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THE FLEECE TYPE OF SHEEP AND ITS ROLE IN THE ADAPTATION TO SEMI-ARID ENVIRONMENTS.

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ABSTRACT

This study was carried out on 201 lambs, 110 of local coarse wool desert Barki sheep and 91 5/8 Merino 3/8 Barki, born during the winter and raised under semi-arid conditions. Ambient temperature ranged from 11.1 to 20.8 ᵒC, during winter, and 33.4 to 38.6 ᵒC, during the summer.

The purpose of the study was to investigate the role played by coat type, from birth to the adult stage (16 months of age) on thermoregulation, hence adaptation to the prevailing semi-arid conditions. Newly born lambs were classified, in an increasing order of halo hair density, into 7 grades, which were grouped into three types: Type 1, the lower birthcoat halo hair grades (1,2,3), Type 2, the medium grades (4,5) and Type 3, the high halo hair grades (6,7). A third of the local Barki lambs birthcoats are of the medium type, and two thirds of the high type, whereas the of 5/8 Merino crossbred lambs were distributed between the low type (34.07%), the medium type (38.46%) and the high type (27.47%). Lambs, regardless of breed, with lower type of birthcoat (1) retained more heat during winter, followed by Type 2 and the least was Type 3. Type 1 birthcoat, with its short, dense wavy appearance, compared to Types 2 & 3 with the long, less dense, straight and higher content of coarse fibers, provided more protection during winter. Lambs with Type 1 birthcoat were more comfortable during winter where the respiration rate, RR, was the lowest and increased towards type 3.

Lambs were regraded, at 2 months of age up to the 1 st shearing at 16 months of age, with a trend of increase, from type 1 to type 3, in coat depth, belly staple length and kemp score and a reversed trend in staple structure, where type 3 had more open structure. Rectal temperature, RT, of the three regraded types were almost similar. However, a trend of decrease in RR occurred towards Type 3.

At the first fleece level, a trend of an increase was encountered in staple length, mean fiber diameter, kemp, coarse fibers and medullation index and a reversed trend in fine fibers % towards Type 3. This paralleled a trend of decrease in RR, towards higher fleece types, where type 3 was the most comfortable and favorable during the prevailing hot summer.

A general trend of increase, towards higher coat type was encountered in birth, weaning and yearling weights, birth-weaning and weaning –yearling daily gains and daily production (grammes) of greasy fleece and clean fleece weights.

Lower types of birthcoat, 1 and 2 in crossbreds and 2 in Barki, were the best in thermoregulation during winter (lambing season), as they retained more heat, compared to the high type 3.

When lambs were regraded, during the period 2-16 months, and at the adult fleece level (16-month) the same trend was observed.

Regardless of breed group, a general trend was reported of an increase in reproductive efficiency, as kilograms weaned per animal joined at mating, of ewes that had type 1 towards higher types. Values were 10.98, 11.29 and 11.43kg for types 1,2 and 3, respectively. However, selection would be chanelled towards the reproductive efficiency suitable to the prevailing environmental conditions, which would reflect adaptation, and this would mean certain fleece type.

Keywords: Wool coat; Thermoregulation; Adaptation; Semi-arid environments

INTRODUCTION

In the semi-arid areas, e.g. Egyptian deserts, high heat load, low rainfall and subsequently harsh environments with poor pastures and salinity of water and diseases usually result in low productive and reproductive performance of sheep. The fleeces of sheep are primarily a protective integument where it plays an important role through insulation, reflection, absorption and heat retention under various climatic conditions (Blaxter; McC Graham, and Wainman, 1959).

This work was carried out to study the role of some coat characteristics in sheep, both in the juvenile and adult stages, in thermoregulation, hence in adaptation to semi-arid conditions.

MATERIALS AND METHODS

A total of 201 lambs born during December 1980 at the Maryout Research Station of the Desert Research Center, 35 kilometers south west of Alexandria. All experimental sheep were of the local coarse wool desert Barki and 5/8 Merino 3/8 Barki type. The numbers of lambs were 69 and 41 in Barki and 49 and 42, in 5/8 Merino breeds, for male and female lambs, respectively.

