A COMPARATIVE STUDY OF DABOYA (GHANA) AND ABEOKUTA (NIGERIA) LOCAL DYEING

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DECLARATION

I declare that this research work is my own work towards the master of philosophy degree in Integrated Art and Industry and that to the best of my knowledge; it contains no materials previously published by another person, nor materials which has been accepted for the award of any other degree of the university, except where due acknowledgement has been made in the text.

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ABSTRACT

Ghanaians and Nigerians practice similar forms of local dyeing. Daboya local dyers of Northern Ghana among the Gonjas of North Gonja district and Yoruba indigo dyers of Abeokuta in South Western Nigeria are famous in the local dyeing industry in West Africa. Locally dyed products such as the Daboya smock (fugu), kuntunkuni and badie suffer in terms of fastness to abrasion, light and wash unlike Abeokuta locally dyed products that have good fastness to abrasion, light and wash and are internationally patronised. These deficiencies have led to the decline in patronage of local dyeing products in Ghana. The study seeks to comparatively identify fabrics, yarns, plant dyes, and methodology used in Daboya and Abeokuta local dyeing industries, and to carry out experiments on methodology derived from the studies to help improve upon Daboya local dyeing in terms of fastness to abrasion, light and washable. The scope of the study covered selected dyeing groups in Daboya and Abeokuta in Ghana and Nigeria respectively. The study adopted the qualitative research method and employed descriptive and experimental research designs. Visitations were made to Daboya and Abeokuta in Nigeria. Observations and interviews were carried out on practical activities on yarns, fabrics, plant dyes and methodologies used by both towns under study. Results from studies revealed that the methods for dyeing, dye extraction and resist techniques for both towns can be adopted interchangeably to achieve a good fastness to abrasion, light and washing to Daboya locally dyed fabrics. For the sustenance of the industry, it is recommended that Daboya local dyers incorporate various resist dyeing method of fabrics, to help bring diversity in their profession and to improve their economic status and the nation as a whole. In addition, research institutions such as Council for Scientific and Industrial Research should come together with government organizations to improve upon the cultivation of indigo plants, local dye extraction for local dyeing processes.

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CHAPTER ONE

INTRODUCTION

1.1 Overview

This chapter covers the background to the study, statement of the problem, purpose of the study, research question, significance of the study, limitation of the study, delimitation of the study, definition of terms and organization of the study.

1.2 Background of the Study

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Ghana and Nigeria by their proximity to the forest zone of West Africa are rich in dye yielding plants. Akwaboa (1994) affirms that such an environment possesses dye yielding properties which are extracted and processed to obtain different colours with varying degree of fastness. He further states that dyes can be extracted from the barks, leaves, roots, seeds, fruits, flowers of trees or the young shoots.

The Schumacher Centre for Technology (2013) further states that dyes derived from crushed fruits, berries and other plants are extracted and dyed by immersion. This ancient art is mostly conceived to add value to goods and makes them desirable to consumers. Natural dyes produce colours which are aesthetically uncommon; they are soothing to the eyes and come with soft shades as compared to synthetic dyes.

Local dyers in Ghana and Nigeria, especially among the Gonjas of Daboya in the North Gonja District of Ghana and the Yorubas of Abeokuta in Ogun State of Nigeria respectively perceive the trade as part of their culture. Materials produced are worn by people of prestige. Local dyeing in both towns are carried out in small scale centres.

The literature reveals that the Yoruba resist dyeing technique is referred to as the most popular and durable compared to its Ghanaian counterpart craft on the continent. This

informed the researcher to find out methodologies of the Yoruba dyeing technique that makes their locally dyed product more durable to that of the Ghanaian counterparts.

The researcher sought to conduct a comparative study of Daboya (Ghana) and Abeokuta (Nigeria) local dyeing in order to bring to the fore the findings so as to advise policy makers, especially, Council for Scientific and Industrial Research (C.S.I.R.) to make amends in this area to improve the output of dyers.

1.3 Statement of the Problem

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The two countries (Ghana and Nigeria) under study both engage in local dyeing using different techniques (methods). Their products are gaining popularity in the European and American markets. The empirical study indicates that products such as Adire seems to have excellent abrasion, light and wash fastness, but similar fabrics used in Ghana such as the Daboya smock (Fugu), Kuntunkuni and Badie seem to suffer such deficiencies.

These locally dyed fabrics in Ghana keep their colour only when they are sun dried, but fade quickly when washed. To avert this disparity, the researcher deems it fit to do a comparative study of types of plant dyes, fabrics, yarns and the methodology used in order to upgrade the methodology used in Ghana for the benefit of the local dyeing industry.

1.4 Purpose of the Study

The purpose of the study is to pursue a comparative study of Daboya (Ghana) and Abeokuta (Nigeria) local dyeing.

1.5 Specific Objectives

The study aims at the following;

1. To identify and describe, yarns, fabrics, plant dyes and methodology used in Daboya and Abeokuta local dyeing industries.
2. To comparatively ascertain the abrasion, light and wash fastness of Daboya and Abeokuta local dyes.
3. To experiment on the methodology derived from Daboya and Abeokuta to produce useful artefacts.

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1.6 Research Questions

1. What are the yarns, fabrics, local plant dyes and methodology used in Daboya and Abeokuta local dyeing industries?
2. Are these local dyes, fast to;
   a. Abrasion?,
   b. Light?
   c. Washing?
3. How can the methodologies derived from Daboya and Abeokuta be used to produce useful artefacts?

1.7 Significance of the Study

The study seeks to alter the face of Daboya craft village by upgrading the methodology used. The results of the study will prove that local dye can be used for dyeing yarns and fabrics. The durability of the artefacts produced from Daboya is bound to improve if the findings are well implemented. The findings would give policy makers a platform to organize training programmes for the local dyeing industry to enhance the welfare of the

It would play a major role in enhancing tourism in Ghana and Nigeria, Finally the study would be a source of reference for further research.

1.8 Limitation

Collection of data from some dyers to some extent was not forthcoming and this made it impossible for the researcher to get the full complement of participation by the dyers as expected.

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1.9 Delimitation

The research is limited to local dyeing and the comparative advantage Abeokuta Yoruba indigo dyeing has over Daboya yarn dyeing. Geographically the survey areas are the Daboya craft village in the north Gonja district and Abeokuta in Ogun State of Nigeria specifically Ijeimu Idi Aro for first hand information, since these places are known for their skills and craftsmanship.

1.10 Definition of Terms

Abrasion: Is the physical destruction of yarns and fabrics, resulting from the rubbing of a textile surface over another surface.

Affinity: The ability of a fibre or fabric to attract dye.

Colour fastness: The ability of fabrics or yarns to retain the dyes used to colour them.

Dip dyeing: The art of dyeing by immersing the yarn or fabric into the dye bath.

Dye bath: A solution of dye and water in which yarns and fabrics are dyed.

Dyes: Colourants used to colour yarns and fabric.

Fabric: Is a uniform texture produced from yarns or fibres by weaving.

Fading: It is the loss of colour in a dyed yarn or fabric.

Fibre: It is the main constituent of the material to be dyed.

Indigo: Is a deep blue colour derived from any of the indigo dye bearing plants, primarily those in the genus Indigofera (Indigofera tinctoria).

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Indigo dye: Is a natural vat dye.

Light fastness: Is a measure of how resistant a colouring material such as a dye is to fade due to the exposure to sunlight.

Resist dyeing: It is a traditional method of dyeing in which certain areas of yarns and fabrics are "resisted" or prevents dye from reaching, thereby creating patterns.

Spinning: It is the process of making yarn from the fibre.

Wash fastness: A measure of resistance of a dye to washing out of the fibre.

Yarn: It is a thin structure consisting of many short fibres arranged parallel and regularly over its length and twisted for a better strength.

1.11 Organization of the Study

The thesis has been divided into five chapters. Chapter one introduces the thesis with a background information in the study sets statement of the problem, objectives of the research, formulates research questions, outlines the research delimitation and states the

importance of the study. It also defines some technical terms and states the organization of the research work.

Chapter two reviews selected topics related to the study while chapter three explains the methodologies adopted for the study, the research technique employed in collecting detailed data on tools, materials, dye extraction and dyeing processes for Daboya and Abeokuta. This information was supported with literary sources and some photographs from the field.

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Chapter four presents, discuses and analyses data collected from the field. It also discusses the results and findings relating them to the objectives. Chapter five presents summary of the study, draws conclusions and makes recommendations for possible implementation.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1 Overview

Natural dyes are widely used in colouring natural fibres such as cotton, silk and wool. They are also used in colouring foods, natural leather, cosmetic products and it is used to produce inks, watercolours and artistic paints. In textiles, colour adds value to products, it is the key element of design that attracts the consumers.

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Several researchers have indicated that some dyes from plants generally possess desirable colour properties. They have a respectable public presentation on natural fibres which are comparable to some highly rated synthetic dyes.

The critique of literature covers dyes, classification of dyes, natural dyes, plant dyes, animal dyes, mineral dyes, synthetic dyes, colour fastness, mordants, history and evolution of Daboya indigo local dye, The rest are history and evolution of Yoruba indigo local dye, characteristics of Daboya local dye, characteristics of the Yoruba indigo (local) dye, uses of Daboya local dye and the uses of Yoruba indigo dye.

2.2 Definitions and Explanation of Dyes

Dyes are colouring material that colour commodities of our day to day use, they are also referred to as a dyestuff. Dyeing and dyestuff are as old as textiles. (Retrieved from:// www.practicalaction.org).

By definition, dyes can be said to be coloured, ionizing and aromatic organic compounds which show affinity towards the substrate to which it is being applied. Dyestuff is a substance which is capable of colouring a textile material in a way that it becomes part of the fibre and cannot be easily removed by simple physical means like rubbing or mild

detergents. It must be soluble in water and must combine with other soluble chemicals to form the colouring solution (Sackey, 2002).

Melo (2009) shares the opinion that natural dyes were used to colour fibres or to paint. Dyes are generally organic compounds that are soluble in solvent. Colour is obtained by using a chemical compound called chromophore or chromogen, (something that brings or creates colour). When used as textiles dye the chromosphere or chormogen must also be captured as strongly as possible into the fibre. This implies that it must be resistant to washing. Dyes can bind to the surface of the fibre or be trapped within them, they are often bound to material with a metallic ions know as mordant.

Epp (1995), assert that colourants for textiles include dye and pigment; dyes are organic chemicals which selectively absorb chemicals and reflect wavelengths of light within the given spectrum. Dyes usually diffuse into the innermost of a fibre from water solution, unlike pigments which are water insoluble, microscopic-sized colour particles that are usually applied to the surface of a fibre with resin.

Katz (2003), explained further that, dyes used for fabric such as cotton, fleece and silk are complex organic molecules that comprise what is known as chromospheres group, they contain some conjugated alternating double and single bonds in parts of the particle.

These particles can absorb certain wavelengths of visible light and reflect remaining light and, thus give a fabric colour.

2.3 Classification of Dyes

Dyes have been classified in many diverse ways.

According to Sackey (2002) dyes stuffs can generally be classified into the natural dyes and artificial dyes. The earliest classification was, according to alphabetical order or according to botanical names. Later it was classified on the basis of hue, chemical constitution and application. (Gulranjani & Gupta, 1992).

The literature reveals that natural dyes are separated into two groups: "Substantive dyes" such as indigo and turmeric, which dye fibres directly and adjective dyes" such as logwood and madder which are mediated with metallic salts.

On the contrary colouring matter can further be classified as" Monogenetic dyes", that is those that produce only one colour irrespective of the mordant present on the fibre or applied along with the dye and "Polygenetic dyes" that is those that create different colours with different mordant applied such as alizarin. (Dedhia, 1998).

Natural dyes can further be classified on the basis of origin. Natural dyes are generally separated into three classes, namely, vegetables, mineral and animal. Nearly five hundred vegetable origin dyes colouring matter are derived from root, leaf, bark, trunk or fruit of plants. (Samanta & Konar, 2011). Origin of dyes can be explained as the source of dyes. Sackey (2002), explains further that, natural dyes can be split into three main groups according to the source of procurement. These are plant dyes, animal dyes and mineral dyes.

2.4 Natural Dyes / "Local Dyes"

History proves that primitive man developed dyes from natural objects like plants, animals, and minerals, natural dyes are usually prepared through grinding, crushing and steeping in water or boiling Sackey (2002). Samanta and Konar (2011) asserts that shades produce by natural dye colorants are usually soft, lustrous and soothing to the human eye. However Akwaboa (1994), added that local dyes need mordant's to work well.

Natural dyes are harmonious with each other, the unique qualities can make the colour vibrate or glow, they are sometimes less colourfast overtime than synthetic dyes, but their richness is always invigorating. (Duerr, 2011).

