Faculty of Engineering

Department of Textile Engineering

"Comparative Study on colorimetric & fastness properties of different dyes on cotton and viscose fabrics"

Course code-4214 Course title- Project (Thesis)

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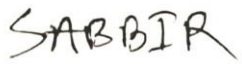
A thesis submitted in partial fulfillment of the requirements for the degree of

Bachelor of Science in Textile Engineering
Advance in Wet Processing Technology

Spring-2019

Declaration

We here by declare that, this internship has been done by us under the supervision of **Ms. Nawshin Farzana,** Assistant Professor, Department of Textile Engineering, Faculty of Engineering, Daffodil International University. We also declare that, neither this report nor any part of this has been submitted elsewhere for Reward of any degree or Diploma.



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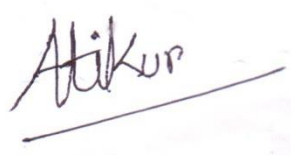

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LETTER OF APPROVAL

This project report prepared by Sabbir Ahmed (ID: 162-23-4764) and Md. Atikur Rahman Chowdhury (ID:162-23-4748) is approved in Partial Fulfillment of the Requirement for the Degree of BACHELOR OF SCIENCE IN TEXTILE ENGINEERING. The said students have completed their project work **"Comparative Study on colorimetric & fastness properties of different dyes on cotton and viscose fabrics"** under my supervision. During there search period I found them sincere, hard working and enthusiastic.

Ms. Nawshin Farzana

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ACKNOWLEDGEMENT

Firstly, we express our gratefulness to almighty Allah for his divine blessing makes us possible to Finished this project successfully.

We are grateful to our supervisor **Ms. Nawshin Farzana**, Assistant Professor, Department of Textile Engineering, Faculty of Engineering, Daffodil international University. Deep knowledge and keen interests of our supervisor in the field of textile dyeing and finishing influenced us to convey out the project work. Her endless patience, scholarly guidance, continual encouragement, energetic supervision, formative criticism, valuable advice, reading manyinferiordraftandcorrectingtheseatallstageshavemadeitpossibletocompletethis project.

We would like to express our thanks to **Prof. Dr. Md. Mahbubul Haque**, Head, Department of Textile Engineering, Faculty of Engineering, Daffodil International University for his Genial help to finish our project report. We want to thank **Prof. Dr. S. M. Mahbub-Ul- Haque Majumder,** Dean, Faculty of Engineering, Daffodil International University, for his stimulating support and encouragement. We would like to express our thanks to **Prof. Dr. Md. Zulhash Uddin**, Dean, BUTex for providing us necessary information to complete the report on time.

We would like to deliver thanks to our Full course mates in Daffodil International University, who took part in the discussion while completing the course work.

Finally, we would like to express sense of gratitude to our beloved parents and friends for their mental support, potency and assistance throughout writing the projectreports,

DEDICATION

"To our dignified parents & teacher may they live long"

ABSTRACT

This research presents a comparative study of on colorimetric & fastness properties of 100% Cotton and 100% Viscose knitted fabric dyed with Reactive, Direct, Vat Dyes for 2% shade is reflectance% and carve ware contested and L.a.b.c values and K/S (Color Strength) also measured by using spectral meter color fastness to wash and rubbing test were performed to compare dyeing perform. The results should darker shade on viscose for all dyes than in cotton all most similar wash fastness values were found for reactive and vat dye on both fabric were as direct dye should poor results direct dye should lower (poor) wet rubbing fastness on both fabric then the other two dyes.

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Chapter-1

Introduction

Introduction

Cotton is a soft, fluffy staple fiber that develop in a boll, or protective case, around the seeds of the cotton plants of the genus Gossypium in the mallow family Malvaceae. The fiber is almost Fresh cellulose. Under natural conditions, the cotton Pod will increase the dispersal of the seeds. The plant is a shrub local to tropical and subtropical regions around the world, including the Americas, Africa, Egypt and India. The best diversity of wild cotton species is found in Mexico, followed by Australia and Africa. Cotton was independently domesticated in the Old& New Worlds.

The earliest known samples of yarn and fabric were found near Oberhausen, Switzerland, where fragments of flax ribbons and yarn and plain-woven linen fabric were about 7,000 years old. Cotton has been cultivated and used for making clothes for at least 7,000 years. It may exist in Egypt at 12000 BC. In cotton cloth, there were archaeologists (3500 BC), India (3000 BC), Peru (2500 BC), and South-West America (500 BC) in Mexico. [1]

The viscose process dissolves pulp with aqueous sodium hydroxide in the presence of carbon disulfide. This viscous solution bears the name viscose. The cellulose solution is used to spin the viscose rayon fiber, which may also be called viscose. Viscose rayon fiber is a soft fiber commonly used in dresses, linings, shirts, shorts, coats, jackets, and other outerwear. It is also used in industrial yarns, upholstery and carpets, and in the casting of cellophane.

Chemist Robert Hooke has been recognized as the first person to hold the idea of making artificial fiber in his 1664 publication. Micrographia An artificial glutinous composition, much similar, if there can be a way of making. Good as well, not good, that excrement, or whatever other substance which is the surface of the ray cable-Plays his clew. [2]

This paper focuses on the Comparative study of dyeing with Reactive, Direct, Vat, dyes. Cotton, Viscose, fabric Comparison was done on the basis of color strength (K/S) Colorimetric value (L*,a*,b*,c*) and color fastness properties.

Objectives

- Comparative Study on Spectral value of cotton & viscose fabric dyed with different dyes.
- Comparative Study on Fastness property of cotton & viscose fabric dyed with different dyes.

Chapter-2

Literature Review

2. Literature Review:

2.1 Cotton

2.1.1 History

Natural fibers Cotton, flakes, silk, and wool Ancient civilization represents the main fibers available. The earliest known samples of yarn and fabric were found near Oberhausen, Switzerland, where fragments of flax ribbons and yarn and plain-woven linen fabric were about 7,000 years old. Cotton has been cultivated and used for making clothes for at least 7,000 years. It may exist in Egypt at 12000 BC. In cotton cloth, there were archaeologists (3500 BC), India (3000 BC), Peru (2500 BC), and South-West America (500 BC) in Mexico. After the creation of the new world colony, cotton has not gained commercial importance in Europe. Silk culture remained special from the specialty of China (2600 BC) for six centuries, when the results were first raised in the Byzantine Empire. [3]

Figure-2.1 Cotton fabric

2.1.2. The Current World Cotton Situation

Cotton is the most used textile fiber in the world today. Its current market share is 56% for all fiber used for clothing and home furniture and sold in the United States. Other contributions are regarded as nonwoven textile and personal care items. It is generally recognized that most consumers prefer cotton personal care items containing synthetic fibers. In 1998 the cost of world textile fiber was approximately 45 million tons. This is about 20 million tons of cotton compared to this total.

South American cotton was also a cotton wool. Cotton cultivation first spread from India, from Egypt, China and the South Pacific. Although cotton fiber was already known in South America, the large North American cotton cultivation reached the southern part of today's United States with the arrival of colonists in the early 16th century. The largest increase in cotton production was linked with the discovery of saw-tooth cotton gene by Eli Whitney in 1793.With this new technology, cotton fiber production was possible, thereby making major changes in the spinning and weaving industry, especially in England. [2]

We have the basis for the idea of the International Cotton Advisory Committee (ICAC) to oversee the global cotton situation and cotton and textile industry because I want to review your current world cotton situation. Textile fiber cost and cotton cost fundamental determinant World economic growth year textile fiber cost year change in economic change years of economic change.

Table bellow shows the production and cost of leading cotton producing countries in millions of tons in 2002.

Table-2.1 Production and cost of major cotton producing countries.

COUNTRIES	PRODUCTION	CONSUMPTION
US	3.8	1.7
India	2.5	3
Pakistan	1.8	1.9
Turkey	0.9	1.4
Brazil	0.7	0.9
Indonesia	0.4	0.6
China	4.8	5.9

Over the past few years the global economic growth has been more than 3% and has created a good environment for the textile industry. Until the Asian economic crisis develops in the second half of 1997, the global economy will increase by 1% or by 4% in 1998. As a result of the crisis the International Monetary Fund reduced the forecast of economic growth of 1998 to 3%.

The economies of East Asian were mostly affected by the crisis, at most 7% rate. Instead they can contract for the same rate. This reduction in global income is expected to be quite strong in economic growth as it makes its way through Japan. Economy and region's main trading partners. We're probably not fully yet its effect is appreciated. [4]

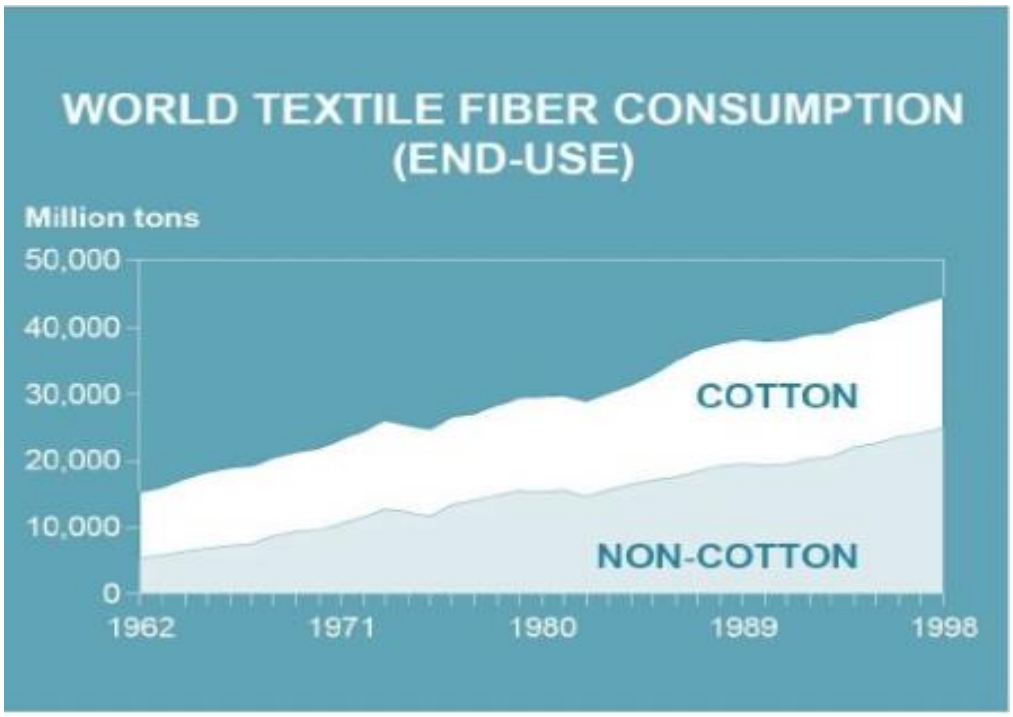


Figure-2.2 World textile fiber Consumption

Cotton classification is used to determine the quality of cotton fiber in grades, length and micrometer [3]. USDA [9] classification typically characterizes the characteristics of fiber length, length uniformity, strength, Micronesia, color, preparation, leaf and exotic subjects. In the past, these qualities are classified only by an experienced classroom hand and eye. Since 1991, all the classifications have been done with a set of up to date machines, called "HVI" (high volume instrumentation) Classification [3]. However, other features of cotton fiber, measuring maturity and measuring techniques as a brief fiber content, are also being developed.

