



IN-SITU FINISHING OF COTTON FABRIC

ANTI MICROBIAL EFFECT FROM NATURAL SUBSTANCES

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Abstract:

In the textile wet processing industry, finishing plays a vital role for quality and value. A garment which has undergone any finishing treatment will enjoy a high commercial value in the globalized market. Finishing is the special or added feature to a garment during processing which enhances the final usage of the same. In the abundance of various finishes, importance is given to Anti-Microbial Finish since people take much care about health and hygiene.

Even though Finishing is important, it consumes more time and resources when it is done separately. Hence in this project "IN-SITU FINISHING ON COTTON FABRIC" It was decided to combine two finishes in a single bath in order to reduce the time consumption and resources without sacrificing the effect of finishing. Direct dye which has wide application in dyeing is comparatively cheap and easily available dye. But it lacks behind its fastness properties

Based on these considerations, in this work Anti-Microbial finish is imparted on the cotton fabric. The natural sources such as Neem, Turmeric and Aloe vera considered to be anti microbial agents are added to the direct dye bath which is in the extract form in order to enhance the fastness property of the direct dye and impart Anti-Microbial effect on the fabric. The ingredients used are eco-friendly, easily available and give good effect to human skin. These fabrics with anti-microbial finished effect can be used for the production of many valuable garments such as medicinal purpose, baby garments, undergarments etc.

Index Terms – Combined process, Natural Substances.

I. INTRODUCTION

In the present era, the textile industry has achieved a tremendous growth to contribute the national economy. The Indian textile industry has a significant presence in the world textile economy by virtue of its contribution to world textile capacity and production of textile, India has the highest Loom age in the world of about 57%. The consumption of time, water and resources in a textile industry upon the processing operation employed during the conversion of fibre to textile fabric.

Today in the eco-friendly environment, it has become very important for human beings to live in a world of hygiene and freshness. So finishing is given much importance in the wet processing industry. Finishing is the final aspect of the clothing and textile which gives additional value to it and the consumption of time and resources are high in the processing industry.

Clothing and Textiles are carriers of micro-organisms such as pathogenic bacteria, odour- generating bacteria and mould, fungi. These micro-organisms may cause problems to wearers or users of textile materials. Due to growing demand for comfort, clean and hygienic textile goods, there arises a necessity to give suitable treatment on textiles in general and particular. Anti-microbial fabrics have gained significant importance in the recent years due to their wide acceptance in medicinal field and for baby clothing.

In order to meet all the situations, in this project study, it is tried to combine two processes in a single bath, namely direct dyeing and Anti-Microbial finishing. It is carried out by treating the cotton fabric in the direct dye bath with the natural resources such as Turmeric, Neem and Aloe vera by the techniques such as;

- Exhaust method and
- Pat-Dry-Cure method

The microbial finish is imparted on cotton fabric for

- Protection of the wearer or user of a textile material against microorganisms
- Protection of the Textiles itself from bio-deterioration
- Protection of textiles from insects and other pests
- The Natural sources combined with direct die are
- Non-Toxic
- An excellent absorbtive
- Exhibits anti-odour
- Eliminates odour caused by human sweat on cloth
- Durable protection of wide variety of substrates against microorganisms

This project work comprises of the test samples & photographs which are shown in Results and Discussions are on quantitative evaluations of microbes, using parallel streak method in the laboratory

EXPERIMENTAL

3.1 Materials

In this project work 100% plain cotton fabric was used with the following specifications.

FABRIC CONSTRUCTION	PLAIN WEAVE
Ends / Inch	98
Picks / Inch	123
Fabric Weight (GSM)	102

3.1.1 Dye Used

Direct Dye

1. Direct turquoise blue
2. Direct green
3. Direct golden yellow of commercial grade

3.1.2 Ingredients Used

- Turmeric – Extract
- Neem – Extract
- Aloe Vera – Extract
- Sodium Chloride – Exhausting Agent
- Hydrogen Peroxide – Bleaching Agent
- Sodium Carbonate – Alkali
- Sodium Hydroxide – Alkali

3.1.3 Instruments

- Crock meter
- Spectronic spectro photo meter
- Bacterial culture plate
- Padding mangle

3.2 METHODS

3.2.1 Pretreatments

The grey woven cotton fabric was subjected to various pre-treatments such as:

- Desizing
- Scouring
- Bleaching

a) Desizing

Desizing is done to remove the added size ingredients from the cotton materials.

