

## A Comparative Study on the Effect of Finishing Agents on Stiffness and Drape of Khadi Fabric

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### Abstract

A comparative effect of finishing agents as synthetic starch (revive) and synthetic resin (silicone) on stiffness and drape of khadi fabric has been reported in this study. Effect of 3 concentration of finishing agents was observed on thick, medium and fine thickness of cotton khadi. It was found out that amount and size of the finishing agents affect the stiffness and drape of khadi fabric. Maximum increase in stiffness and drape was seen in fabric treated with revive and minimum in silicone treated fabric. Significant difference in stiffness and drape of fabric of different thickness was also found.

**Key words:** Finishing agents (revive, silicone), stiffness and drape co-efficient.

### I. Introduction

Khadi is hand spun and hand woven cloth. It can be cotton, silk or wool. It is only recently that the fabric has caught the attention of high fashion. The common man has been wearing it simply for its versatile character and comfort.

Unlike other fabrics, khadi has stood as a testament of India's past and is proof that 'old is truly gold'. What distinguishes khadi from handloom is that khadi is hand-spun with the help of a charkha (spinning wheel), whereas handloom yarn, on the other hand, is processed in the mill. This is what makes khadi so unique and resilient as it keeps the wearer warm in winter and cool in summer. Its weave structure allows ample amount of air to pass over and around the body. It has capacity to absorb moisture. It is 100% natural and therefore, not harmful to skin.

Khadi is available in many weaves and designs and stands apart from mill made unnatural fabrics. Today it is beginning to emerge as fashion fabric. It has become synonymous with designer wear. However, khadi's hand limits its use in designing of garment of particular styles only.

Pattern and styles of garment keep on changing from time to time with changing fashion trends. As ultimate appearance of garment is influenced by stiffness vs. softness and draping quality of fabric, these are utilized for creating new styles in garment.

Ability of fabric to fall under its own weight into wavy folds is called drapability, has played significant role in providing graceful aesthetic effects in garment. Drape of fabric has been a *device* of special adornment in the garment. The drape relieves monotony of shape and enhances the beauty of garment and its appreciation.

Drapability of a fabric is combined effect of several factors such as stiffness, flexural rigidity, weight, thickness etc. Stiffness, an attribute of fabric hand is one of the most important factors determining draping quality of fabric. (Booth, 1968) Stiffness of fabric itself depends upon components of textile fabric like fiber type, yarn structure and fabric structure (Joseph, 1986). Finishing agents may also be used to modify fabric stiffness (Pant and Chauker, 2004). If stiffness vs. softness and drape of khadi fabric is changed by application of finishing agents, its use can be multiplied in designing garment of different styles. Present study is a step in this direction.

Finishing agents can be used to alter fabric hand and change draping quality. Starching gives body, weight, smoothness and stiffness to fabric. Resins can modify hand of fabric and produce a variety of effects. Change in stiffness and drape can be utilized to create different designs or change look of khadi garments.

It is on the basis of above context that present work has been planned. Cotton khadi & its blends were treated with different stiffening agents such as starch (revive) and resin (silicone) to modify stiffness and drape. Concentration of finishes was varied to study the effect discretely. New designs of skirt were developed on the basis of change in drape.

### II. Methodology

#### Material

#### Fabric:

Commercially available three types of cotton khadi fabrics varying in thickness and weight were used (table 1).

**Table 1: Preliminary data of fabrics used**

Cotton khadi	Thread count (per square inch)		Thickness (mm)	Weight/unit area (gm/sq mt)
	No. of warp yarns	No. of weft Yarns		
Thick	33	23.6	1.7	1224.70
Medium	67	41.4	1.5	847.05
Fine	77	64.8	0.47	365.8

**Chemicals:**

Commercially available starches such as revive (a water soluble ready to use starch) and thermoplastic resin such as silicone emulsion were used.

viz. 10%, 15% and 20% for revive and 20%, 30% and 40% for silicone. Material liquor ratio was 1:30. After the application of finishing agents in different concentration, add on % of finishing agents was calculated.

**III. Method**

**Desizing and scouring of khadi fabric:**

Commercially available khadi fabrics were used in this study. Cotton khadi fabric is finished with starch to impart smoothness and luster in final finishing treatment, so in the first step fabrics were desized to remove starch. Acid desizing technique was used to remove size and after that fabrics were scoured, rinsed and dried.

**Determination of properties of fabrics Stiffness:** (IS: 6490-1971) Stiffness was measured by employing “Eureka stiffness tester”

**Percent drape coefficient:** (IS: 8357-1977) Circular drape meter was used for determining percent drape coefficient of fabric. Number and shape of nodes were also assessed.