2.1.3 Physical properties of Cotton

2.1.3.1 Fiber Length

Fiber length is described as "the average length of the average length of the long half length". This measure is scanned "bearded" of parallel ribbons through a sensing region. Made from fiber taken from sample specimen, clasped into a holding clamp and combed the fibers enclosed. The normal length of the apple cotton can be 0.79 to 1.36in.

2.1.3.2 Length Uniformity

Length identities or uniformity ratio is defined as "the proportion between the mean length and the middle half of the upper half and the percentage is expressed as a percentage". Generally comparisons are described below. Low Unity Index shows that small fiber may be high content, which will reduce the quality of textile products in the future. [6]

2.1.3.3 Fiber Strength

Fiber power denier is measured in every village. It is determined by the strength needed to break the beards of the fibers, stuck in two sets of jaws, (1/8 inches apart). The typical tensile dimension is illustrated. Cotton breakers are about 3.0 ~ 4.9 g / dinaria, and fragile growth is around 8 ~ 10%. [8]

Table-2.2 Fiber strength

DEGREE OF STRENGTH	FIBER STRENGTH [g/tex]
Very Strong	>31
Strong	29-30
Average	26-28
Intermediate	24-25
Weak	<23

2.1.3.4 Micronaire value

Micronarial measure reflects fiber and maturity. A constant mass of cotton fibers (2.34 g) constricts a place in the familiar volume and the wind permeability measurement of this compressed sample is taken. This, when the conversion of the appropriate number, indicates the value of the micronea.

Table-2.3Micronaire value

COTTON RANGE	MICRONAIRE READING
Premium	3.7-4.2
Base Range	4.3-4.9
Discount Range	>5.0

2.1.3.5 Color

The cotton sample color is determined from two parameters: Reflection Degree (Rd) and Yellowness (+ b). Reflection reflects degree of cotton pigmentation and degree of yellowness brightness. A defined area located in a niches-Hunter cotton-colored painting presents each color code. Tissues are influenced by climate conditions, insects and fungal effects, soil, storage conditions, etc. Here are five white recognizable groups: white, gray, described, tangled and yellowish. Due to the poor color of cotton, the process of fiber reduces. [5]

The work at the University of Tennessee uses the spectrometer's CI-based average color measurement and a color uniformity measurement, through image analysis, using image analysis to improve accuracy and provide extra measurements for color grading. Later investigators created two color grading systems using expert systems and neuro networks.

Figure-2.3 color of cotton

2.1.3.6 Trash

A trash measurement describes non-lint material (such as cotton plant part) in fiber. The trash material is evaluated to scan cotton sample pages with a video camera and calculate the percentage of surface region covered by trash particles. Trash content values should range from 0 to 1.6%. Trash Content Sample Page Grade is highly correlated. [4]

2.1.4 Reactive dye

A dye, which is capable of reacting chemically with a substrate to form a covalent dye substrate linkage, is known as reactive dye.

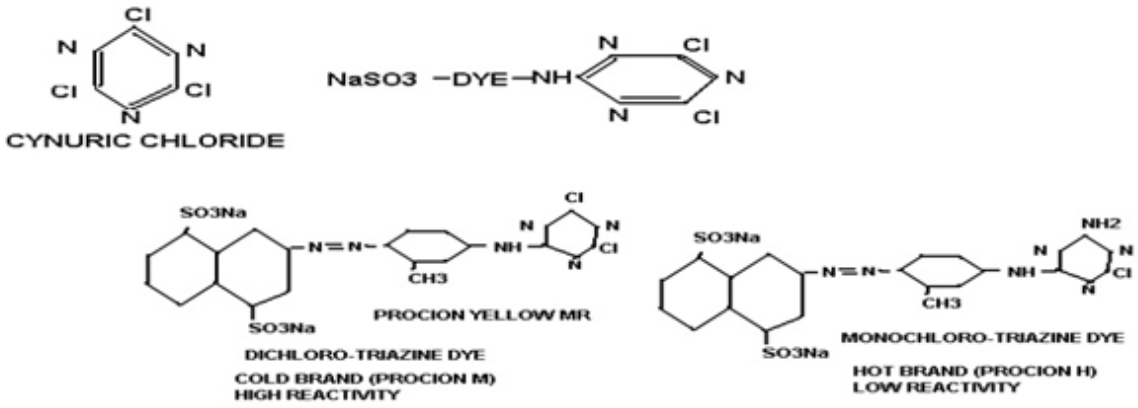
2.1.4.1 History of Reactive dye

Reactive dye first appeared commercially in 1956, after their invention in 1954 by Rattee & Stepheness at the Imperial chemical Industry (ICI). Dyestuffs Divion site in Bleckley, Manchetor. UK. [8]

2.1.4.2 Mechanism of reactive dye

Dyeing mechanism of material with reactive dye takes place in 3 stages:-

1. Exhaustion of dye in presence of electrolyte or dye absorption.
2. Fixation under the influence of alkali.
3. Wash-off the unfixed dye from material surface.



2.1.4.2.1 Structure of dyeing cotton fabric with reactive dye

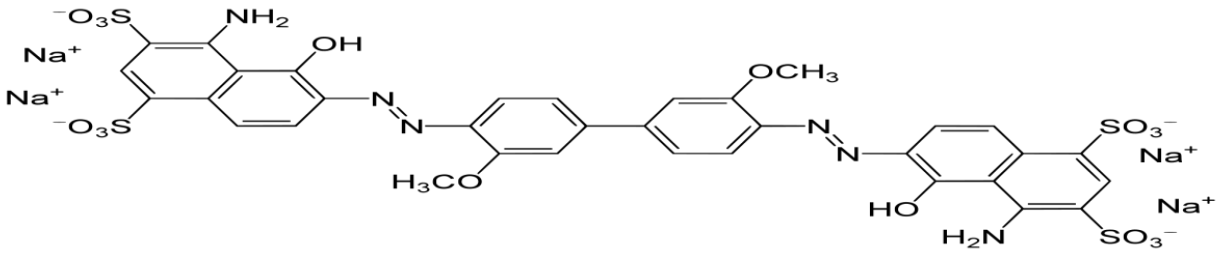
2.1.4.3 Direct dye

Direct dyes are mainly applied on Cellulosic fibers. It is Anionic dyes, it is also called substantive dye direct dye are one of the most versatile classes of dyestuff applicable to cellulose, wool, nylon fabric. [9]

2.1.4.4 Mechanism of Direct dye

The dyeing process involves absorption, expansion and migration on fiber directly for the application of color directly to cellulose fiber. Different causes of dyeing process; However, the most important cellulose fiber structure, structure and electrolyte use. When cellulose fiber is mixed with water, the formation of units in 20-100 small holes in the abnormal region of fiber -

small size die molecules spread through the fiber structure through these holes. The addition of electrolyte (such as sodium chloride, sodium sulphate) helps neutralize the spread and fatigue of direct anemia by neutralizing negative surface charges of cellulosic fibers. Then die anions are associated with cellulosic fiber through hydrogen bonding and van der Waals forces.



2.1.4.4.1 Structure of Dyeing cotton fabric with direct dye

2.1.4.5 Vat Dye

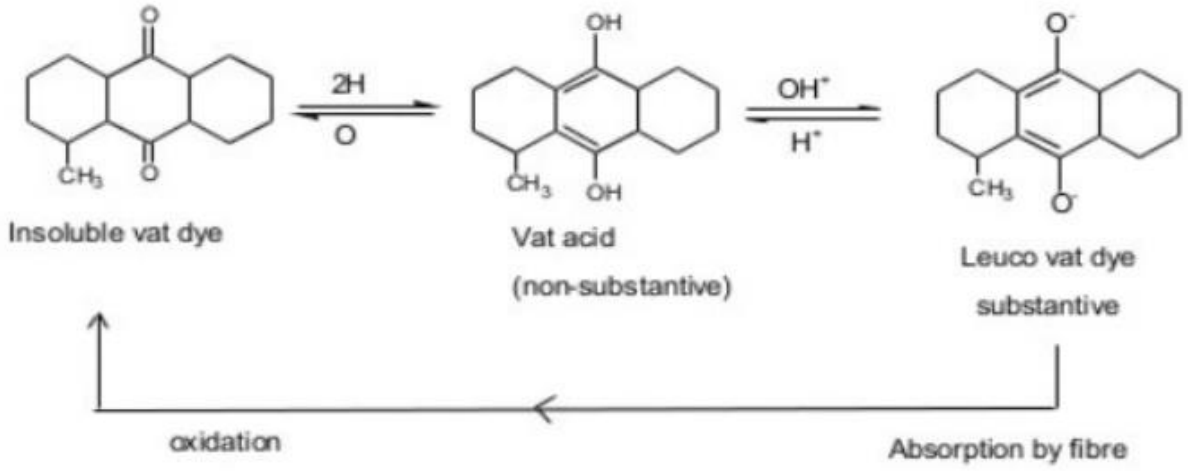
Cannot be used directly and requires warehousing because it is not soluble in water. But the vat dyes acceleration features are good in all colors. The word "vat" means ship. The dye takes their generic name from vatting. vat dyes naturally collects colored materials from ancient times and puts them in wooden vats and creates vat volumes through the process of admission - so it is called vat Dye.

