

A Comparative Study of Fleece Characteristics in Iraqi Sheep, II. Fibre diameter, medullated fibres % and fibre length

G.M. Ashmawy and W.A. Al-Azzawi

Faculty of Agriculture, Cairo University, Egypt and
Faculty of Agriculture, Salah El-dean University, Iraq.

THE INFLUENCES of breed (four' age (1 to 4 years), husbandry system (intensive and extensive) and location (different) on wool fibre diameter, medullated fibres %, and fibre length of Iraqi sheep were estimated. Right midside subsamples were collected from 94 Awassi, 64 Arabi, 32 Karadi, and 32 Hamadani ewes. The thickest and longest fibres (30.70 ± 0.82 microns, and 22.92 ± 0.48 cm) were given by Karadi sheep. The finest and shortest fleeces (26.16 ± 0.43 microns and 17.34 ± 0.40 cm) were produced by Arabi sheep. Fleeces of Awassi sheep were finer than those of Karadi and Hamadani sheep and shorter than those of Karadi sheep. Hamadani breed yielded wool nearly almost similar in thickness to that of Karadi breed but shorter than that of Awassi breed. Breed effect had a highly significant contribution to the variations in fibre diameter and length. Differences due to breed in case of medullated fibres % were limited (1.5%) and non-significant. Age had only a significant influence on fibre length. The longest fibres were given when Awassi, Arabi and Hamadani ewes were two years old while those of Karadi ewes reached their maximum length at four years of age. Differences attributed to between locations within breed effect were only significant for fibre diameter. Awassi fleeces yielded at Mosul were finer than those produced at Baghdad or at Rutba. Arabi sheep gave finer fibres at Thi-Qar than at Maysan. No significant differences in fibre diameter, length or medullated fibres % were found among ewes underwent the intensive system of husbandry and those kept under the extensive one. Interactions among the different factors were studied.

The objective of this study was to compare the fibre diameter, length and medullated fibres % of the main sheep breeds of Iraq, *i.e.* Awassi, Arabi, Karadi, and Hamadani. Such information may help in setting up plans and programs for the improvement of Iraqi wool. Moreover, the study aimed at accessing the role played by some important nongenetic factors, *i.e.* location, age, and husbandry system on fibre thickness, length and percentage of medullated fibres of each breed, the matter which seems necessary for the within breed improvement.

Material and Methods

The subsamples of 221 right mid-side samples taken in April 1976 from Awassi, Arabi, Karadi, and Hamadani ewes belonged to different age groups, locations and husbandry systems (Table 1) were used in this work. Each subsample was immersed in four xylol (a fat solvent) baths for 10 min. To obtain the average fibre diameter, the method suggested by Chapman (1960)

was adopted. The diameters of 300 fibres were randomly measured by a microprojectoscope apparatus "lanameter" and the average was computed. The number of medullated fibres was estimated, while examining the diameter by using the method described by the International Wool Textile Organization (1952). For measuring fibre length, a length tester machine was used. The length of 300 randomly drawn fibres was estimated using a decreased staple. Analysis of variance for the three way factorial with nested factors were carried out according to the methods given by Snedecor and Cochran (1973).

TABLE 1. Breed, age of ewes, number and source of wool subsamples.

Age	Awassi						Arabi				Karadi		Hamadani	
	Baghdad		Mosul		Rutba		Thi-Qar		Maysan		Solya- mania		Asky- kalak	
	A	(B)	A	(B)	A	(B)	A	(B)	A	(B)	A	(B)	A	(B)
1	4	(4)	4	(4)	4	(4)	4	(4)	4	(4)	4	(4)	4	(4)
2	4	(4)	4	(4)	4	(4)	4	(4)	4	(4)	4	(4)	4	(4)
3	4	(4)	4	(4)	4	(2)	4	(4)	4	(4)	4	(4)	4	(4)
4	4	(4)	4	(4)	4	(3)	4	(4)	4	(4)	4	(4)	4	(4)
Total number				93				64				32	3	32

A = Samples collected from governmental flocks.
B = Samples collected from commercial migrating flocks.