Weaned lambs, at 120 days, grazed Berseem clover (*Trifolium alexandrinum*) during winter and were fed hay (an average of 0.5 kg/ head/ day) for the rest of the year. Animals were supplemented with a concentrate mixture, composed of 65% cotton seed cake, 20% rice polish; 12% wheat bran, 2% limestone and 1% common salt.

Newly born lambs were classified according to Halo hair (HH), the first occupants of the follicle that develop in the prenatal period, fiber density (Dry, 1955), where grade 1 had no HH, 2 few, 3 and 4 medium, 5 and 6 high and 7 highest density of HH. Positions examined were (1) withers, (2) back, (3) hip, (4) shoulder, (5) mid side and (6) britch.

For the easiness of analysis, birthcoat grades were grouped into three types, in an increasing order of HH fiber density (Table 1), where type 1 was of 1-3, type 2 of 4-5 and type 3 of 6-7 scores of HH grades. Percentages were 13.8, 38.5 and 47.7 for birthcoat types 1,2 and 3, respectively.

Table (1): HH grades of lambs.

Breed	Type 1			Type 2			Type 3			Total
Group	Male	Female	Total	Male	Female	Total	Male	Female	Total	
BB	-	-	-	26	13	39	43	28	71	110
XS	15	16	31	22	13	35	12	13	25	91

HH= Halo hair.; BB= Barki.; X's=5/8 Merino 3/8 Barki.

Samples of birthcoats were obtained at an age of one month. A smaller tuft of samples (Burns, 1972) containing not less than 200 fibers, were sorted into different types (Dry, 1933 & 1934 and Stephenson, 1956) and fiber type arrays were identified.

Birthcoats of lambs more than two months of age are not easily identified into fiber types, due to weathering off the apical curls. The following regarding system with different criteria was used:

1- Coat depth, using a ruler.
2- Belly staple length (by measuring the vertical distance between skin and distal end of the coat); a scale of three grades, small, medium and long with corresponding values of <3, 3-4 and >4cm was developed.
3- Degree of Belly coat cover (low, medium and high grades corresponded to bare, half and totally covered).
4- Kemp score; a subjective scale of Kemp fibre density of four grades, zero, no Kemp; 1, few; 2, medium and 3, high density.
5- Staple structure, where grade 1 had an open; 2, medium and 3, dense tip structure.
6- Score of opening, based on the easiness to open staples, with grade 1, easy; 2, medium and 3, was hard to open.

At shearing of the first fleece (16 months of age), greasy fleeces were weighed to the nearest 10 grams. Fleeces were then skirted into fleece wool (back and sides) and skirtings, where each component was weighed. Representative samples of each, of about 0.5kg, were taken for measuring some fleece traits: -

Clean fleece weight: samples of about 0.5kg were scoured (International Wool Textile Organization, 19-7 E, 1971).

Staple Length: Average length of 10 staples, using a ruler, was recorded to the nearest 0.5cm (Chapman, 1960).

Fiber types: Samples of not less then 500 fibers, were sorted and the different fiber types identified as fine, non medullated; coarse, medullated; hetrotypes, part Kemp and a wooly part along the same fibre; Kemp fibers, and percentages were recorded.

Medullation index: Originally suggested by Pilkington and Purser (1958) to measure medullation in cross sections of lamb samples and adopted by Guirgis (1973,a) to study the medullation in the whole fibers where he classified them into four classes in an increasing order of medullation. The classes were fine, coarse, heterotype and Kemp with scores of 1,2, 3 and 4, respectively.

$$\text{Medullation Index} = \sum_{i=1}^{4} iPi,$$

Where.

i = 1,2,3, and 4 as scores for fine, coarse, heterotype and kemp. Pi is the percentage of i^{th} class.

Mean fibre diameter: An average of 500 snigpets mounted in liquid paraffin, was measured using a lanameter microprojector. Samples prior to sectioning were conditioned over night in the laboratory atmosphere and results were corrected to the optimum conditions (20°c & 65% RH, Anderson, 1955).

Productivity:

As determined by body weights at weaning and yearling, pre-and post- weaning daily gains and fleece weight.