2.1.4.6 Mechanism of Vat dye

Vat dyes need a depleting agent to characterize them. The most common depleting agent is sodium hydrosulfite (Na2S2O4), which converts Dike into a soluble form of its "lemon" form. Once connected to the fabric, the oxygen leukocyte is oxidized, which is highly colored. Chemical reactions such as oxidation, reducing, pH control are often required; Even for the reduction of the dissociation process, the exact amount of sodium and sodium hydroxide measuring the need for measuring the quantity. [8]

The dye is only soluble in its reduced form. In this oxygen-free diabetes fiber is repeatedly sinking then it is produced in the air, where water reduces the soluble size, because the oxygen becomes converted into water-soluble form. For these reasons, vat dyes are less suitable for

amateur use than fiber- reactive colors. Indigo is an example of this die class: it changes from yellow, diabetes, green and then from blue to air. All vat dyeing is not done with vat dyes.



2.1.4.6.1 Structure of Dyeing cotton fabric with Vat dye

2.2 Viscose Fabric

2.2.1A Short Background to Regenerated Cellulose and Viscose Rayon

Chemist Robert Hooke has been recognized as the first person to hold the idea of making artificial fiber in his 1664 publication. Micrographia An artificial glutinous composition, much similar, if there can be a way of making. Good as well, not good, that excrement, or whatever other substance which is the surface of the ray cable-Plays his clew. [3]

However, in the mid-19th century, artificial ribbons were not invented for clothes. The first man made fibers were developed to replicate the natural features of natural silk, without the high limit. These were named in the time rtifiaticsilk. These were made from polymer cellulose, primarily made From wood pulp or cotton linters Melt and treated in chemical, forming a fiber suitable for textile use.

Later, such silk became known as semi-synthetics, which is different from true synthetic fiber produced from true chemicals: such as the first synthetic fiber, nylon, introduced in 1936. Viscose Rayon is a semi-synthetic group known as repetitive cellulosic fiber, so their name

collapses, and then includes the resurgence of the cellulose molecular structure in filament form. Five processes have been invented to reorganize cellulose fiber production. Incidentally, these five processes are currently named,; Cellulose Nitrate (Production no longer), Viscose Rayon, Modal and Liquid. In this, the viscose achieved maximum success in the rayon scale and production length.

This deterioration fiber changes its properties wet strength and dimension change and give a tendency to wet when wet. This problem is not a problem for modal and cellulose fibers, such as wet energy has improved. [5]

Due to the production process of reproduction of cellulosic fibers, they can look the same and it may be challenging to differentiate between fiber recognition analyzes. To make matters more complicated, they can look like other man-made fiber types like acrylic. Someone who works in the laboratories at the Royal Botanic Gardens, discovered three British chemists, Charles Cross, Clayton Beadle and Edward Beven, in 1829, the vascular process of reducing cellulose patented. Their efforts were not immediately indicated in the textile Industry. The Creation of viscose rayon fibers comes instead following, fellow kew worker, Charles Topham's Invention of a centrifugal spinning method for extruding filaments Topham's supervisor' stearn, realized the potential of Topham's spinning method for the viscose process to make textile fibrepatention it in 1898.

Figure-2.4 Viscose fabric

Manufacturers worldwide took up both cross et al `.s and Topham`s patens. Initially, the process proved inconsistent and unreliable commercial success for viscose rayon only come after Samuel courtauld and co. Ltd – later courtaulds Ltd- bought therights to the viscose process in 1904and work together with a large-scale production process.53In 1905 they opened a factory in Coventry and began production of viscose rayon. [8]

2.2.2 Manufacturing of viscose rayon

The viscose process consists of four main stages. The following description has been sourced from Gordon Cook‘s Hand book of Textile Fibres Vol. II Man-Made Fibres.

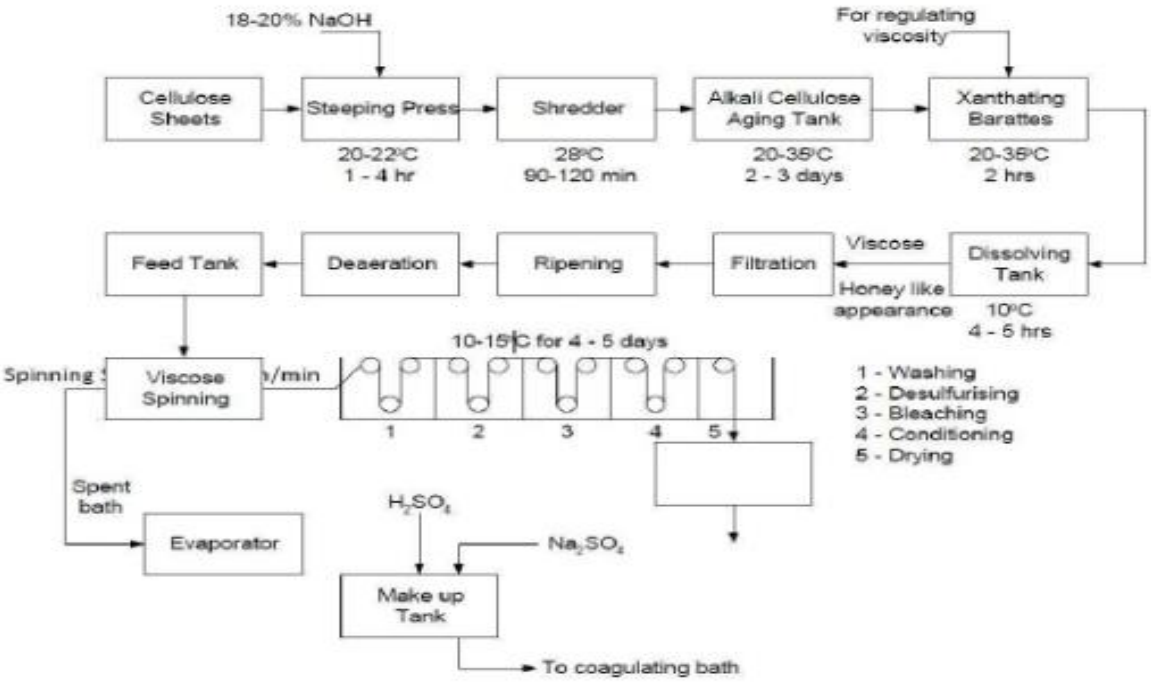


Figure-2.5 Process flow diagram for Viscose Rayon Manufacture

2.2.3 Properties of Viscose Rayon

1. With thickness of 1.7 to 5.0 dTX, especially fibers between 1.7 and 3.3 dtx dominate the mass production.

2. Tenacity ranges from 2-3 to 2.6 g / dry and 1.0 to 1.5 g / dense when dry.

3. Fiber wet energy is important in its production time and subsequent use. Changes in the production process have caused problems of defeating less wet energy.

4. Dry and wet radiation extend on a range depending on polymerization and degree of crystallization. Rayon's high crystals and orientation are drastically drop on the upper, wet.

5.Thermal properties: Viscose rayon loses strength above 149° C; chars and decomposes at 177 to 204° C. It does not melt or stick at elevated temperatures.

6.Chemical properties: Hot dilute acids attack rayon, whereas bases do not seem to significantly attack rayon. Rayon is attacked by bleaches at very high concentrations and by mildew under severe hot and moist conditions. Prolonged exposure to sunlight causes loss of strength because of degradation of cellulose chains.

7.Abrasion resistance is fair and rayon resists pill formation. Rayon has both poor crease recovery and crease retention. [10]

Chapter-3

Materials and Method

3.1 Material

3.1.1. Fabric Speciation

Industrially Scouring-Bleaching Sample were collected from the lab of Naz Bangladesh Ltd.

Table-3.1fabric speciation

Parameter	Description	Description
Composition	100% Cotton	100% viscose
Types	S/J (knitting)	S/J(knitting)
WPI	34	37
CPI	48	54
GSM	132gm	128gm
YC	30	30

3.1.2 Recipe

3.1.2.1 Reactive dye

Dye	- 2% (o.w.f.)
Sequestering Agent	- 1 g/L
Wetting Agent	- 1g/L
Salt	- 25g/L
Soda	- 6g/L
Temperature	- 60℃
PH	- 9.5-11.5
M:L	- 1:50
Materials	- 5gm
Time	- 30min

3.1.2.2 Direct Dye

Dye	- 2% (o.w.f.)
Wetting Agent	- 1g/L
Salt	- 2 g/L
Soda	- 1g/L
PH	- 6-7
Temperature	- 60℃
Time	- 30min
M:L	- 1:50
Materials	- 5gm

3.1.2.3 Vat Dye

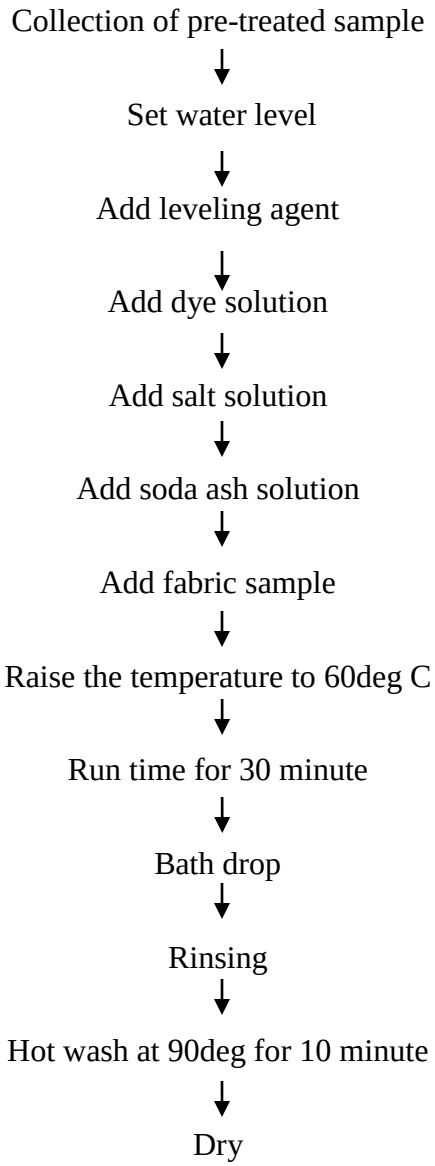
Dye	- 2% (o.w.f.)
Wetting Agent	- 1g/L
NaoH	- 3g/L
Hydrose	- 2g/L
Salt	- 2g/L
Temperature	- 80℃
PH	- 11-12
Time	- 45min
M:L	- 1:50
Materials	- 5gm

