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WOOL FIBRE DIAMETER AND ITS DISTRIBUTION IN BARKI SHEEP WITH REGARD TO THE SAMPLING POSITIONS AND SEASONS

H.M. EL-GABBAS

Wool Production and Technology Department , Animal Production Division, Desert Research Center , Matareya , Cairo , EGYPT .

SUMMARY

The average fibre diameter, *AFD,* and its variability as well as the percentage of medullated fibres, *%Med,* were investigated in relation to season, sampling position and animal sources of variation. Twenty- nine coarse wool Barki ewes were used to obtain wool samples from six body positions at three months intervals to represent wool growing in summer, autumn, winter and spring. Fibre diameter distribution was specified and the prickle factor , *PF*, was estimated in the present materials.

The *AFD* was found to be 34.86 μm with 11.52 *%Med* as well as 45.1% *PF*. Animal, season and position sources of variation indicated highly significant effect on all traits studied. The least *AFD* observed in July indicated a reduction of only 5.2% from the maximum value obtained in January. Similarly, the minimum *%Med* found in April showed a reduction of 43.5% from the maximum value obtained in January. Dorsal positions indicated higher *AFD* and its variability as well as higher *PF* and slightly less *%Med*. In general, the studied traits tended to be higher towards the posterior positions. In terms of *AFD* and *%Med* as well as the *PF*, fibres appeared to be finest on the shoulder position and coarsest from the britch sample .

Generally, as *AFD* increased the measurements of fibre diameter variability as well as *%Med* and *PF* tended to increase. The fibre diameter distribution of Barki wool was found to be extended towards the right hand side as the skewness was positive in all positions and seasons. It is expected that about 95% of the Barki wool fibre diameter would be in the range of 18.86 μm to 50.86 μm. In general, the britch appeared to be a favourable sampling position in order to represent the *AFD* and its variability as well as the *%Med* in Barki fleeces.

It is suggested that improvement of Barki sheep as a carpet wool breed could be attained through applying a breeding program to increase the *AFD* up to 36 μm and maintain the level of medullation to meet the requirement of the carpet

wool specifications. Indirectly, that would also contribute to higher meat production.

Keywords: Barki sheep, fibre diameter and its variability, % medullation, fibre diameter distribution, prickle factor.

INTRODUCTION

Wool, like all biological materials, is variable in its properties not only between animals within a breed or flock but also within the fleece , staple and even along the individual fibre. This has been one of the chief points of unfavourable comparison between wool and the man made artificial fibres. This is due to the complexity of the inheritance of wool characters and the exposure of the grazing animals to all the exigencies of environment.

Fibre diameter and variability of raw wool have long been recognized among sheep and wool investigators as important factors in evaluating fleeces of sheep in a breeding program for wool improvement. Furthermore, fibre diameter and its variability are of acknowledged technological significance as they influence the characteristics of their end products. Wool that is uniform in diameter is more desirable to manufacturers because of its better processing as well as being subject to less breakage during carding and combing processes (Whiteley and Thompson ,1985).

In most circumstances, the mean fibre diameter gives no indication of the extent to which the fibres vary in diameter. Many studies dealt with fibre diameter variability used different measures of dispersion such as standard deviation, standard error or coefficient of variation . Thus, the present study encompasses three measures of fibre diameter variability in order to compare results pertaining to local wools with those obtained from other wool research studies going elsewhere. On the other hand, fibre diameter distribution analysis is an objective measure of wool quality and is required to be described adequately for a carpet wool. Recently, there has been a great deal of interest in fibre diameter variation in relation to fabric comfort. Hence, in addition to standard statistical terms, some other expressions such as prickle factor and coarse edge are being used by the producers and processors of the wool industry to denote the percentages of fibres with diameters exceeding 30 µm which existed in the coarse tail of the fibre diameter distribution.

Barki sheep which dominates the north western coast is considered to be one of the main breeds of Egypt as well as being much closer to the carpet wool type. Scanty data on between position and among season variation of fibre diameter have been published. Information on the body position most representative to the average fibre diameter and variability as well as the percentage of medullated fibres are lacking in Barki fleeces. Furthermore, fibre diameter distribution as well as the prickle factor have never been described for the indigenous breeds of sheep. Therefore, the present study was undertaken to elaborate on these parameters and include them into the package of evaluating Barki wool to elucidate its suitability for the carpet industry .

MATERIALS AND METHODS

The present study was conducted in the Barki sheep flock which belongs to Mariout research station, 35 kilometer west of Alexandria. The flock was raised where the rainfall averaged 80-100 mm /year. Relative humidity (%), maximum and minimum temperature (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. Sheep were grazed on irrigated pastures and supplemented by feed concentrates.

