

# Commercialization of Cassia gums in eco-printing of textiles

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■ **ABSTRACT** : Printing is one of the traditional fabric decoration techniques and a creative art nurtured and patronized through centuries. Textile printing is one of the processes of textile industry that causes very high water pollution due to unfixed colour, thickening agent and other ingredients of printing paste which are washed off from the fabric into natural water bodies. An increasing awareness about the realization that the intermediates and chemicals used in synthetic dyes being toxic and hazardous to human health as well as to the environment has led to the increase in demand for nontoxic eco-friendly materials. Hence, in the present study, keeping in view the importance of natural gums in apparel and textile industry, an attempt was made to print the fabric using naturally prepared gum. The printed fabrics were utilized for construction of clothing and home textiles, which were assessed for the acceptability. Questionnaire was designed on five point scale to obtain relevant information from the thirty respondents. The results showed that all the entire natural printed products were highly preferred and appreciated by the respondents.

■ **KEY WORDS**: Block printing, Screen printing, *Cassia tora*, Thickener

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People have found ways to enhance their own appearance and beauty by adorning their garments. Even today most of the individuals still think of clothes as more than just body coverings. The art of dyeing and printing has played a significant role in adding beauty to the textile world (Yadav and Gaba, 2016). Currently, as a result of the strict environmental standards imposed by many countries in response to the toxic and allergic reactions associated with synthetic dyes, the demand for the use of natural dyes in textile coloration is increasing at faster rate (Nagia and EL-Mohamedy,

2007).

Dyeing with natural dyes normally requires the use of mordants, which are metallic salts of aluminum, iron, chromium, copper for ensuring a reasonable fastness of the colour to sunlight and washing (Robertson, 1973). The metal ions present in mordants can act as electron acceptors for electron donors for the formation of coordination bonds with the dye molecules, making them insoluble in water. The use of natural dyes significantly cuts down synthetic dyes due to high amount of toxic effluents resulting from synthetic dye processes (Hakeim

*et al.*, 2005 and Rekaby *et al.*, 2009). Natural dyeing has been used by humans for different purposes varying from coloration of food, cosmetics and textiles to impart other functions to them (Yi and Cho, 2008).

Printing is the application of colour according to a predetermined design (Gohl and Vilensky, 2005) which brings the textile material into full bloom by conferring flexibility to it for fashion designs (Arora, 2016). Textile printing is one of the processes of textile industry that causes very high water pollution due to unfixed colour, thickening agent and other ingredients of printing paste which are washed off from the fabric into water bodies (Dayal and Dobhal, 2001). It is believed that the process of printing with natural dyes has been in practice since 10<sup>th</sup> century (Mishra, 2000).

In printing, the thickener is the crucial component of print paste. The purpose of the thickener is to give proper viscosity to printing paste and helps in uniform and even colour application. Also, it holds the colour in place so that one colour paste can be applied adjacent to another without the colour bleeding onto other. An increasing awareness about the realization that the intermediates and chemical used in synthetic dyes being toxic and hazardous to human health as well as to the environment, has led to the increase in the demand of nontoxic eco-friendly resources (Babel *et al.*, 2015). Calls for the usage of natural thickening agents appear to be ideal choice for consumers with eco concern. This is because natural dyes and thickening agents have better biodegradability and higher compatibility with environment (Babel and Gupta, 2013). Thus, keeping in view the importance of natural gums in apparel and textile industry, the present study was designed with the objectives to print and commercialize the cassia gum printed products, create awareness among artisans and printing units about usage of natural gum for natural printing and to design products for popularization.

## ■ RESEARCH METHODS

Desizing and degumming was carried out for plain white cotton and silk fabric, respectively to remove the sizes/ gums and other impurities. Cotton fabric was desized by treating in 5gpl soap solution at MLR 1:40 for 40-45 min. Likewise, silk fabric was degummed using non-ionic liquid detergent (2g/ litre) 45 min at 60° C keeping the MLR at 1:50. The fabric was squeezed and rinsed under running water to make it free from traces

of detergent and shade dried.

### Pretreatment of fabric :

The fabric was pretreated with 1% myrobalan solution (owm) maintaining the 1:30 MLR (material to liquor ratio). Myrobalan powder was soaked overnight in required quantities of water. Desized/ degummed fabrics were then treated in the solution for 3 hours. The fabrics were squeezed and dried under sunlight.