Natural dyes fall into the following categories:

- Leaves and stems
- Twigs and prunings
- Flower heads
- Barks
- Roots
- Outer skins, hulls and husks
- Hardwoods and wood shavings
- Berries and seeds
- Lichens

2.4.1 Plant Dyes

Plant dyes are technically referred to as vegetable dyes. They can be obtained from the roots, stems, barks, leaves, fruits, seeds, flowers and twigs of the plant. One of such dyes is indigo (a natural vat dye) which is obtained from the indigo plant. Other examples are

cola nuts, Bougainvillea flower, mango tree bark, leaves of guinea corn plant and pawpaw leaves. Dyes from these states are not obtained with a degree of purity necessary for effective control in their application when used in a cold state. The dyes must be hot to get effective dyeing, some are faster, but may be dull in appearance. They are commonly used for dyeing cellulosic fabric, typical colours of traditional vegetable dyes are blue, indigo, black, red, yellow and orange (Sackey 2002). The above mentioned setbacks of vegetable dyes forms the basis of this research, an in-depth study will be carried out to find a lasting solution to it.

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The literature reveals that Primitive dyeing technique includes sticking plants to fabric or rubbing crushed pigments into cloth. The methods became more sophisticated with time and techniques using natural dyes from crushed fruits, berries and other plants which were built into the fabric, their light and wash fastness were developed. Nature provides a wealth of plants which will yield dye for the purpose of dyeing, many have been used since antiquity.

Some of the well known ancient dyes include, a red dye made from the roots of the rubia tinctorum, blue, indigo from the leaves of Indigofera tinctoria, yellow from the stigmas of saffron plant and dogwood, an extract of the pulp of the dogwood tree. Almost any organic material will produce a colour when boiled in a dye bath, but only certain plants will yield colour that act as a dye.

Natural dyes derived from plants have recently gained economic advantage over synthetic dyes because of their non toxic, non – carcinogenic and biodegradable nature (Bhuyan & Sailia, 2008; Samantha & Agurwal 2009). They are environmentally friendly, making them a top priority for use in the textile industry (Bhuyan & Saikia 2008; Das & Tiwari, 2005).

Duerr (2011), supports the fact that plant based dyes are ecologically friendly, alternatives to the synthetic dyes because they come from plants which are renewable from non toxic resources, biodegradable and are best when applied to natural fibres, leather, yarns, rugs, hair and paper. Below are the colours from onion skins and logwood respectively.

Plate 2.1: shades from onion skin.

Retrived from:
(Technical_ Report_Natural_Dyes.pdf)

Plate 2.2: shades from logwood.

Retrived from:
(Technical_Report_Natural_Dyes .pdf)

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Table 2.1 shows a list of plant dyes, the botanical names, parts used, state and shades obtained.

Plant	Botanical	Part used	State	Shade
Nim tree	AzadirachaIndica	Leaves	Dry	Ceram
Annatto	Bixaovellana	Seeds	Fresh & tender	Red
Kramankote	Sphenocentrum	Root	Dry	Yellow
Sobolo	Hibiscus Sabdarifa	Leaves/stalk	Dry	Pink
Lale	Lawsoniainermis	Leaves	Dry	Brown
Ayigbemogyaduro	Pseudocedrelakotschyi	Wood	Dry	Red
Camwood	Baphianitida	Bark	Dry	Yellow
Badie	Brideliaferruginea	Bark	Dry	Black
Onyamidua	Alstoniabooni	Root	Dry	Cream
Flamboyant	Delonixregia	Seed pods	Dry	Cream
Sorghum	Sorghum bicolour	Leaves stalk	Dry	Pink
Fresh mango leaves	Magniferaindica	Leaves/bark	Fresh	Yellow
Dried mango leaves	Mangniferaincica	Leaves/bark	Dry	Cream
Mahogany	Khayasenegalesis	Bark	Dry	Red
Cashew leaves	Anacrdiumoccidentale	Leaves	Dry	Cream
Dry cashew leaves	Anacardiumaccidentale	Leaves	Dry	Brown
Teak	Tectonagrandis	Leaves	Fresh	Pink
Teak	Tectonagrandis	Leaves	Fresh & tender	Read
Prekese	Tetrapleuratetraptera	Fruit	Dry	Cream
Fresh pawpaw leaves	Carica papaya	Leaves	Fresh	Yellow
Dry pawpaw leaves	Carica papaya	Leaves	Dry	Cream
Cola nuts	Cola acuminate	Fruit	Dry/fresh	Brown
Pear seed	Perseaamericana	Seed	Fresh	Brown
Siriga	Pseudocedalakotschyi	Bark	Dry	Cream
Kuntunkuni	Bonibax	Barks/root	Dry	Black

Source: (korankye, 2010)**.**

2.4.2 Animal Dyes

These are dyes obtained from animals in most cases from their shells or secretions. Animal dyes are very scarce because they can be obtained from very few animals in very few quantities are classified as protein dyes (Sackey, 2002). A good example of animal dye is cochineal (plate 3), which is a brilliant red dye produced from insects living on cactus plants. Cochineal is harvested on the Canary Islands (Driessen, 2003).

Plate:2. 3 shade from cochineal dye.
Retrived from: (Technical_Report_Natural_Dyes.pdf)

Cunningham (2010) asserts that it is recorded that the Tyrian purple (plate 4) was extracted from the pituitary glands of Murex shellfish for purple. Dyeing methods that used animal parts have disappeared from most cultures. However, in the past centuries it was widely used for its bright colour palette. The Tyrians harvested the Murex shell fish, for purple. It took around 10,000 shellfish for one garment. Tyrian purple was extracted from the pituitary glands of Murex shell fish and left to oxidize in the warm sun of the Mediterranean.

Plate 2. 4: shade from Tyrian purple

Retrived from:
(Technical_Report_Natural_Dyes.pdf)

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Diehl (1972) shares the view that one of the oldest scarce insect dyes was beautiful oriental Kermes which was made from scale insect dyes called coccusilicus, which lives on a subtropical species of oak. Forbes (1956) mentioned further that Kermes produced a much desired scarlet colour. Textile fibres dyed with Kermes have been found in a Neolithic grotto of Adoast in Bouches- du Rhone, in France. The fibres were found together with food remains on a dish consisting of barley malt and Kermes. Kermes use is recorded as early as 1727 B.C. It was a precious animal dye with a glorious history which became available for home consumption in 638 A.D. Sackey (2002), states clearly that protein dyes are not popular in dyeing, he mentioned further that there exists a type of cuttle fish which produces a secretion from which a brown dye can be obtained as a source of protein dyes.

2.4.3 Mineral Dyes

Sources of mineral dyes are rocks, clay and iron filings, the clay of termite hill is a source of red dye and it is popular in the dyeing industry. Ochre is a dye obtained from an impure earth ore of iron. Driessen (2003), reports that mineral dye is the principal ore of iron and Hematite is a constituent of a number of abrasives and pigments.

2.5 Synthetic Dyes

Synthetic or artificial dyes are made by different chemical compositions, usually from coal tar sources.The first synthetic dye was obtained from an anime, a byproduct of coal tar. Synthetic dyes are sometimes referred to as commercial dyes and they are easier to use and less costly than natural dyes. They are grouped into classes according to their mode of application, behaviour and fastness. The major groups are direct dyes, basic dyes, vat dyes, sulphur dyes, Azoic dyes, acid dyes, mordant dyes, disperse or acetate dyes and reactive or procaine dyes. (Sackey, 2002).

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2.6 Colour Fastness

Dean (2009), mentioned that colour fastness is one of the important factors in the case of buyers demand. The outstanding important property, of a dyed material is the quality of shade of colour. Colour fastness refers to the resistance of colour to fade or bleed of a dyed or printed textile material to various types of influences such as water, light, rubbing, washing and perspiration to which they are normally exposed in textile manufacturing and in daily use. Factors affecting colour fastness include the following:

- The chemical nature of fabric that is to say compatibility (bondage) of dye with the fibre is very important.
- The amount of dye present in the fibre that is depth of shade. A deep shade will be less fast to a pale shade.
- The presence of other chemicals in the fabric.
- The actual condition prevailing during exposure.

(Retrieved from wikipedia.org/wiki/dye/dye-cached)

2.7 Mordants

According to the Schumacher Center for Technology and Development (2013), few local dyes are colourfast with fibres. Mordants are substances which are used to fix a dye to the fibres.They also improve the take- up quality of the fibres and help improve colour and light fastness. Mordant is a term derived from the Latin word ‘’ mordere’’ to bite. Madder and weld are but a few local dyes that are mordanted before dyeing.

Traditionally, wood ash or stale urine has been used as alkali mordant. The most commonly used mordant is alum; other mordants are iron (Ferrous sulphate), Tin (stannous chloride) copper sulphate, Tannic acid and oxalic acid. A number of plants and minerals found in and around our surroundings will yield mordant; substitutes for a selection of mordants are listed below.

- Plants such as mosses and tea contain a small amount of aluminium. This can be used as a substitute with alum.
- Iron water can be used as a substitute for ferrous sulphate. This can be done simply by adding some rusty nails and a cupful of Vinegar to a bucket – full of water and allowing the mixture to sit for a couple of weeks.
- Oak galls or sumach leaves can be used as a substitute for tannic acid.
- Rhubarb leaves contain oxalic acid.

  Mordant can be added before, during or after the dyeing stage, using different mordant with the same dyestuff can produce different shade.

  Dean (2009), confirms that mordant is a chemical that aid the attachment of dye stuff to fibres, by bonding to both the fibre and the dye and affects the hue produced with certain dye stuff. Mordants are necessary for dyes with very low or no natural affinity for the fibre. Mordant can be applied before (pre-mordant),

with or after (after-mordant) the dye, depending on the nature of the dye, the fibre and mineral.

2.8 History and Evolution of Daboya Local Dyeing

According to Mumuni (personal communication 5th March, 2013.) Daboya local dyeing also referred to as mud dyeing is as old as old Ghana. History has it that it was discovered by the ingenuity and exploration of herbs by their forefathers. Daboya local dyeing traditionally referred to as *kayo* was believed to have started in Daboya in the north Gonja District *Bagaramaspe* to be precise. Daboya town used to be a wildlife conservation area which has a host of trees of various species. Sister villages such as *Shinga* and *Yezore* also grow the indigo plant and currently they remain the only villages that grow the indigo plant.

Since time immemorial indigo leaves (*Gara fata*) are harvested and processed by women. Dye extraction and dyeing remain the reserve of men. Resist dyeing on fabric was practiced alongside yarn dyeing. Currently yarn dyeing remains the main dyeing activity practiced by textile artisans of Daboya. (Dyeing was done in pots, pit dyeing which is regarded by most dyers as the cheapest is what has come to stay). The colours produced still remain shades of blue to black.

2.8.1 Characteristics of Daboya Dye

Tettehfio (2009), shares the view that Daboya local dye is a natural vat dye. It is also referred to as mud dye. Daboya local dye is a mixture of substance that goes through certain processes to have the molecules of the dye solution reduced to enable dyeing take place. Mumuni (personal communication 4th March, 2013) asserts that, Daboya local dye locally referred to as *Gara fata* is an indigo plant dye.

2.8.2 Uses of Daboya Local Dye

Daboya local dye is basically used to dye yarns (Tettehfio, 2009). Mumuni (personal communication 4th March, 2013) shares the view that Daboya local dye was used to dye fabrics using resist dyeing methods.

2.9 History and Evolution of Yoruba Indigo Dyeing

The Yoruba indigo dyeing first emerged in the city of Abeokuta, a centre for cotton production, weaving and resist dyeing (*Adire).* The art of dyeing was the reserve of female special artist locally referred to as *iya alaro* they were engaged in yarn dyeing, cloth dyeing and refurbishing faded clothes.

In the early twentieth century the trade of indigo dyed clothes was successful due to the massive importation of shirting fabrics. This brought about innovation in the local dyeing industry. Following World War II, the importation of low-priced printed cloth from Europe, Asia and Africa textile mills; there was low patronage for locally dyed fabrics. The Yoruba indigo dyeing improved in the past twenty years as interested citizens have taken it up to train the youth in growing indigo plants, dye extraction and dyeing. (Retrieved from Adire clothing and fashion).

2.9.1 Characteristics of Yoruba Indigo Dye

According Picton and Mark, the most extensively used non industrial dye in Africa is indigo. It is obtained from Lonchocarpus cynanescens. The indigo vine or Yoruba wild indigo (*ellu aja*) is regarded by dyers as giving the more permanent dye. Yoruba indigo dye gives various shades of colours from the palest blue to a deep intense black. Eicher (1976) was of the opinion that natural and synthetic dye stuffs are available and used, but Yoruba indigo dyed clothes with intricate patterns stands out vividly as a Nigeria contribution to textile art.

2.9.2 Uses of Yoruba Indigo Dye

Yoruba indigo dye is the principal dye used by local textile designers for traditional classic Adire. Kashim et al (2012).

Plate 2. 5: an indigo quilt made with local materials.
(Retrieved from://www.resjournals .com/ERJ.)

CHAPTER THREE

METHODOLOGY

3.1 Overview

This chapter provides information on the research methods and the multi data collection instruments adopted for collecting relevant data that answer the research questions. It also discusses the research design used, the study population from which data were collected, sample and sampling technique, the data analysis procedures used, concepts of comparative study and importance of comparative studies.