3.2 Method

3.2.1 Dyeing Method and Curve

3.2.1.1 Reactive dye

Process flowchart-



3.2.1.1.1 Process Curve

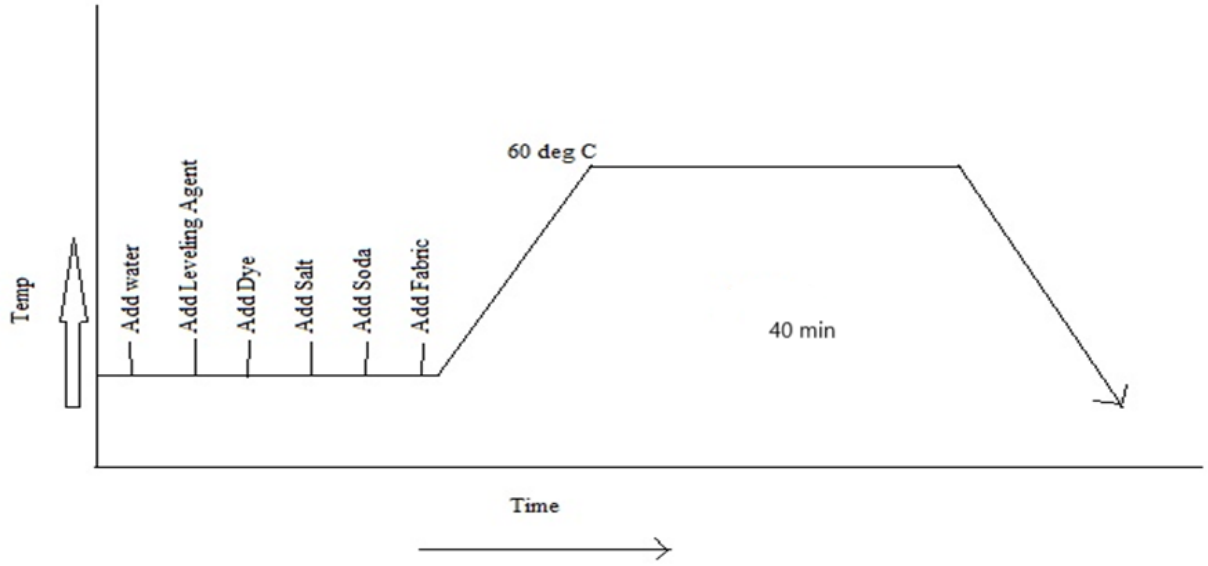


Fig 3.1 Process Curve for reactive dye

3.2.1.2 Direct Dye

Process flowchart

Collection of 100% cotton Pretreated fabric

↓

Dyeing with Direct dye at 100^{o} C for 20min

↓

After treatment

↓

↓

Cold rinsing

↓

Hot wash

↓

Cold rinsing

↓

Drying

3.2.1.2.1Process curve for direct dye

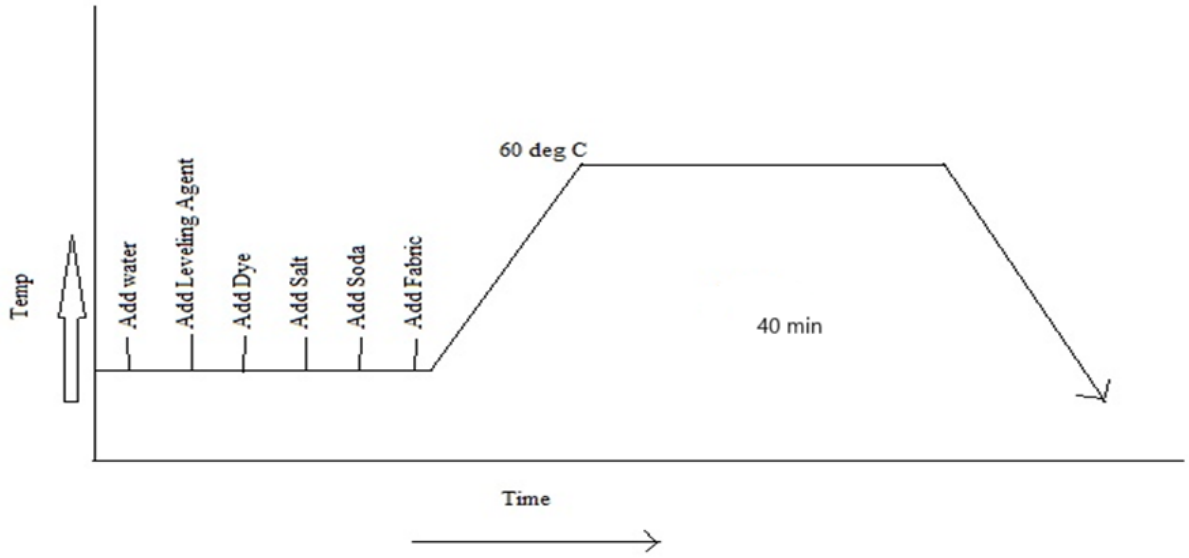


Fig 3.2 Process Curve for direct dye

3.2.1.3 Vat Dye

Process flowchart

Collection of 100% cotton pretreated fabric
↓
Vatting Temperature at 80deg for 5min
↓
Dyeing temperature at 100deg for 15min
↓
Oxidation
↓
Cold rinsing
↓
Hot wash
↓
Cold rinsing
↓
Drying

3.2.1.3.1 Process curve for vat dye

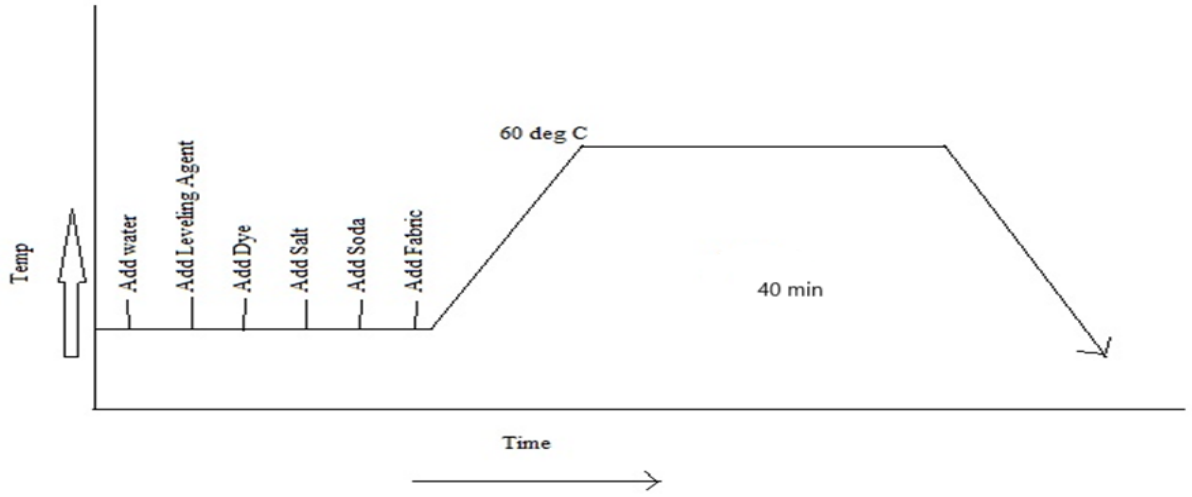


Fig 3.3 Process Curve for vat dye

3.2.2 Test Method

3.2.2.1 Spectral Analysis

Sample were measured using Spectrophotometer. Reflectance(%), color strength (K/S),L,a,b,c were determined for dyed cotton and viscose samples. K/S was calculated as following equation-

$$K/S = \frac{(1-R)^2}{2R}$$

3.2.2.2 Color fastness to wash test

ISO 105 CO2 was adopted to test CF to wash of all sample.

3.2.2.3 CF to Rubbing test

ISO 105 X12 was adopted to test CF to wash of all sample.

Chapter-4

Result and Discussion

4.1 Spectral Results

4.1.1. Colorimetric values of different dyes on cotton & viscose

4.1.1.1. Reactive dyes

Table 4.1: Comparison of colorimetric values of cotton and viscose fabric with **reactive dye**

parameter	Cotton at 600 nm	Viscose at600 nm
R%	17.510	15.550
K/S	1.943	2.293
L	57.51	55.41
a	-1.49	-1.24
b	-25.62	-26.42
c	25.66	26.45