### Preparation of printing paste :

Dye source	: Marigold flowers
Fabric	: Cotton and silk
Pre-treatment	: Myrobalan
Mordant	: SC and CS+FS
Mordant Conc.	: 1 %
Thickner	: <i>Cassia tora</i>
Thickner Conc.	: 5 %
Printing technique	: Screen and Block
After treatment	: Salt/ citric acid treatment for cotton/ silk, respectively, washing and drying in shade.

### Product development :

Large scale printing was carried out at Leprosy centre, Hospital for the Handicapped Rehabilitation and Training Unit, Hubli. The printing was conducted at centre twice in order to create awareness among artisans about the importance of natural gum in printing.

Myrobalan treated cotton and silk fabrics were used for printing by implying block and screen printing techniques using cassia gum. The natural cassia gum printed cotton and silk fabrics were further utilized for development of seventeen different clothing and home textiles. Clothing comprised of baby layette (jabla, bonnet and nappy), tailed bonnet, frocks, scarfs, *Kurtas*, *Kurtis* and jacket. Home textiles consists of bed spread with pillow covers, divan set and table cloth.

### Description of the developed printed products :

Various fields and different age groups were considered before developing the products. Diversified printed articles were developed to assess the suitability of the products to the targeted areas such as clothing and home textiles (Table 1). Baby layette, tailed bonnet and baby frock were constructed for infants as eco-friendly products are very good for the skin of the infants.

Table A : Description of the printed products							
Products	Type	Fibre content	Print type	Colour	Mordant	Size	Utility
Baby layette	Jabla, Bonnet, Nappy	Cotton	Screen print	Yellow (Bonnet) Dark green (Jabla and Nappy)	Stannous chloride Ferrous sulphate + copper sulphate	0-6 months	Infants clothing
Tailed bonnet	Tailed bonnet	Cotton	Screen print	Dark green	Ferrous sulphate + copper sulphate	4-8 months	Infants clothing
Frocks	Frock-1	Cotton	Screen print	Yellow Dark green (Bodice)	Stannous chloride Ferrous sulphate + copper sulphate	0-6 months	Infants clothing
	Frock-2	Silk	Screen print	Yellow (Bodice) Dark green (Sleeves, skirt and strings)	Stannous chloride Ferrous sulphate + copper sulphate	3-4 yrs	Toddlers
<i>Kurtas</i>	<i>Kurta-1</i>	Cotton	Screen print	Yellow Dark green (Neck line)	Stannous chloride Ferrous sulphate + copper sulphate	38	Adolescents and adults
	<i>Kurta-2</i>	Cotton	Screen print	Yellow (Neckline) Dark green	Stannous chloride Ferrous sulphate + copper sulphate	38	Adolescents and adults
	<i>Kurta-3</i>	Cotton	Block print	Yellow (filling) Dark green (outline)	Stannous chloride Ferrous sulphate + copper sulphate	38	Adolescents and adults
<i>Kurtis</i>	<i>Kurti-1</i>	Cotton	Screen print	Dark green	Ferrous sulphate + copper sulphate	34	Adolescents and adults
	<i>Kurti-2</i>	Cotton	Screen print	Yellow	Stannous chloride	34	Adolescents and adults
Scarfs	Scarf-1	Silk	Block print	Yellow	Stannous chloride	-	Toddlers, adolescents and adults
	Scarf-2	Silk	Screen print	Dark green	Ferrous sulphate + copper sulphate	-	Toddlers, adolescents and adults
				Yellow	Stannous chloride	-	Toddlers, adolescents and adults
Jacket	Jacket	Silk	Screen print	Yellow Dark green	Stannous chloride Ferrous sulphate + copper sulphate	-	Adolescents and adults
Home Textiles	Divan set	Cotton	Block print	Yellow	Stannous chloride	Bed spread 96" x 50" Cushion covers 15" x 15"	Furnishings
	Bed spread with pillow covers	Cotton	Block print	Yellow (filling) Dark green (outline)	Stannous chloride Ferrous sulphate + copper sulphate		Furnishings
	Table cloth	Cotton	Block print	Yellow	Stannous chloride	28" x 23"	Furnishings

Different styles and patterns of *Kurtas*, *Kurtis* and scarfs were designed and developed for college going adolescents and adults. Home textiles are decorative, which create a sort of aesthetic appeal in the room which helps to build an internal environment with a positive energy among the people residing in the building. Hence, divan set, bed spread with pillow covers and table cloth were designed in order to seek the response regarding the suitability of the natural printed products for the home

textiles (Fig. 1 and 2).