Reproductive efficiency:

Expressed as the number of kilograms weaned per ewe joined at mating.

Physiological responses:

Rectal temperature (RT) and respiration rate (RR) were measured three times a day at 08.00, 14.00 and 20.00 h from birth to weaning at weekly intervals and biweekly thereafter to the first shearing (16 months). Increase and decrease in physiological parameters were calculated as differences between values at 08.00 and 14.00h and those between 14.00 and 20.00 respectively.

Statistical analysis:

Means and standard errors were calculated (Steel and Torrie, 1960).

RESULTS

Birthcoat type played an important role in keeping lambs warm (in winter) by affecting their ability to maintain normal body temperature. Differences were encountered between types where type1 lambs showed the highest heat retention. It was of interest to note that values of CT/Pre Ct, ratio of birth coat fibres that started with a curl (CT) to those of HH, super sickles and sikle fibres, paralleled those of heat retention, and it might be considered that differences encountered in heat retention were related to differences in birthcoat types, where type I, with its short, dense, higher content of less coarse fibers, wavy appearance, provided more protection during winter, compared with type2,3 with their long, less dense, straight and higher content of coarse fibers. Thus type1 was more effective and excelled the other types in thermoregulation. Values of heat retention were 0.55, 0.27 & 0.17°c, in crossbred lambs for types 1, 2&3 respectively, whereas values of 0.24, 0.23°c, were close to each other in Barki lambs for types 2&3, respectively.

Regardless of breed, values of heat retention were 0.55, 0.26 & 0.22°c, for types1, 2 & 3, respectively. Respiration rate followed almost the same pattern as that of the rectal temperature.

Heat retention was highest in type 1 and decreased towards type 3. This might be useful in winter. However, as ambient temperature rose during summer, medium type 2 performed better.

Lambs with high CT/Pre CT ratio have birthcoats with high frequency of less coarse or fine, crimpy CT's which increases insulation ability, hence the advantage of type 1 birthcoat in better themoregulation during winter. Earlier, Alexander (1962 a & b) and Slee (1978) related heat conservation and cold resistance to deferences in the birthcoats of lambs. Guirgis (1977) ascribed differences in CT/Pre CT ratio in birthcoats of lambs to differences in S/P ratio.

Lambs older than two months up to the yearling age were regraded into groups 1,2 and 3. Group 1 had generally the shortest coat depth, belly staple length, lowest content of Kemp fibers, higher content of less coarse fibers in their fleeces, dense staple structure and medium opening (Table 2). Due to density of fibers and uneasiness of opening of staples, it retained more heat, 0.26°c, where the initial RT was 39.07 ± 0.027°c. The initial RR was 54 and increased by 33, and decreased by 30 R/M, values of which implied that lambs might try to use their respiratory system in regulating their body temperature as a means of heat dissipation.

Group 2 lambs exceeded those of group 1 in coat depth, belly staple length and Kemp fiber content, but lower in staple structure, of medium density and medium in easiness of opening staples. Thus, lambs were relatively able to regulate their body temperature where their initial RT was 39.16 ± 0.042°c, retained 0.25°c, and had the initial RR that increased by 28 and decreased by 25 R/M. The lower initial respiration rate with limited changes during day times showed some advantages in themoregulation compared with group 1, partly attributed to coat difference, specially in Kemp content and medullated fibers, medium density and medium easiness of opening staples, which relatively help lambs to tolerate heat load.

Group 3 showed highest values of coat depth, belly staple length, Kemp fiber content, as well as 52% of the belly were covered with coarse fibers, and the least dense staple structure. The initial RT was 39.08 ±0.021°c and retained 0.26°c, and that the initial RR was 44 increased by 27 and decreased by 24 R/M. Hence, it might be the best group in thermoregulation with their coat features of higher Kemp and medullated fiber content and less dense structure of staples.

It could be generally concluded that lambs (crossbred) with the lowest Kemp content had the highest RR, and that Barki lambs with the highest Kemp content had the lowest RR. This might be related to density of fibers in the coat, where crossbreds were of higher density than Barki coats. This coat features give the Barki lambs some advantages in thermoregulation. The regraded lambs showed trends of increase in coat depth, belly staple length, kemp score and of a decrease in staple structure, showing more openness, that was observed (Table 2) form group 1 to group 3.

