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EFFECT OF SEASONS AND BODY POSITIONS ON THE ASSESSMENTS OF COLOUR, HANDLE LUSTRE, BULK AND KEMP IN BARKI FLEECES

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SUMMARY

Handle,HG,Lustre, LG, Kemp, KS, bulk, BLG and greasy, GCG, and scoured colour grade, SCG were visually appraised in Barki wool and investigated in relation to season, position and animal sources of variation. Wool samples from 29 Barki ewes were taken from six body positions at three months intervals to represent wool growing in summer,autumn, winter and spring. The grading system of Sumner(1969) was adapted to suit the Barki wool and applied to assess HG, LG, GCG and SCG in the present study. A grading system for BLG was also suggested. The studied traits were discussed in relation to the carpet industry.

Barki wool appeared to be of medium lustre and handle with few kemp fibres as well as being of less bulky wool. There is much yellowness in Barki wool and scouring had little effect on colour properties. Season, position and animal indicated highly significant effect on most studied traits. Wool samples clipped in January appeared to be whiter, softer, lustrous and more bulky with least kemp fibres compared with those of other seasons. Antero-posterior gradient was evident in most studied traits. Dorsal positions revelated higher GCG, SCG, KS and BLG as well as lower values of HG and LG compared with lateral ones. The best sampling position to represent the fleece average appeared to be the back for GCG, KS, LG and HG whereas the withers sample is good for BLG and shoulder position is favourable for SCG.

Keywords: Sheep, visual assessments, lustre, loose wool bulk, kemp, carpet industry, body positions, seasonality

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INTRODUCTION

The wool industry relies on information of growing the fibre, its harvesting, processing and marketing of the finished product. It is vitally concerned with the assessment of a rang of wool properties both subjectively and objectively. At the point of sale, the assessment of wool quality always depends on visual inspection. Most expert appraisers appear to see, feel and compares a handful of wool sample and rub the fibres between their fingers. The ability of wool appraisers to assess differences in wool traits proved to be a desirable skill, definetly needed for the industry. Careful evaluation of wool traits, through objective measurements, comes later to supplement the "educated fingers".

Wool manufacturer usually blend different types of wool together for a variety of reasons; price, availability in addition to the processing system of spinning, dyeing.. etc. His main task is to place the interrelationship between fibre properties and processing and end use performance on a sound scientific basis.

The wool breeder, however, has to provide the manufacture with wide scope of wool types to choose from to coop with the ever changing requirements of the textile industry and consumers.

It is widely accepted that there is danger of deteriorating many traits and qualities if not properly monitored by paying attention to a few major traits while neglecting the others. Apart from kemp, there is no published information on handle, lustre, bulk and greasy and scoured colour in the Egyptian wool and their relation to the carpet industry. Therefore, the aim of the present study is twofolds. Firstly, to provide some new information regarding the quality of Barki wool in terms of the above subjective traits. Secondly, to elucidate the effect of season, body position and animal on these traits. There is much to be done to study various wool traits important for carpet in the Egyptian wool and hopefully knowledge of genetic parameters and economic factors will be gathered in the next few years to clarify the breeding program for wool improvement.

MATERIALS AND METHODS

In a preliminary survey, subjective assessments of handle, lustre, greasy and scoured colour were done on a large number of Barki fleeces according to Sumner (1969). It was found that reducing Sumner's grades into five scores would be rather more suitable for Barki wool. The following is the grading system suggested for these traits:

Handle, HG:H_1 = extremely hairy, H_2 = slight harsher than average, H_3 = average handle, H_4 = clearly softer than average and H_5 = extremely soft.

Lustre, LG: L_1 = no lustre, L_2 = slightly lustrous, L_3 = medium lustre, L_4 = more lustre than average and L_5 = extremely lustrous.

Greasy, GCG, and Scoured, SCG, colour grades: C_1 = very bad discolouration, C_2 = pronounced yellow, C_3 = slight yellow, C_4 = slight cream and C_5 = perfectly white.

Loose wool bulk and resistance to compression are closely related (Dunlop et al.,1974) and both are referred to the behaviour or wool subject to compression. Grading system for loose wool bulk, BLG, was suggested as follow: B_1 = extremely flat (no compressibility, B_2 = slight compressible than average, B_3 = medium compressibility, B_4 = more compressible and B_5 = extremely compressibility.

Kemp score, KS, the subjective assessment of kemp density, was done according to Dry (1933) as follow: K_1 = no kemp, K_2 = few kemp, K_3 = kemp fibres plentiful and B_4 = dense kemp fibres.