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3.2 Research Design

Research design is simply explained as the conceptual structure within which research is conducted (Opoku 2005). The careful preparation and formulation of the conceptual structure facilitates research work yielding maximal information. In other words the function of research design is to provide for the collection of relevant evidence with minimal expenditure of effort, time and money.

To buttress this, Opoku (2005) further explained that a serious research must have a carefully thought out design before data are collected in order to save valuable time and effort. Since the purpose of the study is to upgrade the methodology used in Daboya local dyeing industry, it was necessary to study the problem in their natural environment as they go about with the various processes involve in dye extraction and dyeing. The qualitative research approach was used because of its systematic and holistic approach in describing and understanding a phenomena or complex situations in its natural environment. Leedy and Ormrod (2005) assert that qualitative research is typically used to answer questions about the complex nature of phenomena, often with the purposes of describing and understanding the phenomena from the participants' point of view.

Qualitative research involves an interpretive naturalistic approach to the world. Implying that, qualitative researchers study things in their natural settings, attempting to make sense of or to interpret the phenomenon in terms of the meanings people bring to them (Denzim & Lincoln, 2000).

Wheeler (2010), defines a qualitative research method as a form of social inquiry that focuses on the way people make sense of their experience and the world in which they live. The strength of qualitative research method lies in the fact that it has a holistic focus, allowing flexibility and attainment of deeper, more valid understanding of a subject that could be achieved through a more rigid approach (Duffy, 1985).

Wheeler (2010) also asserts to the fact that qualitative research does not impose, but gives an account of reality seen in participants. Thus the study sought data on Daboya and Abeokuta local dyeing in all its complexities, describing the processes of dye extraction and dyeing as stated by the people, the activities they engage in what it means to the people and how they make sense of it.

Furthermore, a qualitative researcher is referred to as an "instrument" because of his or her ability to make sense of what he or she sees. (Leedy & Ormrod, 2005). Accordingly, the researcher personally went to Daboya and Abeokuta dyeing communities, interviewed, gathered and observed events as they unfolded and recorded information that answered the research questions.

In conclusion, qualitative research is simply the systematic process of understanding, describing, interpreting, verifying and evaluating a phenomenon in the researcher's point of view.

Since the bulk of information sought in regards to this study was highly descriptive and personalized, the Descriptive research method under the qualitative research design was used in this study. The researcher believed that collecting data using both qualitative and quantitative approaches is possible; Eisner (1998) and Silverman (1993), explained that it is not unusual for a researcher to count (quantify) certain kinds of data in all intent and purposes as qualitative investigation. Hence the researcher adopted the experimental research method under quantitative research approach. According to Berg (2007), by combining several lines in sight, researchers obtain better and more substantive picture of reality. The process in which both quantitative and qualitative data are collected to solve a research problem is known as triangulation (Leedy & Ormrod, 2005).

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3.3 Descriptive Research

Descriptive research involves identifying characteristics of an "observed phenomenon or situation, in every case, descriptive research examines a situation as it is, it does not involve changing or modifying a situation under investigation (Leedy and Ormrod, 2005). Descriptive research is concerned with practices, structures, Opinions held, relationships that exist, processes that are going on or trends. Descriptive research under qualitative describes and records the observation of phenomena in great detail.

Thus, the researcher adopted the descriptive research to describe, explain and interpret Daboya and Abeokuta art of local dyeing, tools and materials used by both towns, methodologies adopted by both towns, fastness of locally dyed fabrics and yarns and the experimentations carried out. The tools and materials were vividly described and the step by step process involved in dye extraction and dyeing for both towns were described and explained systematically.

3.4 Experimental Research

In Clarke (2005), point of view, experimental research is trying to isolate and control every relevant condition which determines the events investigated, so as to observe the effects when conditions are manipulated. Experimental research focuses on studying the relationship between variables to identify cause and effect relationships.

Within this study the experimental method was used to test abrasion, light and wash fastness on the finishing products and also the suitability of acquired methodologies from both towns. This experiment took place in the natural setting unlike true experimental research method which takes place within the laboratories.

3.5 Population of the Study

Agyedu, Donkor and Obeng (2011), refer to the term population as the complete set of individuals (subjects), objects, or events having common observable characteristics in which the researcher is interested in studying. All individual within a certain population usually have a common binding characteristic or trait. Thus, in this study, the population includes persons having information on local dyeing and those within the local dyeing industry.

There are two types of population, target population (theoretical population) and accessible population (study population). Target population refers to the entire group of individuals or object in which the researcher is interested in generalizing their conclusions. In the study, all textile artisans in the North Gonja District (Ghana) and Abeokuta (Nigeria) both male and female are the target population.

The accessible or study population is the population in which the researcher applied the conclusions. This population is the subset of the target population. In spite of that, the

accessible population for this study is local dyers and people knowledgeable in local dyeing in Daboya in the North Gonja District and Abeokuta specifically within *Ijeimo idi aro* in the southwestern part of Nigeria. Daboya was selected because it is the only place in the Northern region of Ghana that practice local dyeing, *Ijeimo idi aro* was selected because of their long standing history of local dyeing and remain the only place that practice local dyeing in Abeokuta. It was from the accessible population that the researcher drew the samples for the study and the process involved is termed as sampling.

Latham (2007), describes sampling as the ability of the researcher to select a portion of the population, which is truly a representative of the population. Using a correct sampling method allows researcher the ability to reduce cost, conduct more efficient (speed) and have greater accuracy. It is mostly impossible and time consuming for researchers to collect data from an entire population because of the amount of people and places of thing within the population (Latham, 2007), the purposive sampling technique was used to collect a manageable size of the research sample.

Purposive sampling according to Leedy and Ormrod (2005) is selected based on the purposes of study. Because the purpose of the study requires only people who has in-depth knowledge in the art of local dyeing for both towns. The researcher thought it wise to pick samples of the groups believed to come from the lineage that discovered local dyeing from both towns. The target population of Daboya and Abeokuta was too large to study effectively. And therefore three dyeing groups, each from both towns were selected. The researcher collected data from forty five dyers, fifteen traders (dealing in locally dyed fabrics) and two knowledgeable elders in Daboya whereas in Abeokuta, forty five dyers, fifteen traders (dealing in locally dyed fabrics) and two knowledgeable elders giving a total of one hundred twenty four respondents from the sampled dyeing groups. The table below indicates the breakdown of the target and the accessible population in percentages.

Table 3.1 Shows a summary of the population of the study.

Category	***Target Population***	***Accessible Population***	***Percentage***
Baape dyers	30	15	50%
Youlmi dyers	30	15	50%
Bagrmaspe dyers	20	15	75%
Group A (*Ijeimo idi aro*)	25	15	60%
Group B *(Ijeimo idi aro)*	27	15	55.6%
Group C *(Ijeimo idi aro)*	15	15	100%
Elders (Daboya)	2	2	100%
Elders (Abeokuta)	5	2	40%
Traders dealing with locally dyed product (smock) in Daboya.	30	15	50%
Traders dealing in locally dyed fabrics in Abeokuta	50	15	21.43%
Total	234	124	52.9%

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3.6 Instrument for Data Collection

The primary aim of every qualitative research work is to collect and generate data that answer the research questions. According to Leedy and Ormrod (2005), qualitative researchers often use multiple forms of data in a study. These data are collected using tools (instrument) such as observation, interviews, object, written documents, audiovisual materials, electronic document and anything or procedure that can help the researcher answer the research questions. Within this study, observation and interview were the data collection instruments used to collect primary data. The data collected were thoroughly and accurately recorded using notes, audiotapes and photographs.

3.7 Observation

Observation is defined as the selection and recording of events in all its complexities as they occurred in their natural setting using the sense of vision (Leedy and Ormrod 2002). The observation method provides first hand information without relying on reports of others. Thus giving one greater understanding of events as they occur.

In order to carefully examine and record data that are relevant to the study an observation checklist was prepared which include, items such as; the nature of tools and materials, methodologies (dye extraction and dyeing), constituents of the dye, fabrics, yarns, drying, washing and the finished products in Daboya and Abeokuta respectively.

3.8 Interview

The Interview is one of the most common methods of data collection used in qualitative research. Interviews are particularly useful for getting the story behind a participant's experience and also to further investigate their response (McNamara, 1999). There are three most fundamental types of research interview; structured, semi structured and unstructured. A semistructured form of the interview was employed; it is the type of interview that consists of several key questions that help to define the areas to be explored.

The questions asked were of the following; history and evolution, uses of dye, tools and materials used, dyeing processes, dye extraction processes, finishing, apprenticeship and any other question relevant to the research area. It also provided the researcher and respondents the opportunity to carry out the discussion in a more detailed manner to ensure reliability and validity. This instrument enables the researcher ask follow up questions for clarity.

3.9 Data Collection Procedure

Since in qualitative research, situations have been observed or study in their natural setting, the researcher firstly visited the research areas (Daboya in the north Gonja district of Ghana and Abeokuta in Ogun State of Nigeria) to acquaint herself with the areas and the people.

The second session of interviews carried out was with the dyers. The researcher interviewed three different groups of dyers namely Bagaramaspe dyers, Yolmi dyers and Baape dyers all at different time using the prepared interview guide. The questions were asked personally by the researcher in Hausa and sometimes translated into Gonja by Halim (research assistant). During the interview sessions with dyers observations on events were made and recorded in the natural settings. The researcher observed the environment, dyeing site, tools, materials, pit preparation, dyeing and dye extraction processes. Data collection for Abeokuta local dyeing was made possible by an organized trip to Ogun State precisely Abeokuta in Nigeria. The first place to visit in Abeokuta was Itoku Kemta (a market square dedicated to marketing and selling locally dyed fabrics). Informal interview was carried out with 75 years old head of Kampala (locally and synthetically dyed fabrics) Association Alaja Alimotu Sadia Akama. Traders dealing in the locally dyed fabrics were also interviewed using the interview guide.

The second phase of data collection in Abeokuta was carried out in a community called *"Ijemo idiaro"*. Dyeing activities were carried out in groups with every group representing a family (House). Interviews were organized for three different families because it was almost impossible interviewing all the families since their number was so large. Participant observation was adopted in observing the methodologies, tools and materials.

3.10 Project 1

In solving the research problem of the first objective a comparative study was done to identify and describe yarns, fabrics, plant dyes and methodology used in Daboya and Abeokuta local dyeing industries.

3.10.1 Concepts of Comparative Studies

Comparative study is defined as the comparison of outcomes, results and responses for different techniques, therapeutic approaches or other inputs. (www.refrence/files/ D003/md003/ Md003160 html). Al-Thunibat (2011) explained further that a comparative study is a method or a tool that a researcher use to show the differences and similarities and provide his or her recommendation (whether by agreeing or modifying or adding to the conclusion of that comparison) which is placed under the purpose of using the comparative study.

3.10.2 Importance of comparative study

Comparative study is of benefit in the following ways;

It aims at showing the connection and differences between the subjects being compared. It also provides a deep knowledge regarding the subject that the comparative study is based on. A comparative study provides a useable and adoptable view that can demonstrate the outcome and recommendation of a comparable work.

Below are the explanations given for identifying yarns, fabrics, plant dyes and methodology used in the local dyeing industry for both towns.

3.10.3 Yarns Used in the Local Dyeing Industry

Yarns are threads that have been spun for weaving and knitting. There are different types of yarns ranging from natural to synthetic. However, in Daboya yarns are the main

materials dyed, cotton yarns are preferred for dyeing. The reason being that it is highly absorbent, it has good affirmation for dye and it is durable. More so, it is easy to get because of its availability currently this cotton yarn are bought in the market, but in the olden days the yarns were spun by women who were active in the local dyeing industry.

There are two types of cotton yarns available in the Daboya market, factory spun yarns (plate 3.6) as the name connotes is a machine spun yarn. The second one is the hand spun yarn shown in plate 3.7 locally referred to as *"gbayen gyse"* which is mainly spun using the hand.

Plate 3. 6: factory spun cotton yarn (Source: researcher)

Plate 3. 7: hand spun cotton yarn (Source: researcher)

3.10.4 Fabrics Used in the Local Dyeing Industry

In *Ijeimo idi aro* (Abeokuta), the dyers dye fabrics instead of yarns. The fabrics, dyed are mostly *sheda* locally referred to as *guinea* by the Yoruba's of South Western Nigeria. *Sheda* is a loosely woven, reversible figured cotton fabric woven on a jacquard loom with one warp and one weft. The patterns after weaving usually appear in warp-faced or satin weave and the ground in weft-faced or sateen weave. Sheda is characterized by shin and

thickness, it is used by the dyers because of its strength, availability, affordability, colour variations, and because it comes in plain and designed forms as shown in plates 3.8 and 3.9. The designs in the sheda enhance the fabrics dyed because of the motifs present in the fabrics.