Barki sheep produced slightly lower greasy fleece weights than those of the crossbred, averages were 3.33 & 3.39kg, respectively. Lambs with lower grades of birthcoat (type 1 in crossbred and type 2 in Barki) (Table 3) developed lower adult fleece weights at first shearing than those with higher grades. The higher fleece weights of crossbred animals corresponded with higher initial RT and also higher increase and decrease of RR during day time, indicating that the heavier fleeced animals, might try to use their respiratory passage in regulating body temperature. Thus animals with heavy fleeces might encounter some troubles (during hot months) in maintaining body temperature. Hence, Barki sheep may be more adapted by having lower initial RT and RR with lower changes during day periods.

2-3

Values obtained of clean fleece weight (CFW) were 1.40, 1.41 and 1.54kg for groups, 1,2 and 3 respectively. Total values were 1.44 and 1.46kg for crossbred and Barki sheep, respectively. Guirgis (1980) reported clean yield percentages of 41.89 and 38.32 and clean fleece weights of 1.06 and 1.35kg, for local Barki and 5/8 Merino sheep, respectively, where the amount of impurities adherent to the Barki fleece were comparatively lower than those of crossbred fleeces.

The mean fiber diameter, showed a trend of increase towards group 3 (Table 4), values were 22.40, 27.16 & 30.06um for groups 1,2 & 3, respectively. Barki wool was coarser than that of crossbred type, values were 31.76 & 23.63um, respectively. The lambs with lower birthcoat grades developed finer fleeces than those of higher grades. Coarser fleeces showed better thermoregulation.

Table (4): Some adult coat characteristics ± SE of different fleece types

Type of coat	Xum	St.L/cm	F.T.R. % Kemp	F.T.R. Hetero-type	F.T.R. Coarrse	F.T.R. Fine	Med. Index	RT	RR
C1	22.40 ±0.458	8.56 ±0.370	0.37 ±0.076	0.03 ±0.019	5.21 ±0.993	94.39 ±1.008	10.44	39.11 ±0.085	58.00 ±3.00
C2	27.1 ±0.982	10.04 ±0.488	3.11 ±0.571	0.40 ±0.198	23.38 ±2.633	73.11 ±3.032	13.45	39.22 ±0.066	51.00 ±3.00
C3	30.06 ±0.771	12.22 ±0.310	5.64 ±0.597	0.66 ±0.146	29.96 ±1.635	29.96 ±1.635	14.83	39.12 ±0.055	43.00 ±1.00

Xum = Mean fibre diameter (microns).; St. I. = Staple length.; F. T. R. = Fibre type ratio; Med. Index = Medullation index; RT = Rectal temperature.; RR = Respiration rate.

Values showed a trend of increase in staple length towards group 3. Barki sheep had also longer staples than those of crossbred wool (Table 4).

A trend of higher heat retention and respiratory changes was encountered with a decrease in staple length and fiber diameter. However, all animals used their respiratory system with large capacity trying to control their body temperature against heat load. The difference between groups and breeds indicated that fiber diameter, staple length and greasy fleece weight played an important role in assisting animals to dissipate heat from the coat. In this respect Barki sheep with its coat of longer staple, coarser fiber diameter and lower greasy fleece weight had some advantages in affecting body temperature where the initial RT, RR and changes during the day were lower, indicating better adaptation to the prevailing climatic conditions, than crossbreds which suffered from heat load as evidenced by higher initial RT and RR and greater changes in these parameters during day time.

Kemp values reported (Table 4) showed a trend of increase towards group 3, percentages were 0.37, 3.11 and 5.64 for groups 1,2 and 3, respectively. In crossbred sheep, percentages were 0.37, 1.73 and 1.55 for groups 1,2 and 3, respectively, whereas those of Barki were 4.72 and 7.00 in groups 2 & 3, respectively. Barki wool had higher content of Kemp fibers than those of crossbred wool, values were 6.49 and 1.28 respectively.

