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A STUDY ON FLEECE CHARACTERIZATION OF HAMADANI SHEEP IN ERBIL PLAIN

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ABSTRACT

This study was undertaken on 196 Hamadani sheep (179 ewes & 17 rams) to characterize the fleece quantitatively and qualitatively and to determine the effect of flock (1 – 4), ewe age (1.5 to ≥ 5.5 years) and ewe status (barren, rearing single and twin lambs) on the studied traits besides the relationships among these traits. The results indicated that the overall means were: body weight 59.4 kg, greasy fleece weight 2.3 kg, staple length 11.9 cm, fiber length 18.3 cm, fiber diameter 37.2 µm, crimps 0.65 crimps/cm, medullated fibers 3.4 %, hairy fibers 59.4 %, fine fibers 36.7 %, heterotype fibers 1.1 % and kemp fibers 2.8 %. Furthermore, it was noticed that the grease content in greasy and scoured wool were 1.73 and 0.86 % respectively. Statistical analysis revealed a significant effect of flock on body weight, greasy fleece weight, staple length, fiber length, fiber diameter, crimps, medullated fibers, heterotype fibers and kemp fibers whereas, age of ewe affected only greasy fleece weight, staple length, fiber length and fiber diameter significantly.Non of the studied traits were affected significantly by ewe status.

INTRODUCTION

Karadi (Kurdi) sheep are considered to be the largest size of local breed raised in the mountainous region of Iraqi Kurdistan.They represent about 20% of the total sheep population of the country (Juma&Alkas,2000) and belong to the fat – tailed carpet – wool sheep.

Hamadani sheep is one of the important & favored indigenous strain of Karadi sheep among sheep owners in the plain areas due to its high twinning rate (Al-Kamali,1976), large body frame, high milk production and heavy fleece weight (Aziz,1993 and Juma&Alkas,2000).

Wool production has an economic importance for some countries (Australia & New Zealand) and its study is not less important than that of muttion and milk production due to the availability of specialized breeds in fine and coarse wool production (Crean&Bastian, 1997). Consequently, part of the owners income depends upon quantity and quality of produced wool.

Physical properties of wool have an important role in processing stages and end-products; the coarser, longer, stronger, higher medullated and crimpier fibers are desirable in carpet manufacture due to their influence on carpet bulkiness and durability (Ince, 1978 and Champion & Robards, 1999).

Since conflicting results had been documented on the properties of Hamadani sheep wool by many researchers such as Al-Azzawi (1977), Maarof *et al.* (1982), Maarof (1989), Aziz (1993) and Ali(1999), this study was conducted and the objectives of this study were to: investigate wool characteristics; determine the influence of flock, ewe age and ewe statuse on studied traits and detect the relationships among the traits.

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MATERIALS AND METHODS

Animals:A total of 196 Hamadani sheep (179 ewes & 17 rams) from Erbil plain were hand- sheared at the end of April, 2001. The sheep belonged to four flocks, five ewe age groups (1.5 to ≥ 5.5 years) and three ewe statuses for the animals (barren, rearing single and twin lambs).Although the managerial practices in terms of feeding & husbandry differed among flocks, the traditional system in sheep feeding was availiable that depends upon low quality pasture & cereal stubble. In addition, supplying barley grain and wheat straw during winter season.

Measurements: For each animal, body weight and greasy fleece weight were recorded immediately after shearing to the nearest 0.5 and 0.1kg respectively, and approximately 50 g of wool sample was taken from it's right mid-side.It is worthwhile to mention that it was possible to obtain body weight from flocks No.1&2 only (84 ewes & 6 rams).Further, three values of greasy fleece weight from rams were not availiable, which leaded the number of greasy fleece weight to be 193.

The average staple length of triplicate for each greasy wool sample was estimated, by a ruler, from their cut base to the midway in the pyramid formed by the tip (Von Bergen, 1963).

