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RESEARCH NOTE

Physical properties of Muga silk and Tencel yarn

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Union fabrics are the fabrics where in the fibre content of warp is different from that of weft. Union fabrics are desirable because the properties of two sets of yarns are combined in a fabric for further use.The golden yellow coloursilk is prerogative of India.Unique Muga silk is produced mainly in Assam alone and negligible amount in Meghalaya, Nagaland and Arunachal Pradesh. Tencel is regenerated cellulose possesses many properties of other cellulosic fibres such as cotton, ramie and rayon. In this studyMuga silk was interwoven with Tencel yarn to incorporate the properties of Muga and Tencel yarn in a fabric. The samples were woven using hand fly shuttle loom in plain weave. Before weaving process, the assessment of yarn characteristics for yarn count, yarn twist, yarn tenacity and elongation and yarn crimp was assessed in laboratory. The results concluded that Muga silk was finer than Tencel yarn therefore Muga silk yarn has more twist, lesser breaking strength, and more yarn crimp.

Key words: Muga, Tencel, Union fabrics, Weaving

Silk industry in India has been identified as an employment-oriented industry. India holds world monopoly in production of Muga silk along with tropical Tassar. The golden yellow colour silk is prerogative of India. Muga culture is specific to the state of Assam and an integral part of the tradition and culture of the state. Unique golden yellow Muga silk is produced mainly in Assam alone and negligible amount in Meghalaya, Nagaland and Arunachal Pradesh.

There has been a growing demand for absorbent fibres with the need hinging on comfort and fashion. Tencel is latest man-made cellulosic fibre, possesses many properties of other cellulosic fibres such as cotton, ramie and rayon. The lyocell fiber has a highly crystalline structure which offers good wet strength as well as excellent dry strength. Further, it shrinks less when wetted by water than other cellulosics such as cotton and viscose rayon (Borbély, 2008). Silk as a fibre, has good tensile strength, strongest natural fibre and has moderate abrasion resistance. Silk fabrics retain their shape and have moderate resistance to wrinkling. Silk has a liability and suppleness that, aided by its elasticity and resilience, gives it excellent drapability.

Thus, by taking into account the properties of Muga silk and the Tencel yarn, an effort is made to weave together Muga silk yarn with Tencel yarn to discover the properties of the transformed fabric with the objective to explore the possibilities of weaving Muga silk and Tencel union fabrics.

Muga silk yarn of 75 d was selected for the study which was procured from Sualkuchi in the Kamrup district of Assam. The yarn was purchased in hank form. Tencel yarn of 20s and 30s were purchased in a cone from Pallava textile, Coimbatore, Tamil Nadu.

Muga silk yarn and Tencel yarn were subjected to physical testing in laboratory to determine its quality parameters. In a direct yarn counting system the yarn number or count is the weight of a unit length of yarn.

The following formula is used to calculate direct count.

$$N = \frac{W \times l}{L}$$

Where, N = the yarn number or count

W= the weight of the sample at the official regain in the units of the system

L= length of the sample

l = the unit of length of the system

Twist in yarn was determined by following BIS method IS:83 using the MAG Electronic twist tester. The gauge length was set at 25 cm and yarns were clamped in between the jaws. The yarn should be straight but not stretched. The clamp was revolved in proper direction so as to untwist the specimen. The rotation was continued until all twist gets untwisted or removed. The number of turns registered on the dial was noted down and average was calculated.

Crimp percentage is a measure of the waviness of interlaced warp and weft yarns in a fabric.

$$\text{Crimp percentage} = \frac{\text{Straightened length - crimped length}}{\text{Crimped length}} \times 100$$

The specimen was gripped between two clamps of the instrument and load was applied longitudinally until the specimen ruptures. Values of tenacity and elongation of the test specimen were recorded directly from the digital display of the instrument.

The specimens were tested as directed in IS-12673, 1989. Unistretch 250 was used to test the specimens.

Table 1 shows that Muga silk was having the yarn count of 75d and Tencel was of 20s and 30s. Muga silk is having highest twist of 11 turns per inch and both Tencel of 20s and 30s with 7 tpi. This may be due to Muga silk yarn was relatively fine because of its fibre content, filamentous nature, greater twist per inch and single yarn structure.