A trend of a slight increase towards group 3 was encountered (Table 5). Barki fleeces had higher average percentages of heterotype fibers (0.21) than that of crossbred (0.09). This might mean a higher percentage of Kemp producing follicles that changed over to continuously growing fibers (Guirgis, 1967).

Table (5). Means ±S.E. of some body and fleece weight of different breeds.

Breed	ACFlWt	AGFWt	ABWt	AWWt	AYrlWt	16 M Wt
BB	1.51± 0.182	3.20 ± 0.410	3.05 ± 0.256	16.21 ± 1.917	31.66 ± 2.620	41.64 ± 3.448
Xs	1.62 ± 0.408	3.74 ± 0.918	3.95 ± 0.330	21.85 ± 3.475	38.06 ± 5.862	50.44 ± 5.452
Coat Type						
I	1.34 ± 0.408	3.39 ± 0.918	3.23 ± 0.572	22.00 ± 4.287	38.42 ± 5.862	50.53 ± 7.710
II	1.52 ± 0.288	3.61± 0.649	3.04 ± 0.285	19.87 ± 3.031	38.36 ± 4.145	50.44 ± 5.452
III	1.86 ± 0.235	4.17 ± 0.529	3.01 ± 0.173	20.03 ± 2.475	35.01 ± 3.385	46.04 ± 4.457

ACFlWt: Average clean fleece weight. **AGFlWt: Average greasy fleece weight.**
ABWt: Average body weight. **AWWt: Average weaning weight.**
AYrlWT: Average yearling weight. **16M Wt: Average16 months weight.**

A trend of increase (Table 5) towards group 3 was observed, percentages were 5.21, 23.38 and 29.96 in groups 1,2 and 3, respectively. Barki wool had a higher percentage of coarse fibers than that of the crossbred, values wee 35.61 and 10.76% in the first and latter respectively.

An opposite trend (Table 4) was encountered in fine fibers, where a decrease occurred from group 1 to 3, and crossbred fleeces had higher average (87.96%) than that of Barki (57.09%).

Barki fleeces had a higher content of medullated fibers, hence a higher medullation index, values were 15.66 and 11.49 in Barki and crossbred wool, respectively. A trend of increase (Table 4) towards group 3 was encountered.

Reproductive efficiency is considered an important indication of adaptability, the most suitable measure of which is the number of Kilograms weaned per ewe joined. In the present study the crossbred ewe weaned an average of 14.90 kg of lambs, corresponding value for the Barki ewe was 16.07kg. Hence. Barki ewes were more adapted than those of the crossbred. Regardless of the breed, a general trend of increase towards group 3 in reproductive efficiency was observed; values were 14.92, 15.10 and 15.30 kg for groups 1,2, & 3, respectively, where the higher the HH grades at birth, the higher the reproductive efficiency.

The Barki sheep, that had the higher birthcoat grades, produced lower greasy fleece weight, higher diameter and longer staple and higher medullation index, than those of crossbred sheep, and possessed the higher reproductive efficiency, proving to be better adapted than the crossbreds.

DISCUSSION

Results encountered showed that lambs with lower birthcoat types (1& 2) retained more heat, thus were best in thermoregulation at the first winter. It was found that lower types of birthcoat had higher percentages of CT's, histerotrichs and higher values of CT/Pre CT ratio than that of the high type (3). CT's and histerotrichs are usually finer than Pre-CT's.

Guirgis (1967) considered high values of CT/Pre-CT ratio as indicative of better evolution of the fleece. Goot (1941) indicated that during evolution the birthcoat fibers have undergone a series of changes and that the trend is towards a coat composed entirely of CT fibers.

Birthcoat samples examined from two to eight weeks of age showed a trend of increase in CT/Pre CT ratio and histerotrichs, which might parallel a similar increase in S/P ratio. Early selection of S/P ratio could be carried out (Guirgis, 1977) using calculated values from birthcoat fiber types.

During the intermediate stages of development of the juvenile fleece to that of the adult, regraded Barki lambs showed a decrease in kemp score, staple structure and belly staple length towards higher reproductive efficiency. Thus, selection of Barki lambs, before the first fleece stage, with low Kemp score, open structure of staple and shorter belly staple length would be favourable to reproductive efficiency.

