COMPARATIVE EFFECT OF LAUNDERING ON THE PROPERTIES OF NIGERIAN AND FOREIGN MADE WAX PRINT FABRICS.

BY

OBIANA, VIOLA UCHE ANAZODO

DEPARTMENT OF VOCATIONAL AND TECHNICAL EDUCATION
FACULTY OF EDUCATION,
AHMADU BELLO UNIVERSITY, ZARIA.

JUNE 2011

COMPARATIVE EFFECT OF LAUNDERING ON THE PROPERTIES OF NIGERIAN AND FOREIGN MADE WAX PRINT FABRICS.

BY

OBIANA, VIOLA UCHE ANAZODO
(MED/EDUC/14963/07-08)

A THESIS SUBMITTED TO THE SCHOOL OF POSTGRADUATE STUDIES, VOCATIONAL AND TECHNICAL EDUCATION DEPARTMENT, HOME ECONOMICS SECTION, FACULTY OF EDUCATION, AHMADU BELLO UNIVERSITY, ZARIA.

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTER OF EDUCATION (M.Ed) DEGREE IN HOME ECONOMICS (CLOTHING AND TEXTILE)

JUNE, 2011.

DECLARATION

I declare that the work in the thesis "COMPARATIVE EFFECT OF LAUNDERING ON THE PROPERTIES OF NIGERIAN AND FOREIGN MADE WAX PRINT FABRICS has been conducted by me in the Department of Vocational and Technical Education under the supervision of Dr (Mrs) S. L Ajayi and Dr (Mrs) P .E Onuigbo The information derived from the literature has been duly acknowledged in the test and the list of references provided. No part of this thesis was previously presented for another degree at any University.

Obiana Viola Uche Anazodo	_____	_____
Name of Student	Signature	Date

CERTIFICATION

This research work titled "COMPARATIVE EFFECT OF LAUNDERING ON THE PROPERTIES OF NIGERIAN AND FOREIGN MADE WAX PRINT FABRICS, meets the regulations governing the award of the degree of masters of education in Home Economics (clothing and textiles) of Ahmadu Bello University, and was approved for it's contribution to knowledge and literary presentation.

Dr (Mrs) S.L. Ajayi Chair Person Supervisory Committee	_____ Signature	_____ Date
Dr (Mrs) P.E Onuigbo Member Supervisory Committee	_____ Signature	_____ Date
Dr. M,M Aliyu Head of Department.	_____ Signature	_____ Date
Prof. A.A. Joshua Dean, School of Postgraduate Studies	_____ Signature	_____ Date

ACKNOWLEDGMENT

My thanks go to my major supervisor Dr (Mrs) S.L. Ajayi who saw me through my study despite her tight schedule, her constructive direction and provision of some materials has greatly improved the standard of the work. My second supervisor Dr. (Mrs) P.E Onuigbo, I register my sincere gratitude for special interest, correction and encouragement she demonstrated in the course of this study. My thanks also go to Dr A. Danladi of the Department of Textile Science and Technology for his guidance, direction during the course of the practicals of this study. You stood as pillars to the success of this work. May God bless you.

I am very indebted to my lectures Dr. M.M Aliyu, Dr (Mrs) V.O Babalola, Dr (Mrs) T.O Ojo, Dr (Mrs) A.Z Mohammed, Dr (Mrs) E. Ike, Dr (Mrs) M.F Ahuwan, Dr (Mrs) E.E Adamu, Dr. D.O Oni, Dr A.A Udoh, Dr. D.O Endomi Dr B.I. Okee and (Mrs) S.E Kantiok for their guidance and valuable suggestions towards the accomplishment of this work. My sincere gratitude goes to the Head of Department Textile Science and Technology Dr. M.K Yakubu, the laboratory personnel Mr. A.O Omata and Mr. S.O Okeje, Mr. A. Umaru, Mr G. Akeen for helping me during the conduct of the practicals and interpretation of the data. My thanks also go to the H.O.D of fashion and textile technology Kaduna Polytechnic, Mrs C. Alabi and the laboratory technician Mallam Bello for his guidance and direction and imput during the practicals. I am also grateful to my former principal, Mallam Z. Yahuza, the V.P. Academic, Mr Adetoye and all, my colleagues and staff of Home Economics unit, Federal Government College, Kano for their for-bearing me during the course of this study. My gratitude goes to my Typist,

Miss M.O Emmanuel who took pains in typing and retyping this work, special thanks goes to Mr Y.K Gideion who help in the statistical analysis of this study.

I am most grateful to my family members particularly my husband and our six children Somto, Chinedu, Ebele, Onyinye, Chinechelem, Victoria for their patience, endurance, love and prayers during my frequent absence from home. Thank you all for your wonderful work, may God bless and reward you all Amen.

Above all, I sincerely express my profound gratitude to Almightily God for granting me the good health, strength and knowledge and for sustaining me throughout the period of my study.

ABSTRACT

The purpose of conducting this research is to comparatively investigate the effect of laundering on Nigerian and foreign made wax print fabrics. So as to guide consumers in making good decision when purchasing wax print fabrics and taking proper care of the fabrics. Six wax print fabrics were used in this research, three made in Nigerian (Nichem, UNTL and Quali wax) and three foreign made namely Hitarget, Deluxe and Hollandiase Vlisco. The samples were bought from open market, and selected from representative of the ranges in print and quality commercially available in the Nigerian market. Experimental research design using laboratory method was employed. Factorial approach was used in the collection of data. The data collected were subjected to statistical analysis using mean, standard deviation and percentage mean deviation to test the research questions. The findings shows that differences exist in the abrasion resistance, crease recovery, drape, tensile strength, fastness to washing and light properties of Nigerian and foreign made wax print fabrics after laundering. It also revealed that, synthetic detergent, increase time of washing, high temperature of laundering water, and drying under the sun fades wax print fabrics. Recommendations were made towards improving consumption skill and proper care of wax print fabrics which include the following: consumers should buy wax print fabrics base on performance end use requirement not based on Nigerian or foreign because some properties are better in Nigerian and some in foreign fabrics. Rate and time of washing, concentration of detergent and temperature of laundering water should be minimal to reduce fading. Soap should be used for washing and drying should be under the shade, better quality dye should be used in dyeing of Nigerian made wax print fabrics to increase it's fastness property.

TABLE OF CONTENTS

ABBREVIATIONS

TEPIA:	Textile Fibre Products Identification Act
F.T.C:	Federal Trade Commission
HLCC:	Home Laundering Consultative Council
EPCM:	End Per Centimeter
OPS:	Organophosphate Samples
PPM:	Picks Per Meter
PPC:	Picks Per Certimeter
ACHE:	Acetyle Cholinesterase
OP:	Organophosphate
AATCC:	American Association of Textile Consultative Council
P/C- Blend:	Polyester/Cotton Blend
R.U:	Relectance Unit
APA:	American Psychological Association
AEAHE:	Assian Regional Association for Home Economics
T.R.J:	Textile Research Journal
T.R.I:	Textile Research Institute

LIST OF TABLE

LIST OF FIGURE

LIST OF APPENDIXES

OPERATIONAL DEFINITIONS OF TERMS

Local wax print Fabrics: Textile wax prints products, that are made, produced or manufactured in Nigeria by Nigeria textile companies e.g top wax, super wax, Nichem wax etc.

Weaving: The process of converting yarn into fabric (clothes)

Colour Fast: A colour is said to be "fast" when it does not fade. The fastness, of colour depends on three factors – type of dye, chemical structure of the fiber and method of application.

Gray Goods: Fabric as it comes from the loon before it is finished

Dyes:- are compounds, that penetrate the fibers use to colour the entire fabric or create special designs on the fabric.

Hand: How a fabric handles and feels.

Hydrophobic: Water loving

Hydrophilic: Water hating

Planned Obsolescence: Manufacturing things so that they fall apart and need to be replaced in a short period of time.

Pima:	Means that the cotton fiber are extra long and is of best quality.
Mercerized:	Means that the cloth has been treated with chemicals to add strength and luster.
Sariforized:	Means that there is not more than one percentage (1%) residual shrinkage (¼ inch to a yard)
Weft:	The yarn or thread that runs cross-wise in a woven fabric.
Warp:	The yarn or thread that runs length –wise in the woven fabric.
Sizing:	Natural or chemical finishes applied to increase strength, smoothness, Stiffness and weight.
Drape:	Ability of a fabric to hang in loose fold.
Desizing:	Removal of the Natural or chemical finishes applied to increase strength smoothness, stiffness and weight.
Soap:	The detergent made from natural fat/oil and caustic potash.
Synthetic detergent:	The detergent made from a mixture of Alkane plus sulphuric acid. It can be in paste, liquid or powdered form.

CHAPTER ONE
INTRODUCTION

1.1 Background of the Study

Textile in the form of clothing is among the three basic needs of man, from historical evidences, it has been found that prehistoric people knew how to weave over 3000 years ago. A textile fiber is the basic unit from which fabric is made (Weber 1990). Ogunluyile (2005) stated that textile was derived from the Latin verb 'texere" which means to weave. He however, expanded the scope to embrace yarn, fibers and other materials that could be made into fabrics through interlacing, knitting, bonding, felting, tufting and braiding. Fabrics are the finished product of textiles (Nkeonye 2009). The most common uses of textile product are apparel and home finishing. Besides these uses, textile products are indispensable to industry, agriculture, transportation, space exploration, health services and other areas (Malfoy 1992).

Weber (1990) Stated that washing fabric or garment by hand or by machine with a soil removing product is called laundering. As fabrics are used, dirt, soil, grease and perspiration from the body all accumulate to make it dirty. They need to be washed to remove the dirt and make them clean and safe for use again. Measurement of effect of laundering on fabric properties would assist the apparel manufacturers in developing laundering recommendations based on the fabric's performance and in selecting fabrics which will serve their useful purpose to consumer satisfaction. Fabric care involves washing, drying, pressing, mending folding and putting away (storing) clothes and household fabrics. Weber (1990), stated that fabric care helps to save money that would have been used to replace garment ruined through improper care and help to save laundry bills. Also, proper care helps to extend the length of service of the garment to users. The

most important thing consumer put into consideration when buying and taking care of fabric is how best to reduce or eliminate fading from occurring. Therefore, to avoid wasting money, they tend to go for foreign fabrics which they consider to be colourfast more than Nigerian made fabric but some times the reverse is the case (Yusuf 1998).

Fabric Properties are those characteristics of a fabric which determines its comfort and performance during usage. These two widely accepted phenomena, are affected by many attributes and can be assessed either subjectively or by an objective measurement. The performance of any fabric is dependent upon the combination of inherent fiber properties as well as upon the geometrical arrangement of fibers which vary greatly according to the construction of the fabrics and the types of fibres used and other factors introduced by weaving. Performance refers to how a fabric will react during the life of the garment or item. Gawthorpe (1974) viewed that the female perception of cloths is probably more concerned with appearance than with comfort. Nevertheless if cloths are to serve their proper purpose, they must satisfy other requirement other than smartness. Some fabrics are chosen for their tensile strength, others are chosen for their colour or abrasion resistance. The knowledge of fibers and fabrics will help to improve consumer's skills, give them confidence that they need to make wise fabric choices, help one to take better care of one's purchases, thus making one's cloth to last longer and one will be more satisfied with them (Weber 1990).

Made in Nigerian wax print fabric is a general term employed by Nigerians to include wax printed fabrics that are woven, printed in Nigeria using resins, dyes and wax processes to achieve a distinctive indigenous design commonly referred to as wax print (Akinwumi 1984). Made in Nigerian fabrics are in two folds, those produced by

traditional producers and the contemporary fabric industries. The former produces fabrics such as Adire, Batik, Tie and Dye, Aso-Oke, Akwete, Akwa Ocha, Okene, Ota Ochi, Anger and Atu. Veritable Wax, Guinea Brocades, Damasks are products of contemporary fabric industries.

Foreign wax print fabrics are imported wax print textiles from other western countries. Dosi, Pavit and Soete (1992) noted that the existence of original designs form Hong Kong, Batiks form Indonesia could adversely affect the local products. According to Dosi, et al (1992) these foreign products possess higher quality in terms of colour fastness and durability.

Colour fading has been a major problem threatening the choice of Nigeria veritable wax print fabrics. Corbman (1983) observed that the beauty of the colour of any fabric is of no value to the consumer unless the dyes are considered fast under the condition in which the fabric will be used. He noted that the colour must meet such test as washing, ironing, steaming, perspiration, strong light and dry cleaning. Colour characteristics of fabrics determine acceptability, viability and durability, colour adds interest and emphasis to fabrics, (Web-Lupo and Lester, 1987).

Therefore, the knowledge of how a fabric will perform during its life as it undergoes washing, drying, exposure to sun; exposure to detergent will help the consumer, when choosing clothing to choose rightly according to intended end use. It will also help the consumer take good proper care of her garments, save money that would have been used to replace easily worn out garments due to improper care, gives the consumer the satisfaction he desires from her money worth and finally help in the family financial management.

1.2 **Statement of Problem**

The researcher observed that special concern have emerged about the quality and performance quality of wax print fabric bought from our Nigerian market. This observation about the relative poor quality of wax print fabrics in the market affects the consumers in diverse ways.

The researcher have heard a lot of complaints from friends, relatives and even from personal experience, on how disappointed they felt on a wax print fabric bought and sewn and only on a first or subsequent wash, looses it's aesthetic appeal that made them purchase it in the first place. Most Nigerian women spend a lot of money on clothing because the ones they buy do not last, they fade after some time and they would have to replace them.

It has been read from the newspaper that the Nigerian government is making concerted efforts for Nigerians to patronize made-in-Nigeria goods including fabrics (Aruwgun 2002 as in Punch. July 29, 2002). The researcher has also observed from bill board advert of Ministry of Commerce and Industry advising Nigerians to "buy Nigerian and dress Nigerian". The researcher has also heard the minister of commerce and industry on NTA News of 3rd February 2011 advice Nigerian to take interest in made in Nigerian fabrics. He said the government has made it mandatory for civil servants to wear made in Nigerian fabrics on Fridays. This effort has been consolidated by ban on importation of African print fabrics and fashion articles that can be produced in Nigeria, however it is necessary to ensure production of fabrics that are durable and acceptable by consumers. Fading is an undesirable characteristic associated with Veritable wax print fabrics. This

has made consumers to now have the most confusing problem in clothing selection. Wingate (1976) stated, that when textile manufactures can say with prove that a particular blend is the most satisfactory for instance men's suit, women's wrapper and give the consumer logical reasons why, the consumers will have one of his most confusing problem in clothing selection solved. It is only through research like this, that this decision can be possible.

Technology has brought the consumers many lines of improved goods. Many new fabrics are so utterly novel that the consumers does not know whether they can be washed without shrinking and without changing color; whether the colour is sunfast or what fiber the material is made; and how to care for the finished article so that it will give its money worth.

Based on the above observations, Yusuf (1998) argued that many foreign made fabrics are not necessarily superior to their Nigerian counterpart to a large extent, and that the attachment to them is sentimental and so irrational. He opined that superiority cannot exist in all cases. Ejiofor (1989) also observed that while many made in Nigeria goods are intrinsically of low quality, there is no doubt that there is a generally unhealthy attitude to these products. According to him this attitude is influence by the Nigerian business environment, education, attitude of business owners, workers behaviour, inferiority complex, greed to get rich quick, smuggling, the quality of the products and industrial relations. The net effect is that some goods made locally are given the derogating tag "Igbo made, Abana–anya, second hand clothing, so strong is the

unfavourable attitude that many venture some manufacture give foreign labels to their products in order to make it more marketable.

These problems have prompted the researcher to compare the effect of laundering on the properties of Nigerian and foreign made wax print fabrics. This is aim at finding lasting solution to the above stated problems with the view of guiding consumers in the wise clothing selection. It will also help them to know better how to take proper care of their clothing. It will also create more consumer satisfaction from performance end use and provide lasting peace in family clothing financial management.

1.3 **Objectives of the Study**

The main objective of this research is to find out the effect of laundering on the properties of some selected Nigerian and foreign made wax print fabrics and determine which one retains its aesthetic value after laundering thereby determining its quality.

The specific objectives are to:

1. determine the effect of laundering on the properties of Nigerian and foreign made wax print fabric in terms of:
    a. Abrasion,
    b. Creases recovery
    c. Drape,
    d. Tensile strength
    e. colour fastness to washing
    f. colour fastness to light
2. find out the effect of using soap/synthetic detergent on the Nigerian and foreign made wax print fabrics.
3. access the effect of using different concentration of detergent, time and temperature of water in laundering of Nigerian and foreign made wax print fabrics.

4. investigate the effect of drying under the shade/sun on the Nigerian and foreign made wax print fabrics.

1.4 Research Questions

The following research questions were formulated for the study.

1. to what extent does laundering affect the following properties of Nigerian and foreign made wax print fabrics in terms of:
   a. Abrasion resistance
   b. Crease recovery
   c. Drape
   d. Tensile strength
   e. colour fastness to washing
   f. colour fastness to light
2. What is the effect of using soap/synthetic detergent on the Nigerian and foreign made wax print fabrics?
3. To what extent does the use of different concentration of detergent, time and temperature of washing affect the fading of Nigerian and foreign made wax print fabrics.
4. What is the effect of drying under the shade/sun on the Nigerian and foreign made wax print fabrics?

1.5 Significance of the Study

Fabric is valued not only for its appearance but also for its serviceability and end use performance. These criterions are influenced by a number of complex properties such as washability, handle, abrasion resistance, tensile strength. All of which are amongst the properties that determine the performance quality and ease of care of a fabric. This research will be of help to the following people in the following ways.

It will help the consumers to know the effect of laundering, use of soap or detergent and effect of drying under the shade or under the sun on their fabrics. This will

better educate and remind them on how to adequately care for their garments so that they will last longer. This will boost their satisfaction with the garment.

Hopefully, the findings of this study would be of benefit to the Nigerian families and individual, in that, it will help to improve consumer skills in fabric consumption and give them the benefits to make wise fabric choice in terms of choosing good quality fabrics. This will go a long way in saving the family a lot of money which would have been used to replace worn out clothing caused by poor consumption behaviour or inappropriate way of maintaining the fabric.

It will also help Nigeria producers to identify their strength and weakness in terms of quality of their product. It will help them to know the area where necessary improvement is needed for their product to suit the consumers and compete favourably with others, nationally and globally so as to remain relevant in business.

The study will help to show case the superiority or inferiority of Nigerian or foreign made wax fabric, which will ultimately help Nigerian producers to redesign their products, producing new ones, developing packages and evaluating channels of Advertisement. This will boost consumerism of home made fabrics. This is needful because Nigerian wax print fabrics symbolizes our traditional motif and costume which enhance our identify and contribute in preserving our heritage. Which ultimately facilitate our better understanding of who we really are and not just allow the western culture erode our own culture.

- It will serve as a reference to future research studies related to laundering or fabrics in general.

- It will be useful to Home Economics teachers and students in teaching and learning topics like laundering, fabrics and their properties.

1.6 Basic Assumptions

For the purpose of this study, the following assumptions were made:

1. Washing does not affect Nigerian and foreign made wax print fabrics differently as they have the same properties being made of cotton and dyed with the same dye stuff after laundering.
2. Consumers prefer using synthetic detergents to soap when washing because it lathers better and removes dirt faster.
3. People prefer to dry their cloth under the sun as it dries faster and smell fresher to the one's dried under the shade.
4. Nigerian made wax print fabrics are not durable and have faster fading quality.

1.7 Delimitations of the Study

This study is delimited to the following practical testing or experimentation of the effect of laundering on the following properties: Abrasion resistance, crease recovery, drape, tensile strength, colour fastness to washing, colour fastness to sunlight . The research will also be delimited to, washing of the fabrics to determine the effect of using soap and synthetic detergent on the fading, using different concentration of detergent, time and temperature of washing water to determine their effect on the fading of the wax print fabrics. Drying under the shade and sun to determine the effect of sun on the fading of the fabrics .

The research will also be delimited to cotton wax print fabrics, three Nigerian made and three foreign made wax print fabrics only. Commonly known as Nichem, Untl, Quali Wax for Nigerian made and Hollandaise Vlisco, Hitarget, Deluxe for foreign made. The above names are brand names; the researcher chooses them because they are all made of cotton and the same type of dye. This is to enhance accurate generalizations of findings.

CHAPTER TWO
REVIEW OF RELATED LITERATURE

The reviewed literature for this study is reported under the following sub-headings.

2.1 Fiber, fabrics, properties /performance
2.2 Fabrics classification, construction and finishes
2.3 Clothing and fabric care
2.4 Dirt, soil and their removal
2.5 laundering,Laundering agents, processes, and equipment
2.6 Hand washing
2.7 Nigerian and foreign made wax print fabrics
2.8 Empirical studies
2.9 Summary of review of related literature

2.1 Fiber, Fabrics, Properties/ Performance

Fiber and fabrics are all around us, sometimes their uses are very obvious. Everybody expects a shirt to be made from fabric. According to American textile manufacturing institute, the average American uses sixty pounds of textiles each year for, clothing, furnishing both at home, recreational, industrial, medical and transportation areas. Fibers are used for rope, cording, fishing lines. Thompson (1976) noted that fabrics are of various kinds, produced from those made from natural fibers to those made with synthetic fibers and those blended. Fabrics were made more beautiful by designing them skillfully using various shape and forms. He stressed that textile manufacturers, both local and industrial, make use of one or more of these elements to create more meaning to fabric, most especially in beautifying them. They are very versatile consisting of prints floras, loud stripes, checks as well as solids which happen to be part or vary in

texture and colours (Thompson 1976). Fabrics is a flexible material made up of a network of natural or artificial fibers formed by any of the weaving, knitting or other fabrication methods (Vanderhoff 1985).

Weber (1990) defined fiber as the basic unit from which fabric is made. He stated that a fiber for use in fabric should have four essential properties.

i. It must be fairly strong or it is worthless
ii. The fiber must be pliable or able to bend without breaking otherwise it cannot be twisted into a yarn and then woven or knitted into fabric
iii. The fiber must have some elasticity, or ability to stretch and return to shape
iv. The fiber must be long enough to be able to be spun into yarn.

He pointed that, the knowledge of fibers and fabrics helps the consumer in the following ways.

- Helps consumer to improve his skills in consumption
- Gives the consumer the confidence to make wise choice
- Help, the consumer to take better care of his cloths which will enable it last longer.
- Gives the consumer satisfaction with what he purchased because even after long usage the material still look and feel good even though you have worn them over and over again
- Make the consumer a better shopper as he will be able to better evaluate the textile he is thinking about purchasing

- Helps the consumer to care about the fabric and know what to expect when it comes to taking care of cloths. Weber (1990).

The quality of any fabric, in relation to strength, durability, determines the end use to which it is subjected to whether for apparel or home furnishing and house decoration (Marshal, Jackson and Stanly 2000). Okewole and Akanbi (2003) defined fabric as the actual material woven from variety of yarns.

Nkeonye (2009) defined fiber as a unit of matter characterized by flexibility and fitness and a high ratio of length to thickness. To him, the word fiber creates a mental picture of a long, thin, hair like object and indeed all textile fibers have this physical characteristics, although he submitted that not all fibers that are having this property are suitable for textile purposes. He further stated that fibers are used to produce fabrics by the process of interlacing the warp and weft yarns. He stressed that since the late 1990's there has been a great innovation in the textile industry where blended fabrics and fibers are produced. He further observed that blended fibers are a combination of two or more natural and synthetic fibers. He explained that blended fiber allows a wide range of yarn to be produced as well as fabric.

Fabric Characteristics/Properties and Performance

Fabric properties are those characteristics of a fabric which determines it comfort and performance during usage e.g strength, drape etc. Weber (1990) stated that fabric characteristics and properties affects it's performance and the way the fabric reacts when it is used is determined by how the fibers are used, how the fibers are formed into fabric and how the finishes are applied to the fabric. He also observed that fabric characteristics are those traits that distinguish one fabric from another. They include the type of

construction, texture, hand and weight. He noted that some types of fabric are easily identified by their construction. This can be recognized as terry cloth by its hops, velvet with a raised surface or pile while ribbed corduroy has rows of pile. Satin has a shiny look produce by its special types of weave. He pointed out that texture refers to how the surface of a fabric looks and feels. It can be smooth, rough, dull, shiny, ruby, fuzzy, or a combination. Thus the texture of a fabric often dictates its end use for example; a rough, dull texture would look off place in a formal environment of smooth silky fabrics. He further noted that how a fabric handles and feels is called the fabrics hand. He said, it can be described as soft, firm, crisp, stiff, or drape-able.

Ajayi (1997) defines handle as "the impression which arises when fabrics are touched, squeezed, rubbed or handled". Schwarz (1999) defines handles as the feel of the material and qualitatively includes such terms as silhouettes (or umpires, hardness or softness) and roughness (or smoothness). To him, the hand of fabric is influenced by flexibility (pliable or stiff), compressibility (Soft to hard), extensibility (stretching or non stretchy) resilience (spring to limp), density (compact to open), surface contour (rough to smooth), surface friction (harsh to slippery), and thermal character (cool to warm). Weber 1990 also explained that fabrics can range in weight from very light to very heavy weight, and is determined by the yarns and the type of fabric construction. For example, chiffon and batiste are very light weight fabric, while canvas and coating fabrics are heavy weight fabrics. Bulky fabric, such as thick knits and some fur are also considered heavy weight. According to him, weight is not always related to hand. A light weigh fabric can be very soft or heavy weight fabric can be very soft or very crisp.

Fabric Performance

The way fabric reacts during its usage can be as a result of fibers used for the construction or special finishes introduced to the fabric to improve on the characteristics that are not natural to the fibers. Weber (1990) noted that performance refers to how a fabric will react during the life of the garment or item. Does it wrinkle? Is it comfortable to wear? Does it breathe; resist or absorb stain? Will it shrink when laundered? Is it strong and durable? Does it need ironing? He also noted that sometimes a fabric's performance is a result of the fibers that are used. At other times, special finishes can be applied to the fabric to provide characteristics that are not natural to the fibers. Fabric performance can be divided into three area; durability, comfort and ease of care.

Durability: According to Weber (1990), durability refers to all those characteristics that can affect how long you will be able to wear or to use a particular garment or item. These include strength, shape retention, resiliency, abrasion resistance and colorfastness.

Strength: Marjorie (1986) observed that most textile fiber exhibit greater molecular orientation or order, in their longitudinal direction than in the direction of their transverse axis, therefore most textile fibres have different indices in the longitudinal and transverse direction and these correlate with the tensile strength of fibres. Different fibers have different tensile strengths or ability to withstand tension or pulling. Strength is also related to the fabric construction. Tightly woven or kitted fabrics are usually stranger than loosely woven or knitted fabric. (Weber 1990).

