

Acceptability of Khadi Fabric Dyed With Antibacterial and Antifungal Natural Dye

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Abstract

*With an increasing awareness of environmental pollution and health hazards associated with synthesis, processing and use of synthetic dyes, there is a worldwide interest in natural dyes for textiles. Nowadays, demand for natural dyes has been growing rapidly due to increased awareness on hazardous, toxic and allergic reactions associated with synthetic dyes. In the present study evaluated the acceptability of Khadi fabric dyed with antibacterial and antifungal natural dye. In this study eight dye (Toon, Gular, Bargad, Jamun bark and Shisham, Mehndi, Guava, Ashok leaves) were selected to extraction the dye. After extraction the dye Khadi fabric was dyed with natural dye. Dye sample colour properties were tested and then construct the garment (Hanky, Sameej and Scarf) for test the acceptability of natural dyed Khadi fabric. 640 responses were used for the study. Natural dyed Khadi fabrics were sell the customer to check the visual evaluation. The questionnaires were used to collect data after using the Khadi dyed fabric. After collected the data we analysis the data and we found that result was good. Hypothesis was tested at 0.05 level of significance using 't' test. We found that all samples were accepted as a good quality of dye. The 't' test were significant at 0.05 level of significance. The dye sample was accepted by the customer for their different quality like durability, skin friendly, and anti allergic, pleasant in looking, wearable. **Keywords:** Natural dye, bark, leaves, Khadi fabric, Antibacterial activity, Antifungal activity, colour fastness, acceptability.*

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Introduction

Natural dyes were used instead of synthetic dyes due to environmental conditions. Natural dyes are very important for textiles as well as to replace synthetic dyes, because of non-polluting, non-carcinogenic and eco-friendly. As synthetic dyes are causing water pollution and waste disposal problems, so they are broadly disparaged in the world. Natural dyes are environmental friendly, biodegradable and non-toxic. They are attracting the awareness of people.¹

Recently, most of the commercial dyers and textile export houses have started re-looking to the maximum possibilities of using natural dyes for dyeing and printing of different textiles for targeting niche market. Natural dyes produce very uncommon, soothing and soft shades as compared to synthetic dyes.² On the other hand, synthetic dyes, which are widely available at an economical price and produce a wide variety of colors, sometimes causes skin allergy and other harmfulness to human body, produces toxicity/chemical hazards during its synthesis, releases undesirable, hazardous, toxic chemicals etc.³

For successful commercial use of natural dyes for any particular fibres, the appropriate and standardized techniques for dyeing for that particular fibre natural dye system need to be adopted. Therefore to obtain newer shade with acceptable colour fastness behaviour and reproducible colour yield, appropriate scientific dyeing techniques/procedures are to be derived. Thus, relevant scientific studies and its output on standardization of dyeing 30 Natural Dyes methods, dyeing process variables, dyeing kinetics and test of compatibility of selective natural dyes have become very important, however the information on which is insufficient.⁴

Environmental regulations are becoming stricter the world over and the complex technologies are shifting towards the less technological intricacies. Among other chemical industries, textile industry is regarded as the most polluting, due to water pollution caused by effluents. During the usage of most of these chemical dyes, toxic chemicals are released, like carcinogenic amines and mutagens in Azo dyes, heavy metals etc.⁵ Mostly these chemical dyes are used in dyeing of carpets, leather, coloring food items, drugs, cosmetics, paints, holi colours and the textiles. Many of such chemical dyes and intermediates are harmful to human health and environment. Because of all this ecological issues are becoming important factors in the consumer goods, including textiles.⁶ In this context, ban on certain chemicals is enforced under eco-norms by Germany, Holland, Turkey, France and India.⁷ The European Union is preparing to ban around 300 textile dyes containing chemicals known to increase the risk of cancer. Thus the textile industries have to start using

alternate dyes for the manufacture of eco-friendly textiles. This led to the urgent need to explore and realize the importance of eco-friendly, biodegradable natural dyes and the traditional technologies to use natural auxiliaries for dyeing and printing.⁸ The present research deals about the natural dye obtained from the bark (Toon, Gular, Bargad and Jamun) and leaves (Shisham, Mehndi, Guava and Ashok).

