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Blending: An eco- friendly approach to utilize silk waste

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Abstract
Blending is a way to combine fibers so that good qualities are emphasized and poor characteristics are minimized. It may also enrich the properties such as strength, appearance, comfort etc. Fibers were blended to produce fabric and products of improved functionality, performance and greater comfort appeal. Pure tibetian wool fabric and mulbery silk waste both the fiber fall under protein fiber category. Pure tibetian wool fabric had high elongation, thermal insulation property and thickness whereas mulbery silk waste fabric had better drape and strength. In case of blended samples of tibetian wool and mulberry silk waste weight/meter^2 (in g) also reduced with the increased proportion of silk waste fiber. This study will help the handloom industries of India to increase the usage of silk waste and wool blend. These blends can be utilized at textile sectors as well as in fashion industries for production of aesthetically beautiful and light weight and warm fabrics and products. Thus it will be an eco-friendly approach to convert waste into valuable products.

Keywords: Blending, silk waste fiber, eco-friendly, protein fiber

Introduction
In present scenario waste minimization is an important issue for pollution free environment and quality improvement. Need arises to adopt techniques which proves effective for cleaner production and waste minimization. Due to rapid industrialization environmental pollution rises in certain areas, which leads to ecological imbalance. Pollution also affected air, rainfall pattern and disturb climate. Adverse effects of pollution can be minimised by either conserving energy or by preserving environmental balances. There is a general awareness of eco-textile in the world market. So, it is imperative to adopt appropriate technology which will help in decreasing the cost as well as improve quality of product. Technology of blending waste and left over fibers with other suitable fibers not only improve qualities of constituent's fibers but also leads to cost effectiveness of the resultant product. Keeping above mentioned views objective of the study are as follows:
1. To prepare fabric from pure and blended fabric.
2. To test their physical properties.

Methodology: All four kinds of silk fibers are available in Uttrakhand. Processing of silk is also done at some parts of Kumaon and Garhwal regions. The waste of mulbery is also available so it was selected for the present study whereas tibetian wool was procured from Riverview factory, Almora. Fabric of pure and blended yarn 65:35,50:50,35:65 blend ratio were woven and physical properties of blended and pure fabric were evaluated.

Results and discussion: The physical properties which were evaluated were elongation, weight /meter^2, thickness, drapability, thermal insulation value. The results were tabulated and shown in table-1.

Table: Physical properties of pure and blended fabrics

S. No.	Properties		T*:M** 100:0	T:M 65:35	T:M 50:50	T:M 35:65	T:M 0:100
1.	Elongation%	Warp	49.06	43.91	43.83	40.99	40.89
		Weft	20.30	19.44	15.45	14.86	14.75
2.	Weight/meter ^{2}		301.0	293.0	289.8	286.0	279.0
3.	Thickness		1.16	1.08	1.06	1.05	1.04
4.	Drape coefficient (F value)		6.0	5.7	4.0	4.1	3.7
5.	Thermal insulation value (%)		98.50	97.50	95.0	90.0	75.0

T*=tibetian wool, M**=mulbery silk

Elongation (%): The elongation percent was found to be maximum in case of pure tibetian wool i.e. 49.06% in warp direction and minimum for mulbery silk waste fabric (i.e.40.89%). Above results indicate that elongation percent for wool is higher as compare to silk.

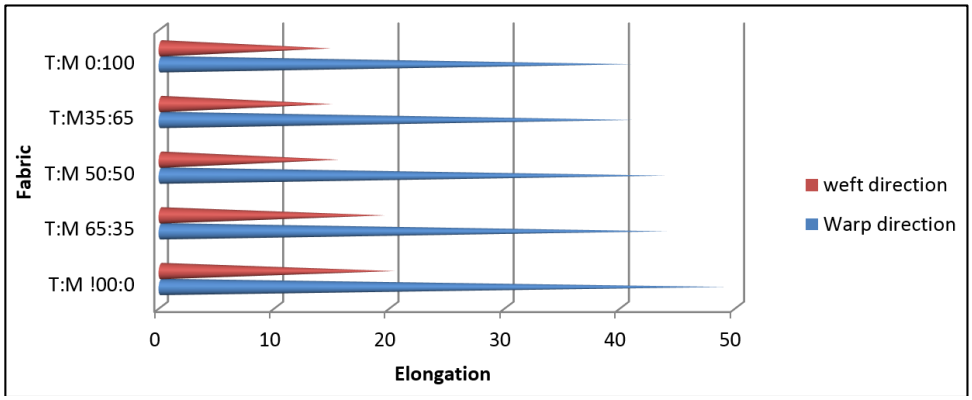

Fig 1: Comparison of elongation of pure and blended fabric

Weight/meter^2: The highest value of fabric weight was observed for pure tibetian wool fabric (301 g) whereas lowest value was found in case of pure mulbery silk waste fabric (279 g). Above results indicate that as the silk fiber increases in proportion weight of blended fabric decreases. This may be due to the lesser diameter of mulberry silk waste fiber.