Twenty-nine coarse wool Barki ewes were chosen at random and used in the present study, the animals were about two years old, all singles and looked healthy throughout the study. From each animal, a wool sample was taken as close as possible to the skin surface using scissors. These samples were collected from six body positions at three months intervals throughout one full year to represent wool growth in summer , autumn, winter and spring. At each occasion , the six body positions sampled were three on the lateral (shoulder, Sh; mid-side, Ms; britch, Br) and three on the dorsal(withers, Wth; back, Bk; rump, Rp) locations of the animal.

Prior to sectioning, five staples were drawn at random from each sample and conditioned overnight in the laboratory atmosphere and results corrected later to the optimum conditions of 65% RH and 20°C (Anderson, 1955). These staples were inserted in the slot of the hand microtome where a length of 2mm was cut from these fibres. These cuttings were mounted on a microscopic slide and well spread in liquid paraffin to avoid the fibre segments to cross over each other and to allow more fibre segments to be viewed in one image frame. These cuttings were then covered with a slide cover and measured at room temperature.

The average number of fibres measured per sample was found to be 472 fibres. The diameter of these fibres was measured in microns (μm) using a Lanameter projector at 500x magnifications. By systematically moving the slide horizontally and vertically different fibres are brought into the center of the screen where they were measured directly with a graduated scale. From the longitudinal view, fibre diameter equals the distance between two edges of a fibre. Each measurement is recorded against its micron number on the sample sheet and a frequency distribution of fibre diameter was obtained for such wool sample. The number of medullated fibres occurring in the sample were also counted in the same sample and the % of medullated fibres, *%Med*, was computed. At the end, the average fibre diameter *AFD*, Standard error

SE, standard deviation *SD* as well as coefficient of variation, *CV%* of such sample were calculated.

Statistical procedures.

The arcsine transformation was used for all percentages included in the study. The analysis of this data was done using SAS (1990). The analysis of was conducted to partition the variability to its sources. The model included season, position, animal and the interactions of animal x season, animal x position and season x position. These sources of variations are considered to be fixed except the random animal effect. Correlation coefficients were also calculated for each trait between each of the six body positions and the average of these positions, the fleece average.

To estimate the shape of the fibre diameter distribution, the skewness was estimated according to Croxton and Cowden(1939). The prickle factor, *PF*, was calculated from the fibre diameter distribution as a percentage of fibres with diameters exceeding 30µm from the total number of fibres (Sheperd, 1979 cited by Whiteley and Thompson, 1985).

RESULTS AND DISCUSSION

Means

In the present material, the overall average fibre diameter, *AFD*, was found to be 34.86 µm with 11.52% medullated fibres, *%Med* (Table 1). Similar estimates for *AFD* in Barki sheep were obtained (Ragab and Ghoneim, 1961; Ghanem, 1965 and Guirgis, 1973) and were found to be in the range of 30.3 µm -36.9 µm. Ragab and Ghoneim (1961) estimated the *% Med* in Barki sheep as 14%. Wool produced from Barki sheep in the present study appeared to have almost similar *AFD* and *% Med* compared with other Barki wool produced elsewhere.

Results generally revealed that the % *Med* increase with increasing *AFD* as the thicker fibre diameters are often medullated. Ross (1950) cited that Dry (1941) stated that the large and medullated fibre is usually produced from a very vigorous follicle which produces more fibre material than it is able to keratinize, resulting in a medullated central core. Due to such vigour the fibre is eventually shed or it will show marked 'crisis thinning'. Fibers up to a diameter of approximately 26 µm have a keratinizing ability sufficiently powerful per unit of fibre diameter increase to keratinize a part of the increased diameter. From about 26-40 µm, the vigour of a unit increase in fibre diameter results, through an inability to keratinize the fibre material produced, in a decreasing cortical diameter. It is over this range of fibre diameters that follicle vigour results in large changes in the percentages of medulla diameter to fibre diameter.

Table 1. Least Squares means for fibre diameter and its variability measurements as well as the Med% obtained from different positions

	FD	SE	SD	Med%	CV%
Overall mean	34.86	0.47	8.02	19.84	22.75
Season					
January	35.90±0.3	0.51±0.01	8.19±0.2	22.53±0.5	22.62±0.4
April	34.39±0.3	0.51±0.01	8.97±0.2	16.73±0.5	25.54±0.4
July	34.02±0.3	0.40±0.01	7.46±0.2	19.89±0.5	21.88±0.4
October	35.13±0.3	0.46±0.01	7.45±0.2	20.24±0.5	20.97±0.4
Position					
Shoulder	31.57±0.4	0.37±0.01	6.20±0.2	14.76±0.6	19.55±0.5
Mid-side	33.68±0.4	0.47±0.01	8.01±0.2	18.20±0.6	23.54±0.5
Britch	38.69±0.4	0.51±0.01	8.68±0.2	26.35±0.6	22.55±0.5
Withers	33.60±0.4	0.45±0.01	7.60±0.2	17.23±0.6	22.46±0.5
Back	33.46±0.4	0.48±0.01	8.18±0.2	17.73±0.6	24.16±0.5
Rump	38.15±0.4	0.55±0.01	9.44±0.2	24.79±0.6	24.25±0.5

