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TRANSFORMATION OF JUNCACEAE INTO VARIED ARTIFACTS: EXPLORING THE FRONTIERS OF TEXTILE ART PRODUCTION IN SOUTHERN VOLTA

BY

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DEDICATION

I dedicate this thesis to my children, parents, lecturers, friends, siblings, and my executive director of NBSSI, Madam Kosi A. Yankey.

DECLARATION

I hereby declare that this submission is my own work and that, to the best of my knowledge, it contains no material previously published or written by another person nor material which to a substantial extent has being accepted for the award of any other degree or diploma at Kwame Nkrumah University of Science and Technology, Kumasi or any other educational institution, except where due acknowledgment is made in the thesis.

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ABSTRACT

Juncaceae are swamp tall grass, which is used to weave mat in Southern Volta while in other countries, they are used in diverse ways. Formerly, concerns about sustainable development focus on environmental protection without the culture and identity of the society. The objective of the study is to examine the Juncus materials and improve upon their strength and colour, to produce innovative interior decoration products. Exploration and experiments were used to address the set objective-based conceptual framework adapted from the Engineering Method Steps Model and Art Studio Based Approach. It was identified that very few people were aware of the three (3) different types of Juncus namely Juncus *Acutiflorus,* Juncus *Inflexus,* and Juncus *Effusus* found in the Southern Volta. Moreover, the study found out that harvesting Juncus at the right time and cleaning them before weaving improves upon the strength, colour, ply and weave structure. Dyes and print paste fastness were poor with reactive dye, vat dye, water base print paste, fabric paste, acrilex and acrylic but red and green suede have excellent fastness. Variations in weave structure and sizes resulted in a wide range of products, incorporating kente cloth and Ewe symbols in some of the products. The study identified that the neglect of the Juncus was due to a lack of innovation and awareness in the industry.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

The most important quality of traditional textile goods is sustainability where products made from safe, organic, non-toxic, recyclable, or compostable materials (Rusu 2011). United Nations Conference on Sustainable Development (UNCSD) also known as Rio+20, which took place in Rio de Janeiro, was about earth submits and the outcomes were to address the factors that are degrading the environment (Sanchez and Croal, 2012). Similarly, the mission of the Ghana Environmental Protection Agency (EPA) act 490 is to guide development to prevent, reduce and eliminate pollution and actions that lower the quality of life (EPA 2017). Again, dedication to improving, conserving and promoting the country's environment and striving for environmentally sustainable development with sound, efficient resource management including social and equity issues (Eumolpo, 2017). Moreover, World Environmental Day was established since 1975 and celebrated annually to increase awareness of natural environmental problems with an exhibition of theme and venue that rotates every year in the ten regions of Ghana. Furthermore, Cambridge Advanced Learner's Dictionary also defines sustainability as something causing little or no damage to the environment and able to continue for a long time. Juncaceae literally known as swamp tall grasses are natural and sustainable plants that grow in a swamp, has cylindrical, elliptical or leaf round shape with umbrella-like cluster flowers. Their height ranges from 3-8 feet and flower between June and

September (Herbarium, 2015). According to Theford (2015), in Florida, it is an example of ornamental with many species that were introduced in landscaping a few years ago.

Pfaf (2012) outlines that, Juncaceae also known as Swamp Tall Grasses (STG) can be found in Britain, Sweden, Himalayas, Mongolia, Northern Ireland, Israel, Africa including Ghana and various regions. In Southern Volta STG covers a vast wetlands from Atito, Lakple, Deta, Fiaxo, Kodzi, Atiavi, Dabala, Agorkoe, Avalavi, Agbozume to Aflao and there are three (3) major species namely:

- *Juncus Acutiflorus* also called *Ketsi* literally meaning sharp flowers
- *Juncus Inflexus* also called *Ava* literally meaning Blue arrow
- *Juncus Effusus* also called *Yeke* literally meaning Soft rush

Personal communication with Senahia (2017) the leader of the Juncus mat weavers association asserts that matured STG are harvested, dried and sold in bails or woven into baskets, fence and two kinds of mats: a light one literally referred to as *Aba* thick one *Tsatsa* as shown in Plates 1 & 3 respectively.

