

CHARACTERISTICS OF HASHTNAGRI WOOL AND ITS STANDARDIZATION FOR CARPET MANUFACTURE

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Full fleeces of wool obtained from Hashtnagri sheep, habitant of Hashtnagar tract of West Pakistan, were studied. About 25,000 fibres were tested for average fibre diameter; 31,000 for percentage proportion of the four types of fibres, viz., true, heterotypical, medullated and kemp; and 12,000 for fibre diameters as well as fibre lengths of the four types of fibres. Results obtained were standardized against the available standards for an ideal carpet wool. It has been found that the wool satisfies all the conditions for an ideal carpet wool except for the only drawback that the coefficients of variation of the said proportion and dimensions stand higher than the desired limits. Consequently, measures for development have been suggested.

1. Introduction

Pakistan produces over 30 million lbs. of raw wool annually, the bulk of which is exported as carpet wool. As such, the above commodity ranks as the third major exportable item of the country. Indigenous wool is obtained from about 17 different breeds of sheep.¹ The fact that no authoritative datum exists on the quality and characteristics of the indigenous wool is a great handicap in connection with the development of the wool trade and the industrial exploitation of different varieties of the raw wool for specific purposes.

Since the birth of Pakistan, only a limited number of reports on the above characteristics have been published. In the first, Haq² furnished data on the fineness of 15 trade varieties of Pakistani wools and urged for exhaustive investigations on indigenous wools. Next, Ishaq and Ali³ reported data on the percentage of non-medullated and medullated fibres and the diameters of the former type of fibres obtained from Salt Range, Thalli and Lohi Sheep. A large number of important aspects of Pakistani wools and their standardization for the purpose of specific industries, however, still lie unexplored.

Prior to the introduction of Pak-Mark wool grades, wools from the sub-continent were exported under trade names mostly derived from the names of the areas from which they were collected. Peshawar wool is known at home and abroad, as one of the main carpet wools and has been described to be, "lofty, resilient and of medium length (1-6)".⁴ One of the constituents of the said Peshawar wool is the wool obtained from Hashtnagri breed of sheep.² In the present work data on a number of significant characteristics, viz. average fibre diameter (separate for body wool and skirtings); percentage proportion of all the four types of fibres, viz., true, heterotypical, medullated and kemp; and lengths as well as

diameters of the said four types of fibres of the Hashtnagri wool have been supplied. Further, in the light of the results obtained, the utility of the wool has been discussed by standardizing it against the desirable standards for the manufacture of carpets.

2. Materials and Methods

Samples were collected in the Autumn shearing season (Sept.-October) of 1960 and again in the Spring shearing season (April) of 1961 from the home tract of the breed, viz., Charsadda and Mardan Tehsils of the Peshawar Division. Full fleeces were collected at random from about 10 per cent of each flock chosen itself at random at various stations spread over the home tract.

Every sample was dusted, and fibres were picked up at random from different parts of the sample. For the determination of average fibre diameter, fibres were treated with benzene and were cut to a length of approximately below 0.2 mm. Ordinary scissors was applied for this purpose. Thereafter, the sections were degreased with ether, conditioned for 24 hours, mounted and reconditioned for further 24 hours. The slides were studied at a magnification of 500, and 200 readings (separately for body wool and skirtings) were recorded per sample.

For the determination of percentage proportion of various types of fibres, about 500 fibres of body wool of each sample were isolated into true, heterotypical, medullated and kempy categories. The four types of fibres so obtained were further tested for diameter as well as for stretched length. All the available number of fibres (upto a maximum of 100 in case of true fibres and a maximum of 50 in case of the rest of the three types of fibres) were tested for both of the tests, viz., diameter and stretched length.

In all about 13,000 fibres were tested for average fibre diameter of body wool; 12,000 for average fibre diameter of skirtings; 31,000 for the percentage proportion of the four types of fibres; 6,500 for fibre diameter and fibre length of True wool; 2,300 for diameter and length of heterotypical; 3,400 for diameter and length of medullated and 366 for diameter and length of kempy fibres.