Any fabric should possess adequate shape retention, resistance to tearing and fabrics that are made from inherently strong fibres will tend to have adequate strength for the selected used and care. However, other factors may influence the properties and the

fabric may be subjected to quick wear because of low resistance to tear and pulling stress (tensile strength), one of the most important properties of textile fibres is their ability to elongate under an applied load. Without this ability, they would be so completely brittle that they would be harsh, and useless. Elongation to rupture is usually measured in conjunction with the determination of tensile strength and tenacity Piper (1974).

Kaswell in Orivir (2005) reported that by proper chemical engineering and physical control, a wide range of stretch and elongation properties can be attained in almost all the synthetic fibres. According to him, the breaking strength of fabric is used as a performance standard for industrial or other purpose where the fabric is in fact subjected to tension. He noted that it is proper that breaking strength be measure so that in case were the fabric is not required to withstand tensile forces, rightly or wrongly, breaking strength is probably the most popular method of maintaining quality control. Breaking strength of a fabric gives a quick and reliable indication that the fibre, yarn or fabric is up to standard. However, there are many textile applications where strength is little consequence and it's use as standard of quality index might be meaningless.

Abrasion Resistance: Abrasion is a series of repeated stress application usually caused by forces of relatively low order of magnitude, which occur many times during the life span of the material. Hambuiger (1978), noted that Fabric in use are subjected to a variety of different forces, which are repeated many times until finally the fabric wear out. Fabrics are abraded in use against various materials (elbows on tables, fabric against fabric, under the arm), under various pressures (the seat of a pair of slacks): under dry and wet conditions. The life of a fabric is very dependent on it's resistance to abrasion. Damage from abrasion is the result of certain inherent fibers properties and the abrasion

resistance of a fabric is very much influenced not only by the choice of fibre but also the construction of the yarn and fabric (Ajayi 1992). Weber (1990) stated that Abrasion is worn spot that can develop when the fabric rubs against something. The question then is, will the fabric resist abrasion. According to him, abrasion can occur on the inside of a collar where it rubs the back of your neck or at your side where you carry your books. Some fabrics can pill or form tiny balls of fibers on the fabric. There are three methods of fabric abrasion, namely frictional wear, surface cutting and fabric plucking or slippage (Backer in Orivri 2005).

*Crease Recovery or Resiliency***:** Fabrics to be used in clothing must be flexible and capable of being creased and folded to conform to the figure and be comfortable to wear. Morton and Hearle (1975) noted that crease resistance is that property, which prevents a fabric from being folded and from forming undesirable wrinkle. He also noted that, if they are to retain a good appearance, however, they must have good crease shedding properties, that is, recovery from unwanted creases that occur in a fabrics in use and during laundering. According to him, Wrinkle recovery of many fabrics is the product of a combination of factors, including geometric and chemical finishes. Fabric with durable press finishes, for examples, will behave, quite different from a similar fabric without such finish. When a fibre is bent, two things may occur.

1. The cross-link may break and join in new positions. When the load is removed, recovery from the crease is restricted by the new position of the cross-links and the textile will show poor crease recovery.
2. The cross –link may be stretched without actually breaking; so that when the load is removed they will tend to return the fabric to its original shape. Resiliency is

the ability of the fabric to bounce or spring back into shape after crushing or wrinkling. (Weber 1990).

Shape Retention: The shape of a fabric can be lost when the fabric is washed or machine dried. This is because some fabrics shrink when exposed to water or heat. According to Morton and Hearle (1975), an increase or decrease in length or width of a fabric is called dimensional change. To him, a decrease in size is referred to shrinkage and an increase as growth. He also observed that the dimensional stability of a fabric is its ability to resist shrinkage or stretching. He noted that heat sensitive fibres shrink when exposed to temperatures above that at which the fabric, yarn or fibre was heat set. He recorded that many of these fibres shows very little relaxation shrinkage if properly heat set and the fabric have good dimensional stability but that relaxation shrinkage can occur on such fabric if the heat setting process was improperly done. Weber (1990) observed that shape retention is the ability of the fabric to retain its shape after wearing or cleaning or stretch so that you end up with a bag knees and elbows. He opined that shape can also be lost when the fabric is washed or machined dried and that some fabrics shrink when exposed to water or heat.

Colour Fastness: Colour of fabrics, when in use tends to fade with time. Hamburger (1978) stated that, colour fastness for each physical and chemical action is determined by the degree of paling or fading of the initial colour and the degree of white material colouring caused by the action. The degree of paling and white materials colouring are established by means of colour fastness standards (grey scales). Grey scales are usually used to assess fastness and there are two types

1. Grey scales for assessing change in colour
2. Grey scales for assessing staining.

Weber (1990) stated that colour fastness means that the colour in the fabric will not change. It will not fade from washing, from chlorine in a pool, or from exposure to sunlight. Elebiyo (2000) stated that the colour fastness is the capacity of textile materials to withstand the action of light, outdoor exposure, soap solution, distilled lime and sea water, washing, perspiration, ironing, rubbing, dry cleaning and so on. He opined that the above mentioned factors causes physical and chemical changes in the structure of dyes and impair their cohesion with fibres, which result in irreversible changes of the material colour and the colouring of contacting surfaces.

Comfort:

According to Weber (1990), comfort is another factor to consider, when selecting fabric. He also stated that, a fabric can be right weight and texture, durable and easy to care for but uncomfortable to wear. He further said that, it may be too hot, to cold, or too clammy. He concluded that a fabric absorbency, wicking ability, breathability and stretchability all affect how comfortable the fabric is on your body. Nanalee (1994) said more than any other factor, comfort determines whether you will enjoy wearing a particular fabric or not. He said knowing what makes clothes comfortable helps you do a better job in selecting them.

Absorbency: The term refers to how well the fabric takes in moisture. Absorbency can be increase by fabric construction or by finishing process. A loosely constructed fabric or one with a napped surface, for example, is more absorptive than a smooth surface fabric (Corbman. 1983). Some fiber, such as cotton and wool, are very adsorbent, other fibers

such as polyester and nylon are not. (Weber 1990). The quickness with which a fabric absorbs moisture and gives it up again in evaporation has an important bearing to health and comfort.

Wicking:

According to Weber (1990) wicking refers to a fabric's ability to draw moisture away from your body so that it can evaporate. The wicking ability of some fibers makes up for the fact that they are very absorbent.

Breathability (Air permeability)

This refers to the ability of air or moisture to pass through fabric. Saville (2004), stated that the air permeability of a fabric is closely related to thermal properties and is frequently a major factor in body comfort and in protection against moisture build up as well as heat retention or release. Fabrics with good permeability encourage heat loss by air movement. As air freely moves through the fabric, heat can be dissipated to the outside, conversely, heat can pass through the fabric to the body. He stress that to make comfortable hot weather apparel, from hydrophobic fibres, fabrics should be of porous construction so that they permit air permeability, moisture diffusion and wicking.

Fabric Drape

Fabric drape is the extent to which a fabric will deform when it I allowed to hang under it's own weight. According to B .S 5058 (173) drape is defined as the percentage of the total area to an annular ring of fabric obtained by vertically projecting the shadow of the draped specimen. Corbman (1983) stated that the drape-ability of a fabric or it's ability to hang and fall into graceful shape and fold, is dependent upon the finish, construction, the kind of yarn used and the fiber in the yarn. Other factors being equal,

the pliability and springiness of the various fibers will contribute different amount of drape. Marjorie (1976) Opined that a complete description of the diverse draping effect possible in textiles and their causes has not been established, but he stated that two factors, stiffness and weight are of foremost important to the drape-ability of fabrics. While the weight of the fabric provides the force causing it to drape, the stiffness provides the resistance. Drape is a complex phenomenon, involving parameters other than bending length. Drape is normally constructed to depict a visual reaction to the fabric appearance, as produced by its tendency to fall into pleasing and graceful folds. However, fabric drape is dependent to a large degree on the same properties that influence fabric handle e.g. Stiffness, flexural rigidity, thickness and compressibility stiffness is measured in a simple direction and has a three – dimensional aspect.

Drape paper is normally used in the measurement of fabric drape. It is assumed that the paper is of constant density, so that the weight of a piece of paper is proportional to its area. Fabric drape is the extent to which a fabric will deform when it is allowed to hang under its own weight. Drape coefficient is determined by considering the areas of i.e.

Ap = Area of specimen
Ad = Area of central platform
As = Projected area of draped specimen

The drape coefficient is the ratio of the project area of the draped specimen to its undraped area after deduction of the area supporting this thus

$$F = \frac{As - Ad}{Ad - Ad}$$

Thus can be calculated from

$$F = \frac{\text{Weight of cut portion of paper ring } (M_2) \times 100}{\text{Weight of complete paper ring } (M_1)}$$

Therefore drape coefficient "f" $= \frac{M_2}{M_1} \times 100$

Fabric Thickness:

Fabric thickness is the precise measurement of the distance between the upper and lower surfaces of the material measured under "specific pressure". According to Booth (1989) fabric thickness is important in the study of other fabric characteristics such as thermal insulation resistance, dimensional stability, stiffness abrasion resistance. The thickness of textile fabrics influences their heat insulation properties permeability, stiffness draping properties etc. the thickness of a fabric depend on its mass per unit area, the type of yarn used, the weave structure and the amount of crimp in the warp and weft yarn and the yarn linear density (Ajayi 1988).

Fabric Flammability:

Flame resistance of a fabric depends on chemical composition of fabric yarn, weight of fabric and finishing. Booth (1989) stressed that a flame proof fabric is one which is self extinguishing while a flammable one is that which is supportive to or propagate flame. For fabrics which propagate flame, flame resistance is related to their weight as well as fiber content for any given fibre, the heavier the fabric the higher will be the flame resistance. He however said, to ensure adequate safety, the finishing treatment with fire proof polymer or metalized coating is necessary.

Fabric Sett:

Fabric sett is also one of the factors which determine the quality of woven fabrics. Booth (1989) stated that, fabric set is the number of yarns per centimeter in a fabric. Usually, the higher the fabric sets, the better the durability and stability of the fabric. He further stated that fabric sett is expressed in picks per centimeter (ppcm) and ends per centimeter (epcm). Picks per centimeter is the number of filling per centimeter while ends per centimeter is the number of warp yarn per centimeter.

Yarn Count

The fineness or coerciveness of yarn is described in terms of their weight per unit length. This is referred to as the yarn count. It is one of the factors which determine the fabric quality. It also determines the appearance and general behaviour of the fabrics produced from each yarns. Yarn count is also referred to as the linear density (Booth 1989).

Fabric Weight Per Square Meter:

This is the weight in grams per square meter of fabric. It is influenced by fabric sett and the yarn linear density with high weight per square meter drape better than those with how weight per square meter Booth (1989).

Ease of Care

The type of fabric determines how easy it is to care for the garment or other item made from it. Weber (1990) noted that washing, dry-cleaning, ironing, brushing and folding are all methods of fabric care. He further observe that some fabric require more

routine care than others and that fabric should be chosen to match one's lifestyles in terms of washability, soil retention, soil and stain resistance.

Washability: Weber (1990) noted that fabric should be chosen putting into consideration how easy it is to care for it. Washable cloths are better than dry cleaning ones to reduce bills from dry cleaning. Hand washing is also better where there is no washing machine and electricity.

Fabric Soil Retention:

Soil retention according to Booth (1989) is the time taken to wash off dirt completely from the fabric. The longer the time taken to wash off dirt from fabrics, the higher the soil retention property. To him, fabric type as well as electrostatic properties of the fabric influences the soil retention properties of fabrics.

2.2 Fabrics Classification, Construction and Finishes

Fibers can be classified according to their sources or origins. For example, those that come from natural sources such as plant and animals, are called natural fibers and others that result from scientific experimentation and development manufactured fiber or man made fiber or synthetic fibers. Fibers can also be classified by their generic name e.g cotton, wool, nylon, rayon and polyesters.

Natural Fiber:

Natural fibers are obtained from natural elements either plant or animals. Those obtained from plant are called vegetable fibers e.g. cotton flax, ramie. While those obtained from animals are called animal fibers e.g. Wool, Silk etc. These are made of

protein. Wool comes from sheep, and silk is spin by silkworms. Other animal hair fibers include cashmere, camel mohir etc. (Weber 1990).

Cotton:

Cotton is a hair attached to the seeds of cotton plants of genius grossypium. Weber (1990) explainss that cotton comes form the ball, or seed pod of the cotton plant and that after, the pods are harvested, the cotton fiber is separated from the seeds and processed. He further stated that under a microscope, a cotton fiber look like a twisted ribbon. He noted that the type of cotton plants that produce seed balls with fibers as long as 2" (5 cm) are known as long stable fibers and are used for fine quality cotton fabrics. He noted that cotton is strong absorbent, comfortable to wear, and washable. He said, it can be washed in high temperature and with strong soaps or detergents and that cotton accepts dyes readily. However, he observed that cotton wrinkles easily and can shrink, easily attacked by mildew and is inflammable. He finally stated that special finishes can be applied to cotton fabric for wrinkle resistance, shrinkage control mildew resistance and flame retardance. Nkeonye (2009) explained that cotton plant is a shrub which grows to a height of 1:2 to 1:6 meters and is indigenous to many sub-tropical countries. He further explained that it is one of the most useful and versatile of fiber and it is used for a wide variety of fabrics for both clothing and home finishing. Wax print fabrics are made of 100 % cotton fibers.

Manufactured Fiber/Synthetic Fiber or Man – Made Fiber

Manufactured fibers are produced from the chemical treatment of certain raw materials like wood pulp, petroleum, natural gas, air etc. There are two types of man made fibers: cellulose base and non cellulose base fibers. Anyakoha and Eluwa (2010), noted that cellulose base fibers are produced primarily from wood-pulp, cotton linter with

minimum of chemical steps examples are rayon, acetate and triacetate. While non cellulose base fibers are made from molecules that come from petroleum natural gas, air and Water examples of fabric made from non cellulose base fibers are nylon and polyester.

Fabric Construction

Fiber are hair-like and very slender, thin and often short to be made directly into fabrics and as such, most of them are first twisted or spun into thread or yarns. Morton and Hearle (1975) commented on the length of the individual fiber as a determinant factor to the qualities of the yarn. They stated that yarns spun from long fibers tend to be smoother and stronger than those from short ones. They also said silk and man-made fibers are not produced as short fibers but as continuous fine filament. They also observed that yarns are constructed into fabrics and fabrics made from continuous filament yarn are often very strong. Fabric Construction Method according to Weber (1990) include: Weaving, Knitting, Crocheting, Knotting, braiding, felting and bonding. Method of weaving according to Weber includes plain, ribbed, basket, twill, satin and pile weaving.

Fabric Finishes

Every fiber and fabrics has certain desirable and undesirable characteristics, therefore substances has to be applied to fabrics to improve their appearance. Lyle (1976) said that finishing enhances the appearances of the fabrics and also may add to it's serviceability. Weber (1990) said that when fabric first comes from the loom, it is called gray without any colour. He said finishes are those substances applied to fabrics to

improve their appearance, their texture, and their performance. This is because every fiber and type of fabric has certain desirable and undesirable characteristics. He further stated that finishes are added to reduce the undesirable characteristic or improve the desirable ones. He also added that finishes are added to create a specific design or offer a softer, firmer, or smoother hand. It may be permanent or temporary.

Anyakoha and Eluwa (2010) said fabric finishes are treatment applied to fabric at some state in their production to improve their qualities in different ways. Some important finishes according to them includes.

1. *Luster or sheen finishers*: -They give a glossy surface to the fabric example are mercerization and glazing
2. *Easy-care finishes*: These gives fabric a drip –dry quality by helping to cut down on wrinkling. Fabric given easy care finishes require little or no ironing.
3. *Shrink-resistant finishes*: These control the amount of shrinkage which a fabric will undergo when it is washed. Sanforizing is a well known process which guarantees that a fabric will not shrink more than one percentage.
4. *Water–repellant finishes*: These finishes make fabrics resist wetting so that they can be penetrated only by continuous exposure to water.
5. *Water-proofing treatment*: This makes fabric water –proof even for heavy down pocks. It is used for rain coats or rain wear.
6. Flame-resistant: Finishes are applied to prevent fabric from flaring and burning up quickly.

- *Handles Finishes:* To restore a satisfactory handle, addition of substances like oil, or wax and similar substance been recently added to achieve a soft handles (Hurren, Kaynak and Wang 1995). In the same way as compounds are applied to textile materials to achieve a softer handle, a compound can be applied to obtain a stiffer, crisper handle, as is done for example, to cotton shirting fabric. Weber (1990) stated that some finishes are applied to

a. Add colour and create a specific design

b. Improve surface texture and hand

c. To increase their performance.

- *Texture finishes:* Most fabric have some type of finish applied to improve surface texture and hand. These finishes according to Weber (1990) include. Calendaring, Glazing, Napping, Beetling etc.
- *Performance Finishes:* Some finishes are applied to fabrics to increase their performance. While some finishes improve durability and others make the fabrics comfortable to wear. Weber (1990) also stated that various finishes are designed to make the fabric easier to care for because they control wrinkling. Other finishes are used to protect the fabric from bacteria, mildew, insects and perspiration. These finishes includes: Crease-Resistant and wrinkles, Durable press and wash and wear finishes, Shrinkage –control finishes, Stain and spot resistant finishes, Soil-Release finishes etc

Temporary stiffening finishes

Finishing enhances the appearance of the fabric and also may add to its serviceability and durability, thus increasing its value. Gawthorpe (1974) observed that manufacturer of cotton and linen fabric often treat them to improve their appearance and to give them "body" or firmness, but when washed, they loose these features. To restore the new appearance, starch and other siffening agents has been used for this purpose for hundreds of years. The following are the temporary finishes that can be given to fabrics

- Starch: Is used in laundry work to stiffen cotton and linen fabrics. It gives the fabric a smooth surface and fresh look. A starched article keeps clean longer than an unsearched article because dirt cannot adhere easily to the smooth surfaces. Here in Nigeria laundry starch are mostly made from cassava because it is stronger than starches obtain from other food stuff. Gawthorpe (1974), stated that there are different types of starch and they are explain as following *Hot or Boiling Water Starch, Cold Water Starch or Instant Starch, Spray Starch:*. Anyakoha and Eluwa (2010), noted that other types of temporary finishes include plastic starch, Gum Arabic, Borax, Glue wax, Paraffin, Ironing, Beating and Calendaring

Colour Design Finishes

Colours are use to alter the appearance of fabric by dying or printing the fabric. As far back as prehistoric times, people have decorated their clothing with colour. Weber (1990) said, dyes are compound that penetrated and colour fibers. They can be used to colour the entire fabric or to create special designs on the fabric. He noted that colour is said to be "fast" when it does not fade. He identifies three factors that determines the fastness of colour

- type of dye
- The chemical structure of the fiber
- The method of application

He observed that many dyes are not colour fast to everything; some may be more affected by washing, dry cleaning, sunlight or perspiration. He also stated that there are two types of dyes, natural and synthetic. Natural dyes are made from bark, root leaves berries flowers insects and animals. These materials are boiled squeezed soaked or pounded to obtain the liquid colour. Then the fabric is soaked in the dye. Synthetic dyes were produced from chemical reaction from substances like coal tar etc. they have greater colourfastness and are less expensive. Muhammad, Ahmad and Shabaz (2001) reported that dyeing of fabric has the economic advantage of avoiding storage of fibers and yarns of varied colours and it makes it easies to meet demands of the customers for a wide variety of shades, which are subjected to rapid changes dictated by fashion. Warner in Muhammed et al (2001) reported that whether or not a dyed cotton fabric will bleed or fade in a give treatment depends on the type of dye and it's fastness characteristics. Nkeonye (2009) observed that the beauty of colour in any fabric is of no valued to the consumer unless the dyes may be considered fast under the condition in which the fabric will be used. He noted that colour must meet such test as washing, ironing, steaming, perspiration, strong light and dry-cleaning.

Nkeonye (2009) noted that no dye is absolutely fast under all conditions of use, and the most suitable dye, for a particular end use are those which will provide the required dyes for a particular end use. He observed that some dyes may be fast to washing and dry-cleaning but not to sunlight. Other may be fast to perspiration and

rubbing when wet but not to hot pressing and so on. This varying fastness of dye to different agencies originates from several factors such as the chemical structure of the dye, the type of fibre onto which it is applied, the method of application, the depth of the dyeing and the condition of the atmosphere for light fastness.

- *Fastness to Washing*: The resistance of a dye to heat, water, soap, detergent and mechanical action as employed in domestic laundering is an important feature in the use of coloured textiles. Assessment of washing fastness is made by a series of five washing test varying in severity from No 1 which is equivalent to hand washing to No 5 which is equivalent to machine washing at near boiling temperature. The test is carried out in a wash –wheel or other approved equipment which enables time and temperature to be controlled during the process. The degree of staining is assessed by stitching the appropriate un dyed piece of fabric to the specimen to be tested. After the test, the specimens are dried and the change in colour and the degree of staining of the un dyed fabric are assessed using the appropriate gray scale.
- *Fastness to Light*: Light causes deterioration of all textile fibre and dyes to some extent due to the high-energy ultraviolet light in daylight. The most common effect of light on dyestuff is change in colour which is usually recognized as fading or loss of colour strength. Colour fastness to light is assessed by prolonged exposure of the specimen to daylight, or by accelerated testing under an artificial light source. At the end of the test, the change in colour of the specimen is compared with changes which have occurred in the standard.
- *Fastness to Perspiration*: The perspiration produced by the human body is a chemical fluid which can have an adverse effect on a coloured fabric in regular contact with it.

All perspiration contains common salt which can affect some dyes, but can vary in acidity or alkalinity according to the particular individual. To test the fastness to perspiration, two chemicals approximate to human perspiration are used. The one being slightly acid and the other slightly alkaline. Fabrics are immense in these solutions and heated to change at body temperature for 4 hours and then examined for change in colour.

- *Fastness to Rubbing*: Certain dyes may have good fastness to light and washing but are sensitive to abrasion in that the dyestuff may be removed from the fibre surface by the physical action of wet or dry rubbing. An apparatus known as the crock meter is used to test fastness to rubbing or crocking. A relatively simple test is to rub the dyed fabric with a piece of white fabric wrapped round the finger, first with the white fabric dry and then with it wet. If the dye is not fast to rubbing it will stain the white fabric.

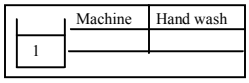
2.3 **Clothing and Fabric Care**

Fabric care involves washing, drying pressing, mending, folding, and putting your clothes and household fabrics away. In some cases, a person might be responsible to take care of his or her clothes or the household clothes or fabric, in another case, the task of taking care of household clothes and fabrics may be divided among family members such that sometimes family member rotate tasks like washing the clothes one week then folding the family laundry and putting items away. To maintain good appearance and obtain the most wear out of a garment, it is essential to take good day to day care of the garment and fabric.

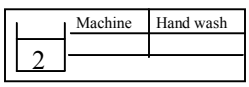
Weber (1990) stated that clothing and fabric care is important to an individual in the following ways

1. It will help you save money you would have used to replace garment ruined through improper care
2. By learning how to remove spots and stains you can save cleaning bills
3. By learning how to take care of fabrics, you are also able to extend their length of service.

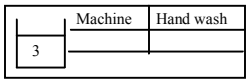
He also sited that care labeling rule was first passed in 1972 and it requires that permanent care labels be placed in all textile clothing and label must be permanently attached and remain readable for the life of the garment. He also noted that in 1984, the rule was revised and it provided more detailed information to be listed on the label for example, washing label must tell you what method and care temperature for drying. If ironing is needed, the temperature for ironing must be included Nkeonye (2009), noted that most garments produced in the world have care labels numbered 1 to 8. The following illustrate the Home Laundering Consultative Council (HLCC) care labeling scheme.



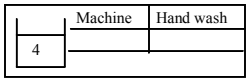
Vigorous washing condition at a temperature up to boiling point. For white cotton and linen articles without special finishes.



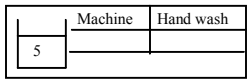
Vigorous washing condition but at a temperature which maintains fast colours. For cotton, linen or rayon without special finishes, where colours are fast at 60^0C.



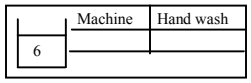
Washing at 60^0C under conditions less vigorous than either 1 or 2 above. For white nylon.



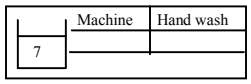
Same as process 3 except for washing temperature (50^0C). for coloured nylon; polyester; cotton and rayon with special finishes; acrylic/cotton mixture. Lower temperature safeguards colour fastness.



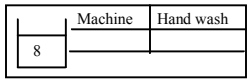
Warm wash (40^0C) and medium agitation. For cotton, linen or rayon articles where colours are fast at 40^0C, but not at 60^0C.



Low temperature washing (40^0C) and minimum agitation, to preserve colours, shape, and minimize creasing. For acrylics; acetate and triacetate including mixtures with wool; polyester/wool blends.



Low temperature washing and minimum agitation, to preserve colour, size and handle. For wool, including blankets and wool mixtures with cotton, or rayon; silk.



Articles that must not be machine- washed. For washable pleated garments containing acrylics, nylon, polyester or triacetate; glass

Nkeonye (2009) also observed that HLCC, which consist of representative of the textile industry, manufacturers of domestic appliances and detergent manufacturers, have agreed on washing temperature for different textile fabrics and also provided a rough guide on how to determine the washing temperature without actually using a thermometer.

Table 2.1 Washing temperatures and guides for different fabrics

Warm	40^{0c}	Pleasantly warm	Wool, wool mixture, silk acrilan courtella, orlon, tricel cellulose acetate. Cotton and linens if colours are not fast at high temperature
Hands hot	48^{0c}	As hot as hand can bear	Cotton fabrics with special finishes, viscose rayon, coloured nylon
Hot	60^{0c}	Hotter than the hand can bear	Coloured cotton and linens if the colour is fast cottons without special finishes while nylon terelene
Very hot	85^{0c}	Near boiling point too hot for hand	White cotton and linen without special finishes
Boiling	100^{0c}	Bubbling out the surface	Cotton and linens when necessary

Source: Nkeonye(2009)

Routine Care

Weber (1990) stated the following care for clothing and fabrics on a routine basis.

a. Check for spots, stains and soil. It has been observed that light coloured fabrics show soil and stain clearly and are easy to evaluate. He noted that we should not let cloth to be too dirty before laundering because the fabrics will be more difficult to clean.

- Dirty cloth should be set aside in a particular location or basket meant for them so that they will not be over looked when laundering time comes.
- Check for any signs of stains and remove any spots or stains as soon as they occur or shortly after. This is because the longer a stain remain on fabric, the harder it will be to remove. If the stain needs to be pretreated before they are laundered, pre-treat such stains. If they are difficult to remover, after consulting the stain removal chart, refer to a professional dry cleaner especially for fabric that cannot be washed. To keep sports and stains under control, quickly examine your clothes each evening when you undress and put any stained garments aside for cleaning.
- Check for repairs: Weber (1990) observed that no matter how careful you are with cloths, small repairs need to be done; has a button popped off? Has the hem come loose? Has a small rip appeared in a seam? He advised to repair the garment as soon as possible otherwise the rip may become longer, or the entire hem will fall down. He also stated that if you do not set cloths to be repaired aside, you may forget about the needed repair until you want to wear the garment again and you may not have the time to do it. A stitch in time save nine so can many repairs be done in only a few minutes a loosed button, nap, or hook and eye.
- Reanchor a loose fastener before it comes off completely.