Five greasy staples were randomly selected from each sample, scoured in water (55 c^{o}) containing non – ionic detergent, rinsed and air – dried. Then staples were scoured by petroleum spirit and air – dried prior any subsequent measurement. One hundred fibers were randomly drawn from a degreased staple and used for fiber length measurements, while average number of crimps/cm was measured from ten selected fibers. The diameters of 225 fibers were measured by projection microscope (Lanameter) from each sample in accordance to the ASMTT (1978). The medullation percentage was estimated by counting the number of medullated fibers occurring in the sample used for measuring the diameter as described by the IWTO (1976).Also, the weight of the different fiber types (hairy, fine, heterotype & kemp fibers) were determined by visual separation of one degreased staple by applying the method of Doney and Smith (1961).

Alcohol extractable matter (grease content) from greasy and scoured wool samples, after washing a sub-sample of 20 g of greasy wool (Chapman,1960 and Aziz, 1991), was determined for each age group belong to flock No.2 only, due to shortage of wool samples from other flocks, by Soxhlet

extraction following the instructions and procedures adopted by the IWTO (1976).

Statistical analysis: The statistical computer package SAS (1989) was used to explain the influence of flock, age and status on different traits for ewes only due to the limited number of rams and the correlations among traits.The completely randomized design (CRD) in factorial experiment was applied according to the following mathematical model;

$Y_{ijkl} = \mu + F_i + A_j + S_k + E_{ijkl}$

Where, Y_{ijkl} is the l^{th} observation of the i^{th} flock at the j^{th} age and k^{th} status, μ is the common effect of all observaion, F_i is the flock effect, A_j is the ewe age effect, S_k is the ewe status effect and E_{ijkl} is the random error. The differences between means of subclasses were tested by using Duncan's Multiple Range Test.

RESULTS AND DISCUSSION

Body weight:The results presented in Table (1) indicate that the overall mean of body weight for Hamadani sheep was 59.4 kg with an average of 57.6 kg and a range from 43.5 to 95.5 kg for ewes,whereas with the limited number of rams in the present study, the average was 85.2 kg and a range from 53 to 106 kg .In comparison to other Iraqi local breeds,Hamadani sheep are known for their larger body weight(Asker & Juma,1966 and Juma & Alkass, 2000).The present result is in agreement with other researchers for other local breeds that the body weight of rams is higher than that of ewes (Asker,1964 and Asker & El-Khalisi,1964).

Wool physical characteristics:Table (1) shows that the overall mean of greasy fleece weight was 2.3 kg.The average fleece weight reached 2.3 kg with the range (1.3-4.5 kg) for ewes, while for rams the average was 3.0 kg and a range (1.5-4.5 kg).In this respect,the earlier findings of Al-Azzawi(1977), Maarof *et al.*(1982), Maarof(1989) and Aziz(1993) reported that the average fleece weight for Hamadani sheep ranged from 1.8 to 2.3 kg.The exceedness of rams over ewes in average fleece weight(3.0 vs 2.3 kg) , mainly due to their larger size.

The overall mean of staple length and fiber length were found to be 11.9 and 18.3 cm respectively (Table 1).The average staple length and fiber length for ewes were 11.7 and 18.0 cm while for rams were 13.7 and 20.7 cm respectively,this might be related to slow fiber growth in ewes due to physiological statuse (Ryder, 1975).The present result is higher than that observed by Maarof (1989) for Hamadani rams (10.43 cm), but closer to the results obtained by Al-Azzawi (1977), Maarof *et al.*(1982) and Aziz (1993) for Hamadani ewes.In this regard, it should be mentioned that desirable staple length for a speciality carpet wool blend compound is 10 cm (Ross,1978).

The overall mean of fiber diameter of Hamadani sheep fleeces was 37.2 µm
(Table 1) with the range from 32.3 µm to 42.4 µm. Earlier researchers (Maarof *et al.*,1982;Maarof,1989 and Aziz,1993) found similar values to the present result while

Al-Azzawi(1977) and Ali(1999) reported finer fiber diameter(30.0 & 28.4 µm) respectively, this difference might be due to small sampling size used by the last two researchers. The wide fiber diameter distribution in the fleece of Hamadani sheep (Fig. 1) is due to the fact that Hamadani sheep are not selected for their wool production.

