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Efficacy assessment of environmental friendly sizing agent from *Cassia fistula* seeds

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Abstract

Nature has provided abundant plant wealth, which possess medicinal virtues for all living creature. The essential values of some plants have long been published but a large number of them remain unexplored as yet. In this regard, one such plant is *Cassia Fistula*. With this in the mind the present research entitled "Efficacy assessment of environmental friendly sizing agent from *Cassia fistula* seeds. Optimization and application of starch, assessment of CIE colour values and assessment of the acceptability of starched fabric by consumer. Muslin cloth having different fabric weight was selected for the experiments. Three concentration of starch 2.5%, 5%, and 7.5% were prepared and applied on desized muslin fabrics. The starched samples were assessed to see the effect of different concentrations. These starched samples were evaluated to select one best concentration out of three. Then one selected concentration of *Cassia fistula* was applied on cotton *Dupatta*. 30 post graduate girls were select for assessment of the acceptability of starched *Dupatta*. Findings of the study revealed that *Cassia fistula* starch can be used on muslin fabric with different concentrations. It gives good results in terms of texture, luster, thickness, stiffness and drapability. Cotton *Dupatta* starched with *Cassia fistula* seeds was found highly acceptable by the respondents.

Keywords: *Cassia fistula* starch, CIE value of starched fabric, Acceptability of *Cassia fistula* starch

Introduction

Textiles have such an important bearing on our daily lives that everyone needs to know something about them. Each person builds an image which represents him in the eyes of others it is the expression of his inner self projected through his outer appearance. A large percentage of his total image can be attributed by the clothes he wears his clothing expresses his values and his feelings about himself. Clothing has served many purposes arising from diverse need. Ever since man took to wearing clothes, the necessity of washing, finishing and restoring them to original appearance has been a problem in maintaining a satisfactory appearance of textiles. Sizing or size is any one of numerous substances that is applied to fabric of fine quality and light weight or loosely woven fibres. Starching makes the fabric heavier, stiff, and crisp. It also adds shine and smoothness to the fabric. Cottons – muslin, poplin, cambric and thin silks are generally starched. Sizing agents are derived from both natural and synthetic polymers. Starch has long history of being used as a sizing agent in the textile industry. Natural starch and its derivatives still constitute nearly 75 percent of the sizing agents used in the textile industry throughout the world. Nature has provided abundant plant wealth, which possess medicinal virtues for all living creature. The essential values of some plants have long been published but a large number of them remain unexplored as yet. In this regard, one such plant is *Cassia fistula*.

Cassia fistula Linn. (*Cassia*) family Caesalpiniaceae commonly known as Amalthus and in English popularly called "Indian Laburnum" has been extensively used in Ayurvedic system of medicine for various ailments. *Cassia fistula* is widely grown as an ornamental plant in tropical and subtropical areas. It is deciduous and mixed-monsoon forests throughout greater parts of India, ascending to 1300 m in outer Himalaya. It is an Indian medicinal plant. With the emerging worldwide interest in adopting and studying traditional starching methods and exploiting their potential based on different plant source, the evaluation of the natural starch or sizing sources are essential. The other reason for selecting the starch source is that *Cassia fistula* seed starch is totally ecofriendly and cost effective.

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The main aim of the study was to develop ecofriendly and cost effective sizing for cotton. The present study was under taken keeping in view the objective; to optimize the starch recipe for sizing of cotton fabric with *Cassia fistula* seed starch; to study the effects of sizing agents from *Cassia fistula* seeds on cotton fabric at different concentration; to assess the CIE values of *Cassia fistula* starched muslin fabric and to find out the acceptability of starch fabric by the consumers.

Methodology: Following steps were adopted to carry out the present study

- *Cassia fistula* pods was collected from *Gulab Bagh* and MPUAT University campus. Seeds were separated from pods, than cleaned and washed in tap water to remove sticky brown pulp from seeds. Dried in sun light for 2-3 days outer brown husk was removed than Inner white portion of seed was pulverized into fine powder. This powder was used as starch.
- For conducting the experimental trials of different concentrations of *Cassia fistula* starch on muslin fabric. Muslin cloth having different fabric weight (Thin, Medium and Thick) was selected for the experiments. It was required to have muslin fabric free from starch or from any other stiffening agent. Hence a laboratory procedure for desizing prescribed at IS: B1967- 1961 was used to desize the fabric.
- The concentration of starch was optimized by taking three solution prepared by boiling method, 2.5, 5, 7.5, gms of *Cassia fistula* seed powder each in 3 beakers containing 1:30 MLR of distilled water after boiling, starch solutions were filtered and keep in side.