Sampling procedure

The correct measurement and interpretation of the *AFD* and its variability is quite complicated. That is because comparing sheep within a flock implies that the samples to be measured should be grown under the same conditions. Usually a sample is taken at about one inch from the base of a staple or at skin level. While that might appear reasonable, the *AFD* measured at this point might be misleading and will not be representative of the fleece, particularly if there is great variability in diameter along the staple. The measure of the diameter at a point along a staple will be dependent on the *AFD* at that point. Different growth rates occurring among different fibre types might also be incorporated in this context. As sheep are often subjected to varying conditions of wool growth , thus a decrease in diameter due to lactation, lack of feed, ..etc. would not occur all along the staple ,nor at the same level of all fibre types, so that some deviations would be expected. On the other hand, it is possible in this method that some of the fibre, with interrupted medulla escaped notice.

A staple profile might evaluate the changes along the fibre as sheep respond to the different physiological and environmental conditions which contribute to variation in staple strength and position of break. The staples may be cut into consecutive 2 mm length snippets and these are measured. However, while it is informative, it is time consuming and might not be practical and only suitable for research applications. Since the objective is to rank some samples taking into consideration the variability of fibre diameter along the fibre, this could be done by wrapping the staple several times along its length and then inserting it in the slot of the hand microtome. The cuttings of 2 mm length would be obtained from these fibres at random as well as at different levels along these staples. These cuttings might be used for the measurements to include the along fibre variability. A discussion of other practical and more accurate ideas regarding this context are invited.

Seasonal effect

Season indicated highly significant effect on *AFD* as well as *%Med* (Tables 1 and 2). The minimum *AFD* value existed in July (34.02 µm) tended to increase to reach the maximum in January (35.90 µm) and then decreased thereafter. The least *AFD* observed in July indicated a reduction of only 5.2% from the maximum value obtained in January. The maximum reduction found in *AFD* from July sample might reflect the feed shortage during summer dry period. Similar trend was observed for *%Med* in which it tended to increase from April (8.29%) to reach the maximum in January (14.68%). The minimum *%Med* found in April showed a reduction of 43.5% from the maximum value obtained in January.

Table 2. Analysis of variance estimates for the studied traits

Sources of Variation	d.f.	Mean Squares				
		FD	SE	SD	Med%	CV%
Total	695					
Season (S)	3	120.33**	0.49**	91.28**	991.85**	679.40**
Animal (A)	28	270.61**	0.28**	66.11**	748.96**	274.56**
Position (P)	5	958.85**	0.46**	138.44**	2477.09**	352.27**
A x S	84	30.79**	0.11**	23.15**	84.63**	145.91**
A x P	140	28.25**	0.02**	6.75**	72.02**	14.60
S x P	15	17.50**	0.02**	6.01**	54.96**	29.22**
Residual	420	10.50	0.01	2.53	28.63	9.91

* P<0.05 ** P<0.01

The causes of the variability of fibre diameter are probably the reaction of the growing fleeces to varying environmental influences. Individual animals and the different types of fibres in the fleece will react differently. Thus, in any season or between seasons the effects within a flock may be very diverse . The growth patterns of wool may be so modified by nutrition, pregnancy, lactation, light and temperature. Probably the stock management is the most important factor involved. Seasonal variation in availability or quality of feed is responsible for the initiation of the rhythm as well as the magnitude of the difference between summer and winter production (Doney and Smith, 1961; Henderson, 1953). While the wool growth rate is reduced from the start of pregnancy there is more marked reduction during lactation (Story and Ross, 1959). Ferguson et al. (1965) confirmed that adrenal steroids suppress follicular activity and suggested that their increased output at times of physical and emotional stress is responsible for break or tenderness of the fleece. In Merino, Ossimi and their crosses, both fibre length and diameter in normal light exceeded those in dim light except in winter time (El-Sherbiny et al., 1978).

The remarkable annual variation observed in wool growth and particularly in fibre diameter is considered to be of great disadvantages from a practical point of view and would affect the usefulness and the value of such wool as a textile fibre. Cockrem and Rae (1961) reported that the thinning which occurs in fibre diameter would account for a reduction in fibre strength and hence, result in poorer manufacturing performance as well as a greater loss of fibre during carding or combing. When extreme thinning exists, the follicle will cease growth which might lead to more fibre breakage or tenderness and perhaps shedding of the fibre occurs. If such breakage takes place while the fleece is on the animal, the fibres become entangled, and cotting may result. Therefore, possible causes of this thinning of the fibre have to be considered. Feeding as well as management and shearing practices of the sheep ought to be adjusted, as far as possible, in such a way that the seasonal variations and their unfavourable effects are reduced to a minimum to be able to grow a satisfactory fleece from the processing point of view.

