

A Comparative Study of Fleece Characteristics in Iraqi Sheep I. Greasy-Fleece Weight, Shrinkage % and Fibre Type ratio

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A NUMBER of 221 midside wool samples were collected and analysed to study the influence of breed, age, location and husbandry system on greasy-fleece weight, shrinkage %, and fibre type ratio of Awassi, Arabi, Karadi and Hamadani sheep. Significant differences were found among breeds in all traits, the matter that gives evidence to the identity of each breed. The heaviest clean fleece weight (1.070 kg), which is a function of the greasy fleece weight and shrinkage %, and the highest % of innercoat fibres (68.46%) were obtained from Arabi sheep followed by Awassi, Hamadani and Karadi sheep respectively. Kemp fibres % was highest in Awassi breed (6.90%) than other breeds (2.39 to 2.85 %). Age had a significant effect on greasy-fleece weight and innercoat fibres %. Location within breed had a significant effect on all traits except kemp % studied. The heaviest and cleanest Awassi fleeces with the greatest content of innercoat fibres were obtained at Baghdad, followed respectively by those of Rutba and those of Mosul. Mesan region was more suitable than Thi-Qar region for obtaining heavier Arabi fleeces containing less impurities and more innercoat fibres. The intensive husbandry system led to less shrinkage % in the four breeds. It also reduced innercoat fibres % but increased outercoat fibres % in Awassi, Arabi, and Hamadani sheep. Interactions among the different factors that affected wool traits were investigated.

Sheep in Iraq are considered to be the most important farm animal. The Iraqi wool, although being coarse in nature, yet it is famous for its quality. The over increasing demand for wool initiates the necessity for wool improvement either in quantity or quality. Sheep are spread all over the country. The present study was carried out with the aim of investigating the influences of age, husbandry system, and location on greasy-fleece weight, shrinkage %, and fibre type ratio of the main types of Iraqi sheep. The knowledge gained through such studies would no doubt yield information to be taken into consideration in improvement plans needed for improving the Iraqi wool.

Material and Methods

In total, 221 Awassi, Arabi, karadi, and Hamadani ewes were used in the present work. Awassi breed represents some 53% (some 4 million heads) of the total sheep population of Iraq (Al-Dejealy, 1971). Awassi sheep are usually white with coloured head. They are scattered all over the country

with the densist numbers in the central regions. Relatively abundant vegetations are found in these regions. The Arabi breed comes next in number to the Awassi (nearly 19%). It is the smallest and the hardest Iraqi breed. Its head is white, brown or black. The fleece is white but some 12.3% of the Arabis are coloured (Asker and El-Khalisi, 1965). The Arabi breed dominates the southern area of Iraq which is characterised by its hot desert climate & its poor vegetation. The number of karadi sheep is 1-1.5 million heads representing 16% of sheep population of Iraq Ghoneim *et al.*, 1974). The karadis are white with black heads. The black colour of the head may extend to the neck, the upper chest, and some other part of the body. The Hamadani number does not exceed few thousands. They are almost similar to the karadis in shape, colour, but are characterized by base of their larger body constitution, longer pedunlous ears & two wattles at the the throat. Both breeds dominate the northern zone of the country which is characterized by the steppes climate and the abundant vegetation.

Samples studied were gathered from ewes existing in seven locations scattered in different geographical regions. These locations were Baghdad, Mosul and Rutba for the Awassis, Thi-Quar and Maysan for the Arabis, and Solay-mania and Askykalak for karadis and Hamadanis respectively. Within each location equal number of samples was collected from ewes reared in governmental, farms and from ewes belonged to commercial migrating flocks occasionally present in the neighbouring sites of every farm. In the governmental farms, sheep undergo an intensive husbandry system. They are sheltered in semi-open sheds, given *ad lib.* amounts of roughages (straw or hay), 0.25 kg/head/day of a concentrate mixture (containing 13-15% digestable protein) and permitted to graze alfalfa or Egyptian clover for 3-5 hr/day. Fresh water is available all the time. Vaccination, drenching and dipping are carried out regularly. Males are separated from females except at the mating season (April to June). Hand shearing is practised annually in April and May. Sheep of the migrating flocks are under an extensive husbandry system. They are travelling after natural pasture anywhere. During drought -some flock owners supply their sheep with limited amounts of straw and barley. Watering takes place once daily or every other day. No hygienic routine is practised. Mating is permitted all the year round. The animals are shorn by hand in April and May.

