassi Ewes

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Abstract

This study aimed to investigate the effect of wool shearing and the environmental factors represented by some hot months of the year (July August and September) on some production characteristics in Turkish Awassi ewes. 18 ewes, aged 3-5 years, with an average weight of about 55±1.43 kg, were used. The ewes divided into three treatments. The first group control (T1) were not shorned the wool, the second group (T2) wool of ewes were sheared at a distance of 1 cm from skin, while third group (T3) wool of ewes were sheared at level of the skin. The value of the weekly Temperature-humidity index THI in this study (32.33, 31.08, 31.70, 32.53, 33.45, 33.83, 34.60, 33.91, 31.90, 31.10, 31.84, 32.74) weeks respectively, while the monthly THI was (31.63, 33.48, 31.82) months of the study in July August and September in a respectively. The results showed a significant difference ($p<0.05$) between the treatments in body weight that were recorded at the tenth week where the THI reached. While the Second group recorded (2.16 ± 0.802) kg compared to T1, T3 (0.916 ± 0.723) (0.583 ± 0.490) kg respectively. While the total body weight of ewes and birth weight showed non-significant differences between different treated groups. From another hand the result showed non-significant differences feed and significant differences in water consumption between different treated groups. From the current study concluded that the level of shearing wool in Turkish Awassi ewes in conjunction with high temperature has an effect in production characteristics by reducing the effect of heat stress on the ewes.

Keywards: Shearing wool, Temperature-humidity index, Production, Awassi ewes

تأثير جز الصوف و الأشهر الحارة من السنة في بعض الصفات الإنتاجية للنعاج العواسي التركية

الخلاصة

هدفت هذه التجربة الى التعرف على مدى تاثير جز الصوف والبيئة المحيطة المتمثلة ببعض الاشهر الحارة من السنة في بعض الصفات الإنتاجية للنعاج العواسية التركية . و نفذت التجربة في محطة الدوار البحثية محافظة الانبار التابعة لدائرة البحوث الزراعية / وزارة الزراعة . للمدة من 1 تموز 2019 ولغاية 1 ايلول 2019 . واستخدم في التجربة 18 نعجة عواسية تركية بعمر3-5سنة وبمتوسط وزن 55 كغم . قسمت النعاج عشوائيا الى ثلاث معاملات متساوية في كل معاملة 6 نعاج . نعاج مجموعة السيطرة (T1) لم تجرى عليها عملية جز الصوف , وعوملت المعاملة الثانية (T2) بالجز على مستوى 1 سم عن سطح الجلد , وعوملت المعاملة الثالثة (T3) بالجز بمستوى سطح الجلد . بلغت قيمة THI الأسبوعي في هذه الدراسة (32.33 , 31.08 , 31.70 , 32.53 , 33.45 , 33.83 , 34.60 , 33.91 ,31.90 , 31.10 , 31.84 ,32.74) لأسابيع الدراسة على التوالي فيما بلغ THI الشهري (31.63, 33.48 , 31.82) لأشهر الدراسة تموز اب ايلول على التوالي . أظهرت نتائج الدراسة الحالية فيما يخص الزيادة الوزنية الاسبوعية وجود فروقات معنوية بين المعاملات سجلت في الأسبوع العاشر من التجربة والذي بلغ فيه معدل THI (31.10) درجة اذ تفوقت المجموعة T2 بمعدل (2.16 ± 0.802) كغم بالمقارنة مع T2,T1 بمعدل (-0.916 ± 0.723) (0.683 ± 0.490) كغم على التوالي .اما بالنسبة لمعدل الزيادة الوزنية الكلية لم تسجل فروقات معنوية بين المعاملات على الرغم من وجود فرق حسابي سجل لصالح المجموعة T2 بالمقارنة مع T1,T3. ولم تظهر فروقات معنوية في وزن المواليد بين المعاملات على الرغم من تسجيل فرق حسابي لصالح المجموعة T3 بالمقارنة مع T1,T2.ولم تظهر اي فروقات معنوية في معدل استهلاك العلف . وسجلت مجموعة T1 تفوقاً في معدل استهلاك المياه بفارق معنوي بالمقارنة مع T2وT3. نستنتج من الدراسة الحالية أن لمستوى جز الصوف في النعاج العواسية التركية بالتزامن مع ارتفاع درجة الحرارة له تأثير على الصفات الانتاجية عن طريق تقليل تأثير الإجهاد الحراري على النعاج .