- For starching the muslin fabric hot starching method was adopted. The starch powder presoaked in cool water carefully removing all the lumps, this solution added in boiling water and continued boiling till the starch particles burst out and making colorless, gelatinous and translucent solution. Than cooling of starch solution and filtered it through double muslin cloth. Fabric sample (desized) soaked in prepared solution for 10 minutes. Removed the fabric sample and slightly wringing of starched sample. Dried in direct sun light.
- A panel of five members was selected from the Department of Textile and Apparel Designing as subject matter specialists. The visual evaluation of cotton fabric samples sized with all the three concentration of *Cassia fistula* starch (2.5%, 5% and 7.5%) was done by these panel members on the basis of texture, luster, drapability, stiffness, thickness for the selection of the one best concentration.
- Best selected starch concentration was applied on cotton *Dupatta*. Thirty respondents who were using starched cotton *Dupatta* were randomly selected from College of Home Science for assessment of the acceptability of *Cassia fistula* starched *Dupatta*.

Optimization of the different concentration of *Cassia fistula* seed starch through visual evaluation: Fabric sample starched using different concentrations of *Cassia fistula* seed starch (2.5, 5 and 7.5 gm) were visually evaluated by a panel of experts for various attributes viz. texture, luster, stiffness, thickness and drapability of the starched fabric sample. Result of visual assessment is presented in table no-2

Table 1: Score and Percentage Obtained by *Cassia fistula* Starched Muslin Fabric N = 5

S. No.	Muslin	Texture	Luster	Stiffness	Thickness	Drape	Total score	(%)	
1.	Thin	2.5%	10	12	6	6	14	48	38.4
		5%	12	15	12	8	15	62	49.6
		7.5%	14	11	14	12	14	65	52
2.	Medium	2.5%	23	23	18	18	20	84	67.2
		5%	24	21	21	22	24	112	89.6
		7.5%	20	18	21	16	18	93	76.8
3	Thick	2.5%	18	17	17	18	16	86	68.8
		5%	15	13	11	16	11	66	52.8
		7.5%	12	10	10	12	6	50	40

Table no – 1 showed that on the basis of texture medium weight sample with 5 percent starch concentration was given the highest preference with a total mark of 24 out of 25. The next preferred concentrations on the basis of texture were 2.5 percent medium weight fabric with total marks of 23. It is clearly visible from the table that the starched sample were not smooth in texture in thin and thick fabric at 2.5 percent, 5 percent and 7.5 percent concentration hence least preferred by the judges.

In terms of luster of the starched fabric 2.5 percent in medium weight fabric was highly preferred by the judges with a total

score of 23 out of 25, whereas medium weight sample with 5 percent was next preferred with 21 marks out of 25. Sample starched with 7.5 percent at thin, thick and medium fabric showed poor result due to dullness of the fabric.

In term of stiffness, medium weight fabric with 5 percent and 7.5 percent concentration were equally preferred with a maximum score of 21 out of 25. The second most preferred concentration is 2.5 percent at medium weight fabric with a total score of 18 out of 25. Thin muslin at 2.5 percent concentration were least preferred by the judges.

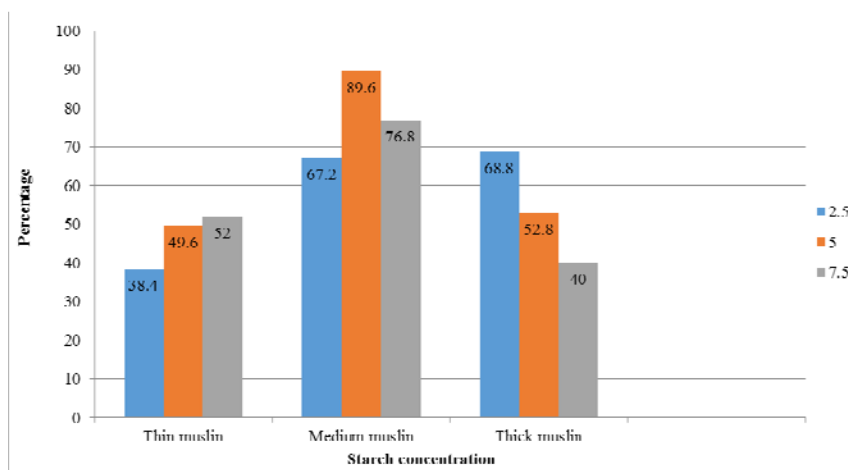


Fig 1: Percentage obtained by different starch concentration through visual evaluation

In term of thickness of the fabric 5 percent concentration at medium weight muslin was highly preferred by the judges with total score of 22 out of 25, whereas medium and thick muslin at 2.5 percent concentration were next preferred with 18 marks out of 25. In term of thickness of the fabric thin muslin fabric showed poor results with all three concentrations.

In term of drapability of the fabric again medium weight muslin at 5 percent was given the highest preference with a total score of 24 out of 25. The next preferred concentration on the basis of drapability of the fabric was 2.5 percent at medium muslin with total marks of 20 out of 25. Thin and thick muslin at different concentration did not show satisfactory results.