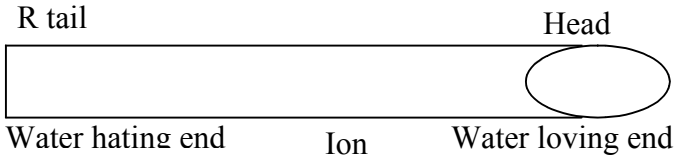
Carefully remove the old loose zipper and pin new zipper in place stitch following the original stitching lines. Worn out elastic can be replaced by inserting new elastic into the casing.

- Air or Brush it. Garment that may not need to be washed or dry-cleaned need to be freshened before wearing again. Woven garment should be hanged were air can circulate around it. This will help to remove odour picked from the air or body. Knitted fabric can be draped over a chair, if the fabric or garment has picked up any dust, lint or animal hair, it can be gently brushed to remove the substances.
- *Hang or fold:* Weber (1990) also advise that for good and proper care of garment, we should form the habit of putting your clothes away in a closed drawer or shelf. This will help to prevent wrinkling and save you from pressing or repressing clothes before you want to wear them again. Also this will also enable you to locate them easier and faster. He advice that we should resist the temptation to toss our shirt on our bed or on the flood but should be hung on hangers that will better support the shoulders of the garment.

2.4 **Dirt, Soil and their Removal**

Dirt according to Cambridge advance learners dictionary, are dust, earth or any substances that makes cloth or surfaces not clean. Gawthorpe (1974) observed that our clothes become soiled with greasy perspiration from the inside. The outside is made dirty by rubbing against dirt and having dust, dirt, deposited on it from the air. He noted that some fabrics become dirty more easily than others e.g. a smooth textile will stay cleaner than a rough one. He said, when all these dirt accumulate on the fabric, it makes the cloth dirty.

Nkeonye (2009) stated that the word ‘soil’ or ‘dirt’ covers a wide range of substances which may contaminate fabrics. The dirt may consist partly of a greasy substance or of particles of carbon deriving from air-borne contamination. The soiling of fabrics is a universal nuisance which increases human expenditure through laundering and dry-cleaning. Laundering itself leads to fabric deterioration, some shrinkage and fading of colours. He noted that the rate of soiling varies amongst different fabrics. The amount of dirt in the air also affects the rate of soiling. Fabric soiling occurs partly through the filtering out of dirt by the fabric structure. Fabrics of open construction will therefore tend to filter out more dirt than one of close or tight construction. He also observed that the nature of the fabric surface also affects soiling rate. A fabric with a rough or hairy surface will pick up dirt much more readily than one with a smooth surface. He said that, this explains why fabrics made smooth by starching and ironing stay clean longer than one without these treatments. Another important factors is the presence or absence of static charge. A static charge on a fabric will attract dirt, and any soil acquired in this manner becomes very firmly held. Thus fabrics made of triacetate, polyester, nylon and acrylic tend to soil readily due to the static charge generated during rubbing in use. Nkeonye (2009) said that in the structure of detergent, two ends are present namely water hating and water loving ends. Hydrophobic and hydrophilic ends respectively



The hydrophobic tail has some grease and it buries itself into the soil, which has to be removed from the fabric. The dirt (soil) tends to roll around into a ball, which is then surrounded by detergent molecules with their tail buried in the soil and head (hydrophilic) in water. This leads to complete removal of dirt from fabric and remains suspended in water. which is easily rinsed off and drained.

2.5 Laundering, Laundering Agents, Processes and Equipment

As clothes are used, they get soil and the dirt needs to be removed by laundering. Laundering or washing are applied to fabrics which are washable. This can be carried out in two ways laundering with (water based) and dry cleaning. Weber (1990) said washing of garment by hand or machine with a soil removing product is called laundering. According to Cambridge advanced learners dictionary, laundry are dirty cloths and sheets which needs to be washed and finished. Oxford English dictionary (2000) defines laundry as a place where clothes are washed and ironed.

Anyakoha and Eluwa (2010) said laundering of articles involves washing them so that they look new again. It involves keeping clothes clean and ready to wear. Stains have to be removed and articles may be stiffened if necessary. Finishing by ironing or pressing gives the articles a smooth appearance and helps it stay clean longer.

Importance of Laundering

Anyakoha and Eluwa (2010) observed that laundering is important for the following reasons.

- For good health and hygiene: Dirt is unhygienic and can be dangerous. Dirty clothes and household linen can harbors germs such as scabies and disease carrying pests,

lice bedbugs, and fleas. These can be transferred to the skin when we wear dirty clothes. In fact our skin cannot be neater than the clothes we are wearing.

- To look clean: Dirty and stained clothes and articles are unpleasant to look at and smell bad. A person wearing dirty clothes would be avoided by others.
- To make it last long: Dirt can damage fabric, it can form a chemical combination with the fabric. This can weaken the fabric if neglected. Laundering of clothes helps them to last longer. Clothes are expensive to buy so they ought to be taken good care of through proper regular laundering. Frequent washing is desired in fabrics especially those born next and the skin. If such materials are not washed after each use, they become more difficult to clean. However, the body perspiration absorbed by the fabric causes it to deteriorate while waiting for cleaning.

Laundering Agents

Cleansing agents according to Anyakoha & Eluwa (2010) are substances which aid the removal of dirt. They include solvents detergents, alkalis, acids, bleaches etc.

- *Solvents***:** Solvents are substances which act to remove dirt or soil by liquefying it and holding it in suspension. There are different types of solvent, some of which are inflammable while others are not. Solvents include the following.
- *Water*: Water is the most common solvent it loosens or dissolves dust particles readily. Soft water is better solvent than hard water. Hot water is also a better solvent for most dirt than cold water. A combination of water, heat and soap will dissolve greasy dirt.

Uses of Water for Laundering

Water is used for soaking clothes and household articles before washing. During soaking or steeping, water penetrates the fibres and the fabric is made thoroughly wet, it is possible then to loosen and remove dirt. (Gawthorpe 1974). Water alone can be used to cleanse articles with non greasy dirt to a certain extent e.g. sugar on a table linen will dissolve in water. Dirt such as dust can soften and finally moves away from the fabric into the water when vigorous agitation is applied to the fabric as was done by less civilized people. (Gawthrope 1974). Hot water will melt and soften grease. It however requires other cleaning agents, such as soap, to emulsify and remove the grease. Water is used for rinsing: Rinsing is important to remove all the soapy water and dirt and to give the clothes a good colour. Water is used for ironing. In order to remove creases or wrinkles from almost all fabrics, water must be present. The water is turned into steam as the iron moves across a dampened article, and fabric gradually becomes smooth as it dries out. (Anyakoha and Eluwa 2010).

- Grease solvent: These are organic solvents and include paraffin, turpentine, methylated spirit, benzene, amly acetate, acetone, carbon tretrachloride and petrol. These act by dissolving grease, evaporating and carrying the dirt with them. Any remaining dirt or markings can then be removed by brushing, wiping or washing depending on the type of material (Anyakoha and Eluwa 2010).

Detergents

A detergent is a cleaning agent which exerts cleansing action on a material by helping the water to soak into the material quickly to make washing easier. Gawthorpe

(1974) said detergent is a substance which will remove the surface tension of water. Therefore soap is a detergent and so are all non soap powders and liquid known correctly as synthetic detergent. Kaka (1998), said it may be in the form of powders, tablets liquid and flakes and used for all kinds of washing. It helps the water to soak into the material quickly so that the washing is done easier as they keep in the cloths. Mills (1998), said a detergent is an emulsifier, which protects and breaks up the oily film that binds dirt to the fabric. It is a wetting agent which allows dirt to float. Nkeonye 2009 opined that detergents are a group of surface – active compounds with cleaning or dirt removing properties. The group includes soap and synthetic detergents.

Soap

The detergent made from natural fat and oils is called by its age old name "soap" Nkeonye (2009) said soap is formed by the chemical action of animal or vegetable fat/oil and caustic potash (Alkalis). A process known as saponification. The products are soap and glycerin.

Fat + Alkali $\xrightarrow{\text{heat}}$ soap + glycerin Soap can be made into long or short bars, or soap flakes. Kaka (1990) also described soap as the chief material intended to assist cleaning. She opined that a good laundering soap should possess the following properties.

a. Possess good cleaning powers
b. Contain no materials that will be harmful to the fibers or colour of the fabrics washed
c. Be readily soluble in water so that it may be useful for cool washes, dissolve quickly in the wash and rinse out thoroughly after washing.
d. Give a good lather, but not used up too quickly for friction making.

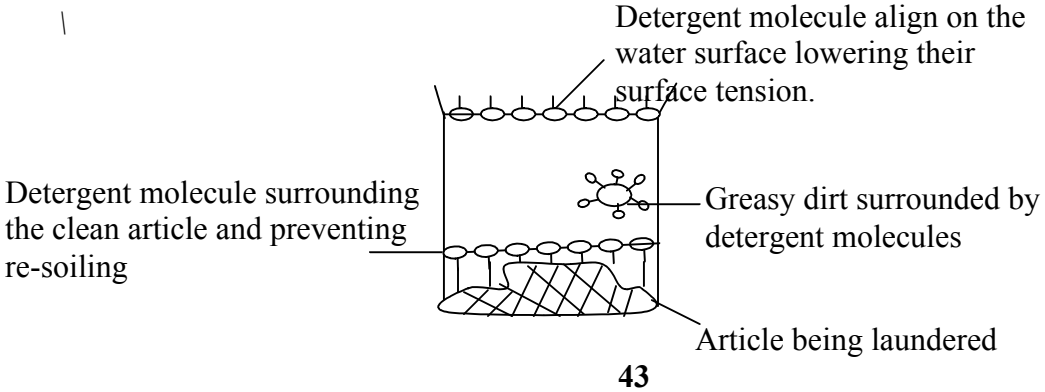
Synthetic Detergent

During the war, when there was shortage of oils and fats in great Britain, that lead to the production of synthetic detergent compounds which came into use in packaged domestic washing powders, which the general public became aware of, with the word detergent. Synthetic detergents is produced from a mixture of Alkane (which is a waste by product from a petroleum company) plus (+) sulphuric acid. Caustic soda solution is then added to form a sulphunated paste, which is spray dry to form the power detergents. Synthetic detergent can be in the form of powders, paste or liquid. They dissolve oil and greasy dirt readily and do not form scum in hard water. (Gawthorpe 1974)

Soap and synthetic detergent can emulsify grease and enable it to be washed away along with the dirt it held. They act in the following ways

1. The detergent molecules align them-selves on the surface of the water by so doing; they lower the surface tension of water.
2. They enable the water to wet the fabric. Thus, the detergent water penetrates between the fibres of the fabric and the dirt particles.
3. The detergent emulsifies any grease or oil present, breaks it up into tiny particles and separates them from the article being laundered.
4. The dirt removed from the fabric is held in suspension in water and prevented from resoling the articles

\



Bleaches: Bleaches are used to whiten cotton or linen articles, to remove certain stains and to sterilize articles. Anyakoha and Eluwa (2010) classified bleach into two types as follows:

i. Oxidizing bleaches as chlorine bleach ii reducing bleaches e.g sodium hydrosulphide. Direction for using a bleach are usually given on the container and should be followed strictly. They opined that Chlorine bleach are very useful in laundry. When using chlorine bleach, use bleach only on fabrics that are not damaged by it. They advised users to make up the bleach solution according to the manufactures instruction or recommendation. They also instructed that for article, soak or steep in the bleach solution for about ten minutes check the stain, repeat treatment if necessary. For coloured articles, try a weak solution in some inconspicuous part leave for a few minutes and rinse with cold water. Check for any colour loss, if the colour is unaffected, then treat the article with the bleach solution. Never use bleach neat or undiluted.

Nkeonye (2009) noted that two types of bleaches are employed in stain removal. These are the oxidizing bleaches, which destroy stains by oxidation, and the reducing bleaches which destroy stains by reduction. He said that typical oxidizing bleaches are hydrogen peroxide, and chlorine bleach (usually containing sodium hypochlorite). An example of a reducing bleach is sulphur dioxide; bleaches of this type are mainly used by laundries and dry-cleaners. Before using any bleach; always test a small piece of the cloth (if coloured) for colour fastness. (Nkeonye 2009).

He also advised users to read care labels when using bleaches, as they may damage your fabric or your skin. He warned never to use undiluted hypochlorite (chlorine) bleach, never use hypochlorite bleach on wool, silk or anything created with a

flame-resistant finish. He admonished user to rinse thoroughly immediately after treatment to remove any trace of bleach left on the material. He noted that the usual concentrations of bleach used in stain removal are:

Hydrogen peroxide (from chemists): One part of hydrogen peroxide in four parts of cold water. Hypochlorite (chlorine) bleach: 10ml of 14% bleach in 800 ml of cold water. (14% bleach is the usual concentration found in commercial house-hold bleaches).

*Alkalis***:** Alkalis combine readily with greasy dirt and so reduce the amount of rubbing needed for cleaning. Alkalis cleaners may damage material with an oil base such as linoleum and paint. The alkaline can combine with the oil base and dry out the oil-based materials being cleaned, so that it may Crack and chip. Some Alkalis may also affect dyes and colours. It is therefore, important to choose and use alkaline cleaners carefully. Examples of alkaline cleaners according to Anyakoha and Eluwa (2010) include:

1. *Borax*: This is a mild alkali which can be used as a water softener in laundry work.
2. Caustic soda (sodium hydroxide) this is a strong alkali which is useful in soap making and dyeing.
3. Ammonia: This is useful in laundry it will also emulsify grease but should not be used on aluminum.
4. Washing soda (sodium carbonate) this is a water softener and a grease solvent, but not suitable for laundry purposes.

- *Acids*: Ayakoha and Eluwa said acids are used in laundering for cleaning example vinegar. *Vinegar* is useful in laundry for the purpose of reviving colours on coloured fabrics.

- *Water Softeners*: Nkeonye (2009) noted that when permanent hard water must be used for laundering purposes. It is necessary to use a softner that will precipitate these salts of the alkaline earth e.g. addition of soda, use of calgon etc.

Laundering Process.

Laundering or washing is applied to fabric which are washable in watery medium. The objective of laundering articles is to release soil or dirt from the article and so leave it in a clean condition Corbman (1983) observed that when a fabric is known to be washable, frequent and prompt washing is desirable, particularly of clothing worn next to the skin. He said that if such garments are not washed after each use, they are more difficult to clean and the body perspiration that they have absorbed causes the fabric to deteriorate while awaiting cleaning. He also stated that just knowing that a fabric is washable is not enough information, for good result in laundering. He noted that the consumer must be acquainted with the proper method for washing each type of garment and fabric.

Anyakaoha and Eluwa (2010), enumerated that laundering process is made up of the following steps.

a. Sorting the articles to be washed
b. Mending the articles
c. Removing all stains from the article articles
d. Steeping or soaking white cotton or colour fast article
e. Washing articles according to fabric types
f. Rinsing the washed articles

g. Boiling articles if necessary

h. Applying blue and or starch if necessary

i. Drying the articles

j. Ironing or finishing of laundered article

k. Airing of finished articles

l. Storing of laundered articles

Sorting: After collecting all the dirty articles, sort them according to differences in fabric. Separate articles into whites and coloured separate each group into smaller piles of fabric type i.e. cotton and linen articles, wool and wools mixtures, fine or delicate fabrics. Baby's clothes should be washed separately. Heavily soiled materials should be separated from lightly soiled ones. Inspect pockets to see that they are empty. Remove such things as dirt, pins, coins, papers. Zip all zippers closed to prevent damage to them and to the garment they fasten. Remove shoulder pads and trimmings that are not washable

Mending: Before washing mend any tear or holes in all the articles. If an article is not repaired before washing, the tendency is that, tear may get larger in the process of laundering. A stitch in time saves nine.

Stain Removal: Any special stains on the articles should be removed before washing. Hot water used in washing can set some stains such as blood and make them very difficult to remove

Soaking or Steeping: Do not soak articles that are not colour fast.
Heavily soiled articles that are colour fast should be soaked according to the type of fabric being washed. White cotton and linen articles can be soaked for forty five minutes in a solution of bleach before washing. Handkerchiefs especially those used by cough patients should be soaked in salt water.

Washing: Washing can be done by squeezing, kneading and rubbing with hand for the soil to be removed properly, you need to agitate the fibres by washing. Washing can also be done in a washing machine. In a washing machine, the articles are tumbled and rubbed together in the detergent solution. During the washing process, the fibres are flexed and the soil or dirt is gradually removed and held in suspension by the detergent solution, so that it cannot resettle on the article. Odunpe (2005) suggested some things to consider before washing are: the type of fibre, fabric construction, finishes, colour, and amount of soil.

- When washing, use a soap or synthetic detergent suitable for the type of fabric you are washing for instance use heavy duty detergent such as omo for white and colour fast cotton, and mild soap such as lux flake for fine delicate fabrics or baby wears.
- Wash the cleanest articles before the dirtiest
- Change the washing water when it becomes dirty. When the water becomes dirty, the leather disappears and the soapy water is unable to hold any more dirt in suspension so dirt is re-deposited on the garment.
- Grease or oil dissolves more readily in hot water than in cold water hence hot water is better for washing certain types of fabrics.
- Use the correct method of washing for the type of fibers as follows
    a. *Rubbing or fiction*: For this, hard soap or heaving duty detergent is used and the soap is rubbed on the fabric, which is then rubbed vigorously with hand this is used for cotton and linen.
    b. *Kneading and squeezing*: These methods used a soap solution or sub. The fingers gently knead the soapy water into the article. As this is done, the soap cleanses the

articles and the washing water becomes dirty. This method is used for polyester blend, nylon, coloured and printed cotton and linen articles with colours that are likely to run.

c. *Squeezing alone*: Here the article is cleaned by gently squeezing in the soapy water without kneading
d. *Kneading*: This is used for delicate materials such as wool, silk and washable pleated garments containing acrylics, nylon, etc.

Rinsing: This is the process by which dirty lather is washed off the articles thus leaving the laundered articles clean and saopless. This is important to give the article a clean colour. The first rinse is better done with hot or warm water depending on the type of fabric. Rinsing must continued until the rinsing water becomes clean and soapless

Boiling: Boiling help to whiten articles and kill any germs or bacteria in the laundered articles. Boiling is particularly necessary for articles use by the sick. Delicate fabrics like wool, silk nylon should not be boil.

Optional Finishing Treatment: (Blueing, starching, fabric softening)

Optional finishing treatment can be applied to the fabric after rinsing. The article can be blued or stiffened or softened as desired.

Water Extraction: After rinsing, water can be extracted from the article by hand wringing, mangling, gentle squeezing, rolling the garment in a clean absorbent towel or by spinning where a spinner is available, except for drip dry garment. The procedure to use for water extraction from article depends on the type of fabric. Water extraction shortens the drying time and reduces the risk of garment being pulled out of shape by the weight of the water they contain.

Drying: After washing, the material has to be dried. The ease of drying depends on the type of material and the drying method employed. Drying can be carried out indoors or outdoors. Outdoors drying involves drying the laundered article in sunlight. The following drying devices are employed spin drier. Tumblers driers, wringer. Outdoor Drying is the best way of preserving the colour of fabrics; light and moisture help to freshen them. Outdoor drying does not present much difficulty in this country. The main items required are line, poles to fix the lines and pegs to hold the articles. (Nkeonye 2009)

Finishing: When articles are washed and dried, they become clean. But they have a rough appearance with creases and wrinkles. They, therefore, need to be finished so that they can regain their original smooth feel and appearance. Temporary finishing in the home can be done by beating, mangling, pressing and ironing. Anyakoha & Eluwa (2008) proffered the following method to be use depending on the type of fabric.

*Beating***:** The articles is neatly folded and put on a clean smooth flat board. It is then lightly sprinkled with water and beaten with another clean flat board. Beating is usually applied to heavy woven local fabrics.

MangIing: Un-starched materials, such as bed sheets, curtains etc can be smoothened by folding them neatly and passing them between the rollers of a mangle. This is however, not a common finishing method today in Nigeria.

Pressing: This is the process of finishing laundered fabrics by pressing the iron down where needed. Lifting it and then pressing it again without moving the iron about on the fabric. Steam iron can be used for pressing. All woolen article, Knitted garments and crepes require pressing

Ironing: This involves finishing a fabric by moving the iron to and fro on the material. The iron is moved over the entire surface of the material. Effective ironing requires moisture, heat and pressure for effective finishing. Nkeonye (2009) stated that before ironing, the iron must be at the correct setting for the types of fabric to be ironed. He said HLCC recommends the following conditions for different fabrics.

Table 2.2: HLCC iron setting for different fabric.

Setting	Feel	Temperature	Fabric
Nol	Cool	100^{0C}	Acrylics/acrilan courtelle orlon
No2	Warm	150^{0C}	Acetate, nylon polyester tricel and wool
No3	Medium hot	180^{0C}	Rayon
No4	Hot	200^{0C}	Cotton, linen
No5	Very hot		

Source:HLCC as in Nkeonye (2009).

He further proffered these general rules for ironing

I. The material must be of the right degree of dampness
II. The iron must be at the correct setting
III. Always iron in the direction of the selvedge
IV. Iron double parts first if the material is thick
V. Iron double part last if the material is thin
VI. If a shiny finish is desired, iron material on the right side. For dull finish, iron on the wrong side.

Iron until dry

Airing: Anyakoha & Eluwa (2010), noted that after ironing a cloth, there is always a little steam left between fibres or thread. The steam is so little that it cannot be felt with the hand. However, if it is left in the cloth, it could result in creasing and spoiling the ironing. The dampness can encourage mildew attack and in some cases, especially with children's wear, chill the wearer. Ironed articles should therefore, be aired by

a. Putting them out in the sun where possible for a little while so that the dampness can dry out completely
b. Place them on a clothe –horse, a line or the back of a chair near a window for some time.

Folding and Storage: After airing, clothes can be stored away by either hanging them in a wardrobe where available or folding and putting them away in a box or a drawer

Laundering Equipment

Laundering equipment are those use for washing rinsing drying and pressing of clothes and household fabrics Nkeonye (2009) noted that wide range of equipment is employed in laundry work and the following are the most essential equipment.

Enamel Bowls: These must be cleaned with soapy water or a paste cleaner to remove any greasy ring left after washing.

Plastic Bowls: These come in attractive colours and are quick to handle. Remove greasy ring with soaping water do not use an abrasive. Never put near fire, or pour boiling water directly into a plastic bowl.

Nail Brush: A nail brush, is useful for light scrubbing when washing delicate fabrics. Do not leave in the water and never boil. Rinse and dry thoroughly after use, before storage.

Clothes Line: This can be rope or plastic. The rope type should be taken in after use and kept in a clean bag. It can be boiled if necessary wipe before use. Plastic type should be wiped with a damp cloth before use.

Pegs: Wooden and plastic types are available, but the latter types are preferred because they are easier to clean and they also last longer. All pegs should be stored in a clean bag after use.

Washing Machines: These are labour saving devices, and are particularly useful where a large amount of materials has to be washed. There basically two main types: fully automatic machines and twin or single tub machines

Fully Automatic Machines: These machines will wash, spin and turn themselves off without needing any attention once the programme has been set. All automatics have at least seven washing programmes or even more. There are programmes to deal with anything from working overall to very delicate garment. They rinse better than single or twin-tubs, are less likely to crease cloths and may take a large load.

Twin Tubs, Single Tubs: These machines are cheaper to buy and also to run because the same water can be used for two loads. There is also less to go wrong and they may spin better and wash quicker. There major disadvantage is the need to stay with the wash and move the clothes from one tub to the other (twin tub). When buying, check that the castors run smoothly and hoses are long enough to reach the taps.

2.6 Hand Washing

Some articles require washing by hand in order to safeguard the fibre, colour or special finish applied to it. Nkeonye (2009), noted that articles with loose colour should be care for in the following ways.

i. Wash before the articles get very dirty

ii. do not steep

iii. Wash very quickly and gently, using a lightly built detergent

iv Squeeze the article, but do not rub

v. Rinse thoroughly. A tablespoon of vinegar in the last rinsing water may help to brighten the colour.

vi. Put through the wringer or dab dry in an old towel.

vii. Hang up to dry at once, away from strong heat and sunlight

vii. Keep away from other articles

viii. Iron as soon as possible (protect ironing-sheet or ironing board cover with an old piece of materials)

2.7 Nigerian and Foreign Made Wax Print Fabrics

Made fabrics are one of the product that greatly reflect the culture, wisdom, unique creativity of people. They are woven by various methods for the purpose of daily use and for special occasion Payananth (2001). Akanem (1987) Stated that, made in Nigerian wax print fabrics are commonly used in making African garment as it reflects black peoples passion for bright colours. Wax print fabrics are generally made of cotton fibres which have the ability to absorb moisture and heat away from the body. This makes it a choice fabric for Africans and Nigerians at large considering the tropical

nature of its weather. The need for technological development, economic sustainability, job creation etc gave birth to contemporary production of textile in the industries in different states of Nigerian. Nigerian wax prints such as Abada, Ankara are made in Aba, Kano, Asaba and Onitsha (Ekanem 1987). Using the brand names such as Untl, Nichem tex etc.

Kajogbola (1997) pointed out that the consumers consider these materials as not durable and have faster fading of colours. He commented that if this erroneous conception persist, it will erode all the efforts geared towards self-reliance, maintenance of our culture and natural identity and economic growth. It is also in this light that the federal government embarked on campaign to disabuse the minds of Nigeria by banning the importation of textiles fabric and cloth. This is to encourage Nigerians to patronize made in Nigerian fabrics. Performance research on the effect of laundering on textile fabric are considered very important because it will help guide both the consumers and producers on what is expected of a quality textile.

Factors affecting the quality of Nigerian made wax Print fabrics

1. Raw Material:- Ejiofor (1989) is of the view that the quality of finished product of manufacture cannot be much better than the quality of raw material fed into the plant and machinery used in making them. When low quality raw material and supplies are fed into outdated equipment, output will naturally be below expected quality level. In terms of Geographical origin, raw material fall into two broad groups, namely imported and local raw materials. It has been observed that some imported raw materials get into Nigerian ports in good condition but soon suffer deterioration due to prolonged temporary storage

and careless handling at the ports. Even when they get to the factory, they may also deteriorate as a result of prolonged storage since many manufactures stock pile raw materials inventory to hedge against the vicissitudes of the nation's economic policies, supply bottlenecks and inadequacies of public utilities besides, inadequate storage facilities and exposure to weather lead to deterioration in quality. Local raw materials, like the imported ones, deteriorate in the face of prolonged and adequate storage, careless handling, and exposure to weather. This according to Ejiofor falls under direct materials factors which is one out of a multiplicity of factors that adversely affect the quality of locally made goods notably textiles. Other factors as discussed by Ejiofor are human factors infrastructural factors and market forces.

