

Bleaching Methods Used on Rambouillet Wool Fiber to Create Fashion Apparels

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Abstract

Now-a-days, consumers are demanding more and more value addition in the products. So the fibers need some techniques/methods of fiber processing which can be easily tried to convert them in a cleaned form. Bleaching of wool is carried out to clean and to remove yellowish tinch from the wool fibers. Seven methods of bleaching were tried on rambouillet wool to improve fiber whiteness. Best method of bleaching was selected on the basis of physical properties of rambouillet wool fiber.

Key Words: Fashion, bleaching, rambouillet wool

Introduction

Wool is unique animal protein fiber and enjoys a special position among textile fibers because of its unmatched properties of warmth, excellent resiliency, water repellency, flame retardency and superior compression recovery. It is attractive in appearance, pleasing to touch, can be dyed easily. Colors have more value in the products and make it trendy. So, bleaching is required to remove natural colouring matter from wool. It's look, texture, handle and performance can be changed according to numerous applications including apparels, interiors, and industrial uses.

Therefore, the present study has been designed with following objectives:

Objectives

- 1. To process/ bleach the rambouillet wool with seven different bleaching methods.
- 2. To evaluate the physical properties of bleached rambouillet wool fibers.
- 3. To finalize the best/suitable method of bleaching on the basis of physical properties of wool.



Materials & Methods

Rambouillet wool fiber was selected for the present study. Rambouillet wool was purchased from Exotic Sheep Grading Farm,Makku, Distt. Rudraprayag (Uttarakhand) in`.36/- kg. Scouring was done to remove the grease and suint present in the wool. Seven methods of bleaching were used to find out best suitable method of bleaching on the basis of physical properties.



Table.1 Seven bleaching methods

Method used	Material	Conditions	Procedure
Method- I	PRO dye	3 gm	Bleaching solution was prepared, in a
Anon ¹ ,2009	activator or		stainless steel pot by mixing3gmsoda
	Soda Ash		ash and 12.5 ml hydrogen peroxide
			Both was boated to $= = 0^{-1}$ and then heat
			was turned off
	Synthrapol	10 Ml	Scoured wool fibers were added in this.
	Hydrogen peroxide (35%)	12.5 ml	
	M:L	1:30	Wool fibers were bleached for 16 to 24 hours at a room temp maintaining the temperature between 21°C
	рН	8-9	Liquid was poured off and wool was rinsed well in lukewarm water.
	Temp.	55°C	After rinsing wool was neutralized in a solution containing 1.75 ml of acetic acid (56%) or 1.65 ml household white vinegar (5%) in water for 10 minutes.
	Time for bleaching	16-24 hours at 21°C	Finally the wool fibers were rinsed well, squeezed out to remove extra
	Acetic Acid (56%)	1.75 ml/ liter for final rinsing	liquid and dried under shade
Method- II Mathur.2003	H_2O_2 (30%)	4-5 cc/lit	Bleaching liquor was prepared by mixing H ₂ O ₂ and sodium silicate.
	Sodium Silicate	0.2 -0.3 g/l	In this bath wool was entered at 50°C and kept for 1 hour at pH 8-8.5
	Temp	50°C	Wool fibers were rinsed with water & treated with 0-2 ml/ liter acetic acid at room temperature for 10-15 minutes.
	Time	3-4 hour	Wool was kept in nylon net bag,
	рН	8-8.5	washed, squeezed gently and dried.
	M:L	1:30	
	Acetic acid	2 ml./lit	
	Time	10-15 min	
Method-III	Wetting agent	0.5 – 1.0g/l	Wetting agent, peroxide stabilizer and
Anon ² ,2010	Peroxide	3.0 g/lit	hydrogen peroxide (50%) were taken
	Stabilizer		thoroughly in water
	WO Ciba)		
	Hydrogen Peroxide (50%)	15.0 – 17.5 g/lit	pH was maintained at 10.0–10.5
	pH	10.0- 10.5	After bleaching; the wool was rinsed



Method used	Material	Conditions	Procedure
	M:L	1:30	thoroughly first with lukewarm water and then with cold water.
	Acetic Acid	1ml/lit.	These wool fibers were neutralized by rinsing them in dilute acetic acid (1ml/lit), squeezed and dried in shade.
Method- IV Kothawala, <i>et.al</i> 1984	рН	9	Bleaching liquor was made by mixing H_2O_2 (0.6%) in water. pH was maintained at 9
	H_2O_2	0.6%	Wool fiber were soaked and treated at 50°C for 4-5 hours
	Temp.	50°C	Wool was rinsed and treated with
	Acetic Acid	1 ml/lit	diluted acetic acid.
	Time	4-5 hrs	Wool was rinsed and squeezed and dried in shade
Method- V Kothawala, <i>et.al.</i> 1984	M:L	1:30	Bleaching bath was made with 30% hydrogen peroxide (30 ml/lit of water) and 5 gm Sodium silicate.
	Temp. & Time	50°C for 4 hr.	Wool fibers were added and treated for 50°C for 4 hours
	Hydrogen peroxide (30%)	30 ml/ lit of water	After this, solution of sodium phosphate (5gm/lit) was added to prevent rapid liberation of oxygen from hydrogen peroxide.
	Sodium Silicate	5 gm	Fibers were stirred frequently and at the end, rinsed, washed in water and
	Sodium phosphate	5 gm/ lit	dried in shade.
Method-VI Tripathi.1994	Potassium Permanganate	0.3 g/lit	Bleaching liquor was made by mixing 0.3g/l potassium permanganate and 0.5g/l sulphuric acid.
	Sulphuric Acid	0.5g/ lit	Wool fibres were immersed in liquor for 20 min at room temp.
	Sodium metabisulphite	4%	Fibres were rinsed and again treated in 4% sodium metabisulphite for 20min.at 50°C
	Temp. & Time	50°C for 20 min	Finally wool was squeezed and dried in shade.
Method-VII As explained by Director	Hydrogen Peroxide	5 ml/lit	Bleaching liquor was made by mixing 5 ml hydrogen peroxide in one lit of water
Central Silk board,	Time	1 hours	Scoured fibres were immersed in this and treated at 50°C for 1 hour.
Dehradun,2011	Temp.	50°C	Fibers were washed in luke warm
	M:L	1:30	water, squeezed and dried in shade