The overall mean of the number of crimps was 0.65 crimps/cm (Table 1). Similar results were obtained by Maarof *et al*.(1982) and Maarof(1989) whereas Ali(1999) recorded 2.3 crimps/cm.

The overall mean of medullated fiber percentage was 3.4% (Table 1).Higher values were reported earlier by Al-Azzawi (1977), Maarof *et al.* (1982) and Aziz (1993).

Table(2) displays the overall means of hairy, fine, heterotype and kemp fibers percentage by weight,which were 59.4, 36.7, 1.1, and 2.8 % respectively.The obtained values are much closer to those obtained by Maarof *et al*.(1982) than those obtained by Al-Azzawi(1977) and Ali(1999). Conversely the kemp fiber percentage is nearly similar to that obtained by Al-Azzawi (1977) and Aziz (1993) but lower than that reported by Maarof *et al.* (1982) and Ali (1999).

Alcohol extractable matter:Figures 2&3 presented the alcohol extractable matter content for greasy and scoured wool at different age groups.The average values were found to be 1.73 and 0.86 % for greasy and scoured wool respectively. Similarly, Al-Murrani (1975) observed low values in scoured wool for other Iraqi breeds (Arabi, Awassi and karadi).This low wax content is due to the low S/P follicle ratio of the coarse wool sheep(Fraser and Short,1960).

Effect of factors (flock, ewe age and ewe statuse) on studied traits: The data presented in Tables (1&2) revealed a significant effect of flock at $p \leq 0.05$ on medullated fibers and at $p \leq 0.01$ on the rest of studied traits except in case of hairy and fine fiber percentages, this may be attributed to different manegmental practices that were availiable among flocks because raw wool variability is highly influenced by environmental factors(Ryder and Stephenson,1968).

The effect of ewe age appeared to be only significant at $p \leq 0.05$ on staple length and fiber length and at $p \leq 0.01$ on greasy fleece weight and fiber diameter (Table 1). In this respect, the lowest (51.7 kg) and highest (64.5 kg) body weights were recorded in the groups of 1.5 and 4.5 years old respectively.This is in agreement with those results observed by Sabbagh *et al*.(1986) for the other Iraqi breeds (Kurdi, Awassi and Arabi). On the other hand, the first age group (1.5 year old) produced the heaviest greasy fleece weight (2.5 kg) and the longest staple length and fiber length (12.5 cm&19.6 cm) respectively while ewes aged 5.5 years produced the lightest greasy fleece weight (1.9 kg) and the shortest staple length and fiber length(10.9 cm&16.7 cm) respectively.This was due to that the wool produced for the first age group was for the period of 1.5 year while for the other groups for one year only. Also, the low produtivity for the aged group (5.5 year) may be attributed to low feed intake, consequently low wool follicle eficiency, in addition, to the effects

of reproduction (Corbett,1979). Similar trend was observed in Arabi sheep by Al-Saigh (1990). The finest (36.0 µm) and the coarsest (38.3 µm) fiber diameter were observed for the groups of 1.5 and 4.5 years old respectively.Similar pattern were observed earlier for other Iraqi sheep (Ali, 1999 and Magid, 2000).

Despite insignificant effect of ewe status on studied traits, the barren ewes gave lower body weight but heavier fleece weight, longer staple length and fiber length and finer fiber diameter as compared to those ewes rearing single and twin lambs.The plausible explanation is that most of the barren ewes were in the age of 1.5 year old besides the influence of pregnancy and lactation upon wool growth (Corbett,1979). In this regard, Aziz (1993) observed that barren ewes produced about 40 % more greasy wool than ewes rearing single and twin lambs.