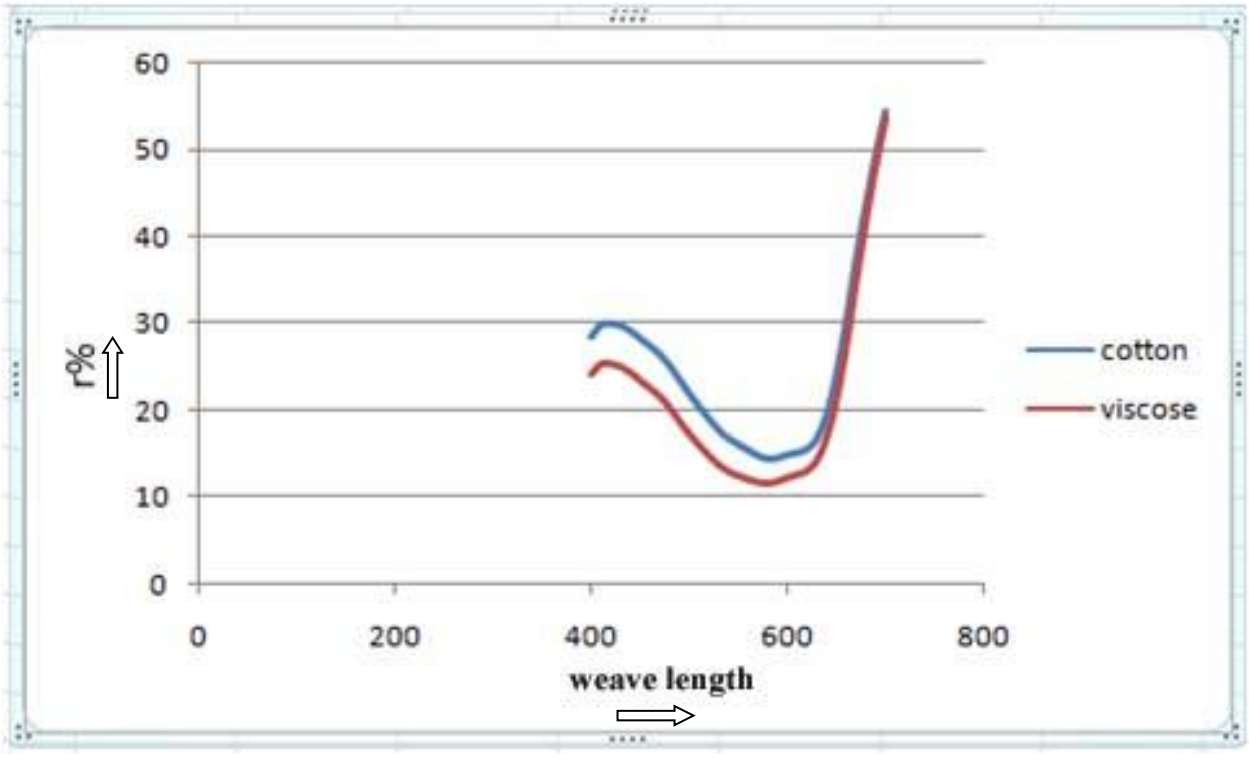


Figure 4.1: Reflectance% for Reactive dye on cotton and viscose fabric

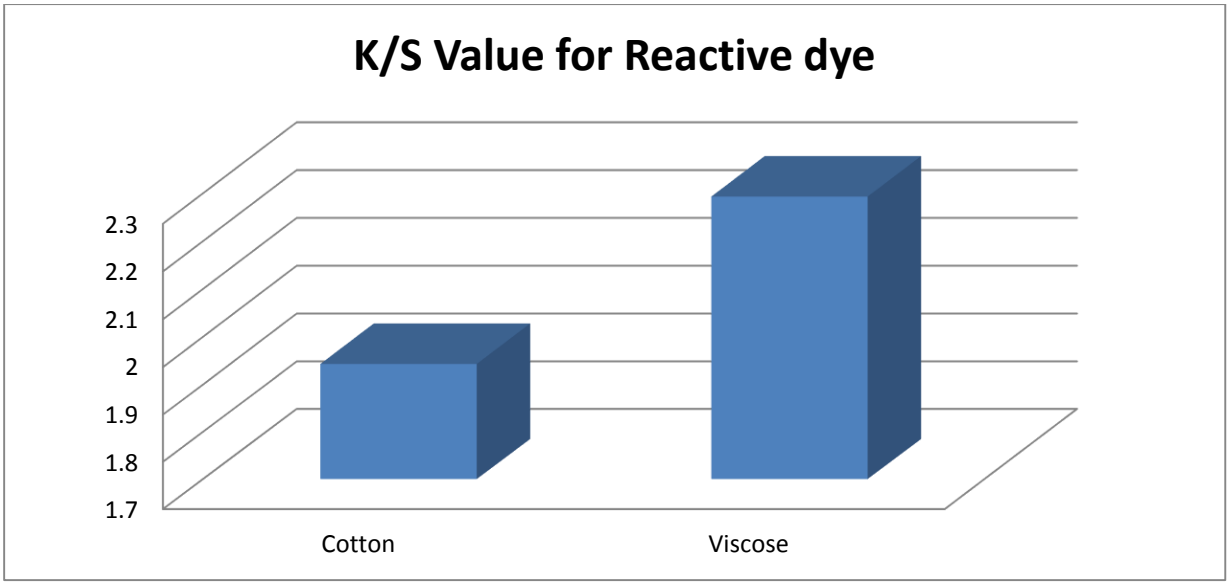


Figure-4.2 Compare of color metric K/S value in column-Diagram,

Table-4.2 Comparison of colorimetric values of cotton and viscose with reactive dye

Parameter	value
ΔL (L cotton-L viscose)	2.1
Δa (a cotton-a viscose)	-0.25
Δb (b cotton-b viscose)	0.8
Δc (c cotton-c viscose)	-0.79

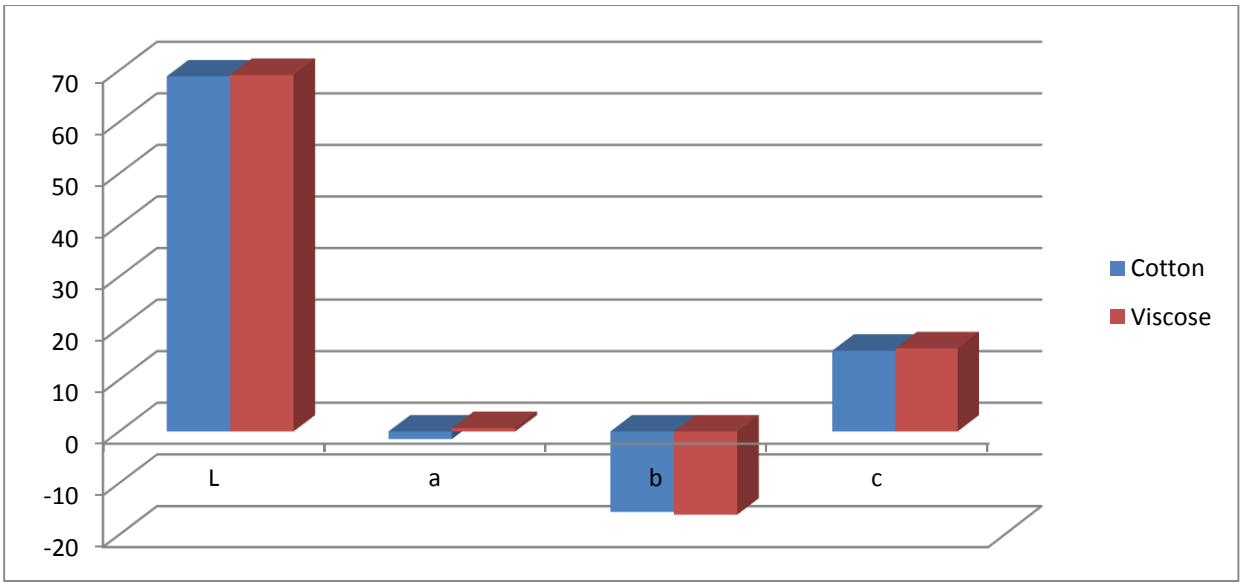


Figure-4.3 Compare of color metric L, a, b, c.values in column-Diagram,

Discussion:

Reflectance values were found to be 17.51%. for cotton and 15.55% for viscose at 600 nm and 600 nm respectively. As K/S value is higher in viscose as compared to cotton, then the shade will be darker in viscose for same dye %. From the values of L,a,b, c it can be said that the shade will be lighter, more greener and less bluer and almost similar in purity of color in cotton fabric than in viscose.

4.1.1. Colorimetric values of different dyes on cotton & viscose
4.1.1.1. Direct dyes

Table 4.1.1 Comparison of colorimetric properties of cotton and viscose fabric with **direct dye**

parameter	Cotton at580 nm	Viscoseat 580 nm
R%	14.370	11.570
K/S	2.551	3.379
L	49.22	44.57
a	4.09	6.52
b	-17.93	-18.01
c	18.39	19.15

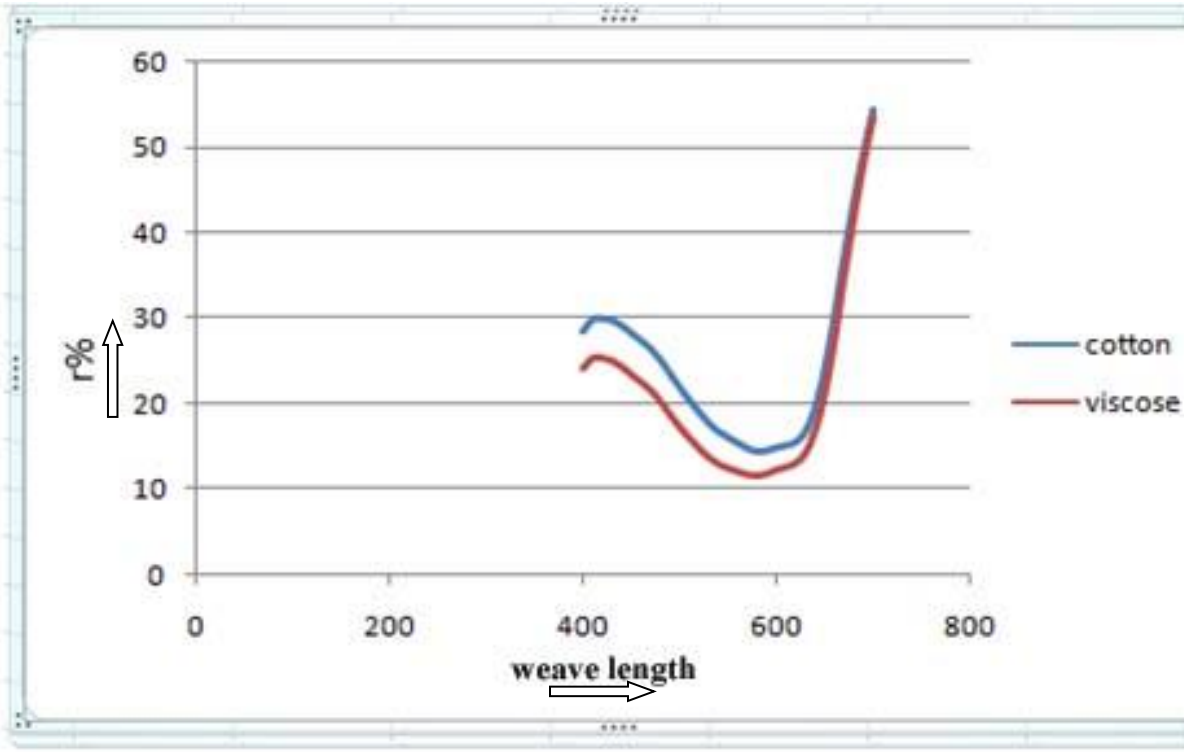


Figure 4.1.1Reflectance% for Direct dye

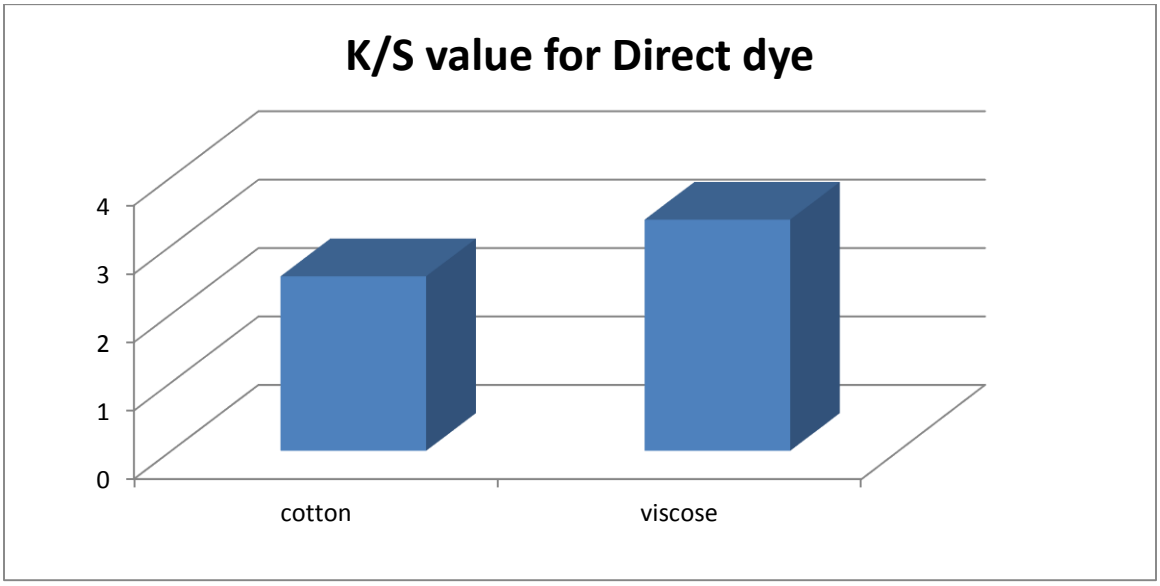


Figure 4.1.2 Compare of color metric K/S values in column-Diagram

Table-4.1.2 Comparisum of color metric value of cotton and viscose with direct dye