2. Outdated Machinery: Yusuf (1998) observed that on plant machinery and equipment, it is widely known that at times foreign suppliers supply out dated but reconditioned equipment to their Nigerian customers. Many of these are supplied without appropriate service agreements or even users manuals. Frequent breakdown, and malfunctioning of the equipment lead to poor quality product.

3 Human factors: Ejiofor (1989) said quality is adversely affected due to problems created by such human factors as adulteration. Inadequate standardization and grading. Specifically human factors include lack of technical know how, bad management, questionable integrity etc.

4 Lack of technical know-how:- It has been observed that Nigerian have not yet imbibed the technological culture. As a result, even qualified technicians many fumble with sophisticated and modern equipment. In addition, considering the low level of literacy of the workers, many Nigerians workers are not qualified for the post which they

are holding, unqualified workers operating on even the best raw material produce substandard products (Yusuf 1998)

5 Bad Management: Ejiofor (1989) observed that just as many of the workers are unqualified, many managers and supervisors are also inexperienced. There is inadequate supervision. Managers and supervisors are often taken away from their factories to attend to organizational and extra organizational problems like lobbying for contracts, chasing payments, arranging for connection or reconnection of the utilities etc. The under managed workers naturally produce shoddy products.

6 Questionable Integrity: Yusuf (1998) noted that many Nigerian today do not consider a place good enough to work in unless there are some immoral deals to milk. Some ten percent to take away, or some organization's properties to pinch. New equipment may be stolen and replaced with old ones. Adulteration may be perpetrated to cover up diversion of materials and parts.

7 Bribery and corruption also affect products quality. These blind the culprit to supply deficiencies and workers inadequacies. Substandard materials and equipment supplied are eagerly, accepted by an official who had already bargained home his ten percent. Unqualified workers hired corruptly, and job –for – the girls found for immoral reasons place incompetent people in position of authority and enthrone indiscipline. All these affect product quality adversely.

8 Infrastructural Factors: Infrastructural factors adversely affect product quality. Product quality in Nigeria fall into two broad groups: namely physical infrastructure and marketing infrastructure. Physical infrastructure is caused due to effect of unreliable utilities such as power failure, poor voltage , water shortage and impure water supply

affects product quality. Power failure can disrupt production and damage electrical appliances and high voltage standby generators are not yet perfect substitute in factories, since few of them can run continuously for 24 hrs a day, seven days a week. In addition, most factories are high quality water users for instance textile companies are noted for using high volume and high quality water. The quality of the water being used can affect the quality of the product.

9 Market Forces: Ejiofor (1989) opined that, while poor quality raw materials, parts and equipment, dysfunctional human influences, and inadequate supply of public utilities adversely affect the quality of locally made textile wax prints, what makes the production of low quality products a foregone conclusion is inadequate competition. For some time now, the Nigerian market has largely been a sellers market. Literally, whatever is produced is sold out within a short time. Improvement of product quality comes about through market research, rigorous quality control and drastic rejection of defective products and these are expensive measure especially in the short run. So an over age profit- maximizing investor may not see the need to adopt these measures unless forced into it by the result of these factors. Nigerian consumers and producers are fed with inferior quality and product (such as some textiles from Asian countries) and industrial goods and they easily shift to imported superior quality products at the slightest opportunity.

High cost of utilities. Unreliable supply of public utilities not only affect quality but also production cost. Foreign wax print fabrics are imported textiles from other countries outside Nigeria. Ejiofor (1989) disclosed that one reason for the disinclination of Nigerians to patronize Nigerian made fabrics is that their foreign counterparts are

available. “given that foreign made textiles are superior in quality, it would be the height of irrationality for a consumer or industrial buyer to patronize inferior goods. A rational consumer buys the best in the cheapest market and sells it at a very high cost. Nigerian consumers should not be exceptions” Ejiofor contended.

Yusuf (1998) said foreign textile fabric products are made available in Nigeria by the dubious attitudes of smugglers and unpatriotic activities of some customer agents, despite government ban on the importation of all forms of textile fabric. It is also known to all that many of the Nigerian textile industries has grounded up and the very few remaining are operating on skeletal capacity. The government contend that allowing foreign textiles product to flood Nigerian market, will not only be unhealthy for marketing of made in Nigerian textile fabric but will spell doom to the textile companies which is not in the interest of the government and the Nigerian economy.

2.8 **Empirical Studies**

Related studies have been conducted on properties of fabric and consumer attitude to local textile fabrics.

Keeble, Coorell and Ehirch (1990) conducted a research on the effect of laundering on ability of Glove fabric to decease the penetration of organophosphate insecticides through in vitro epidermal system. Two kit glove fabrics, one of 100% cotton and one of 100% polypropylene, were examined for their capability to decrease the penetration of the organophosphate insecticides (Ops), azinphos-methyI and paraoxon after 4 hours at field concentrations (3000 and 15 ppm, respectively through an in vitro epidermal system. The glove fabrics were examined under three different conditions of use: new, after they had been abraded then laundered. New and laundered cotton fabric

was also examined for its capability to decrease the penetration of azinphos-methyI through another in vitro epidermal system, after 4 and 24 hours of exposure. Capability of the media under the in vitro epidermal systems to inhibit brain acetyle cholinesterase (AChE) was used as the indicator of penetration. Results were compared to OP-Cuased inhibitions seen in media under the fabric alone and in media under the in vitro epidermal systems alone. Incubations of azinphos-methyI suspensions and the in vitro epidermal systems covered with fabric indicated that both the epidermal cells and fabric provided protection against AChE inhibition caused by this OP and that the protective effects were additive, whether measured after 4 or 24 hours of exposure. Therefore, neither laundering nor abrasion followed by laundering altered the capability of the in vitro epidermal systems to absorb azinphos-methyI suspension. For paraoxon solution, however, new cotton glove fabric prevented absorption, and this protective effect, noted after 4 hour of exposure, was lost when the fabric was laundered. Abrading the fabric did not cause a greater effect than laundering alone. These results suggest that the pesticide as well as its formulation may be factors of consideration when protective fabrics are chosen, and that, for cotton glove fabric, the protection against some Ops may best be provided before the fabric is laundered. http://ww.ncbi.nlm.nih.hor/pubmed.

The study is related to the present study in the following ways: it is a study on the effect of laundering on fabric just like the present research. But it is dissimilar in the following ways. The above study aim at examining effect of laundering on the capability to decease the penetration of organophosphate insecticide through epidermal system, while the present study aim at examining and comparing the effect of laundering on the colour fastness of Nigerian and foreign wax print fabrics.

Yusuf (1998) assessed the market acceptability of made in Nigeria textile fabrics. Parameters such as quality (design, aesthetic appeal, handle, durability etc.), prices distributors and promotional effort to market the products formed the basis for the investigation. Information related to these parameters was sourced from observation, questionnaire and interviews of randomly selected textile staff, distributors, retailers and consumers of the product. A total population of six hundred respondents was involved in the study. The data were carefully examined and analyzed. The outcome of the findings revealed that made in Nigeria textile products are only of moderate quality as against the expected high quality (measure of the international quality assurance) which is what makes textiles acceptable all over the world. Thus has consequently led to low market acceptance of the products.

This study is similar to the present study, because it is a survey research on wax print made in Nigeria fabric but is dissimilar in that they used only locally made fabric, and only subjective method to assess the level of acceptability but the present research wishes to use objective laboratory experiment to determine quality by assess the fastness to washing, sun soap and synthetic detergent and other variables between local and foreign wax print fabrics.

Leonas (1998) investigated the effect of laundering on the barrier properties of reusable surgical gown fabrics. The purpose of the research project was to examine the relationship between selected fabric characteristic and the barrier effectiveness of surgical gown fabric to bacterial transmission were examined. The effect of laundering on these characteristics was determined. Five commercially available reusable surgical gowns were evaluate in this study. Four of the gowns were produced from woven fabrics. One

gown was produced from a 3 –layer composite that contained a microporus membrane between a woven and knit fabric. By using standard test methods, the following characteristics were evaluated: thickness, weight; pore size and oil and water repellency. Gowns were laundered 25 and 50 times by a commercial laundry services that specialized in cleaning surgical gowns. Gown fabric were sterilized only before laboratory evaluation and not after each laundering cycle. Resistance of the fabric to the transmission of microorganism supervisions under a hydrostatic pressure were determined staphylococcus aureus was microorganism used in this study the result shows that a combination of several fabric characteristics were associated with the barrier properties of the surgical gown fabric studied repellency and pore size contributed gown performance. Laundering reduced the ability of the fabric to prevent the transmission of bacteria through the fabrics. Only 1 fabric showed no transmission of bacteria after laundering. Thus fabric retained the greatest-degree of repellency and had the greatest thickness. Higher repellency ratings generally corresponded with higher barrier properties. Two fabrics showed no significant increase in the amount of bacteria that transmitted through the fabric after laundering. Both of these gowns were reinforced with a second fabric layer.

The above two studies are related to the present study in the following ways. They examined the effect of laundering on reusable surgical gown fabric. They also use experimental methods. But they are dissimilar to the present study in that aim at finding out the ability of the laundered fabric to prevent bacterial penetration after several tested laundering. But the present study aim at finding out the ability of the fabric to retain their colours and aesthetic appeal after having been subjected to several series of testing.

Coughlin (1999) studied the effect of laundering on the barrier properties of reusable surgical gown fabrics. The purpose of the research project was to examine the relationship between selected fabric characteristics and barrier effectiveness of surgical gown fabric to bacterial transmission and to determine whether laundering had an effect on these characteristics. The researchers evaluated five commercially available surgical gowns after zero laundering, 25 laundering, and 50 laundering. Gowns were designated A (i.e. 99% polyester, 1% carbon; plain construction, woven, B (i.e. 100% polyester, plain construction), C (50% cotton, 50% polyester, plain construction) O (i.e., 100% polyester face, composite construction; water-repellent fabric, plain construction; 100% polyester back, membrane jersey, knit), and E (i.e 100% polyester; plain construction). Gowns were laundered at a laundry service facility and the gowns were segregated from soiled gowns to prevent interference of contaminants. Sterilization was not done in between the laundering but was done before being expose to bacteria containing fluid.

Fabric characteristics of the Gowns were evaluated at zero, 25 and 50 laundering. The researcher evaluated thickness weight, pore size, oil and water repellency and yarn count. Staphylococcus aurous was the organism used.

The ability of the fabrics to prevent bacterial penetration was measured in accordance with the Association of the Non-woven Industry Standard Test 80-7a -82 Resistance to as non-woven pressure. The result shows that four out of the five gown fabric (i.e. A BCE) showed a reduced repellency, rating after 25 launderings. The largest reduction was exhibited by B and C, with a loss of 26% and 24% respectively Gown E showed a 10% loss, and gown had a 14% loss. Three of the gown fabric (i.e. B, C, E) received a zero rating (i.e. scale of zero to 100, with 100 representing the highest

repellency and zero the lowest) after 50 launderings. Gown A's fabric maintained a mean repellency of 62 after 50 launderings. Gown D's fabric had the lowest repellency initially, but increased to 50 after laundering.

Elebiyo (2000) conducted a subjective and objective comparative analysis of the locally hand woven fabric and wax print. He used an experimental analysis of the properties of the fabric an also conducted a survey study to determine how best locally hand woven fabric could compete with wax print. The result obtained from the experiment showed that although most of the Nigerian locally hand woven fabric are more attractive than the wax prints, their limitation in the area of end-use performance characteristics and their coarseness which causes discomfort to the body has gone a long way to limit their everyday use.

Okewole and Akanbi (2003) carried out a study on textiles and clothing maintenance for undergraduates. The study deals with the theoretical aspects of textiles fabrics repairs, renovations and laundry work as are commonly presented in the operation of the home. The study concerned with the outward appearance of the individuals and the home in so far as clothing and textiles contribute to such appearance, proper understanding of textiles and the clothes which can be economically made from them will enhance the national characteristics in every home. The book is designed to cover several topics in laundry work for those who are in training as Home Economics teachers in schools. The study concluded that coloured fabrics, whether fast or not, should not be exposed to strong sunshine, but put out to dry in breezy or shady places, because sunshine has a fading effect on colours. This study is related to the present study in that it is a theoretical study on clothing maintenance of undergraduate students and considers

the effect of sunlight on fabrics but it is dissimilar because the present study sought to find out the effect of laundering on local and foreign wax print fabrics using practical experimental method.

Paek (2004) studied the effect of detergent type and laundering temperature on soil removal and soil re-deposition performance of cotton and polyester /cotton blends with and without Durable press finish. Three sated test cloths of cotton and 65% Dacron/cotton blend with and without durable press finish were subjected to twenty-five repeated laundering in launder meter to determine the effect of fabric type, wash temperature, and laundering interval on the soil removal and soil re-deposition performance. The reflectance of the test fabric as measure by a hunter lab D -40 reflect meter and the amount of soil removed and re-deposited was computed in reflectance unit (RU), expressing the difference in reflectance of the test samples before and after washing.

Soil removal and re-deposition performance were significantly influenced by fabric type, and laundering interval. Duncan's multiple range test indicated that Dacron/cotton blend with and without durable press finish retained and re-deposited significantly less soil than cotton. Powder detergent cleaned test fabric better than liquid detergents. The result shows that there is highly significant correlation between soil removal and re-deposition RU and whiteness measurements were found therefore, both computations serve as reliable method to evaluate soil removal and re-deposition performance. htt://www.interscience.wiley.com/journal

The study is related to the present study in that the research studied the effect of detergent on laundering temperature on cotton and blends fabrics and he uses

experimental method just like the present study. But it is dissimilar to the present study in that the researcher aim to find out the ability of the detergent type and laundering temperature on the soil removal and soil re-deposition performance of the cotton and polyester blends fabrics tested while the present study aim to find out the comparative effect of laundering on the local and foreign fabrics tested.

Orivri (2005) also conducted a comparative study on the properties of some selected foreign and locally made furnishing fabrics. The result shows that, it is evident that these fabrics posses unique properties with a character of their own that can be optimized for suitable end-use. The fabrics are valued for their end-use, performance and aesthetic attractiveness. The results obtained, further suggest that the locally made fabrics are better in terms of wash fastness, fabric shrinkage, air permeability and abrasion resistance while the foreign fabrics are better in terms of crease recovery, drape-ability: tensile properties, wet ability, crimp, thickness, flammability and soil retention fabric sett weight M^2 light fastness and fabric handle. Analysis of the result also shows that for warp and weft text count, they both have similar values and in all cases, the warp count is greater than the weft counts. Elebiyo (2000) and Orivri (2005) research studies are very much related to the present studies, in that they also studied the properties of some fabrics objectively, hence their findings will be useful in the discussion of the present research. But the study is dissimilar to the present study in that it used different samples of furnishing fabrics and compared their properties only. It did not study the effect of laundering on Nigerian and foreign wax print fabrics as a guide to fabric care which the present study worked on.

Hurren, Kaynak, and Wang (2007) studied the effect of laundering on conductivity of polypyrrole –coated textiles. The study examined the resistance change in conductive polypyrole-coated pet fabric under the AS 2001. 4.15-1994 laundry test conditions. The effects of individual detergent components of a standard detergent, including auxiliary chemicals, at four different temperatures were studied. When the coated fabrics were washed under the 2001 4.15-1994 conditioned, the reference detergent and pure soap flakes (sodium state) both repellency and pore size contributed to gown performance. Laundering reduced the ability of the fabric to prevent the transmission of bacteria through the fabrics. Only I fabric showed no transmission of bacteria through the fabrics. Only I fabric showed no transmission of bacteria after laundering. Thus fabric retained the greatest degree of repellency and had the greatest thickness. Higher repellency ratings generally corresponded with higher barrier properties. Two fabrics showed no significant increase in the amount of bacteria that transmitted through the fabric after laundering. Both of these gowns were reinforced with a second fabric layer.

The study is also related to the present study because it investigated the effect of laundering and uses experimental method just like the present study. It is however dissimilar in that it studied the resistance change is conductive polypyrole-coated fabric and the effects of individual detergent components including auxiliary chemical at four different temperatures. But the present study concentrated on comparing the effect of laundering, use of soap and synthetic detergent, drying under the sun and shade on the wax print fabrics sampled.

Jezhi (2008) studied the effect of soap and synthetic detergents on cotton fabrics dyed with reactive dyes. He uses duck, Joy, Canoe Omo and Klin and Ariel to carry out the experiment to know which one removes soil better and faster than the others. She found out that duck soap removes soil very well followed by Omo, Klin, Canoe Joy and lastly Ariel. This is based at the concentration at which each detergent attain maximum absorbance. She concluded that duck soap, Omo and Klin detergnet's are the best soap and detergent to be used for washing fabrics such as cotton, wool, polyester etc.

Edache (2008) investigated the attitudes of consumers in Benue State towards locally manufactured textiles fabrics. The objective of the study was to find out the affective, the cognitive and the behavioral component of attitudes of consumers in Benue State towards made in Nigeria fabrics. One null hypothesis was formulated and tested. The researcher used survey research design method. The research uses a total people of 1,253,000, a target people of 23 local government councils in Benue State and a sample of 63 consumers. Questionnaire was used as a data collection instrument, and the data was analyzed using students t-test statistics at 0.05 level of significance. The findings of the study showed that affective components of attitudes of consumers toward locally manufactured textiles fabric were low. Consumers expressed high cognitive component of attitudes towards locally made textile fabrics. It was noted that behavioral components of attitudes of consumers was exhibited in clear manner that enable one to understand the reason for their behavior. The research has a lot of similarities with this study in that it is a study of locally or Nigeria textile fabrics.

Orzada, Moore, Collier and Chen (2009) Conducted a Study on the effect of laundering on fabric drape, bending and shear. The purpose was to investigate the effect

of laundering on drape, shear, and bending properties of bottom weight fabric. Six bottom-weight 100 percent cotton fabrics were included. Collier's Drape Tester was utilized to obtain drape value. Bending and shear value were measured on the KES –F shear tester and the pure Bending Tester. Three laundering cycles (unlaundered one and five home launderings) following AATCC methods were explored. The findings show that laundry cycle did not have a significant effect on fabric drape shear or bending properties. However, drape values increases overall, while shear and bending modulus and hysteresis decrease, resulting in a more durable, pliable fabric after five laundry cycles. http://www.emeraldinsingt.com/insigth/viewcontenttem.

The study is related to the present study in that the researchers studied the effect of laundering on fabric and uses experimental method just like the present research. But it is dissimilar in that the purpose is to ascertain the laundry effect on the drape shear and bending properties of bottom weight fabric but the present research aimed at comparing the effect of laundering on the properties of the fabric most especially on the colour fastness to different exposure like sunlight, washing, detergent .

Lee, Kimura, Lee , Park and Kim (2010) studied the effect of laundering on the thermal and water transfer properties of mass produced laminated Nanofiber Web for use in wear. The purpose of the study was to measure the functional properties of mass-produced Nanofiber web and then to investigate any change of those functional properties that may occur as a result of laundering. The measured functional properties include the water transfer properties of water-proofness and vapor permeability as well as the thermal conductivity. They concluded that the maintenance of Nanofiber web morphology despite

repeated laundering allows for the retention of the water and thermal transfer properties of the material.

The study is related to the present study in that it is the study of the effect of laundering on Nonofiber web for use as wear (cloth). It also uses experimental laboratory method just like the present study. It is however dissimilar to the present study in that it aimed at investigating the change that may occur on the properties of the fabric as a result of laundering. While the present study aim at investigating the changes that may occur on the properties of the fabrics especially color fastness as a result of laundering.

Omale (2010) studied the washing effect of soaps ad synthetic detergent on cotton fabrics. The purpose of the study was to determine the cleaning performance of soap and synthetic detergent using natural soiled laundering and artificial soiled fabrics. He sought at validating factors influencing washing result, such as compact of soap, detergent, water, washing time temperature and mechanical action during the washing process he concluded that synthetic detergent removes or absorbs more soil than do soaps and that synthetic detergent fades cotton fabrics faster than the soaps.

The study is related to this study in that it is an experimental research and is on laundering using soap and synthetic detergent. It also used cotton fabrics just like the present study but it is dissimilar in that it sort to establish the soil removing capacity of soap and synthetic detergent while the present study sought to establish the difference in quality of local and foreign wax print fabrics through laundering so as to guide consumers in making good choice and taking good care of the fabrics.

2.9 Summary of Review of Related Literature

The reviewed literature above highlighted the various definitions of fibers and fabrics by different authors and presented so many properties of textiles . The literature has also reviewed studies on classification of fibers produced from natural, man-made or synthetic and blends of fibers.

Understanding the different methods of fabric construction will help the consumer to identify closely woven cloth and loosely woven fabric and as such help in evaluating quality in fabrics and clothing. The knowledge of fabric finishes will help a consumer identify when a particular finish is used to camouflage an undesirable characteristics in fabrics. Use of temporary finishes like starching enhances the appearance of fabric and also may add to its serviceability and durability.

The knowledge of laundering and laundering aids will help a home maker take proper care of our veritable wax prints and ultimately manage the home effectively.

The design for this work will provide a lot of information on the effect of laundering on the properties of six Nigerian and foreign made wax print fabrics available in a typical Nigeria market like ‘Kasuwan Kwori’ in Kano State.

CHAPTER THREE
RESEARCH DESIGN AND METHODOLOGY

This chapter focuses on the methodology and procedures the researcher applied in collecting and treatment of data in order to achieve the objectives of this study. The chapter comprises of

- Research design
- Research instrument/equipment/apparatus
- Materials
- Identification and collection of material
- Conditioning of samples specimen.
- Experimental method
- Procedure for data analysis

3.1 Research Design

A research design according to Akuezuilo and Agu (2003) is a systematic or scientific plan for research project, which provides guidelines that direct the researcher towards solving the research problems. It is a term used to describe a number of decisions which need to be taken regarding the collection of data before ever the data are collected.

For this study, experimental research design using laboratory method was employed in this study. Akuezuilo and Agu (2003) noted that experimental research attempts to answers the question, "if this is done under carefully controlled conditions, what will happen?" To answer this question, the researcher deliberately and systematically manipulated certain influences or variables, and then observed how the specimen of the study is affected or changed. Meaning the variable controlled in such a

way that the effects observed were attributed to the variable manipulated. Therefore it was of great necessity to adapt this method of research so as to have purposeful and practical information on the outcome of the study.

3.2 Research Instrument/Equipment/Apparatus

A research instrument according to Jen (2004) is a measurement device or tool that helps a researcher in collecting, recording or measuring data, which are required to provide answers to research questions or test hypothesis. The following were the instrument used for this study:

Participant observation, Textbooks, camera.

Washing Equipment:

- enamel and plastic bowls,
- fabric (cloth),
- line,
- peg,
- soap,
- synthetic detergent,
- washing machine – or wash wheel,
- electric iron

Laboratory Machines and Equipment

:- cussick drape tester

- Universal strength testing machine

- Shirley crease recovering tester

-Gray scale for assessing change in colour, Gray scale for assessing staining.

The above listed tools or research instrument were used in this study to help the researcher be sure in identification, data collection and experimental process.

3.3 Materials

In this research, six (6) wax print cotton fabric were used in this work. The fabrics were divided into two, made in Nigeria (S_1 S_2 S_3) and foreign fabrics (S_4 S_5 S_6). The samples evaluated include three made in Nigerian wax print namely Nichem, UNTL, Quali Wax and three foreign Wax print namely Hitaget, Deluxe Wax and Hollandaise Vlisco . The samples evaluated were bought from the open market. The fabrics selected were a representative of the ranges in print and quality commercially available in the Nigerian Market.

3.3.1 Identification and Collection/ Sample and Sample Procedure

Identification

To be able to identify the different cotton wax print fabric for the study, the researcher went to the popular Kwori Market in Kano known for textiles where different textile fabrics were being sold. The researcher used the observation method to identify cotton wax print fabric both Nigerian and foreign made ones.

Collection

The method of collection employed in this study was gotten from the suggestion and emphasis made by Kogi (1997), that one of the process of obtaining information on materials required going to the field to find the appropriate material and the desired

quantity. The textile materials used for this study were purchased and collected at "Kantin Kwori" market Kano State.

Conditioning of the Sample

The fabric samples specimens were conditioned under the standard condition of relative humidity of 65 + 26 and temperature of 20 + 2^0c for forty – eight hours prior to Testing. The white cotton material for the composite was also de-sized to remove finishing treatment before using.

3.4 Experimental Methods

Five judges were selected for the assessment of change in colour using the gray scale instrument for assessing change in colour and staining for the analysis on the six wax print fabrics. For ease and convenience, the researcher selected clothing and textile students, laboratory technicians and assistant lectures, who double up to be users and consumers of wax print fabrics.

The researcher used two groups ,the control group and the experimental group (Nigerian and foreign)The researcher, with the help of the laboratory attendant, who is a trained laboratory research assistant conducted the practical experiments for a period of four weeks. The following were the experiment that the researcher conducted in this study

The six fabric samples were evaluated for:

i. The effect of laundering on the following properties require for satisfactory end use performance i.e. frictional abrasion resistance, crease recovery, drape, tensile strength, colour fastness test to washing and light.

ii. Fading effect of washing with soap and synthetic detergent on the fabrics

iii. Fading effect of concentration, time and temperature on these fabrics

iv. Fading effect of drying under the sun and shade on the fabrics colour

Experiment I

Evaluation of the Effect of Laundering on Fabrics Physical Properties

The following properties of fabrics required for satisfactory end use performance were assessed before and after laundering: Abrasion resistance, Tensile strength, drape, crease- recovery, Wash fastness and Light fastness properties .

Abrasion Resistance

The test was conducted using the Martindale wear and abrasion tester in accordance with British standard handbook (1974) as in Hamburger (1978). The machine was set at 20,000 rubs. The weight of the each specimen was determined before and after washing. How many rubs and time taken for the fabric to abrade was also recorded. The mean percentage weight loss was calculated for each fabric sample and the results were given in a tabular form.

Crease Recovery

The Shirley crease recovery tester was used for this test. Six specimen from each conditioned sample fabric were cut measuring 5cm x 2.5. Thirty specimen were prepared. Specimens were carefully creased by folding in half, placing it between two glass plates and added a 2kg weight to the folder specimen for 5 minutes. The weight was removed and the specimen transferred to the fabric clamp on the instrument and was allowed to recover from the crease for 5 minutes. As it recovers, the dial of the instrument was rotated to keep the free edge of the specimen in line with, the knife edge. At the end of 5

minutes recovery, the recovery angle in degrees was read on the engraved scaled. The mean recovery angle, standard deviation and percentage mean deviation was calculated for all samples. The samples were washed, dried and tested again for crease recovery, the difference in the recovery rate due to laundry were calculated.