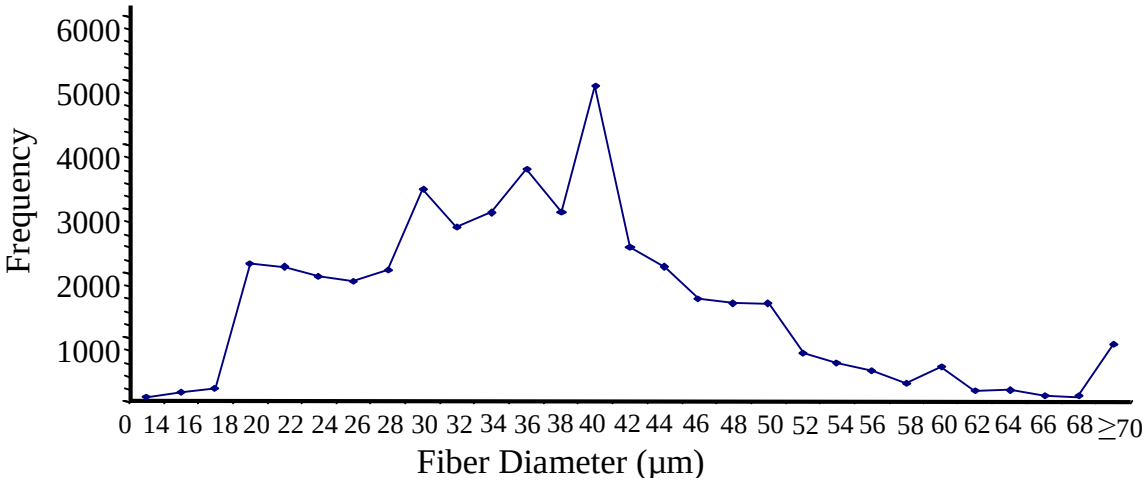

Fig.(1):Frequency distribution of Fiber Diameter for the Fleece of Hamadani Sheep.

Correlation analysis:The data presented in Table (3) showes phenotypic correlation between most of the characteristics under study, so the emphasis is concentrated on the main points: the value of correlation between body weight and greasy fleece weight (0.50, $p \leq 0.01$)was higher than those of other Iraqi breeds (Awassi & Arabi) which ranged from 0.04 to 0.24 (Asker & Juma, 1966; Al-Saigh, 1990 and Ali,1999), while it was closer to the results obtained by Maarof (1989) on same type of sheep.There was also a highly significant ($p \leq 0.01$) positive correlation between the greasy fleece weight and each of the staple length (0.50) and fiber length (0.56). Similar results were observed

Table(1):Means ± Standard Deviations for Body Weight and Wool Physical Characteristics.

Sheep Variables	No.	Body Weight (kg)	No.	Greasy Fleece Weight (kg)	No.	Staple Length (cm)	Fiber Length (cm)	Fiber Diameter(µm)	Crimps/cm	Medullated Fibers (%)
Overall Mean	90	59.4±13.22	193	2.3± 0.61	196	11.9±1.77	18.3±3.04	37.2±1.62	0.65±0.17	3.4±3.05
Sex										
Ewes	84	57.6± 10.30	179	2.3± 0.55	179	11.7±1.65	18.0±2.98	37.2±1.59	0.66±0.17	3.3±3.08
Rams	6	85.2± 22.30	14	3.0± 0.89	17	13.7±2.01	20.7±2.61	37.8±1.88	0.60±0.17	4.0±2.75
Flock		**		**		**	**	**	**	*
1	48	51.4 ± 4.95 a	48	2.4± 0.53 a	48	12.2±1.49 ab	19.1±2.89 a	36.8±1.47 bc	0.65±0.20 b	3.3±3.09 b
2	36	65.8± 9.92 b	36	2.3± 0.42 a	36	11.5±2.03 bc	18.6±2.73 a	38.2±2.17 a	0.82±0.16 a	4.3±3.43 a
3			38	2.4 ±0.68 a	38	12.4±1.48 a	18.9±2.56 a	37.4±1.23 b	0.68±0.06 b	4.0±3.31 a
4			57	2.0± 0.48 b	57	11.0±1.29 c	16.2±2.67 b	36.7±1.10 c	0.54±0.08 c	2.2±2.28 b
Ewe age (year)		N.S.		**		*	*	**	N.S.	N.S.
1.5	13	51.7 ± 5.78	30	2.5± 0.68 a	30	12.5±1.67 a	19.6±3.36 a	36.0±0.99 a	0.62±0.15	3.9±3.48
2.5	24	58.9± 10.04	52	2.3± 0.44 ab	52	11.9±1.71 ab	18.0±2.62 bc	36.8±1.38 b	0.67±0.18	2.6±3.02
3.5	24	55.5± 7.72	40	2.3± 0.52 ab	40	11.7±1.52 ab	18.5±2.86 ab	37.1±1.40 b	0.64±0.18	3.7±3.33
4.5	16	64.5± 14.29	32	2.2 ±0.54 b	32	11.3±1.67 bc	17.0±3.2 c	38.3±1.66 c	0.69±0.17	3.8±3.05
≥5.5	7	55.2 ±6.76	25	1.9± 0.47 c	25	10.9±1.22 c	16.7±2.08 c	38.1±1.42c	0.67±0.15	2.9±1.89
Ewe status		N.S.		N.S.		N.S.	N.S.	N.S.	N.S.	N.S.
Barren	15	52.7± 5.82	32	2.4 ±0.58	32	12.1±1.38	18.9±2.39	36.4±1.40	0.66±0.14	3.7±3.80
Rearing Single Lambs	61	57.6 ±10.40	131	2.2 ±0.54	131	11.7±1.69	17.9±3.17	37.3±1.58	0.65±0.14	3.0±2.71
Rearing Twin Lambs	8	66.7± 10.86	16	2.2 ±0.49	16	11.5±1.74	17.3±2.11	37.9±1.49	0.72±0.15	4.9±3.88