Plate 3.8: Factory designed sheda yet to be dyed. (Source: researcher)

Plate 3.9: Plain sheda yet to be dyed. (Source: researcher)

3.10.5 Plant Dyes Used in Daboya and Abeokuta Local Dyeing Industry

Indigo plant dye is the local (natural) plant dye used in both towns, it is a deep blue colour dye derived from indigo bearing plants precisely *Indigofera tinctoria* also referred to as true indigo. The *Indigofera tinctoria* has many species and can be annual, biennial or perennial plant depending on the climatic condition, thus it grows in the tropics, hot and humid places with fertile soil.

Daboya indigo dye and Abeokuta indigo dye are derived from the species botanically named *Lonchocarpus cynanescenes* (plate 3.10). It is locally referred to as *"gara fata"* by the Gonjas and *ellu aja* by the Yorubas, it is a natural vat dye which requires different mode of application. Moreover *gara fata* or *ellu aja* is preferred by dyers in Daboya and *Ijeimo idi aro* because it produces the ideal shades of blue on yarns and on fabrics.

Plate 3.10: indigo plant (*Lonchocarpus cynanescenes*)
(Source: researcher)

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3.10.6 Dye Extraction In Daboya

Methodology in this study refers to the tools, materials, dye extraction processes and dyeing processes in Daboya and Abeokuta local dyeing industries. Within this context the tools, materials, processes involve in dye extraction and dyeing for Daboya are as follows.

3.10.7 Tools and Materials

- Stirring stick *(mouse)*
- Stretching stick
- Dyeing pits
- Drying lines
- Warping pegs
- Metal bucket
- Wooden slab
- Basin
- Indigo leaves (*gara fata*)

- Baked mud (*zaarta)*
- Synthetic indigo dye (*balba)*
- Aweii leaves *(Pakia biglobosa)*
- *Dawadawa* logs *(Pakia clappertoniana)*
- Cotton yarns
- River water/ pipe borne water

3.10.8 Method for Dye Extraction

Plate 3. 11: moulded gara leaves

(Source: researcher)

In Daboya dye extraction the additives required are *gara fata* (indigo plants), *zaarta* (baked mud), *keidi* (potash) and *balba* (synthetic indigo dye).The first stage in dye extraction is the decomposition of the *gara fata (*indigo leaves). Leaves of indigo plants locally referred to as *gara fata* are harvested from the bush by women. The leaves are pounded, moulded into balls, and dried (Plate 3. 11) approximately for a week.

It is then soaked in a container overnight to loosen it to facilitate decomposition, the mixture is poured in a basket to strain the water and to allow it decompose. It stays in the basket (plate 3.12) for a maximum period of four weeks for the decomposition to fully take place. It can stay less than four weeks, when the decomposed *gara fata (*indigo

leaves) begins to emit smoke it is a good sign of its potency and it is ready to be mixed with other dye constituents.

Plate 3. 12: decomposed indigo leave (*gara)*
(Source: researcher)

The next stage is the preparation of *zaarta* (baked mud) which is a mixture of clay, indigo leaves, pelt, *abetrebi leaves (Pakia biglobosa*), *balba (*synthetic indigo dye) and *keidi* (potash). These materials are mixed together in a clay pit to form the mud. This clay pit (plate 3.13) has been kept from generations to generation for the preparation of the mud (*zaarta)*. The mixed mud is moulded into small balls (plate 3.14) with the exhausted dye solution from the dyeing pits. They are exposed to the sun to dry, drying takes five days or a week depending on the weather. The dried mud (plate 3. 15) are arranged in a circular form for firing. Dried woods from *dawadawa* tree (*Pakia clappertoniana)* are placed on the dried muds and set on fire (plate 3.16) .The last additive is the potash (*keidi),* it is prepared by burning a special grass locally referred to as *aweeii (Pakia biglobosa)* it is burnt together with logs from *dawadawa* tree*(Pakia clappertoniana)* , the burning takes a day.

Plate 3.13: mud pit
(Source: reasearcher)

Plate 3. 14: moulded mud *(zaarta)*
(Source: researcher)

Plate 3.15: dried mud *(zaarta)*
(Source: researcher)

Plate 3.16: fired mud *(zaarta)*
(Source: researcher)

Mixing of the dye additives is the next process, it takes place in a deep pit filled with clean water and the pit varied in depth mostly within the ranges of 9 feet to 12 feet. Before the additives are mixed in the pit, it is firstly cleaned by removing the residues from the previously used dye vat as shown in plate 3.17. The mixture is prepared firstly by filling the pit with water, then *keidi (potash),* decomposed "*gara"* leaves are poured, baked "*zaarta"* is pounded and also poured into the vat and stirred for 15 minutes. The vat is left for a week or five days to ferment before dyeing starts (plate 3.18), the vat is stirred (plate 3.19) for 30 minutes in each day till the fermentation process is over. Two litres of the dye solution are fetched and 3 kilograms of synthetic indigo dye locally

referred to as *"balba"* is added and stirred to get a strong solution of the dye (plate 3.20) it is then poured into the vat and stirred for 3 minutes. In plate 3.21 is vat ready to be used.

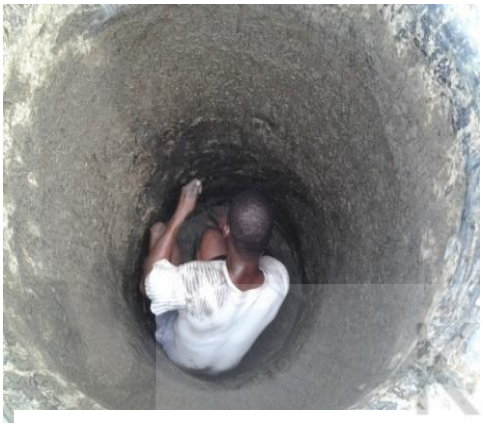

Plate 3.17: pit preparation.

(Source: researcher)

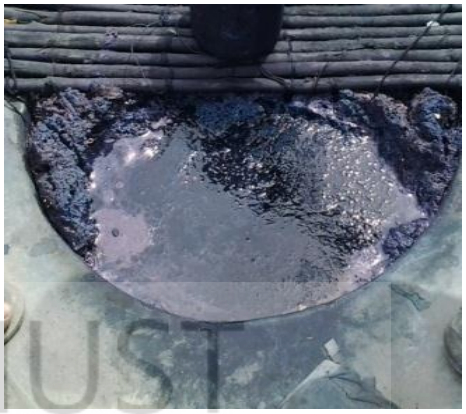

Plate 3.18: dye solution.

(Source : researcher)

Plate 3.19: dye solution been stirred.

(Source: researcher)

Plate 3. 20: balba preparation.

(Source: researcher)

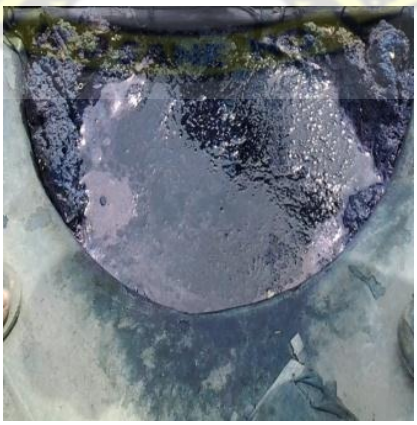

Plate 3.21: dye solution ready to be used.

(Source : researcher)

3.10.9 Daboya Yarn Dyeing Processes

Cotton yarns are the main items dyed in Daboya, the yarns are factory spun yarns that are wound on bobbins and will have to be converted into hanks to facilitate manipulation during the preparation and dyeing processes. The yarns are converted into a hank by laying them on warping poles that have been placed apart, the process is seen in Plate 3.22 and 3.23.

Plate 3.22: yarn laying process.
(Source: researcher)

Plate 3.23: laid yarns
(Source: researcher)

The hank is removed from the warping poles and a portion of the hank is sometimes resisted with a rope to create a pattern on it. The hank is sent to the river for wetting locally referred to as *kuchichi* this process is believed to be superstitious. The wet hank (3.24) is beaten with a flat wood for thirty minutes (Plate 3.25) a process locally referred to as *kubiri.* This process is believed to prevent uneven dyeing. The wet beaten hank of yarns is then squeezed (*kukito)* (Plate 3.26) on a stretching stick (*kukitibi)* to remove water before dyeing commence as is seen in Plate 3.27.

Plate 3.24: wet yarns
(Source: researcher)

Plate 3.25: yarn beating process.
(Source: researcher)

Plate 3.26: squeezing process.
(Source: researcher)

Plate 3.27: dyeing starts
(Source: researcher)

During dyeing processes the dyer sits at the edge of the pit and have his legs stretched as seen in plate 3.28 to enable him carry out the process with ease since the dyeing pit is low. The hank is dipped into the vat for 15 minutes and turned several times (Plate 3.29) to avoid uneven dyeing, it is removed from the vat, the dye solution is squeezed (3.30) from the dyed hank, it is then stretched (Plate 3.31) on the stretching stick (*kukitibi)* and hanged to dry on lines for 10 minutes as seen in plate 3.32 to enable oxidation take place. It is brought back to the solution and the process is repeated over and over again until the required shade is arrived at.

Plate 3. 28: dyeing in progress.

(Source: researcher)

Plate 3. 29: dyeing of yarns

(Source: researcher)

Plate 3.30: squeezing of dyed yarns.

(Source: researcher)

Plate 3. 31: stretching of yarns

(Source: researcher)

Plate 3.32: dyed yarns hanged on lines to dry.

(Source: researcher)

The prepared vat can be used over and over again until it loses its potency. When the vat loses its potency it turns black (plate 34). According to Mumuni (2013.) A resisted dyed yarns is referred to as "kpalto" yarns dyed black is known as *"gyesine",* also yarns dyed with a deep blue shade is referred to as *"frucho"* while the undyed yarns is called *"Bolsu"* among Gonjas.

Plate 3. 33: dyed yarns
(Source: researcher)

Plate 3. 34: waste dye
(Source: researcher)

3.10.10 Dye Extraction In Abeokuta

Comparably the tools, materials, dye extraction and dyeing processes for Abeokuta are as follows.

3.10.11 Tools And Materials

- Plastic spoon (*sibi)*
- Plastic basin (*basia)*
- Stirring Stick (*igi)*
- Plastic bowl *(ike)*
- Dyeing pot (*kok oaro)*
- Drying lines *(igishaaso)*
- Cooking pot *(koko)*
- Indigo leaves (*ellu aja)*

- Shells from cocoa pods (*epkuo coco)*
- Synthetic indigo dye (*aro)*
- Caustic soda *(soda)*
- Cola nuts *(obi)*
- Dry pepper*(ata)*
- Sheda (*gini)*
- Aluminium roofing sheets (*ideri)*

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3.10.12 Method of Dye Extraction

In Abeokuta, dye extraction is in two parts; pounding of the immature indigo leaves to facilitate fermentation process and the preparation of the mordant or Alkali medium. The young leaves of the *ellu aja* plants (indigo plant) are mostly preferred by dyers because it is believed that they have a greater amount of dye content. Once collected (Plate 3.35) the leaves are pounded in a wooden mortar with a pestle (Plate 3.36), when they are well pounded, a green blue mass is left in the mortar. The dyer scoops the residue and moulds them into balls (Plates 37-39) and dry for a day to preserve them for a better dye.

Plate 3. 35: dyer plucking indigo leaves. (Source: www.arcadia-film.de)

Plate 3.36 : indigo leaves being pounded. (Source: www.arcadia-film.de)

Plate 3. 37: pounded indigo leaves being collected.
(Source: www.arcadia-film.de)

Plate 3. 38: pounded leaves being moulded into balls.
(Source : www.arcadia-film.de)

Plate 3. 39: Pounded and moulded Yoruba indigo plant.
(Source: researcher)

The second part of dye extraction is the preparation of the alkaline solution in which the indigo plants will be dissolved. The Shells of the fruit of cocoa pods are used in the preparation of alkaline. The collected cocoa pod shells are exposed to the sun by spreading them on the floor to dry (plate 3.40). Dried shells are burned into ashes (plate 3.41) and left to cool. The cooled cocoa ash is collected and kept in a heavy earthenware pot with a hole at bottom, this hole is covered with twigs which serve as a sieve and allows water with only the fine ashes to run through it.

Plate 3.40 : cocoa shells
(Source : www.arcadia-film.de)

Plate 3.41: burning of cocoa shells.
(Source: www.arcadia-film.de)

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The cocoa ash is poured into the earthenware pot (plate 3.42) clean water from well or stream is added to the cocoa ash and sieved. The sieved mixture which is belived to contain a good amount of alkaline property is collected from the bottom of the pot as seen in plate 3. 43 The alkaline solution is poured into a pot where dyeing will take place known as "*koko aro*" (plate 3.44). Twenty five "elu" balls or more are needed to produce a deep blue of indigo dye.