### Consumer acceptances for natural printed products:

A self-structured questionnaire (5 point scale) was developed to elicit the information regarding acceptability of natural printed products by thirty Home Scientists. Printed products were displayed in both 2D (printed) and 3D form (exhibited) to depict the proper utility of the

product. The data generated regarding suitability of the prints and consumer preference were statistically analyzed by Weighted mean scores.

Scale	Rating
Excellent	5
Very Good	4
Good	3
Fair	2
Poor	1

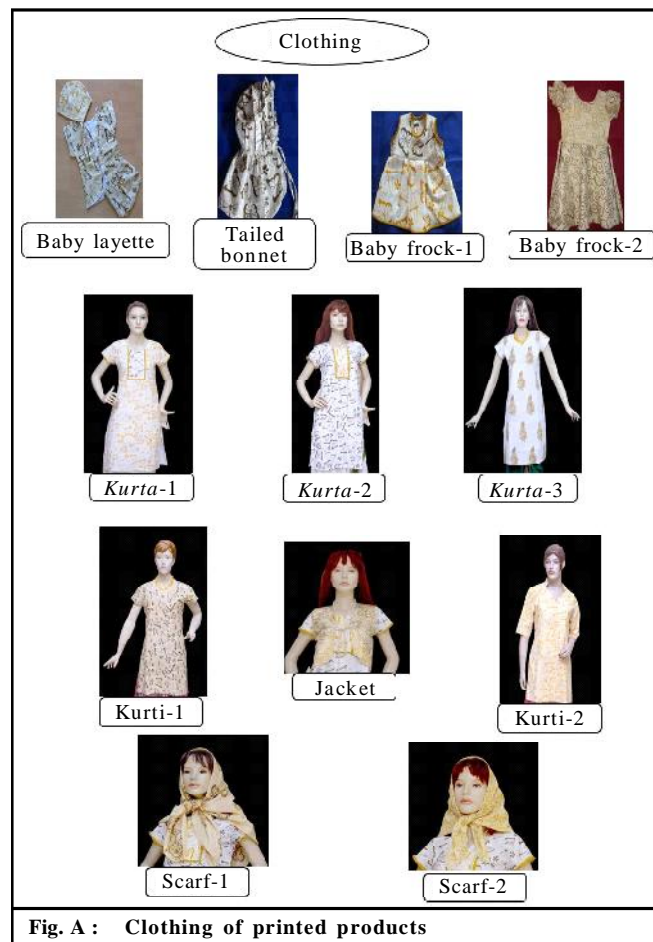


Fig. A : Clothing of printed products

The entities considered for assessment were suitability of motif for the product, arrangement of motifs, harmony between motif (size and shape) and product, suitability of print colour to the base, sharpness of the print and outline, suitability of printing technique for the product and overall appearance. Cost is one of the important features of any developed article. The actual cost of each product was worked out separately, including the cost of fabric, printing and labour charges



Fig. B : Home textile

involved in printing, stitching and 30 per cent profit.

### RESEARCH FINDINGS AND DISCUSSION

In order to give the information about naturally available sources and to explore the artisans for utilization of naturally available sources such as cassia gum in the printing paste to save our environment from the hazards causing due to use of synthetic dyes and gums. Hands on experience on printing using natural gum enhanced the confidence level in the artisans.

### Consumer acceptance for quality of natural products :

The preferences of the respondents for the prepared products on the basis of suitability of motif for the product, arrangement of motifs, harmony in the size and shape of motif and product, suitability of print colour to the base, sharpness of the print and outline, suitability of printing technique for the product and overall appearance have been presented in Table 1.

**Suitability of motif for the product :**

Based on the suitability of motif for the product, it was found that majority of the respondents preferred tailed bonnet constructed from screen printed cotton

material and divan set (block printed cotton material) with weighted mean score of 4.47, followed by bed spread with pillow covers (4.27) and *Kurta-3* and scarf-1 (screen printed silk material) with weighted mean score

