Short Communication

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STUDIES ON THE DIFFERENT PARTS OF THE FLEECE OF HASHTNAGRI SHEEP

Part I. Difference in Felting Potential of Loose Wool Fibres

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Felting has been defined by Makinson[1] as 'the process of progressive entanglement of the fibres in an assembly occurring as a direct result of agitation by undirected external forces'. A considerable amount of work has been carried out on felting and has been reviewed by Moncrieff.[2] It has been proved that migration of the fibre occurs during felting and for this migration to take place the fibre must have a scale structure on its outer surface.[3-5] But as most of the work done on felting is on fine wool (free from medullation) we cannot apply these results to wool which contains a considerable amount of medullated fibres.

Recently some papers have been published in Pakistan on the felting behaviour of Pakistani wool.[6,7] It has been concluded that Pakistani indigenous wools possess good felting properties, except crossbreed Kaghani wool. Furthermore, it has been shown that with the increase in percentage of medullated fibres the felting propensity decreases. The optimum percentage of medullated fibre for making compact felt has been suggested not to exceed 40%.

The export of felts to foreign countries could be enhanced considerably if the quality of felt can be improved. One of the drawbacks in the present commercially manufactured felts is the nonuniformity in thickness and looseness of the fibres in some places. This problem is probably due to the absence of a systematic classing system in the country. It has been reported[8] earlier that different parts of the sheep's fleece produce wools showing differences in medullation, fineness and strength. Therefore, it was considered necessary to establish the felting behaviour of the different portions of the Hashtnagri fleece. In the present study the fleece is divided into six distinct parts and the wool obtained is felted separately. The percentage of the various types of fibres, i.e. true hetrotypical and medullated was also determined to find the effect of medullation on felting.

Materials and Methods

Wool Samples. Animals of indigenous Hashtnagri breed were kept on a sheep farm on the P.C.S.I.R. Laboratories campus. The wool samples were taken from nine sheeps and the six different parts selected from each fleece were back wool; body wool; belly wool; shoulder wool; neck wool; and britch wool.

The samples were purified by Soxhlet extraction with ethyl ether followed by soaking in ethanol and finallly by washing with distilled water.[9]

Medullation. About 0.5 g of wool staple was removed from each part of the nine fleeces and the three types of wool fibres, i.e. true heterotypical and medullated were separated by using benzene test.[10] Each type was weighed and the percentage calculated. Kempy fibres were not included due to the small proportion present.

Felting. The wool samples were carefully hand-carded and mixed thoroughly to minimize sampling differences. All vegetable matter was removed. Exactly one gram wool was placed in a wide-neck bottle (internal dia 6.0 cm, length 6.5 cm) which contained 50 ml 0.1N HCl together with a drop of nonionic detergent. The well known method[11] which consists of a three-dimensionally shaking machine (Gallenkamp) was employed to evaluate felting propensity. The time of felting was kept at 60 min at a machine speed of 180 rev/min. The diameter of the resultant ball is an indication of the feltability of wool: a lower diameter signifying a higher felting propensity and vice versa. At least two felted balls were produced from each sample and the diameter of the ball was measured at four different places using a vernier calliper.

Results and Discussion

The quantity of wool produced from the indigenous Pakistani breed is very low as compared with Merino and other fine woolled type breeds. Merino sheep usually have folds and are covered with wool on all parts of their bodies whereas the Hashtnagri breed has no folds and no wool on either head or legs. Smith[12] divided Merino fleece (free from medullation) into 11 distinct portions and reported that the best wool comes from the shoulder and sides of the sheep, followed by wool from the lower part of the back, the loin and the upper part of tle legs. Wool from the neck, britch, belly, chest, head, throat and lower parts of the legs are all of inferior quality. Wakil and Khan[8] have shown that in the case of the fleece of Hashtnagri sheep shoulder wool contains a minimum number of medullated fibres followed by fleece (body wool) and neck wool. Belly wool contains the highest percentage of medullated fibres. The best wool is obtained from the shoulder and neck of Hashtnagri sheep (Table 1). The percentage of medullated wool in back, body and britch wool is more or less the same. In belly wool the percentage of medullated fibre is the highest (mean 75.3%). It should be pointed out that large variations occur in Hashtnagri wool even in the same part of the same sheep.[13]

Table 2 shows the felting behaviour of the six parts of the Hashtnagri fleece. It is abvious that the shoulder wool exhibits maximum (mean 24.9 mm) and belly wool minimum felting (mean 27.3 mm). The other parts (back body and neck wool) show approximately the same felting behaviour lying in

TABLE 1. PERCENTAGE OF MEDULLATED FIBRES IN DIFFERENT PARTS OF HASHTNAGRI FLEECE.