Position effect

Tables (1 and 2) indicated highly significant position effect on all studied traits. A distinct dorso-ventral gradient was evident in which dorsal line had thicker diameter (35.07 μm Vs 34.65 μm) and slightly less *%Med* (11.88 Vs 11.98) as well as higher variability in terms of SE (0.49 Vs 0.45) , SD (8.41 Vs 7.63) and CV% (23.6 Vs 21.88) as pooled estimates over seasons. Furthermore, an anterior-posterior gradient existed in which *AFD* and *Med%* tended to be higher towards the posterior positions. In terms of *AFD* and *% Med*, fibres appeared to be finest on shoulder position (31.57μm and 6.49%) and coarsest from the britch sample (38.69 μm and 19.70%). Similar trends were reported by Ghanem (1965) and Guirgis (1973) in Barki sheep.

The peculiar features of the gradient system indicate that there are large differences between body regions of the animal. The individual body region appeared to have characteristic localized skin growth rates which can be related to the growth of the whole. A proof was lacking that different nutritional regimes caused a certain skin region to grow at the expense of another (Henderson, 1953). A gradient of various wool traits were observed over the body positions of Barki sheep (El-Gabbas, 1993, 1993 a and b) as well as in many sheep breeds. An inherent factor associated with either the skin or its follicle population was proposed (Cockrem, 1962) to be involved in determination of the amount of wool grown on a particular position.

While the antero-posterior gradient of *AFD* is evident in all seasons, it is not as clear in January and April especially on the dorsal line. Moreover, the dorso-ventral gradient was not consistent among seasons. While all seasons indicated higher *AFD* towards posterior positions, October samples had slightly less diameter in the posterior parts compared with anterior ones (35.08 μm Vs 35.18 μm). That might explain the significant effect of season x position interaction on *AFD* found in Table (2).

Animal effect

Animal indicated highly significant effect on *AFD* and its measures of variability as well as % *Med*, which implies the importance of genetic factors in controlling these traits. Furthermore, Table (2) indicated that rankings of sheep and positions varied across the four seasons as the interactions of animal x season and position x season occurred for the studied traits. The animal x position interaction was also significant which indicates that ranking of position changed among animals.

Fibre diameter variability

The present study dealt with three measures of dispersion for fibre diameter, they were standard deviation, SD, standard error, SE and coefficient of variation, CV%. The first two parameters were designed to measure the spread of fibre diameters within the original sample. However, the CV% is expressed as SD as a percentage of the *AFD* and enables a comparison of diameter variation between groups differing in *AFD*. As expected, the measurements of fibre diameter variability increased as the *AFD* increased as well as exhibiting the same trend in which they tend to increase towards the dorsal and posterior positions. That is, coarser fleeces were associated with a wider distribution of diameter. The correlation of *AFD* was found to be 0.53 with average SD which might indicate that these two variables are not independent, whereas the expected correlation for samples from a normal distribution is zero.

The variability in fibre dimensions might be due to the differences in productivity of primary and secondary follicles. A fall in level of nutrition would affect the primaries and secondaries differentially and hence upsets the regularity of the fleece. Ryder and Stephenson(1968) considered the S/P follicle ratio as an important factor in influencing the uniformity of the fleece since the decrease in the S/P ratio would cause an increase in the variation of fibre sizes. In addition to variations in dimensional attributes from fibre to fibre within the staple, considerable variations are to be found in the cross-sections at the length of the individual fibre. Fibre diameter was indicated to be closely associated with bulb and papilla measurements (Hynd, 1995). If the along-fibre variation is high, the strength is reduced and hence the wool becomes tender.

Many investigators (Wickham, 1971; Hansford, 1992; Iman, et al., 1992) have indicated that the variability of fibre diameter comes from a number of sources: i) variation along the length of individual fibres , ii) variation between fibres within a staple , iii) variations between regions of the fleece, iv) variation between fleeces and v) variation between lines of wool. Differences in diameter between sheep within a flock would produce an individual wool clip comprised of fibres with more variation in diameter. Wool top and yarn produced from this clip would similarly display variation in the diameters of their constituent fibres. If sale lots are blended to form a processing consignment, as is generally the case, then additional variation in diameter may be introduced. According to the forgoing studies, the major component of variance in fibre diameters was attributed to variation among fibres within staple. However, the variation between sheep has never contributed more than 10% of the total variation in fibre diameter. Consequently, an interesting practical demonstration is that the different methods of preparation of wool sale lots as well as extensive blending of wools would appear to have comparatively a marginal effect on the overall fibre diameter distribution.