Drape

The fabrics were placed on a flat horizontal surface, and by means of template the specimens were traced, their centres were marked and they were cut out. The circular specimens were held concentrically between smaller horizon discs and angular ring of fabrics were allowed to drape into folds around the lower supporting disc. The shadows of the draped specimens were cast unto an angular ring of paper of the same size as the unsupported part of the fabric specimens. The outlines of the shadows were traced onto the ring of paper, the mass of which were determined as (M1). The papers were then cut along the trace of the shadows and the mass of the inner part (M_2) representing the shadows were determined. The drape co-efficient were calculated from the rate of the two masses (ie M_2 / M_1 x100 is = drape coefficient) in accordance with British standard 5058 B.S Handbook (1973) using the cussick drape tester.

Tensile Strength Test

The universal tensile strength tester was used for this experiment in accordance with the British standard handbook specification 1974.

Preparation of Specimen: The research conditioned the fabrics for 24 hours at 27^0c (R.H 65%) 6 specimen of 150mm 15cm x 15cm 50mm were take from warp and weft direction each and these 12 specimen (from both the warp and weft direction) were taken from all the conditioned fabric.

Procedure: The tensile strength tester was adjusted to a gauge length of 100 mm and the tester was calibrated for an automatic return of the jaws to the starting position after a test specimen has been broken. Each specimen were tested and axially extended until it breaks under the applied load. The load elongation parameters were recorded. Five readings were taken for both warp and weft direction and the mean value taken. This test was replicated after the specimen has been washed with soap, synthetic detergent and dried. The difference in the tensile strength were measured and recorded.

Experiment II

Colour Fastness to Washing

The beauty of a fabric is of no value unless the dye is fast. The resistance of a dye to heat, water, soap, synthetic detergent, mechanical action as employed in domestic laundering is an important feature in the use of coloured textiles (Nkeonye 2009). Therefore, the aim of the wash fastness test is to determine the wash fastness characteristic. Experiments were carried out to evaluate the fastness characteristics of the wax print fabrics samples on repeated washing. The tests were carried out in a wash –wheel and hand washing which enable time and temperature to be controlled during the process.

Procedure: The test specimens of dimension 5 cm x 4 cm were placed between two specified pieces of un-dyed fabrics of dimension 10 cm x 8 cm. The three pieces were stitched together to form a composite. Fabric samples were washed in a washing solution containing 5g of domestic detergent (soap) per liter of water. The fabrics were thoroughly rinsed and dried. The change in colour and degree of staining of the un-dyed fabric were assessed using the grey scale.

Colour Fastness to Light

To test for light fastness a piece of each test specimens or samples (S_1 S_2 S_3 S_4 S_5 S_6) were exposed to direct sunlight, or artificial light for a period of 5-6 hours, for 5 days and then they were compared with another pieces of the same samples fabric which were left under room temperature (ageing) for the period of ten days the results were compared and recorded according to grey scale for the shade change or fading.

Fastness to Soap/Synthetic Detergent (washing with soap/synthetic)

The experiments were carried out to assess the effect of soap/synthetic detergent on wax print fabric samples. The fabric samples S_1 S_2 S_3 S_4 S_5 S_6 were washed 10 times in a washing bowl with 5 gram of soap (flakes) per litter of water using rubbing method for 5 minutes. Another set of samples were washed with 5 gram of synthetic detergent (Omo) per liter of water using rubbing method respectively. The two sets of sample wash with soap/synthetic detergent were thoroughly rinsed and dried. The degrees of fading were assessed and compared using the grey scale.

EXPERIMENT III

Washing with different Concentration, Time and Temperature

The fabrics were cut into small pieces, 100 ml of water which was used for washing was measured and poured into small beakers each and into each beaker containing 100 ml of water 0,1,5,10 and 20 grams each of soap or synthetic detergent was poured to make the detergent solution. The six different samples were then washed in each of the detergent solution of different concentration at a stated unified time and temperature (40^0c) for five minutes. Some precautions were noted, such as putting enough water to cover the fabrics, inside the beaker, setting the washing duration and

temperature, which were 5 minutes and 40^0c respectively. At the end of the washing, the test samples were removed from the washing bowl/beakers, rinsed and dried. The effects on the colour change were assessed using gray scale.

For time; the procedure was repeated five time by varying the different time from 5, 10, 15, 20 and 30 minutes used while retaining constant concentration and temperature (40^0c at 5g/L). Also for temperature, the procedure was also repeated but temperature of washing water was varied from 27, 30, 40, 50 and 60^{0c} while retaining a constant time of 5 minutes and concentration of 5g/L

EXPERIMENT IV

Effect of Drying Under the Sun / shade

Test sample of S_1, S_2, S_3, S_4, S_5 and S_6 were washed for ten consecutive times and dried under the sun for 20 minute for the ten times washed. Anther set of samples of S_1, S_2, S_3, S_4, S_5 and S_6 were also washed ten times and dried under the shade for the ten concretive times. The two set of fabrics dried under the sun and shade were then assessed for the level of colour change with a gray scale instrument for assessing change in colour and the results are recorded by the five judges. The results collected are used for data analysis.

Expression of Results

The result of the findings or changes were expressed in the following format

Change in Colour

1 = Much change in colour (Fading)

2 = Considerable change in colour

3 = Slight change

4 = Negligible change

5 = No change

Staining Change

1 = Heavily stained

2 = Considerable stained

3 = Slightly Stained

4 = Negligible stained

5. No stain

3.5 Procedure for Date Analysis

The data obtained from the experiments were subjected to statistical analysis using mean, standard deviation and percentage mean deviation to test the research questions.

CHAPTER FOUR
DATA ANALYSIS AND PRESENTATION

This chapter reports and discusses the result and analysis of the data collected from the experimental study. The results of the analysis were tabulated and summary of each table were presented below:

4.1 Data Analysis

Research Question I

What is the effect of laundering on the abrasion resistance, crease recovery, drape, tensile strength, fastness to washing, and light properties of Nigerian and foreign made wax print fabrics..

To analyse the effect of laundering on the abrasion resistance of Nigerian and foreign made wax print fabrics, from the laboratory experiment, the percentage weight loss only is used in comparing the effect of laundering on the abrasion resistance.

Table 4.1 Abrasion Resistance before and after Laundering between Nigerian and Foreign Made Wax Print Fabrics

Before laundering							After laundering					
Fabrics	**No. of Rubs at rupture**	**Time taken**	**M1**	**M2**	**Weight Loss**	**% weight loss**	**No. of Rubs at Rupture**	**Time taken**	**M1**	**M2**	**Weight Loss**	**% weight loss**
Nichen	30	53.77	0.15	0.13	0.02	13.33	30	40.26	0.15	0.13	0.3	20
Untl	30	32.12	0.14	0.13	0.01	7.14	20	27.12	0.14	0.13	0.01	7.14
Quail	30	49.09	0.17	0.15	0.02	11.76	20	27.09	0.17	0.15	0.02	11.76
Total local	**30**	**44.99**	**.15**	**.04**	**.01**	**10.7**	**23.3**	**31.49**	**.15**	**.14**	**.11**	**12.97**
Hitarget	20	27.32	0.18	0.17	0.01	5.55	10	15.56	0.18	0.14	0.04	22.22
Deluxe	30	43.14	0.14	0.13	0.01	7.14	20	30.79	0.14	0.13	0.01	7.14
Vilisco	50	63.48	0.15	0.14	0.01	6.66	20	25.99	0.15	0.13	0.02	13.33
Total foreign	**33.3**	**44.65**	**.16**	**.15**	**.01**	**6.5**	**16.66**	**24.11**	**.16**	**.13**	**.02**	**14.23**
Paired total	**63.3**	**89.14**	**0.31**	**.29**	**.02**	**17.2**	**39.96**	**55.96**	**0.31**	**.27**	**0.13**	**27.15**

% Weight loss $\frac{M1-M2}{M1} \times 100$

Table 4:1 shows that Nigerian fabrics have a higher percentage weight loss of 10.7 as against foreign samples with 6.5 percentage weight loss before laundering. After laundering, the percentage weight loss for Nigerian and foreign fabrics were 12.97 and 14.23 respectively. This shows that Nigerian fabrics abrade less than foreign wax print fabrics. This implies that Nigerian wax print fabrics have better abrasion resistance after laundering. When percentage weight loss is compared with time taken for fabric to rupture, laundered samples took a short time to abrade than unlaundered samples. Also when compared to number of rubs at rupture, laundered samples took lesser rubs to

rupture (except S_1) to unlaundered samples. The thickness of a sample does not necessarily determine how easily, it is to abrade a fabric as can be seen with S_4 (Hitarget) which was thicker than S_5 (deluxe), but took less rub to rupture

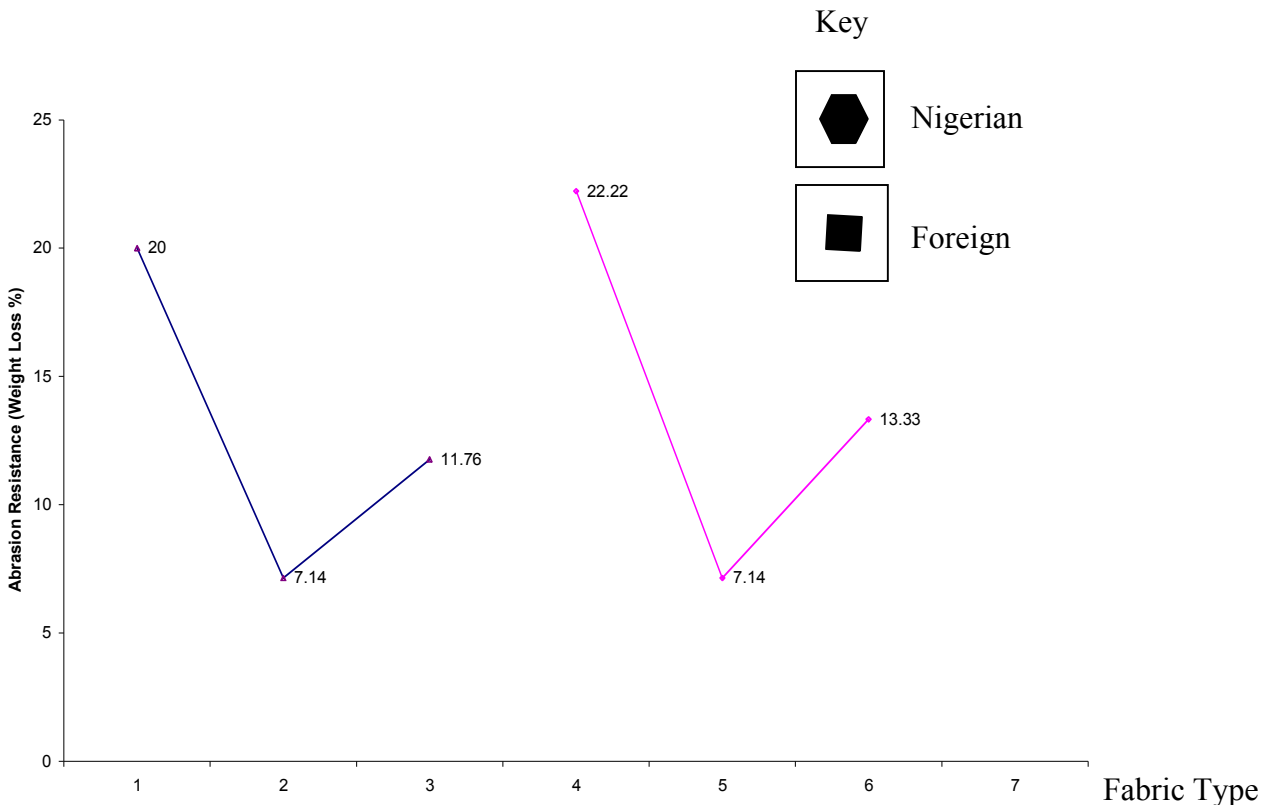


Figure 1: Graph of Abrasion Resistance of Nigerian and Foreign Made Wax Print Fabrics after Laundering Versus Fabric Type

Table 4.2 Crease recovering of Nigerian and Foreign Made Wax Print Fabrics before and after Laundering

		Before laundering			After laundering		
Fabric Code		**Mean**	**SD**	**PMD %**	**Mean**	**SD**	**PMD%**
Nichen	P	37.2	6.11	16.4	40	1.26	3.15
	T	31.6	1.85	5.85	40	3.4	8 .5
Untl	P	42	5.1	12.1	30	7.1	27.7
	T	52.4	3.0	3.73	20	0	0
Quail	P	35.2	1.41	3.98	17	2.45	14.4
	T	39.8	0.98	2.46	20	3.16	15.8
Total Nigerian		**39.72**	**3.09**	**7.42**	**27.84**	**2.90**	**11.59**
Hitarget	P	20	0	0	35	3.16	9
	T	20	0	0	39	2.37	6.1
Deluxe	P	12.4	2.24	18.1	30	5.47	18.25
	T	11.2	2.4	21.4	40	0	0
Vilisco	P	10	0	0	35	3.16	9
	T	10	0	0	37	4	10.8
Total Foreign		**13.93**	**0.77**	**6.6**	**36**	**3.03**	**8.86**
Paired Total		**26.83**	**1.93**	**7.01**	**31.92**	**2.97**	**10.02**

P = Warp T = Weft

Table 4: 2 shows that Nigerian and foreign made wax print fabric have a mean crease recovery value of 39.72 and 13.93 respectively before laundering. After laundering, they acquired a mean recovery angle of 27.84 and 36 respectively. This implies that, laundering reduces the crease recovery properties of Nigerian and foreign made wax print fabrics. It also shows that Nigerian wax print fabrics have a better crease

recovery property and need less ironing than foreign wax print fabrics before laundering. After laundering, the crease recovery property reduces to 27.84. This could be attributed to the fact that Nigerian wax print fabrics were treated with stronger temporary crease resistant finish, which loses its effect after laundering. After laundering of foreign fabrics, the mean crease recovery angles increase to 36 making it to have a better crease recovering angle than Nigerian wax print fabrics.

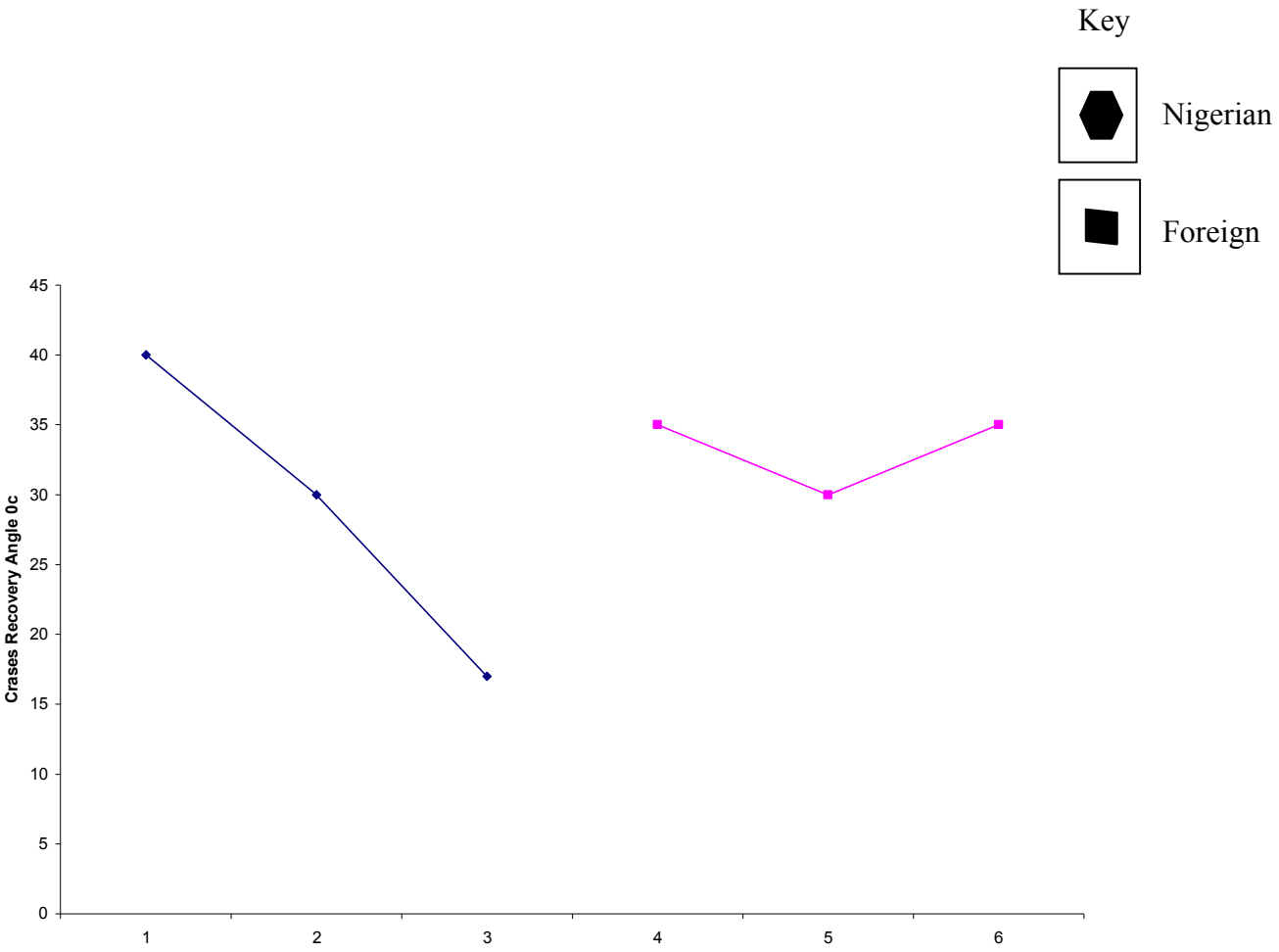


Figure 2: Graph of Crease Recover Angle of Nigerian and Foreign Wax Print Fabrics after Laundering Versus Fabric Type (Warp Direction)

Table 4.3: **Effect of Laundering on Fabric Drape between Nigerian and Foreign Made Wax Print Fabrics**

	Before laundering			After laundering		
Fabric	**Weight before cutting M1 (g)**	**Weight after cutting M2 (g)**	**Drape co-efficient %**	**Weight before cutting M1 (g)**	**Weight after cutting M2 (g)**	**Drape co-efficient %**
Nicehm S_1	12.63	5.68	44.97	12.41	4.36	35.13
Untl S_2	12.48	4.66	37.33	12.51	4.80	38.36
Quail S_3	12.62	6.49	51.38	12.58	4.38	34.81
Total Nigerian	**12.58**	**5.61**	**44.56**	**12.5**	**4.51**	**36.1**
Hitarget S_4	12.54	5.40	43.06	12.44	3.36	27.00
Delux S_5	12.47	5.71	45.78	12.52	4.51	36.02
Vilisco S_6	12.57	5.25	41.76	12.61	4.53	35.92
Total Foreign	**12.53**	**5.46**	**43.53**	**12.52**	**4.13**	**32.98**
PairedTotal	**12.57**	**5.53**	**44.05**	**12.53**	**4.32**	**34.55**

Drape co-efficient = $\frac{M2 \times 100}{M1}$

Table 4:3 shows that Nigerian wax print fabrics have 44.56 percentage drape co-efficient while foreign fabrics have 43.53 percentage of drape co-efficient before laundering, but after laundering, Nigerian and foreign wax print fabrics have 36.1 and 32.98 percentage of drape co-efficient respectively. A fabric with low drape co-efficient is said to be soft and flexible and can take any shape of the body and are used for every day wear. The result of table 4:3 shows that foreign fabrics have a lower drape co-efficient and have better drape quality to Nigerian samples before and after laundering. The table also showed that laundered samples have a total of 34.55 drape co-efficient which is lower drape co-efficient than unlaundered samples with a total of 44.05 percent of drape co-efficient

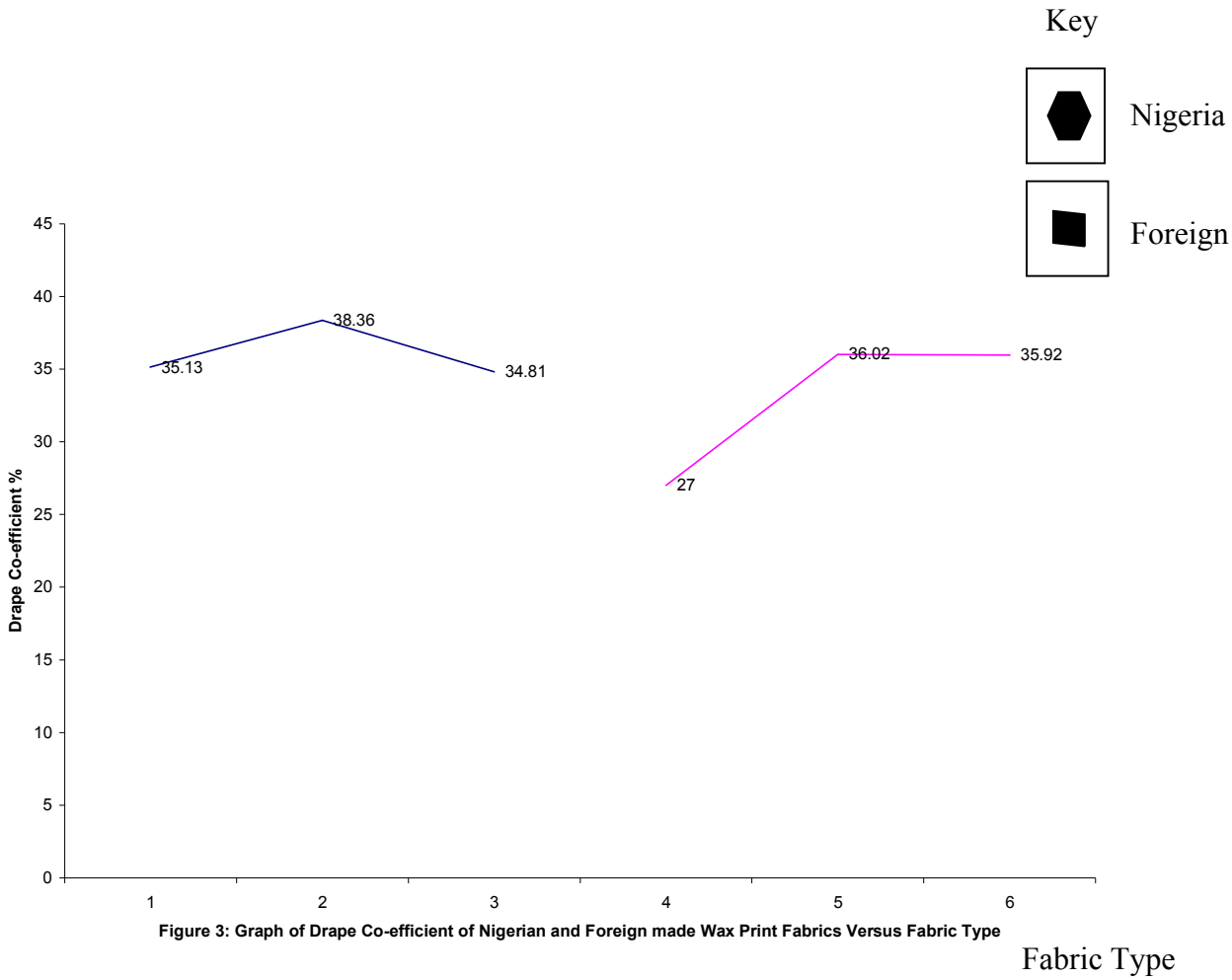


Figure 3: Graph of Drape Co-efficient of Nigerian and Foreign made Wax Print Fabrics Versus Fabric Type

Table 4.4: Effect of Laundering on the Tensile Strength after laundering between Nigerian and Foreign made Wax Print Fabrics

		After laundering			Before laundering		
Fabric		**Breaking load (N)**	**Elongation (mm)**	**Work of rupture J x 10^3**	**Breaking load (N)**	**Elongation (mm)**	**Work of rupture J x 10^3**
Nichem	P	139.775	11.145	.77	202.03	4.315	.404
	T	148.93	18.09	1.5	90.84	8.487	.364
Untl	P	138.145	13.745	1.0	185.53	4.165	.372
	T	163.18	6.992	.64	117.13	10.565	.644
Quali	P	131.63	10.99	.73	198.18	4.558	.495
	T	171.78	9.837	.96	119.285	12.45	.714
Total Nigerian		**148.90**	**11.96**	**0.83**	**152.17**	**7.42**	**0.50**
Hitarget	P	123.38	12.85	.80	117.18	4.135	.354
	T	124.38	17.335	1.1	79.68	10.50	.440
Delux	P	114.28	15.29	.86	183.43	4.470	.336
	T	121.53	7.558	.01	125.295	14.085	.875
Vilisco	P	123.53	14.95	.93	142.185	3.41	.213
	T	167.115	5.108	.42	129.49	13.27	.838
Total foreign		**129.04**	**12.18**	**.69**	**129.55**	**8.31**	**0.51**
Paired total		**138.97**	**12.07**	**.76**	**140.86**	**7.87**	**.50**

\Work of rupture = ½ breaking load x breaking elongation

P = Warp, T = Weft

Table 4.4 Shows that Nigerian wax print fabrics after laundering has a breaking load, elongation and work of rupture of 148.90, 11.96, and 0.83 while foreign wax print fabrics have 129.04, 12.18 and .69 . This shows that Nigerian wax print fabrics are stronger than foreign wax print fabrics. The table also shows that upon laundering, the breaking load of the Nigerian and foreign wax print fabrics reduces from 152.17 to

148.90 and 129.55 to 129.04. But elongation increases from 7.42 to 11.90 for Nigerian fabrics and 8.31 to 12.18 for foreign fabrics. This is because laundering relaxes the twist and increases the bending property as some stiffening agent might have been washed away. The work of rupture also reduces upon laundering for both Nigerian and foreign fabrics. This implied that laundering reduces the tensile strength of both Nigerian and foreign wax print fabrics