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Introduction

Shearing the wool is one of the seasonal farm operations requirement to manage the herd and improve the welfare of sheep that can improve their productivity (1) . In spite of the seasonality of this practice in sheep farming systems in most countries to suit the beginning of the high summer temperatures, intensive production systems need to shear the sheep at any time during the year, and this is what is currently used in milk product farms in many of the leading countries In sheep milk production (2) .wool is covers the body of sheep and works to modify the impact of climate, plays a role as improving the flexibility of sheep to adapt to the harsh environment, which leads in part to enhancing energy exchange between the animal and the surrounding environment, which contributes to changing the level of tolerance of cold or heat, and this is on the welfare of sheep and their productivity, and it can be considered that the two main factors determining the low critical temperature are feeding and removal of insulators from the body (3) .The shearing, regardless of the season, is always accompanied by a degree of thermal effect, the latter begins with a number of Physiological and chemical interventions vitality with the goal of maintaining some of the treatments that occur within the body and that ultimately affect the level of production (4) .The previous studies have done that the length of the wool has an effect on the size of the stress that sheep are given, so sheep with a wool of 8 mm in length are more stressful than those with a wool length of 20 mm (5) .The environmental conditions around sheep are considered a stress cause (6) .Surrounding conditions such as temperature, relative humidity, and solar radiation are among the major non-biotic factors that are impact for sheep as they stimulate thermal stress in certain conditions (7).The environmental impact ranges on the animal's health are determined by measuring the average temperature and relative humidity THI, when the value of THI <22.2 is considered acceptable and does not indicate the presence of an effect of heat stress, and when the value of THI <25.6, this is an indication of the presence of acute heat stress (8) .It was found that sheep advancing to an increase in the ocean temperature negatively affected their biological functions, causing a decrease in the value of some productive and reproductive traits (9) .The study aimed to identify the extent of the effect, in conjunction with the rise in temperatures in some months of the year, on some productive characteristics (weight gain, birth weight, feed consumption, water consumption) in Turkish Awassi ewes.

Materials and methods

This experiment was conducted during the period from July 1, 2019 to September 1, 2019. To investigated the effect of wool shearing and the hot months of the year on some productive performance of Turkish Awassi ewes. The ewes were divided into three groups, the first group (6 ewes) was not sheared (control), the second group (6 ewes) was treated with shearing at a level of 1 cm above the skin, the third group (6 ewes) was treated with shearing at the level of the skin , and the process of shearing for the second and third groups were done using the SitaiTm Model: DJ350-A electric milling machine of Chinese origin after the necessary modification was made for the purpose of shearing at a distance of 1 centimeter in the second group. The temperature and humidity measurements were taken by two electronic thermometers. The measurements were taken at a daily rate at two day periods 12 at noon and 12 at night. The value of the Temperature - Humidity Index (THI) was estimated according to the following formula:

$$THI = T - \{(0.31-0.31 \times RH) (T-14.4)\} \quad (10)$$

As:
T = ambient temperature .
RH = relative humidity.(%)

The body weight of the animals was measured at the first day of experiment and weekly, using a balance of Camry type and Graduation 500 grams of Chinese origin, as it was provided with a quarry made of iron, the birth weight was measured after birth directly, the amount of feed consumed by the ewes was measured daily ,with both concentrated and coarse types, at 1 kg / head / day for both types and the remainder is collected from the quantity provided on the next day and its weight To

determine the quantity, without preventing the sheep from reaching the feed throughout the whole day to meet their full food requirement. The water consumption was estimated by presenting it in water after performing the weighing process for the provided quantity according to what the daily consumption of the animal requires on a daily basis and in the morning and evening meals. On the next day, the remaining amount is weighed, and the sum of the remaining quantity is subtracted from the submitted amount. The amount consumed is estimated .