Twenty-nine Barki ewes were chosen at random from the sheep flock belonging to Mariout research station, 35 km west of Alexandria. Animals were about two years old, all singles and looked healthy throughout the study. They received the normal level of management as their flockmates. Sheep were grazed on irrigated pastures and supplemented by feed co-co mix.

During the course of the experiment, rainfall averaged 80-110 mm/year. Relative humidity(%), maximum and minimum temperatures (C°) were 77.4, 34.2 and 23.3 in July; 65.1, 24.8 and 17.7 in October; 62.7, 17.6 and 9.2 in January and 74.5, 20.7 and 13.0 in April.

Wool samples were obtained from six body positions; three dorsals (withers, Wth, back, Bk, rump, Rp) and three laterals (shoulder, Sh, mid-side, Ms, britch, Br). These samples were taken at intervals of approximately three months in July (summer), October (autumn), January (winter) and April (spring). Thus, wool collected in one occassion represented the preceding growth period. For instance, summer shearing in July representing the wool grown in spring. At the end of the experiment the greasy fleece weight was recorded for each animal.

At each sampling occassion, wool samples were clipped close to the skin from each of the six positions using fine scissors. Each greasy sample was kept in a plastic bag for further analysis. Greasy samples were assessed according to the five-scale grading system mentioned earlier for HG, LG, BLG, GCG, and KS as well as after scouring for SCG. The assessments were repeated after 3 weeks and the average of the two assessments was taken and recorded for each sample.

Statistical procedures:

The model used to partition the variability included season, position, animal and the interaction of season x position. These sources of variations were considered to be fixed except the random animal effect.

Correlation coefficients were calculated for each trait between estimates of each of the six body positions and the average of these positions, the fleece average. These correlations were also obtained between traits for each season. Where no significant differences between correlations were found, They were pooled over seasons using Fisher's Z transformation (Snedecor and Cochran, 1980).

RESULTS AND DISCUSSION

The overall means of greasy colour grade, GCG and scoured colour grade, SCG, were found to be 2.12 and 2.98 respectively. Barki wool appeared to have much yellowness and slight improvement occurred after scouring. Table (1 and 3) indicated that season, position and animal had highly significant effect on colour in terms of GCG and SCG while lowest values occurred in October samples. On the other hand, dorsal positions had better GCG and SCG compared with lateral ones. There is also a general trend for GCG and SCG to increase towards the anterior of the body, however, some fluctuations existed for GCG on the ventral line. The trends of GCG and SCG were not persistent across seasons and positions which resulted in highly significant season x position interaction. Moreover, animals showed highly significant effect on GCG and SCG which implies the importance of genetic factors when improving wool colour.

Yellowness seemed to affect the commercial value of Barki wool as discoloration causes problem at dyeing. There are two main types of discoloration, black and brown melanin pigmentation incorporated into the fibre during growth, and yellow discoloration. The latter is probably the main factor affecting wool value. There appear to be several causes of discoloration but yellowing is due to the combined effects of wetness, warm temperatures and certain skin secretions. colour is also affected by management particularly season and frequency of shearing (Henderson, 1965). More recently Bateup (1984) demonstrated the effect of protein contaminant layer on the scoured colour. On the other hand, Black and brown pigmentation in the fleece are inherited, therefore culling of black lambs and their parents is warrented in white flocks.

Colour per se has little effect on processing performance and yarn and fabric properties, however, it is of importance on dyeing characteristics. The range of colour to which a given fibre can be dyed is dependent upon the component of the colour contributed by the

fibre itself; the lighter the intrinsic colour of the fibre the greater the number of different shades to which it can be dyed. While dark shade carpets can be made from pigmented wools, white wools have the advantage of greater dyeing flexibility.

The overall average of lustre grade, LG, was found to be 2.99 which means that Barki wool is of medium lustre. LG appeared to be significantly affected by season, position and animal (Table 1 and 3). The highest LG was indicated in January samples while the lowest value of LG was assessed in October clip. Dorsoventral and antero-posterior gradients were evident in which lustrous in January

Table 1. Means of greasy colour grade, GCG, scored colour grade, SCG and lustre grade, LG ± their standard errors from different positions and seasons.

