

Properties of Camel Kid Hair: Chokla Wool Blended Yarns and Fabrics

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ABSTRACT The aim of present study was to find out the effects of blending camel kid hair with *chokla* wool on performance of yarn and fabric. Camel hair was blended with *chokla* wool in three ratios viz. 25: 75, 75:25, and 50:50 on *khadi* hand spinning system. Knitted fabric samples were prepared on circular hand knitting machine. Properties of yarn and knitted fabric were evaluated. It was found that blending of *chokla* wool with camel hair improves strength of yarn. Performance of CH75:C25 knitted fabric was found better in terms of strength, abrasion resistance, warmth and knitting performance in comparison to other blends.

INTRODUCTION

Camel hair fibers belong to the class of specialty hair fibers. Specialty hair fibers are the rare animal fibers which have unique characteristics such as luster, softness, warmth and natural color. These fibers form the minor part of world's fiber resource. Specialty hair fibers are the most valuable asset when used in optimum proportion with other fibers. These fibers modify and improve handle and appearance of the final product either alone or in blended form. Unlimited combination of specialty fibers with wool, silk and synthetic fibers is possible (Patni and Dhillon 1988).

In India only Dromedaries camels are available, which generally produce short and coarse fibers. Hair obtained from younger camel is finer and softer than the hair of adult camel. It is more suitable for apparel purpose but has not been utilized in a proper manner because of rarity and special requirement of the processing. It is essential to focus efforts on blending of camel hair with other natural and synthetic fibers, as well as to develop newer products. This will not only modify functional and aesthetic qualities of fiber but will also diversify its utility.

Wool of different origins has a wide structure and property spectrum. Each type of wool has

its own specific characteristics. India is rich in producing medium- coarse quality wool which is used mostly for making carpets, blankets, shawls and other such articles. There is need to develop diversified products and innovative blending processes that will make use of the coarser varieties of wool in apparel production possible. *Chokla* is pure bred Indian wool produced in north-western part of India. It has been found that in comparison to cross bred wool, *chokla* is better in terms of staple length; variation in fineness, length, tenacity and elongation.

Studies on blending of camel hair with polyester, viscose, silk and wool have already been reported (Patni and Dhillon 1988; Gupta et al. 1989). Work on utilization of blended camel hair yarn for woven fabrics has already been done (Arora 1988). These researches have shown encouraging results. However, very little work has been done on camel kid hair. The camel of Bikaneri breed of 2-3 years of age produces higher annual yield as compared to other age groups and breed. An attempt was made in this study to find out performance of blended yarn of camel kid hair with *chokla* wool for its utility for knit wear.

Decentralized *khadi* sector today coexists with most modern spinning, knitting and weaving mills and faces tough competition from mill sector. *Khadi* industry is trying to evolve but is not able to keep pace with latest trends. Literature showed that wool and hair processing data on decentralized hand and *khadi* spinning is scanty. Systematic research needs to be carried out in this area for standardizing the processing. Fur-

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ther camel hair having limited production cannot fulfill the demand of organized sector of textile industry hence its more appropriate use is in the decentralized *khadi* sector.

Objectives of the Study

- (1) To evaluate the impact of blending kid camel hair with *chokla* wool different ratios on properties of yarn
- (2) To prepare the knitted fabric with blended yarns and study their properties.

MATERIAL AND METHODS

Material

Kid camel hair of Bikaneri breed and *chokla* wool was selected for the present study.

Method

Determination of Properties of Fibers

The conditioned fibers of camel hair and *chokla* wool were tested for following properties-

Fiber length (IS: 1377-1971), Fiber diameter (ASTM D: 2130-90) Single fiber tenacity (IS: 235-1988), Medullation percentage and Crimp frequency (Agrawal 2006)

Development of Camel Hair-wool Blended Yarns

Khadi spinning system was used to prepare blended as well as pure yarn. Camel hair was blended with *chokla* wool in three ratios viz. 75:25, 50:50, 25:75. 100% camel hair and *chokla* wool yarns were also prepared for base reference. Camel hair and wool fibers were thoroughly opened and blended manually. After this sandwich blending technique was followed to prepare blend of fibers. Hair oiling was done to minimize the fiber breakage as well as to reduce fly waste and static electricity during carding. Woolen carding system was used for carding of blended fibers. Hand spinning was done on *Ghantaria Charkha* to prepare single yarns.