Within each husbandry system, four ewes of the age one year and the same numbers of ewes 2,3 and 4 years old were randomly chosen to get mid-side samples from. The number of samples collected from each location was thus 32. The only exception to this occurred in case of the extensive husbandry system at Rutba location as it was available to obtain only 2 and 3 samples respectively from Awassi ewes of the age groups 3 and 4 years. The previous sampling schedule allow the collection of 93 Awassi, 64 Arabi, 32 karadi and 32 Hamadani samples. Sampling took place at shearing time in April 1976. The samples were gathered from the right mid side position using fine scissors. Ewes sampled where shorn and their greasy - fleece weights recorded to the nearest 50g. Unfortunately, it was not possible to estimate fleece weight of the migrating flocks.

Some 25 g of the mid-side sample were used to determine shrinkage %. A remaining part (nearly 2 g) was used to estimate other wool properties. The method suggested by Chapman (1960) was adopted for estimating shrinkage %. The weights of the different fibre types were determined by visual separation of 0.2-0.3 g of the xylol washed subsample into innercoat, outercoat and kemp fibers by applying the method of Doney and Smith (1961). Each of the three types was weighed by an analytical balance to the fifth decimal to determine the percentage of every wool type. Analysis of variance for the three way factorial with nested factors were carried out according to the methods described by Snedecor and Cochran (1973).

Results and Discussion

Breed

The highest greasy-fleece weight was given by the Hamadani followed by the Awassi and the Arabi while the least wool yield was that of the Karadi (Table 1). The difference between breeds was significant (Table 2). The greasy-fleece weight of the Iraqi sheep is within the limits of wool production recorded for carpet wool sheep (0.48, 1.8-2.00, 1.90 and 2.29, 2.49, 1.63 and 2.15 kg) as reported by Ragab, and Ghoneim (1961), Gadzhiev (1968), Imeryuz *et al.* (1970) and Demiruren *et al.* (1971) respectively. The significant interaction (Table 2) between breed and location reflexes wide variation in wool yield of the Iraqi breeds when kept under different regions. Such inference is supported by the wide range (1.36 to 3.00 kg) in greasy-fleece weight of Awassi sheep raised in different neighbouring countries (El-Mekkwawi, 1963, Ashmawi, 1965; Gadzhiev, 1968; Imeryuz *et al.*, 1970; Sidal, 1972; Tekes, 1974 Wallace and Eyal, 1974). It should be pointed out that the overall averages obtained for greasy-fleece weight of Iraqi breeds are higher than those reported for Egyptian Ossimi, Rahmani and Barki fleeces (Sidky, 1948; 1950; Ragab *et al.*, 1956; Ragab and Ghoneim, 1961 and Ghanem, 1963).

The maximum and minimum average shrinkage % of the Iraqi fleeces was that of the Hamadani and the Arabi respectively. Awassi and Karadi sheep occupied intermediate positions in this respect. The effect of breed on shrinkage % was highly significant (Table 2). Data in the same table showed that interaction between location within breed, location by age within breed, location by system of husbandry within breed, location by age by husbandry system- within breed all were found to have a highly significant effect on shrinkage %.

