Effect of Selected Pretreatments on properties of Oak Tasar Silk Fabric

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By: Suman Pant & Suman Bhatt

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INTRODUCTION

Tasar is one of the varieties of natural silk. It stands next to mulbury silk in production as well as quality. There are two varieties of tasar – tropical and temperate. Temperate tasar is also known as oak tasar.

Morphologically silk consists of two single endless filaments surrounded by silk gum sericin. Tasar contains approximately 5 – 15 % sericin. Presence of sericin and other impurities imparts a harsh and stiff feel to fabric and also impedes penetration of dyes and other chemicals.

Basic preparatory process known as degumming is given to remove sericin from silk. Soap, enzyme, alkali and acid are used for degumming. Removal of sericin enhances luster, smoothness, softness and even dye uptake.

Tasar silk is brown to grayish in colour due to the tannin present in oak leaves so it requires preliminary bleaching to impart whiteness.

A study on degumming of tasar silk was conducted by Das and Chaudhary (1993) to find out degumming efficiency of alkaline and enzymatic methods. Optimum conditions for bleaching of tasar silk were studied by Gulrajani et. al.(1992).

It is essential to ensure that good qualities of textile fiber remain intact in fabric while giving pretreatments. Present study was undertaken to find out effect of degumming and bleaching on physical properties and dyeability of Oak tasar silk fabric.

Experimental Procedure

Material – Raw 100% oak tasar spun silk fabric was selected.

Degumming was done with acid, alkali and synthetic detergent. Hydrogen peroxide was used in bleaching. One natural dye, Maddar (Rubia tinctoria) and one acid dye, T541003 Red BRL were used for dyeing.

Method –
Degumming of Oak tasar silk fabric was done using given recipes –

Acid degumming

Acetic acid	-	6 g/l
MLR	-	1: 30
Time	-	60 min.
Temp	-	90°C
pH	-	5

Alkaline degumming –

Sodium bicarbonate	-	8.4 g/l
Sodium carbonate	-	10.6 g/l
MLR	-	1:30
Time	-	60 min
Temp.	-	90°C
pH	-	10.2

Detergent degumming –

Synthetic detergent	-	2.5 g/l
$Na_2 CO_3$	-	a pinch
MLR	-	1:30
Time	-	30 min
Temp.	-	90°C
pH	-	11.5

Degummed samples were tested for thickness, weight, thread count, crease recovery, stiffness, drape coefficient, strength using standard procedures. % dye absorption was calculated. Handle and luster were determined by subjective analysis technique and ranks were assigned.

On the basis of result acid degummed samples were selected for further study i.e. bleaching. Degummed samples were bleached as per given recipe –

Hydrogen peroxide (35%)	-	20-30 ml/l
Sodium silicate	-	4 g/l
MLR	-	1:30
Time	-	3 Hour
Temp	-	80-90°C

Degummed and bleached samples were again tested for above properties.

Result and Discussion

Table 1 shows effect of pretreatments on thickness, weight and thread count of Oak tasar silk fabric. Thickness and weight of fabric increased after degumming which further increased after bleaching. Acid degummed silk showed less increase in thickness and weight than alkali and detergent degummed silk.

Wet treatment caused shrinkage of the fabric which resulted in compactness of structure as is evident from thread count. This led to increase in thickness and weight of silk fabric.

It is clear from table 2 that stiffness decreased after degumming. Acid degumming was most effective in reducing stiffness than alkali and detergent degumming. Decrease in stiffness after degumming was due to removal of gum. However, stiffness increased after bleaching. Sodium silicate was used as stabilizer in hydrogen peroxide bleaching which made silk fabric stiff.

% drape coefficient values show that drapability improved after degumming but after bleaching it decreased. Drapability depends upon stiffness of fabric. Decrease in stiffness resulted in enhancement of drapability and vice versa.

Crease recovery decreased after degumming treatment. Lowest crease recovery was exhibited by acid degummed sample. Stiff fabrics resist deformation to some extent under light load. When gum was removed, fabric became soft which decreased crease recovery. Bleaching treatment improved crease recovery. This may be because of increase in stiffness after bleaching.

Tearing strength of silk fabric decreased after degumming (Table 3). Acid degummed fabric showed maximum strength loss followed by alkali and detergent degummed silk fabric in both warp and weft direction although there is not much difference among three degumming methods. It further decreased after bleaching.

Both sericin and fibroin contribute to strength of raw silk. When silk is degmmued, there is loss in breaking load and also because of possible mechanical or chemical damage to fibroin. Tearing strength of fabric depends upon tensile strength of fiber & yarn.

Handle of acid degummed silk fabric was ranked first by judges followed by alkali degummed silk. This may be due to the fact that Acid was most effective in removing gum (Table 5). However, luster of untreated sample was rated first followed by acid degummed sample.

Table 4 shows that percent dye absorption improved markedly when degumming and bleaching treatments were given. Dyeability of acid degummed silk improved markedly than alkali and detergent degummed samples.

Percent dye exhaustion of natural dye was better than acid dye. This may be because of difference in molecular structure and size of dye molecules.

Conclusion

Result of the study show that degumming treatment made oak tasasr silk fabric soft and pliable, enhanced drapability, dyeability and handle however, it reduced fabric strength and crease recovery. Effect of acid degumming was more pronounced than alkali and detergent degumming. Bleaching after degumming made fabric stiff, reduced strength, handle but increased dyeability further.

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Table 1: Thickness, Weight and thread count of Oak Tasar Silk fabric

S.No.	Treatment	Thickness (mm)	Weight (oz/sq.yard)	Thread count warp weft/inch
1.	Control	1.12	6.12	24 x 44
2.	Degumming			
	- Acid	1.28	6.80	27 x 47
	- Alkali	1.45	7.72	27 x 48
	- Detergent	1.49	7.82	28 x 49
3.	Bleaching	1.63	7.56	27 x 48

Table 2: Stiffness, drape and crease recovery of Oak Tasar silk fabric

S.No.	Treatment	Bending length (cm)		% Drape coefficient	Crease recovery angle (0)	
		Warp	Weft		Warp	Weft
1.	Control	3.20	2.79	41.27	143.8	137.8
2.	Degumming					
	- Acid	2.41	2.09	31.85	127.0	130.0
	- Alkali	2.44	2.69	39.18	133.0	131.0
	- Detergent	2.80	2.79	40.57	134.0	133.0
3.	Bleaching	3.69	3.60	45.81	145.8	145.8

Table 3: Strength, Texture and luster of Oak tasar silk fabric

S.No.	Treatment	Tearing Strength (kg)		Texture Rank	Lustre Rank
		Warp	Weft		
1.	Control	3993	2965	2nd	Ist
2.	Degumming				
	- Acid	3539	2575	Ist	2nd
	- Alkali	3558	2581	3rd	4th
	- Detergent	3594	2632	5th	5th
3.	Bleaching	3421	2480	4th	3rd

Table 4: Dyeability of Oak Tasar Silk Fabric

S.No.	Treatment	% Dye Exhaustion	
		Acid dye	Natural dye
1.	Control	8.79	13.18
2.	Degumming		
	- Acid	27.08	87.68
	- Alkali	12.60	67.03
	- Detergent	10.25	19.68
3.	Bleaching	47.21	98.05

Table 5: Effect of degumming on % Weight Loss

S.No.	Degumming Treatment	Percent Weight Loss
1.	Acid	5.75
2.	Alkali	3.68
3.	Detergent	3.05

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