Table 1 : Visual evaluation of printed products		(n=30)						
Products	Articles	Weighted Mean Score (WMS)						
		Suitability of motif for the product	Arrangement of motifs	Harmony between motif (size and shape) and product	Suitability of print colour to the base	Sharpness of the print and outline	Suitability of printing technique for the product	Overall appearance
Baby layette	Jabla	4.07	4.13	3.87	4.33	4.20	4.07	4.00
	Bonnet-1	3.93	3.87	3.73	3.33	3.60	3.60	3.87
	Nappy	3.53	3.33	3.33	3.60	3.40	3.20	3.47
Bonnet	Bonnet-2	4.47	3.87	3.93	3.93	4.33	4.07	4.13
Frocks	Frock-1	4.00	3.87	3.80	3.60	4.07	3.93	3.87
	Frock-2	3.67	3.53	3.53	3.47	3.13	3.53	3.33
<i>Kurtas</i>	<i>Kurta-1</i>	3.53	3.53	3.53	3.27	3.27	3.47	3.53
	<i>Kurta-2</i>	3.80	3.80	3.73	3.80	3.80	3.93	3.73
	<i>Kurta-3</i>	4.20	4.20	4.20	4.07	4.00	4.07	4.07
<i>Kurtis</i>	<i>Kurti-1</i>	3.47	3.67	3.60	3.60	3.53	3.33	3.53
	<i>Kurti-2</i>	3.53	3.27	2.93	3.13	3.00	3.20	3.07
Scarfs	Scarf-1	4.20	3.87	3.87	3.93	4.07	4.07	4.00
	Scarf-2	3.73	3.60	3.47	3.40	3.40	3.53	3.53
Jacket	Jacket	3.33	3.53	3.27	3.33	3.40	3.33	3.40
Home Textiles	Divan set	4.47	4.33	4.40	4.20	4.07	4.40	4.40
Textiles	Bed spread with pillow covers	4.27	4.20	4.27	4.27	4.33	4.33	4.00
	Table cloth	4.13	4.07	4.00	3.80	3.73	3.87	3.47

Table 2 : Consumer acceptance for cost of the printed products		(n=30)	
Products	Type	Cost of the product	WMS
Baby layette	Jabla	140.00	3.73
	Bonnet		
	Nappy		
Frocks	Tailed bonnet	70.00	3.20
	Frock-1	83.00	3.47
	Frock-2	557.00	2.53
<i>Kurtas</i>	<i>Kurta-1</i>	358.00	3.00
	<i>Kurta-2</i>	358.00	3.13
	<i>Kurta-3</i>	358.00	3.00
<i>Kurtis</i>	<i>Kurti-1</i>	358.00	2.87
	<i>Kurti-2</i>	436.00	2.47
Scarfs	Scarf-1	478.00	2.33
	Scarf-2	478.00	2.27
Jacket	Jacket	380.00	2.80
Home Textiles	Divan set	507.00	3.13
	Bed spread with pillow covers	416.00	3.40
	Table cloth	78.00	3.73

of 4.20.

#### **Arrangement of motifs :**

Highest weighted mean score was obtained for block printed cotton divan set (4.33), followed by *Kurta-3* (block printed cotton material) bed spread with pillow covers each (4.20) and jabla (4.13) on the basis of arrangement of motifs on the product.

#### **Harmony between motif (size and shape) and product :**

It was found that the divan set constructed from block printed cotton fabric got highest weighted mean score (4.40) for the harmony between motif (size and shape) and product due to the elegance of the design, followed by bed spread with pillow covers (4.27) and *Kurta-3* (4.20).

#### **Suitability of print colour to the base colour:**

Jabla made of screen printed cotton fabric was at top with high mean weighted score of 4.33 with respect to the suitability of print colour to the base colour followed by bed spread with pillow covers (4.27) and divan set (4.20) prepared from block printed cotton material.

#### **Sharpness of the print and outline :**

The screen printed cotton tailed bonnet and bed spread with pillow covers were rated high mean weighted score (4.33), followed by jabla (4.20), frock-1, screen printed silk scarf-1 and block printed cotton divan set (each 4.07) for the sharpness of the print and outline.

#### **Overall appearance:**

With regard to overall appearance of printed products, divan set constructed from cotton block printed material was rated highest with weighted mean score of 4.40, followed by tailed bonnet (4.13) and *Kurta-3* (4.07). Most of the respondents' preferred the divan set because of simple, light and cool colour combination of the motif to the product. The patterns provided a sort of cooling effect to eyes and mind which provides a healthy mood at bed time.

#### **Consumer acceptance for cost of the printed products :**

Table 3 depicts the cost acceptability of the printed products by the respondents. Cost of each product was

calculated separately based on the printed and lining material consumed, stitching charge and 30 per cent profit. Most of the respondents preferred baby layette consisting of jabla, bonnet and nappy and table cloth with highest weighted mean score (3.73) costs Rs. 140.00, followed by the frock-1 (2.53) costs Rs. 83.00 and bed spread with pillow covers (3.40) of Rs. 416.00. The least score was rated for the silk printed products as the cost of the silk material was high.