Recipe for Desizing

Material weight : X g
 HCl / H₂SO₄ : 10 g/l
 MLR : 1:20
 Temperature : 50° C
 Time : 1 hour

b) Scouring

This is done to remove natural as well as added impurities essentially of water repellent character as completely as possible and make the cotton material highly absorbent without damaging it.

Recipe for Scouring

Material weight : X g
 NaOH : 3% (owm)
 Na₂CO₃ : 1% (owm)
 TR oil : 1% (owm)
 MLR : 1:20
 Temperature : boil
 Time : 3 hours

c) Bleaching

This is mainly carried out to remove the natural colouring matters and to obtain white material and facilitate the production of pale and bright shades.

Recipe for Bleaching

Material weight : X g
 H₂O₂ : 2% (owm)
 Sodium Silicate : 2% (owm)
 NaOH : 1% (owm)
 MLR : 1:20
 Temperature : 90-95 ° C
 Time : 2-3 hours

3.2.2 DIRECT DYEING

This is the process of imparting colour to the bleached fabric using dyeing chemicals (Direct)

Recipe for Direct Dyeing

Material weight : X g
 Dye : 2% (owm)
 Sodium Chloride : 2% (owm)
 Sodium Carbonate : 1% (owm)
 MLR : 1:20
 Temperature : Boil
 Time : 45 minutes

Neem and Turmeric which is in the form of extract (powder soaked in water for 12 hours and the filtrate is extracted after boiling it for one and half hours) is added to the direct dye bath and applied on to the fabric using exhaust method. Then the fabric is washed. Aloe vera gel is padded to the treated fabric and cured at 150 degree Celsius then it is subjected to washing and dried.

3.2.3 Measurement of dye uptake on direct dyed cotton fabric

The dye uptake of the direct dye applied on the cotton fabric was measured using spectronic spectrophotometre by absorption technique

3.2.4 Rubbing fastness of the direct dyed cotton fabric

The cotton fabric dyed with direct dye was subjected for rubbing fastness in a crockmeter, by rubbing the dyed fabric using the rough head in the crock meter for one minute in dry as well as in wet state.

3.2.5 Light fastness of the direct dyed cotton fabric

The direct dyed cotton fabric was exposed to sun light in the intensive period of 10:00 a.m. to 4:00 p.m. for 6 days continuously This is not a correct method but due to lack of light fastness measuring instrument it was crudely carried out by this accepted method.

3.2.6 Heat fastness of the direct dyed cotton fabric

The cotton fabric dyed with direct dye was subjected for pressing in the presence of heat at 80 degree Celsius for one minute

3.2.7 Antimicrobial finish application method

The normal "exhaust method" and "pad-dry-cure" method have been adopted by various sum of the process parameters like concentration, temperature and time for the anti microbial chemicals.

A) Antimicrobial activity testing (Parallel streak method)

Anti bacterial agent: In Textiles any chemical which kills bacteria or interferes with the multiplication, growth or activity of bacteria.

Test organism: Staphylococcus aureus, American type culture collection

Test specimen: Test specimens are cut by hand or with die

Rectangular specimens of size 25 X 50 mm are laid across five parallel mocolum streaks each of diminishing width from about 8mm to 4mm width. The size of the zone cannot be constructed as a quantitative evaluation of the anti microbial activity.

