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SPINNING EVALUATION OF PAKISTANI AND NEW ZEALAND WOOL YARNS FOR CARPETS

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ABSTRACT

Woollen Yarns were spun from Mixed Yellow, Mixed White, Cholistani, Harnai, and New Zealand wools for carpet industry. The results of yarn count, strength, breaking strength efficiency, elongation, moisture and unevenness were discussed. Differences among all wool samples and their yarn quality characteristics (other than elongation at break) were highly significant.

INTRODUCTION

The spinning performance of a yarn and its quality are mainly reflected by the characteristics of the material used. Since the quality characteristics of wool, viz. length, thickness, fibre types and strength are known to vary in different sheep breeds due to various factors like genetic makeup, variation in diet, grazing practices and condition of pastures, difference in follicular substratum and photochemical degradation of fleece due to exposure to weather, therefore, the woolen yarn is likely to have variable characteristics. Although considerable work has been reported on various characteristics of wool in raw state, yet either no research results seem to have been reported on woollen yarn spinning performance or insufficient attention has been paid to its quality spinning However, the suitability and the improvement of Pakistani wools for the purpose of carpet production has recently been discussed in an International Seminar on Sheep and Wool Research and production (PARC, 1982) and the properties of wool yarns spun for carpets have been reported by Ahmad *et al.* (1981).

The present study was, therefore, carried out to evaluate our indigenous wool in mixed bulk form and compare it with New Zealand Crossbred imported wool in respect of spinning performance.

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MATERIALS AND METHODS

Cholistani, Harnai, Mixed White, Mixed Yellow wool samples, 40 kg each from autumn (1982) clip of six months growth were collected from Wool Market, Multan. For the purpose of comparison, New Zealand Crossbred wool was taken from Watton Woollen Mills Ltd., Rawalpindi, where the wool samples were scoured on commercial scale on ring spinning frame with the following operational fixations:

Traveller number	=	15
Spindle speed	=	4×10^3 rpm
Twist multiplier	=	1.7
Turns per meter	=	115.0
Nominal count	=	7 0

Yarn's count, strength, elongation, moisture and unevenness were determined in the testing laboratory of the Lawrencepur Woollen and Textile Mills Ltd., Dawoodpur, according to standard methods (Anonymous, 1963 and Booth, 1974). The entire data were subjected to analysis of variance. The varietal differences were studied according to the technique suggested by Duncan (1955).

RESULTS AND DISCUSSION

Prior to yarn spinning and its testing, the wool samples were subjected to evaluation for their quality characteristics to know the description of the material to be used (Table 1).

Table 1. *Quality characteristics of yarn wool samples*

Wool variety	Staple length (mm)	Fineness (um)	Fibre types (%)			Clean wool (%)	Scouring loss (%)
			True	Medull-ated	Hetero-typic		
Mixed Yellow	79.38	37.65	41.50	14.75	43.75	35.56	63.44
Mixed White	69.53	36.47	40.50	22.62	36.88	36.97	63.03
Cholistani	76.75	39.32	28.25	31.75	40.00	33.62	66.38
Harnai	86.28	33.02	59.75	15.25	25.00	51.83	48.17
Overall average	77.99	36.62	42.50	21.09	36.41	39.73	60.26
New Zealand Crossbred	92.83	35.03	62.25	13.00	24.75	69.15	30.85

Harnai wool yielded the best results (although it stands just next to the New Zealand wool for scoured wool content), followed by New Zealand, Mixed White, Mixed Yellow and Cholistani.

The mean and range values alongwith their analysis of variance of various parameters observed in this study are presented in Table 2. This table indicates that the differences among various wool samples studied for characteristics other than elongation, are highly significant.

It is evident from Table 2 that Harnai wool has giver the finest count in the present set of wool varieties while the Mixed Yellow clip produced comparatively coarse count. New Zealand wool though produced a bit finer count yet it ranked quite close to Mixed White fleece as is obvious from analysis of variance (Table 2). Similarly, non-significant difference was observed between Cholistani and Mixed Yellow wools. These results show significant variation in count values. In coarse fibrous material like carpet wools, such variation was a common occurrence (Anonymous, 1963). Moreover, it was shown that the finer count of yarn was associated with the uniformity in diameter of the fibrous mass (Gerdes, 1950). The present results thus agree with these findings as is clear from Tables 1 and 2.