Plate 1. Light mat

Plate 2. Frame for weaving

Source: Field report (2017)

Plate 3. Thick mat

Plate 4. Method of weaving

Source: Field report (2017)

Kete weaving is the second income-generating activity among men and women. Weaving STG mats on a four (4) by six (6) feet wooden frame as seen in Plate 2 and thick type tied on the ground with legs and hands as in Plate 4.

These mats were formerly used for drying cocoa and other cereals in Kumasi, Mankesim, Koforidua, Travanu, Dzodze, Togo but currently they are sold in local markets at Akatsi, Agbozume, Denu, and Togo solely for sleeping (Senahia, 2017). Most STG is reported to be toxic to mammals but *Juncus Acutiflorus* was common food in Northern Europe and the seeds used as medicine in China (Burke et al., 2011).

Lastly, Coulter (1958) as cited in Chhetri, Hynniewtan and Borthakur (2011) in his old book mentions that grasses are valuable commodities but commonly neglected. Due to the insignificant economic importance of Juncus, they are always neglected and suggests more studies in the field in order to save the species.

1.2 Statement of the Problem

In other countries, STG is used in diverse ways but in Southern Volta, it is limited to mat weaving. Formerly, concerns about sustainable development focus on environmental protection without the culture and identity of the society. However, sustainability has been described in three domains – environment, economy, and society. Furthermore, Kolberthbot (2017), defines sustainable development as organizing principle for meeting human development goals while sustaining the ability of natural resources and ecosystem services upon which the economy and society depend. Similarly, Daly (2011), said environmental sustainability requires society to design activities to meet human needs while preserving the life support system. Rusu (2011), shares the view that adaptation, change, and innovation are part of humanity and will continue in their path as creativity but will be lost if there are no long term solutions that will help the weaver to earn a fair income and quality culture value. However, Wolf & Quitty (2011), stated that, "Do It Yourself" (DIY) is a method or behaviour of building, modifying or repairing of things without direct aid of an expert or professional where individuals engage raw or semi-raw materials and components parts to produce, transform or reconstruct materials possessions including those drawn from natural environment. (NR Art & Drawing 2018) channel called DIY explores a similar concept. DIY behaviour can be triggered by various motivations as the market place (economic benefits, lack of product availability, lack of product quality and need for customization) and identity enhancement (craftsmanship, empowerment, and community seeking uniqueness).

A similar view from Mohamed (2016) states mat made from el- Summar herb (Juncus) and flax are traditional craft dating back to ancient Egyptian era and the local people have

developed innovative products to face common problems of humidity and insects. He adds that mats are displayed in Torino Museum, Italy but unfortunately the Juncus mat craft is no more well known and popular like old time. This is clear evidence that industry needs a new turn to regain popularity as attested by Ahmed & Javed (2007); Motti et al. (2009) quoted in (Amel, et al. 2002) some recent studies have focused on the contemporary economic importance of plant-based handicrafts.

With the advocacy on sustainability this study is motivated to explore Juncaceae weaving industry in Southern Volta under the concepts of DIY with Material Culture" by Jstor (2017), is cultural diffusion: the spreading of a cultural trait (material object, idea or behaviour pattern) from society to another; it is also culture symbolic based on symbols including language, objects with meanings and significance.

1.3 Objectives of the Study

1. To Access the production process of the various Juncus mats.
2. To Examine the materials and improve their strength and colour.
3. To Produce durable and innovative interior decoration products.
4. To Incorporate the Southern Volta identity through artifacts.

1.4 Research Questions

- Why do the local weavers always weave plain structure?
- What other materials and dyes can be used to strengthen and colour the Juncus?
- What other innovative products can be produced?
- Is it important to incorporate culture into artwork?

1.5 Delimitation

There are different species of STG that grow in various parts of Ghana, however, this study is narrowed to Southern Volta with three (3) species namely *Juncus Acutiflorus*, *Juncus Inflexus*, and *Juncus Effusus* because the raw material is sustainable and covers a vast land.

Mats weaving is the major income-generating activity of women in the selected area and Juncaceae is mostly used as a raw material (Senahia, 2017). Therefore, the study involves a lot of weaving production processes in addition to painting, applique, and knotting.

Innovative interior designs include different types of curtains, picture and mirror frames, lampshades, wall hangings, and wall covers. Furthermore, some Ewe traditional symbols will be incorporated into the work to promote their culture.