Testing of Yarns

Conditioned yarns were tested for following properties-

Yarn count in NM, Twist in yarn (IS: 832-1985), Single yarn strength and elongation (IS: 1670-1991)

Development of Knitted Fabric Samples

Knitted fabric samples were prepared on 6 gauges, 14" diameter circular hand knitting machine. Plain knit was used for knitting with the help of 210 needles. 100% camel hair yarn could not be knitted due to its coarseness and unevenness.

Determination of Properties of Knitted Fabric

Following properties were tested after scouring and conditioning the knitted fabric -

Weight per square meter (IS: 1964-1970), Wales per Inch and courses per Inch, Fabric thickness (IS:7702-1975), Stitch Density and Stitch length (Parmar and Srivastava 1999), Tightness factor (Padama 2003), Bursting strength (BS:4768), Thermal Insulation (Shakyawar et al. 2007), Air permeability (IS:11056-1984), Abrasion resistance (ISO: 12947-2-1999), Pilling (IS:10971-1984)

Knitting performance of the yarn was assessed from the number of yarn breaks during knitting of 2 meter of fabric. If there is no breakage during knitting, it indicates good single yarn strength.

Hand of fabric samples were evaluated by touch and feel method by twenty experts from the field of textiles. The hand was evaluated on five points rating scale - very soft, soft, medium, harsh and very harsh.

RESULTS AND DISCUSSION

Properties of Fibers

Table 1 reveals that kid camel hair was finer with more variation than *chokla* wool but difference was marginal. However, medullation percentage was quite high in camel kid hair.

Length of camel kid hair was little less with slightly higher variation in comparison to *chokla* wool. Crimps/cm was almost similar in both the fibers. Parthasarthy (2009) mentioned that Indian wool has very poor crimp, less than two crimps per cm. The coarse wool devoid from bilateral structure and ortho and para cortex arranged in concentric arrangement, results in low crimp in coarse fibre (Ramarao 1989).

Table 1: Physical properties of camel kid hair and chokla wool fiber

S. No.	Fiber Property	Camel kid hair	Chokla wool fiber
1.	Average fiber diameter (microns) CV%	23.4943.05	24.7741.80
2.	Medullation %	25.99	13.33
3.	Fibre length (cm) CV%	7.0824.73	7.8120.99
4.	No. of crimp per cm CV%	1.6115.03	1.1033.18
5.	Tenacity (g/tex) CV%	21.9922.56	15.9817.82
6.	Elongation (%) CV%	31.7315.04	29.0617.95

Camel hair showed higher tenacity compared to *chokla* wool. Presence of medulla influences the tensile properties of wool fibres. The breaking load, tenacity and elongation are greater in medullated fibres than in non medullated fibres. The tenacity values are in accordance with the earlier work reported by Parthasarthy (1982). Generally medullated fibres are coarse in wool. Their breaking load may be more because of their coarseness. This may be the reason for high strength of camel hair.

Properties of Blended Yarns

Table 2 reveals that pure *chokla* wool yarn was finer and more uniform than pure camel hair yarn. Fineness of camel hair yarns improved on blending *chokla* wool with camel hair. The reason for decrease in thickness of blended yarns of camel hair and *chokla* might be less medullation in *chokla* wool. Thickness of yarn decreased with decrease in percentage of medullated fibers.

Pure camel hair yarn showed minimum tenacity value with higher CV percentage as compared to other pure as well as blended yarns. It is clear from the data that blending of camel hair with *chokla* wool fibres resulted in decrease in strength of yarn. In general strength of blended yarns decreased up to the incorporation of 25% of camel hair and after that it increased. In other words strength of camel hair yarn improved on blending *chokla* wool with camel hair.

Table 2: Properties of pure and blended yarns

S. No.	Yarn characteristics	100% camel yarn	100% chokla` yarn	CH25:C75	CH50:C50	CH75:C25
1.	Yarn count (Nm) CV%	8.8816.90	12.833.89	11.394.41	10.014.97	10.2510.96
2.	Twist per inch CV%	9.9315.73	12.105.55	11.385.11	11.5510.30	10.939.63
3.	Tenacity (g/tex) CV%	1.02139.67	1.78317.05	1.52523.08	1.63122.01	1.65021.09
4.	Elongation (%) CV%	4.61942.71	5.49420.26	3.16735.43	5.53922.28	5.13632.34

CH- camel hair, C- *chokla* wool fiber

When fibres having different elongation are blended together, the resulting yarn may be weaker than a 100 per cent blend of either fibre and have respectively less elongation as a result of unequal loading of the component fibres. Press (1959) clearly explained this phenomenon that when a yarn or fabric containing high and low elongation fibres is stretched or torn, the low elongation fibres will break first. In blends fibre strength are additive only to the extent of the stress absorbed up to the limit of stretch of the lower elongation component.