In the present work, the bark ((Toon, Gular, Bargad and Jamun) and leaves (Shisham, Mehndi, Guava and Ashok) were used for the extraction of dye, dyeing of the selected fabrics at optimized conditions and evaluate the antimicrobial properties of dye extract and the colour fastness of the dyed sample. After extraction the dye Khadi fabric was dyed with natural dye. Dye sample colour properties were tested and then construct the garment (Hanky, Sameej and Scarf) for test the acceptability of natural dyed Khadi fabric and collect the data and analysis the acceptability of collected data.

Materials And Methods

Materials

Source

The bark ((Toon, Gular, Bargad and Jamun) and leaves (Shisham, Mehndi, Guava and Ashok) collected.

Experimental Methods

Dye Extraction

The clean air dried barks and leaves were chopped into small pieces and coarsely ground using electric grinder. Aqueous medium was prepared in 300 ml of water without using chemicals and maintained the pH 6 separately 30gm of dyestuff was added and the dye was extracted for 90 min. at 90 æ% C the solution was filtered.

Test solutions of natural dye

Test solution of a series of concentrations viz. 20, 50, 100, 250, 400 mg/ml were prepared by dissolving natural dye obtained from different leaves and barks in aqueous medium.

Antibacterial screening test

Antifungal screening test

Collection of fabric for dyeing

Preparatory process of the fabric dyeing

Scouring (ECE phosphate detergent) was done to prepare the fabric for dyeing.

Preparation of final fabric

Solution containing 0.5 ml mild detergent per hundred ml of water was prepared and heated at 50°C temperature. These fabrics were dipped into solution & stirred gently for about 30 minutes. Then it was rinsed under tap water till free from trace of detergent.

Optimization of time & temperature for fabric dyeing

A series of following experiments was conducted to determine the dyeing time and dyeing temperature:-

Dyeing time

To optimize the dyeing time 3 options were considered i.e., 45, 60, 90 minutes. 90 minutes was found best results and this was selected for the study.

Dyeing temperature

To optimize the dyeing temperature 3 options were 45, 60, and 80 temperature. 80°C temperature was found best results and this was selected for the study.

Identification and naming of obtained colours

Test the properties of Khadi fabric prior to dyeing (physical properties)

Measurement of colour strength (K/S Value)

Test the properties (fastness) of dyed Khadi fabric

To construct the naturally dyed Khadi fabric garments and study for customer acceptability

Garment construction procedure

The present study was taken up during the year 2018-2019.

Selection of raw materials

Khadi fabric was selected to prepare the garments (Hanky, Saree and Scarf).

Collection of raw materials

Khadi fabric was purchased from KHADI BHAWAN, Saharanpur.

Equipment used

For the development of clothing for dye many type of equipment used. There were sewing machine, picko machine and embroidery machine.

Material used

Some helping material like scissors, inch tape, thread reel, Milton chalk were used in the preparation of clothing. Embroidery has the great importance in beautification of the hanky. Picko and cotton laces were used for giving the final touch and embroidery to the hanky for embellishment.

Sketching the garment

Based on the skin touch fabric feature three garment (Hanky, Sameej, Scarf) sketching was prepared.

Drafting the garment

Garment drafting was prepared for construction the garment. Drafting was an easy method to construct the garment. Drafting save the time and fabric.

Construct (development) the garment

Three different type of clothing were developed for dyeing in which Hanky, Sameej and Scarf were prepared with keeping in mind that the garment are use on the direct skin and after dye the garment evaluate the skin allergic properties.

Dye the constructed Khadi fabric

After construct the garment, All garment were dyed with antibacterial and antifungal dye. Dye the garment than garment dried in air and ironed.

Dye the constructed Khadi fabric

Dye, picko, embroidery and other construction expenses included in cost of each garment and create the cost label.

Sample sell procedure

Selection of the study area

Locate the study

This study was conducted in Saharanpur and Haridwar. The two places were purposively selected increase the awareness of antibacterial and antifungal dye. The researcher accessibility and safety to area were the other factor kept in mind while selecting the locale.

Sampling Method

Sample Design

In Haridwar and Saharanpur, 3 main garment for customer so purposive sampling was used in the study to collect the data from group of Haridwar and Saharanpur city. Every groups were helped in collection of data. Address of customer was collected from every group customer.

Sample size

Total 640 samples sizes was taken for this study. Three type of samples (garment) were selected, these are as follow:- (a) Working persons (b) Non-Working persons (c) Shopkeepers (d) Teen agers groups (e) Fourth class (d) Bussiness group

Tool used for data collection

Observation cum questionnaire method and opinion schedule was used to

collect data and information. A well structured questionnaire was developed to collect the data related to the customer general information, visual evaluation and assessment of the Khadi fabric dyed with anti-bacterial and anti-fungal dye.