3. Results

Results obtained have been given in Tables 1 to 4. Table 1 gives the average fibre diameter of body wool and skirtings. In the case of body wool, the range of the fibres which is remarkably wide and the frequency of various groups have also been furnished. In this case, the fibres ranged from 10 μ to 186 μ with an average of 37.3 μ and a coefficient of variation of 61.1%. The bulk of fibres, viz., 88%, however, fell within the range 13 μ to 60 μ . In the case of skirtings, fibres ranged between 10 μ and 190 μ with an average of 45.7 μ and a coefficient of variation of 74.8%. Table 2 shows the percentage proportion of the four types of fibres. The percentage of kempy fibres is not so high, being only at 1.2%, whereas the other fibres are: true, 60.0%; heterotypical, 12.6%; and medullated, 26.2%. It may, however, be mentioned that the total available number of kempy fibres was only 366 out of a number of about 31,000 fibres isolated into various categories.

Fibre diameters of the four types of fibres are:

true-25.0 μ , heterotypical-40.2 μ , medullated -63.7 μ and kempy -54.0 μ with the coefficients of variation of 36.7%, 24.7%, 38.6% and 36.2%, respectively, and with ranges as given in Table 3. Of course, the average fibre diameter of kempy fibres is the arithmetic mean of the three parts of the fibre.

The fibre lengths of various types of fibres are: true -4.04"; heterotypical -4.82"; medullated -4.92"; and kempy 2.73", with coefficients of variation of 27.78%; 23.82%, 25.64% and 20.48%, respectively, and with ranges as given in Table 4.

Table 5 gives both the dimensions of heterotypical fibres (irrespective of the type of medullation) discussed elsewhere in the present work.

TABLE 2.—PERCENTAGE PROPORTION OF TRUE, HETEROTYPICAL, MEDULLATED AND KEMPY FIBRES IN HASHTNAGRI WOOL.

Type	No. of samples	No. of fibres	Range	Percentage proportion
True	60	18362	38-88	60.0
Heterotypical	60	3871	2-27	12.6
Medullated	60	8020	5-44	26.2
Kemp	60	366	0-5	1.2

TABLE 1.—FIBRE DIAMETERS OF BODY WOOL AND SKIRTINGS OF HASHTNAGRI VARIETY (MICRONS).

Type	No. of samples	Interval	Frequency	Interval	Frequency	Interval	Frequency	Interval	Frequency	Total No. of fibres	Mean	Coefficient of variation
Body Wool	60	9- 10	24	55- 56	162	101-102	22	147-148	4	12633	37.3	61.09%
		11- 12	71	57- 58	149	103-104	30	149-150	3			
		13- 14	268	59- 60	164	105-106	20	151-152	2			
		15- 16	364	61- 62	89	107-108	29	153-154	2			
		17- 18	607	63- 64	145	109-110	29	155-156	2			
		19- 20	1038	65- 66	90	111-112	17	157-158	—			
		21- 22	1009	67- 68	60	113-114	18	159-160	3			
		23- 24	1138	69- 70	90	115-116	11	161-162	4			
		25- 26	934	71-72	53	117-118	17	163-164	—			
		27- 28	694	73- 74	45	119-120	13	165-166	1			
		29- 30	807	75- 76	64	121-122	10	167-168	—			
		31- 32	516	77- 78	52	123-124	11	169-170	—			
		33- 34	498	76- 80	72	125-126	10	171-172	1			
		35- 36	392	81- 82	35	127-128	14	173-174	—			
		37- 38	292	83- 84	54	129-130	18	175-176	—			
		39- 40	353	85- 86	50	131-132	15	177-178	1			
		41- 42	270	87- 88	30	133-134	7	179-180	—			
		43- 44	331	89- 90	47	135-136	12	181-182	—			
		45- 46	244	91- 92	29	137-138	3	183-184	—			
		47- 48	180	93- 94	35	139-140	9	185-186	1			
49- 50	269	95- 96	40	141-142	5	187-188	—					
51- 52	160	97- 98	31	143-144	3	189-190	—					
53- 54	198	99-100	39	145-146	4	191-192	—					

4. Discussion

Burns, Johnston and Chen studied the characteristics of carpet wools and supplied standards for the definition of an ideal carpet wool.⁵ Their recommendations include the following:

TABLE 3.—DIAMETERS OF TRUE, HETEROTYPICAL, MEDULLATED AND KEMPY FIBRES OF HASHTNAGRI WOOL.

Type	No. of samples	No. of fibres	Mean (Microns)	Coefficient of variation
True	60	6573	24.98	36.65%
Heterotypical	60	2338	40.21	24.74 %
Medullated	60	3400	63.67	38.56%
Kemp.	60	366	53.99	36.23%

TABLE 4.—LENGTHS (STRETCHED) OF TRUE, HETLROTYPICAL, MEDULLATED AND KEMPY FIBRES OF HASHTNAGRI WOOL.