Crossbred lambs, selected before the first fleece stage with shorter coat depth that have an easy to open coat and open structure of staple would be favourable to reproductive efficiency.

Guirgis (1973, b) sorted Barki fleeces into three grades. Percentages were 11, 58 and 31; diameter means were 27.7, 34.0 and 38.3um; staple length averages were8.9, 12.2 and 19.0cm in grades, 1,2 and 3, respectively. The majority of Barki wool has medium values of diameter and staple length and results encountered, in the present work showed that medium values coincided with better thermoregulation. Hence, development of Barki wool towards the apparel uses would be recommended for the welfare of animals. Furthermore, it might be inconvenient to develop Barki sheep to produce carpet wool type, the feed requirements of which would favour more of a steady supply throughout the year.

Lambs with lower birthcoat types grew adult fleeces with shorter staple length, finer diameter, lower Kemp score and medullated fibers and high fine fiber percentage.

Sheep were sorted into three levels of reproductive efficiency, low, medium and high. For higher reproductive efficiency, in Barki, sheep would have adult fleeces with shorter staple, medium diameter, high greasy fleece weight, low Kemp content, lower fine fiber percentages and lower medullation index. In crossbreeds, sheep would grow fleeces with shorter staple, slightly lower diameter, lower greasy fleece weight, slightly higher coarse fiber percentage and slightly lower fine fiber percentage.

Barki sheep with high reproductive efficiency had also, in their birthcoats, lower CT/Pre-CT ratio and lower CT's and higher histerotrichs percentages. It was also shown that higher reproductive efficiency was associated with lower birthcoat grades. Thus, selection of Barki lambs with lower birthcoat types that have low CT percentage and medium values of CT/Pre-CT ratio would be favourable for reproductive efficiency.

In crossbreds, better reproductive efficiency was associated with lower birthcoat types that had lower Pre-CT's, higher CT's and higher CT/Pre-CT ratio.

The amount of heat loss from hair coat was reported to be inversely related to hair length and ambient temperature (Hafez et al., 1956) and that the insulation of the coat depended on coat depth (Blaxter et al., 1959). In addition. Parer (1963) showed that the rate of heat conduction per unit area through wool was very rapid when wool was below 1cm in length and that insulation increased with wool length up to 4cm. Alexander (1962 a & b) in a study of newborn lambs reported that lambs with hairy coats were able to conserve heat more readily than those with fine coats. Furthermore, Slee (1978) showed that cold resistance was strongly influenced by breed difference in birthcoat morphology and probably by other physiological factors, partly attributable to the different genetic background associated with birthcoat type.

Generally, Barki sheep produced fleeces that showed advantages in regulation of body temperature compared with those of crossbred fleeces. Barki fleeces had a higher content of Kemp, heterotype and coarse fibers, and were lower in fine fiber content. Hence, the improved thermoregulation of Barki lambs as compared with crossbred lambs, might be related to the presence of coarse and medullated and kemp fibers that might play a role in controlling body temperature.

Dowling (1959) reported that the incidence of medullation makes Jersey cattle more heat tolerant than other European breeds. Kassab and Stegenga (1965 a, b & c) showed that the percentages of medullated hairs in Holsteins were less in winter and autumn than those of other seasons. The production of cattle living in hot countries is to a certain extent governed by their ability to disperse the excess of heat in their bodies and that the coat of cattle is one of the important factors affecting the rate of heat dissipation of the body. Hayman (1965) also reported that coat medullation was an important characteristic of Bos indicus breeds, and the summer coats consisted of medullated hairs. In addition, Benjamin (1985) believed that short, coarse, medullated coat of certain breeds, of cattle aid in heat dissipation.

He found that a reduction in number of continuously medullated fibers occurred in winter and an increase of those having discontinuous medulla, which might possibly assist in a decreased outward flow of heat through the hair coat, during winter.

Table (5) showed that crossbreed lambs were better in all weights than those of Barki.

Table (6) indicated an increase in average clean fleece weight and average greasy fleece weight from coat type one towards coat type three and a decrease in birth weight, weaning weight, 16 month weight from coat one to coat type three.

Table (6). Coat type (CT)of different grades and their weights.