** P≤0.01 * P≤0.05 NS=Non-significant

Values within the same column with different superscripts are significantly different(P≤0.05).

Table(2): Means ± Standard Deviations for Fiber Type Ratio by Weight.

Sheep Variables	No.	Hairy Fibers (%)	Fine Fibers (%)	Heterotype Fibers (%)	Kemp Fibers (%)
Overall Mean	196	59.4±4.37	36.7±5.14	1.1±0.66	2.8±3.32
Sex					
Ewes	179	59.6±3.97	36.5±4.76	1.1±0.68	2.8±3.34
Rams	17	56.6±6.89	39.7±7.68	0.9±0.37	2.9±3.14
Flock		N.S.	N.S.	**	**
1	48	59.6±3.72	37.5±4.21	0.9±0.43 b	1.9±2.10 b
2	36	60.9±3.95	35.0±5.07	1.8±0.83 a	2.4±2.09 b
3	38	59.0±4.04	35.5±5.15	1.0±0.48 b	4.5±3.90 a
4	57	59.3±4.06	37.2±4.50	0.8±0.52 c	2.8±4.03 b
Ewe age(year)		N.S.	N.S.	N.S.	N.S.
1.5	30	59.4±3.78	37.0±4.42	1.0±0.65	2.6±3.37
2.5	52	59.5±4.25	37.0±4.83	1.2±0.73	2.4±2.88
3.5	40	60.2±3.42	36.0±4.34	1.0±0.66	2.7±2.86
4.5	32	60.2±4.54	35.6±5.66	1.3±0.72	2.9±3.58
≥5.5	25	58.7±3.67	36.5±4.55	0.9±0.48	4.0±4.40
Ewe status		N.S.	N.S.	N.S.	N.S.
Barren	32	58.8±3.54	37.7±4.34	0.9±0.70	2.6±3.33
Rearing Single Lambs	131	59.8±3.91	36.4±4.75	1.1±0.61	2.8±3.29
Rearing Twin Lambs	16	60.4±5.18	34.4±5.19	1.6±0.93	3.7±3.79

** P≤0.01 * P≤0.05 NS=Non-significant

Values within the same column with different superscripts are significantly different (P≤0.05).

by Maarof (1989), Aziz (1993) and Al-Saigh (1990). The correlation between staple length and fiber length (0.84, p≤ 0.01) for Hamadani sheep is less than that observed by Andrews and Rottenbury(1975) for Merino sheep (0.97). This explains the staple configaration difference between carpet wool type and fine Merino.