**Application of finishing agents and determination of percent add on of the finish:**

Finishes were applied on fabric samples by pad-dry-cure method. The fabrics were immersed in the finish solution for 10 minutes and then passed between two rollers to squeeze out air and to force liquor inside material. Revive and silicone resin treated fabrics were dried and then cured at 120°C in oven for 5 minutes. Finishes were applied individually with three concentrations of each finish

**IV. Result and discussion**

**Effect of revive starch on stiffness and drape of cotton khadi fabrics**

Table 2 shows that stiffness of thick cotton fabric increased progressively with increase in concentration of starch whereas stiffness of cotton fabric of medium thickness increased up to 15% concentration of starch after that it decreased. In case of fine cotton khadi fabric stiffness increased upon increasing the concentration of revives starch up to 10% after that it decreased gradually.

**Table 2: Stiffness and drapability of cotton khadi fabrics treated with varying concentration of revive finish**

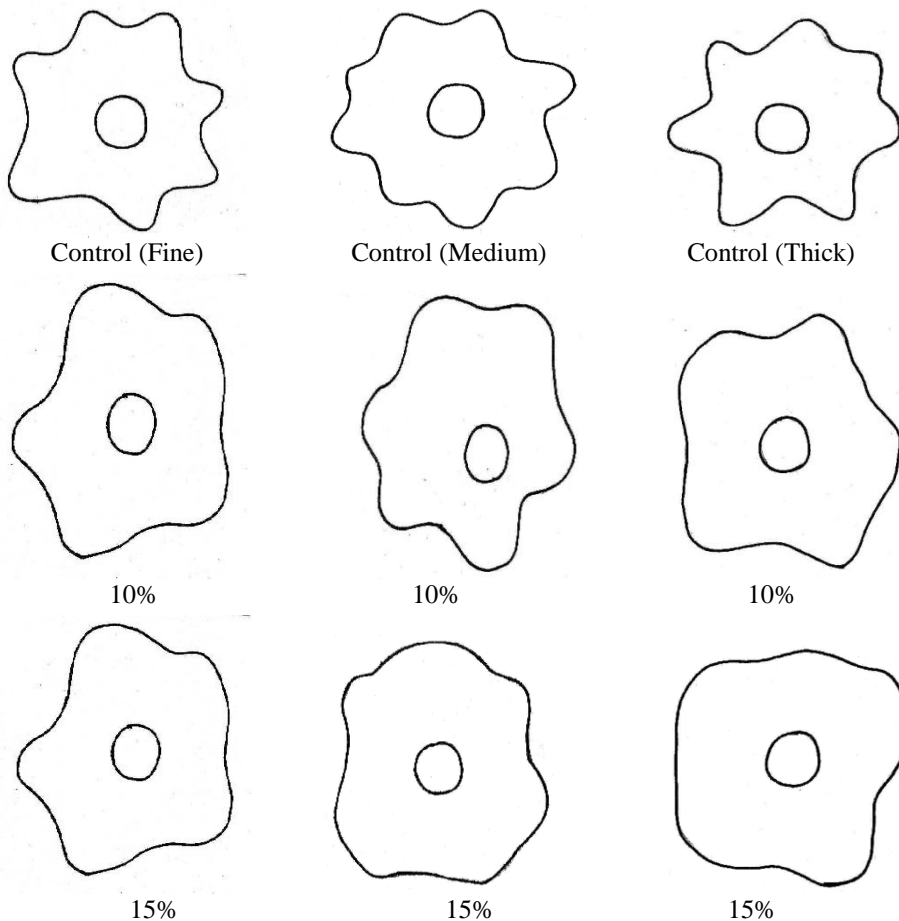
Type of khadi	Concentration of finish	% Add on	Stiffness Bending length(cm)		Drapability	
	W/W		Warp	Weft	% Drape coefficient	No. of nodes
Thick	Control	0	1.59	1.65	45.55	7
	10%	6.5	2.72	2.56	78	5
	15%	5.6	2.53	2.3	85.29	4

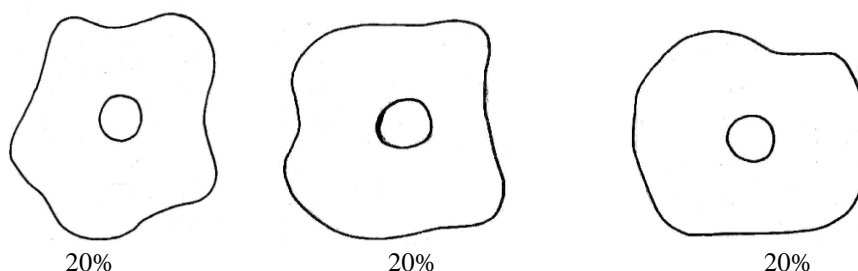
	20%	1.47	2.72	2.75	89.4	4
Medium	Control	0	1.45	1.47	39	8
	10%	12.2	2.05	1.74	68.23	6
	15%	1	2.39	1.68	77	6
	20%	5.3	2.17	2.05	75.64	5
Fine	Control	0	1.63	1.56	46	7
	10%	2.2	1.89	2.23	64.33	5
	15%	4.3	1.69	2.16	80	5
	20%	2.2	1.64	2.4	75.29	5

