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Research Paper

Appraisal of eco friendly products developed by natural fabric printed with natural dyes and natural thickener

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■ **ABSTRACT :** Natural dyes and natural thickening agents appear to be ideal choice. This is because natural dyes and thickening agents have better biodegradability and higher compatibility with environment. The block and screen printed silk and cotton fabric using indigo dye with starch extracted from Mango kernel seed has been carried out. To explore the acceptability of Eco friendly printed products, for this purpose Block and screen printed products like stole, table cover, bed sheet, scarf, duppatta, *Saree* border, necktie, magazine holder and letter holder were hand printed using natural starch obtained by Mango kernel and natural dye concentrate. Opinion of thirty respondents was obtained. Results revealed that all the printed products were liked by all the respondents. All the respondents were willing to purchase the products.

■ **KEY WORDS:** Natural fabric, Natural printing, Natural thickening agent, Eco friendly product, Acceptability of natural printed products

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India has a very rich tradition of using natural dyes and it has been renowned for its printed and dyed textile since 12th century and the craft flourished as the fabric received royal patronage. Natural dyeing and printing is a technique to dye and print the textile fabrics with the colours extracted from natural sources like plants (flower, stem, bark, seed etc.) animal, minerals etc. Natural dyes are commonly used for textile industries, due to their harmless effect. Natural dyes work on cotton silk and wool etc. their colour is stable and eco friendly because of no irritating effects on human skin. The use of non allergic, non toxic and eco friendly natural dyes on textiles has become a matter of significant importance due to the increased environmental awareness. Textile industry consumes large amount of water and chemicals for processing and dyeing of fabric. The toxic nature of synthetic dyes and finishes creates more problems to the textile processing industries. Recently, a number of commercial dyer and small textile export houses have started looking at the possibilities of using natural dyes for regular basis dyeing and printing of textile to overcome environmental pollution caused by the synthetic dyes. On the other hand synthetic dyes are widely available at an economical price and produce a wide variety of colours these dyes however produce skin allergy, toxic wastes and other harm to human body.

Each printing method requires a paste or thickening agent with special characteristics frequently referred to as the flow characteristics. The types of thickening agent are quite diverse. Various starch based thickening agent

such as modified starch, CMC, PVA, Sodium alginates are commonly used. Alginates of different salts can be universally used in all different dye stuff but they are more expensive and the dye stuff yield is too low. CMC is also used rarely in textile printing as it is very expensive. Increase demand, high price, scarceness of natural thickeners stimulates the search of locally available materials *i.e.*, suitable to be used as an alternative to the traditional thickeners. The synthetic thickening agents used are generally extremely high-molecular weight polymers capable of developing a very high viscosity at a relatively low concentration. However, the paste or thickening agents are difficult to dispose off as it creates sedimentation in the water during its waste disposal. 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 revival of interest in the non toxic eco friendly colouring materials. A number of studies have been already conducted on extracting colour from natural dye sources like flowers, barks, fruits etc. which can be effectively used for dyeing of textile substrate.

Mango (*Mangifera indica* L.) is one of the most favoured and commercially valuable fruit growing throughout the tropics and is used in a variety of food products. Considerable amounts of mango kernels (seeds) are discarded as waste after industrial processing of mangoes (Puravankara *et al*., 2000). Depending on the variety, mango kernels contain 6.0 per cent protein, 11 per cent fat, 77 per cent carbohydrate, 2.0 per cent crude fibre and 2.0 per cent ash, based on the dry weight average.

For successful commercial use of natural dyes, the appropriate and standardized printing techniques need to be adopted without scarifying required quality of printed textiles materials. Therefore, to obtain newer shades with acceptable colour fastness behaviour and reproducible colour yield, appropriate scientific techniques or procedures need to be derived from scientific studies on preparation of printing paste, printing process variables, printing kinetics, compatibility of natural dyes with natural thickening agent. Eco friendly substance as alternative to toxic synthetic dyes, chemicals and thickening agents is upmost priority for the researchers and industrialists.