Comparisons among fibre type ratios of the four breeds (Table 3) showed that while the Arabi and the Awassi fleeces contained more innercoat and kemp fibers, the Karadi and the Hamadani fleeces had higher % outercoat fibres. Differences among breeds in innercoat, outercoat and kemp fibres % were all highly significant (Table 2). The innercoat % of the Awassi is within the range 55.6 to 66.4% recorded in case of Syrian Awassis by Mukhamed (1973). But the later breed contained more kemp fibres % (9.8 to 19.8% as estimated

by the same author. Kemp content of the Iraqi fleeces is less than the 5.8 to 11.8% kemp recorded for the Egyptian carpet wool (Badreldin *et al.*, 1952, and Ragab *et al.*, 1956).

TABLE 1. The average greasy-fleece weight (kg), shrinkage %, and fibre type ratio of the Iraqi breeds at different ages.

| Age | Trait | Awassi | Arabi | Karadi | Hamadani |
|-----|-------------|-------------|-------------|-------------|-------------|
| 1 | Gr. fl. wt. | 1.564±0.26 | 1.950±0.64 | 1.250±0.58 | 1.525±0.10 |
| | Shrink. % | 46.50 ±2.40 | 45.08 ±3.45 | 44.99 ±2.09 | 49.38 ±2.44 |
| | Inner. % | 69.57 ±2.23 | 67.19 ±4.79 | 51.00 ±5.45 | 57.66 ±4.51 |
| | Outer. % | 24.87 ±1.05 | 31.99 ±2.14 | 46.70 ±2.95 | 38.61 ±3.26 |
| | Kemp % | 5.56 ±0.73 | 0.82 ±0.09 | 2.30 ±0.29 | 3.73 ±1.04 |
| 2 | Gr. fl. wt. | 2.110±0.81 | 1.938±0.65 | 1.700±0.28 | 2.250±0.62 |
| | Shrink. % | 44.38 ±2.63 | 40.09 ±3.43 | 45.08 ±1.79 | 48.61 ±2.66 |
| | Inner. % | 58.01 ±2.70 | 66.57±4.43 | 44.42 ±2.57 | 56.34 ±4.84 |
| | Outer. % | 35.66 ±2.37 | 31.56 ±4.09 | 52.82 ±0.15 | 42.09 ±5.22 |
| | Kemp. % | 6.33 ±1.08 | 1.87 ±0.64 | 2.76 ±0.38 | 1.57 ±0.69 |
| 3 | Gr. fl. wt. | 1.992±0.35 | 1.763±0.05 | 1.475±0.15 | 2.475±0.57 |
| | Shrink. % | 45.50 ±2.62 | 40.20 ±3.76 | 46.04 ±2.15 | 53.22 ±2.95 |
| | Inner. % | 60.59 ±3.22 | 69.70 ±3.50 | 48.46 ±4.19 | 51.45 ±4.80 |
| | Outer. % | 32.25 ±2.32 | 27.30 ±3.11 | 48.65 ±1.08 | 47.15 ±3.75 |
| | Kemp. % | 7.15 ±0.75 | 3.00 ±0.91 | 2.89 ±0.36 | 1.40 ±0.01 |
| 4 | Gr. fl. wt. | 2.058±0.24 | 1.789±0.21 | 1.551±0.21 | 1.950±0.76 |
| | Shrink. % | 46.46 ±2.96 | 44.55 ±3.47 | 48.37 ±2.56 | 53.03 ±3.63 |
| | Inner. % | 61.83 ±2.66 | 70.38 ±4.06 | 47.96 ±5.71 | 59.91 ±3.14 |
| | Outer. % | 29.61 ±1.69 | 23.91 ±0.79 | 49.79 ±3.60 | 37.23 ±1.09 |
| | Kemp. % | 8.56 ±1.42 | 5.71 ±1.75 | 2.25 ±0.42 | 2.86 ±0.58 |

Age

The heaviest greasy - fleece weight was obtained at the second year of age in Awassi and karadi, and at the third year of age in Hamadani sheep (Table 1). The differences among age groups in greasy- fleece weight were significant (Table 2). Similar findings were reported on different breeds of sheep (Karam and Ragab 1959; Sharafeldin and Ghoncim, 1963; and Ghoneim *et al.*, 1973).