1.6 Significance of the Study

A research in exploring frontiers of textiles art through Juncus transformation would contribute to the following:

- Put the raw material into more innovative use.
- Improve upon the livelihood of the people and the nation through industrialization.
- Contribute to global campaigns about the use of bio-degradable and sustainable raw materials towards environmental protection.
- Promote the unique identity of Southern Volta.

1.7 Definition of Technical Terms

Frontier -It is the limits of what is known or what has been done in an area of knowledge or activity.

Textile - Arts are crafts and arts that use plant, animal or synthetic fibers to construct practical or decorative objects.

Juncaceae - Is a rush family or smaller plants that look like a type of grass which are found in wet marshy areas all over the world.

Transformation - Is a progressive change or modification from one state to another, again a complete characteristic of something especially so that they are improved.

'Aba'– A light mat woven on a frame.

'Tsatsa' – A thick mat woven on the floor with the hands and feet.

1.8 Abbreviations

UNCSD -United Nations Conference on Sustainable Development

EPA - Environmental Protection Agency

STG - Swamp Tall Grasses

DIY – Do It Yourself

3D - Three Dimensional

Fig. - Figure

1.9 Organization of the Rest of the Chapters

Chapter Two deals with the review of selected related literature. Chapter Three discussed the materials and methods of the study. Chapter Four reports on results and discussions of the findings. Chapter Five is the summary, conclusion, and recommendations.

CHAPTER TWO

REVIEW OF SELECTED RELATED LITERATURE

Overview

The primary concern of this chapter is to assess the extent of what other researchers have done and comprehensive analysis of related literature will help acquire an in-depth understanding of bridging of gaps between other parts of the world and Southern Volta. The areas considered for the review included: textile art, material culture, Juncaceae, processing of Juncaceae, fabrication techniques, uses of Juncaceae and marketing.

2.1 Textile Art

According to Howard (2018), textile art offers a unique platform for artists to develop and create innovative artistic expression. In addition, it is becoming increasingly useful and of great interest in interior decoration worldwide. He again states in Textile Art (2007) is the creation of textiles or creation with textiles in which textile artists use various techniques such as crocheting, embroidery, felt making, knitting, lace, patchwork, quilting, sewing, weaving and knotting to create artwork using thread and fibres sometimes combination with paints or dyes. Further definitions by Howard op cit are textile art or craft are practical or decorative objects constructed from plants, animals or synthetic fibres (Dowuona-Hammond, 2015). In a similar view, woven fabrics including products of art that contain filament under the conditions of flexibility by interlacing, plaiting, netting, weaving, sewing, and embroidery. Some of the materials used are twigs, roots, leaves, and grasses to produce baskets, mats, nest, shelter, hangings, garments under three (3) phenomena – constructive, functional and aesthetics (Holmes, nd**;** Amel et al., 2002).

Lunin (1990) pointed out that, there was a serious recognition of studio art craftsman's contribution not only in fibre but in several media with creative concepts. He also mentions DeGraw and, that Lenore Towney a weaver who created 3D forms and DeGraw in 1972 noted that contemporary fibre artists have explored vast resources of fibre types. Currently, artists combined fibrous materials with thread, clay, grasses, paper, wood, and even metals among others in their works. Here are some renowned Textile Artists: Anatsui who creates virtual fabrics with drape effect from discarded metal tins, Olga de Amaral (2012) creates 3-D effect with fibres and yarns, Agatha Olecksiask (2013) she crochets everything that enters her space and the theme is limitless, Leisa Rich (2015) works in 3-D innovative textile with varied textile materials to create realistic scenes, Gwen (2010) fuses textile with cement; the process produces surfaces with strong visual and tactile appeal for wall and ceiling decorations. Techniques like weaving, twining, knotting, wrapping, sewing, and felting were employed in the ancient period. Today some of these techniques are aided by electronic devices. Oyman (2013) is of the view that textile artist interpretations, techniques, and materials have changed and resulted in originality and unique artworks. In view of the above, there are possibilities of transforming Juncus into textile arts through material and technique.

2.2 Interior Design

Genchev and Kokorska (2017) mention that, the unique identity of a home is determined by its interior construction and furniture. Changes in social and cultural life has a direct impact on people's needs and the drive to simplify living space and minimalist started in the 21st century. However, there is an inclination towards the use of natural materials for aesthetic and texture.