The growing demand for eco friendly and sustainable products is playing an important role in promoting use of natural dyes and thickening agents. In the present study fabric were printed by block and screen printing technique using natural dye and natural thickening agent. And printed fabric further processed into value added, home furnishing and apparel products and assess their suitability at various parameters. The objective of present study is to find out the acceptability of eco-friendly prints using natural thickening agent and natural dyes by the consumers.

■ RESEARCH METHODS

In present study the printing (block and screen) was done using Indigo as dye source and mango kernel starch as thickening agent to develop various value added products. Cotton or silk was purchased by market. Scouring was done in order to remove the impurities from the fabric. Cotton fabric was boiled for 45 min. in a solution containing 2 g of nonionic detergent and one g of NaOH per litre of water. After this by kneading and squeezing the samples were rinsed in tap water and sun dried.

Fabric was treated with harda keeping the material to liquor ratio 1:30. Treated fabric was dried and side exposed to sun was used as front side of fabric.

	English name	Botanical name
Fabric used	Cotton and silk	
Dyes used	Indigo dyes	*Indigofera tinctoria*
Thickener used	Mango Kernel	*Mangifera indica*
Printing techniques	Block and screen printing	

Preparation of printing paste:

Dye concentration - 5 g

Mango kernel starch - 2.5 g

Mordant- Copper sulphate and Ferrous sulphate

Water- 70-90 ml

Mango kernel starch was dissolved in 10 ml of lukewarm water. The mixture was kept undisturbed for 15 minute. The selected mordant was mixed in 5 ml. lukewarm water. All the ingredients were mixed with constant stirring. The remaining water was added and boiled the mixture till the required thickness is obtained.

Printing of fabric:

Silk and cotton fabric pre treated with Harda was used for printing. Colour trays and printing tables were prepared and pre treated fabric was spread on the

printing table. The printing paste was applied on the fabric through block and screen printing techniques.

All the printing paste was applied to the fabric through screen printing technique. The printing process consist of forcing a various print paste through the open areas of the screen with a flexible, synthetic rubber, squeegee. The rubber blade, which is contained in a wooden or metal support, is drawn steadily across the screen at a constant angle and pressure. The pressures exerted must be as similar as possible.

For block printing the wooden block was first pressed on to the ready colour tray and then pressed it firmly on the marked area on the fabric with even pressure. Hold for a few seconds and carefully removed. It was pressed properly with the wooden mallet with a knock to transfer the colour. For printing more than one colour separate colour tray was prepared. The process of printing was repeated at predefined placement, till the whole length of fabric was printed. After printing the fabric was dried in the sunlight for few hours.

The printed samples were given after treatments with alum to improve colour fastness. Fixation was done by steaming at 125° for 30 minute or once dried; the fabric is rolled in newspapers and steamed in special boilers. After steaming, the fabric is washed, dried in the sun again. After drying iron the printed sample with iron on the reverse side for proper fixation of colour. Each of these steps contributes to fixing.

Value added products Table 1 cover, *Dupptta*, Scarf, Wall hanging, Stole, Purse, Table mates and *Saree* border were made. Proper finishing was given to each value added product. For acceptability assessment thirty respondents were selected randomly who were using natural dyed and printed products. Acceptability percentage was calculated by following formula :

Acceptability per cent:

Acceptability was calculated using following formula

$$\text{Acceptability per cent } Z \frac{\text{Total scores of each value added article}}{\text{Maximum score obtained}} \text{ x } 100$$

Total score:

Total score of each article = sum of score of suitability of design arrangement according to product, size and shape of motifs in relation to the size and shape of product, sharpness of printed outlines and workmanship and finishing of the product.

Maximum score obtained:

It was found 600 in case when 30 respondents gave a scoree of 5, in all 4 parameters of each article (5 x 4 x 30=600) and 150 was minimum possible score in five parameter of judgment.