II. RESULTS AND DISCUSSION

In this chapter the data of anti microbial effects achieved on cotton fabric after different treatments (with neem, turmeric and aloe vera) are given in tables 4.2, 4.3 and 4.4 and charts respectively. The results are discussed with regard to the tables and charts

4.1 Dye uptake on cotton fabric dyed with direct die and natural sources

The dye uptake applied on woven cotton fabric is given in table 4.1. it is clear that there is a good dye uptake when dyed with direct dye and natural sources on cotton fabric. The dye uptake value is between 84% and 90% respectively. The average directly dye uptake on cotton fabric is 87%

TABLE 4.1 MEASUREMENT OF DYE UPTAKE

S.NO.	DYE UPTAKE (%)
1	84
2	86
3	87
4	84
5	85
6	88
7	89
8	90
9	87
10	90

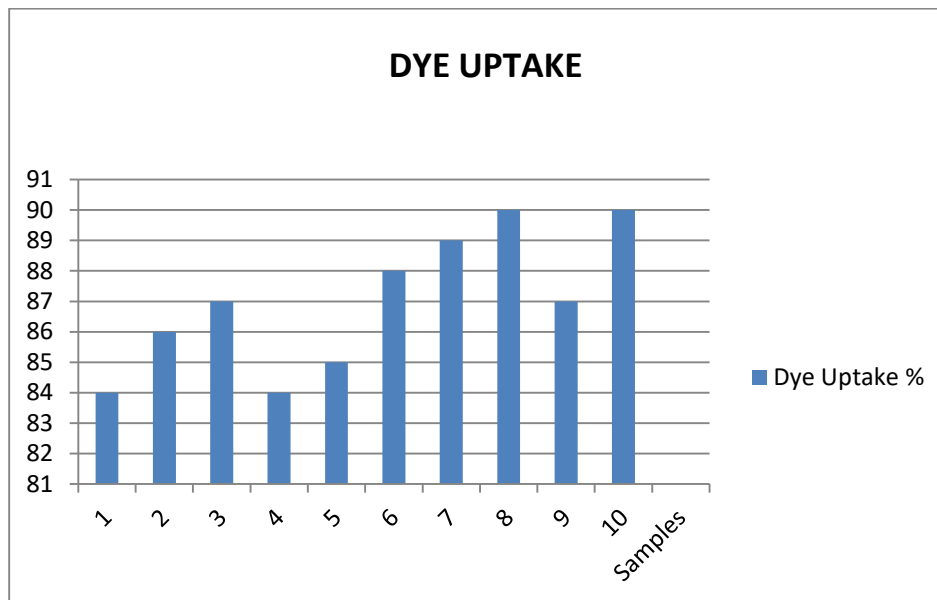
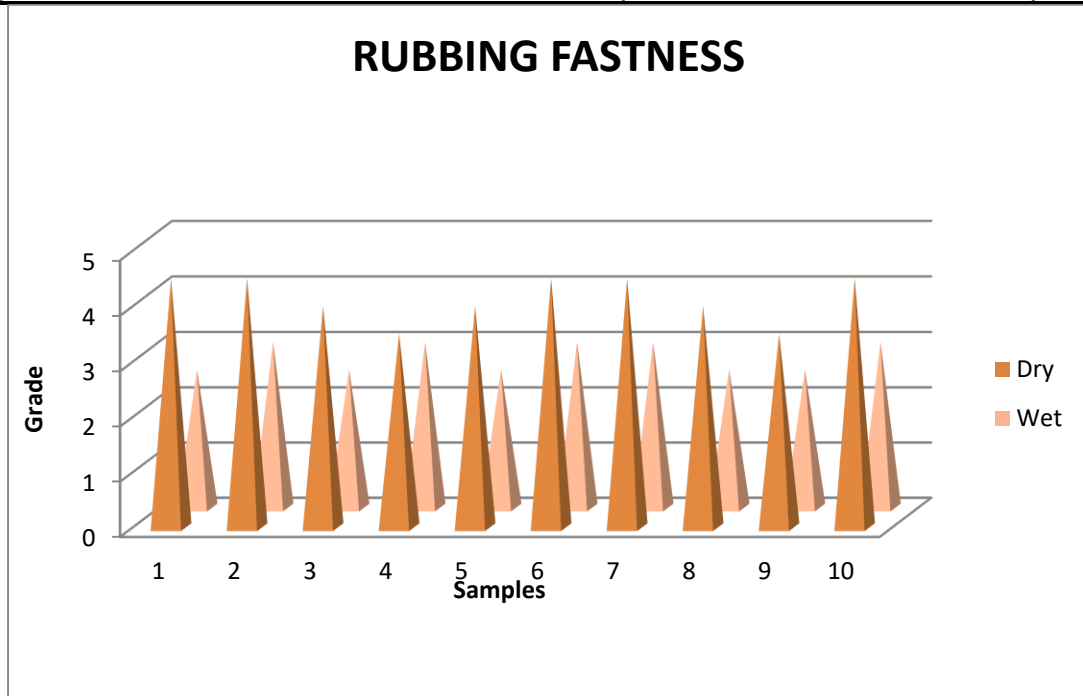