Fibre diameter and medullation in processing

Story (1978) indicated that the industry would like the *AFD* to be high, preferably 36 μm or higher together with no kemp and as much medullated fibres as possible, provided fibre strength and elasticity are satisfactory. The industry associates a coarse fibre diameter with crisper handle , more medullation as well as being sounder and process better . Carpets made from coarse wool have better marketing properties in terms of resilience , appearance retention and abrasion resistance . Ali et al. (1971) indicated that variation in wool handle is determined largely by *AFD*; the softer the wool the less *AFD*. As the latter increases the resistance to compression increases and breaking yarns decreases (Hunter 1980). On the other hand, in wools of increasing *AFD* which have little medulla, Story (1978) reported that *AFD* alone has very little effect on floor performance of carpets including appearance retention as well as carpet handle . Also, the abrasion resistance of carpets does not increase with increasing *AFD* , but on the contrary it may decrease.

Medullation has received a lot of attention in sheep breeding since it can influence many yarn and carpet properties. Medullated fibres and kemps have a major effect on the handle as they tend to lie on the outside of the yarn and resulted in harsh handle. These outer fibres, being more brittle, can lead to excessive fibre loss in carpet manufacture and in the carpet during wear (Ince, 1979). Higher bulk and resilience which is common in all carpet wools appeared to result mainly from their medullation (Story, 1978). On the other hand, medullation has a very big effect on dyeing. The appearance of the carpet is obviously affected by the appearance of yarns used. That is because a yarn containing highly medullated wools appears to dye to a paler color compared with non-medullated wools although it absorbs as much dyestuff (Ince, 1979).This is a phenomenon of colour physics due to internal light reflection in the hollow fibres. Most buyers of plain carpets prefer the appearance of non-medullated wools whereas the appearance of the more hairy wools in patterned carpets is masked to some extent by the design The irregular dyeing of wool is a serious defect when clear solid shades are desired. Hence, blending wools with such widely different coloration properties should be avoided, particularly in plain carpets because of risks of streaks.

Fibre diameter distribution

Is an objective measure of wool quality which shows the spread in fibre diameter within a tested sample. In the present Barki materials, some fibres were found to be as fine as 3µm and others were as coarse as 200 µm .The spread of diameters was specified in the fibre diameter distributions for different seasons (Figure 1) as well as positions studied (Figure 2). The positive skewness obtained in all positions and seasons (Table 3) could be explained as all of these fibre diameter distributions were found to be extended towards the right hand side.The skewness of the overall fibre diameter distribution was + 2.1. While the least skewness was observed in the withers position (+ 0.8), the rump sample had the highest value (+2.1). This might indithat wool obtained from the withers would be of less variability while that obtained from the rump would have a widespread distribution. On the other hand, the least skewness was indicated in April (+1.0) while the maximum was obtained in October (+2.6).

The overall fibre diameter distribution showed an *AFD* of 34.86µm with a SD of 8.0 µm. If the fibre diameter distribution is normal, then it is expected that about 66% of the fibres will be between 26.86µm and 42.86 µm. It is also expected that about 95% of the fibres will have diameter within the range of 18.86 µm to 50.86 µm.

Skin irritation is caused by coarse and stiff fibres which may be largely responsible for "prickle", a serious disadvantage of wool fabrics worn next to the skin, not if it is in outer garments. The problem appeared to be related to the "prickle factor" or the occurrence of about 5% or more of fibres greater than about 30 µm (Whiteley and Thompson, 1985; Hansford, 1992). It has been recently confirmed that prickle is not an allergic reaction to wool, since the same physical response was demonstrated using acrylic fibres (Naylor, 1992 cited by Hansford, 1992). Lewer (pers. com) demonstrated that the higher the *AFD*, the greater the chance that a sheep will have higher proportion of wool fibres exceeding 30µm. Hence, garments made from wools with an *AFD* of about 20/21µm or finer are unlikely to cause prickle if worn against the skin . Thus, underwear is often made from very fine fibre diameter wool to reduce the possibility of prickle.

Table 3. The Skewness, *Sk*, and the prickle factor, *PF*, for the fibre diameter distributions of various positions and seasons

	Position						Season				Pooled
	Sh	Ms	Br	Wth	Bk	RP	Jan.	Apr.	Jul.	Oct.	
Sk	+1.1	+1.3	+1.9	+0.8	+1.9	+2.1	+2.3	+1.0	+1.9	+2.6	+2.1
PF	37.12	40.57	56.49	40.92	41.61	53.88	47.32	44.28	43.77	45.74	45.07