Parameter	value
ΔL (L cotton-L viscose)	4.65
Δa (a cotton-a viscose)	-2.43
Δb (b cotton-b viscose)	0.08
Δc (c cotton-c viscose)	-0.76

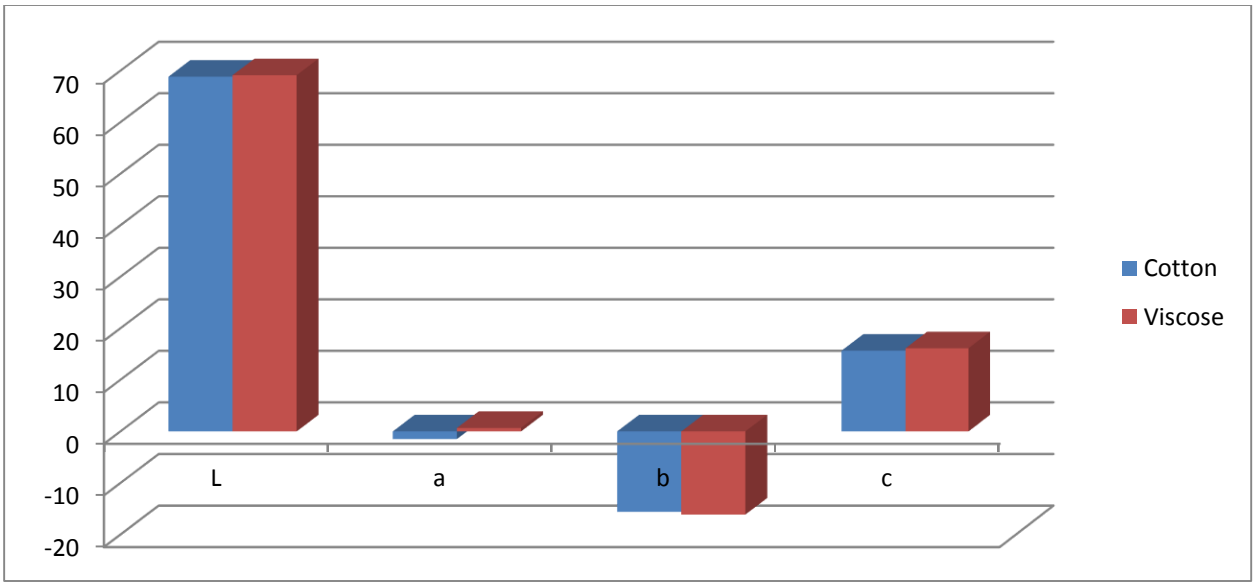


Figure-4.1.3 Compare of color metric values in column-Diagram, L, a, b, c.

Discussion:

Reflectance values were found to be 14.37%. for cotton and 11.57% for viscose at 580 nm and 580 nm respectively. As K/S value is higher in viscose as compared to cotton, then the shade will be lighter in viscose for same dye %. From the values of L,a,b, c it can be said that the shade will be lighter, more reader and less bluer and almost similar in purity of color in cotton fabric than in viscose.

4.1.1. Colorimetric values of different dyes on cotton & viscose

4.1.1.1. Vat dyes

Table -4.1.1.1Comparisum of color metric value of cotton and viscose with Vat dye

parameter	Cotton at 600 nm	Viscose at 600 nm
R%	33.170	34.800
K/S	0.673	0.610
L	68.85	69.13
a	-1.48	0.67
b	-15.58	-16.11
c	15.65	16.12

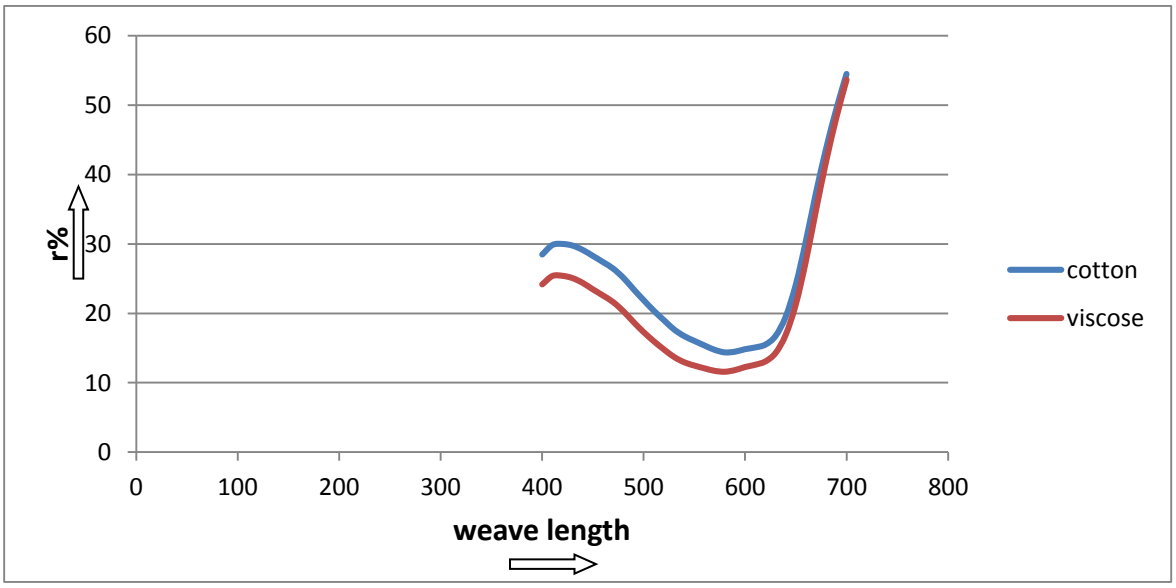


Figure- 4.1.1.1Reflectance% for vat dye on cotton and viscose fabric

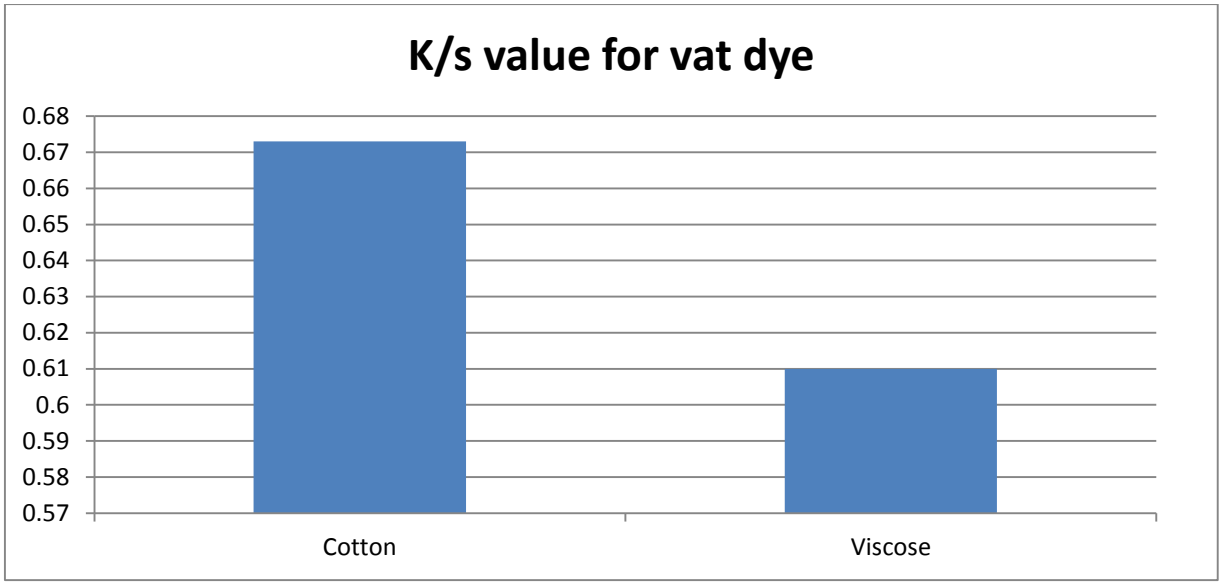


Figure 4.1.1.2 Compare of color metric K/S values in column-Diagram

Table -4.1.1.2 Comparisum of color metric value of cotton and viscose with Vat dye

Parameter	value
ΔL (L cotton-L viscose)	-0.28
Δa (a cotton-a viscose)	-2.15
Δb (b cotton-b viscose)	0.53
Δc (c cotton-c viscose)	-0.47