Considering the result of all the attributes of visual evaluation the one most preferred concentration of developed starch was selected. The selected highest scored concentration was further to assess the acceptability of starch fabric by consumer.

Fabric Colour: Colour value of the sample was analyzed on the basis of L* a* b* values using reflectance spectra through (colour eye 3100) Macbeth UV spectrophotometer. The L* value is measure of lightness and darkness of the colour while a* and b* define the colour on a two dimensional chromatic space of green-red axis and blue- yellow axis, a* and b* values were evaluated.

Table 3: Effect of Sizing Treatment on fabric colour

S. No.	Sample	k/s	L*	a*	b*	C*
1	Thin Muslin					
	Control	0.592	90.187	0.148	8.987	8.988
	2.5%	1.140	85.135	2.285	15.093	15.265
	5%	1.037	85.377	2.388	14.088	14.289
	7.5%	0.896	87.422	0.970	12.099	12.130
2	Medium Muslin					
	Control	0.876	85.715	1.347	13.088	13.149
	2.5%	1.251	82.573	2.531	16.133	16.33
	5%	1.121	82.951	2.653	14.838	15.073
	7.5%	1.351	84.414	1.572	15.303	15.384
3	Thick Muslin					
	Control	1.275	83.707	2.945	17.079	17.331
	2.5%	1.208	79.739	3.612	15.344	15.763
	5%	1.292	79.498	3.765	15.969	16.407
	7.5%	1.187	80.833	2.805	15.636	15.886

The Table 3 shows that colour strength of different starched sample at all the starch concentration was increased as compare to control or unstarched fabric sample. L* of the starched samples was slightly decrease. The l* value of different starched sample at 2.5 percent and 5 percent concentrations shows similar results. The L* value of 7.5 concentration is less which shows more darkness of starched sample. The a* value indicates redness or greenness and b* value indicates yellowness and blueness.

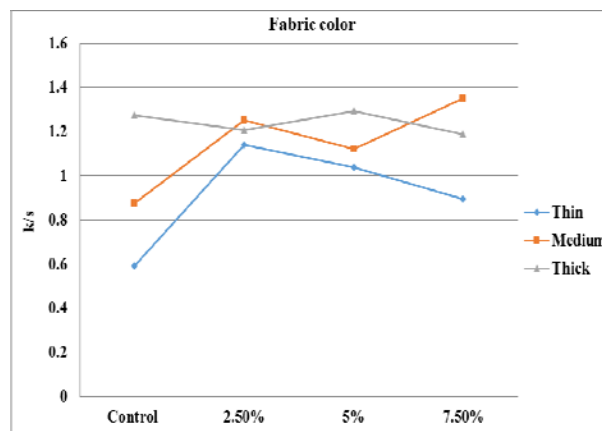


Fig 2: Effect of sizing treatment on fabric color (k/s)

Assessment the acceptability of starched fabric by the consumer: The developed starch solution applied on cotton Dupatta and then this Dupatta was evaluated by 30 respondents to find frequency and percentage of consumer acceptability. In order to assess the acceptability of the developed starch a rating Performa was developed bases on five point rating scale and was given to the respondents. The responses derived by respondents for each attribute were coded and presented in table.

Table 4: Acceptability score obtained by starched Dupatta with Cassia fistula seed n=30

S. No.	Criteria of the evaluation	Score	Percentage (%)
1.	Texture of the fabric	140	93.33
2.	Thickness of the fabric	133	88.66
3.	Stiffness of the fabric	144	96.00
4.	Drapability of the fabric	127	84.66
5.	Luster of the fabric	114	76.00
6.	Color of the fabric	116	77.33
	Total score obtained	774	86%

It was found that in term of stiffness of the fabric was highly acceptable (86%) with a total score of 144 out of 150. Texture of the fabric was next favored with total marks of 140 out of 150. Following the same trend, thickness of the fabric and drapability of the fabric were next favored with a total score of 133 and 127 respectively. Among the all attributes luster of the fabric and color of the fabric were least favored by the respondents with a total score of 114 and 116 out of 150 respectively. The finding in Table 4 shows that the respondents gave score 774 out of 900. *Dupatta* starched with *Cassia fistula* seed starch was found acceptable by 86 percent respondents. According to Bhavani (2011) [2] starching of cottons is an age old aristocratic and well known process for giving a fabric stiff and smooth finish, elegant look and good drape. Stiffening agents are applied on cloth in order to build up the apparent weight, impart thickness to improve luster and also to prevent the fabric from soiling quickly.

Conclusion: Thus, it can be concluded that developed starch showed better results. There was improvement in the physical properties when treated with *Cassia fistula* seed starch. Developed starch was highly appreciated and liked by the consumers. Use of *Cassia fistula* for sizing make new innovation in nature based sizing. Hence, *Cassia fistula* starch can be recommended as an eco-friendly and user friendly sizing agent.

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