The data were presented as Mean and Standard Error (Mean±SE) and subjected to statistical analysis (one-way analysis) and the trend included the effect of experiment parameters, by following the general linear model (general linear model) and using the SAS Statistical Ready Edition program 9.1 (11), and tested the significant differences between the mean characteristics of the traits using the least significant difference test (LSD) (12).

Results and discussion

The values that were calculated for the THI index for the experiment (Table 1) indicate that the ewes that had been subjected to thermal stress throughout the experiment period due to the high temperatures, but the highest value recorded during the weeks of the experiment were in the seventh week with a rate of 34.60 degrees and higher a monthly value recorded during the month of August of the experiment at a rate of 33.48 degrees, and this agree with (8) that receded the value of THI $\geq$ 25.6, this is an indication of the environmental impact that leads to exposure of the animal to severe heat stress. Therefore, the animals that were studied under these conditions will be forced to disperse the high temperatures that they were exposed to as a result of the high ambient temperatures, with the aim of reorganizing the temperature of their internal bodies(10). The result were in agreement with what(13) had referred that the rise in temperature and relative humidity values has a negative impact on livestock, as it stimulates thermal stress. The variation in THI temperatures recorded during the study weeks is due to the changes witnessed in the daily temperature and humidity recorded during the study days. This caused to a variation in the effect on the recorded measurements of the thermal endurance of sheep, and also formed a variation in the impact on productive characteristics and the level of wool coverage as a reason for this variation.

The results of the current study for weight gain and birth weight (Table 2) showed that there were significant differences ($P\leq0.05$) between the treatments recorded in the tenth week of the experiment in which the rate of THI (31.10) degree as the shear group T2 rate of (2.16 ± 0.802) kg compared to the control group and the shear group T3, which recorded to (- 0.916 ± 0.723) (0.583 ± 0.490), respectively, this result was consistent with the findings(14) ,which found that the animals that were sheared were higher in the rate of weight increase from those that not sheared. Regarding the period, it was noted that a significant difference ($P\leq0.05$) was recorded in T2 in most of the experiment periods, as it exceled during the weeks (1.2.3.5.7.10) and at a rate of (2.00 ± 0.683) (2.00 ± 0.223) (2.08 ± 0.238) (2.75 ± 0.381) (2.58 ± 0.374) (2.16 ± 0.802) kg, respectively, compared with other periods. The results indicate a decrease in the weight increase in most of the periods for the control group compared with the two treatment groups. This is agree with (15) indicated that high environmental temperatures have a significant effect on the weight gain and this is due to the low of feed consumption due to the effect of heat stress. Overall weight increase, no significant differences were observed between the treatments despite the presence of an arithmetic difference recorded in the shear groups with a distance of 1 cm and the shear group at the level of the skin surface and at a rate of (12.5 ± 1.16) and (12.0 ± 1.25) kg, respectively, compared with the control group, which recorded an average of (10.5 ± 1.51) kg. The daily weight increase, it recorded a mathematical superiority in the shear groups T2, T1 at an average of (0.138 ± 0.012) (0.133 ± 0.013) kg compared to the control group which amounted to (0.116 ± 0.016) kg. This difference mathematical in the weight gain may be attributed to (16) who indicated that the indirect effects of heat stress, which include changes in the metabolic, levels of some hormones, blood flow, and a decrease in the amount of food led to a