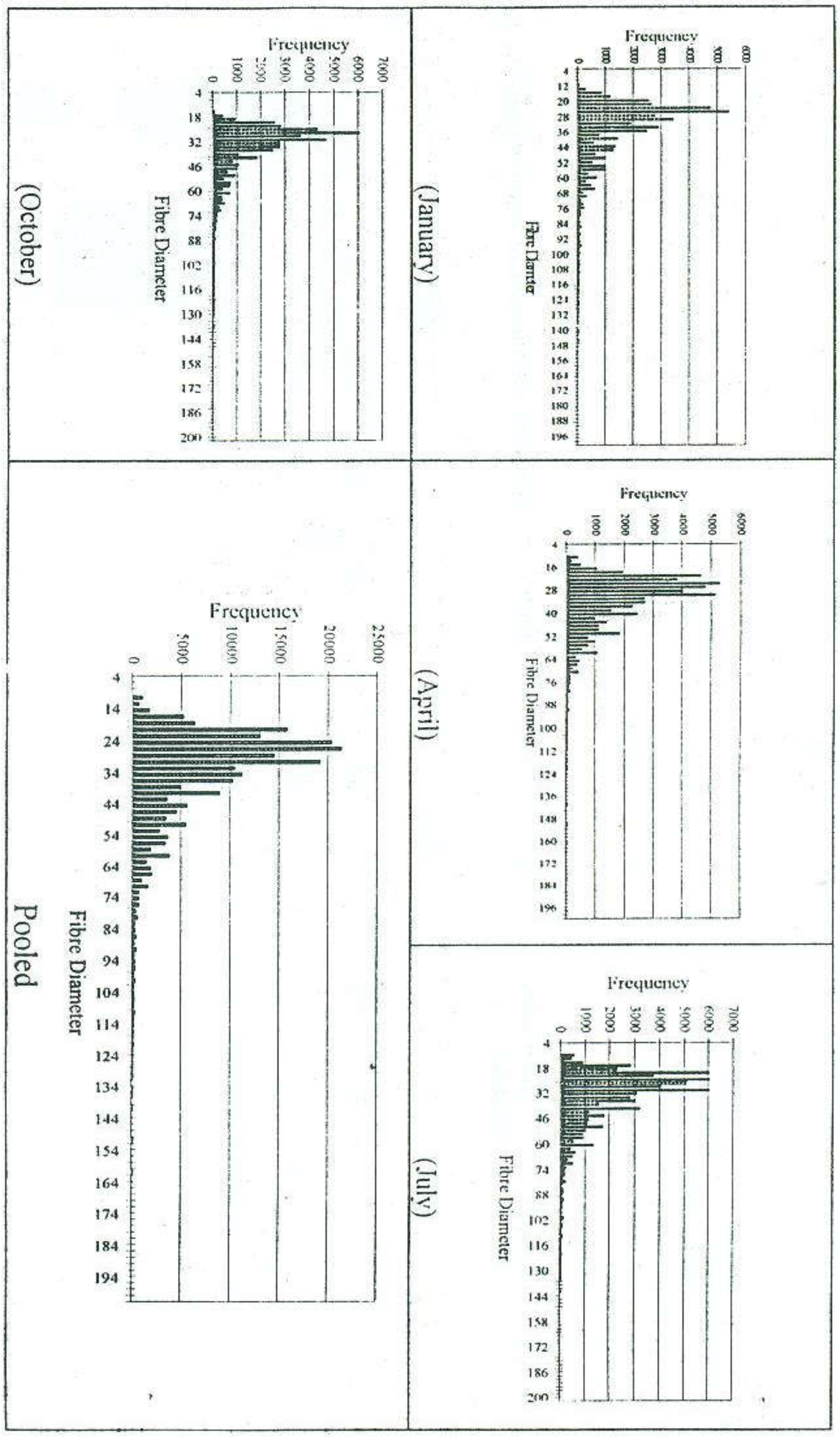

Fig 1. Pooled fiber diameter distribution as well as those obtained from various seasons in Barki sheep.