		July	October	January	April	pooled
	GCG	1.45±0.01	1.31±0.01	2.55±0.01	2.14±0.01	1.86±0.00
Sh	SCG	2.79±0.03	2.28±0.03	3.48±0.03	3.38±0.03	2.98±0.01
	LG	2.38±0.02	2.72±0.02	3.69±0.02	2.93±0.02	2.93±0.00
	GCG	1.90±0.01	1.52±0.01	2.66±0.01	2.07±0.01	2.04±0.00
Ms	SCG	2.90±0.03	2.52±0.03	3.28±0.03	3.10±0.03	2.93±0.01
	LG	2.93±0.02	2.79±0.02	3.69±0.02	3.10±0.02	3.13±0.00
	GCG	1.93±0.01	1.48±0.01	2.35±0.01	2.10±0.01	1.97±0.00
Br	SCG	2.45±0.03	2.24±0.03	3.59±0.03	2.86±0.03	2.97±0.01
	LG	2.59±0.02	2.83±0.02	3.72±0.02	3.35±0.02	3.12±0.00
	GCG	2.55±0.01	2.21±0.01	2.79±0.01	2.00±0.01	2.39±0.00
Wth	SCG	3.69±0.03	2.45±0.03	3.93±0.03	2.79±0.03	3.21±0.01
	LG	2.90±0.02	2.31±0.02	3.45±0.02	2.55±0.02	2.80±0.00
	GCG	2.72±0.01	2.31±0.01	2.76±0.01	1.62±0.01	2.35±0.00
Bk	SCG	3.72±0.03	2.52±0.03	4.07±0.03	2.17±0.03	3.12±0.01
	LG	3.21±0.02	2.52±0.02	3.55±0.02	2.45±0.02	2.93±0.00
	GCG	2.31±0.01	1.59±0.01	2.66±0.01	1.93±0.01	2.12±0.00
Rp	SCG	3.45±0.03	1.93±0.03	3.59±0.03	2.45±0.03	2.85±0.01
	LG	3.17±0.02	2.72±0.02	3.55±0.02	2.55±0.02	3.00±0.00
	GCG	2.14±0.00	1.74±0.00	2.63±0.00	1.98±0.00	
Pooled	SCG	3.17±0.00	2.32±0.00	3.66±0.00	2.79±0.00	
	LG	2.86±0.00	2.65±0.00	3.61±0.00	2.82±0.00	

samples while the lowest value of LG was assessed in October clip. Wool was found in lateral and posterior positions compared with dorsal and anterior ones. Highly significant animal effects reflected the importance of genetic factors in controlling LG in Barki sheep.

Lustrous wool reflect light in a mirror-like manner. Generally, lustre is not preferred in carpet wool since it is associated with low bulk and resilience (El-Gabbas,1986). However, some processors favour lustrous wool which enable them to produce brighter colour in the end products. Wickham (1984) reported that the heritability of lustre ranged from 0.3 to 0.4 in the New Zealand Romney sheep which means that genetic factors are important in determining lustre. On the other hand, Orwin and Woods (1983) clearly demonstrated that lustrous wool maintain predominantly round-shaped fibres and undergo only gradual changes in diameter. Furthermore, they pointed out that other fibre characteristics such as surface roughness, fibre contour, colour and high degree of crimp tend to enhance light scattering and acts as delustrants.

In the present materials, the overall average of kemp score,KS,was found to be 2.09 which means that Barki fleeces had few kemp fibres. Tables (2 and 3) showed that position and animal had highly significant effect on KS. July samples indicated the highest value of KS while the lowest one was observed in January the differences, however, were not significant. Generally, dorsal positions appeared to produce more kemp than lateral ones and there is also a trend for KS to increase towards the posterior positions. Genetic factors might have a major role in controlling KS in Barki sheep as Indicated by highly significant animal effect.

Kemps are short, very heavily medullated fibres which may be shed in the fleece. They tend to lie on the outside of the yarn and causes harsh handle. Coarser fibres are considered to be sounder, process better to produce carpets with better appearance retension and higher abrasion resistance (Ross,1978). Medullation has a very big effect on dyeing and colouration. A yarn containing highly medullated wools appear to a paler colour than one with non-medullated wools although it absorbs as much dyestuff. This is because of internal light reflection in the hallow fibres. Blending wools with such widely different colouration properties is considered to be undesirable in plain carpets because of risks of streaks. Ross (1978) indicated that continuously- medullated fibres are desirable in carpet wool whereas too many very coarse fibres with little cortex in the cross section can have adverse effects especially when fibre strength and elasticity are required. Kemp fibres should be kept to a low level.