Statistical Analysis

Collection of data

We collect the data to sell the sample to the customer and take the information related to the customer and dyed anti bacterial and anti fungal dye.

Tabulation of data

Tabulate the data basis of questionnaire information which take the customer during sell the sample to the customer.

Interpretation of data

Interpretation the data basis of questionnaire information which take the customer during sell the sample to the customer.

Results and Discussion

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads:-

Assessment of acceptability of Khadi fabric dyed with Toon antibacterial and antifungal natural dye

Sr. no.	1. Toon dyed Khadi fabric						
1.	Statistical value point	Durability	Skin friendly	Anti allergic	Pleasant looking	Wearable	Over all
2.	Total Marks	782	800	800	461	789	3,632
3.	Average	9.77	10	10	5.76	9.8	45.04
4.	Percentage	97.75	100	100	57.68	98.62	90.8
5.	Mean	726.4					
6.	S.D.	148.56					
7.	't'	0.83					
8.	df	4					
9.	p	<0.05					

Above table 3.1 explain that Toon dyed Khadi fabric got good marks in skin friendly and anti allergic aspect comparison of other as aspect and 't' value are significant at 5% ($p < 0.05$) level.

Assessment of acceptability of Khadi fabric dyed with Gular antibacterial and antifungal natural dye

Sr. no.	1. Gular dyed Khadi fabric						
1.	Statistical value point	Durability	Skin friendly	Anti allergic	Pleasant looking	Wearable	Over all
2.	Total Marks	794	800	800	479	799	3,672
3.	Average	9.92	10	10	5.98	9.98	45.90
4.	Percentage	99.25	100	100	59.87	99.8	91.8
5.	Mean	734.4					
6.	S.D.	142.79					
7.	't'	0.93					
8.	df	4					
9.	p	<0.05					

Above table 3.2 explain that Gular dyed Khadi fabric got good marks in Skin friendly and Anti allergic aspect comparison of other as aspect and 't' value are significant at 5% ($p < 0.05$) level.

Assessment of acceptability of Khadi fabric dyed with Bargad antibacterial and antifungal natural dye

Sr. no.	2. Bargad dyed Khadi fabric						
1.	Statistical value point	Durability	Skin friendly	Anti allergic	Pleasant looking	Wearable	Over all
2.	Total Marks	795	800	800	483	800	3,678
3.	Average	9.33	10	10	6.03	10	45.97
4.	Percentage	99.3	100	100	60.37	100	91.95
5.	Mean	735.6					
6.	S.D.	70.61					
7.	't'	1.88					
8.	df	4					
9.	p	<0.05					

Above table 3.3 explain that Toon dyed Khadi fabric got good marks in texture aspect comparison of other as aspect and 't' value are significant at 5% ($p < 0.05$) level.

Assessment of acceptability of Khadi fabric dyed with Jamun antibacterial and antifungal natural dye

Sr. no.	1. Jamun dyed Khadi fabric						
1.	Statistical value point	Durability	Skin friendly	Anti allergic	Pleasant looking	Wearable	Overall
2.	Total Marks	793	800	800	468	799	3,660
3.	Average	9.91	10	10	5.85	9.98	45.75
4.	Percentage	99.12	100	100	58.5	99.8	91.5
5.	Mean	732					
6.	S.D.	147.60					
7.	't'	0.92					
8.	df	4					
9.	p	<0.05					

Above table 3.4 explain that Jamun dyed Khadi fabric got good marks in Skin friendly and Anti allergic aspect comparison of other as aspect and 't' value are significant at 5% ($p < 0.05$) level.

Assessment of acceptability of Khadi fabric dyed with Shisham antibacterial and antifungal natural dye

Sr. no.	2. Shisham dyed Khadi fabric						
1.	Statistical value point	Durability	Skin friendly	Anti allergic	Pleasant looking	Wearable	Overall
2.	Total Marks	795	800	800	480	795	3,670
3.	Average	9.69	10	10	6	9.93	45.97
4.	Percentage	99.3	100	100	60	99.37	91.75
5.	Mean	734					
6.	S.D.	142.012					
7.	't'	0.96					
8.	df	4					
9.	p	<0.05					

Above table 3.5 explain that Shisham dyed Khadi fabric got good marks in Skin friendly and Anti allergic aspect comparison of other as aspect and 't' value are significant at 5% ($p < 0.05$) level.