One way analysis of ANOVA was conducted to determine whether the influence of different blend ratio on strength of yarn is significant. Tenacity values were significantly different for Camel hair: *chokla* (F=13.08, P<0 .01).

Properties of Blended Fabrics

Table 3 shows that fabric weight increased with increase in percentage of camel hair. This might be due to the increasing order of yarn thickness in each blend. As the yarn became thick the fabric weight increased, but in case of camel hair 75: *chokla* 25 fabric weight decreased. Reason of this might be manual process of blending and spinning which affected thickness and regularity of yarns, which in turn affected weight. Blended fabrics showed higher thickness as compared to pure wool knitted fabrics. It was also observed that in blended fabrics thickness increased with increase in camel hair proportion. Present investigation also reveals that thickness increased with the increase in fabric weight. Thickness of fabric is related to thickness (fineness) of component yarns. Thick yarns produce thick and heavy fabrics.

It was found that bursting strength increased with increase in camel hair proportion except in case of CH25:C75 blend. Yarn strength is one of the factors affecting bursting strength of knitted fabric. This may be the reason for poor bursting

Table 3: Properties of knitted blend fabrics

S. No.	Fabric property	100% Chokla	CH25:C75	CH50:C50	CH75:C25
1.	Fabric weight (GSM)	435.5	448.2	456.7	439.3
2.	Thickness (mm)	1.76	1.90	2.05	2.26
3.	Wales/inch (wpi) Course/inch (cpi)	1114	1113	1113	1113
4.	Stitch density	154	143	143	143
5.	Stitch length (mm)	10	10	10	10
6.	Tightness factor (K)	0.88	0.94	1.00	0.99
7.	Bursting strength (KPa)	712.8	710.2	752.0	786.3
8.	Thermal insulation value (Clo)	1.25	1.34	1.39	1.44
9.	Air permeability (cm ³ /cm ² /sec)	179.9	158.2	129.4	115.7
10.	Abrasion resistance (% weight loss after 5000 cycles)	8.39	14.27	17.35	11.28
11.	Pilling grade	4	4	4	4
12.	No. of yarn breakage during knitting of 2 m fabric	2	4	4	3
13.	Hand (weighted mean score)	3.1	2.2	1.5	1.3

CH- camel hair, C- *chokla* wool fiber

strength of camel hair 25 *chokla*: wool 75 blend. ANOVA was calculated to find out the effect of different blend ratios on bursting strength. Significant difference at one per cent level was found between bursting strength of fabrics made up of different blend ratios of camel hair and *chokla* (F=12.01, P<0.01).

As the percentage of camel hair in blends increased, thermal insulation value also increased. Thermal insulation value of fabrics increased owing to increase in fabric thickness. Thickness is directly related to thermal insulation of fabric. Higher the thickness, higher will be the insulation value. Data presented in Table 3 also indicates that air permeability decreased in blended fabrics with the increase in camel hair proportions. Decrease in air permeability resulted in increase in thermal insulation value.

Pure *chokla* wool fabric showed less abrasion loss per cent in comparison to their blends with camel hair. Increase in camel hair ratio increases the abrasion loss per cent but when percentage of camel hair was increased to 75%, abrasion loss per cent decreased but it was still higher than pure knitted fabrics. Effect of blend ratio on abrasion loss was found significant at one per cent level (F=85.86, P<0.01).

All the blended fabrics as well as pure wool fabric showed slight pilling. Wool pills are considered weak and indeed sometimes drop off spontaneously. Pure *chokla* wool yarn and camel hair: *chokla* blended yarn showed 2 to 4 breaks respectively. It was observed in all blended fabrics that harshness of fabric increases with increase in camel hair proportion. This is due to the fact that camel hair is slightly harsher than *chokla* wool.

CONCLUSION

It can be said that blending of *chokla* wool with camel hair significantly adds to the value of camel hair yarn. It improves yarn fineness and tenacity. Blended fabric shows improved bursting strength and thermal insulation.

RECOMMENDATIONS

The camel hair which is presently utilized for traditional cheap products like rope, blankets, rugs, bags, mattresses can be successfully used to prepare apparel items. Blended yarns of camel kid hair and *chokla* wool can be successfully used to prepare value added knitwear such as sweater, shawl, mufflers etc.

There is further scope of the study. Chemical finishing can be given to improve hand of the blended fabric. Camel kid hair can be blended with other natural and manmade fibers.

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