A Cl Fl / 16 m. wt	**Density Fl. Wt / Body Wt. $^{0.75}$**	**Grade**
1.34/50.53	0.07	I
1.52/50.44	0.08	II
1.86/46.04	0.11	III
A G Fl / 16 m. wt	**Density Fl. Wt / Body Wt. $^{0.75}$**	**Grade**
3.39/50.53	0.18	I
3.61/50.44	0.19	II
4.17/46.04	0.24	III

Average clean fleece weight (A CL FL WT)
Average greasy fleece weight (A G FL WT)

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نوع الجزة في الاغنام : دورها في الاقلمة للبيئات شبة الجافة.

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أجريت هذة الدراسة علي ٢٠١ من الحملان (١١٠ منها من سلالة البرقي المحلية ذات الصوف الخشن و ٩١ من خليط ٨/٥ مارينو و ٨/٣ برقي) ولدت هذة الحملان في فصل الشتاء (ديسمبر) عام ١٩٨٠ تحت ظروف شبة الجافة. حيث تراوحت درجات الحرارة الجوية من ١١,١ الي ٢٠,٨ °م أثناء الشتاء ومن ٣٣,٤ إلي ٣٨,٦ °م أثناء الصيف عند الساعة الثامنة صباحا والثانية ظهرا علي الترتيب.

هدفت الدراسة إلي بحث دور غطاء الجسم منذ عمر الميلاد إلي عمر الحصول علي الجزة الأولي (١٦ شهر) في التنظيم الحراري والتأقلم للظروف البيئية السائدة.

قسمت الحملان عند الولادة طبقا لكثافة صوف الهالة (الهالوهير) إلي سبع رتب Grades أدمجت تحت ٣ فئات.

الفئة الاولي (١) :- وتشمل أقل ثلاث رتب من الهالوهير في صوف الميلاد (١ – ٢ – ٣).
الفئة الثانية (٢) :- وتشمل الرتب المتوسطة (٤ – ٥).
الفئة الثالثة (٣) :- وتشمل الرتبتين الاعلي من الهالوهير (٦ – ٧).

كان ثلث صوف الميلاد من أغنام البرقي من الفئة المتوسطة بينما كان الثلثين الاخرين من الفئة الثالثة. بينما توزع صوف الميلاد للأغنام الخليط ٨/٥ مارينو كما يلي:-
٣٤,٠٧ % من الفئة الاولي ، ٣٨,٤٦ % من الفئة الثانية ، ٢٧,٤٧ % من الفئة الثالثة.

أظهرت الحملان عموما من الفئة الاولي (١) إحتفاظا أفضل بحرارة الجسم خلال فصل الشتاء تلتها الفئة (٢) بينما كانت الفئة (٣) هي الاقل إحتفاظا بحرارة الجسم. وتميزت الفئة (١) بألياف قصيرة وكثيفة ذات مظهر متموج مقارنة بالفئتين (٢) ، (٣) واللتان تميزتا بألياف أطول وأقل كثافة ومستقيمة وذات محتوي أعلي من الألياف الخشنة. وبالتالي وفر صوف الميلاد من الفئة الاولي حماية أفضل أثناء الشتاء وكانت الحملان في هذة الفئة أكثر استقرارا وذات أقل معدل تنفس بينما زاد معدل تنفس بارتفاع فئة صوف الميلاد وكان الاعلي في الفئة الثالثة.

بعد عمر شهرين وحتي الجز الاول عند عمر ١٦ شهرا زاد سمك الغطاء وطول الخصلات علي البطن ودرجة الكمب بارتفاع الفئة من (١-٣) بينما ظهر اتجاه معاكس في تركيب الخصلة حيث كانت الخصلة في الفئة الثالثة أكثر تفتيحا. كانت حرارة المستقيم متشابهة في الثلاث فئات ومع ذلك ظهر انخفاض في معدل التنفس تجاه الفئة الثالثة.