TABLE 4.2 RUBBING FASTNESS ON DYED COTTON FABRIC

The data of the rubbing fastness in dry and wet state on the direct dyed cotton fabric are given in table 4.2. The rubbing fastness in dry state is more compared to those obtained in wet state.

The rubbing fastness rating in dry state is good (4) moderate (3) whereas in the wet state it is moderate (3) good(4). Experimental evidence shows that the average rubbing fastness upon the direct dyed cotton fabric in dry and wet state is 4 and 3 respectively

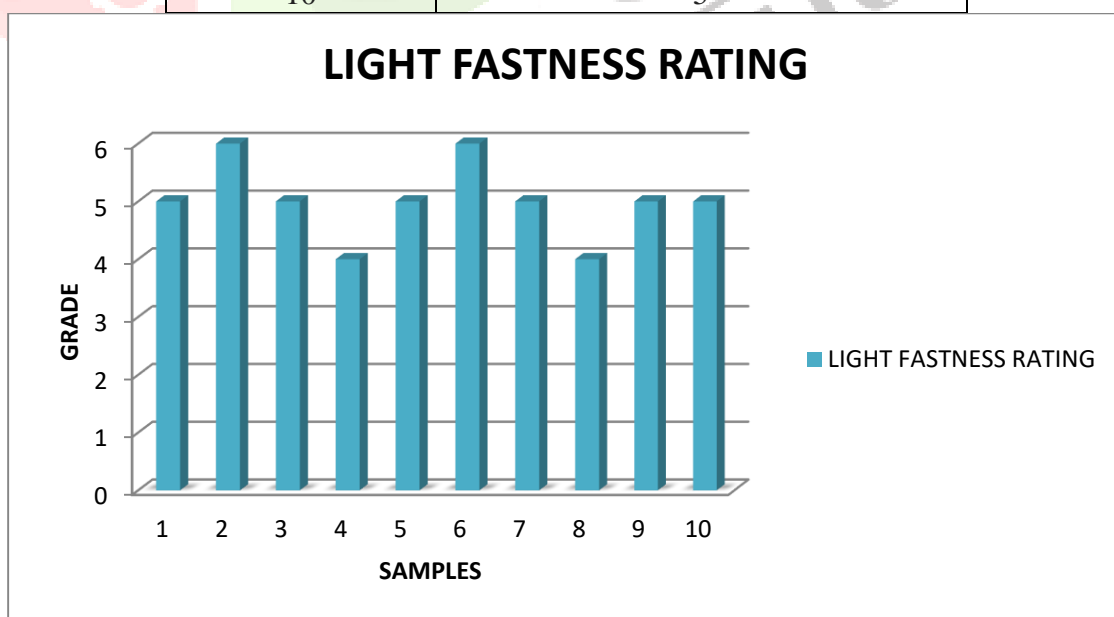
S.NO.	RUBBING FASTNESS RATING	
	DRY	WET
1	4.5	2.5
2	4.5	3.0
3	4.0	2.5
4	3.5	3.0
5	4.0	2.5
6	4.5	3.0
7	4.5	3.0
8	4.0	2.5
9	3.5	2.5
10	4.5	3.0



4.3 LIGHT FASTNESS ON DYED COTTON FABRIC

The results of direct dyed cotton fabric are given in Table 4.4. There is a good light fastness achieved on the fabric died with the direct dye. The light fastness rating is between 5 (moderate) and 6 (good) and 8 (excellent)