Correlation analysis:The data presented in Table (3) showes phenotypic correlation between most of the characteristics under study, so the emphasis is concentrated on the main points: the value of correlation between body weight and greasy fleece weight (0.50, p≤ 0.01)was higher than those of other Iraqi breeds(Awassi &Arabi) which ranged from 0.04 to 0.24 (Asker & Juma, 1966; Al-Saigh, 1990 and Ali, 1999), while it was closer to the results obtained by Maarof (1989) on same type of sheep.There was also a highly significant (p≤ 0.01) positive correlation between the greasy fleece weight and each of the staple length(0.50) and fiber length (0.56). Similar results were observed by Maarof (1989), Aziz (1993) and Al-Saigh (1990). The correlation between staple length and fiber length (0.84, p≤ 0.01) for Hamadani sheep is less than that observed by Andrews and Rottenbury(1975) for Merino sheep (0.97). This

explains the staple configaration difference between carpet wool type and fine Merino.

It is worthwhile to mention that correlation among most of studied traits were positive except for the negative correlation emerged between the undesirable kemp fibers percentage and most of the characteristics.This suggests that it should be possible to increase wool production quantitatively and qualitatively.

In the light of the above mentioned results, it can be concluded that Hamadani sheep fleeces exhibited the most desirable characteristics for a specialty carpet wool. Since the individuals varied in all studied traits, this will make the selection easier

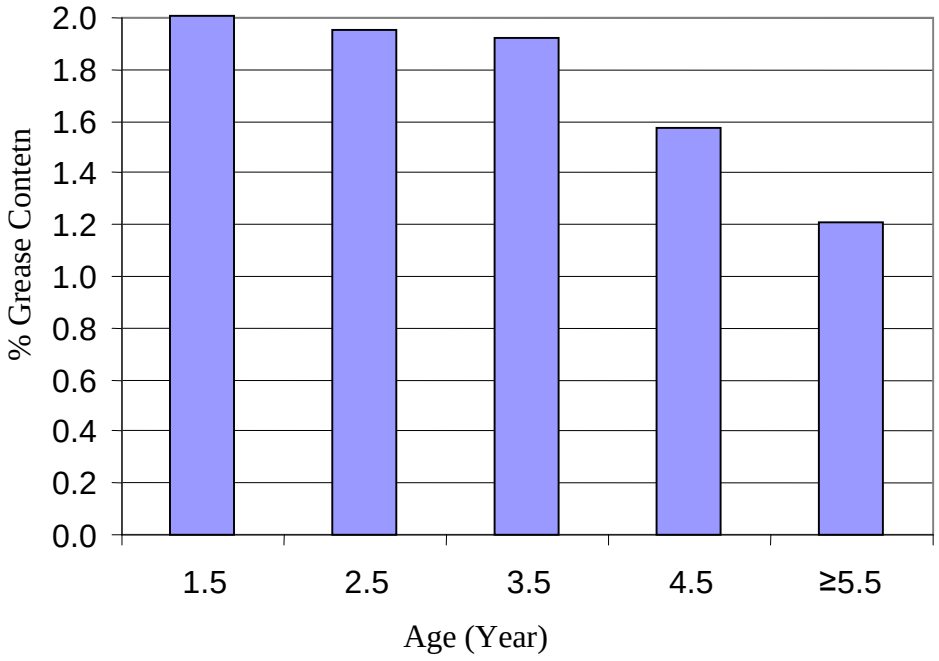

Fig. (2): Grease content in greasy wool for Hamadani sheep.fleece at different age groups