Plate 3.42 :Preparation of cocoa ash
(Source: www.arcadia-film.de)

Plate 3.43 :Preparation of alkaline solution.
(Source: www.arcadia-film.de)

The dried indigo leaves are scrambled into the alkaline solution and left to stand for 5-7 days depending on the weather (plate 3.45) for fermentation to take place; when it is hot, fermentation occurs in about 3 days but in cooler or rainy season, fermentation occurs in a week. The mixture needs to be stirred (plate 3.46) for half an hour every day and carefully covered so that rain water or dirt does not enter. Synthetic indigo dye locally referred to as "*aro*" is mixed separately (plate 3.47), and poured into the vat and stirred. Finally, the indigo dye is ready to be used. An experienced dyer knows when this happens by tasting the dye or making it run through the fingers, observing its colour and feeling its consistency. The dye remains active for about five days, after which more indigo balls are added and alkaline solution is added (plate 3.48). The indigo dye will be active for another three days. Dyers prepare three or four pots which dye at different stages of maturity.

Plate 3.44 : alkaline solution being poured into the dyeing pot *(kokoaro).*
(Source: www.arcadia-film.de)

Plate 3.45 :dried indigo plant being put into the alkaline solution.
(Source: www.arcadia-film.de)

Plate 3.46: stirring of dye solution.
(Source : researcher)

Plate 3.47 : mixing synthetic indigo dye with the vat.
(Source: researcher)

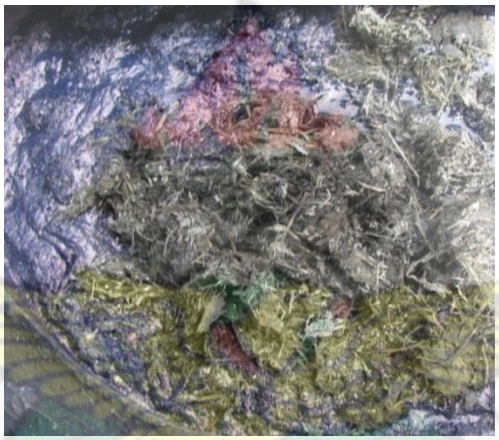

Plate 3. 48: used dye solution being recharged with deried indigo leaves.
(Source : researcher)

3.10.13 Abeokuta Fabric Dyeing Processes.

Dyeing is done differently with different timing depending on the type of resisting method used. Wet out is the first process carried out (plate 3.49), Fabrics resisted using the tritik method stays in the dye solution for 2 hours. It is brought out of dye solution after every 15 minutes (plate 3.52) and hung on poles for oxidation to take place for 5 minutes (plate 3.53). The process is repeated several times depending on the depth of colour desired (plate 3.54). Fabrics resisted with cassava starch are dyed for 5-10 minutes

to prevent the resist from destroying, they are then hung on poles to dry (plate 3.55) and oxidized. This process is done repeatedly depending on the depth of colour desired.

Plate 3.49: wet out process
(Source: researcher)

Plate 3.50: dyeing starts
(Source: researcher)

Plate 3. 51: dyeing
(Source: researcher)

Plate 3. 52 dyer removing fabric from vat
(Source: researcher)

Plate 3.53: oxidation process
(Source: researcher)

Plate 3. 54: redyeing process
(Source: researcher)

Plate 3. 55: drying process

(Source: researcher)

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3.11 Project 2: Testing for Fastness

All test conducted on dyed yarns, dyed fabrics to ascertain wash, abrasion and light fastness were done in the dyeing studio of the Integrated Rural Art and Industry of the Faculty of Art, Kwame Nkrumah University of Science and Technology. That was carried out under art studio conditions where conventional laboratory facilities for conducting chemical tests were non-existent. For this reason the dyed yarns and dyed fabrics were subjected only to basic physical test, including washing and direct contact with sunlight purposely to determine wash fastness, resistant to light and abrasion of both yarns and fabrics used.

3.11.1 Tests for Daboya Dyed Yarns

3.11.2 Tools and Materials.

The following are the tools and materials used in testing for fastness in abrasion, light and washing for Dabya locally dyed yarns.

- Plastic bowls (medium size)
- Drying lines
- Wooden stool

- Salt
- Detergent (key soap & klin soft washing powder)
- Pipe water
- Daboya dyed yarns (*gyesino & frucho)*

3.11.3 Test for Abrasion.

A series of test were carried out in testing for fastness in abrasion on Daboya locally dyed yarns. With the first test the dyed yarns (*frucho & gysine)* were rubbed over a surface of a wooden stool for thirty minutes as seen in plate 3.56. Secondly abrasion test was done by rubbing the dyed yarns over each other for thirty minutes in the plate 3.57 below. The last test was carried out by exerting pressure while washing dyed yarns in water, thirty minutes were choosen for the series of test because the researcher realized in the preliminary stages of the tests that, the results were not accurate. Observation of the results indicates that some yarns broke. Others have their textures and the shade of the dye disrupted.

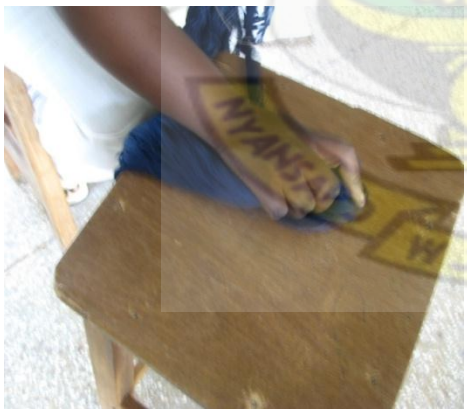

Plate 3.56: rubbing yarns on stool
(Source: researcher)

Plate 3.57: rubbing yarns on each other
(Source: researcher)

3.11.4 Test For Wash Fastness

Three tests for wash fastness were done for both "gyesine" (warp yarns) and "Frusho" (weft yarns). The measurement given to the yarns is a two woman clothes which are approximately four yards. The yarns were tested for wash fastness two days after dyeing and drying were completed.

The dyed yarns were divided into three parts and one part was washed in cold water with a traditional detergent (key soap) for 10 minutes. It was then rinsed and stretched on pegs to dry.

Plate 3.58: test for wash fastness for Daboya.
(Source: researcher)

The second test for wash fastness was carried out by washing a different set of yarns *(frucho & gysine*) in cold water for 10 minutes with traditional detergent (Klin soft washing powder). It was rinsed and stretched to dry on the warping poles.

The last test for wash fastness was carried out by first pouring two spoonful of salt into cold water. Dyed yarns *(frucho & gysine*) were washed with traditional detergent (key soap) for 10 minutes. It was rinsed and stretched to dry on warping poles. Ten minutes were chosen because the diffrences in shades were insignificant at the preliminay stages of the various test. The researcher realized that the yarns washed faded.

3.11.5 Test for Light Fastness.

Light fastness was carried out in two ways; dyed yarns *(gyesine)* were stretched on poles to dry in the sun from morning to evening as indicated in plate 3.59.

Plate 3. 59: test for light fastness.
(Source: researcher)

The second test for light fastness was carried out by drying another set of dyed yarns (*frucho)* in the shade (plate 3.60) from morning to evening. Yarns dried in the shade retained colour, while yarns dried under direct sunlight changed in colour.

Plate 3.60: test for light fastness
(Source: researcher)

3.11.6 Tests on Abeokuta Locally Dyed Fabric

Since one of the objectives of the study is to comparatively ascertain the abrasion, light and wash fastness for Daboya and Abeokuta local dyes, it was necessary to perform similar tests on Abeokuta locally dyed fabrics as it was done for Daboya locally dyed yarns. The tools and materials used are similar to what was used in carrying out their tests on Daboya locally dyed yarns.

Procedure

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3.11.7 Test for Abrasion

A series of test on abrasion were carried out on Abeokuta locally dyed fabrics. Similar to the Daboya locally dyed yarns the first abrasion test involve rubbing of Abeokuta locally dyed fabric over the surface of a wooden stool for thirty minutes showing in plate 3.61. The researcher observed after the test that the surface of the fabic was slighty rough.

The second test involved rubbing of the surfaces of two locally dyed fabrics (plate 3.62) together . This activity was done in thirty minutes. The last test was carried out by exerting pressure while washing of the locally dyed fabrics as seen in plate 3.63. The results for both tests proved negative.

Plate: 3. 61: rubbing fabric on stool (Source: researcher)

Plate 3. 62: rubbing surface of faric together (Source: researcher)

Plate 3. 63: rubbing dyed fabric while washing.
(Source: researcher)

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3.11.8 Test on Wash Fastness for Abeokuta Locally Dyed Fabric.

Two yards of Abeokuta locally dyed fabric were washed in cold water with a traditional detergent called key soap for 10 minutes as seen in plate 3.64. The washed fabric was then hung to dry. The researcher realized that the change in colour shade was not significant.

Plate 3.64: washing of the fabric
(Source: researcher)

The second and third test for wash fastness were carried out the same way with the same procedure, timing, detergent (key soap and klin soft) and the right amount of salt just like the instructions given for wash fastness test for Daboya locally dyed yarns. The results indicate, that there was no change in colour of the fabrics.

3.11.9 Test for Light Fastness for Abeokuta Indigo Dyed Fabric

Locally dyed fabric was divided into two and one part was dried in the sun (plate 3.65) and the other dried in the shade (plate 3.66) from morning to evening. The fabrics tested retained its colour.

Plate 3.65: fabric dryed in the sun
(Source: researcher)

Plate 3. 66: fabric dryed in the shade
(Source: researcher)

3.12 Project 3

3.12.1 Experiment Using Abeokuta Methodology Applied by Abeokuta Dyers.

During the researcher's visit to Abeokuta specifically "*ijemo idiaro"* (a community in Abeokuta known for local dyeing), experiments on their methodology (tools, materials, dye extraction, designing and dyeing) were carried out. The essence of this experiment is to test the methodology on made in Ghana yarns and fabrics most especially yarns used by Daboya dyers. In this context the tools, materials and processes are as follows.

3.12.2 Tools & Materials

- Dyeing pot
- Dyeing stick
- Plastic basin

- Starch
- Natural indigo dye solution
- Synthetic indigo dye
- Drying line
- Ghanaian cotton yarns
- Ghanaian mercerized cotton fabric

The Yoruba tritik resist method was done on mercerized cotton; it was later on dyed following the dyeing procedures and timing explained above (Abeokuta dyeing procedures) as seen in Plates 3.67- 3.75. In the second phase of the experiment, cones of cotton yarns were converted into a hank and dyed using Abeokuta dyeing techniques. This has been interpreted in plates 3.76- 3.80.

Plate 3. 67: Resist fabric
(Source: researcher)

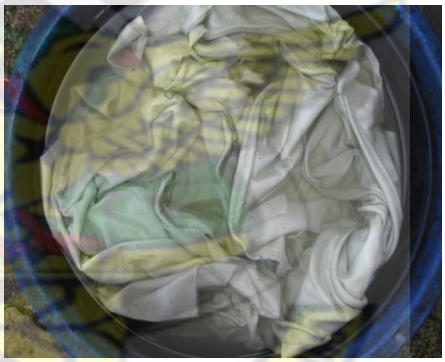

Plate 3. 68: wetout process
(Source: researcher)

Plate 3.69: dyeing starts
(Source: researcher)

Plate 3.70: dyeing process
(Source: researcher)

Plate 3.71: oxidation process

(Source: researcher)

Plate 3.72: re-dyeing process

(Source: researcher)

Plate 3.73: researcher untieing resist.

(Source: researcher)

Plate 3.74: dyed fabric been rainsed in starch.

(Source: researcher)

Plate 3.75:starched fabric hanged to dry

(Source: researcher)

Plate 3.76: cones of yarns

(Source: researcher)

Plate 3.77: hank preparation
(Source: researcher)

Plate 3.78: a hank of yarns
(Source: researcher)

Plate 3.79: wet out process
(Source: researcher)

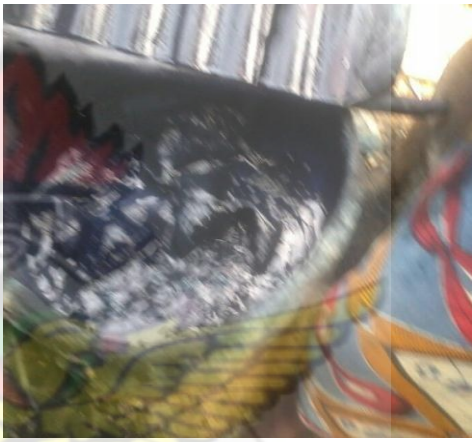

Plate 3.80: yarn dyeing
(Source: researcher)

Plate 3.81: oxidation process
(Source: researcher)

Plate 3.82: dyed hank of yarns
(Source: researcher)

3.12.3 Experiments on Methodology Derived From Study

After series of interviews and observations on methodology (tools, materials, dye extraction and dyeimg) in the study areas. The researcher did a comparative analysis of the methodology used in both towns, this analysis aided the researcher to carry out experiment on methodology derived from the study. The above mentioned experiment was carried out to enable the researcher arrive at a standardize methodology (tools, materials, dye extraction and dyeing) with an appreciable level of fastness to abrasion, light and washing. The experiment was carried out with the dyers at the dyeing site in Daboya, the tools, materials, dye extraction and dyeing processes are as follows.