Results and Discussion

Breed

The karadi sheep had the thickest fibres followed by the Hamadani and the Awassi while the Arabi sheep produced the finest of all (Table 2). The differences among breeds in this respect were highly significant (Table 3). The average fibre diameter for the Iraqi Awassi was less than that given by Ashmawy (1965) for the Syrian Awassi ewes and that recorded by Imeryus *et al.* (1970) for the same breed in Turkey. The fibre diameter of the Karadi sheep was also finer than that reported by Ghoneim *et al.* (1974) for the same breed. It seems however, that the Iraqi sheep produced wool fibres similar in thickness to those of the Egyptian sheep studied by Badreldin *et al.* (1952), Ragab and Ghoneim (1961), ElSherbiny and El-Sheikh (1969), and Scoudy *et al.* (1969). The interactions between breed and husbandry system, breed,

TABLE 2. The average fibre diameter (micron), medullated fibres % and fibre length (cm) for the different breeds, locations, and husbandry systems.

Breed, location and hus-bandry system	Trait		
	Fibre diameter (micron)	Medullated fibres %	Fibre length (cm)
Awassi			
Baghdad	29.19±0.56	9.64±0.34	19.35±0.63
Mosul	26.79±0.56	9.20±0.60	20.56±0.62
Rutba	30.39±0.69	9.90±1.79	19.83±0.74
Intensive	28.52±0.49	8.28±1.33	20.55±6.54
Extensive	29.06±0.58	10.88±0.89	19.27±0.52
Overall average	28.79±0.35	9.58±0.23	19.91±0.38
Arabi			
Thi-Qar	25.64±0.58	11.68±0.36	17.36±0.59
Maysan	26.68±0.90	10.12±0.46	17.42±0.54
Intensive	26.48±0.71	12.55±0.83	17.82±0.66
Extensive	25.84±0.50	9.25±1.39	16.96±0.44
Overall average	26.16±0.43	10.89±0.27	17.39±0.40
Karadi			
Solymania	30.70±0.82	9.50±0.56	22.92±0.48
Intensive	29.26±1.31	7.27±1.31	22.74±0.71
Extensive	32.13±0.75	11.73±0.88	23.09±0.66
Overall average	30.70±0.82	9.50±0.56	22.92±0.48
Hamadani			
Asky-kalak	29.97±0.98	9.38±0.66	18.56±0.67
Intensive	32.46±1.57	9.85±1.00	18.08±0.71
Extensive	27.48±0.85	8.91±0.93	19.04±0.66
Overall average	29.97±0.98	9.38±0.66	18.56±0.67

age and husbandry system, locality, age and husbandry system within breed were found to be highly significant (Table 3). This denotes to the fact that fibre diameter is very sensitive to changes in age, locality and system of husbandry as it is a breed characteristic. Arabi wool had the highest % of medullated fibres followed by Awassi, karadi, while the lowest % was obtained by the Hamadani sheep (Table 2). Breed was found to have a non-significant influence on medullated fibres %. The average medullated fibres % of Iraqi Awassi sheep was higher than that reported for the Awassi sheep in Turkey (Imeryuz *et al.*, 1970 and Tekes, 1973). The average medullated fibres % of the karadi sheep was lower than that given by Ghoneim *et al.* (1974) for the same breed. Iraqi fleeces contained less % of medullated fibres as compared with those of other breeds studied by Rao *et al.* (1960), Arikurk *et al.* (1963), Johnri and Agarwal (1970) while in was higher than that recorded by Ozcan (1970), ozancar (1971) and Tekes (1973) in different breeds of sheep.

The average fibre length of the Karadi sheep was longer than those of others breeds studied of which the Arabi was the shortest (Table 2). The difference among breeds in fibre length were highly significant (Table 3). The obtained average for fibre length of Iraqi Awassi sheep was longer than that recorded for Awassi in Syria by Erokhin (1973). It also exceeded the chinese coarse wool breeds of sheep (Papkov, 1964), some Indian breeds of sheep (Kalra, 1967 Johari and Agarwal, 1970), Bulgarian Tsigai (Nedelchev, 1972), the USSR Akhangaran mutton wool (Tapilskii *et al.*, 1974) and the Barbary sheep in Libya (Labban, 1973).