The present study revealed that Barki wool is of medium handle as the overall average of handle grade, HG, was found to be 2.89. Tables (2 and 3) indicated the highly significant effects of season,

position and animal on HG. January clip showed softer wool whereas October samples had harsher one compared with other seasons. Dorso-ventral gradient is evident in which dorsal positions had harsher wool than lateral ones. Wool tended to be softer in the anterior parts of the body,this was clear on the lateral line. Animals had significant effect on HG indicating the importance of genetic factors in determining this trait.

Table 2. Means of kemp score, KS, handle grade, HG and bulk grade, BLG ± their standard errors from different positions and seasons

		July	October	January	April	pooled
	KS	2.07±0.01	1.69±0.01	1.72±0.01	1.79±0.01	1.82±0.00
Sh	HG	3.14±0.01	2.76±0.01	3.79±0.01	3.28±0.01	3.24±0.00
	BLG	2.17±0.01	2.03±0.01	2.86±0.01	2.97±0.01	2.51±0.00
	KS	2.35±0.01	1.93±0.01	2.03±0.01	1.86±0.01	2.04±0.00
Ms	HG	3.00±0.01	2.93±0.01	3.48±0.01	3.28±0.03	3.17±0.00
	BLG	2.28±0.01	2.21±0.01	2.93±0.01	2.83±0.02	2.56±0.00
	KS	2.48±0.01	1.79±0.01	1.90±0.01	2.00±0.01	2.09±0.00
Br	HG	2.35±0.01	2.17±0.01	3.03±0.01	2.83±0.01	2.60±0.00
	BLG	2.10±0.01	2.03±0.01	2.79±0.01	2.69±0.01	2.41±0.00
	KS	2.10±0.01	2.17±0.01	2.14±0.01	2.17±0.01	2.15±0.00
Wth	HG	3.03±0.01	2.62±0.01	3.76±0.01	2.62±0.01	2.76±0.00
	BLG	3.07±0.01	2.97±0.01	3.28±0.01	3.03±0.01	3.09±0.00
	KS	1.93±0.01	2.24±0.01	2.21±0.01	2.24±0.01	2.16±0.00
Bk	HG	3.17±0.01	2.59±0.01	3.17±0.01	2.72±0.01	2.91±0.00
	BLG	3.10±0.01	3.10±0.01	3.31±0.01	3.10±0.01	3.16±0.00
	KS	2.21±0.01	2.31±0.01	2.24±0.01	2.41±0.01	2.29±0.00
Rp	HG	2.97±0.01	2.62±0.01	2.52±0.01	2.52±0.01	2.66±0.00
	BLG	2.79±0.01	2.59±0.01	3.07±0.01	2.90±0.01	2.48±0.00
	KS	2.19±0.00	2.05±0.00	2.04±0.00	2.08±0.00	
Pooled	HG	2.94±0.00	2.62±0.00	3.13±0.00	2.87±0.00	
	BLG	2.59±0.00	2.49±0.00	3.04±0.00	2.92±0.00	

Handle is the most important wool character at the point of sale. Crispy wool is desirable for carpet although there is a market for soft handling carpets. Shah and Whiteley (1971) observed that the

softness of loose wool is heavily dependent on fibre diameter both within and between breeds whereas crimp parameters were of significant but minor role. On the other hand, the heritability of HG was reported to be 0.2- 0.5 in the New Zealand Romney (Wickham, 1984).

Table 3. Analysis of variance estimates and f values for the studied traits

Source of Variation	d.f	GCG		SCG		LG		KS		HG		BLG	
		MSQ	F	MSQ	F	MSQ	F	MSQ	F	MSQ	F	MSQ	F
Total	695												
Season(S)	3	24.66**	94.8	55.61**	71.3	31.55**	85.3	0.81**	2.5	7.81**	31.2	12.06**	50.3
Animal	28	1.43**	5.5	2.70**	3.5	1.84**	5.0	8.79**	27.5	2.80**	11.2	1.82**	7.6
Position(P)	5	5.20**	20.0	3.03**	3.9	1.83**	4.9	2.89**	9.0	8.43**	33.7	11.54**	48.1
SxP	15	2.72**	10.5	4.84**	6.2	2.17**	5.9	0.88**	2.8	1.84**	7.4	0.98**	4.1
Residual	644	0.26		0.78		0.37		0.32		0.25		0.24	

** P < 0.01

The compressibility of Barki wool appeared to be slightly less than average as the overall mean of loose wool bulk grade, BLG, was found to be 2.76. Table (2 and 3) indicated highly significant effects of season, position and animal on BLG. Wool clipped in January indicated the highest BLG whereas the lowest value was observed in October. Dorsal positions had more bulky wool compared with lateral ones. Furthermore, BLG was generally highest in the mid-line (Ma and Bk) and tend to decrease towards the rear and front parts. Genetic factors might play a major role in controlling highly of Barki sheep as the animal indicated highly significant effect on BLG.