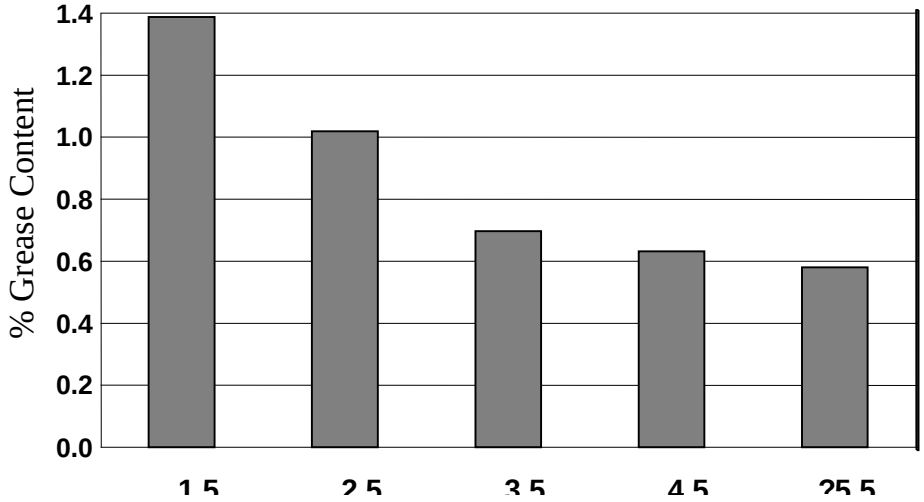

Fig. (3): Grease content in scoured wool for Hamadani sheep fleece at different age groups

Table(3):Crrelation Coefficients for Live Weight and Studied Fleece Characteristics of Hamadani Sheep.

Character	Greasy Fleece Weight	Staple Length	Fiber Length	Fiber Diameter	Crimps	Medullated Fibers	Hairy Fibers	Fine Fibers	Heterotype Fibers	Kemp Fibers
Live Weight	.50**	.21*	.15	.28**	.17	.21*	.00	-.06	.22*	.06
Greasy Fleece Weight		.50**	.56**	-.02	.03	.09	.02	.07	-.03	-.13
Staple Length			.84**	-.10	-.13	.01	-.06	.13	-.18*	-.09
Fiber Length				-.07	.05	.06	.02	.14*	-.09	-.23**
Fiber Diameter					.31**	.31**	.05	-.24**	.22**	.27**
Crimps						.06	.07	-.03	.33**	-.11
Medullated Fibers							-.08	-.14*	.21**	.28**
Hairy Fibers								-.75**	.15*	-.19**
Fine Fibers									-.32**	-.50**
Heterotype Fibers										.09

**P≤ 0.01 *P≤ 0.05

N.B. No. of observations for above traits were: Live weight (90), Greasy fleece weight (193) and the rest of traits (196).

دراسة مواصفات جزة الأغنام الحمدانية فى سهل أربيل

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الخلاصة

اجريت هذه الدراسة على ١٩٦رأسا من الأغنام الحمدانية (١٧٩نعاج و ١٧كباش) لتوصيف الجزة كماً و نوعاً وتحديد مدى تأثير القطيع (١ – ٤)، عمر النعجة (١.٥ – ٥.٥ سنة و اكثر) و

حالة النعجة (جافة، والدة حملان فردية و والدة حملان توأمية) على الصفات المدروسة وكذلك معاملات الارتباط بين هذه الصفات. بلغت المتوسطات العام لوزن الجسم ٥٩.٤ كغم،وزن الجزة الخام ٢.٣كغم،طول الخصلة ١١.٩ سم، طول الليفة ١٨.٣ سم،قطر الليفة ٣٧.٢ مايكرون، التجعدات ٠.٦٥ تجعد/سم،الألياف النخاعية ٣.٤ %،الياف الشعرية٥٩.٤ %، الألياف الناعمة ٣٦.٧%، الألياف الخليطة ١.١% و الألياف الشعرورة ٢.٨% .كما ان نسبة الدهن في الصوف الخام والمغسول بلغت ١.٧٣% و٠.٨٦% على التوالى. أشارت النتائج الى وجود التأثير المعنوى للقطيع على وزن الجسم،وزن الجزة الخام،طول الخصلة، طول الليفة،قطر الليفة، التجعدات،الألياف النخاعية، الألياف الخليطة و الألياف الشعرورة و كذالك التأثير المعنوى للعمر فقط على وزن الجزة الخام،طول الخصلة،طول الليفة وكذلك قطر الألياف. حالة النعجة لم يأثر معنوياً على أية الصفات المدروسة. أظهرت جزة الأغنام الحمدانية معظم صفات الصوف السجاد الممتاز وتباينت أفرادها فى جميع الصفات المدروسة مما يوفر امكانية اجراء الأنتخاب عليها مستقبلاً.

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