3.12.4 Tools And Materials

- Plastic bucket
- Plastic bowl
- Pair of gloves
- Warping poles
- Indigo leaves
- Plantain peel
- Synthetic indigo dye
- Mercerized cotton
- Cotton yarn
- Paraffin wax

3.12.5 Dye Extraction and Dyeing Processes

From the comparative analysis on methodology for both towns, the researcher realized potash or alkaline solution was used to dissolve the indigo leaves to extract the dye. In that context the researcher collected plantain peels, dried them under the sun for a week

and burn them to get potash as seen in plates 3.83 and 3.84. The ashes of burnt plantain peels are the source of potash or alkaline solution for this experiment.

Plate 3. 83: drying plantain peels
(Source: researcher)

Plate 3. 84: burning dried plantain peels
(Source: researcher)

50 grams of ashes from burnt plantain peels were poured in a bucket filled with water. It was stirred thoroughly to have the ashes dissolved in the water properly, 12 balls of dried indigo leaves each moulded into a size of tennis ball weighing 1kilogram per ball were scrambled into the alkaline solution and stirred for 10 minutes. It was left for 5 days for fermentation to take place (plate 3.85). Within these five days of fermention the vat was continually stirred three times daily for 30 minutes on each day. When the fermentation process was over, six spoonful of sodium hydro sulphite was poured into the vat and stirred to have it dissolved; the vat is now ready to be used as seen in plate 3.86.

A resist technique popularly referred to as batik was used to create patterns on mercerized cotton, three cones of cotton yarns were converted into a hank which measured what is technically referred to as two woman cloth (4yards). Wetout was carried out on fabric to avoid uneven dyeing, the fabric was then dyed for 30 minutes (plate 3.87), the dyed fabric was then dried for 10 minutes for oxidation to take place (plate 3.88). The colour produced after 30 minutes was not too deep in shade, so the researcher added two

spoonfuls of synthetic indigo dye to the vat to enhance it. Dyeing continued for another 30 minutes (plate 3.89), a blue black shade was produced after dyeing three times, the fabric was dewaxed and ironed to give it a good finish .

Plate 3.85: fermentation process
(Source: researcher)

Plate 3.86: dye ready to be used.
(Source: researcher)

Plate 3.88: drying process
(Source: researcher)

Plate 3.87: dyeing fabric
(Source: researcher)

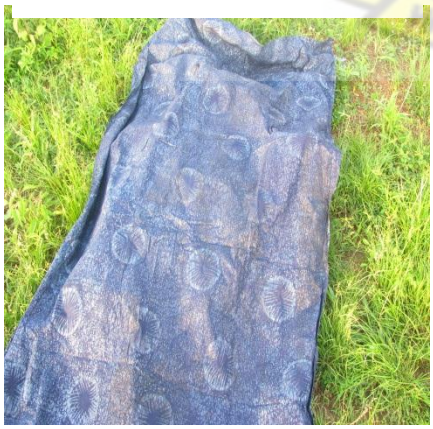

Plate 3.89: redyeing fabric
(Source: researcher)

Plate 3.90: dewaxed fabric
(Source: researcher)

The hank was taken through the preparatory processes (tying, wetout and beating) as seen in plates 3.92- 3.94. It was then dyed for 10 minutes after which it was stretched and dried for oxidation to take place (plates 3.95-3.98). Dyeing, stretching and drying processes continued ontil the actual shade was achieved. The dyed fabric and hank were subjected to tests on abrasion, light and wash fastness, just as it was carried out in the previous chapters.

Plate 3.91: warped yarns to be dyed
(Source: researcher)

Plate 3.92: tying process
(Source: researcher)

Plate 3.93: wet out process
(Source: researcher)

Plate 3.94: beating process
(Source: researcher)

Plate 3.95: dyeing process

(Source: researcher)

Plate 3.96: squeezing process

(Source: researcher)

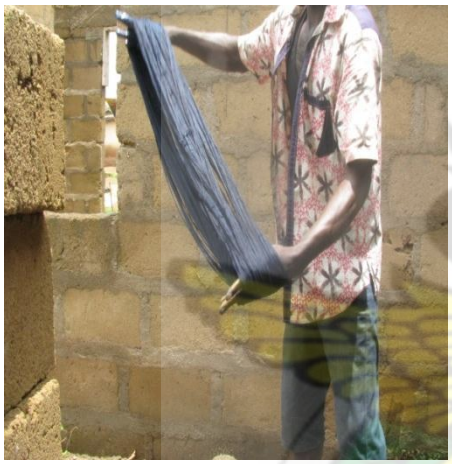

Plate 3.97: stretching process

(Source: researcher)

Plate 3.98: drying process

(Source: researcher)

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3.12.6 Designing and Production of Artefacts Using the Researcher's Resultant product

Using the concept of how the Daboya smock (fugu) is, the researcher did a series of sketches of attire for both female and male.

Fig 3.1: concept A

(Source: researcher)

FRONT **BACK**

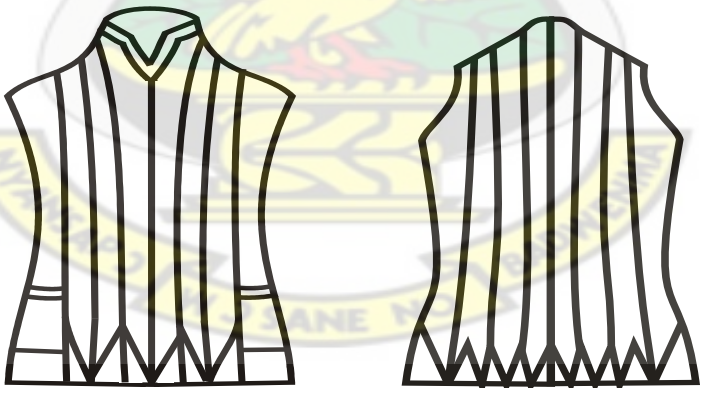

Fig: 3.2: concept B

(Source: researcher)

Fig: 3.2: concept C

(Source: researcher)

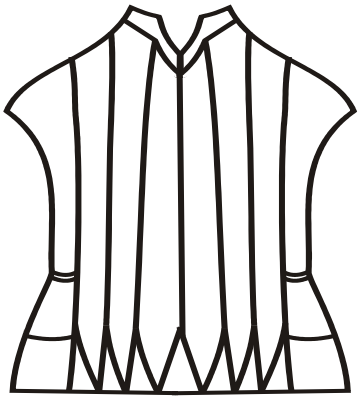

Fig: 3.2: concept D

(Source: researcher)

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Fig: 3.2: concept E

(Source: researcher)

Fig: 3.2: concept F

(Source: researcher)

Plate 3.99: front view of male sewn attire

(Source: researcher)

Plate 3.100: back view of male sewn attire

(Source: researcher)

Plate 3.101: front view of female sewn attire

(Source: researcher)

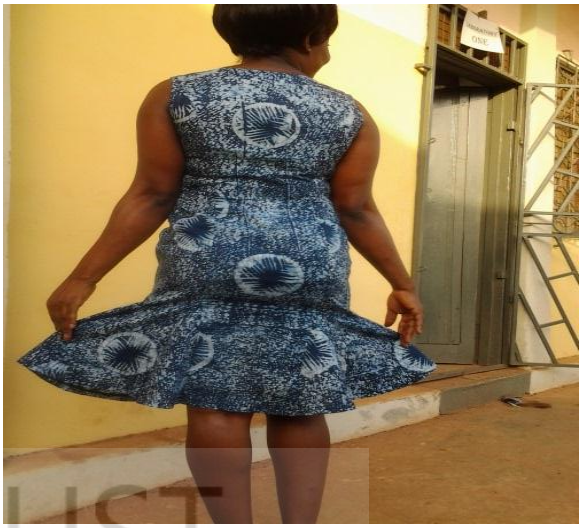

Plate 3.102: back view of female sewn attire

(Source: researcher)

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CHAPTER FOUR

RESULTS AND DISCUSSIONS OF FINDING

4.1 Overview

This chapter describes the results of the experiments conducted on the methodology derived from the study against abrasion, light and wash fastness. Data collection and presentation of the research sites for the study were based on the three major objectives adopted by the researcher. This chapter also deals with the analysis and interpretation of data collected from the study areas.

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4.2 Demographic of Respondents

Table 4.1: Demographic of respondents

Town	Age	Sex	Percentage	Total No. of Respondent	Educational background
Daboya	15-45	Male dominance	95%	62	Basic education
Abeokuta	18- 45	Female dominance	85%	62	Basic education

From the survey, it was revealed that the majority of the dyers from Daboya and Abeokuta were between the ages of 15-45 years and 18-45 years respectively. This means that relatively young and energetic people are engaged in the local dyeing industry.

The survey also revealed that the males (95%) dominated the local dyeing industry in Daboya, while the females (85%) dominated the local dyeing industry in Abeokuta. The reason for this situation in Daboya is as a result of the tedious nature of the dyeing

processes, it was also revealed that the dyeing processes are governed by some traditional taboos and beliefs. Whereas, in Abeokuta the females dominate because dyeing was regarded as domestic chores since in the past it was the mothers' obligation to refurbish clothes for the family, so the art of dyeing was passed on from mother to the girl child. This means that, taboos and beliefs still have a significant role to play in the development of the local dyeing industry in Ghana and Nigeria respectively. Finally, it was revealed that the dyers from both towns had relatively basic education, that is, from primary education to junior high education. This will help the industry in case of any reformation.

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4.3 Objective 1: To identify and describe yarns, fabrics, plant dyes and methodology used in Daboya (Ghana) and Abeokuta (Nigeria) local dyeing industry.

4.3.1 Comparative criteria

A comparitive analysis was carried out on the basic materials used, methodology adopted and fastness to abrasion, light and washing.

4.3.2 The Basic Materials Identified in the Dyeing Process

Cotton yarns are the only type of yarns used by Daboya textile artisans. It is the main material that is locally dyed in Daboya. It comes in two types, factory spun cotton yarn and hand spun cotton (*gbayene gyese)* as indicated in plates 3.6 and 3.7 respectively. The use of hand spun cotton (*gbayene gyese)* yarn is fading out since it's time consuming according to the artisans interviewed. The hand spun cotton yarns are thicker, stronger and creamer in nature, unlike the factory yarns, which are finer, stronger and off-white in colour. It was, however discovered during the study that, hand woven cotton fabrics were used by Daboya artisans for tie-dye. The study revealed that cotton yarns are mostly preferred by the dyers because of the following reasons; its availability, it is the only

textile material apart from Daboya natural indigo dye that makes the Daboya smock (*fugu*) an indigeneous product from Ghana (Daboya), it is durable; and thus it withstands all the processes it is being subjected to and it is mostly preferred by tourists.

Comparatively, Abeokuta textile artisans used any kind of cotton fabric that has affinity to the Yoruba indigo dye. The most used fabric is sheda (cotton fabric) locally referred to as "*guinea"* as seen in plates 3.8 and 3.9, it is factory woven it comes as designed or plain, it is durable and fine. The literature reveals that hand woven cotton fabric was used by Abeokuta local dyers just like Daboya dyers. The survey reveals that sheda locally referred to as *'guinea'* (cotton fabric) is preferred by dyers for the following reasons; it is durable, always available, affordable and it is comfortable when worn during any weather condition because of its woven structure.

This finding indicate that, cotton yarns and sheda play a major role in the local dyeing industry in Ghana and Nigeria respectively, this also means that the factory spun cotton yarns needs to be sustained in order to maintain and develop the local dyeing industry in Ghana.

4.3.3 The Plant Dye Used by Both Towns

Both Daboya (Ghana) and Abeokuta (Nigeria) use the same plant dye, the indigo dye from the family of genius Indigofera specifically from the species botanically named *lonchocarpus cynanescenes.* The indigo plant dye from the two countries have the same physical and scientific qualities. The study reveals that, unlike many other natural dyes that requires high temperature indigo plant dye requires low temperature and does not melt wax. However, it works quickly since yarns or fabrics are dyed blue after 10 minutes, also it does not require the use of mordants to help fix the dye content onto the fibre. From the study it was realized that, "*Gara fata"* and "*ellu aja"* , are vegetable dyes

that are categorized as a natural vat dye; thus requires alkaline or potash solution to make it soluble by removing oxygen from the vat through a process called fermentation this takes place during dye extraction. After the necessary additions have been completed, in the initial dyeing processes, the materials dyed seems to appear colourless as they emerge from the dye bath; but develops in colour gradually on exposure to air (oxygen). The study reveals that, the concentration of the dye from the indigo plant is high, especially when it is fresh, this accounts for the reason why dyers from both towns prefer the fresher and younger leaves to the fully grown leaves.

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Currently the indigo plant (*gara fata*) in Ghana is grown and harvested at *Shinga* and *Yezore* both in the Northern region. The Yoruba indigo plant is also grown and harvested in "*Oke owo*" in the southwestern part of Nigeria. Daboya local plant dye (*gara fata)* and Abeokuta local plant dye (*ellu aja*) produces shades ranging from blue, blue-black to black.