Concerning the effect of age on shrinkage % no particular trend could be detected in case of Awassi and Arabi, but in case of Karadi and Hamadani there was a tendency for higher shrinkage% with advance in age. However age proved to have a non-significant effect on shrinkage % (Table 2). Ashmawi (1965) using Syrian Awassi sheep came to the same conclusion.

TABLE 2. Analysis of variance for the effect of breed, age, husbandry system and locality on greasy fleece weight, shrinkage % and fibre type ratio.

| Source of variance | Greasy fleece weight | | Shrinkage % | | Inner | | Outer | | Kemp | |
|---------------------|----------------------|---------|-------------|----------|-------|-----------|-------|----------|------|----------|
| | d.f. | M.S. | d.f. | M.S. | d.f. | M.S. | d.f. | M.S. | d.f. | M.S. |
| Bet. breeds (B) | 3 | 0.246* | 3 | 47.12** | 3 | 298.74** | 3 | 404.36** | 3 | 188.63** |
| Bet. ages (A) | 3 | 0.260* | 3 | 12.96 | 3 | 31.89* | 3 | 41.88 | 3 | 38.17 |
| Bet. Husb. sys. (S) | — | — | 1 | 301.37** | 1 | 132.53** | 1 | 178.68* | 1 | 1.72 |
| B × A . . . | 9 | 0.045 | 9 | 3.21 | 9 | 14.73 | 9 | 14.77 | 9 | 8.42 |
| B × S . . . | — | — | 3 | 23.73 | 3 | 101.58** | 3 | 53.06 | 3 | 128.83** |
| A × S . . . | — | — | 3 | 12.57 | 3 | 1036.38** | 3 | 36.50 | 3 | 7.13 |
| B × A × S . . . | — | — | 9 | 21.25 | 9 | 75.31** | 9 | 70.29* | 9 | 81.71** |
| Bet. Loc. (L)/B | 3 | 0.437** | 3 | 89.80** | 3 | 96.26** | 3 | 111.30* | 3 | 13.09 |
| L × A/B . . . | 9 | 0.069 | 9 | 34.91** | 9 | 176.45** | 9 | 77.68** | 9 | 33.76* |
| L × S/B . . . | — | — | 3 | 527.54** | 3 | 234.92** | 3 | 214.72** | 3 | 165.67** |
| L × A × S/B . . . | — | — | 9 | 194.73 | 9 | 166.04** | 9 | 178.08** | 9 | 129.50** |
| Residual . . . | 84 | 0.072 | 165 | 11.72 | 165 | 9.79 | 165 | 28.79 | 165 | 15.65 |
| Total | — | — | 221 | — | 221 | — | 221 | — | 221 | — |

* Significant at the 5% level.

** Significant at the 1% level.

TABLE 3. The average greasy fleece weight (kg), shrinkage %, and fibre type ratio of the Iraqi breeds at different locations and under two husbandry systems.