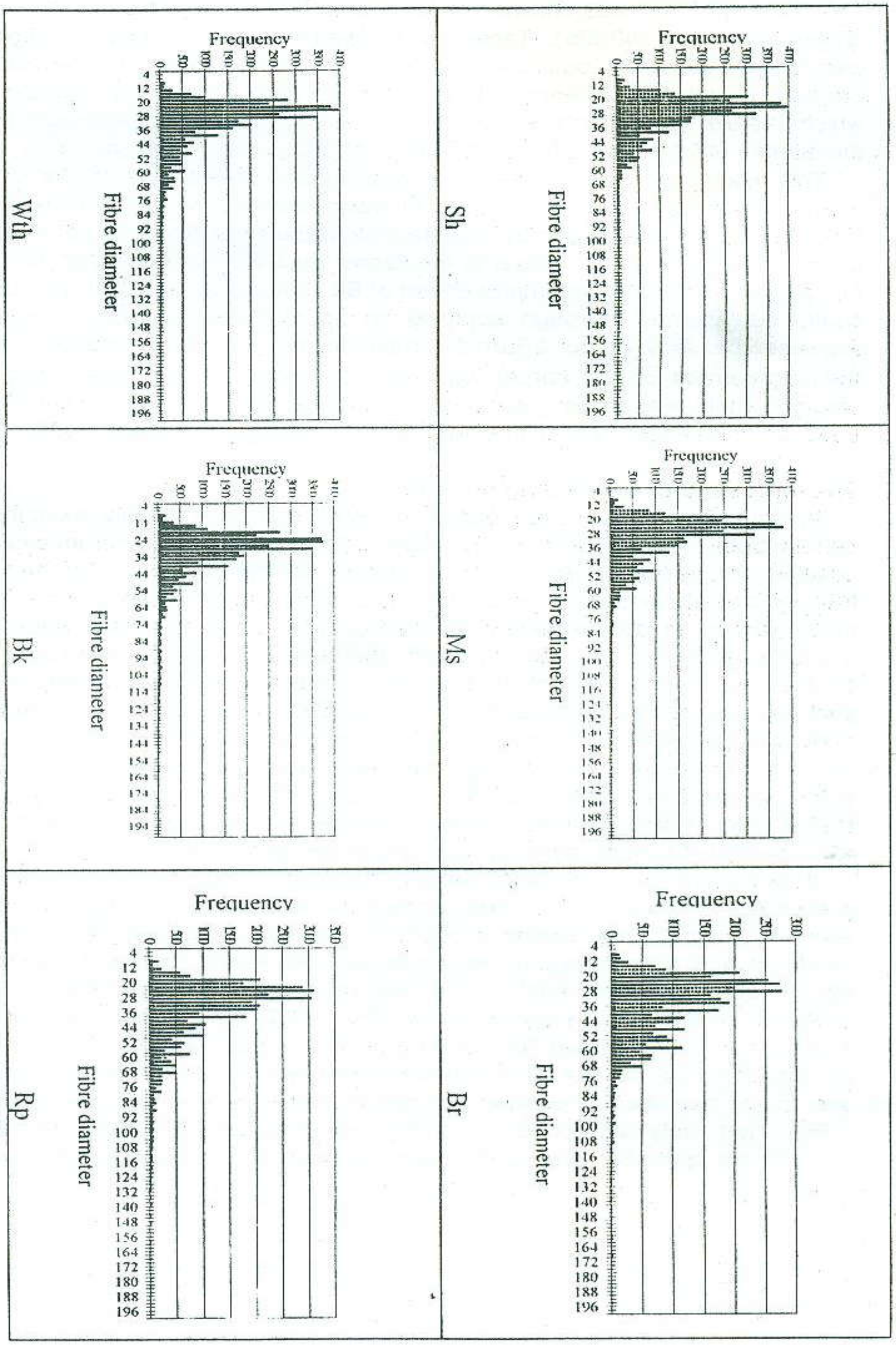

Fig 2. Fibre diameter distribution obtained from various body position of Barki sheep.

In the present study, the overall average of the *PF* was found to be 45.1%. The maximum *PF* was attained in January (47.3%) while the minimum was observed in July (43.8%). Table (3) showed that the *PF* tended to increase towards the posterior positions which indicate the distinct antero-posterior gradient in this trait. Moreover, a dorso-ventral gradient was also observed in which the *PF* was found to be higher on the dorsal positions compared with the laterals (45.5% Vs 44.7%) as a pooled estimates over seasons.

This result might indicate that Barki wool would never be suitable for fabrics worn against the skin. The study of various wool traits in Barki sheep (El-Gabbas, 1993 , 1993 a and b) indicated that Barki wool while it is not a proper carpet wool ,it is much closer to the carpet wool specifications than to those for apparel. However, the improvement of Barki sheep as a carpet wool breed could be attained through applying an appropriate breeding program to increase the *AFD* up to 36μm and maintain the level of medullation to meet the requirement of the carpet wool specifications. On the other hand, that would contribute to higher meat production since there is a positive correlation between coarseness and animal body weights (Guirgis and Galal, 1972).

The representative sampling position

In determining the fleece quality, a wool sample is usually taken from a certain body region.Turner (1956) reported that if the wool trait from a certain position or positions has a high correlation with the mean value of the same trait for the whole fleece, measurements at that position will enable the sheep to be ranked in approximately the same order as if the mean value were available. If there is a regular pattern, sampling procedures can be simplified by the use of a fixed site or sites. While many workers in fine wool breeds such as Merino recommended the mid-side sample, researchers on the other breeds have made no specific sampling recommendations. El-Gabbas (1993, 1993 a and b) have determined the most representative position for some subjective and objective wool traits in Barki sheep. In India, Acharya et al., (1972) have indicated the back position as the most representative position for average fibre diameter, average fibre length and percentage of medullation.

The correlation coefficients among the studied traits were calculated and presented in table (4). The most representative sample to the fleece average was indicated by the highest correlation coefficients between each of the six positions and the average of these positions, the fleece average for a specific trait. It appeared that britch is the best sampling position for *AFD* (r = 0.83), *%Med* (r = 0.87) and standard error, SE (r = 0.92). Moreover, rump position seemed to be favourable for standard deviation, SD (r = 0.92) and coefficient of variation, CV % (r = 0.90). On the other hand, as far as the SD and CV % are concerned, the correlations obtained for britch sample were found to be of 0.86. That little difference in correlations obtained from rump and britch position for both SD and CV% does not justify the advantage of using the britch position as only one position to be sampled to represent *AFD* and its variability. Consequently, britch position in general might be considered as a good representative for the average fibre diameter and its variability in Barki fleeces.