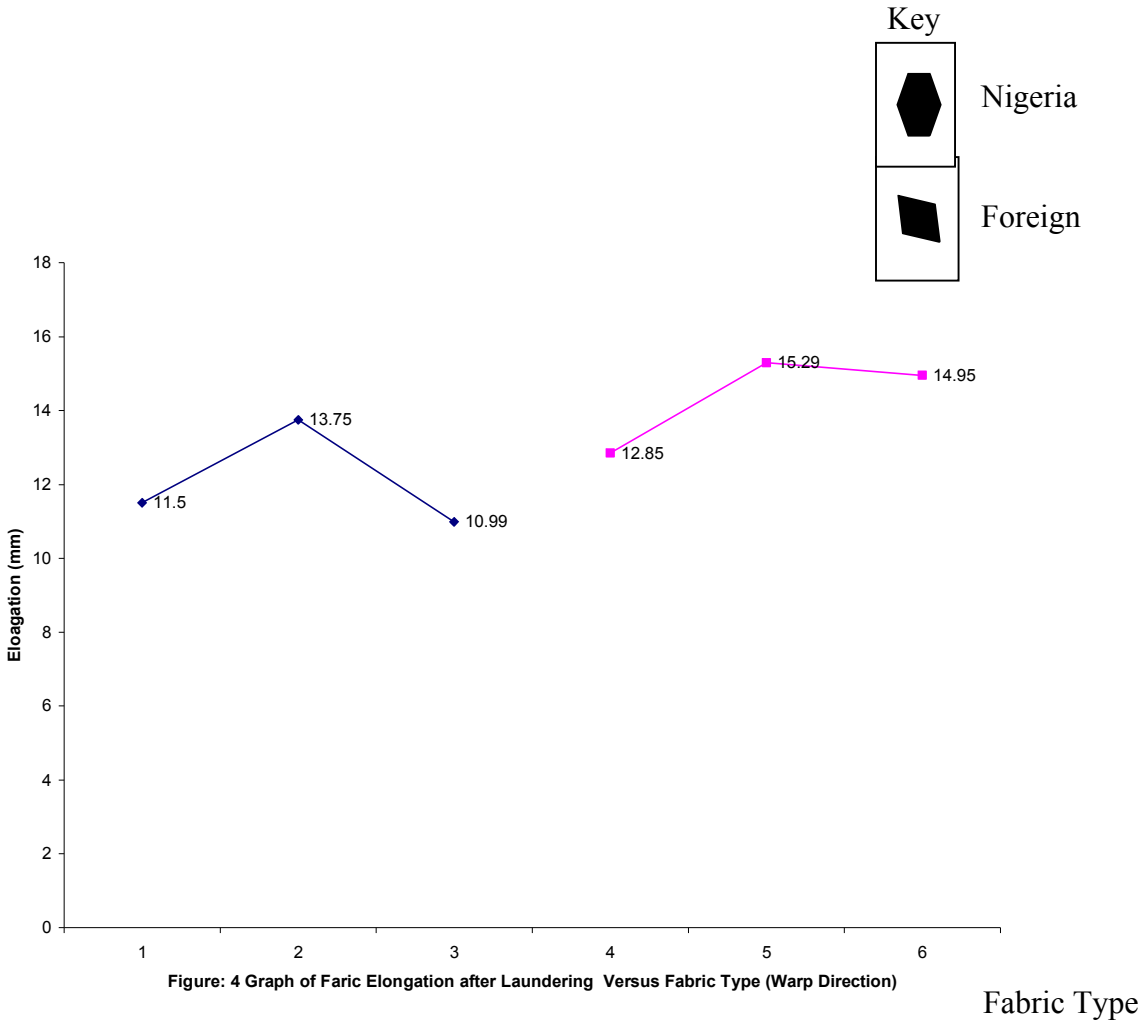


Figure: 4 Graph of Faric Elongation after Laundering Versus Fabric Type (Warp Direction)

Table 4.5: Mean Fading Scores between Nigerian and Foreign made Wax Print Fabrics Colour Fastness to Washing with different Soaps and Synthetic Detergent (Machine wash)

Fabric	Effect		B29	Canoe	Premier	Omo	Klin	Ariel
local	colour Change	mean	4.0000	4.0000	4.0000	3.3333	3.3333	3.3333
		N	3	3	3	3	3	3
		S.D	.00000	.00000	.00000	.57735	.57735	.57735
		Sum	12.000	12.000	10.00	10.000	10.000	10.000
	staining	mean	3.8333	3.8333	4.1667	3.8000	3.0000	3.8333
		N	3	3	3	3	3	3
		S.D	.76376	1.04083	.28868	1.05830	.00000	1.04083
		sum	11.50	11.50	12.50	11.40	9.00	11.50
	Total Nigerian	**mean**	**3.9167**	**3.9197**	**4.0833**	**3.5667**	**3.1667**	**3.5833**
		N	6	6	6	6	6	6
		S.D	.49160	.66458	.20412	.80416	.40825	.80104
		Sum	23.50	23.50	24.50	21.50	19.40	21.50
Foreign	colour change	mean	4.0000	4.3333	4.0000	3.6666	3.6666	3.6666
		N	3	3	3	3	3	3
		S.D	1.00000	1.15470	1.00000	1.15470	1.15470	.57735
		Sum	12.000	13.000	12.000	11.000	11.000	11.000
	staining	mean	4.8333	4.6667	4.3333	4.0000	4.3333	4.3333
		N	3	3	3	3	3	3
		S.D	.288868	.57735	.57735	.00000	.57735	.00000
		Sum	14.50	14.00	13.00	12.00	13.00	13.00
	Total foreign	**mean**	**4.4667**	**4.5000**	**4.7333**	**3.8000**	**3.8000**	**3.8000**
		N	6	6	6	6	6	6
		S.D	.81650	.83666	.40825	.80104	.83666	.75277
		Sum	28.00	27.00	29.00	26.50	27.00	25.00
Ground Total		**mean**	**4.1667**	**4.2083**	**4.1250**	**3.6999**	**3.9832**	**3.2417**
		N	12	12	12	12	12	12
		S.D	.68534	.78214	.52764	.96279	.93744	.89082
		Sum	50.00	50.50	49.50	49.40	46.00	50.50

Table 4:5 shows that when Nigerian wax print fabrics were tested for colour fastness property using different soap and synthetic detergent, the total mean fading rate

for Nigerian wax print fabrics were 3.9, 3.9 and 4.1 for soaps like B29, canoe and premier and 3.6, 3.2 and 3.6 for synthetic detergent like Omo, Klin and Ariel . These values are less than the fading values observed when foreign wax print fabrics were tested for colour fastness. The total mean fading values for foreign fabrics were 4.6, 4.5, 4.7 when soap like B29, canoe and premier were used and 3.8, 3.8 and 3.8 when synthetic detergents like Omo, Klin and Ariel were used. This shows that foreign wax print fabrics have better colour fastness property than Nigerian wax print fabrics. The table also shows from the ground total that, the wax print fabrics are more colour fast to soap than to synthetic detergent.

Table 4:6: Light Fastness of Nigerian and Foreign Made Wax Print Fabrics

		Artificial Light		Natural Light	
Fabric		Expose	Covered	Sun	Shade
Nigerian	Mean	6.3333	7.0000	4.6667	7.0000
	N	3	3	3	3
	S.D	.57735	.00000	1.15470	.00000
	Sum	19.00	21.00	14.00	21.000
Foreign	Mean	6.3333	7.0000	5.3333	7.0000
	N	3	3	3	3
	S.D	.57735	.00000	.57735	.00000
	Sum	19.00	21.00	16.00	21.00
Total	Mean	6.3333	7.0000	5.00000	7.0000
	N	6	6	6	6
	S.D	.59640	.00000	.89443	.00000
	Sum	38.00	42.00	30.00	42.00

Table 4:6 showed that when Artificial light was used, it showed that all the samples both Nigerian and foreign, when exposed to light have a mean fading value of 6.3 while samples unexposed have a mean value of 7. This implied that when fabrics are expose to constant light, it fades fast than those unexposed..

Consequently, on the same samples for a period of 10 day, the samples exposed to Natural sunlight has a mean fading rate of 4:6 while same samples kept under the shade has a mean fading rate of 7. showing that sunlight in all cases fades fabrics. In the same view, when the Nigerian fabrics rate of fading is compare with the foreign fabrics, the table showed a mean fading rate of 4.6 for Nigerian samples and 5.3 for foreign samples exposed to sunlight. This shows that the Nigerian samples on the average fade more than the foreign samples. This implied that foreign samples (S_4 S_5, S_6) have better sun fastness properties than Nigerian samples (S_1, S_2, S_3).

Research Question 2: what is the effect of using soap and synthetic detergent on Nigerian and foreign made wax print fabrics

Table 4.7 Mean value of Fading after Washing with Soap and Synthetic Detergent for 10 Cycles

	Soap (canoe)				**Synthetic detergent (omo)**		
Sample code	N	Sum	Mean	S.D	Sum	Mean	SD
Nichem	10	37	3.7	.675	33	3.3	.483
UNTL	10	40	4	.667	36	3.6	.699
Quali	10	39	3.9	.568	32	3.2	.422
Total Nigerian	**30**	**116**	**3.8**	**.1528**	**101**	**3.36**	**.1202**
Hitarget	10	39	3.9	.316	35	3.5	.527
Deluxe	10	41	4.1	.316	34	3.4	.516
Vilisco	10	40	4	.000	37	3.7	.000
Foreign Total	**30**	**120**	**4.0**	**.1000**	**106**	**3.5**	**.1528**
Paired Total	**60**	**236**	**3.9**	**.1264**	**207**	**3.45**	**.13657**

Table 4:7 shows that when Nigerian fabric samples were washed with soap and synthetic detergent respectively, using hand washing for ten times cycles of 10g/l of detergent, the mean fading rate showed 3.86 and 3.6 for soap and synthetic detergent respectively. This result shows that Nigerian samples washed with soap fades less than those washed with synthetic detergent. On the other hand, when foreign samples were washed with soap and synthetic detergent, the mean fading rate were 4 and 3.5 respectively. This also shows that foreign samples washed with soap fades less to those washed with synthetic detergent. When the mean fading value is assessed irrespective of sample type, the total mean fading value is 3.9 when soap was used for washing and 3.45 when synthetic detergent was used. This further implies that synthetic detergent has a

more fading effect on wax print fabrics than soap. This result is in agreement with the findings in table 4:6 when washed with machine.

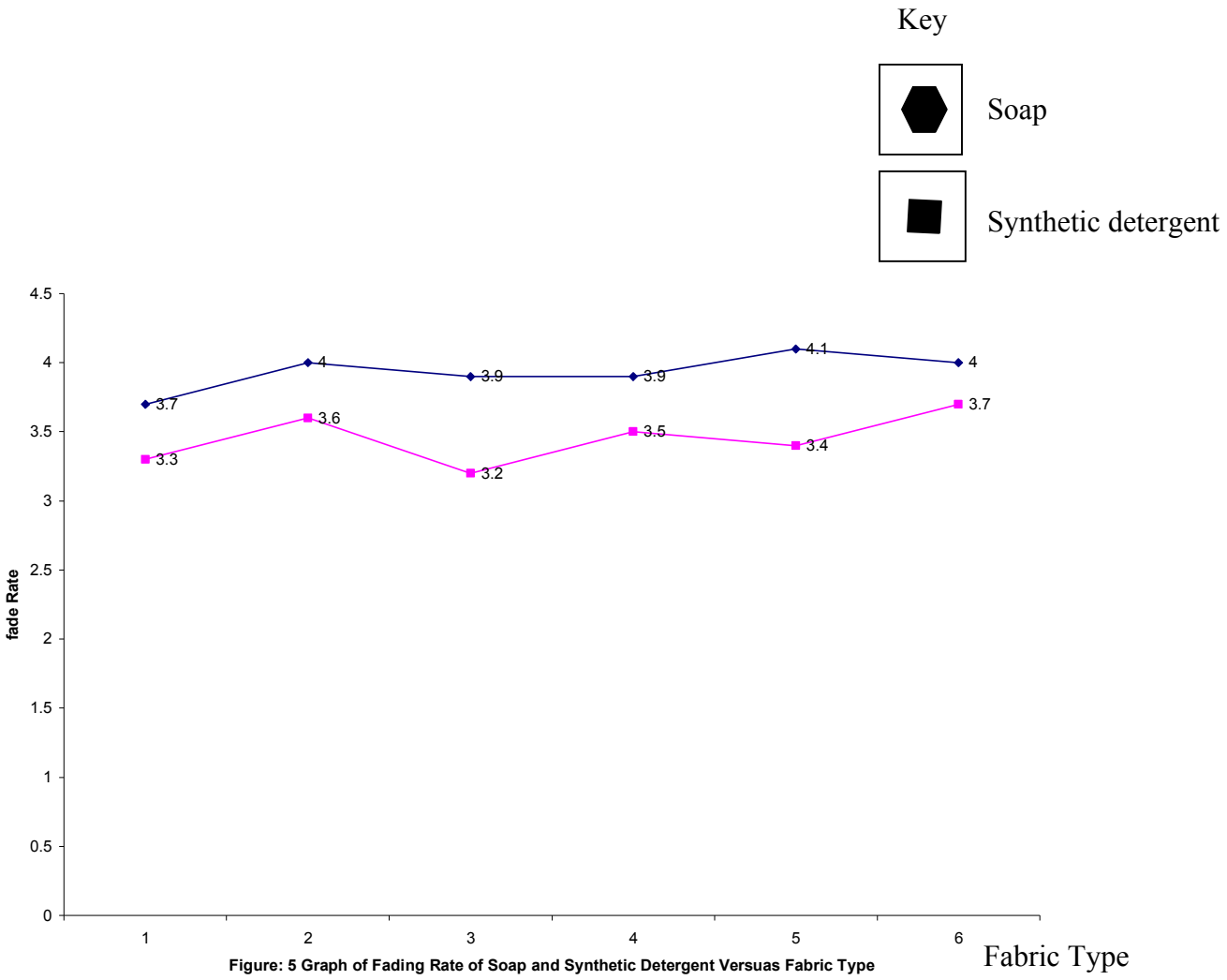


Figure: 5 Graph of Fading Rate of Soap and Synthetic Detergent Versuas Fabric Type

Research Question 3

To what extent does the use of different concentration of detergent, time of washing and temperature of washing water affect the fading of Nigerian and Foreign made wax print Fabrics?.

Table 4.8 Fading value at different concentration of detergent after washing at 40^0c for 5 minutes

Soap	Concentration g/l	Fabric	Mean	S.D.	N
	0	Nigerian	5.00	.000	3
		Foreign	5.00	.000	3
		Total	**5.00**	**.000**	**6**
	1	Nigerian	5.00	.000	3
		Foreign	5.00	.000	3
		Total	**5.00**	**.000**	**6**
	5	Nigerian	4.00	.000	3
		Foreign	4.67	.577	3
		Total	**4.33**	**.516**	**6**
	10	Nigerian	4.00	.000	3
		Foreign	4.33	.577	3
		Total	**4.17**	**.408**	**6**
	20	Nigerian	4.00	.000	3
		Foreign	4.00	.000	3
		Total	**4.00**	**.000**	**6**
Total soap	Total	Nigerian	4.40	.507	15
		Foreign	4.60	.507	15
		Total	**4.50**	**.509**	**30**
Synthetic detergent	0	Nigerian	5.00	.000	3
		Foreign	5.00	.000	3
		Total	**5.00**	**.000**	**6**
	1	Nigerian	5.00	.000	6
		Foreign	5.00	.000	3
		Total	**5.00**	**.000**	**3**
	5	Nigerian	3.33	.577	3
		Foreign	4.00	.000	3
		Total	**3.67**	**.516**	**6**
	10	Nigerian	3.00	.000	3
		Foreign	4.00	.000	3
		Total	**3.50**	**.548**	**6**
	20	Nigerian	3.00	.000	3
		Foreign	4.00	.000	3
		Total	**3.50**	**.548**	**6**
	Total	Nigerian	3.87	.990	15
		Foreign	4.40	.507	15
		Total	**4.13**	**.819**	**30**

Table 4.8 Shows that when fabric samples were washed with soap at 0, 1, 5, 10, and 40 gramme per litre, the total mean fading value were 5.00, 5.00, 4.33, 4.17 and 4.00 respectively. This shows that as concentration of soap increases, fading also increases. Also when synthetic detergent was used to wash at 0, 1, 5, 10 and 20 grammes per litre, the total mean fading value for each were 5.00, 5.00, 3.67, 3.50, 3.50 respectively. This also implies that as concentration of synthetic detergent increases, fading also increases. In both cases, increase in concentration increase fading of fabric.

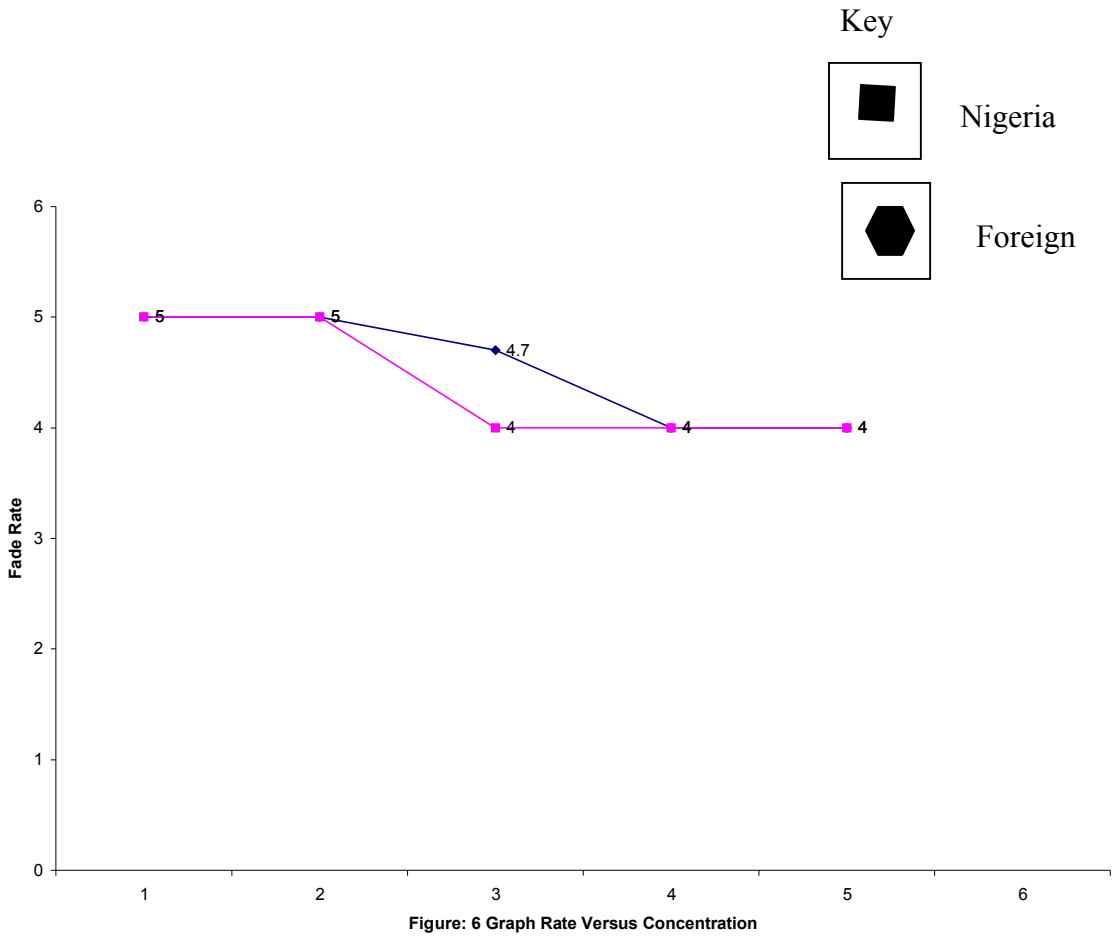


Figure: 6 Graph Rate Versus Concentration

Table 4.9: Fading value at different time of washing, after washing at 40^0C with 5g/l

Time (mins)	Fabric	N	Mean	S.D
5	Nigerian	3	4.33	.577
	Foreign	3	5.00	.000
	Total	**6**	**4.44**	**.508**
10	Nigerian	3	4.33	.577
	Foreign	3	5.00	.000
	Total	**6**	**4.44**	**.508**
15	Nigerian	3	4.33	.577
	Foreign	3	4.33	.577
	Total	**6**	**4.33**	**.000**
20	Nigerian	3	3.66	.516
	Foreign	3	4.33	.577
	Total	**6**	**3.88**	**.405**
30	Nigerian	3	3.33	.577
	Foreign	3	4.33	.517
	Total	**6**	**3.44**	**.559**
Paired total	Nigerian	15	3.996	.565
	Foreign	15	4.598	.346
	Total	**30**	**4.297**	**.456**

Table 4:9 shows that when fabrics samples were washed at different times of 5, 10, 15, 20, and 30 minutes respectively , the total mean fading value for each time were 4.44, 4.44, 4.33, 3.88 and 3.44 respectively. This observation shows that as the time of washing increase fading also increase.

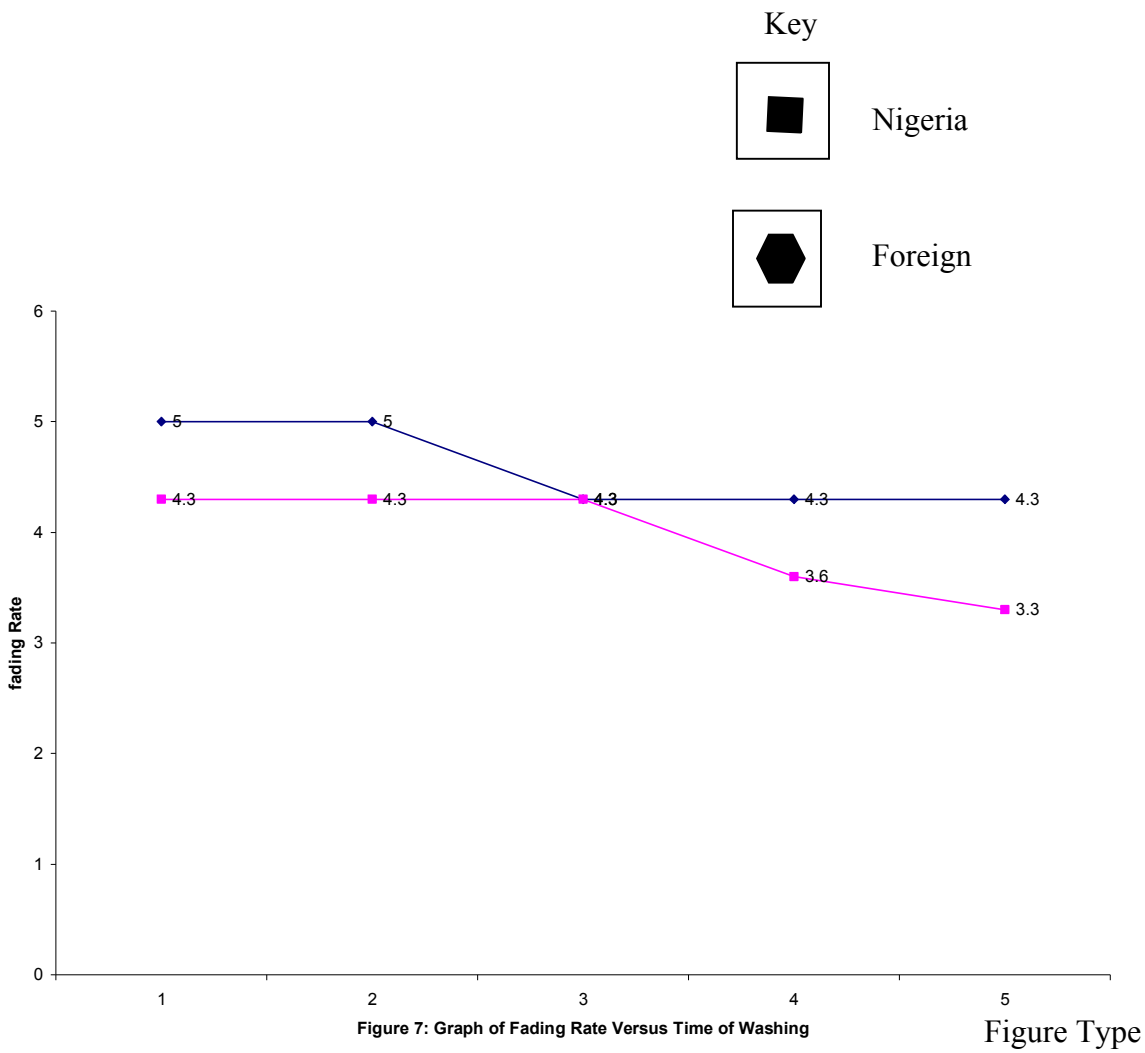


Figure 7: Graph of Fading Rate Versus Time of Washing

Table 4:10: Fading Value at Different Temperature of washing water, after Washing at 5g/l for 5 Minutes

Temperature ^{0}c	Fabric	N	Mean	S.D
27	Nigerian	3	5.00	.000
	Foreign	3	5.00	.000
	Total	**6**	**5.00**	**.000**
30	Nigerian	3	5.00	.000
	Foreign	3	5.00	.000
	Total	**6**	**5.00**	**.000**
40	Nigerian	3	4.50	.548
	Foreign	3	4.67	.516
	Total	**6**	**4.58**	**.515**
50	Nigerian	3	4.00	.000
	Foreign	3	4.00	.000
	Total	**6**	**4.00**	**.000**
60	Nigerian	3	3.50	.548
	Foreign	3	4.00	.000
	Total	**6**	**3.32**	**.432**

Table 4:10 shows that when fabric samples were laundered with different water temperature at 27^{0C}, 30^{0C}, 40^{0C}, 50^{0C} and 60^{0C} respectively at five gramms of detergent per litre of water for 5 minutes, the total mean fading value for each temperature were 5.00, 5.00, 4.66, 4.00 and 3.00 respectively. This result shows that as the temperature of washing water increases above 40^{0C}, fading starts taking place even with wax print fabrics that have good fastness property. This observation shows that, increase in temperature increases the fading of wax print fabrics. When the effect of different temperature is compared across Nigerian and foreign wax print fabrics, the table shows that at 20^0c, 30^oc, 40^0c 50^0c and 60^0c of laundering water temperature, Nigerian fabric has a fading value of 5.00, 5.00,4.67, 4.00 and 4.00 respectively while foreign fabrics has a fading value of 5.00, 5.00, 4.67, 4.00 and 4.00 respectively. This also shows that Nigerian fabrics fade more with increase in temperature of laundering water.

Research Question 4

What is the effect of drying under the shade and sun on the Nigerian and foreign wax print fabrics.