| Breed | Location | Husbandry system | Greasy fleece weight | Shrinkage % | Innercoat fibres % | Outercoat fibres % | Kemp fibres % |
|-----------|-----------|------------------|----------------------|-------------|--------------------|--------------------|---------------|
| Awassi | Baghdad | | 2.325±0.56 | 38.74±1.74 | 69.93±2.30 | 24.18±1.86 | 5.89±0.91 |
| | | Musul | 1.573±0.30 | 52.12±2.31 | 62.9±2.44 | 29.26±0.35 | 7.84±0.51 |
| | Rutba | | 1.895±0.37 | 42.27±2.09 | 55.67±1.87 | 38.36±1.71 | 5.97±0.12 |
| | | Intensive | 1.931±0.38 | 41.71±1.02 | 62.01±1.86 | 33.14±0.95 | 4.85±0.32 |
| | | Extensive | — | 49.71±2.35 | 62.99±2.14 | 28.06±1.69 | 8.95±0.33 |
| | Overall | | 1.931±0.38 | 45.47±1.31 | 62.50±1.41 | 30.60±0.80 | 6.90±0.29 |
| Arabi | Thi-Qar | | 1.713±0.30 | 44.52±3.08 | 66.71±2.50 | 31.63±0.84 | 1.66±0.24 |
| | | Maysan | 2.007±0.48 | 40.44±1.64 | 70.21±3.31 | 25.75±1.18 | 4.04±0.89 |
| | | Intensive | 1.860±0.21 | 37.32±1.83 | 62.15±2.97 | 32.75±0.56 | 5.10±0.62 |
| | | Extensive | — | 47.64±2.71 | 74.75±2.46 | 24.65±0.95 | 0.60±0.02 |
| | Overall | | 1.860±0.21 | 42.49±1.75 | 68.46±2.07 | 28.69±0.73 | 2.85±0.41 |
| Karadi | Intensive | | 1.494±0.24 | 47.38±1.52 | 52.18±3.67 | 45.78±3.61 | 2.04±0.27 |
| | | Extensive | — | 44.86±1.44 | 43.70±2.25 | 53.20±2.89 | 3.10±0.64 |
| | Overall | | 1.494±0.24 | 46.12±1.06 | 47.96±2.25 | 49.49±0.96 | 2.55±0.08 |
| Hama-dain | Intensive | | 2.050±0.63 | 45.53±1.78 | 49.08±2.46 | 47.58±2.43 | 3.34±0.58 |
| | | Extensive | — | 56.59±2.21 | 63.60±2.49 | 34.96±2.41 | 1.44±0.18 |
| | Overall | | 2.050±0.63 | 51.06±1.71 | 56.34±2.15 | 41.27±1.52 | 2.39±0.89 |

Age effect had a non-significant contribution to the variation in ratio of outercoat or kemp fibres and a significant effect on innercoat fibres ratio. The highest proportion of the innercoat fibres for Awassi and Karadi sheep was attained at the 1st year of age. True wool fibres of the Pattonwadi Indian sheep were also found to decrease as age advanced (Narayan, 1951).

Location

Comparisons among greasy-fleece weight of Awassi ewes at different locations revealed that the heaviest weight was obtained at Baghdad followed by those of Rutba and Mosul respectively (Table 3). On the other hand, heavier fleeces were obtained from Arabi ewes kept in Maysan than those when reared in Thi-Qar (Table 3). Analysis of variance set up in (Table 2) showed that location greasy-fleece weight significantly.

It is also clear from data presented in Table 3, that the cleanest Awassi fleeces were yielded at Baghdad, followed by those of Rutba, while the least clean fleeces were those of Mosul. At the same time, Arabi fleeces shrank more at Thi-Qar than at Maysan. Differences due to locality were found to be highly significant (Table 2).

While the difference due to locality within breed was found to be highly significant for the innercoat fibres, it was only significant for the outer coat fibres. Meanwhile, location effect had a non-significant contribution to the variations in kemp fibres ratio (Table 2). It may be concluded that the fleece structure is markedly influenced by the geographical conditions of the region where sheep are reared.

Husbandry system

With the exception of shrinkage % of fleeces yielded in Thi-Qar region, fleeces of all breeds studied shrank more when kept under the extensive husbandry system. Such conclusion might be expected since the fleeces underwent the intensive husbandry system were exposed to natural acquired impurities such as sand, dust, weeds... etc.,. Husbandry system affected shrinkage % in a highly significant way (Table 2). Interactions between locality by system of husbandry within breed and between locality by age by system of husbandry within breed were found to have a highly significant influence, the matter which focused attention on the importance of those factors in determining shrinkage %.