decrease in productive performance. The results of the concentration of the hormone cortisol indicate a variation in the metabolic rate as a result of the variation in the concentration of the cortisol hormone. This is agree with (17) showed that the decrease in the concentration of the hormone cortisol in the ewe blood plasma contributed to reducing the metabolic rate and thus reducing heat production, while it works to increase metabolic rates. This result is agree with (18) referred absence of significant differences in the weight increase between the shearing off and non-shear groups, despite the recording of mathematical differences that indicated that the shear group gave a higher weight than the non shear group. The results agreed with (14) that the animals that were sheared recorded higher increase than the non-shear, despite the lack of significance of the differences, and this result is positive and indicates that the treatment of shearing affected positively on the adaptation of animals to conditions of heat stress. The results of the current study to reach the same results as the published studies indicate that there were no significant differences in body weight among sheep exposed to different levels of heat stress (19) .The result agreed with the findings (20) that the pregnant ewe (Rambouillet) that non sheared, and the pregnant ewes that sheared had no significant differences in the rate of body weight increase (BW). With regard to the birth weight, there was no significant difference between the treatments, but a mathematical difference was recorded in favor of the T3 and T2 at a rate of (5.08 ± 0.327) (4.91 ± 1.22) for the two treatments respectively when compared with the control group, which amounted to (2.50 ± 0.795). This result agreed with (21) referred that the shearing process is an important practice in grazing systems, which leads to the production of lambs that are heavier at birth weight. The result agreed with (13) that showed the pregnant ewes it suffered from heat stress gave placenta weights and embryos less weight.

The results did not show the presence of significant differences between the treatments or periods on the feed consumption, the three groups consumed the daily feed meals without any significant differences (Figure1). From another hand, this result indicated that the heat stress that affected the ewes did not affect in the amount daily feed meals. The result agreed with (6) that the heat stress to which the animal is exposed has an effect on the biological mechanisms that affect production and reproduction, and includes changes in endocrine activity and reduced rumination. The result was agree with (22) study they conducted to determine the effect of heat stress resulting from seasonal change in feeding sheep and goats, and found no difference in the season's effect on the amount of feed consumed, attributing the reason to a decrease in humidity. The result was not agree with (18) the presence of a significant effect on the feed consumption recorded in the shear group and a difference of (0.05) compared to the non shear group during July. The result not agree with (23) that mentioned in heat stress conditions because the hot weather, decline feed consumption and body weight, to palatability loss and this effect is exacerbated when the feed is of poor quality. The reason may be in no significant differences in the feed consumption rate between the three groups in this study to limited quantity.

The results of water consumption showed the significant differences ($p<0.05$) between the treatments in the water consumption in most of the experiment periods in conjunction with the high rate of temperature and relative humidity THI except for weeks (1.2.3) Table (3), there was no significant difference between the treatments but a mathematical difference of control treatment in compared with T2 and T3, the control group recorded the highest level of water consumption during the seventh week at a rate of (79.4 ± 1.12) liters / day in conjunction with recording the highest level of temperature and relative humidity index which reached (34.60) degrees by comparison with the T2 and T3 at a rate (76.3 ± 1.07) (72.3 ± 1.23) liters / day for the same period respectively. With regard to the impact of the period, the control group recorded a significant difference during the second week in which the temperature and relative humidity index reached a rate of (31.08) degrees at a rate of (84.2 ± 0.774) liters / day compared to the other of the periods, and the T2 recorded a highest level of water consumption during the same week, at a rate of (82.9 ± 0.830) liters / day compared to the other of the periods. While the T3 recorded a highest level of water consumption during the

third week at a rate (81.0 ± 0.943) l / day. The results agreed with(9) that the increased use of thermoregulation mechanisms leads to an increase in water consumption. These results showed clear evidence that the sheep in the three groups were exposed to heat stress, which reached its highest level in the control group. The reason for the high water consumption by the control group may be attributed to the high respiratory rate as one of the biological methods for resisting heat stress that dissipates the excess heat through evaporation, and not shearing wool, which prevents heat loss. The result agreed with(24) that among the determinants of the amount of water consumption in small ruminants such as sheep is wool coverage. The result agree with the findings(25) that the amount of water consumed by Malpura sheep that suffered from stress was greater than the consumption of sheep that were not suffered to heat stress or that were treated with anti-stress and the difference was significant.