The study also revealed what is referred to as "fake Daboya dye" (plate 4.103) being used by dyers who are interested in what they call "fast money". What is referred to as fake "Daboya dye" is a solution of water and synthetic indigo dye Mumuni (2013) the elder interviewed in Daboya indicated such practices are not allowed because yarns that are dyed using "fake Daboya" fade very fast. He mentioned that measures are being put in place to check and stop this practice to safeguard the environment and the local dyeing industry.

Plate 4. 103: "fake Daboya dye"
(Source: researcher)

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4.3.4 Methodologies Used in Daboya and Abeokuta Local Dyeing Industries.

4.3.5 Tools Used by Both Towns

Stirring stick (*mouse),* stretching sticks, dyeing stick (*igi,),* plastic bowls *(basia*), dyeing pits, dyeing pots (*kokoaro),* drying lines, warping pegs, plastic spoons *(sibi*), cooking pots and roofing sheets.

The above mentioned tools from both towns are acquired or made locally by dyers to facilitate their dyeing activities. The names of the tools determine the kind of work it is used for. The differences in tools used in both towns include; the use of dyeing pits (Plate 104) in Daboya. The dyeing pits vary in depth ranging from 9ft to 12ft, and 60 inches in diameter, cemented and covered half way with sticks (*zandachi)* that have been put together. Whereas, in Abeokuta dyers carry out dyeing in ceramic dyeing pots (plate 4.105). Abeokuta local dyeing ceramic pots are made from clay and reinforced with cement and has a depth measuring 2ft and 20inches in diameter. Abeokuta dyers use aluminium roofing sheets as a cover for their dyeing pots to prevent dirt and rain water from entering it.

Plate 4. 104: dyeing pit
(Source: researcher)

Plate 4. 105: dyeing pot
(Source: researcher)

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4.3.6 Dye Additives used by Both Towns in the Dye Extraction processes.

The dye additives are the constituents of both Daboya local dye and Abeokuta local dye.

Table 4.2 Indicates materials used for Daboya and Abeokuta local dye extraction.

DABOYA	ABEOKUTA
Baked mud (*zaarta*)	Ashes from burnt cocoa pod shells
Synthetic indigo dye (*balba)*	Synthetic indigo dye *(Aro)*
Ashes from "*abetrebii"* leaves *(Pakia biglobosa)*	Sodium hydro sulphite
potash *(keidi*)	
Logs from *dawadawa* tree *(Pakia clappertoniana)*	
River water/ pipe borne water	Dry pepper *(ata)*
	Kola nut *(Obi)*
	Well water /stream water

4.3.7 The Similarities in the dye Additives used in dye Extraction.

From the study it was realized that, certain similarities exist in the use of additives adopted by both towns for dye extraction. Both towns use synthetic indigo dye to enhance the vat, it was revealed that synthetic indigo dye is the last additive added to the vat to improve the shade of colour produced and to increase productivity. Synthetic indigo is sold in Daboya and Tamale whereas in Abeokuta it is sold in Kemta Itoku.

4.3.8 The Differences in the dye Additives used in dye Extraction

The study revealed that Baked mud "*zaarta"* is one of the materials used in Daboya local dye extraction. It is not just mud, but a mixture of clay, indigo leaves, pelt, "*abetrebii"* leaves, *"aweii"* leaves and ashes from burnt logs from "*dawadawa tree"*. It was revealed during the study that the mud pit which serve as a source of the mud has been kept from generation to generation. In the study it was revealed that "*keidi" (p*otash) is gotten from grasses locally referred to as *abetrebii* (*Pakia biglobosa)* burnt to form potash. It was also revealed that the dye constituents put together makes the indigo plant soluble to enable dye extraction take place. The survey revealed that all the dye constituents in Daboya dyeing industry are recycled after dyeing to form part of the mud.

Unlike Abeokuta dyers that use water from streams (plate 4.106) or wells, Daboya local dyers have an option of using pipe borne water or river water. Abeokuta dyers avoid the use of pipe borne water because of the presence of chlorine in the water, they dyers interviewed explained that it reacts chemically with the dye solution. Just like Daboya all the dye constituents used for dye extraction in Abeokuta are recycled.

Plate 4.106: source of water

(Source: researcher)

Ashes from dried coco pod shells serve as a source of alkaline or potash for Abeokuta local dye, dried powdered pepper and kola nuts were also used in place of the ash to render the indigo plants soluble. Sodium hydrosulphite is used in Abeokuta dye extraction to help loosen the indigo plant dye for the dye to be extracted.

The researcher realized during her visits to both towns that, though they practice local dyeing, materials such as synthetic indigo dye used by both towns and sodiumhydro sulphite used by Abeokuta dyers are both synthetic products that enhance dye extraction, dyeing processes and improve upon the potency of the dye.

4.3.9 The Similarities in the Dye Extraction Processes

The study reveals that, dye extraction in both towns is regarded as tedious and time consuming as it takes a month or more to complete a cycle of dye extraction. They dyers interviewed in both towns revealed that, formaly all processes involved in the dye extraction were carried out solely by the dyers, but currently some dyers specialize in one or two processes to earn a living. For instance, in both towns there exist people (women) who have specialized in growing, plucking, pounding, mounding and drying of the indigo plants, which are sold to the dyers.

The survey revealed that the dye constituents all put together make the insoluble dye of the indigo plants soluble and this happens during fermentation process. The stirring of the vat for half an hour is carried out during the fermentation process in both towns. Scientifically, this process is carried out to remove oxygen from the vat to enable it ferment.

4.3.10 The Differences in the Dye Extraction Processes

It was revealed in the study that in Daboya, dried indigo leaves were made to decompose. This act was explained by dyers during data collection that it loosens the indigo plant. It was also revealed in the study, that the longer the indigo decomposes, the more potent the dye solution becomes. Nevertheless, this process accounts for the odour that comes with most Daboya locally dyed products.

The survey discloses that, in Abeokuta, indigo leaves are soaked in alkaline solution for fermentation process to take place. This takes three to five days, but it is faster during the dry season . Whereas in Daboya fermentation process takes place in vat made up of a mixture of water, decomposed leaves, baked mud and potash, which takes the duration of five to seven days depending on the weather condition. Fermentation process is key to indigo dye extraction, but the additives that forms the vat in which the *gara* leaves are soaked are many; this affects the shade and fastness of Daboya locally dyed products.

It was revealed during data collection that, in Abeokuta dyers performed rituals prior to the commencement of dye extraction, and it is believed that if a pregnant woman walks around the dyeing pots, the dye may lose its potency.

4.3.11 The Similarities in the Dyeing Processes

The survey reveals that Dyers from both towns carry out dyeing differently depending on the shade a dyer wants to produce. In both dyeing centres, it was observed that artisans (dyers) do not observe any safety precaution, dyeing is done with their bare hands, with no protective clothing, and nose mask. This condition, exposes them to the dangers of the toxic gases and chemicals and other harmful bacteria within the dyebath. Dyeing activities are carried out in 1-2 days in both towns depending on the weather and the

shade desired, it was revealed in the study that dyeing activities are faster in the dry season than in the cooler or rainy season.

4.3.12 The Differences in the Dyeing Processes

Dyeing in Daboya is done in the pit while sitting at one edge of the pit with legs stretched wide on the pit lid (*zandachi),* the dyers sit to dye because they use their bare hands to dye. On the contrary, in Abeokuta dyeing is done while standing by the dyeing pot (*kokoaro)* with a stick used to turn fabrics in the dyebath to avoid destroying the resist medium. Regardless of whether sitting or standing both methods are equally effective.

Superstitiously, dyeing of yarns in Daboya differs as they go through certain preparatory processes, namely wet out; this process is carried out only on the river in Daboya. The next procedure is the beating of the yarns with a wooden slab this is to avoid uneven dyeing, the yarns to be dyed are resisted sometimes with ropes made from old discarderd car tubes .

In the survey it was discovered that dyeing in Abeokuta is carried out differently depending on the resist method used. Fabrics resisted using cassava starch are dyed for 5 minutes, after which they are hung to dry. Fabrics resisted using tritik method are dyed for a longer time (15 minutes). Dyed fabrics in Abeokuta are rinsed in starch solution and beaten with a wooden slab to give it sheen.

The researcher detected that dyeing activities are carried out in an open area within the environment of the indigenes of Daboya (Plate 4.107). However, in Abeokuta, dyeing activities are carried out under a shed right in the dyers homes (Plate 4.108). This indicates that more attention is given to dyeing activities in Abeokuta since the dyeing site is located right in the dyers homes.

Plate 4.107: Daboya dyeing site
(Source: researcher)

Plate 4.108: Abeokuta dyeing site
(Source: researher)

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4.4 Objective 2: To comparatively ascertain the abrasion, light and wash fastness of Daboya and Abeokuta local dyes.

The researcher carried out the experiment under art studio conditions where conventional laboratory facilities for conducting abrasion tests are non-existent. For this reason, the Daboya and Abeokuta locally dyed yarns and fabrics were subjected only to basic physical tests, including washing, rubbing and direct exposure to sunlight, to test for abrasion, light and wash fastness.

4.4.1 Results on Abraision Test

It was observed after the abrasion test which was carried out by rubbing locally dyed yarns and fabric on the surface of a wooden stool that; Daboya locally dyed yarns became weaker and lose their colour. Abeokuta locally dyed fabric had its surface becoming rough but the colour of the fabric remained the same.

Tests on abrasion carried out on locally dyed yarn and fabric by rubbing on each other separately revealed that the yarns had their surfaces becoming rough while the result of Abeokuta locally dyed fabric proved negative.

However, the last test carried out by rubbing locally dyed yarns and fabric on each other separately while washing proved negative. From the observation carried out it was revealed, that frequent contact of Daboya locally dyed yarns with hard surfaces can cause destruction in the fibre structure and subsequently causing the dye to fade.

4.4.2 Results on Wash Fastness Tests

Tests on wash fastness for Daboya locally dyed yarns "*gyesine" (*warp yarns) and "*frucho" (*weft yarns) was carried out, washing which was done in cold water over a period of 10 minutes using local detergent (key soap and kilnsoft) revealed changes in the original colour of *"gysine"*(warp yarns*)* which moved from black colour to a deep blue colour and *"frucho"(*weft yarns) changed from deep blue to light blue colour. There were no significant changes in the yarns soaked in a salt solution and washed with the local detergent; this means soaking of products dyed with Daboya local dye will require a mordant like salt before washing to prevent the dye from being washed away. It was also revealed that the odour Daboya dyed yarns have was reduced after washing with local detergent (key soap and klinsoft).

Wash fastness test on the Abeokuta locally dyed cloth (*Adire)* revealed that there were no significant changes in colour. However, it was observed that the fabric lost its lustre and became softer after washing. This is because the starch in the fabric was washed off.

4.4.3 Results On Light Fastness Tests

Tests done on light fastness for Daboya locally dyed yarns revealed, that there were slight changes in colour of yarns dried under direct sunlight for the whole day. However, yarns dried in the shade retained its original colour. This implies that Daboya locally dyed yarns should be dried in the shade. There was no difference, between the test carried out under a

room temperature (shade) and under direct sunlight for Abeokuta locally dyed fabric. This test verifies the fact that Abeokuta local dye is fast to light.

4.5 Objectives 3: To experiment on the methodology derived from study to produce useful artifact

4.5.1 Methodologies Employed in the Dyeing Processes for Both Towns

The results of experiments carried out at both research sites revealed another area (specialization) in the local dyeing industry in Ghana. Abeokuta indigo dye adhered very well to cotton fabrics and yarns used in Ghana by the indigenous dyers.

The experiments on the adire technique brought to light another possibility in the local dyeing industry in Ghana (Daboya). It was revealed that all dye additives used by Abeokuta local dyers can be procured locally in Ghana to help improve upon Daboya local dye; in other words, boost Daboya local dyeing industry.

Though dyeing was carried out in plastic buckets for the experiment, the result was good, meaning dyeing in pots or pits has no bearing on the end results of the material being dyed. However, dyeing in pits is more expensive and laborious since it requires a lot of manpower to complete the dye extraction cycle.

The outcome of the experiment in Daboya revealed, that the methods (techniques) for dyeing, dye extraction and resist techniques for Daboya and Abeokuta can be used interchangeably to produce artefacts with good fastness properties, as it was carried out in the experiment on methodology derived from study. The artefacts produced from this experiment are contribution to the traditional fashion industry.

4.6 Summary of Discussions

The semi structured interview organized for both dyeing centres indicates that the youth are the majority in the local dyeing industry, an indication, that the future of the industry is bright. The study revealed that the male gender dominates in Daboya and the female gender dominates in Abeokuta. The rituals and taboos binding the industries are not strictly observed, this means, that there are currently no traditional or cultural restrictions in the local dyeing industry for both towns.

The results of the experiments on methodology from Daboya and Abeokuta revealed, that tools, materials and methods (techniques) can be used interchangeably to help bring about creativity. The comparative analysis of dye extraction and dyeing for both towns revealed their differences and similarities in the constituents of dye for both towns. Comparably, the differences in dyeing are dyeing in the pits as against dyeing in ceramic dyeing pots, the similarities in dyeing are the types of shades (blue, deep blue and black) produced by both towns.