Age

The thickest wool fibres were given at the 2 nd year of age for Awassi and Arabi sheep and at the 3rd year of age for Karadi and Hamadani sheep, respectively (Table 4). Medullated fibres (Table 4) were least in % when the ewes were four years old (Awassi), three years old (Arabi), two years old (Hamadani), and one year old (Karadi). Analysis of variance (Table 3) revealed a non-significant influence of age on either fibre diameter or % of medullated fibres. Dissimilar results concerning the influence of age on fibre diameter were shown by Roberts and Dunlop (1957), Togay *et al.* (1961), Necinennaja (1966), Bhatnagor *et al.* (1973), Oznacar (1973), and Sliwa *et al.* (1975) on different breeds of sheep. While the longest fibres of Awassi, Arabi and Hamadani fleeces were produced at the second year of age, those of the karadi increased consistently from one to four years of age. Age proved to have a highly significant effect on fibres length of the different breeds studied (Table 3). It is noteworthy that Iraqi wools were comparatively longer at different ages than wool produced by Ossimi, Rahmani and Barki sheep as respectively reported by Ragab *et al.* (1956), Ragab and Ghoneim (1961) and El-Sherbiny and El-Sheikh (1969).

Location

Comparisons among wool fibre diameter and medullated fibres % of Awassi ewes kept in different localities (Table 2) showed that the coarsest fibres and the highest % of medullated fibres were those of Mosul followed

TABLE 3. Analysis of variance for the effect of breed, age, husbandry system and locality on fibre diameter, medullated fibres % and fibre length.

Source of variance	Fibre diameter		Medullated fibre %		fibre length	
	d.f.	M.S.	d.f.	M.S.	d.f.	M.S.
Bet. breeds						
(B)	3	48.06**	3	3.57	3	58.226**
Bet. ages (A)	3	2.69	3	17.60	3	33.721**
Bet. husbandry						
system (S)	1	1.199	1	26.31	1	5.691
B × A	9	3.58	9	7.53	9	2.349
B × S	3	22.49**	3	39.33**	3	3.591
A × S	3	1.59	3	20.68	3	3.630
B × A × S	9	16.85**	9	37.63**	9	13.43**
Bet. Loc. (L)/B.	3	18.03*	3	3.62	3	2.13
LX A/B.	9	21.08**	9	29.58*	9	5.73
L X S/B.	3	44.65**	3	45.55*	3	7.00**
L X A X S/B	9	38.36**	9	82.61*	9	21.12
Residual	165	4.71	165	12.34	165	3.91
Total	221		221		221	

* Significant $P < 0.05$ ** Highly significant $P < 0.01$

respectively in order by those of Baghdad and those of Rutba. On the other hand, fibres of Awassi in Mosul were longer than those of Rutba, the latter excelled in length those of Baghdad. It may be recommended, therefore, to obtain wool from Awassis kept in Mosul as it tends to be finer, longer and contains relatively less % of medullated fibres. As for the Arabi breed, it is clear (Table 2) that fleeces yielded at Thi-Qar were finer and contained less % of medullated fibres than those of Maysan. Fibre length at both localities was almost similar. It may be observed (Table 3) that the influence of locality within breed was only significant in case of fibre diameter.

Husbandry system

Arabi and Hamadani sheep reared under the intensive system gave relatively thicker fibres than their contemporaries under the extensive system. The case was reversed for the Awassi and the Karadi ewes. Medullated fibres % behaved similarly as they were higher when the fibre were thicker.

Concerning the influence of the husbandry system on fibre length, it could be observed (Table 2) that longer fibres were produced when Awassi and Arabi ewes were kept under the extensive system. Contrary results were obtained for Karadi and Hamadani ewes which gave longer fibres when reared under the extensive system. Such dissimilarity in the effect of husbandry system may reflex the differences in pasturing conditions of the northern region, where succulent, rich vegetation is available, and those of the middle and southern regions which are characterized by their poor vegetation

TABLE 4. The average fibre diameter (micron), medullated fibres (%), and fibre length (cm) at 1,2,3 and 4 years of age for the different breeds of sheep.