Conclusion

From the results of the current study, we can conclude that the shear level has an effect in improving the productive performance of ewes by reducing the effect of heat stress resulting from environmental conditions and the level of wool coverage

Table 1. showed weekly and monthly Temperature-humidity index THI values.

Period / week	Average temperature (C º)	Average relative humidity %	THI
1	37.22	31	32.33
2	35.8	29	31.08
3	36.5	30	31.70
4	37.38	32	32.53
5	38.26	35	33.45
6	38.93	33	33.83
7	39.22	34	34.60
8	39.22	31	33.91
9	36.76	30	31.90
10	35.65	31	31.10
11	36.51	32	31.84
12	37.56	33	32.74
Period / month	Average temperature (C º)	Average relative humidity %	THI
July	36.32	31	31.63
August	38.58	32	33.48
September	36.66	30	31.82

Table 2. Effect of shearing wool and the hot months of the year on the body weight gain and birth weight (kg)of ewes.

The weeks	Treatments			LSD	*P*-value
	T1	T2	T3		
1	A 2.50 ± 0.760 a	A 2.00 ± 0.683 a	AB 1.75 ± 0.963 a	2.364	Non
2	ABC 0.250 ± 0.834 a	A 2.00 ±0.223 a	A 2.50 ± 0.806 a	2.056	Non
3	A 3.00 ± 0.670 a	A 2.08 ± 0.238 a	ABC 1.66 ± 0.572 a	1.590	Non
4	AB 0.333 ± 1.03 a	C 0.166- ± 0.210 a	ABCD 0.666 ± 0.459 a	1.997	Non
5	AB 1.08 ± 1.30 a	A 2.75 ± 0.381 a	A 2.16 ± 0.494 a	2.520	Non
6	AB 1.50 ± 1.46 a	C 0.333- ± 0.210 a	BCD 1.26 ± 0.428 a	2.674	Non
7	AB 1.75 ± 0.543 a	A 2.58 ± 0.374 a	A 2.16 ± 0.510 a	1.453	Non
8	AB 1.75 ± 0.882 a	C 0.083- ± 0.396 a	CD -0.166 ± 0.600 a	1.982	Non
9	ABC 0.166 ± 0.586 a	BC 0.250 ± 0.442 a	ABCD 0.583 ± 0.568 a	1.617	Non
10	BC - 0.916 ± 0.723 b	A 2.16 ± 0.802 a	ABCD 0.583 ± 0.490 ab	2.065	0.05
11	C -2.50 ± 0.974 a	D - 2.25 ±0.882 a	D -0.833 ± 0.307 a	2.350	Non
12	AB 1.58 ± 0.554 a	AB 1.50 ± 0.605 a	ABCD 0.916 ± 0.454 a	1.633	Non
***P*-value**	0.05	0.05	0.05		
LSD	2.543	1.435	1.640		
Total weight gain	10.5 ± 1.51 a	12.5 ± 1.16 a	12.0 ± 1.25 a	3.974	Non
Daily weight gain	0.116 ± 0.016 a	0.138 ± 0.012 a	0.133 ± 0.013 a	0.0442	Non

Non .: means no significant differences between the mean of the transactions or the days of taking the sample at the level of significance (P 0.05).

a, b, c: the different lowercase letters within the same row indicate the presence of significant differences between the groups , while the different capital letters within the same column indicate the presence of significant differences between weeks within the same treatment at the level of significance (P≤0.05)

Table 3. Effect of shearing wool and the hot months of the year on water consumption (liter / day/ group)