#### **Cost calculation of the printed products :**

In general, the cost of cotton printed material was Rs. 120/- per meter while that of silk printed material was Rs. 490/- per meter implying that the price range of silk material was higher than cotton material. The cost of the printed products was calculated including the cost of the fabric required, printing paste, mordant, lining material, stitching and labour charges with 30 per cent profit (Table 3). The cost of baby layette comprising of jabla, bonnet and nappy was Rs. 140.00, whereas the cost of tailed bonnet was Rs.70.00. The cost of frock-1 prepared from cotton material was Rs. 83.00 whereas, the frock-2 constructed from silk material was Rs. 557.00. *Kurtas* (*Kurta-1*, *Kurta-2* and *Kurta-3*) and *Kurti-1* costs Rs. 358.00 whereas, the cost of the silk scarf-1 and scarf-2 was Rs. 478.00 and the jacket of silk material costs Rs. 380.00. The cost of the home textiles constructed from cotton fabric was found to be Rs. 507.00 for divan set, Rs. 416.00 for bed spread with pillow covers and Rs. 78.00 for table cloth.

#### **Conclusion :**

Results revealed that all the entire developed products printed by using natural gums were preferred and highly appreciated by the respondents. Divan set made from block printed cotton white fabric was preferred by most of the respondents for its harmony between motif (size and shape) and product, suitability of motif and printing technique for the product and overall appearance. Tailed bonnet was preferred because of suitability of motif for the product, jabla for its suitability of print colour to the base and bed spread with pillow covers for its sharpness of the print and outline. Quoted price of the products developed from natural printed material was found to be adequate with a profit margin. Block printed cotton baby layette and table cloth were found to be economically acceptable by respondents.

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## ■ REFERENCES

**Arora, S. (2016).** Effect of printing on physical properties of muga silk fabric with reactive and acid dyes. *Internat. J. Home Sci.*, **2**(3): 20-23.

**Babel, S. and Gupta, R. (2013).** Block printing with dye concentrate of butea monosperma flowers with gum extracted from waste mango kernel and cassia tora seeds on cotton fabric. *Internat. J. Sci. & Res.*, **4** (4) : 357-360.

**Babel, S., Upadhyay, H. and Gupta, R. (2015).** Optimization of thickening agent based on tamarind seed gum for printing of cotton and its impact on physical parameters. *Internat. J. Fiber & Textile Res.*, **5**(1): 5-8.

**Chavan, R.B. (1995).** Revival of natural dyes—a word of caution to environmentalists. *Colourage*, **42** (4): 27-30.

**Dayal, R. and Dobhal, P.C. (2001).** Natural dye from some Indian plants. *Colourage*, **48** (8) : 33-38.

**Gohl, E.P.G. and Vilensky, L.D. (2005).** Textile Science - An explanation of fibre properties, second ed. CBS Publishers and Distributors Pvt. Ltd., New Delhi, India.

**Hakeim, O.A., Abou-Okil, A., Abdou, L.A.W. and Waly, A. (2005).** The influence of chitosan and some of its depolymerized grades on natural colour printing. *J. Appl. Polymer Sci.*, **97** (2): 559-563.

**Mishra, S.P. (2000).** A text book of fibre science and technology. New Age International Publishers, New Delhi, pp. 2.

**Nagia, F.A. and EL-Mohamedy, R. (2007).** Dyeing of wool with natural anthraquinone dyes from *Fusarium oxysporum*. *Dyes & Pigments*, **75** (3): 550-555.

**Rekaby, M., Salem, A.A. and Nassar, S.H. (2009).** Eco-friendly printing of natural fabrics using natural dyes from alkanet and rhubarb. *J. The Textile Institute*, **100** (6): 486-495.

**Robertson, S.M. (1973).** *Dyes from Plants*, 1<sup>st</sup> Ed. Van Nostrand Reinhold, New York.

**Yadav, S. and Gaba, G. (2016).** Mango kernel starch - A natural thickener for screen printing on silk with kachnar bark dye. *Global J. Res. Analysis*, **5** (9): 159 – 161.

**Yadav, S., Gaba, G. and Jeet Singh, S.S. (2016).** Eco friendly printing of cotton with *Kachnar* bark dye. *Asian J. Home Sci.*, **11**(1): 106-110.

**Yi, E. and Cho, J. (2008).** Color analysis of natural colorant-dyed fabrics. *Colour Res. & Application*, **23** (2): 148-160.

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