COMPARISON OF SCOURING USING BANANA SAP AND DYEING USING BANANA ASH

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Abstract - *To obtain efficiency in scouring using banana sap extract and to reduce effluent load in dyeing by using banana ash instead of sodium chloride (NaCl). Further to it the results were analysed by comparing before and after variations found. Bio scouring (banana sap) firms will rely mainly on inexpensive substrates for bio synthesis, processes that will function at, and will consume little energy and water as well. In textile processing the enzymatic the removal of impurities also reduces the total chemical consumption and possibilities of accident.*

***Key Words*: Banana sap, Bio-scouring, inexpensive substrates.**

1. INTRODUCTION

Scouring is the most important wet process applied to textile materials before dyeing or printing. It is mostly a cleaning process in which unexpected oils, fats, waxes, solid dirt's, soluble and natural impurities are removed.

Basically, good scouring is considered as the foundation of successful dyeing, printing, and finishing .Enzymatic scouring or bio scouring (banana sap) can simply be defined as the application of living organisms and their components to remove natural and added impurities. It is not an industry in itself, but an important technology that will have a large impact on many industrial sectors in the future.

Bio scouring (banana sap) firms will rely mainly on inexpensive substrates for bio synthesis, processes that will function at, and will consume little energy and water as well. In textile processing the enzymatic the removal of impurities also reduces the total chemical consumption and possibilities of accident. Dyeing is a process of adding color to textile products like fibre yarns and fabrics .dyeing is normally done in a special solution containing dyes and particular chemical material after dyeing dye molecules have uncut chemical bond with fiber molecules.

The temperature and time controlling are two key factors in dyeing. Reactive dyes utilize a chromophore attached to a substituent that is capable of directly reacting with the fiber substrate the covalent bonds that attach reactive dye to natural fibers make them among the most permanent of dyes. Cold reactive dyes, such as procion MX, cibacron F and drimarene K, are very easy to use because the dye can applied to room temperature. Reactive dyes are by far the best choice for dyeing cotton and other cellulose fibre at home or laboratory.

1.1. SCOURING

It is the process of removing natural impurities present in the cotton fibre. The natural impurities are pectin's, pectos, ash, wax, mineral compounds, etc. if those impurities present in the cotton fibres are not removed, then it will be difficult to dye or print the fabric uniformly. Normally caustic soda ash is used as main reagent fro scouring of cotton fabric.

Analysis of cotton wax, in the past, has revealed a general composition as 25% fatty acids, 52% alcohols, 10% sterols, 7% hydrocarbons and 6% "inert matters". The main constituents of the wax include 1triacontanol, montanobeta sisteroland a mixture of high molecular weight esters.

Invariably, enzyme scouring resulted in the lowest weight loss values in all the samples followed by solvent extraction. In spite of higher weight losses observed in the solvent extraction, the lower values of enzyme treatment, perhaps, indicate the influence of the surface bound impurities in accessing the substrate for the enzyme reaction. Fineness of the fibres, expressed in terms ofμg/inch or tex, to a larger extent depends on the maturity of the fibres, and also by the amount of the moisture present in the material to some extent. Removal of hydrophobic impurities in the surface of fibres is likely to increase the moisture regain of the fibres, which, otherwise, could reduce the bound water to the hydrophobic surface of the impurities In the case of alkali scoured samples, a significant increase in the fineness values were observed compared raw cotton fibres and enzyme scoured samples.

This, possibly, could be due to residual pectinspresent in the alkali scoured materials and the lower values observed in the case of enzyme treated samples could be, possibly, due to partial removal of hydrophobic impurities from the surface of the fibres as expressed by the lower weight loss values. Removal of hydrophobic impurities in the samples resulted in higher moisture content values in the treated fibres, however, difference in the extraction of hydrophobic ipurities in the treatments could result in the variations in the moisture content of the samples tested after the treatment.

Though solvent extractions resulted in higher weight loss compared to enzyme treatment, the moisture content values were found to be l in the solvent extracted samples, which is interesting and would require further analysis Enzymatic scouring is a widely accepted method in industrial practice since the biocatalysts do not harm the cellulosic materials present in the cotton. However, the entire substrates present in the fibres are not hydrolysed by the enzymes during the enzymatic scouring operation due to poor accessibility of the pecticnsubstances present in the fibres. This also results in difference in various properties like fineness, strength, elongation and moisture control of the fibre.