The weeks	Treatments			LSD	*P*-value
	T1	T2	T3		
1	A 84.0 ± 2.25 a	A 81.2 ± 1.70 a	A 78.8 ± 1.42 a	5.505	Non
2	A 84.2 ± 0.774 a	A 82.6 ± 0.830 a	A 79.8 ± 1.80 a	3.712	Non
3	A 83.8 ± 2.34 a	A 80.5 ± 0.650 a	A 81.0 ± 0.943 a	4.535	Non
4	A 83.1 ± 1.54 a	B 75.5 ± 1.71 b	BC 75.3 ± 1.33 b	4.642	0.05
5	AB 80.5 ± 1.12 a	B 75.1 ± 0.527 b	AB 78.1 ±1.28 ab	3.107	0.05
6	BC 76.5 ± 1.45 a	C 68.5 ± 0.875 c	CD 72.2 ± 0.901 b	3.348	0.05
7	AB 79.4 ± 1.12 a	B 76.3 ± 1.07 a	CD 72.3 ± 1.23 b	3.464	0.05
8	B 77.8 ± 1.29 a	C 71.4 ± 0.916 b	D 69.8 ± 1.13 b	3.398	0.05
9	CD 73.0 ± 1.31 a	C 69.0 ± 1.36 b	E 64.0 ± 0.969 c	3.704	0.05
10	DE 71.2 ± 2.44 a	D 64.9 ± 0.779 b	EF 61.8 ± 0.823 b	4.690	0.01
11	DE 71.3 ± 1.55 a	D 63.6 ± 0.802 b	EF 61.0 ± 0.916 b	3.442	0.01
12	DE 69.6 ± 1.10 a	D 64.1 ± 0.954 b	EF 61.0 ± 1.22 b	3.315	0.01
LSD	4.450	3.007	3.292		
***P*-value**	0.01	0.01	0.01		

*The values represent the mean ± standard error.

**Non .: means no significant differences between the mean of the transactions or the days of taking the sample at the level of significance (P 0.05).

a, b, c: the different lowercase letters within the same row indicate the presence of significant differences between the groups , while the different capital letters within the same column indicate the presence of significant differences between weeks within the same treatment at the level of significance (P≤0.05)

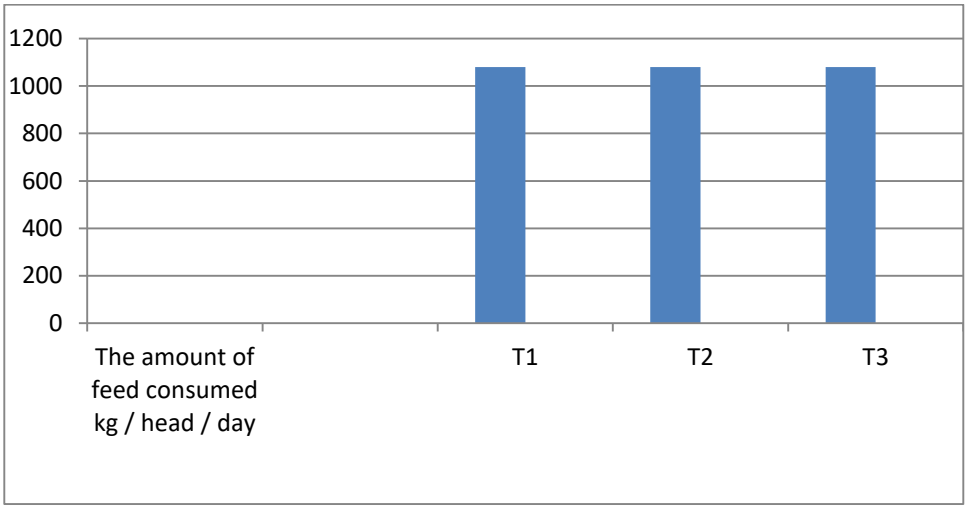

Figure 1. The effect of treatments on the feed consumption rate kg / head / day.

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