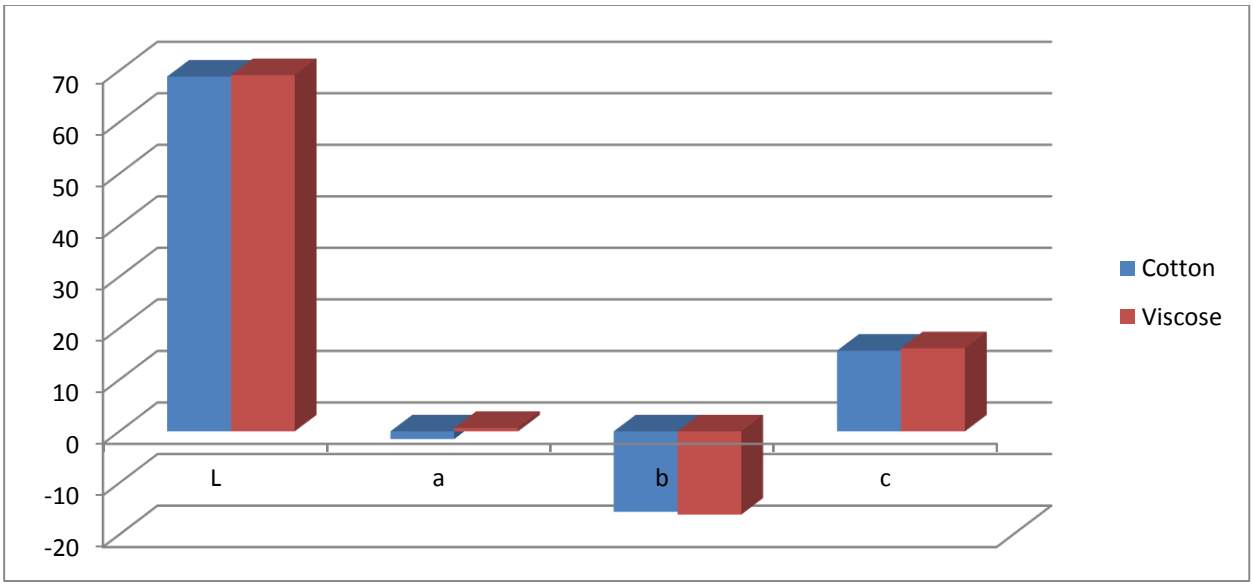


Figure-4.1.1.3 Compare of color metric L, a, b, c.values in column-Diagram

Discussion:

Reflectance values were found to be 33.17%. for cotton and 34.80% for viscose at 600 nm and 600 nm repectively. As K/S value is higher in viscose as compared to cotton, then the shade will be darker in viscose for same dye %. From the values of L,a,b, c it can be said that the shade will be similar, greener and reader and almost similar lightness in similar bluer of color in cotton fabric than in viscose.

4.2 Color Fastness to Wash with reactive dye

Table-4.2.1Comparison of Color Fastness to wash with Reactive dye

		Color Staining					
	Change in Color	A	C	N	P	Ac	W
Cotton	4-5	4-5	4	4-5	4-5	4-5	4-5
Viscose	4-5	4-5	4	4-5	4-5	4-5	4-5

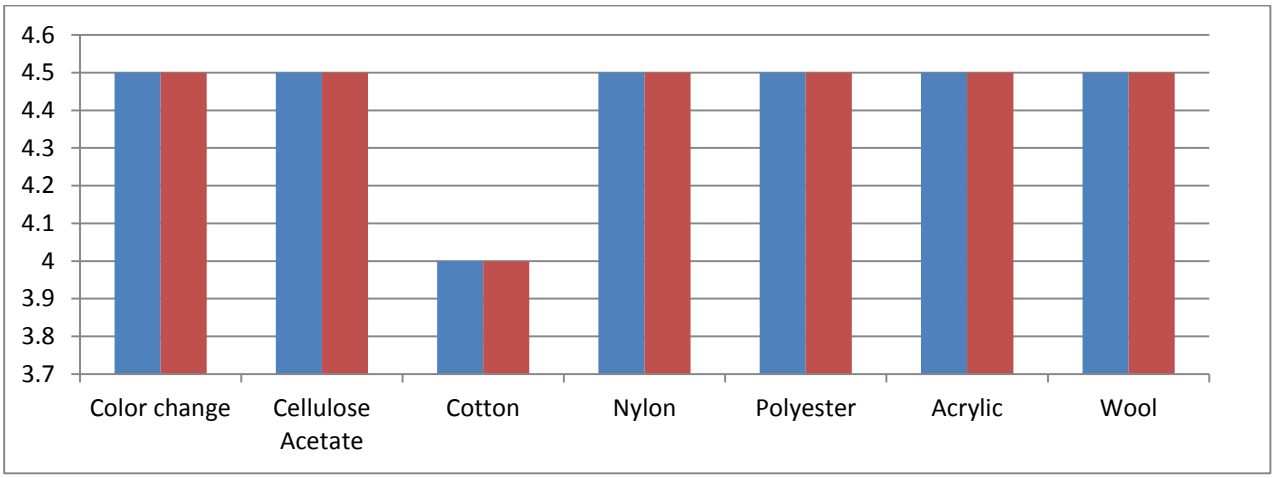


Figure-4.2.1Bar diagram color change fastness to wash of Cotton & Viscose sample with Reactive dye.

4.2.1. Discussion

Change in color similar for both fabric almost similar.

4.2.2 Color Fastness to Wash with Direct dye

Table-4.2.2.1Comparison Color fastness to Wash with Direct dye

		Color Strining					
	Change in Color	A	C	N	P	Ac	W
Cotton	4-5	4-5	3-4	4-5	4-5	4-5	4-5
Viscose	4-5	4-5	3	4-5	4-5	4-5	4-5

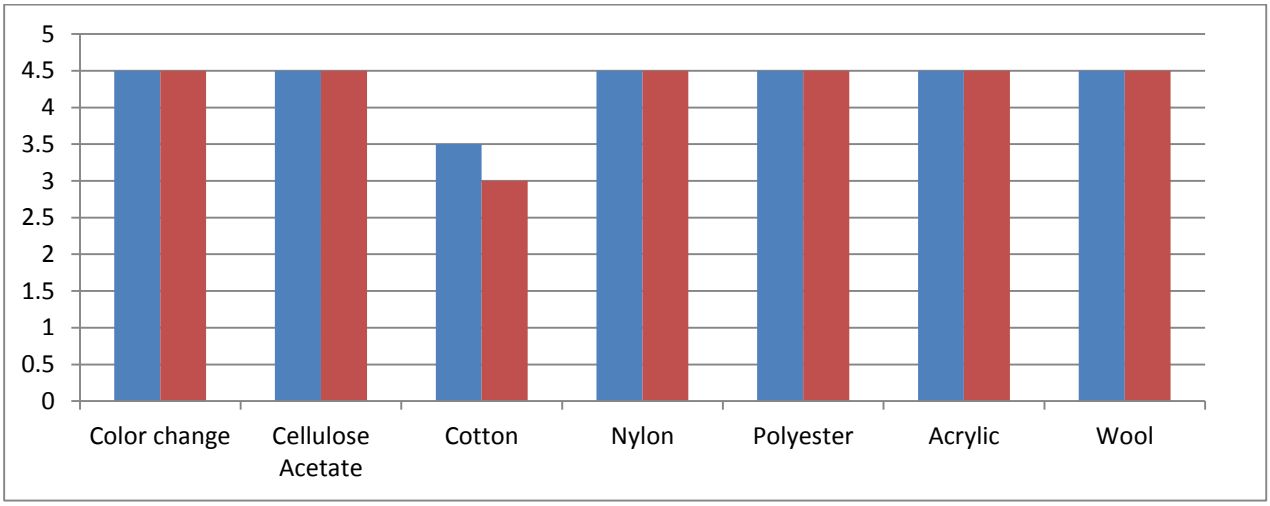


Figure-4.2.2.1Bar diagram color change fastness to wash of Cotton &Viscose sample with Direct dye.

4.2.1. Discussion

Better and similar result were found for both cotton and viscose fabric with direct dye but litile high staining were found for cotton in both cases.

4.2.3 Color Fastness to Wash with Vat dye

Table-4.2.3.1 Comparison Color fastness to Wash with Vat dye

		Color Strining					
	Change in Color	A	C	N	P	Ac	W
Cotton	4-5	4-5	4	4-5	4-5	4-5	4-5
Viscose	4-5	4-5	4	4-5	4-5	4-5	4-5

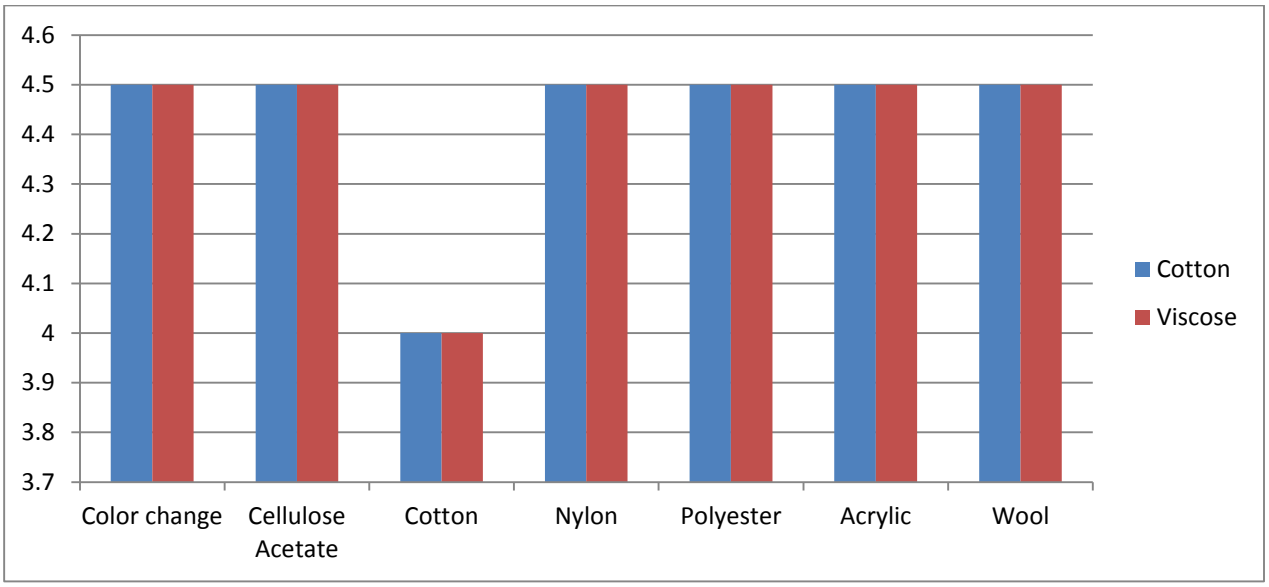


Figure-4.2.3.1Bar diagram color change fastness to wash of C&V sample with Vat dye.