■ RESEARCH FINDINGS AND DISCUSSION

Developed value added products Table cover, *Dupptta*, Scarf, Wall hanging, Stole, Purse, Table mates and *Saree* border were displayed in AICRP- LAB. The developed printed products were evaluated by 30 consumers using 5 point rating scale [ranging from most preferred (5) to least preferred (1)] on following parameters:

– Suitability of design arrangement according to product.

– Size and shape of motifs in relation to the size and shape of products.

– Sharpness of printed outlines.

– Workmanship of finishing of the product.

Table 1 : Evaluation of value added articles

Sr. No.	Criteria of evaluation articles	Suitability of design arrangement according to product(%)	Size and shape of motifs in relation to the size and shape of product (%)	Sharpness of printed outlines %	Workmanship and finishing of the product (%)
1.	Bed sheet	94.66	96.00	84.00	96.66
2.	*Dupptta*	92.66	92.00	86.00	86.66
3.	Purse	85.33	92.00	84.00	82.66
4.	*Saree* border	80.00	81.33	76.66	74.66
5.	Scarf	92.00	92.00	84.00	86.66
6.	Stole	83.33	85.33	92.00	84.00
7.	Table cover	95.33	93.33	96.00	92.66
8.	Table mates	82.00	85.33	77.33	76.66
9.	Wall hanging	93.33	87.330	90.00	81.33

Table 2 : Acceptability scores and percentage of printed products

Sr. No.	Value added products	Total scores	Per cent	Rank
1.	Table cover	566	94.33	1st
2.	Bed sheet	557	92.83	2nd
3.	*Dupptta*	536	89.33	3rd
4.	Scarf	532	88.66	4th
5.	Wall hanging	528	88.00	5th
6.	Stole	517	86.16	6th
7.	Purse	516	86.00	7th
8.	Table mates	482	80.33	8th
9.	Sari border	469	78.16	9th

The responses derived by respondent for each product are presented in table. Table 1 shows that suitability of design arrangement according to product was most liked and accepted by consumers. Shape and size of the selected design was perfect according to size and shape of the products. In term of sharpness of printed outlines all products (Bed sheet, *Dupptta*, *Saree* border, Scarf, Stole, Table covers, Table mates or Wall hanging) were less preferred by the consumer due to large particles of natural thickening agent. In term of workmanship and finishing of the product again all printed products were highly acceptable.

Gaba (2005) in an exploratory research on design development from the sculptures of *Chaturmukhi* Jain temple of "Ranakpur". The researcher has simulated textile prints from sculptural designs and the developed designs were applied on *Dupatta*, tops and bed sheets through screen printing techniques. All the printed articles had acceptability of 80 per cent and above.

It is clear from Table 2 that these printed products were highly preferred by consumers. Researcher was curious to find out which product got 1st rank. It was interested to record that Table cover got maximum scores *i.e.* 566 out of 600 scores. Bed sheet and *Duppatta* got 2nd and 3rd ranks with the score 557 and 536 out of 600 scores. So it is inferred that products developed by using natural dye and natural thickening agent was liked by the most of consumers.

Yadav (2010) conducted a study on "Value addition of Kota *Doria Saree* through block printing and machine embroidery" in which embroidery and block printing motifs were collected by the researcher and twenty *Saree* designs were developed to select the best five placements for development of value added *Saree*. A five point rating scale and a questionnaire were given to thirty respondents to find out the acceptability and market potential of the developed *Saree*. The developed and modified designs were highly appreciated by the respondents and consumers as shown by the higher acceptability (above 70% for each *Saree*).

Conclusion:

All the developed products shows excellent results in subjective evaluation in term of various parameters in term of suitability of design and size and shape of motifs according to product, sharpness of printed outline and finishing and workmanship of the products was found good. Natural dye and natural thickeners can be easily used by the block and screen printing workers at small scale cottage industries. Developing value added products by ecofriendly printed fabric can attract more consumers and will help to conserve the environment.

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