Drape coefficient of thick cotton fabric increased progressively with increase in concentration of starch. In case of medium weight of khadi fabrics similar results were obtained. In case of fine cotton khadi fabric drape coefficient increased progressively with increase in concentration of starch

up to 15% of starch after that it decreased and no. of nodes also decreased or became irregular on increasing the concentration of finish and drape area was also found decreased as compare to control sample (fig.1).

**Figure-1 Drape Profile of Cotton Khadi Fabric after Application of Revive Finish**





Effect of thickness on stiffness was significant at 5% as well as 1% level ( $F=299.31$ ). Effect of concentration of revive on stiffness was also found significant at 5% and 1% level ( $F=1894.9$ ). Interaction between thickness and concentration was also found significant. Thus both the factors significantly affected the stiffness. Effect of thickness on drapability was significant at 5% and 1% level ( $F=82.66804$ ). Effect of concentration of revive on drapability was also found significant at 5% and 1% level ( $F=248653.8$ ). Thus both the factors significantly affected the drapability.

#### V. Effect of Silicone on stiffness and drape of cotton khadi fabrics

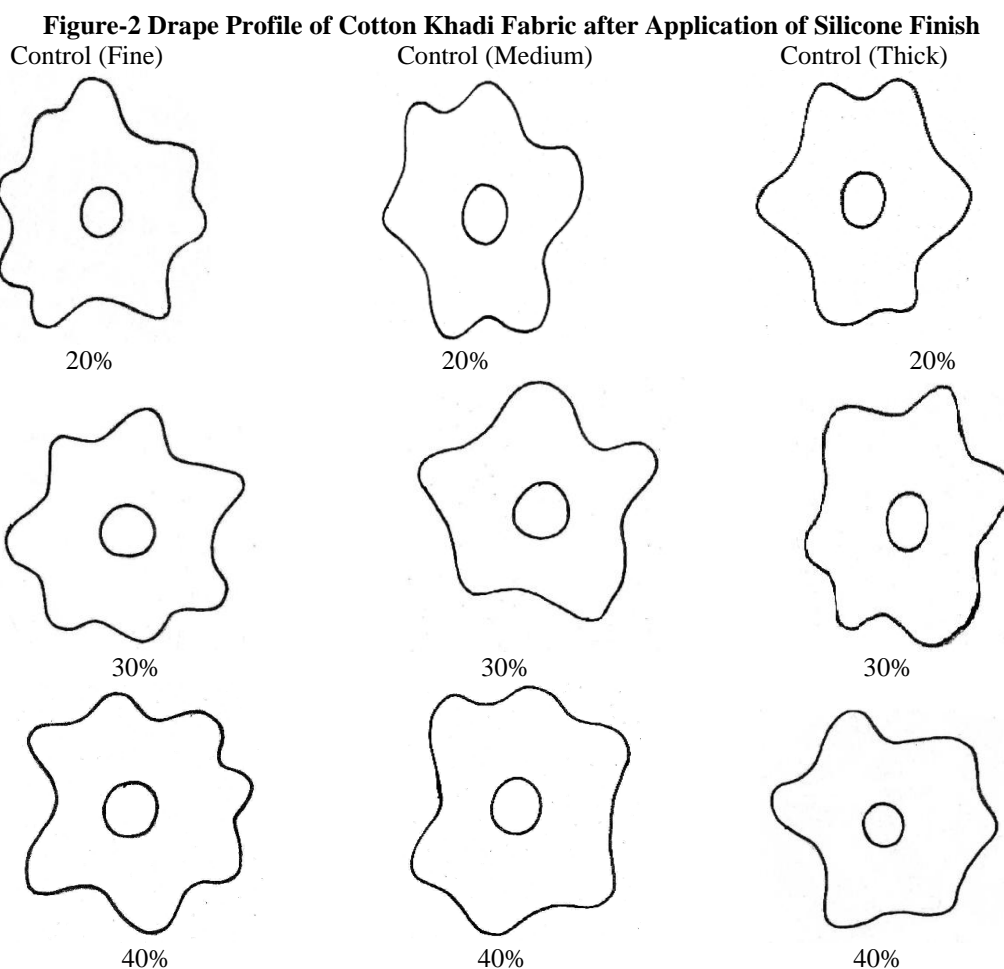
Table shows 3 that stiffness of thick cotton fabric increased in warp direction up to 20%. It decreased when concentration of silicone was increased to 30% and then it increased whereas it decreased in weft direction on application of 30% of finish. Increase in concentration of silicone up to 40% did not cause significant change in stiffness of thick fabric in weft direction.