Carpet manufactures are very conscious of the commercial significance of yarn bulk which in part influences the "cover" a yarn will provide in a carpet and the "apparent" value of the carpet. The latter refers to differences in the amount of pile fibres which the customer considers he is getting for his money.

Knowledge of loose wool bulk of different wool types is of importance to the manufactures when making decisions related to blend composition (Ross, 1978). Addition of high bulk wool to a blend containing a high proportion of low bulk wools will improve the overall bulk of blend with consequent improvement in yarn bulk and carpet cover. Chaudri and Whiteley (1968) pointed out that higher medullation and helical crimp are closely related to higher bulk. Objective measurements of loose wool bulk appeared to be reasonably heritable as the heritability estimates found to be 0.3- 0.4 in the New Zealand Romney (Wickham, 1984).

Correlation coefficients between studied traits revealed some important values to be discussed hereafter. The present data showed

the most representative sample to the fleece average, as indicated by the highest correlation coefficients between each of the six body positions and the average of these positions, the fleece average for a given trait. It seems that back is the best sampling position for GCG (r=0.62), KS (r=0.87), LG (r=0.68) and HG (r=0.76) while the withers sample is good for BLG (r=0.74) and shoulder position is favourable for SCG (r=0.68).

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تأثير الموسم والموقع على جسم الحيوان على تقدير درجة اللون – الملمس – اللمعان والقدرة على الضغط ومحتوى الكمب فى جزات الاغنام البرقى

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تم تقدير الملمس ودرجة اللمعان ومحتوى الياف الكمب والبلك (مقاومة الصوف للضغط) بالاضافة لدرجة لون الصوف الخام والمغسول فى صوف البرقى وكذلك مدى تأثير هذه الصفات بالاختلافات بين مواقع الجسم المختلفة وبين الحيوانات .

وقد اخذت لذلك عينات الصوف من ٢٩ نعجة برقى من ستة اماكن على جسم الحيوان كل ثلاثة اشهر لتمثل نمو فى المواسم المختلفة فى الصيف – الخريف – الشتاء والربيع. وتم تعديل نظام التدريج المقترح بواسطة Sumner (1969) ليلائم الصوف البرقى لتقدير صفات الملمس واللمعان واللون وقد تم اقتراح تدريج لمقاومة الصوف البرقى للضغط. وقد تمت مناقشة تلك الصفات ومدى علاقتها بصناعة السجاد.

وقد اوضحت الدراسة ان الصوف البرقى يتميز بكونه متوسط اللمعان والملمس وباحتوائه على نسبة قليلة من الكمب وبكونه ذو مقاومة قليلة للضغط كذلك فان الصوف البرقى يعيبه الاصفرار الواضح فيه وان الغسيل له تاثير قليل على تحسين صفة اللون.

وقد اتضح مدى تاثير الصفات المدرسة بالاختلافات بين مواقع الجسم المختلفة وبين الحيوانات – وقد كانت عينات الصوف المأخوذه فى يناير اكثر بياضا واكثر لمعانا واكثر نعومة بالاضافة لكونها اكثر مقاومة للضغط واحتونها على اقل محتوى من الياف الكمب مقارنة بالمواسم الاخرى – كما اوضحت الدراسة وجود تدرج واضح لصفات الصوف على جسم الحيوان حيث تميزت المنطقة الظهرية بلون افضل للصوف الخام والمغسول وبزيادة محتوى الياف الكمب ومقاومة اعلى للضغط بالاضافة لكونها اكثر خشونة واكثر لمعانا.

ولقد اوضحت الدراسة ان منطقة منتصف الظهر هى الاكثر تمثيلا للجزة الكاملة عند تقدير لون الصوف الخام ومحتوى الياف الكمب واللمعان واملمس بينما كانت منطقة الظهر هى الاقض بالنسبة للبلك (مقاومة الصوف للضغط) وكانت منطقة الكتف هى الاكثر تمثيلا للجزة بالنسبة للون الصوف المغسول.