Table 4:11 Fading value on the effect of drying under the sun and shade

Fabric	**N**	**Total**	**Mean**	**S.D**	**N**	**Total**	**Mean**	**S.D**
			Sun				Shade	
Nichem	10	33	3.3	.4830	10	3.6	3.6	.5164
UNTL	10	34	3.4	.5164	10	40	4.0	.6666
Quali	10	34	3.4	.5164	10	40	4.0	.6666
Total Nigerian	**30**	**101**	**3.4**	**0.055**	**30**	**36.67**	**3.8**	**0.617**
Hitarget	10	38	3.8	0.505	10	43	4.3	.4830
Deluxe	10	36	3.6	.6921	10	43	4.3	.4850
Vilisco	10	39	3.9	0.000	10	40	4.0	.000
Total Foreign	**30**	**113**	**3.8**	**0.493**	**30**	**126**	**4.2**	**.323**
Paired Total	**60**	**214**	**3.6**	**0.499**	**60**	**236**	**4.0**	**0.47**

The results obtained and displayed in table 4:12 were obtained using the natural sunlight. The samples were washed for 5 minutes and dry under the sun for 20 minutes. The Table shows that Nigerian wax print fabrics exposed to sunlight after washing have a mean value fading effect of 3.4, while the samples dried under the shade have a mean value fading value of 3.8. This implies that those dried under the sun fades more than those dried under the shade. Consequently the foreign samples dried under the shade have a mean fading value of 4.2 while same samples dried under the sun have a mean value fading effect of 3.8. This also implies that foreign samples dried under the sun fades more

than those dried under the shade. The findings shows that samples exposed to sun lights fades more than those kept under shade. All the fabrics irrespective of type dried under the sun have a mean fading value of 3.6 while those dried under the shade have a mean fading value of 4.0

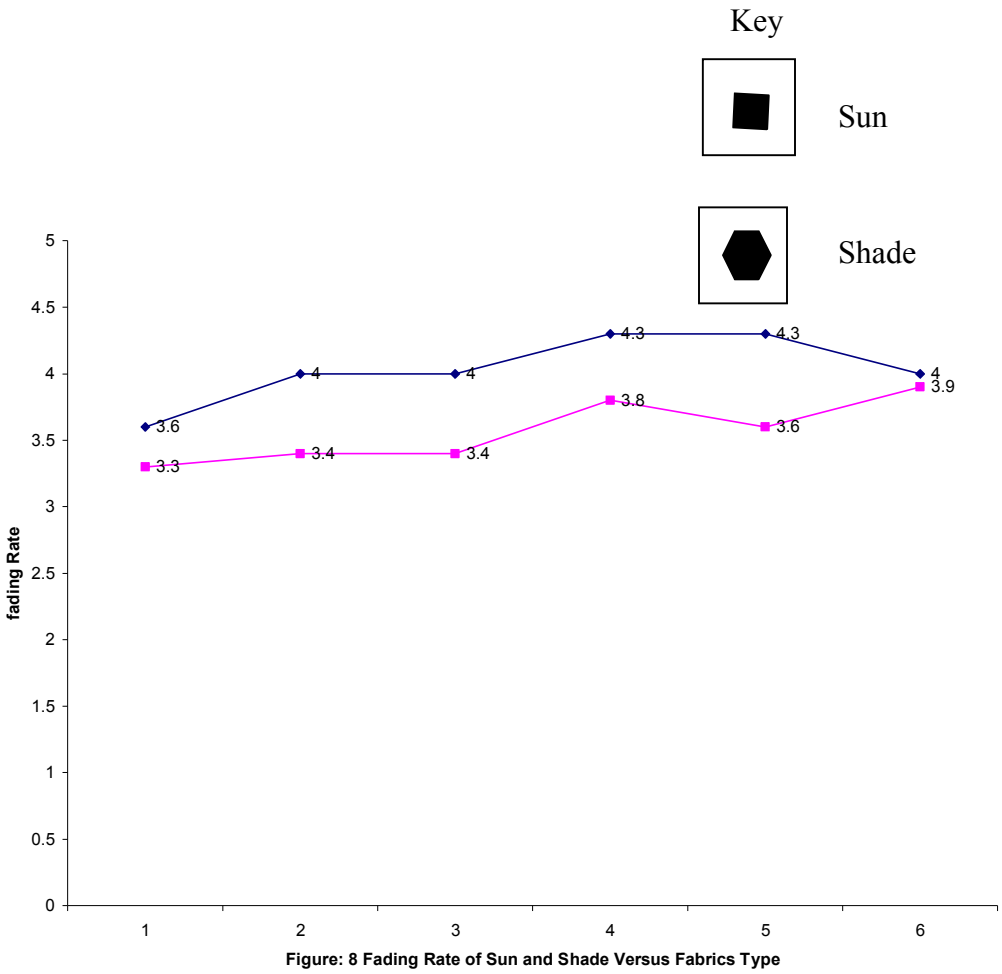


Figure: 8 Fading Rate of Sun and Shade Versus Fabrics Type

4.3 **Discussions of the findings**

The findings of this research shows that upon laundering , foreign wax print fabrics abrades more than Nigerian wax print fabrics .When fabrics were analysed irrespective of fabric type ,the findings shows that laundered fabrics abrades faster than unlaundered fabrics. It was observed that laundered fabrics took less rubs to rupture, less time and less percentage weight loss to rupture. The findings also reveals that,

Nigerian fabrics took more rubs, more time and less percentage weight loss to rupture. The findings conclude that foreign fabrics abrade faster than Nigerian wax print fabrics. This implies that Nigerian wax print fabrics have better abrasion resistance quality than foreign wax print fabrics. The finding of this study is consistent with the finding of Coughlin (1990) which found out that laundering reduces the barrier properties of reusable surgical gown fabrics. This is in agreement with the findings of Orivri (2005) which found out that local made furnishing fabrics has a better abrasion resistance than the foreign ones.

Foreign wax print fabrics recovers faster from creasing after laundering than Nigerian wax print fabrics .Although the findings of the fabrics analyses before laundering shows that Nigerian wax print fabrics has a higher crease recovery angle before laundering but after laundering, did not recover faster. This implies that laundering makes Nigerian wax print fabrics to be less crease resistance .This might have attributed to fact that Nigerian wax print fabrics are treated with a strong temporary crease resistance finishes, which looses its effect after undergoing several cycles of laundering due to absence of sizes in the fabrics. The mean score and standard deviation shows that, Nigerian fabrics has consistently more crease recovery properties and need less ironing than foreign wax print fabrics before laundering. This is in agreement with the work of Elebiyo (2005) which found out that local hand woven fabrics have easy care property and do not need much ironing before use. The producers of Nigerian wax print fabrics might have taken into consideration the epileptic nature of the countries, power supply, the need of the local dwellers who have no electrical supply and the need

to preserve the colour of the fabrics through less ironing but more permanent crease recovering finishing need to be applied to Nigerian wax print fabrics.

- Foreign wax print fabrics have better drape quality than Nigerian fabrics both before and after laundering, as fabrics with lower drape coefficient drapes better than fabrics with higher drape co-efficient. The findings also showed that laundering makes all the samples to have more drape quality. The mean analysis observed that, foreign and laundered fabrics have less drape co-efficient respectively, compared to Nigerian and unlaundered samples. The findings of this study is not consistent with the findings of Orzada *et al* (2009), which found out that laundering cycles does not have a significant effect on fabric drape properties, although they emphasis that drape increase overall after five laundering cycles. This implies that laundering makes fabrics get softer and more flexible
- On tensile strength, Nigerian wax print fabrics are stronger than foreign wax print fabrics both before and after laundering, it was observed that both fabrics have higher elongation after laundering. This is attributed to the fact that fabrics are given twist during weaving and the twist increases after laundering as some stiffening treatment might have been washed away. The mean observations revealed that the tensile strength of all the samples before laundering were consistently higher than the tensile strength after laundering. This shows that laundering weakens and has degrading effect on fabrics strength.
- On wash fastness Nigerian wax print fabrics fades more and stains more than foreign wax print fabrics. This implies that foreign wax print fabrics are more colour fast

to washing than Nigerian wax print fabrics. This is in agreement with the findings of Peak (2004) which found out that fastness to washing is influence by fabrics type.

On light fastness , Nigerian wax print fabrics fades more than foreign wax print fabrics when expose to sunlight .When the whole samples were assessed irrespective of fabric type ,sunlight exposed fabrics fades more than those under cover .This also implies that foreign wax print fabrics are more colour fast to sunlight than Nigerian wax print fabrics. This is in agreement with the survey findings of Yusuf (1998) which found out that made in Nigerian wax print fabrics are only of moderate quality which has led to low market acceptance of the product.

Research Question 2: The findings on the fading effect of washing with soap and synthetic detergent shows that fabric washed with soap fades less to fabrics washed with synthetic detergent. It was observed that when fabric samples were washed with soap, both by hand and machine Table 4.6 and 4:7 shows a negligible change in colour on the two types of fabrics. When samples were washed with synthetic detergent, the mean fading rate of 3.4 and 3.9 were observed on the two fabrics. This is in agreement with the work of Omale (2010) which found out that synthetic detergents fades cotton fabrics more than do soap.

Research Question 3: The observation shows that increase in concentration of washing powder, increase in time of washing and high temperature of washing water increases fading of wax print fabrics. This is consistent with Paek (2004) findings that soil redeposition and fading of fabrics were significantly influenced by fabrics type and laundering intervals. The finding also reveals that there is fading difference at different temperature of washing water. The findings shows that as temperature increases fading

also increases even samples with good fastness properties also starts to fade. This is consistent with the home laundering consultative council recommendation on the temperature of laundering water should not exceed 40^{0C} (pleasantly warm for cotton and linen, if colours are not fast to high temperature). This is in agreement with the work of Paek (2004) which found out that increase in temperature of laundering water increases soil removal and fading of fabrics

Research Question 4: The findings on the effect of drying of wax print fabrics under the sun and shade shows that, fabrics dried under the sun, fade more than fabrics dried under the shade. When the effect of the sun is compared across local and foreign fabrics, the findings shows that, there is difference between the fading of Nigerian and foreign wax print fabrics dried under the sun (Nigerian fabrics fades more). This is in agreement with Okewole and Akanbi (2003) conclusion that coloured fabrics whether fast or not should not be expose to strong sunlight. The findings also shows that when the fabric were dried under the shade, there was no fading different between Nigerian and foreign wax print fabrics dried under the shade.

Summary of findings

The experimental study summarized that six research questions were raised in order to compare the effect of laundering on the properties of Nigerian and foreign made wax print fabrics.

1a. Nigerian wax print fabrics have better abrasion resistance than foreign wax print fabrics after undergoing laundering and laundering generally have degrading effect on wax print fabrics.

b. Foreign wax print fabrics have better crease resistance property than Nigerian wax print fabrics after laundering

c. foreign wax print fabrics drapes better than Nigerian wax print fabrics after laundering. Laundering makes wax print fabrics softer and more flexible.

d. Nigerian wax print fabrics are stronger than foreign wax print fabrics after laundering

e. Nigerian wax print fabrics fade more and stain more than foreign wax print fabrics upon laundering.

f. Foreign wax print fabrics are more colour fast to light than Nigerian wax print fabrics

2. Fabrics washed with soap fade less than fabrics washed with synthetic detergent

3. Increase concentration of washing powder, longer time of washing and high temperature of washing water fades wax print fabrics.

4. Fabrics dried under the sun fade more than fabrics dried under the shade.

CHAPTER FIVE
SUMMARY ,CONCLUSION AND RECOMMENDATIONS

This chapter presents the summary, conclusion and the recommendations of the study based on results of the experiments. It proffers recommendations based on the results of the findings.

5.1 Summary

The study was set out to comparatively and objectively study the effect of laundering on the properties of Nigerian and foreign wax print fabrics.

The main objective of this research work was to examine the effect of laundering on the properties of Nigerian and foreign made wax print fabrics. Based on the above, the following specific objectives were formed to:

1. investigate the effect of laundering on the properties of Nigerian and foreign made wax print fabrics. with specific limitation to abrasion resistance, crease recovery, drape, tensile strength, thickness, wash fastness and light fastness property
2. find out the effect of using soap and synthetic detergent on the Nigerian and foreign made wax print fabrics..
3. determine the effect of using different concentration of detergent, time and temperature of washing water on the fading of Nigerian and foreign made wax print fabrics.
4. observe the fading effect of drying under the sun and shade on the wax print fabrics.

Background of the study, statements of the problem, objectives of the study, research questions, significance of the study, and delimitations of the study were highlighted.

Various related literature were reviewed which highlighted fibers, fabrics and their properties, fabric classification, construction and finishes. Fabric care, laundering, laundering processes, agents, and equipment. Dirt, soil and their removals. Local and foreign made wax print fabrics and empirical studies related to the study.

Experimental research design using laboratory method was employed in this study. Observations, washing equipments and laboratory machines and equipments were used as instruments for data collection. Six wax print fabrics were used for the experiment namely-Nichem, UNTL, Quali wax, which are Nigerian wax prints and Hitarget, Deluxe and Hollandaise Vilisco which are foreign made wax print fabrics. Each of the experiments was replicated five times. Five and seven parameters were selected respectively for the laboratory experiment depending on the test carried out. The change in colour and degree of staining of the undyed fabrics were assessed using the gray scale.

Data collected from the laboratory experiments were subjected to statistical analysis using mean, standard deviation and percentage mean deviation to test the research questions. The data analysed were presented, discussions on the findings were made and summary of the findings were presented.

5.2 Conclusion

From the findings and observations made from this study, the following conclusions were drawn:

The study revealed that differences exist in the abrasion resistance, crease recovery, drape, tensile strength, wash fastness and light fastness properties between Nigerian and foreign made wax print fabrics after laundering but the differences were not

statistically significant. Synthetic detergent, high concentration of washing power, direct sun light, fades wax print fabric. The researcher therefore conclude that foreign wax print fabrics are better in some properties like colour fastness to washing and light while Nigerian wax print fabrics are better in some properties like abrasion resistance and tensile strength when exposed to the same washing conditions..

5.4 **Recommendations**

From the findings of this research, the following were recommended by the researcher.

1. Consumers should buy wax print fabrics on the basis of end use requirement performance properties because some properties are better in Nigerian wax print fabrics and some in foreign wax print fabrics.
2. Manufacturers of Nigerian wax print fabrics should produce fabrics with better permanent crease recovery and colour fastness properties so that they will not loose their crease recovery and colour fastness properties after laundering.
3. Soap should be used in laundering Nigerian and foreign made wax print fabrics to reduce fading.
4. Time of hand washing of wax print fabric should not exceed five minutes and temperature of the washing water of wax print fabric should not be more than 40^{0c} (hand warm.) because the colours are not fast to washing and high temperature.
5. Nigerian and foreign made wax print fabrics should be dried under the shade, to eliminate the effect of fading caused by direct sunlight.

6. Home-economics teachers should teach clothing and textiles with more emphasis on practical aspects of clothing care and maintenance from primary to tertiary institution.
7. Workshop should be organized by Home-Economics Teachers Association (HETAN), from local to state to national level on consumer education, properties, maintenance and care of wax print fabrics.

5.3.1: Suggestions for Further Studies

1. Subjective assessment of local and foreign wax print fabrics should be researched on, to find out consumers opinion/observation on this issue, especially on properties like handle and sheen which are better assessed by subjective method.
2. Effect of using different brand of soap on the wax print fabrics
3. Effect of machine and hand wash on wax print fabrics
4 Finally, this research should be carried out with more samples so that the findings of this study will be regularized to avoid occurrence by chance.

5.4 Educational Implication

The findings of this research are expected to:

1 serve as a guide to Home Economics curriculum planners, teachers, students, on the importance of scientific experiment to the effect of laundering on the properties of fabrics
2 help families in choosing wisely and caring properly for their wax print fabrics ,so as to save unnecessary waste of family finances

3 serve as a guide for laboratory practical experiment for Home Economics (clothing and textile) teachers and students

4 help Home Economics extension services in textile industries to serve as adviser to Nigerian manufacturers of wax print fabrics in areas were there is need for improvement of their products.

5.5 Limitations of the Study

The research had initial problem of non availability of electricity in textile technology department due to electrical fault for a period of two months .This delayed the researchers work, and made her to travel to Kaduna polytechnic daily for two weeks to conduct some of the experiment.

Identification and selection of local wax print fabrics was difficult due to closure of most textile industries in Nigeria.

REFERENCES

Ajayi, J.O(1988). *Objective Evaluation of Surface Characteristics to Determine Smoothness of Pile Fabrics,* Ph.D. Thesis Strathclyde and Sons In PP. 1-10

Ajayi, J.O. (1992). *Effect of Fabric Structure on Frictional Properties.*Textile Research Journal Vol 62 No2. pp 1-8. Published by T.R.I/ Princeton 60/Prospect Avenue P.O Box 625, Princeton, New Jesey

Ajayi, J.O. (1997). *Fabric Friction, Handel, and Compression,* Journal of Textile Institute, 88, No3 pp 1-4. Princeton, New Jesey

Akanem, J.E., (1987), *The Impact of Traditional Fashion on Contemporary Fashion in Nigeria.* Unpublished B.A Thesis. Department of Fine and Applied Arts, University of Nigeria Nsukka.

Akerara, B.B (1998). *Laundering in Textiles*: A Seminar Paper Presented to the Department of Textile Science and Technology A.B.U.

Akuezulio, O.E. and Agu, M. (2003). *Research and Statistics in Education and Social Sciences Nuel Centi Publishers and Academic Press Ltd, Awka Nigeria PP 81-108.*

Anyakoha, E.U. and Eluwa M. (2010). *Home Management for Schools and Colleges Published* by Africana First Publishers Limited.

Aruwgun, I.I (2002). *African Prints in Different forms* Saturday Punch Newspaper PP 8.9

Bavley, S. (2005). *Interaction Design in Small Textiles Clothing and Application in X Fao (Ed) Wearable Electronics and Pothouses* (pp 23-244) Boea-Rator FL. CRC.

Booth, J.E. (1989). *"Principles of Textile Testing" 5th* Edition. A Butterworth Publication, London pp 350-450

Cambridge Advanced Learners Dictionary 5th Edition.

Corbman, B.P. (1983). *Textile Fiber to Fabric* Sixth Edition, New York. Magraw Hill Inc.

Coughlin, M.K (1999). *Effect of Laundering on the Barrier Properties of erusable Surgical Gown Fabrics*. AORM Journal Vol 26 pp 495- 01 http://findarticle.com/p/articles/micofsllis669lao549127821

Edache, A. (2008). *Attitude of Consumers in Benue State Towards Locally Manufactured Textile Fabric*, JHER Vol 9, pages 283-290.

Dorothy, L. (1974). *Performance of Textile,* John Willey and Sons New York pp 270-288.

Dosi, G, Pavit, K. and Soete, L (1992). *The Economic of Technical Changes and International Trade,* London Harvest Wheat Sheat.

Ebute, B.Y (2005). *Traditional Nigerian Textiles for Technological development* Paper Delivered at the 2nd National Conference/ Exhibition of the School of Art Design and Printing Kogi State Polyphonic Lokoja from 5th -8th August 2008.

Eicher, J.B. (2005). *Nigeria Handcrafted Textile Ile-Ife,* Nigeria. University of Ife Press.

Ejiofor, P.N.O (1989). *"Acceptability of Made in Nigeria goods"* Foundations of Business Administration African Feb Publishers Ltd. Nigeria P. 236-244.

Elebiyo, O.M.A. (2000). *Comparative Study of Wax Print Fabrics Versus Hand Woven Nigeria Fabrics* B.Sc Dissertation A.B.U Zaria.

Enozie and Maduewesi B.U (2003) *Citation and Referencing* 5th Edition A.P.A Style.

Florida, R. (2002). *The Rise of the Creative Class and Hoe its Transforming Work, Lersme Community and Everyday Life* New York Basic Books

Gawthorpe, L.M. (1974). *Fabrics and Laundering* Work Hullon Educational Publication, London.

Hamburger, G. (1978). *"Hand Book of Textile Testing and Quality* Control John Wiley and Son, New York p (513 -535).

Hong, B.S. (1985). *"A Positive Study for the Decision on Purchase of Clothes by Married Women"* Chung-Ang University Doctoral Dissertation.

Horn, M.J (1975). *"The Second Skin"* – an interdisciplinary Study of Clothing Houghton Mittlin Company Boston.

htt://www:interscierce:wiley.com/journal.

http//www.ncbi.nlm.nib.gov/pubmed.
http//www.ncbionlm.nih.Gov/pubmed6/8/2010.

http://www.ajicjournal.org/artile.
http://www.emeraldinsingt.com/insight/viewcontentltem.

Hurren, C.J, Kaynak A. and Wang X. (2007). *Effect of Laundering on Conductivity of Polypyrrole –Coated Textiles.* RJJA Vol. II No3. 2007.

Ifezue, N.A (1989). *Buying Motives and Habits of Consumers* F.B.A by Pita Ejlofor p286 -291.

Jen, (2004), *Fundamental of Research Method* 2nd Edition Yola Nigeria.

Jezhi, S.C (2008) *The Effect of Soap and Synthetic Detegerts on Cotton Fabrics Dyed with Reactive Dyes.* Unpublished B.Sc Project A.B.U Zaria.

Johnson J.D and Foster A.G (1990). *Clothing Image and Impact* Cincnnati Ohio South Western Publishing Company.

Kaka H.J (1998) *Laundering and Textile* Chapter 5 pp 22. Unpublished Lecture Handout.

Keeble, V.R, Correll L and Ehrich .M (1990). *Effect of Laundering on Ability of Glover Fabric to Decrease the Penetration of Organo Phosphates Insecticide through Invitro Epidermal System* Depart of Clothing and Textile, College of Human Resources Blacksburg U.S.A. Pub Med Indexed for Medline

Kim,S.H and Rhee,Y.S (1992). *A Study of the Classification of Apparel Store in Seoul Korea* pp 155-168.

Kin M. and Lee S(2006). "*Consumer Behaviour on Brand types According to Clothing Goods Level* UJ. Costumer Culture Associate 10 (5) 93-563

Kogi D.B (1997) Utilization of Locally Extracted Gum – Resins from Ataxcantha (L) Khanrya (L), and Cactus Latex to Serve as Binder for Mixing Pigment for Textile Printing. Unpublished M.A Thesis, Industrial Design A.B.U Zaria.

Kojogbola, O.D (1997). *Technology Capableness of the Information Sector Foot Wear*. Manufactures: Aba and Onitsha as Case Studies NISER Ibadan.

Kotler, .P. (2003). *Marketing Management* Eaglewood Clift New Jersey Prentice Hall Inc

Lee, S., Kimura .D., Lee, K.H., Park, J.C and Kim, I.S (2010). *Effect of Laundering on the Thermal and Water Transfer Properties of Mass Produced Laminated Nano-Fiber Web For use in Wear.* Textile Research Journal Vol 80 No.2 pp 99-105 (2010).

Leonas, K.K. (1998). *Marketing Management* Eaglewood Clift New Jersey Prentice Hall Inc Htt://www.ojicjournal.org/artide/so196-6553.

Lyle, D.S (1976). *Modern Textile* John Willey and Sons. Inc London PP 2-293

Malfoy, S.C. (1992). *Problems of Promoting Made in Nigeria Textile and Clothing in ECOWAS.* Unpublished M.B.A Thesis, Dept of Marketing, U.N.N.

Marjorie L.J (1986). *"Textile Science"* Holt, Rinehart and Winston Inc New York, Chrcago San Francisco Athanta. Fifth Edition.

Marshal, S.G, Jackson H.O. and Stanlecy M.S (2000). *Individuality in Clothing Selection and Appearance 6th Edition* New Jersey: Prentice Hall Inc.

Mildried, T.T and Oris., G. (1961). *Family Clothing* Published by John Wiley

Mills, K.Y (1998). *Washing Wisdom*: Forbes Publication Limited Page 5-9 and 124-138.

Morton, W.E, and Hearle, J.W.S (1975). *Physical Properties of Textile Fibers* Willain Heireman Ltd, London Wix 8BC

Muhammed, .I., Ahmad., N. and Shabaz (2001). *Rubbing Ironing and Dry Clearing Fastness of Reactive Dyed Cotton Knitted Fabric as Influenced by Salt, Alkali and Dye.* Department of Fibre Technology, University of Agriculture, Faisalabad – 38040, Pakistan. International Journal of Agriculture and Biology 1560-8530/2001/03-1-109-112. http://www.ijab.org.

Nanalee, C. (1994) *Young Living* Glencoe Mcgraw – Hill New York PP 182.

Nkeonye, P.O. (2009). *Introductory Textiles* S. Asekome and Co Publishes Semaru Zaria Nigeria.

Nlonge, C.M (2004) *Comparative Study of the Physical and Mechanical Properties of the Nigerian Armed Forces Uniform*. Unpublished M.Sc Thesis A.B.U Zaria.

NTA News of 3rd February, 2011

Odunpe A.S (2004)*Fashion Collection Designer and Publisher*, Diobu PP 5, 7 and 8

Ogunluyile, S.R (2005). *Cottage Textiles Production A Step out of Poverty* Inaugural Lecture Sense 41 Delivered at Federal University of Technology Akure 12th July.

Oguntana, .T. (1998). *Prospects for the Future on Nigerian Textiles:* A Paper Presented at the Nigeria Global Textiles Fair Held at Nicon Noga Hilton Hotel, Abuja.

Okewole, L.F and Akanbi (2003) *Textile and Clothing Maintenance* Immaculate-city Akunlemu, Oye Nigeria PP 28-44.

Omale, S.D. (2010). *Washing Effect of Soap and Synthetic Detergent on Cotton Fabric* B.Sc Project Kogi State University Anyigba.

Onibugadu, E.A (2005). *Clothing Purchasing Decision Making Practice of Home makers in Nasarawa,* State JHER Vol 6 No 2 pg 10-14

Orivri, D.P (2005). *Studies on the Properties, of Foreign and Locally Made Finishing Fabrics*. B.Sc Research Project of A.B.U Zaria

Orzada, B.T., Mooe M. Collier B.J, Chen J.Y (2009). Effect of Laundering on Fabric Draape, Bending and Shear. International Journal of Clothing Science and Technology 2009 Vol. 21 Issue I pp 45-55.

Oxford Advance Learners Dictionary of Current English (2000) 6th Edition Oxford University Press New York.

Payananth .K. (2004) *History of Thai Weaving Fabric*. In Rural Economics Promotion and Environment Development Foundation

Piper, .B. (1974). Fibers and Fabrics Longman group Ltd.

Ridley, .A and William, D. (1974). *Simple Experiment in Textile Science.* Roy Ros Buppa Pastaporn. Arum Printing Fou Bangkok. 2004: 137- 141.

Peak, S.L (2004). *The Effect of Detergent type and Laundering Temperature on the Soil Removal and Soil Redeposition Performance of Cotton and P/C Blends with and without Durable Press Finsih*
*h*tt://www.omterscoemce.wiley.com/journal/120043405

Pine, B.J and Gilmore, J.H (1999). *The Experience Economy: Work is Theatre and Every Business a Stage*. Boston Harvard Business School Press,

Saville, B.P (2004). *"Physical Testing of Textile"* Woodhead Publishing Ltd and CRC Press IIC Reprinted 2004.

Sule, A.M (1989). *Kwara Textile Industry Illorin. A Spatial Integration of Traditional and Contemporary Weaving Process*. Ahmadu Bello University, Zaria PP 4, 5 and 11.

Susan, E.H *Ankara Deigns* City Digest Vol.1 No.6 P.6

Thompson, D. (1976). *Fiber and Fabric of Today*. London Heinemann Educational Book

Usman, V.A (2010). *Practices Adopted by Home Makers in the Management of Family Clothing in Lafia Methropolis of Nasarawa State.* Nigerian Journal of Home-Economics Vol 4 No 4. Pg 44-54.

Yoo, M. (1993). *"A Study of Conspicuous Conception in Clothing as Related to Social Stratification"* Ghonnam National University Doctorial Dissertation 1993.

Vanderhoft, .M. (1988). *Clothing Concept and Construction* New Trsey Prentice Hall.

Webb –Luppo, A. and Lester R.M (1987). *Clothing Decision,* America Macmillan Mc. Graw –Hill.