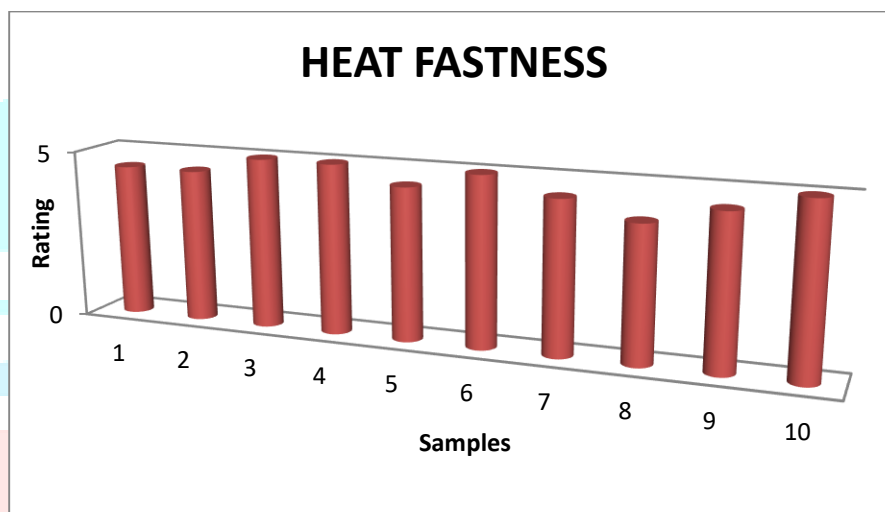
S.NO.	LIGHT FASTNESS RATING
1	5
2	6
3	5
4	4
5	5
6	6
7	5
8	4
9	5
10	5



4.4 HEAT FASTNESS ON DYED COTTON FABRIC

The rate of heat fastness rating of the direct dyed cotton fabric is given in the following table. The direct dyed cotton fabric shows really excellent heat fastness rating. This indicates the good stability of the direct dye with natural sources towards heat at high temperature. This value is in analogy to the direct dye cotton fabric has experimentally evidenced.

S.NO.	HEAT FASTNESS RATING (%)
1	4.5
2	4.5
3	5.0
4	5.0
5	4.5
6	5.0
7	4.5
8	4.0
9	4.5
10	5.0



4.5 Anti microbial effect on cotton fabric treated with Natural sources

The anti microbial effect on cotton fabric treated with various natural sources such as Turmeric, Neem and Aloe Vera in the intact form as well as in combination with direct dye is given in the following table 4.5. It is evident from this table that the cotton fabric treated with the Natural Sources shows some varying resistance towards the growth of microorganisms. The resistances rendered by the Natural Sources when applied on cotton fabrics in the intact form shows 'fair' rating however when turmeric, Neem, aloe vera or combined with direct dye and applied on fabric, the resistance for the microorganism development is further enhanced and the treated samples show 'very fair' (anti microbial effect) rating. This may be due to the affinity of Natural Sources towards cotton fabric.

SAMPL E NO	COMBINATION USED	STATE OF GROWTH OF MICROORGANISMS	SYMBOLIC RATING	RATING IN TERMS OF RESISTANCE
1	Direct dye	Moderate growth	***	Poor
2	Direct dye + Turmeric	Slight growth	**	Fair
3	Direct dye + Neem	Very slight growth	*	Very fair
4	Direct dye + Aloe vera	Very slight growth	*	Very fair
5	Direct dye + Turmeric + Neem	Very slight growth	*	Very fair
6	Direct dye + Neem + Turmeric + Aloe vera	Resistant to growth	❖	Good

❖ No growth

* Visible only under magnifying lens

** Area of growth less than 1/4 of total

*** Area of growth more than half

Conclusion

From this project work following conclusions are arrived

- Anti microbial finish has been imparted to the Cotton sample using Aloe Vera, Neem and Turmeric
- The anti microbial finish on the cotton fabric is good when the natural sources are applied in the combination rather than applied in separate manner
- Time consumption of the treatment on cotton fabric is reduced by combining two processes in a single bath, namely dyeing and Anti microbial finish
- The fastness property of the direct die is slightly improved when applied with the combination of natural sources.
- The finish is not spoiled by repeated cleaning and does not have any effect by the mechanical operation and also properties of textile materials are retained

Generally it is concluded that, by combining the direct dyeing as well as the natural sources treatment in a single bath, the effect of anti microbial is achieved on the fabric increased fastness properties needed for different garments.