1.2. BANANA SAP SCOURING

Removal of hydrophobic impurities in the samples resulted in higher moisture content values in the treated fibres, however, difference in the extraction of hydrophobic impurities in the treatments could result in the variations in the moisture content of the samples tested after the treatment. Though solvent extractions resulted in higher weight loss compared to enzyme treatment, the moisture content values were found to be low in the solvent extracted samples, which is interesting and would require further analysis Enzymatic scouring is a widely accepted method in industrial practice since the biocatalysts do not harm the cellulosic materials present in the cotton. However, the entire substrates present in the fibres are not hydrolysed by the enzymes during the enzymatic scouring operation due to poor accessibility of the pecticsubstances present in the fibres. This also results in difference in various properties like fineness, strength, elongation and moisture control of the fibre.

1.3. DYEING

Physical adsorption of the water soluble dyestuffs from an aqueous medium by the fibre by reversible attachment to active sites present in the fibre mechanical retention of the water insoluble dyes in the fibre by application involving temporary solubilization, before applying dissolution of the dyestuff in the fibre Reactivity of the dye is related to facts-if the reactivity of the dye is increased considerably, the rate of reaction with the fibre increases, dyeing rate is fast however, if the rate of hydrolysis of the dye increases, it leads to deactivation of a part of the dye, resulting in wastage of the dyeIf the reactivity of the dye is decreased, the extent of hydrolysis can be reduced considerably, but this would result in slow rate of reaction with the fibre, however the ultimate objective of dyeing is to react as much o9f the dye as possible with the fibre and minimize the hydrolysis of the dye.

1.4. BANANA ASH DYEING

Banana known as (Musa paradisaca) was the bio-adsorbent of choice use in this study. The banana waste consisting of peel and bunch used in the study were obtained from a group. Banana sap is collected from the banana tree through manual process. Then the recipe was prepared and the fabric was dyed without mordant and with mordant. Hence, mordant Potash Alum and Horitoky were used. Banana ash keeping in mind its ecofriendly nature.by using the banana ash to reduce the effluent load and the efficiency of dyeing is high when compared to normal dye sample. Banana ash can be used instead of sodium chloride.

2. MATERIALS

TYPES OF FABRIC	WOVEN(PLAIN)
GSM	140
EPI	50
PPI	50
WARP COUNT	20^s
WEFT COUNT	17^s

3. TEST METHODS

3.1. ABSORBENCY TEST

Absorbency test is carried out to measure the proclivity of fabric to take up water through AATCC test method 79. Scoured sample was placed in an embroidery hoop with all creases out of it. A burette dispensed a drop of water onto the surface of the fabric from a distance of 9.5mm below the burette. Time was recorded until the drop absorbs completely. Fabric scoured with banana ash took 20-25 seconds to absorb water. On the other hand, chemical scoured fabric absorbed water within 5-10 seconds.

3.2. WEIGHT LOSS %:

Standard range of weight loss is 4-8%. Weight loss % of banana ash scoured fabric is excellent and it reduce the possibilities of over scouring and fabric damages.

3.3. K/S Determination :

K/S Determination Tinctorial value or color strength (K/S) is considered as the most important parameter to test the quality measurement of a sample in terms of the depth of the color dyed fabric. The color strength of a dyed fabric is usually pronounced by its K/S value. Color strength, or value of a pigment, is defined as its ability to impart color to other materials. The lower the concentration required by a colored pigment to achieve a defined impression of color, that is, a given depth of a shade, the greater the color strength of the colored pigments. It depends on the absorption coefficient (K) of colorant and the scattering coefficient (S). Consequently, the strength of any colorant (dyestuff / pigment) is related to absorption property. Reflectance (%) of the dyed fabric samples were measured by using Data color 650 TM spectrophotometer. Kubelka– Munk theory provides the following relation between reflectance and absorbance:

$$K/S = [\{(1-R)2 / 2R\}]$$

Where R is the reflectance, K is absorbance, and S is the scattering. K/S versus Wavelength curve is always the characteristics of every colorant.

3.4. Color Fastness Test:

Color fastness is a term used in the dyeing of textile materials that characterizes a material's color resistance to fading or running. Different color fastness tests were carried out such as color fastness to wash, color fastness to rubbing (dry and wet), and then color fastness to perspiration (acid) through ISO method. Wash fastness test was also carried out through ISO-105-C03 method treating 10 cm × 4 cm sized composite sample (sample fabric and DW multifiber fabric) with soap solution in rota wash machine. Furthermore, the fastness rating by using color fading grey scale and color staining grey scale in color matching cabinet was also evaluated. In addition, rubbing fastness was carried out by ISO-105-X12 method (Dry and Wet) taking a sample size of 14 cm × 5 cm. Hand crank is turned 10 times at the rate of 1 turn/sec and fastness rating was then evaluated by color staining grey scale. In addition, ISO-105-E04 method was followed for testing color fastness to perspiration (acid).

4. METHODOLOGY

4.1. SCOURING

The natural impurities are pectin's, pectos, ash, wax, mineral compounds, etc. if those impurities present in the cotton fibres are not removed, then it will be difficult to dye or print the fabric uniformly. Normally caustic soda ash used as main reagent for scouring of cotton fabric.