عند الجز الاول أظهر كل من طول الخصلة ومتوسط قطر الليفة والكمب والالياف الخشنة ودليل النخاع تزايدا تجاة الفئة الثالثة بينما أظهرت النسبة المئوية للالياف الناعمة إتجاها معاكسا حيث انخفضت تجاه الفئة الثالثة هذا بالتوازي مع انخفاض معدل التنفس تجاه الفئة الثالثة التي كانت أكثر راحة أثناء الصيف الحار.

كما اظهر اتجاه عام لازدياد وزن الفطام والوزن عند عمر سنة وكذلك النمو اليومي في مرحلتي من الولادة الي الفطام ومن الفطام حتي عمر سنة والانتاج اليومي (بالجرام) من الصوف الخام ووزن الجزة النظيف بارتفاع فئة صوف الميلاد.

كانت الفئات المنخفضة من صوف الميلاد (١ ،٢ في ٨/٥ المارينو ، ٢ في البرقي) الافضل في التنظيم الحراري في فصل الشتاء (موسم الولادات) حيث كانت الافضل في الاحتفاظ بدرجة حرارة اجسامها مقارنة بالفئة الثالثة. كما لوحظ نفس الأتجاه في الفترة من عمر شهرين حتي عمر ١٦ شهر وعند عمر الجزة الناضجة عند عمر ١٦ شهر.

وأظهرت الفئات الاعلي من صوف الميلاد زيادة في الكفاءة التناسلية معبرا عنها بالكيلوجرامات المفطومة من كل نعجة ملقحة حيث كانت القيم ١٠,٩٨ ، ١١,٢٩ ، ١١,٤٣ كجم للفئات ١ ، ٢ ، ٣ علي التوالي.

لذلك ينبغي الانتخاب للكفاءة التناسلية المناسبة للظروف البيئية السائدة والتي تعكس التاقلم من خلال نوع جزة معينة.

Table (2) : Averages ± SE of different regrading measurements and some Physiological parameters.

Groups	Coat Depth cm	Belly Staple length cm	% Coat cover on the belly	Kemp score	Staple structure	Opening score	Physiological parameters RT Initial	RT Inc.	RT Dec.	RR Initial	RR Inc.	RR Dec.
1	4.75	4.85	46.00	0.01	1.75	1.21	39.07	0.58	0.32	54.00		3
	±0.272	±0.411	±0.127	±0.125	±0.125	±0.125	±0.027	(0.26)		±10.0	0.00	
												(3.0)
2	5.42	5.61	46.00	1.10	1.52	1.52	39.16	0.53	0.28	48.00		2
	±0.152	±0.419	±0.140	±0.151	±0.146	±0.146	±0.042	(0.25)		±6.00	5.00	
												(3.0)
3	5.68	6.08	52.00	1.74	1.49	1.49	39.08	0.52	0.26	44.00		2
	±0.162	±0.533	±0.105	±0.185	±0.162	±0.162	±0.021	(0.26)		±5.00	4.00	
												(3.0)

RT = Rectal temperature.; RR = Respiration rate.; Inc. = Increase.;Dec.= Decrease.

Table (3): Least squares means ±SE, for some productive triats of lambs with different types of coat (C)

Coat type	Birth Wt. (kg) M. ±	SE	Weaning Wt. (kg) M. ±	SE	Yearling Wt (kg) M. ±	SE	GFW (kg) M. ±	SE	CFW (kg) M. ±	SE	Daily gain/g B-W	Daily gain/g W-Y	Daily gain/g GFW	Daily gain/g CFW
General mean	3.63	0.059	20.38	0.341	47.65	0.874	3.36	0.144	1.45	0.063	139.58	74.57	6.89	2.97
C1	3.47	0.144	19.83	0.802	47.41	2.120	3.22	0.349	1.40	0.153	136.33	75.53	6.61	2.87
C2	3.63	0.084	20.36	0.496	48.03	1.303	3.34	0.214	1.41	0.094	139.42	75.73	6.86	2.89
C3	3.78	0.079	20.97	0.454	47.50	0.998	3.53	0.164	1.54	0.072	143.25	72.82	7.25	3.16
Difference				N.S		N.S		N.S		N.S	N.S			

GFW = Greasy fleece weight ; CFW = Clean fleece weight ;
B-W = Birth to weaning ; W-Y = Weaning to yearling ; N. S = Not significant .