The Tencel 30s was observed with the highest tenacity (347.3 kgf) followed by Tencel 20s (263.3 kgf) and the least in Muga silk yarn (66.43 kgf). A high degree of orientation leads to improved tensile properties for Tencel fibre. The higher strength of the fibre translates into stronger yarn and fabric and plays an

Table 1. Physical properties of Muga and Tencel yarn

Sl. No.	Physical Properties	Type of yarn		
		Muga silk	Tencel 20s	Tencel 30s
1	Yarn count (Ne)	75d	20s	30s
2	Yarn twist (tpi)	11	7	7
3	Yarn tenacity (gf/den)	66.43	263.2	347.3
4	Yarn elongation	8.91	5.73	5.12

Figures in parentheses indicates percentage

Table 1a. Yarn crimp of Muga and Tencel union fabrics

Sl. No.	Samples	Warp way crimp	Weft way crimp
1	Muga control	24 (20)	23 (15)
2	Tencel control	22 (10)	22 (10)
3	Muga × Tencel 20s	27 (35)	23 (15)
4	Muga × Tencel 30s	26 (30)	23 (15)
5	Tencel 20s × Muga	22 (10)	25 (25)

Figures in parentheses indicate percentage

important role in subsequent processing (Joshi and Goel, 2012). Twist of yarn determines the strength of the yarn as well as the strength of the fabric formed. In order to develop the maximum strength in the twisted strand, a compromise must be reached between the increasing cohesion of the fibres as the twist is increased, and a decrease in the effective contribution to the axial loading of the strand due to the obliquity of the fibres.

Muga silk attained highest yarn elongation percentage (8.91 %) followed by Tencel 20s (5.73 %) and least in Tencel 30s (5.12 %). This may be due to fractions of cellular structure and microfibrils of the fibre. It can be also due to the yarn tension or extension due to crimp causes crimp interchange.

From Table 1a it is clear that Muga silk yarn is having the highest crimp percentage (25 %) and Tencel of 20s and 30s are on par with each other (23 %). The excess length of crimped yarn in the fabric determines the low stress fabric mechanical properties. In a paper by Backer and Tanenhaus (1951) it is pointed out that the yarns with high crimp take the brunt of abrasive action.

For the current study two control *i.e.,* Mugaand Tencel control, and three union fabric samples were woven. The union samples were Muga × Tencel 20s, Muga × Tencel 30s and Tencel 20s × Muga.

Muga control had Muga silk yarn of 75d both in warp and weft direction. Tencel control of 20s for both warp and weft. In Muga × Tencel 20s and Muga × Tencel 30s, the warp content was Muga silk for both the samples and weft of Tencel 20s and 30s respectively. In Tencel 20s × Muga the warp content was Tencel 20s and weft was Muga silk. All the test samples were woven in hand fly shuttle loom with plain weave. The constructional detail of weaving is shown in Table 2.

Weaving of Muga and Tencel union fabrics was done to incorporate the desirable properties of Muga silk and Tencel yarn in a fabric. The results revealed that Muga silk was finer than Tencel yarn therefore Muga silk yarn has more twist, lesser breaking strength, and more yarn crimp. Therefore, it can be concluded that Muga and Tencel union fabrics can be woven in a hand fly shuttle loom with plain weave. Muga union fabrics are suitable for making variety of products such as dress materials, shirtings, sarees, stole *etc.*

Table 2. Constructional details of Muga and Tencel union fabrics

Samples	Direction	Fiber content	Yarn type	Twist direction	Yarn count	Weave type
Muga control	Warp	Muga	Single	S	75 d	Plain weave
	Weft	Muga				
Tencel control	Warp	Tencel 20s	Ply	Z	2/20s	
	Weft	Tencel 20s				
Muga ×Tencel 20s	Warp	Muga	Single	S		
	Weft	Tencel 20s	Ply	Z	75 d	
Muga × Tencel 30s	Warp	Muga	Single	S	2/30s	
	Weft	Tencel 30s	Ply	Z	75 d	
Tencel 20s × Muga	Warp	Tencel 20s				
	Weft	Muga	Single	S	2/20s	

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