Table 4. Correlation coefficients for the studied traits taken from different positions and the average of these positions, the fleece average

	FD	SE	SD	M%	CV%
Shoulder	0.75	0.77	0.73	0.78	0.81
Mid-side	0.79	0.86	0.85	0.83	0.87
Britch	0.83	0.92	0.86	0.87	0.86
Withers	0.77	0.87	0.85	0.69	0.89
Back	0.73	0.81	0.77	0.72	0.80
Rump	0.77	0.86	0.92	0.76	0.90

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أقطار ألياف الصوف واختلافاتها في الأغنام البرقى وعلاقاتها بالمواسم المختلفة وأماكن أخذ العينات

حسنين محمد الجباس

قسم إنتاج وتكنولوجيا الصوف , شعبة الإنتاج الحيواني , مركز بحوث الصحراء - المطريه - القاهرة - مصر.

استهدفت الدراسة التعرف على متوسط قطر ألياف الصوف والاختلافات في أقطار الألياف بالإضافة إلى نسبة الألياف ذات النخاع ومدى تأثرها بالاختلافات بين الحيوانات وبين المواسم وكذلك بين مواقع الجسم المختلفة . أجريت هذه الدراسة باستخدام ٢٩ نعجة برقى للحصول على عينات صوف من ستة مناطق على جسم الحيوان كل ثلاثة أشهر لتمثل نموات الصوف في الصيف والخريف والشتاء والربيع . كما تمت دراسة منحنى توزيع أقطار ألياف الصوف وكذلك معامل الوخز في الصوف البرقى.

أوضحت النتائج أن متوسط قطر ألياف الصوف كان ٣٤,٨٦ ميكرون ونسبة الألياف ذات النخاع كانت ١١,٥٢٪ وكان معامل الوخز ٤٥,١٪ .وقد أتضح أن كل الصفات المدروسة قد تأثرت بصورة واضحة بالاختلافات بين الحيوانات والمواسم وكذلك بين المواقع المختلفة على جسم الحيوان. لوحظ أقل متوسط لقطر الألياف في شهر يوليو وذلك بمعدل نقص قدره ٥,٢ ٪ بالنسبة لأعلى متوسط لقطر الألياف الذي لوحظ في شهر يناير. بالمثل كانت أقل نسبة للألياف ذات النخاع في شهر إبريل وذلك بمعدل نقص قدره ٤٣,٥٪ مقارنة بأعلى قيمة لهذه الألياف آلتي لوحظت في شهر يناير. أظهرت منطقة الظهر أعلى متوسط لقطر الألياف وأعلى معدل للوخز وكذلك أكثر الاختلافات في أقطار الألياف مع نقص طفيف في نسبة الألياف ذات النخاع. ومن ناحية أخرى فقد أوضحت الصفات المدروسة بصفة عامه قيما أعلى بالاتجاه إلى المناطق الخلفية من جسم الحيوان. بالأخذ في الاعتبار متوسط قطر الألياف ونسبة الألياف ذات النخاع بالإضافة إلى معامل الوخز فأن منطقة الكتف احتوت على أنعم الألياف بينما احتوت منطقة الفخذ على أخشن الألياف.

أوضحت الدراسة أنه كلما زاد متوسط قطر الألياف زاد التباين بين أقطار الألياف بالإضافة إلى معامل الوخز ونسبة الألياف ذات النخاع . وقد أتضح أن منحنى توزيع أقطار الألياف للصوف البرقى يميل ناحية اليمين في كل المواقع والمواسم التى درست ومن المتوقع أن ٩٥٪ من ألياف

الصوف البرقى تتراوح أقطارها مابين ١٨,٨٦ميكرون إلى ٥٠,٨٦ ميكرون. كما أوضحت الدراسة أن عينة الصوف المأخوذة من منطقة الفخذ كانت الأكثر تمثيلا لجزء الأغنام البرقى من حيث متوسط قطر الألياف والتباين في أقطار هذه الألياف وكذلك نسبة الألياف ذات النخاع. اقترحت الدراسة أن تحسين الأغنام البرقى كسلالة لصوف السجاد يمكن أن يتم من خلال برنامج تحسين وراثي يهدف لزيادة متوسط قطر ألياف الصوف إلى أكثر من ٣٦ ميكرون مع المحافظة على النخاع وذلك حتى تتوافق صفات الصوف البرقى مع الخصائص المثلى لصوف السجاد ومن ناحية أخرى فان التحسين في هذا الاتجاه سوف يؤدى كذلك إلى زيادة إنتاج اللحوم في الأغنام البرقى.