The data given in Table 2 show the dominance of Harnai wool in lea strength of its yarn followed by Mixed White, New Zealand and Cholistani wool yarns. It is known that the photochemical effect due to exposure to sunlight on the fleeces of animals makes the wool tender. Obviously, Mixed Yellow clip provided the weakest yarn. Similar findings emerged out when all these yarns were compared for their breaking strength efficiency (BSE). These results agree in generall with the remarks given by various earlier workers (Fiori and Brown, 1951; Hearle, 1959; Vysoks and Mesyschenho, 1979). According to these authors the strength of yarn spun primarily depended upon the quality characteristics of the fibrous material used, the yarn number, spinning conditions, etc.

As regards elongation of these yarns at break, Harnai wool inspite of giving the highest elongation, stands statistically at par with others as is obvious from Table 2. The non-significant difference observed regarding measurement indicates that all these wool samples behave somewhat in a similar way in their elastic behaviour.

Tabl 2. *Mean and range values of count , lea-strength, breaking strength efficiency (BSE), elongation, moisture, and imperfection of various wool yarns and their multiple comparison*

Wool varieties		Yarn Characteristics						
		Count observed (number)	Lea-strength (gm)	BSE		Elongation at break (%)	Moisture regain (%)	Uneven-ness (u%)
				observed	corrected			
Mixed Yellow (MY)		6.45*a	1153.70 a	7441.37	7431.32 a	11.80 a	14.85 a	19.70 cd
Mixed White (MW)		7.13 b	1384.00 d	9867.92	9870.30 c	12.30 a	14.80 a	16.02 bc
Cholistani (CH)		6.70 a	1290.73 b	8647.89	8642.41 b	12.80 a	14.72 a	20.70 d
Harnai (HN)		7.50 c	1385.40 d	10390.50	10399.64 d	13.90 a	15.98 b	11.82 a
New Zealand Crossbred (NZ)		7.16 b	1334.40 c	9554.30	9557.22 c	12.90 a	17.58 c	14.26 ab
Range	Minimum	6.05 MY	1145.06 MY	7328.99	7311.63 MY	0.08 MY	14.30 CH	9.00NZ
	Maximum	7.75 NZ	1396.18 HN	10491.64	10505.94 HN	15.74 HN	18.00 NZ	24.00 CH
F. Ratio	Calculated	95.12 **	617.41 **	83.21 NS		0.40 NS	26.02 **	13.42 **
	Tab. at 5%	2.58	2.48	2.43		2.48	3.06	2.58
	Tab. at 1%	3.78	3.56	3.56		3.56	4.89	3.78

* Any two means in the same column having different letters are significantly different at 5% level of probability.

** Significant at 1% level of probability.

N.S = Non-Significant.

On moisture regain basis, New Zealand wool showed the greatest capacity to absorb moisture, followed by that of Harnai. There was, however, non-significant difference between Mixed Yellow, Mixed White and Cholistani wool (Table 2). As moisture content depends upon the atmospheric conditions and since Harnai and New Zealand wool are produced in comparatively cold climatic conditions, these should therefore have higher values of moisture than those shown by the animals kept under hot climate.

The results obtained for yarn's imperfection, i. e., unevenness, indicate that Harnai wool produced the most uniform yarn but New Zealand wool yarn was found equally good in this respect (Table 2). Cholistani wool yarn was the poorest in its uniformity as compared to all other yarns tested for this parameter. Further, it was very interesting to note that Mixed Yellow and Mixed White wool yarns stood at par with each other. These results agreed with the findings reported by Charnley and Harrison (1965), Nightingale (1966), and Srivastava *et al.* (1978) who stated that uniformity of yarn depended upon fibre fineness, yarn number, and processing methods. The finer the yarn number, the better would be the evenness; the shorter and the coarser the fibres, the more the hairiness and the lesser would be the evenness of yarn.

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