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Study on modification of properties of cotton *Khadi* fabric by commercial softener treatment

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Abstract

In the recent years the new developments in specialty finishes sector are driven by consumers changing lifestyles, towards a more casual clothing look, with a greater preference for higher standard of aesthetics, comfort, health and safety, protection and easy-care performance. Most of the low and medium handloom fabrics are having some poor properties inherent to them, e.g., poor dyeing quality, poor light and washing fastness, unevenness of clothes due to severe yarn count variation and so on. The fabric made from *khadi* spinning system exhibits rough surface and low comfort properties. Present investigation was aimed to study the effect of commercial softening agents on cotton *khadi* fabric. Softening treatment was given in different combinations and the treated fabric was assessed in terms of hand feel and appearance.

Keywords: Modification, properties, commercial, softener, *Khadi*

Introduction

Khadi is also known by another name Khaddar. Khadi is mainly woven in pure cotton, but it can also be woven in silk and wool or in a mix of fibres it is made by spinning the threads on instrument known as charkha that is used to create khadi. It has a handcrafted self-texture making each khadi cloth unique and expensive. Through the medium of khadi weaving, the weaver expresses art and designing by the spindle and loom. Its inherent strength makes it highly durable. Khadi is a versatile fabric (Dhinakaran *et. al.*, 2017) [2]. It has the unique property of keeping the wearer warm in winter as well as cool in summer season. It has capacity to absorb moisture. It is 100% natural and therefore, not harmful to skin as compared to manmade synthetic fabrics. The fabric is produced by the masses for the masses. It is associated with Gandhian philosophy as well as makes a fashion statement. *Khadi* is a sacred cloth according to M.K. Gandhi. Gandhiji presented *khadi* as a symbol of nationalism, equality and self-reliance. It was his belief that reconstruction of the society and effective *Satyagraha* against the foreign rule can be possible only through *khadi*. *Khadi* is the central core of the constructive activities as recommended by him. According to him there could be no *swaraj* without universal and voluntary acceptance of *khadi*. In his words, "I am a salesman of *swaraj*. I am a devotee of *khadi*. It is my duty to induce people, by every honest means, to wear *khadi*" (Joshi, 2002) [5].

It is widely accepted in the Indian fashion circle. Leading fashion designers now include it in their collection by designing clothes with khadi material. There is huge demand of it in international market, especially in western countries (Dhinakaran *et. al.*, 2017) [2]. However, cotton khadi has some drawbacks. Cotton khadi wrinkles easily. It has poor color fastness, dimensional stability, and drapeability property. Drape is the most important aesthetic property of fabrics, garments and other textile structures. Fabric drape can be defined as a description of the deformation of the fabric produced by gravity when only part of it is directly supported. Ability of fabric to all under its own weight into wavy folds is called drapeability.

In today's world of modernization and industrialization, tastes and preferences of consumers are changing rapidly, so there is a need to bring innovative changes and new designs in clothing. *Khadi* industry is also under continuous pressure to meet growing consumer's aspiration and demand through constant product innovation, improved quality and competition. Today's consumer demands well-fitted, comfortable, and easy to care garments, which can be washed and worn (Pant and Jain, 2014) [8]. With the modernization and the growing demand of suitable fabric hand and drape for each dress design, the need for modification and enhancement of the *khadi* fabric arises to cater the demand. The properties of the *khadi* fabric can be altered using different form of softening and finishing agents.

Softeners give very smooth and attractive look for garments. Softeners is a chemical that, when applied to textile materials, bring about an alteration in handle, resulting in goods being more pleasing to the touch than before applying it. Softening finishes are among the most important of textile chemical after treatments, with chemical softeners; textiles can achieve an agreeable, soft hand (supple, pliant, sleek and fluffy), some smoothness, more flexibility and better drape and pliability (Rastogi *et al.*, 2015)^[9]. Softeners are classified according to their ionic character as cationic, anionic, non-ionic, amphoteric, and silicone softeners.

- The hydrophilic parts of the cationic softener contain quaternary ammonium, which adsorb negatively charged fiber surfaces. The long aliphatic chains are then oriented towards outside of the fiber and act as an excellent boundary lubricant between yarns and fibers.
- Anionic softeners have nowadays only a very limited use in textile processing, due to their low substantivity and minor softness. Some examples of their uses include raising and sanforising processes which result in improved smoothness/antistatic and rewetting properties, respectively.
- Non-ionic softeners theoretically have no electric charge and for that reason show no significant substantivity. They can be easily combined with other active agents or products, are stable against high temperatures and are non-yellowing. For that reason, this product group is ideal for the finish of optically brightened white textiles.
- Silicones became popular in the textile industry in the early 1960s. The first products were mainly polydimethylsiloxanes without modification. The silicon-oxygen bonds are strong and very flexible compared to the carbon-carbon bonds found in the backbones of other polymers. The silicone softeners are classified as polydimethylsiloxanes, amido, amino functional silicones, methyl hydrogen silicones, epoxy functional silicones, hydroxyl functional silicones, silicone polyethers, epoxy polyether silicones.

It is on the basis of the above context that the present work was planned. Cotton *khadi* fabric was treated with different commercial softeners combinations and studied for their appearance and hand feel.

Objective

To study the effect of selected commercial softeners on the hand feel and appearance of cotton *khadi* fabric.