Assessment of acceptability of Khadi fabric dyed with Mehndi antibacterial and antifungal natural dye

Sr. no.	1. Jamun dyed Khadi fabric						
1.	Statistical value point	Durability	Skin friendly	Anti allergic	Pleasant looking	Wearable	Over all
2.	Total Marks	793	800	800	468	799	3,660
3.	Average	9.91	10	10	5.85	9.98	45.75
4.	Percentage	99.12	100	100	58.5	99.8	91.5
5.	Mean	732					
6.	S.D.	147.60					
7.	't'	0.92					
8.	df	4					
9.	p	<0.05					

Above table 3.6 explain that Mehndi dyed Khadi fabric got good marks in Skin friendly and Anti allergic aspect comparison of other as aspect and 't' value are significant at 5% ($p < 0.05$) level.

Assessment of acceptability of Khadi fabric dyed with Guava antibacterial and antifungal natural dye

Sr. no.	2. Shisham dyed Khadi fabric						
1.	Statistical value point	Durability	Skin friendly	Anti allergic	Pleasant looking	Wearable	Over all
2.	Total Marks	795	800	800	480	795	3,670
3.	Average	9.69	10	10	6	9.93	45.97
4.	Percentage	99.3	100	100	60	99.37	91.75
5.	Mean	734					
6.	S.D.	142.012					
7.	't'	0.96					
8.	df	4					
9.	p	<0.05					

Above table 3.7 explain that Guava dyed Khadi fabric got good marks in Skin friendly and Anti allergic aspect comparison of other as aspect and 't' value are significant at 5% ($p < 0.05$) level.

Assessment of acceptability of Khadi fabric dyed with Ashok antibacterial and antifungal natural dye

Sr. no.	1. Ashok dyed Khadi fabric						
1.	Statistical value point	Durability	Skin friendly	Anti allergic	Pleasant looking	Wearable	Over all
2.	Total Marks	783	800	800	477	793	3,653
3.	Average	9.78	10	10	5.96	9.91	45.66
4.	Percentage	97.87	100	100	59.62	99.12	91.3
5.	Mean	730.6					
6.	S.D.	141.93					
7.	't'	0.82					
8.	df	4					
9.	p	<0.05					

Above table 3.8 explain that Ashok dyed Khadi fabric got good marks in Skin friendly and Anti allergic aspect comparison of other as aspect and 't' value are significant at 5% ($p < 0.05$) level.

It was found from the collected data that 640 customer were selected randomly for the assessment of acceptability of naturally dyed Khadi fabric. We found that **Bargad barkdye (45.97)** got **overall** highest average value for Khadi fabric dyed with antibacterial and antifungal natural dye. **Bargad bark dye (9.93)** got higher average value about the **durability** for Khadi for Khadi fabric dyed with antibacterial and antifungal natural dye. **All bark and leaves dye (10)** got higher average value about the **skin friendly** for Khadi for Khadi fabric dyed with antibacterial and antifungal natural dye. **All bark and leaves dye (10)** got higher average value about the **anti-allergic** for Khadi for Khadi fabric dyed with antibacterial and antifungal natural dye. **Bargad Bark dye (6.03)** got higher average value about the **Pleasant looking** for Khadi for Khadi fabric dyed with antibacterial and antifungal natural dye. **Bargad Bark dye (10)** got higher average value about the **wearable** for Khadi for Khadi fabric dyed with antibacterial and antifungal natural dye. Further analysis of data from the result table reveals that mean value, S.D., 't' and df value of all dyed khadi sample are significant at 5% ($p < 0.05$) level.

Conclusion

It has been found that the required scientific studies and systematic reports on dyeing of textile with eco-friendly natural dyes are still insufficient. There are lots of unharnessed natural products. The present excessive use of synthetic dyes,

estimated at around 10,000,000 tons per annum, the production and application of which release vast amount of waste and unfixed colourant causing serious health hazard. Nowadays, fortunately, there is increasing awareness among people towards the use of eco-friendly natural dyes owing to their better biodegradability and higher compatibility with the environment. It was found that different dark and light colour were obtained from materials dyed with different natural dyes. Different natural dye has different antibacterial and antifungal activity. In this study it was observed in dyeing experiment concluded that weld, from which light colour tones are obtained, had the best value in terms of different fastness tests. It was conducted that the dyes gave best results. There was good acceptability of fabric. It can be seen that level of acceptability of dyes in different aspect showed significant results.

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