Weber, J (1990). *Clothing Fashion Fabrics Construction* Second EditionU.S.A MacGraw – Hill Publishers.

Wingate, P. (1976). *Textile Fibric and their Selection* 7th Edition pg 6,10,18 and 37.

Yusuf, Y. (1998). *An Assessment of the Market Acceptability of Made in Nigerian Textile Products;* A Case Study of Selected Textile Companies. Unpublished M.B.A Thesis A.B.U. Zarai.

APPENDIX A

STATISTICAL FORMULAR USED FOR ANALYSIS

A. Fabric Drape:

$$\text{Drape Co efficient} = \frac{M_2 \times 100}{M_1}$$

Where M_1 = total mass of the paper ring in (g)

M_2 = Mass of the paper ring after

Shaded area has been cut.

B. P.M.D. = Percentage mean deviation $= \frac{\text{S.D.} \times 100}{\overline{x}}$

Where x = Summation of test samples—

$\overline{x}$ = Mean average of test samples

n = Numbers of Test carried out

C. Fabric Abrasion

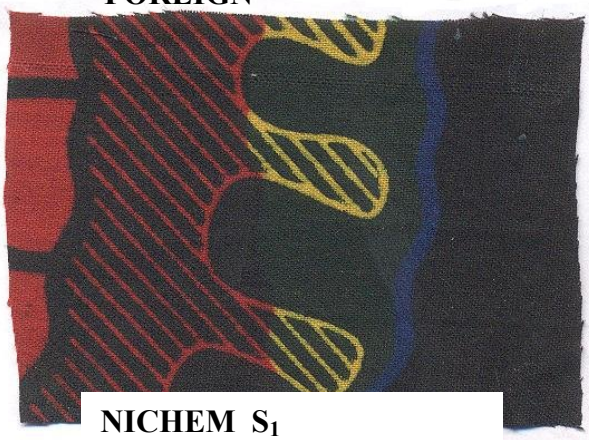
$$\%\ \text{weight loss} = \frac{M1 - M_2}{M1} \times 100$$

Where M_1 = average initial weight

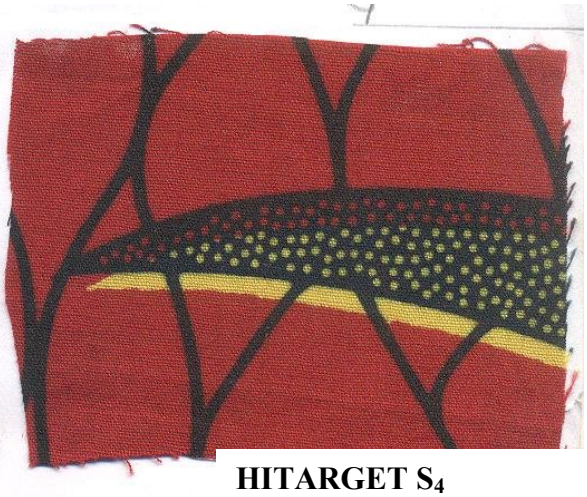
M_2 = Average final weight

APPENDIX B
FABRIC SAMPLES OF NIGERIAN AND FOREIGN MADE WAX PRINTS

NIGERIAN
FOREIGN



NICHEM S_1

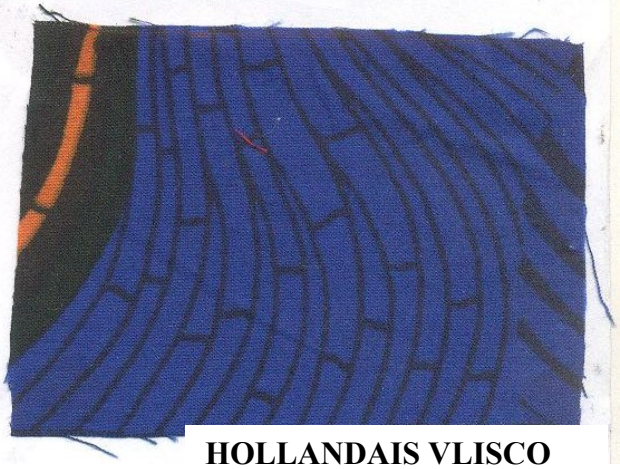


HITARGET S_4

UNTL S_2

DELUXE S_5

QUALI S_3

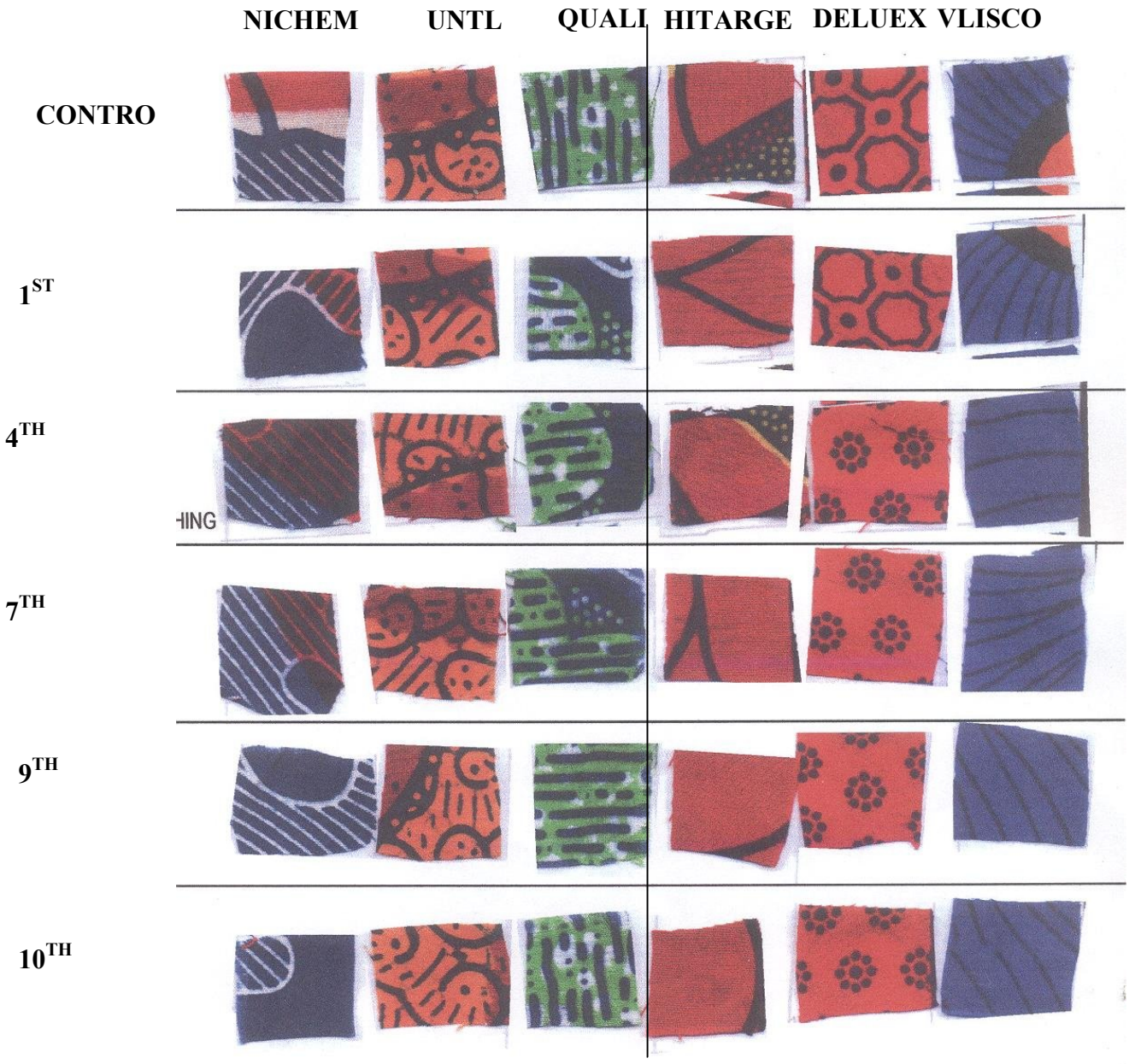


HOLLANDAIS VLISCO

APPENDIX C

NIGERIAN AND FOREIGN MADE WAX PRINTS FABRICS WASHED WITH SOAP AND DRIED UNDER SHADE

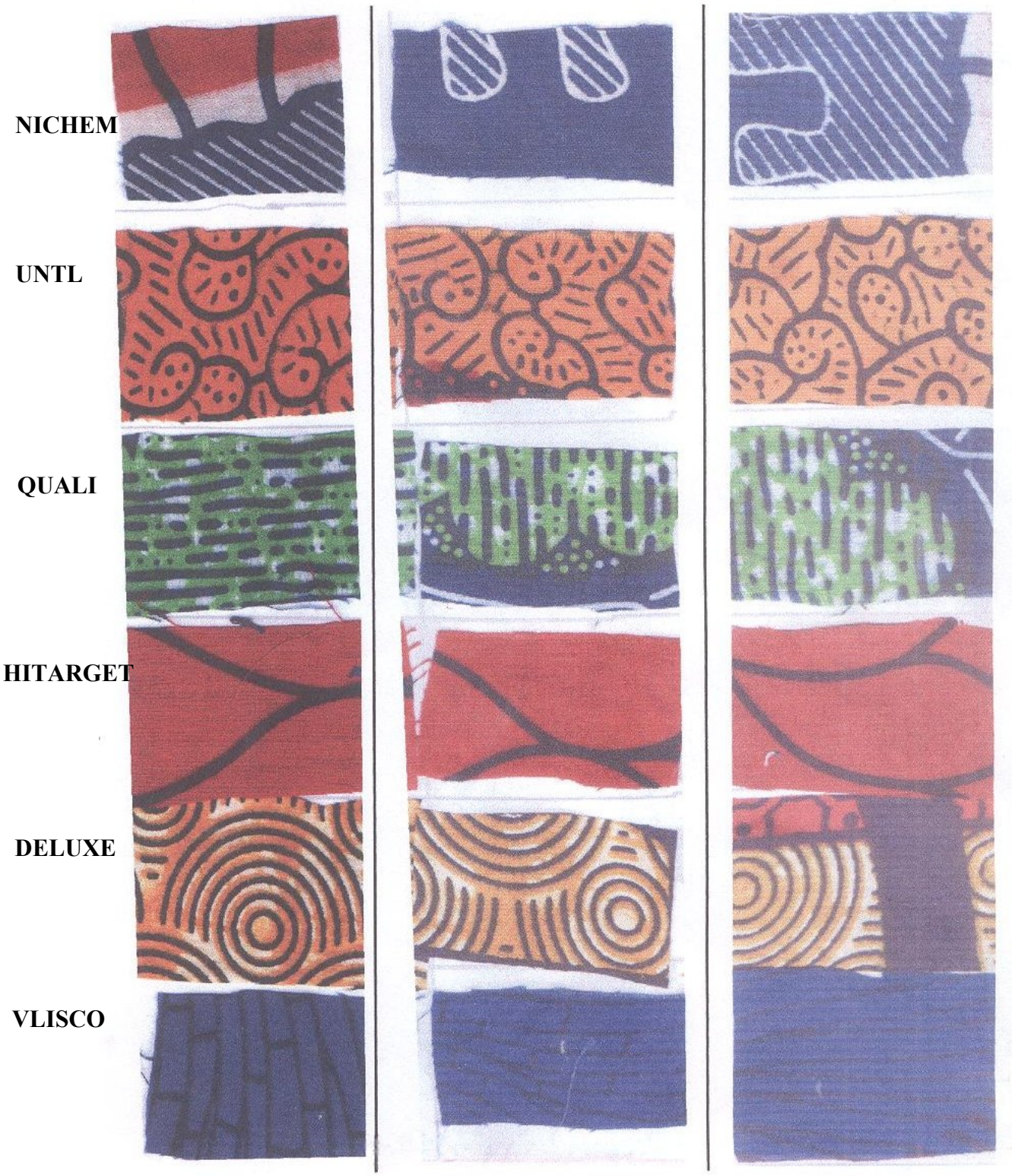
NIGERIAN **FOREIGN**



APPENDIX D

FABRIC WASH FASTNESS TEST TO SOAP AND SYNTHETIC DETERGENT AFTER 10 TIMES WASHING

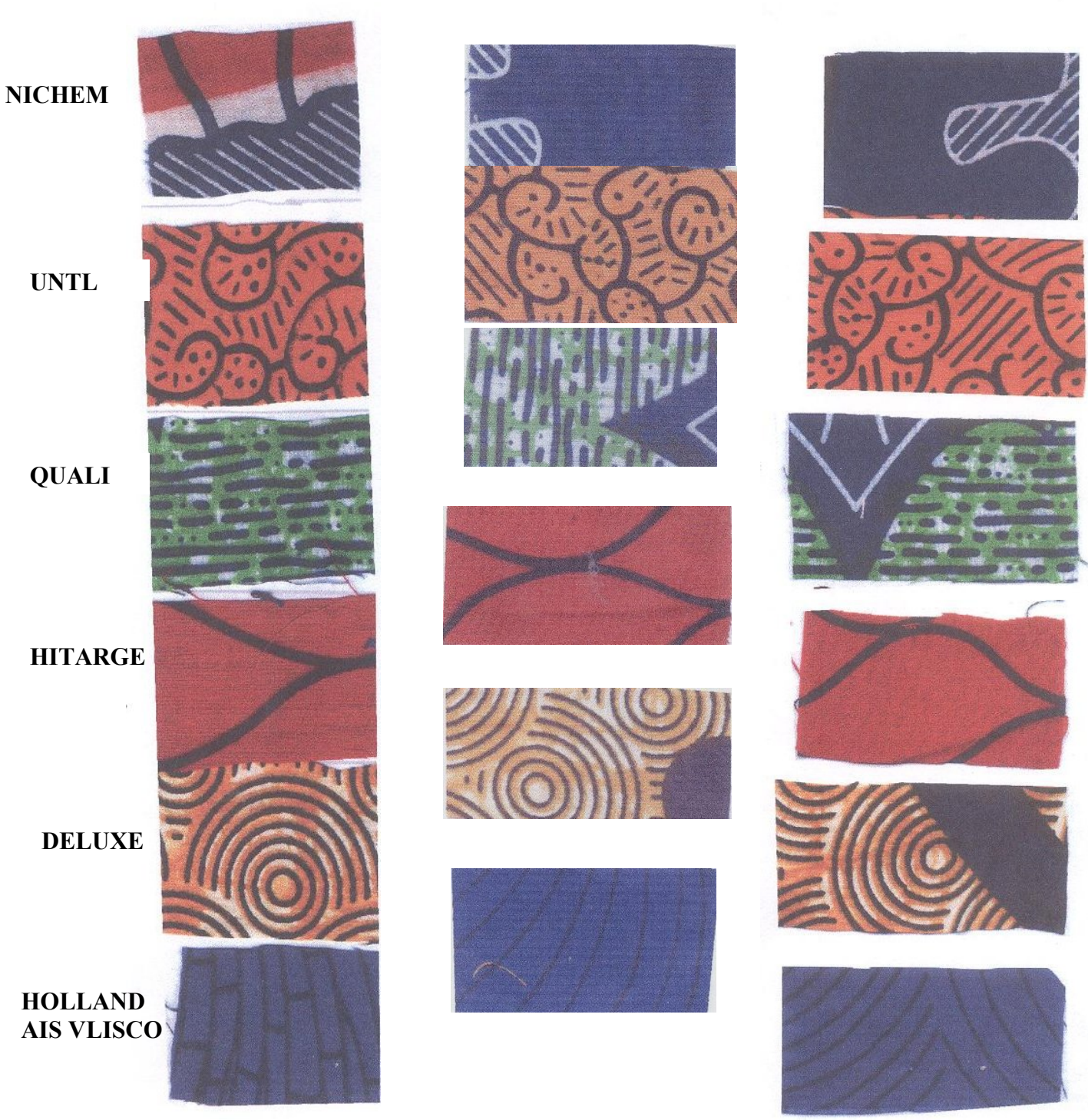
Fabric type **Control** **Soap (canoe)** **Synthetic detergent (Omo)**



APPENDIX E
FABRIC FASTNESS TEST TO NATURAL SUNLIGHT FOR 10 DAYS

CONTROL **SUN**

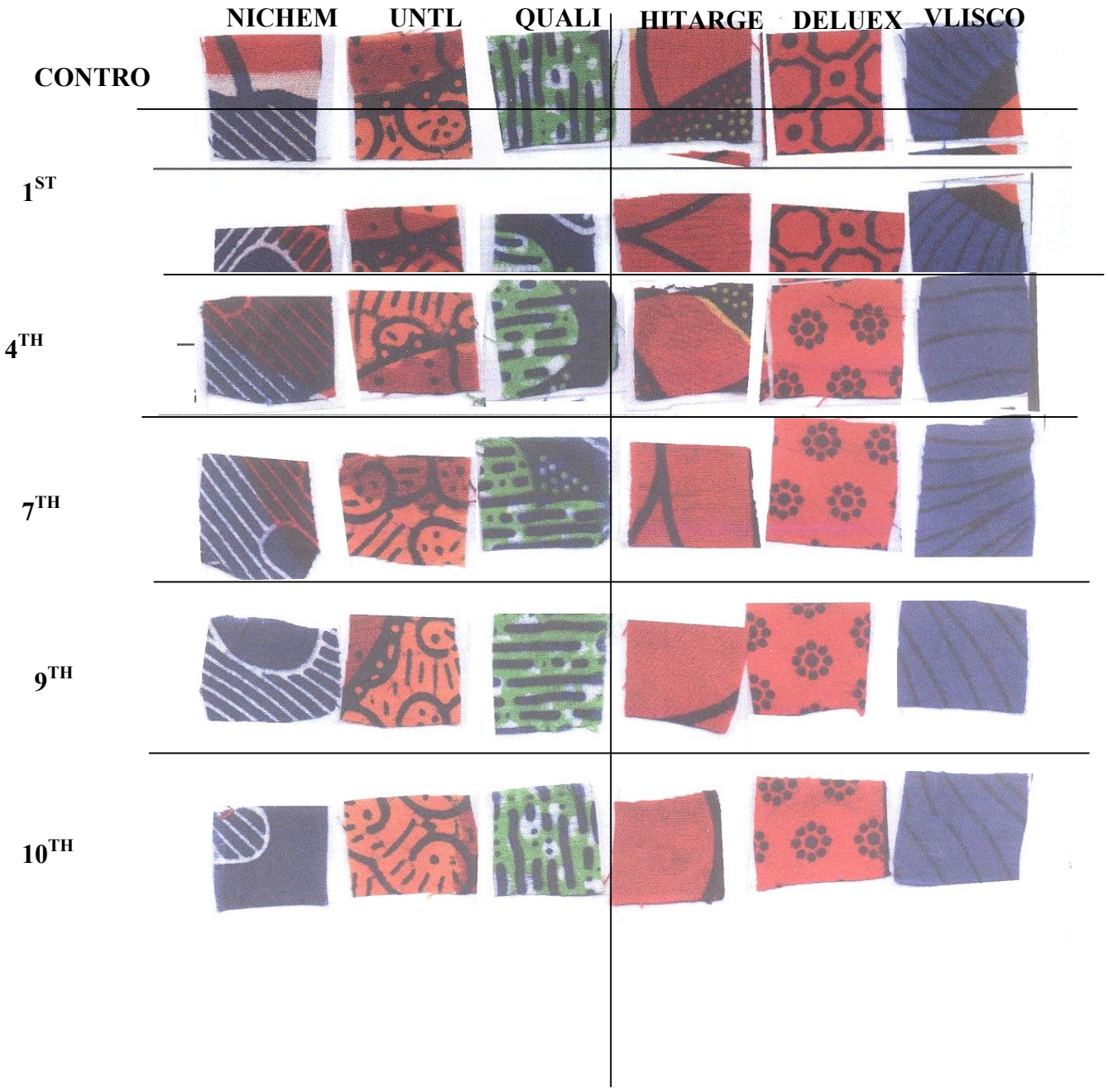
SHADE



APPENDIX F

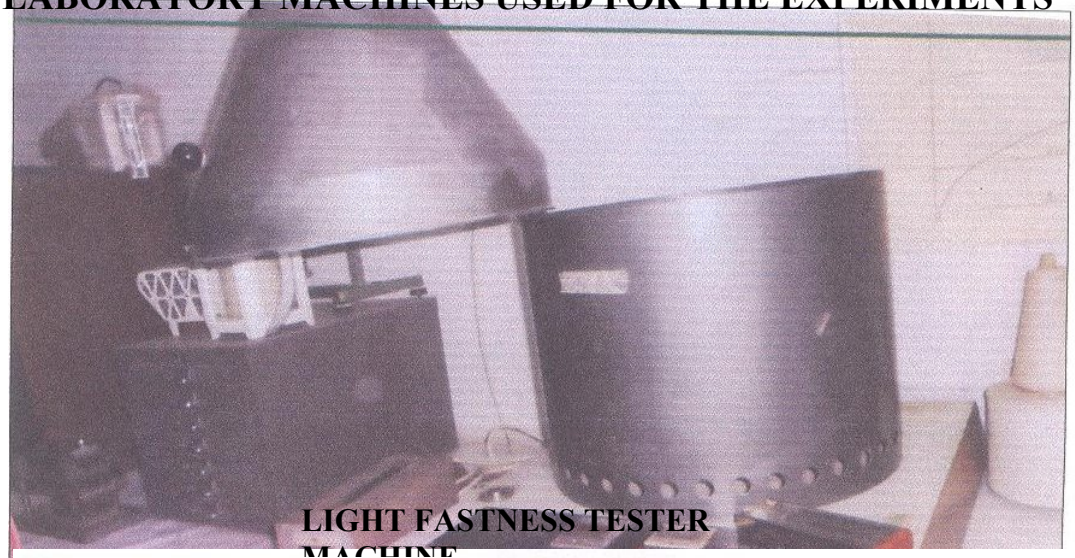
NIGERIAN AND FOREIGN MADE WAX PRINTS FABRICS WASHED WITH SOAP AND DRIED UNDER SUN

NIGERIAN **FOREIGN**



APPENDIX G

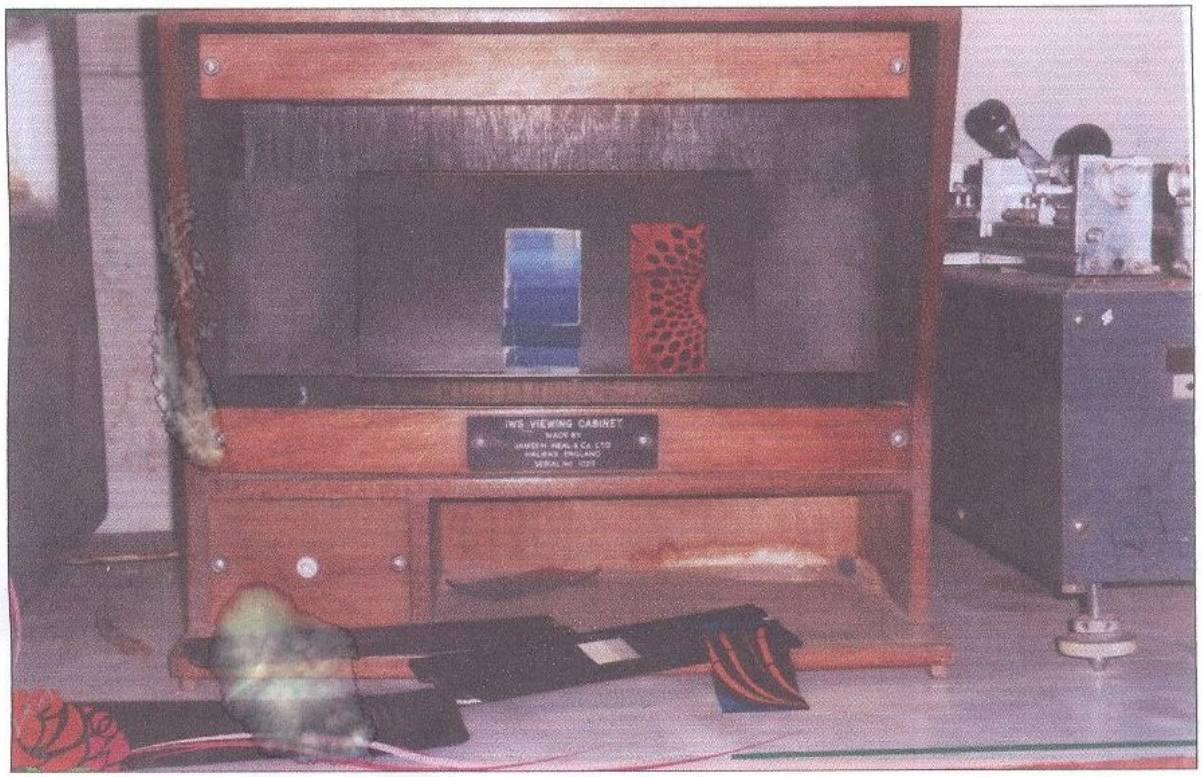
LABORATORY MACHINES USED FOR THE EXPERIMENTS



LIGHT FASTNESS TESTER MACHINE

GRAY-SCALE STAINING TESTER MACHINE

WASH WHEEL MACHINE FOR ASSESSING WASH FASTNESS



GRAY SCALE FOR ASSESSING CHANGE IN COLOUR

COMPARATIVE EFFECT OF LAUNDERING ON THE PROPERTIES OF NIGERIAN AND FOREIGN MADE WAX PRINT FABRICS.

OBIANA, VIOLA UCHE ANAZODO
(MED/EDUC/14963/07-08)
(M.Ed) DEGREE IN HOME ECONOMICS

ABSTRACT

The purpose of conducting this research is to comparatively investigate the effect of laundering on Nigerian and foreign made wax print fabrics. So as to guide consumers in making good decision when purchasing wax print fabrics and taking proper care of the fabrics. Six wax print fabrics were used in this research, three made in Nigerian (Nichem, UNTL and Quali wax) and three foreign made namely Hitarget, Deluxe and Hollandiase Vlisco. The samples were bought from open market, and selected from representative of the ranges in print and quality commercially available in the Nigerian market. Experimental research design using laboratory method was employed. Factorial approach was used in the collection of data. The data collected were subjected to statistical analysis using mean, standard deviation and percentage mean deviation to test the research questions. The findings shows that differences exist in the abrasion resistance, crease recovery, drape, tensile strength, fastness to washing and light properties of local and foreign wax print fabrics after laundering. It also revealed that, synthetic detergent, increase time of washing, high temperature of laundering water, and drying under the sun fades wax print fabrics. Recommendations were made towards improving consumption skill and proper care of wax print fabrics which include the following: consumers should buy wax print fabrics base on performance end use requirement not based on Nigerian or foreign because some properties are better in Nigerian and some in foreign fabrics. Rate and time of washing, concentration of detergent and temperature of laundering water should be minimal to reduce fading. Soap should be used for washing and drying should be under the shade, better quality dye should be used in dying of Nigerian made wax print fabrics to increase it's fastness property.