The experiments also revealed, that certain dye additives for Daboya like the mud (zaarta) need to be eliminated to avoid the smell in finished products and to improve upon the fastness level. The resultant artefacts produced by the researcher affirm the possibility of injecting a new phase of fashion in Ghanaian traditional dressing to accentuate and to promote the Daboya culture. By this research, the study has proven, that the Ghanaian local dyeing industries, especially the Daboya local dyeing industry, has what it takes to be the most successful local dyeing industry if the research material and training would be made available to the people of Daboya and the general public.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Overview

This chapter tries to capture the main issues, that have been raised and discussed and drew valid conclusions from the discussions and recommendations made.

5.2 Summary

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The local dyeing industry has contributed greatly in the cultural, social and economic lives of the people of both countries namely Ghana and Nigeria. The art of local dyeing being practiced in Daboya (Ghana) and Abeokuta (Nigeria) to be precise, has been handed down from generation to generation. However, the locally dyed products in Nigeria unlike that of Ghana has good fastness property to abrasion, light and washing.

The study, therefore, attempts to do a comparative study of plant dyes, yarns, fabrics and methodology used in order to upgrade the methodology used in Ghana for the benefit of the local dyeing industry where locally dyed products lacks fastness to abrasion, light and washing which retards the economic progress of the local dyeing industry. The scope of this dissertation was limited to local dyeing, it also surveyed the Daboya craft village and Abeokuta local dyeing centre for firsthand information and sourced libraries for second hand information. To solve the problem, research questions were posed to meet the set objectives.

The qualitative research method was adopted, interview and observation are the research instruments used. The semi structured interview approach was adopted and one on one interview was organized using the interview guide to collect data from opinion leaders in

The local dyeing industry, dyers and traders dealing in locally dyed products from Daboya and Abeokuta respectively.

Data was collected, analysed, interpreted, conclusions were drawn and recommendations made. With regards to the comparative analysis, the major findings are as follows. The tests carried out for abrasion, light and wash fastness for Daboya locally dyed yarns and Abeokuta locally dyed fabrics gave an affirmation that Daboya local dye is not fast to abrasion, light and washing. The results of experiment on local yarns and fabrics using their local dyes and methodology gave a positive result. However, the *adire* technique carried out in Abeokuta revealed an area of specialization that is potentially beneficial to the local dyeing industry in Ghana.

In addition, the study revealed, that the dye additives used by Abeokuta local dyers can also be sourced locally in Ghana to help improve upon the Daboya local dye. The resultant artefacts produced out of the findings of this project when introduced will enhance the fashion industry in Ghana to project the culture of the people of Daboya and indirectly improve tourism and socio economic condition of the country at large. The success of this study achieved a workable technique for dye extraction and dyeing procedures to attain acceptable colour fastness. Finally, a revealing heartwarming realization was that relatively younger and energetic people are engaged in the local dyeing for both towns which gives the industry a promising future.

In the comparative analysis, implementing their methodology of harvesting fresh and young plants dissolved in a solution prepared from burnt cocoa shells (alkaline) solution, yet avoiding its decomposition by using less additives will be a sure way of achieving fastness to abrasion, sunlight and washing. It is believed that these findings and recommendations when implemented, will contribute greatly to the growth of the local

dyeing industry, improve their methodology which will eventually result in increased production.

5.3 Conclusion

Averting the problem the of lack of colour fastness to abrasion, light and washing in the local dyes cannot be over emphasized. In that, resolving that problem will improve the economic condition of the country, especially with dyers that use local dyes. Having identified and described the plant dyes, yarns, fabrics and methodology used in both countries and comparatively ascertaining their abrasion, light and wash fastness of their local dye.

An experiment conducted using Abeokuta methodology proved successful on the various artifacts produced. Interviews conducted in both towns on the industries activities, processes, buttressed with photographs and practical experimentations lives no doubt that the comparative study conducted will be beneficial if implemented by the local dyeing industry especially in Ghana. The commonalities regarding dye extractions, dyeing, of yarns and fabrics, preparatory processes and plant dyes gives the industry an edge to expand or diversify their end products to compete favourable in the local and foreign markets.

In addition the result of the experimentation on methodology derived from study brought to light that the local dyeing industry is capable of creating job opportunities for its citizenry to boost tourism. The study offers visual Art teachers and students firsthand information on some local dyes (natural dyes), dye extraction and local dyeing. Finally the results of the study involving two towns from two different countries will further help promote the good relationship both countries enjoy in trade.

5.4 Recommendations

Having critically compared and analysed Daboya (Ghana) and Abeokuta (Nigeria) local dyeing, the following recommendations have been made for consideration or implementation to help improve the artistic and socioeconomic status of the indigenes of Ghana and Abeokuta in Nigeria.

1. Daboya local dyers should incorporate various types of resist dyeing methods on fabrics, to help bring diversity in their profession as it is done in Abeokuta (Nigeria) to improve their status and the nation as a whole.
2. Though the vocation is practiced mostly by a particular tribe it has a promising future. It is therefore proposed that educational planners of the Ministry of Education should incorporate it into the educational curriculum at all levels in order to bring about artistic creativity and innovation in the industry.
3. The government organisations and the Council for Scientific and Industrial Research should come together to improve upon the cultivation of indigo plants, dye extraction and local dyeing processes. It is also essential that research institutions carry out scientific research on how to improve upon the fastness level of local dyes in Ghana to expand the colour variations of dyed fabrics and yarns used.
4. Government and Non-Governmental Organizations agencies should establish a research centre to support the local dyeing industry in the areas of designs, materials and technological advancement to meet modern needs. They should also introduce training centres in the district that would train people to research into problems relating to the industry and make possible implementation of the research findings.

5. The application of the result of the study should inform local fashion houses of the need to rely on these products because of their improvement in the fastness to washing, abrasion and light, so as to promote products of the local dyeing industry in Ghana.
6. The university should make available this document to students who would want to research further in this area to use it as a reference material.
7. The researcher will seek permission from the university authority to publish this piece and also to organize seminars and exhibitions to create awareness for the improvement of the methodology adopted in the Daboya local dyeing industry.

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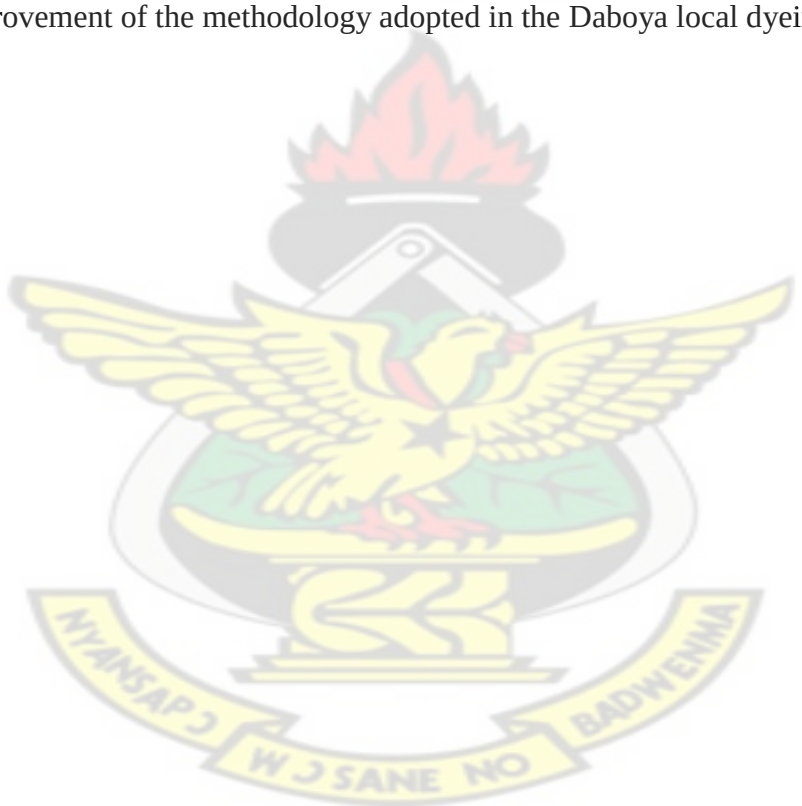

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APPENDIX A

An observation guide used in collecting data on local dyeing procedures in Daboya (Ghana) and Abeokuta (Nigeria) respectively.

1. What are dye additives?
2. Where are they additives obtained?
3. How are they additives preserved?
4. What role do the various additives play in dye extraction ?
5. What are the names of the dye additives?
6. What type of fabrics or yarn do you usually dye?
7. What are some of the tools used?
8. Are they locally made or imported?
9. What are the dye extraction processes?
10. How important is timing in dye extraction?
11. How do you determine the potency of a dye?
12. How is dye solution preserved?
13. What type of dyeing do you practice?
14. What are the preparatory processes for yarns and fabrics?
15. What is the dyeing process?
16. How vital is time when carrying dyeing processes?
17. How is a well dyed fabric or yarn determine?
18. Why are the dyed products dried in the sun?
19. Why are the dyed products dried in the shade?
20. How are locally dyed products the finished?

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APPENDIX B

An interview guide used in interviewing Daboya and Abeokuta local dyers of Ghana and Nigeria respectively

Section A

- ✓ **Social, demographic background information**

1. Age Range: 10 – 18, 19 – 25, 26 -36, 37 and above
2. Sex? Male or Female
3. Occupation, Part time or full-time
4. Which of them is part-time cloth dyeing or any other business

- ✓ **Educational background**

a. Basic education

b. Higher learning

c. Marital status:

Single b. Married c. Separated d. Divorced

Section B

- ✓ **Information on Abeokuta\ Daboya local dyeing as an occupation**

1. What is the name of your dyeing centre?
2. When was it established?
3. Since when have you been dyeing?
4. How did you become a dyer?
5. At what age did you start dyeing?
6. What was the duration of your apprenticeship?
7. At what age did you become a master?

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8. Is your dyeing centre a Co-operate entity, family business, an association, or a one man business?
9. What is the capacity of your workplace?
10. When are your working days?
11. What item do you produce from local dyeing?
12. What are they dyeing techniques used?

Section C

- ✓ **Tools and materials.**

1. What type of fabrics or yarn do you usually dye?
2. Which of the fabric or yarn is preferred by dyers?
3. How do you get the fabric or yarn?
4. Do you weave /spin or buy them?
5. How different is it with various fabrics or yarns dyed?
6. Does the fabric or yarn come in different colours?
7. What are they materials used in extracting dye?
8. Precisely in which part of the country can you find these materials?
9. Do you buy or grow them?
10. Has there been any improvement in the materials used?
11. What are some of the tools used?
12. Are they locally made or imported?
13. What materials are they made of?
14. How are these tools used?
15. Has there been any changes in the type of tools use?
16. If yes, mention them.
17. Has these changes affected production negatively or positively?

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18. Are the tools manufactured by dyers or bought?
19. What are the names of these tools?
20. Are there any taboo surrounding the used of these tools?
21. Are there any rituals performed before using the tools?
22. How are these tools maintained?

Section D

- ✓ **Extraction and Dyeing process**

1. What are some of the process involve in dye extraction?
2. How long does it take to extract dye?
3. Do you add chemicals to quicken the rate of the dye extraction process?
4. How do you determine that a dye solution is already in use?
5. How do you store dye?
6. How do you preserve your local dyes?
7. What is the local name given to the dye extraction process?
8. What are the names of the dye constituents?
9. How were these local names derived?
10. Do you know of any other method of dye extraction dye?
11. What are the attributes or signs of a good local dye?
12. What is (are) the colour(s) produced?
13. Are there safety precautions for dye extraction?
14. Is there any myth surrounding the kind of colours produced?

Section E

- ✓ **Dyeing**

1. What are the schemes of colour produced?
2. What are the dyeing process?

3. Is dyeing a preserve of any sex?
4. If yes, why?
5. What is the duration of dyeing?
6. Do you observe certain safety precautions while carrying out dyeing?
7. What are they dyed fabrics or yarns used for?
8. How do you appreciate colour?
9. What are the local names given to dyeing processes?
10. What are the traditional names and meanings of the colours produced?

Section F

- ✓ **Dye Fastness**

1. Is the dye fast to washing, abrasion and light?
2. How do you check for fastness in abrasion, light and wash?
3. How do you ensure that your dye is fast to abrasion, light and washing?
4. Does any of the dye constituents help improve the fastness level?
5. Has there been any improvement in abrasion, light and wash fastness?
6. If yes, how was it done?

Section G

- ✓ **Marketing and General Questions**

1. How much of dyeing do you do is in a week, month and in a year?
2. Do you solely do dyeing or you run other business?
3. Do you carry out dyeing activities yourself or you have people who dye for you?
4. How do you market your products?
5. How do you calculate for cost?
6. What is your profit margin?
7. Who is your target group?

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8. When do you normally get a lot of jobs?
9. Has there been any competition from western cultures?
10. How has western culture affected your jobs in terms of:

- Quality of ?
- Design of products?
- Patronage?
- Range of products?
- Nature of products?

11. Has the use of your fabrics changed?
12. Is there any retirement age in dyeing?

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