Materials and Methods

- 1. Procurement of fabric:** A survey was conducted in the local market of Hisar, Delhi, Panipat and Jind to procure cotton *khadi* fabric. On the basis of visual inspection, pure cotton *khadi* fabrics suitable for the research work were collected. The collected fabrics were screened depending upon their texture, hand, evenness and

compactness of the weave and uniformity of yarn. Cotton *khadi* fabric exhibiting medium weight was selected for the study and was procured from Khadi India, Jind, Haryana. The selected fabric was subjected to burning, physical and chemical tests for conformation of purity.

- 2. Procurement of commercial softeners:** Three softeners namely Abrosil RUC (aminosilicone), Abrosoft Redico (cationic) and Abrosoft NI (non-ionic) were procured from ABH Biochemicals Private Limited, Gurugram. These softeners were selected for the study as per the available literature, availability, cost effectiveness and eco-friendliness of softeners.
- 3. Pretreatment of the Cotton *khadi* fabric:** To ensure complete wetting and uniform absorbency of the softening agents, the cotton *khadi* fabric was subjected to preparatory process. Desizing and scouring treatments were given to the fabric to remove foreign materials before imparting the finish.
- 4. Enzymatic desizing and scouring:** The cotton *khadi* fabric was desized with 2.5 percent on weight of fabric (owf) EBZYME AMYLASE at 60 °C for 1 hour with material to liquor ratio 1:20 by maintaining the pH at 7. The treatment liquor was drained out and the fabric was given one hot and one cold wash. Then the fabric was dried and weighted. After desizing, the fabric was scoured in a bath containing 2 per cent (owf) EBZYME PECTINASE at 60 °C temperature with 1:15 material to liquor ratio at 7 pH for 60 minutes. The fabric was rinsed in hot and cold water and dried on a flat surface (Verma 2017).

Results and Discussion

Commercial softeners from three different categories were selected based on the literature, suitability for application on cellulose, eco-friendly nature, easy availability and cost effectiveness. Three softeners i.e. Abrosil RUC (aminosilicone), Abrosoft Redico (cationic) and Abrosoft NI (non-ionic) were applied on the cotton *khadi* fabric in 18 different combination ratios.

The data in Table elucidates the preference of experts for 18 different applied combinations of commercial softeners regarding parameters of hand feel and appearance. It is clear from the table that 100% Abrosil RUC (aminosilicone) softener ranked I in the list with weighted mean score of 4.6 (hand feel) and 4.7 (appearance) followed by combination of 80% + 10% + 10% Abrosil RUC + Abrosoft NI + Abrosoft Redico with weighted mean score 4.4 (hand feel) and 4.1 (appearance). Likewise, the combination of 80% + 20% Abrosil RUC + Abrosoft Redico got rank III for hand feel with weighted mean score 4.0 and combination of 80% + 20% Abrosil RUC + Abrosoft NI got III rank in appearance with weighted mean score 3.8.

Hence, 100% Abrosil RUC (aminosilicone) softener was finalized for further research work.

Table 1: Selection of commercial softener combination for softening treatment of cotton *khadi* fabric

S. No.	Commercial softener combinations	Hand feel		Appearance	
		WMS	Rank	WMS	Rank
1	100% Abrosoft Redico	2.0	XIV	2.3	XIII
2	100% Abrosil RUC	4.6	I	4.7	I
3	100% Abrosoft NI	2.4	X	2.1	XV
4	50: 50 Abrosoft Redico + Abrosil RUC	3.1	VII	3.0	VII
5	50: 50 Abrosil RUC + Abrosoft NI	3.2	VI	3.1	VI

6	50: 50 Abrosoft Redico + Abrosoft NI	2.4	X	2.5	XI
7	80: 20 Abrosoft Redico + Abrosil RUC	2.2	XII	2.4	XII
8	80: 20 Abrosoft Redico + Abrosoft NI	2.8	VIII	2.9	VIII
9	80: 20 Abrosil RUC + Abrosoft NI	3.4	IV	3.8	III
10	80: 20 Abrosil RUC + Abrosoft Redico	4.0	III	3.2	V
11	80: 20 Abrosoft NI + Abrosoft Redico	1.6	XVI	1.9	XVII
12	80: 20 Abrosoft NI + Abrosil RUC	2.1	XIII	2.2	XIV
13	60: 20: 20 Abrosoft Redico + Abrosil RUC + Abrosoft NI	2.3	XI	2.6	X
14	60: 20: 20 Abrosil RUC + Abrosoft NI + Abrosoft Redico	3.3	V	3.3	IV
15	60: 20: 20 Abrosoft NI + Abrosoft Redico + Abrosil RUC	1.9	XV	2.0	XVI
16	80: 10: 10 Abrosoft Redico + Abrosil RUC + Abrosoft NI	2.0	XIV	2.8	IX
17	80: 10: 10 Abrosil RUC + Abrosoft NI + Abrosoft Redico	4.4	II	4.1	II
18	80: 10: 10 Abrosoft NI + Abrosoft Redico + Abrosil RUC	2.5	IX	2.1	XV

Conclusion

Softeners is a chemical that when applied to textile materials bring about an alteration in handle, resulting in goods being more pleasing to the touch than before applying it. In the present study different type of commercial softeners and their combinations were applied and examined for aesthetic properties i.e., fabric hand feel and appearance. The study revealed that out of all the applied combinations, 100% Abrosil RUC (amino silicone) scored highest in both hand feel and appearance.

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