4.1.1. RECIPE

Sodium hydroxide	4%
Soda ash	2%
M:L ratio	1:40
Temperature	100°C
Time	30 minutes

4.1.2. PROCEDURE:

1. The material should be conditioned and the weight is measure accuracy
2. Prepare the stock solution according to the required concentration as given in the recipe.
3. The calculated amount of H_2O, TRO, NaOH, and Na2CO3 are taken in a clean vat and stirred well.
4. The sample should be wetted out before entering into the vat, then the vat is placed in a water bath and the temperature is maintained at 90°c for one hour.
5. The liquor should be agitated continuously with the help of glass rod till the end of the process in order to obtain uniform scouring.
6. After one hour once the process gets completed, the liquor is drained and the after treatment is carried out.
7. After treatment process is carried out.

8. Finally the sample is squeezed and dried at 110°c in hot air woven.
9. To determine the percentage weight loss, the material is to be dried well, conditioned and then the weight is measured.
10. With the help of initial and final weight of the fabric sample the percentage weight is calculated.

4.2. BANANA SCOURING

To segregate the pseudo stem and that is cut into small pieces, those small pieces are squeezed well manually. The extract is collected.

4.2.1. RECIPE:

Banana sap extract	4%
Soda ash	2%
M:L ratio	1:40
Temperature	100°c
Time	30 minutes

4.2.2. PROCEDURE:

1. The material should be conditioned and the weight is measure accuracy.
2. Prepare the stock solution according to the required concentration as given in the recipe.
3. The calculated amount of H2O, TRO, BANANA SAP EXTRACT, and Na2CO3 are taken in a clean vat and stirred well.
4. The sample should be wetted out before entering into the vat, then the vat is placed in a water bath and the temperature is maintained at 90oc for one hour.
5. The liquor should be agitated continuously with the help of glass rod till the end of the process in order to obtain uniform scouring.
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9. To determine the percentage weight loss, the material is to be dried well, conditioned and then the weight is measured.
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4.3. DYEING:

These dyes chemically reacted with the fibre with the formation of covalent bond between dye & fibre.

4.3.1. RECIPE:

Dye	4%
Sodium carbonate	20gpl
Sodium chloride	70gpl
M:L ratio	1:40
Temperature	80°c
Time	60 Minutes

4.3.2. PROCEDURE

1. The cotton fabric is weighted the stock solution is prepared by taking calculated amount of reactive dye and it is passed with cold water and dissolved by adding warm water at 50°c then calculated amount of NaCl and Na2Co3 are to be prepared as stock solution.
2. The bath is setup with required M:L 1:40 then the required amount of dissolved dye stuff is added to the dye bath . The sample is wetted out and squeezed then entered into the dye bath. After 10 minutes the required quantity of salt is added into two installments at the interval of each 10 minutes. After 20 minutes of exhaustion the soda ash is added for fixation and worked for 30 minutes .The materials removed and the bath is drained.
3. The after treatment is carried out to remove the unfixed dyes and to improve the color fastness, soaping is carried out.
4. Finally the material is dried in hot air woven 100°c for 15 minutes.

4.4. BANANA ASH DYEING

The banana peels are collected to the requirement of dyeing quantity, then these peels are let to dry till they get an crisp texture now the dried peels are introduced in direct flame for the ash production. Thus the banana ash is collected.

4.4.1. RECIPE

Dye	4%
Sodium carbonate	20gpl
Banana ash	70gpl
M:L ratio	1:40
Temperature	80^{o}c
Time	60 minutes

4.4.2. PROCEDURE

1. The cotton fabric is weighted the stock solution is prepared by taking calculated amount of reactive dye and it is passed with cold water and dissolved by adding warm water at 50oC then calculated amount of NaCl and Na2CO3 are to be prepared as stock solution.
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3. The after treatment is carried out to remove the unfixed dyes and to improve the color fastness, soaping is carried out.
4. Finally the material is dried in hot air woven 100^{o}c for 15 minutes.

5. CONCLUSION

In favor of the environment, this project ensures natural scouring and dyeing processes which were done by banana ash and banana sap. The experimental data shows the suitability of natural process over the existing process. Environment pollution, effluent rate, and health hazard can be extirpated in performing the processes using the easiest way and resources. In this project, it was shown that scouring of cotton fabric with banana ash result in 8% weight loss. Whereas in case of conventional scouring (NaOH), weight loss was calculated as 10%. In addition, dyeing of cotton fabric with banana sap showed better K/S value, and fastness properties than the other samples. Further researches can be carried out on banana sap keeping in mind its ecofriendly nature.

6. REFERENCES

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