2.3 Material Culture

Material is an object that people encounter, interact with and use as defined by Woodward (2007)**;** the Cambridge dictionary (2008) states that the material is a physical substance which things are made from. Culture according to Buchli (2004), refers to the traits of a population's behaviour, values, practices, beliefs, and religion. In other words, it is the total practices of people in a society that includes fashion, language, traditional products, art, music, and ideas which are recognized by culture awareness and it allows a person to build more successful personal and professional relationships in a diverse environment. Moreover, outsiders need to be aware of the culture and traditions related to a specific cultural environment.

Crouch (2008) similar opinion but concentrated on cultural artifacts that they include almost anything or artifact or items that are peculiar to a society which can prompt archaeologist and anthropologist to pay close attention to several things and may ask if the item tells a story, if it has embedded symbolism or illuminates cultural or social attitudes of the producers towards a specific topic (Ezell & Keeffe, 1994). Inferring from these authors, it can be established that culture or identity of a society can be preserved and promoted through artifacts moreover these artifacts are produced from materials.

Sociologists describe interrelated aspects of human culture in two different ways such as physical objects of the culture and ideas associated with the objects. Hence material culture refers to physical objects, resources, and space that people use to define their culture; these include homes, churches, mosques, factories, plants, tools, means of production, goods, and products (Houghton, 2016; Anel et al., 2002). The study extrapolates that, Juncus is an example of plant material culture which is woven into mats

as an income-generating activity notably among the Southern Voltarians. Ewe traditional symbols incorporated in some artifacts as non-material culture confirmed by Houghton op cit, non-physical ideas about non-material culture are beliefs, rules, morals, values, etc; furthermore, he adds that sociologists refer to symbols, language, and norms as a process that can shape feelings, behaviour, and thoughts.

Dant (1999) and Serva (2018) also have a similar view but she added that in the past some early historians, archeologists, anthropologists, and museum directors had a way of presenting material culture that showed bias judgement of cultural superiority. However, in academic disciplines, material culture items are used to learn about other people's cultures and preserve cultural heritage known as Cultural relativism.

Woodward (2007 p.3) as cited by Salvador-Amores et al. (2012 pp1-2) state that, material culture emphasizes how evidently inanimate things within the environment act on people and are acted upon by the people, for the purpose of carrying out social functions, regulating social relations and giving symbolic meaning to human activities. Woodward ibid still adds that there are three (3) uses of objects as makers value, identity and encapsulation of networks of cultural and political powers. In other words (Salvador - Amores, et al.ibid) agreed that studying the material objects can lead to an understanding of the different facet of social, economic and political elements present among indigenous people or as a crucial link between social and economic structure and individual actors.

Further opinion from Lannguy (2017), assert that material culture is the physical and architecture that surround people and according to (Dant 1999) artwork can mediate

messages between time or space or both between people who are not copresent; can transfer message from the creator to viewer and share an image, a feeling or experience.

Basically, all the writers talked about material culture as objects with multiple functions based on our experiences which may be wrong sometimes especially when the object comes from a culture far from its place of origin or removed for a long time. Personal interaction with Nene Nuer Keteku the paramount chief of Agotime Kpetoe (2016) confirms that Ewes are losing their tradition and culture. Similarly, Gomashie (2016), stressed on the need for Ghanaians to promote and preserve our culture in order not to lose our identity; just as California Indians do as stated by Sanchez, Caudel and Walkingstick ibid basket weaving is a luminous thread that connects indigenous environmental, cultural and linguistic restoration. In that case, traditional symbols and Juncaceae mostly use for sleep mat weaving in Southern Volta may find alternative uses in other parts of the world and project the identity of its origin (George and Delma, 2004).

2.4 Juncaceae

Under scientific classification, Juncaceae is a family name, Juncus as a genus name and belongs to the Plantae kingdom (Pfaf, 2012). Allason and Braid (1999) state that Juncus means rush in Latin; and (Pooley, 1998) were of the view that Juncus is a perennial herb that grows up to a height of two (2) meters and grows in salt marshy or fresh slow flow water in large colonies where it occurs. Its leaves are tough, round, spine-tipped and the sheath is shiny black; flourishes between October and February and are topped by spine-tipped bracts.