Trait and breed	Age (year)			
	1	2	3	4
Fibre diameter				
Awassi	29.19±1.01	28.98±0.62	28.62±0.77	28.37±0.56
Arabi	26.33±0.79	26.86±0.87	26.12±0.72	25.33±1.08
Karadi	28.42±1.75	29.91±1.37	33.31±1.55	31.15±1.64
Hamadani	30.74±1.68	29.78±2.30	30.75±2.69	28.61±1.17
Medullated fibres %				
Awassi	12.45±1.74	9.13±0.86	9.32±0.85	7.42±0.81
Arabi	12.52±1.06	11.96±1.00	9.23±1.03	9.89±1.24
Karadi	8.64±1.80	8.99±0.86	10.90±1.12	9.47±1.06
Hamadani	10.06±0.89	7.42±0.96	10.09±0.13	9.95±0.84
Fibre length				
Awassi	17.27±0.59	21.32±0.56	20.92±0.77	20.13±0.80
Arabi	16.19±0.66	18.81±0.65	17.85±0.78	16.70±0.80
Karadi	21.79±1.00	22.95±1.14	22.94±0.93	23.98±0.80
Hamadani	15.78±1.52	21.66±1.19	19.05±0.74	17.74±0.96

Data shown in Table 3 revealed a non-significant effect of the husbandry system on wool traits studied. But the breed by husbandry system interaction, was highly significant in case of fibre diameter and medulated fibres %. This indicates that the response of fibre thickness and medullated fibre % to changes in husbandry system might differ from one breed to another.

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دراسة مقارنة عن خصائص الجزء في الأغنام العراقية
٢ - قطة الألياف ، نسبة الألياف النخاعية % ، طول
الألياف .

جلال الدين محمد عشاوي ، وليد عبد الرازق العزاوي
كلية الزراعة - جامعة القاهرة - مصر
وكلية الزراعة - جامعة صلاح الدين - العراق

درس تأثير النوع (أربعة) ، والعمر (١ - ٤ سنة) ونمط الرعاية (مكثف
وغير مكثف) ومكان التربية (مختلف) على قطر الألياف والنسبة المئوية
للألياف النخاعية وطول الألياف للأغنام العراقية .

أخذت عينات من منتصف الجانب الأيمن لعدد ٩٤ نعجة عواسي
٦٤ نعجة عرابي ، ٣٢ نعجة كراذي ، ٣٢ نعجة حمداني . كانت أسماك
وأطول الألياف (٣٠٠٧٠ ± ٨٢٠ ميكرون ، ٢٢٠٩٢ ± ٤٨٠ سم) هي
النتيجة من نجاج الكراذي بينما كانت أنعم وأقصر الألياف (٢٦٠٦١ ± ٤٣٠
ميكرون ، ١٧٠٣٤ ± ٤٠٠ سم) هي تلك لنجاج العرابي .

كذلك فقد كانت جزات العواسي أنعم من جزات الكراذي والحمداني ،
وأقصر من جزات الكراذي . وقد لوحظ أن أصواف الأغنام الحمداني كانت
مماثلة تقريبا في السمك لأصواف الكراذي وأقصر في الطول عن أصواف
العواسي .

وقد وجد للنوع تأثير معنوي على سمك وطول الألياف . وتأثير محدود
(١٠٥٩%) وغير معنوي على نسبة الألياف النخاعية . أيضا كان للعمر
تأثير معنوي فقط على طول الألياف .

وقد نتجت أطوال الألياف عندما بلغت النجاج العواسية والعرابية
والحمدانية سنتين بينما وصلت ألياف النجاج الكراذي الى أقصى أطوالها
عند عمر أربع سنوات .

وقد وصلت الفروق الراجعة الى تأثير مكان التربية × النوع الى مستوى
المعنوية في حالة سمك الألياف فقط . من ناحية أخرى كانت جزات
العواسي الناتجة في الموصل أنعم من تلك الناتجة في بغداد أو الرطبة ،
كما أعطت الأغنام العرابية أليافا أنعم عند تربيتها في منطقة ذي قار عنها
في ميسان . أظهرت الدراسة أيضا عدم وجود فروق معنوية في سمك
الألياف أو طولها أو نسبة الألياف النخاعية % من النجاج المرباة تحت نمط
الرعاية المختلفين .