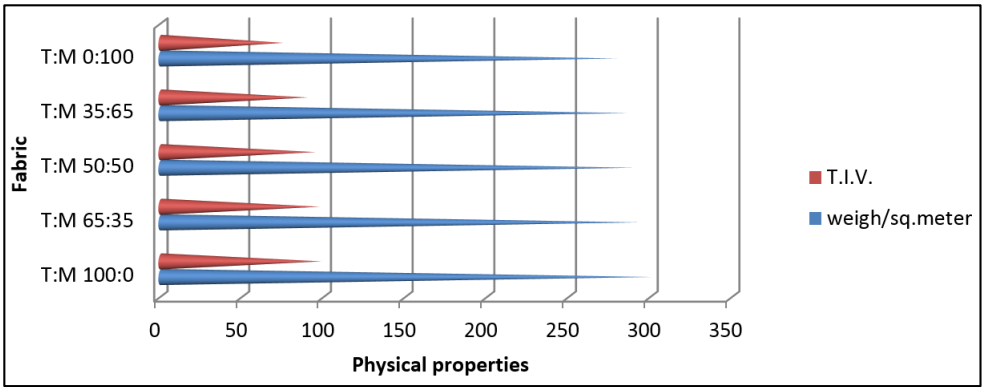

Fig 2: Comparison of weight/meter ^{2} and thermal insulation value of pure and blended fabric

Fabric thickness: Maximum fabric thickness was recorded for 100% wool fabric i.e. 1.16 mm and minimum was recorded in case of 100 % silk fabric (1.04mm).There was not much difference in the thickness of both the fabrics. It may be due to the fact that as mulbery silk was available in waste form and hand spun yarns was prepared which were quite irregular therefore it led to manufacturing of thicker fabrics, near to wool fabric. Thickness in case of 50:50(T/M) and 35:65(T/M) blend was observed as 1.06 and 1.05mm respectively whereas for 65:35(T/M) it was 1.08 mm. It was noticed that fabric thickness slightly decreased with increasing proportion of silk fiber in blended fabric.

Drapability: Minimum drape coefficient was found in pure mulberry silk waste fabric i.e. 3.7 and the maximum value was observed in case of pure tibetian fabric i.e. 6.0. The small amount of drape coefficient (F) indicates the better drapability of the fabric and the large value of F indicates the poor drapability. Above results indicates that drapability increased with increasing proportion of silk fiber into blend. It may be due the reason that tibetiaan wool is a coarse fiber thus cannot provide better drape.

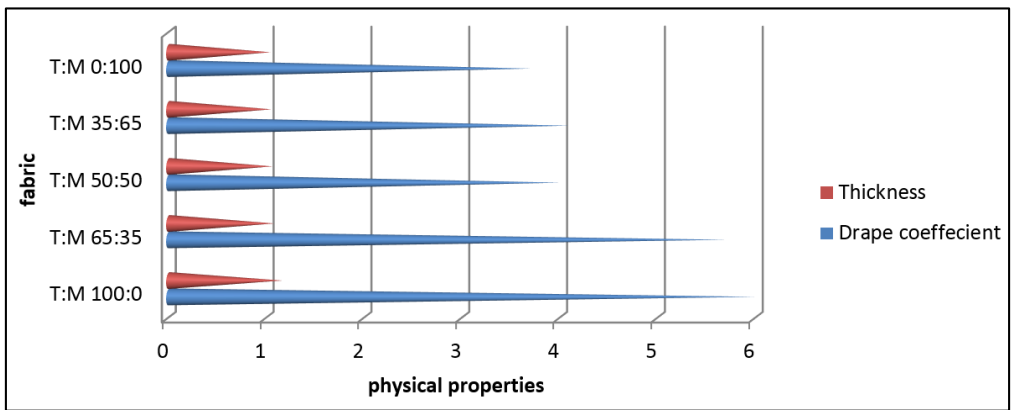

Fig 3: Comparison of Drape coeffecient (F) and Thickness of pure and blended fabric

Thermal insulative value: Maximum T.I.V. was recorded to pure wool fabric i.e. 98.50% and minimum recorded in case of pure silk fabric i.e. 75 %. T.I.V. for 65:35(T/M), 50:50(T/M) and 35:65 (T/M) were noted as 97.50, 95.0 and 90.0 respectively. Significant effect of blend ratio has been observed on thermal insulation. Shakyawar *et al*. (1996) [5] reported that increase in wool content in woven fabric improved thermal insulation. According to Shekar *et al*. (2001) [6] the higher proportion of wool fibers ensures more scattering of woollen fibers on the surface which helps in entrapping the air. Foneseca and Hoge (2001) [2] have opinioned that more the air entrapped the better would be the insulation. Heat insulation of a fabric is governed to a great extent by the air entrapped in it because the conductivity of fibers whether natural and synthetics several times higher than air or in other words thermal insulation value of air is much higher than the fiber. Hence increase in entrapped air inside the fabric increases the thermal insulation value of the fabric. (Roy *et al*., 2005) [4]

Summary and conclusion: Blending is a way to combine fibers of good, fair and poor characteristics so as to improve the quality of the yarn. Fibers were blended to produce fabric and products of improved functionality, performance and greater comfort appeal. Elongation, fabric thickness, thermal insulation value was found maximum in pure wool fabric. The present investigation revealed that blending of mulbery silk waste with tibetian wool could bring about the favourable improvement in the performance of resultant fabric. The blended fabric have lesser weight, good drapability, increased elongation compare to pure fabric. This study will help the handloom industries of India to increase the usage of silk waste and wool blend. These blends can be utilized at textile sectors as well as in fashion industries for production of aesthetically beautiful and light weight and warm fabrics and products. Thus it will be an eco-friendly approach to convert waste into valuable products. Technology of blending waste and left over fibers not only improve qualities of constituent fibers but also leads to cost effectiveness of resultant product.

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