Barn (2017) stated that Juncus is a genus with over 300 species of grassy rushes. Abdelsamed, Ayman and Mohmoud (2012); Sioban and Linder (1998) also hold the same opinion that Juncaceae consists of eight genera of which Juncus L. but added that, the most famous species of the genus are eleven namely: Juncus *acutus* L, Juncus *Effusus* L, Juncus *Inflexus* among others. Again Juncus is a very large family distributed worldwide and usually grow in salty marshes or badly drained soil under different climate conditions. Another viewpoint by (Sanchez, Caudel, and Walkingstick, 2011) who state that Juncus is from a Latin word meaning to join or bind an indigenous plant and there are two hundred and twenty-five (225) species which are difficult to identify botanically that grow in temperate zones worldwide. According to Chhetri, Hynniewtan, and Borthakur (2011), they are of the same view but mention the Latin word as Jungo and add that there are three hundred and thirty-five (325) species worldwide. Additionally, family Juncaceae was established by Jussies in 1789 in Genera Plantarum based on genus Juncus L. commonly known as a rush; further share the habitat, uses and characteristics like other authors.

Jstor (2017), mentioned Juncaceae species as vascular plants which was explained by Augustyn, Bauer, and Eldridge (2018), as a plant system assemblage of conducting tissues and associated supportive fibres. Xylem tissues transport water and dissolve minerals to the leaves and phloem tissues conduct food from the leaves to all parts of the plant. Jstor ibid, states a similar description of Juncaceae as a scientific name and commonly known as rush family. Juncaceae are perennial rushes found in wetlands habitats that spread by rhizomes as seen in Plate 5.

Plate 5. Rhizome of Juncus plant

Source: Vicflora (2018)

They are round but some have flat leaves with flowers concentrated at the terminal inflorescences. Unlike grasses, the flowers reveal three (3) distinct parts: three (3) sepals, three (3) petals, two (2) - six (6) stamens and a pistil with three (3) slender styles see Plate 6 below.

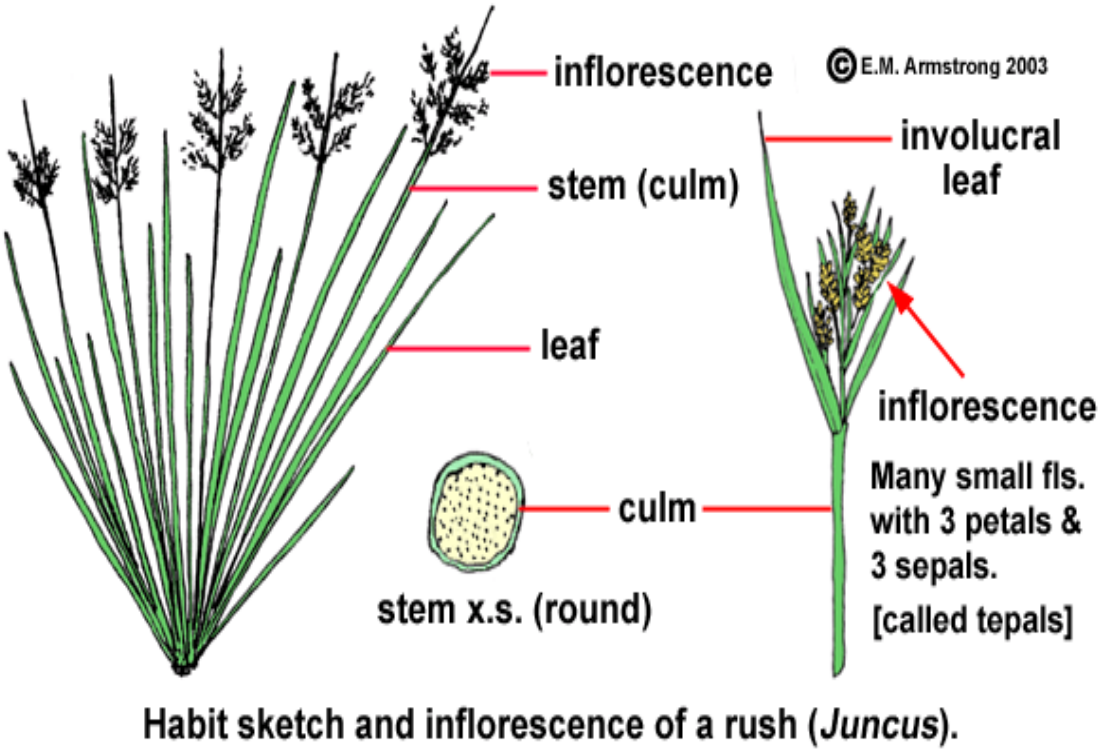


Plate 6. Parts of the Juncus plant

Source: palomar.edu (2018)