It is noted (Table 3) that fleeces of Awassi, Arabi and Hamadani ewes kept under the intensive husbandry system contained less % of innercoat fibres while those of the stationary karadis excelled the commercial ones in this respect. In case of outercoat fibres it was found that the stationary Awassi, Arabi, and Hamadani sheep excelled the commercial ones, with the exception of the stationary karadis which had the lowest % of outercoat fibres.

Rearing Awassi and Karadi sheep under the intensive husbandry system reduced kemp content in the fleece. In case of Arabi and Hamadani sheep, the intensive husbandry system resulted in more kemp fibres%. The system of husbandry had a highly significant effect on innercoat fibres %, significant effect on outercoat fibres %, and a non-significant effect on the % of kemp fibres (Table 2).

In view of the obtained results, it may be concluded that Arabi sheep gave the highest clean fleece weight (1.070 kg). Clean fleece weight of Awassi, Hamadani and karadi sheep averaged 1.053, 1.003 and 0.783 kg respectively. Meanwhile, it seems preferable to raise Awassi sheep in Baghdad region than in Rutba or in Mosul regions as the wool crop in the three regions averaged 1.424, 1.049 and 0.753 kg respectively. Similarly it may be advisable to rear Arabi sheep in Maysan region rather than in Thi-Qar as the average clean fleece weight obtained was 1.195 kg in the first and 0.950 kg in the second. It should be pointed out that the relative high % of kemp fibres in the fleeces of the Iraqi sheep make it necessary to adopt some selection programs to reduce % of such undesirable fibres.

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دراسة مقارنة عن خصائص الجزة في الأغنام العراقية : ١ - وزن الجزة الخام ، النسبة المئوية للفقد ، نسبة طرز الأياف .

جلال الدين محمد عشموي و وليد عبد الرازق العزاوي

وكلية الزراعة - جامعة صلاح الدين - العراق *

فيجست ٢٢٦ عينة صوف مأخوذة من منطقة منتصف الجانب لدراسة تأثير :
النوع ، العمر ، منطقة التربية ، نمط الرعاية على وزن الجزة الخام ،
نسبة الفقد % ، نسبة طرز الألياف لأغنام العواسي والعرايي والكرادي
والحميداني *

وجدت فروق مثنوية بين الأنواع في كل الصفات مما يؤكد هوية كل
نوع ، تحصل على أثقل وزن جزة نظيف (١٠٧٠ كجم) (يعتبر دلالة
لو وزن الجزة الخام والنسبة المئوية للفقد) ، وعلى أعلى نسبة مثنوية
من ألياف الغطاء الداخلي (٦٨٤٦ %) من أغنام العرايي ، تلتها العواسي ،
ثم الحميداني وأخيرا الكراي على التوالي *

كانت نسبة ألياف الكمب % في العواسي (٦٩٠ %) أعلى عنها في
باقي الأنواع (٢٣٩ - ٢٨٥ %) * كان للعمر تأثير معنوي على وزن الجزة
الخام والنسبة المئوية لألياف الغطاء الداخلي *

كانت نسبة ألياف الكمب % في العواسي (٦٩٠ %) أعلى عنها في
ما عدا النسبة المئوية للكمب . تحصل على أثقل وأنظف جرات العواسي
وأكثرها احتواء على ألياف الغطاء الداخلي في بغداد ثم الرطبة ثم الموصل .
كانت منطقة ميسان أكثر ملاءمة عن منطقة ذي قار للحصول على أوزان جرات
ثقيلة من العرايي بها نسبة شوائب أقل ونسبة ألياف صوف داخلية أكثر *
أدت تربية الأغنام تحت نمط الرعاية المكثف الى خفض نسبة الفقد
% في جميع الأنواع . كما خفضت من نسبة طراز ألياف الغطاء الخارجي
وزادت من نسبة طراز الألياف الغطاء الخارجي في العواسي والعرايي
والحميداني *

درست التفاعلات بين العوامل المختلفة المؤثرة على صفات الصوف *