Fleece No.	Back	Body	Belly	Shoulder	Neck	Britch
6	32.9	43.3 7.6*	85.9	8.2 25.1*	14.3 14.6*	60.1 7.0*
8	44.5	32.5 12.4*	63.0 6.8*	33.2 8.5*	39.9	41.9 15.6*
12	42.3 20.5*	61.6	86.0 6.2*	40.2 19.6*	39.4 12.4*	50.0
20	44.0	24.5	72.8	23.3	31.5	22.5
30	38.8 20.6*	41.4 20.6*	94.2	32.5 40.0*	60.5	69.3
51	23.5	43.0	70.2	30.7	36.6 9.9*	44.2
60	35.5	31.2	60.9	22.3	10.1 15.4*	10.0
61	34.0	24.8	41.3	29.3	12.4	35.5
64	49.0	54.5	90.7	29.6	34.6	40.8
Mean	42.8	44.1	75.3	38.0	36.0	44.1

*Heterotypical fibres.

TABLE 2. FELT BALL DIAMETER (mm) OF DIFFERENT PARTS OF HASHTNAGRI FLEECE.

Fleece No.	Felt ball dia (mm)					
	Back	Body	Belly	Shoulder	Neck	Britch
6	23.9	24.7	27.3	22.1	23.0	25.1
8	26.4	25.9	27.0	25.9	25.1	25.2
12	27.5	28.1	28.1	26.0	26.0	27.2
20	24.9	24.0	27.8	23.9	24.6	24.4
30	25.1	25.2	29.7	25.9	27.0	28.8
51	24.3	24.7	26.5	25.5	26.0	26.0
60	25.5	26.3	26.7	24.7	25.6	25.8
61	25.0	24.8	26.1	26.4	25.5	25.5
64	25.4	26.3	26.5	24.5	24.8	24.9
Mean	25.3	25.5	27.3	24.9	25.3	25.8
C.V. %	4.1	4.1	3.7	5.2	4.1	5.0

between that of shoulder and belly wool. The coefficient of variation (c.v.%) in felting in the various portions varies from 3.7 to 5.2%.

In order to establish possible reasons for the differences in the felting behaviour of the various portions in the same fleece it is necessary to show how felting is effected by the presence of medullated and hetrotypical fibres. In fleece nos. 6, 20, 30, 64, the felting rate corresponds with the percentage of medullated fibres, i.e. the higher the percentage of medullated fibres the lower the felting rate and vice versa. In fleece no. 8 the percentage of heterotypical fibres upsets this relationslip. Although in this case maximum felting occurs in neck wool but minimum number of medullated fibre occur in body wool together with 12.4% of heterotypical fibres. In fleece no. 12 body wool and belly wool have got the same felting but the difference in percentage of medullated fibre is very large. In fleece no. 51 felting varies according to medullation except body wool. Similarly in fleece no. 60 felting of back wool does not change corresponding to changes in medullated fibres. In fleece no. 61 felting of all the various portions does not correspond to changes in medullation. The reason for these indiscrepancies may be that the difference between maximum and minimum is very small in felting as well as in medullation.

Other possible factors which may affect felting such as D.F.E., diameter, crimp frequency and length have not been measured due to the fact that it has been established that the above factors do not affect felting.[14–16] However, it has been shown that crimp form plays an important part in felting, i.e. fibres with helical configuration do not felt as well when compared with fibres with a sine configuration or straight fibres.[17–19] The crimp form of the various parts of the Hashtnagri fleece shows that true fibres have a sine configuration while medullated fibres are of the straight type.[20, 6] By visual examination no difference was found in crimp configuration for the various parts of Hashtnagri fleece.

From the above discussion it is clear that only the belly wool has maximum felting due to the highest number of medullated fibres. There is however little difference in felting in other parts of the fleece. It is, therefore, concluded that for making uniform felt the various portions of the fleece should be thoroughly mixed so that the percentage of medullated and true fibre is almost equal in various parts of the felt.

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