Type	No. of samples	No. of fibres	Mean (inches)	Coefficient of variation
True	60	6858	4.04	27.78%
Heterotypical	60	2536	4.82	23.82%
Medullated	60	3353	4.92	25.64%
Kemp	60	366	2.73	20.48%

TABLE 5.—DIMENSIONS OF HETEROTYPICAL FIBRES (IRRESPECTIVE OF THE TYPE OF MEDULLATION) OF HASHTNAGRI WOOL.

Dimension	No. of samples	No. of fibres	Mean	Coefficient of variation
Diameter	60	5738	54.72 μ	44.77%
Length	60	5889	4.86"	25.71%
the average fibre

1. An ideal carpet wool should contain at least 15% by count of heterotypical fibres. These fibres should have an average thickness of at least 30 μ and a length of at least 4" for normal growth (12 months) and the variation should not be more than 15% and 20%, respectively.

2. An ideal carpet wool should contain not more than 2% by count of kemp fibres. The characteristics of these fibres are not so important.

3. An ideal carpet wool should contain not more than 85% by count of true wool fibres. These fibres should have an average thickness not exceeding 25.4 μ and a length of at least 4", the variation not exceeding 25% in both the cases.

So far as ascertained, the above is the only standard definition available for an ideal carpet wool. However, as pointed out by Krishna Rao et. al.,⁶ the standard does not specify the minimum limit of the desirable percentage of true wool fibres and the maximum limit of those of heterotypical fibres. Yet we may take these limits to be 59% and 40% respectively.

Comparing the results obtained above with these standards, we see that percentage of true wool fibres, viz., 60.0% falls within the specified range. The average diameter and length also fall within the range. However, the coefficients of variation are remarkably higher than the desirable limits, the difference being 11.65% and 2.78% respectively.

In Pakistan, shearing normally takes place twice a year, so that the average fibre length found above represents a growth of 6 months. The length for normal growth (12 months), as required by the standard, would come out to be still higher, thus adding to the suitability of the wool.

The term 'heterotypical' as used in the present work represents those fibres which are partially medullated, whereas fully medullated fibres have been classed as 'medullated' fibres only. However, the term heterotypical as used by Burns et al. in the above standard has been interpreted to include all the medullated fibres, irrespective of the type of medullation.⁶ Consequently, to make a comparison possible, the data of the present work on partially as well as fully medullated fibres have been re-arranged so as to give results applicable to total heterotypical fibres as required by the standard. The percentage of such fibres comes out to be 38.8%, which falls within the range of the given conditions. The fibre dimensions of the same fibre have been given in Table 5. The diameter and length of these fibres come out to be 54.7 μ and 4.86", respectively, with coefficients

of variation of 44.8% and 25.7%, respectively. Both the dimensions satisfy the conditions of the standard, except the fact that the coefficients of variation are higher than the maximum limits.

The percentage of kempy fibres, viz., 1.2%, satisfies the conditions, whereas the dimensions of these fibres are not of such importance as indicated by the standard.

Comparing the characteristics of Hashtnagri wool with the available data on those of Salt Range, Thalli and Lohi sheep studied by Ishaq et al.,³ it is found that the percentage of true wool fibres stands higher than in the case of Thali wool by 15% and lower than in the case of Salt Range and Lohi wools by 21% and 14%, respectively. The average diameter of true wool fibres is the lowest of all the 4 breeds under consideration and in this respect Hashtnagri wool is the only wool satisfying the conditions of the standards. The data on the dimensions of rest of the three types of fibres being not available in cases of Salt Range, Thalli and Lohi Breeds, no comparison is possible.

It is clear that, so far as percentages of various types of fibres and their dimensions are concerned, the Hashtnagri wool satisfies all the conditions of an ideal carpet wool: hence establishment of the industrial importance of the commodity. The only drawback is the fact that the coefficients of various dimensions are higher than the maximum limits indicated by the standard. This furnishes pointers towards the development of Pakistani wools. For the purpose of such developments, measures, such as

introduction of scientific breeding, organisation of clipping at regular intervals and introduction of a convenient system of wool sorting would have to be taken recourse to. The need for these improvements has also been stressed by Muhmand,⁷ while working on average staple length of Pakistani wools, and Haq⁸ during the course of a discussion on the improvement of Pakistani wools.

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