In case of cotton khadi fabric of medium thickness stiffness increased up to 20% concentration of silicone and then became constant i.e. no further increase in stiffness was observed. On the contrary, stiffness of fine cotton fabric reduced continuously up to 40% concentration. So far as drapability is concerned, increase in drape coefficient is highest in medium fabric where as it is lowest in fine fabric. Silicone is a softening agent. Silicone polymer has long fatty acid chains. It lubricates the surface by coating the fabric's fiber with a thin elastic film.

In case of thick and medium cotton khadi fabrics the drape coefficient increased at 20% of concentration of finish and on increasing the concentration to 30% drape coefficient decreased and again increased on increasing concentration to 40% concentration. No. of nodes and draped area was found almost similar to the control sample on different cotton khadi fabrics. Nodes were regular and deep which was similar to control sample (fig.2). Another observation is that increase in percent drape coefficient of silicone treated fabric is not as high as in case of revive finishing agents.

**Table 3: Stiffness and drapability of cotton khadi fabrics treated with varying concentration of silicone finish**

Type of khadi	Concentration of finish	% Add on	Stiffness		Drapability	
	W/W		Bending length(cm)		% Drape coefficient	No. of nodes
			Warp	Weft		
Thick	Control	0	1.59	1.65	46	7
	20%	2.43	1.72	1.63	64	6
	30%	3.0	1.66	1.65	60.81	6
	40%	3.33	1.71	1.62	62	6
Medium	Control	0	1.45	1.47	39	8
	20%	2.20	1.66	1.56	64	6
	30%	2.25	1.67	1.58	62.15	6
	40%	3.0	1.67	1.59	63.03	6
fine	Control	0	1.63	1.56	46	7
	20%	2.8	1.50	1.48	51.13	8
	30%	3.0	1.45	1.51	53	7
	40%	3.0	1.46	1.51	50	7



ANOVA calculated exhibited significant effect of thickness on stiffness at 1% level ( $F=209.31$ ). Effect of concentration of silicone on stiffness was also found significant at 1% level ( $F=1173.73$ ). Interaction between thickness and concentration was found significant. Effect of thickness on drapability was significant at 1% level ( $F=330.38$ ). Effect of concentration of silicone on drapability was also found significant at 1% level ( $F=1523$ ). Thus both the factors significantly affected stiffness and drapability of khadi fabrics.

## VI. Conclusion

Present study was undertaken to modify the characteristics as stiffness and drape of khadi fabrics which are relevant to garment making. On comparing the effect of two finishing agents on stiffness and drape of khadi fabrics, it can be said that revive caused highest increase in stiffness and percent drape coefficient whereas effect of silicone was lowest. Fine cotton khadi became soft on application of silicone finish. In addition effect of varying concentration of finishing agents and varying fabric thickness on stiffness and drape was found.

Special look fashion garments can be prepared on the basis of the work, by designers and also by fashion industry as can be seen in following plates 1-4. Result showed that finishing agents can be successfully used to change drape, number, shape and size of nodes/folds as well as to influence drape effect in garments.

Silhouette of garment can be changed according to change in fashion trend through application of finish.

## References

- [1] Booth J E, Principles of Textile Testing, 3rd ed. Newness-Butterworth: London, (1968).
- [2] Brooks JH, Das VK and Smith LT, Effect of lubrication in textile: frictional and weaving properties of sirospun wool yarn. *Textile Research Journal*, 59,382-388 (1989).
- [3] Chaudhary C K, Prediction of Drape Coefficient By Weaving Parameter. Unpublished Master's Thesis, Faculty of Technology and Engineering, M.S.University, Vadodara, (1980).
- [4] Jang K O and Yeh K., Effect of Silicone Softeners and Silane Coupling Agents on the

Performance Properties of Cotton Fabrics.  
*Textile Research Journal*. 63(10): 557-565,  
(1993).

- [5] Joseph ML, Introductory Textile Science,  
5th ed.CBS College Publishing, (1986).  
[6] Lynn JE and Press JJ (ed), Advances in  
Textile Processing, vol 1, Textile Publishers  
Inc. New York, (1961).

- [7] Pant Suman. and Chaulkar B N, Wool and  
Wool Blend Finishing, Banasthali  
University, Navjeevan Publication, Newai,  
(2002).

- [8] Shenai V, Technology of bleaching and  
dyeing, Sevak Publications, Mumbai,  
(1995).



Plate No.1 Unfinished skirt



Plate No.2 Revive Finished skirt



Plate No.3 Unfinished skirt



Plate No.4 Silicone finished skirt