Mansour et al. as quoted in Abdelsamed, Ayman and Mohmoud ibid state that Juncus L species comprise marsh herbs usually with sympodial rhizomes developing leafy shoots (culms) which are typically slender, unbranched and nodeless as shown in Plate 7.

Plate 7. Culm of Juncus

Source: Seed of South Australia Conservation Center (2018)

The fruits are often beaked or pointed and contain numerous seeds. However, the leaves are not noticeable. Plates 8 & 9 show the fruit and seeds respectively.

Plate 8. Juncus fruits

Source: Steve D. Egger, 2008

Plate 9. Typical Juncus seeds

Source: USDA (n.d.)

Nevertheless, Juncus species tend to be fairly resistant to insects and diseases problem however, Aphids may feed on the stems but rarely cause significant damage (USDA, n.d.). Rushes can be found in many parts of the world nevertheless, Guinther (2016) says rushes of the Juncaceae are uncommon in Hawai and are likely to be mistaken for sedges if not flowering. He further quotes Wagner Herbst & Sohmer (1990); Imada (2013) that rushes in Hawaii comprise of two genera (Juncus& Luzula) but with eight species.

2.5 Types of Juncaceae

In view of the numerous description, it is clear that Juncaceae is a swamp or wetland tall grass with many species which can be found all over the world including Southern Volta. However, the study discusses three types namely Juncus *Acutiflorus*, Juncus *Inflexus*, and Juncus *Effusus* because they are common and abundant in the geographical location.

2.5.1 Juncus *Acutiflorus*

Ferchichi et al. (2014) state that, Juncus *Acutiflorus* belongs to Kingdom Plantae, Phylum – Tracheophyta, Class – Liliopsida, Order – Juncales, Family – *Juncaceae,* Scientific name is Juncus *Acutiflorus*, common name in the English language is sharp – Flowered Rush and in french language is Jonca fleurs Aigues.

Juncus *Acutiflorus* is the scientific name and the family name is Juncus. Other synonyms as Genuinus, Brevirostris, Jointed rush, Jointed leaf grass, Juncus *Kraussi.* It is also called the Sharp flowered rush or grassy plant. It commonly grows in swampy wetlands and woodlands but sensitive to nitrate environment. This jointed rush plant has round-shaped leaves or elliptical in cross-section, during pollination a new branch emerge from old ones, with noticeable shades of brown and maroon looking flower that appear between July and September. The seeds look like pointed capsules, straight leaves, smooth and circular in cross-section, hollow with transverse septa and three feet tall (Lindsey, 2019). Green (2017), also describes Juncus *Acutiflorus* as Sharp flowered Rush. It is a perennial plant which flowers in July – September, native tall erected rush with long creeping rhizomes and a height of 90 cm; leaves are rounded or elliptic in cross-section, jointed upright, loose brownish flower heads. A similar view confirms Juncus *Acutiflorus* as perennial geophyte species which extends by its horizontal rhizome, dwells in wet places, marshy, meadows, siliceous mountains, banks of small streams, acidic ponds and peat bogs. It flowers from June to August (Ferchichi, et al. 2014). Senahia, personal communication (2017) knows Juncus *Acutiflorus* as a jointed rush, STG, and *Ketsi* that grows in swampy, wetlands and salty lagoons as seen in Plate

10. It is perennial, flowers during September with clustered flowers that contain seeds; height is three to four feet tall.

Plate 10.Juncus *Acutiflorus* (Jointed rush)

Source: Bee Paysage (2017)

2.5.2 Juncus *Inflexus*

Hot Pepper Wax (2006) state Juncus *Inflexus* as a botanical name which belongs to the Juncaceae family with common names as Blue Arrows rush, European meadow rush and described as greenish gray-blue foliage grass looking perennial plant. It spreads slowly by underground root to form a tall graceful clump, colour ranges from green to rich gray-blue, stem is long and tubular with tiny yellow-green to tan flowers.