Note: 50 gms wool was used for all bleaching method

Evaluation of Physical Properties



Fiber Length

Length of each fiber was measured against a scale as explained by **Booth (1974).** Thirty five wool fiber samples were selected randomly, their length was measured and average value was calculated.

Crimp

As per the method explained by **Skinkle (1972)** the crimp frequency was evaluated. Average of ten readings was taken and crimp was calculated.

Fiber Strength, Elongation and Fineness

The strength, elongation and fineness of wool fibers were determined using Fafegraph-M in joint operation with Vibromat-M **(Booth, 1974).**Thirty five readings were taken for each sample and detailed results were obtained from computer.

Diameter

Diameter of rambouillet wool was evaluated as per test method number (IS: 744-1977) given in **ISI handbook of Textile testing (1982).**Ten observations were taken for each fiber.

Microscopic Appearance

The longitudinal microscopic appearance of rambouillet wool fiber was studied using "Nikon Eclipse E1000 microscope. Cross sectional view of fibers was also checked.

Whiteness Index

Whiteness index of wool was measured with the help of Hunter-colour lab. The readings were recorded on the digital monitor of the instrument.

Result & Discussion

Evaluation of Physical Properties of Unprocessed Fibers

The results of rambouillet wool fiber are being presented in table.2.



Sl.	Properties	Rambouillet wool fibers			
No.					
1	Length (inch)	2.00			
2	Tenacity gm/denier	1.32			
3	Elongation (%)	41.43			
4	Fibre fineness(denier)	5.52			
5	Crimp (no./ inch)	10 -12/ inch			
6	Diameter (microns)	24.62			
7	Whiteness Index	L	а	b	WI
		36.3	1.2	7.7	2.9

Table-2 Physical Properties of Unprocessed Fibers:

Evaluation of Physical Properties of Bleached Wool Fibers

Seven bleaching methods were tried and all bleached fiber was evaluated for their physical properties and their results were compared and best bleaching method for wool was selected.

fibres:								
Name of	Procedure	Tenacity (gm/den ier)	Elongati on (%)	Finene ss (denie r)	Whiteness Index			
Fiber					L	Α	В	WI
Rambouill	Control sample	1.32	41.43	5.52	36. 3	1. 2	7•7	2.9
et wooi	Method II	1.79***	29.03	4.93	67. 2	0. 1	12. 2	1.4
	Method III	0.91**	10.25**	2.41**	71.5	1. 0	13. 6	4.3
	Method IV	1.53	26.78	5.33***	72. 4	0. 8	13. 0	1.2
	Method -V	1.38	24.12	3.95	68. 0	0. 3	11.4	1.9
	Method -VI	1.42	28.67	4.20	59. 2	0. 9	12.1	6.0
	Method – VII*	1.70	30.73***	4.52	69. 7	0. 9	13. 6	5.5

Table-3:-Effect of bleaching on physical properties of Rambouillet wool

*Method VII, selected method for bleaching of wool **Lowest value obtained and ***highest value obtained



Fiber Length

The length of the fiber has significant effect on quality of yarn and fabric. As it is evident from the table 2, that mean length of wool fibers was noted as 2 inch. **Greyelk (2010)** also reported that long, fine wool fibers, with an average length of 2 ¹/₂ inches, are used for worsted yarns. Short, course fibers, with an average length of ¹/₂ Inch, are used for woolen yarns.

Fiber Crimp

Number of crimps per inch in rambouillet wool was observed as 10-12 crimp/inch, **Guptaet.al. (1992)** reported 8-10 crimp/inch in merino wool fibers.

Fiber Diameter

Diameter of wool was observed as 24.62 microns According to **Mishra (2005)** the diameter of wool ranges from 10 microns to 70 microns.

Fiber Tenacity

It is clear from the table 3 that lowest value of tenacity 0.91g/denier for wool was observed when wool was treated with method (III) and highest value 1.79 g/denier from method (II) was obtained in rambouillet wool. Results clearly indicated that bleaching increase the strength of wool except when it was treated with method III (0.91gm/denier).

Fiber Elongation

Results clearly indicated that bleaching reduces the elongation value or extensibility of wool. Because for control sample it was 41.43 percent and reduces to 10.25 percent.

Fiber Fineness

Results clearly indicated that bleaching increases the fineness value of wool fibers.

Whiteness Index of Fibers

A range of whiteness index was observed i.e. between 1.2 to 6.0.

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On the basis of the results of physical testing of wool fibers, **method VII** was selected as best bleaching method for wool.

Microscopic View of Selected Fibers

Longitudinal view was like a solid rod with its surface covered with scales resembling scales of fish. In microscopic cross section, irregular round cross sectional shape was found.



Rambouillet wool

Summary & Conclusion

Method VII was more effective and best selected method on the basis of physical properties of bleached wool. Results of physical properties of bleached wool i.e. tenacity (1.70g/denier), elongation (30.73percent), fineness (4.52denier) and whiteness index (5.5) were found from method VII. Bleached fibers can be dyed in pure hues and after dyeing this can be used for fashion apparels.

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