4.2.3.1 Discussion

Change in color similar for both fabric almost similar.

4.3 Rubbing Fastness with Reactive dye

Table-4.3.1Comparison Rubbing fastness to Wash with Reactive dye

	Dry	Wet
Cotton	4/5	3/4
Viscose	4/5	3/4

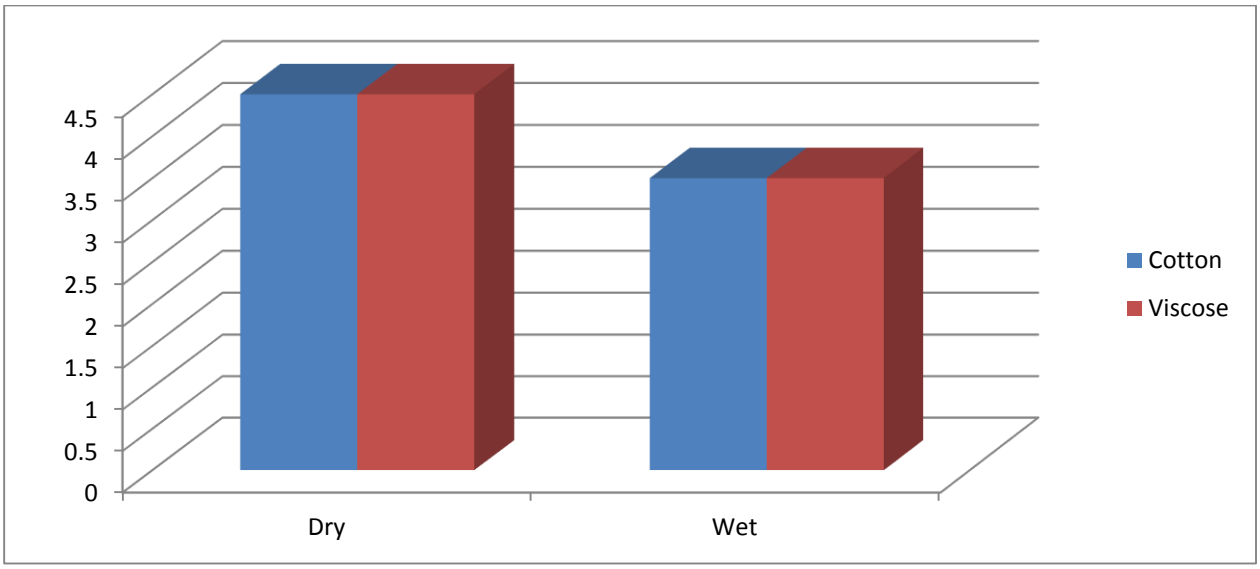


Figure-4.3.1Bar diagram for Rubbing fastness with Reactive dye.

4.3.1 Discussion

Similar and moderated wet rubbing fastness are found both for reactive dye.

4.3.2 Rubbing Fastness with Direct dye

Table-4.3.2.1 Comparison Rubbing fastness to Wash with Direct dye

	Dry	Wet
Cotton	4/5	2/3
Viscose	4/5	4

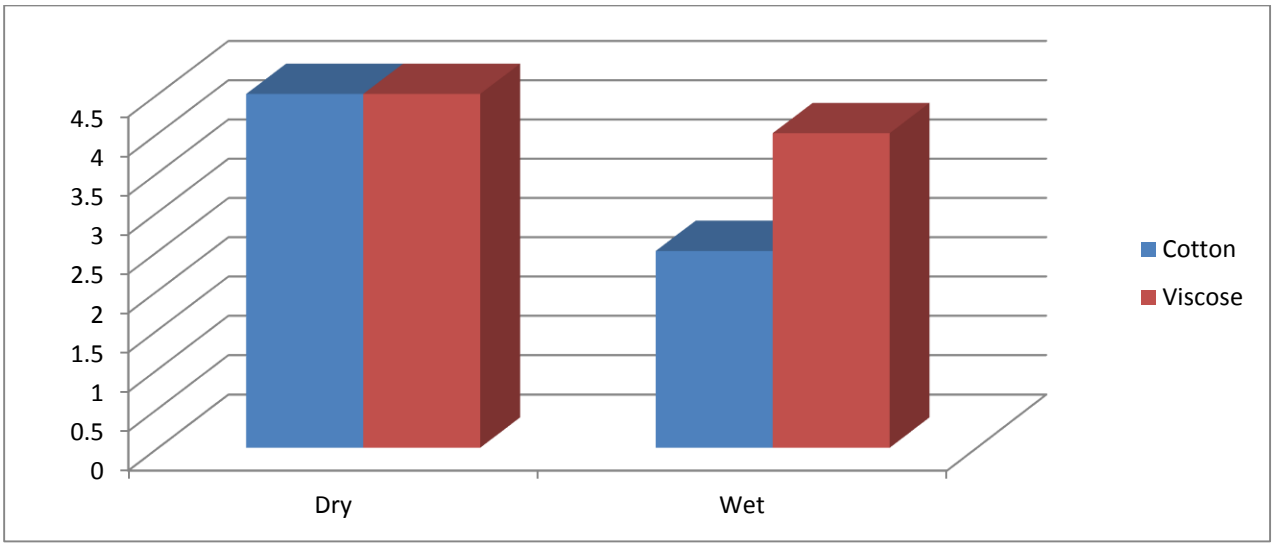


Figure-4.3.2.1Bar diagram for Rubbing fastness with direct dye.

4.3.2.1 Discussion

Poor wet rubbing fastnesswasfound for direct dye cotton fabric (2-3), then direct dye viscose fabric (4),

4.3.3 Rubbing Fastness with Vat dye

Table-4.3.3.1Comparison Rubbing fastness to Wash with Vat dye

	Dry	Wet
Cotton	4/5	2/3
Viscose	4	3

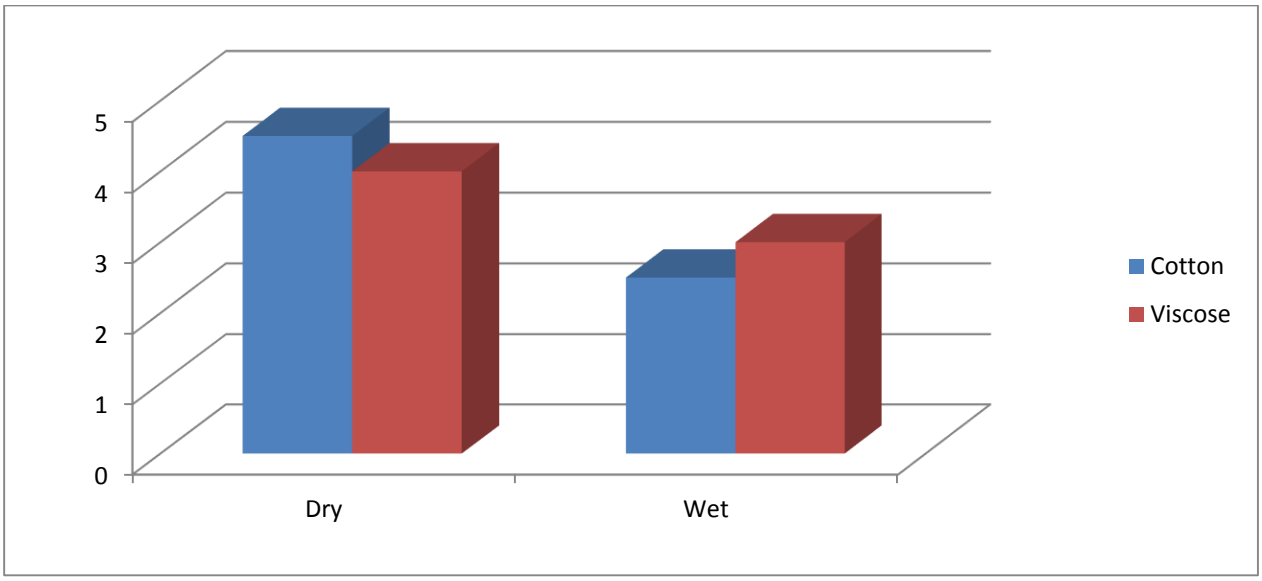


Figure-4.3.3.1Bar diagram for Rubbing fastness with vat dye.

4.3.3.1 Discussion

Cotton should poor (2-3) wet rubbing fastness and moderated,(3) for vat dye viscose fabric

Chapter-5

Final out Comes

5.1 Final Outcome

100% Cotton & Viscose (knitting fabric) was dyed with Reactive, Direct and Vat dye at a specified dyeing condition and the outcomes of the study was as followed:

1.Spectral Value

i) **R%**for **reactive dye** Reflectance values were found to be 17.51%. for cotton and 15.55% for viscose at 600 nm and 600 nm repectively. For **direct dyes**Reflectance values were found to be 14.37%. for cotton and 11.57% for viscose at 580 nm and 580 nm repectivelyfor **vat dye**Reflectance values were found to be 33.17%. for cotton and 34.80% for viscose at 600 nm and 600 nm repectively.

ii) As K/S value is higher in viscose as compared to cotton, then the shade will be darker in viscose for same dye %.for **direct dyes**As K/S value is higher in viscose as compared to cotton, then the shade will be lighter in viscose for same dye %. For **vat dyes**As K/S value is higher in viscose as compared to cotton, then the shade will be darker in viscose for same dye %.

iii) **L, a, b, c, for reactive dyes**From the values of L,a,b, c it can be said that the shade will be lighter, more greener and less bluer and almost similar in purity of color in cotton fabric than in viscose. For **direct dyes**From the values of L,a,b, c it can be said that the shade will be lighter, more reader and less bluer and almost similar in purity of color in cotton fabric than in viscose. for **vat dye**From the values of L,a,b, c it can be said that the shade will besimilar, greener and reader and almost similar lightness in similar bluer of color in cotton fabric than in viscose

2. Color fastness to wash

For **reactive dyes**Change in color similar for both fabric almost similar. For **direct dyes**Better and similar result were found for both cotton and viscose fabric with direct dye but litile high staining were found for cotton in both cases. For **Vat dyes**Change in color similar for both fabric almost similar**.**

3. Color Fastness to Rubbing

Similar and moderated wet rubbing fastness are found both for reactive dye. Poor wet rubbing fastnesswas found for direct dye cotton fabric (2-3), then direct dye viscose fabric (4).Cotton should poor (2-3) wet rubbing fastness and moderated,(3) for vat dye viscose fabric.

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