Plate 11.Juncus *Inflexus* (Hard rush)

Source: Proven Winner (2017)

Juncus *Inflexus* as shown in Plate 11 according to Pfaf (2012), is a type of Juncus family with common names as Hard rush, European meadow rush. Hard rush is reported toxic to mammals by causing irritation of the stomach, diarrhoea, nervousness, blindness, and death. Damp pastures or neutral soil are good for its growth in Europe, Britain, Sweden, South, East and North Africa. Terrain (2012), gave a similar description as being called Hard rush or Blue arrow rush is rhizomatous, densely tufted perennial true rush with upright cylindrical blue-green stems or leaves of 40cm tall. Its favorable habitats are flood plains, marshes, wet meadows, river or lake margins, wet hillsides and found in Europe, Asia, and North Africa.

2.5.3 Juncus *Effusus* (J. *Effusus*)

Hohfeld (2010) states the scientific name as Juncaceae, family common name – rush, genus name – Juncus and species name as *Effusus*. Common synonyms in Washington as Brunneus, Conglomerates, Effuses, Gracilis, and Pacificus. Common names are soft rush, Dudleyi, common rush and candle rush, dwells in freshwater, wetlands, meadows, pastures, fields, shallow water, lakes, pond edges acidic soils medium nitrogen and exposed mineral soils with similar opinion from Ionxchange (2017) that does well in full sun wet conditions, mucky soil, sand, gravel or silt. However, it is possible to grow rush at drier sites as in Plate 12 affirmed by (Loudon 2017) but will need watering during dry spell.

Plate 12. Dry site Juncus *Effusus* as Ornamental plant

Source: Zeeland, Michigan (2017)

It is hardy and adaptable, flowering starts from March to September. Juncus *Effusus* is one of the most frequent and abundant plant species that created management problems at certain research sites because it competes with other plants and do well in acidic wet environment. However, several cutting of J. *Effusus* may reduce moisture and decrease water levels rendering a less favorable environment for growth. It is easy to control in agriculture situations by hand cleaning, mowing, weed whipping and herbicide application (Mc Corry & Florence, 2003). Barn op cit mentioned that J. *Effusus* grows around ponds. Ionxchange ibid, describe J. *Effusus* as a native perennial rush which is about two(2) –four (4) feet tall, vegetative clumps of unbranched rounded cross-sectional medium green stems that stand upright. It is soft and hairless with a prominent dark coloured basal sheath at the base of each stem. Similar view from Lindsey 2019 ibid, that J. *Effusus* has floret which consists of three (3) sepal, three (3) petals a central ovary or seed capsules, three (3) stamens. Further states that, at the stage of maturity there are variations in stem colour ranging from green, straw to dark brown as agreed by (Grange Farms, 2017; Wright, et al. ibid). Furthermore, the roots are short scaly rhizomes and coarse fibrous. It can be propagated by dividing the clum or digging up the rhizomes, seed germination which is slower and problematic and a single style cross-pollination by wind during the blooming period in summer.

Bella Khada as quoted by (Abdelsamed, Ayman and Mohmoud, 2012) share the same opinion as Burke (2011); Ionxchange ibid that, J. *Effusus* is edible but caution is advised because of toxicity risk.

Plate 13. Pithy inside Soft Rush

Source: Tim Johnson (2010)

The pith of the stem as seen in Plate 13 has antiphlogistic, depurative, discutient, diuretic, febrifuge, lenitive, lithotripic, pectoral and sedative is used in the treatment of sore throat, jaundice, oedema, acute urinary tract infection and morbid crying of babies. Moreover, J. *Effusus* have the same uses as stated in Juncus uses in pages 42 - 45 but interesting to know how it is used for stencil paper. The harvested stems are split and cut into usable pieces, soaked for twenty-four (24) hours in clear water, cooked for two (2) hours with lye and beaten in a blender mixed with mulberry fibres make an off white paper.

Florida Wildflower Foundation (2017) also describe J. *Effusus* as soft, grass-like stems of the strict wetland plant in clumps and each bears cluster of very small, greenish-brown, scaly flowers. It is perennial, with dark green to brown colour, blooming time is from July, August to September with a different opinion on uses that muskrats feed on the rootstalks, birds find shelter among the stems but resist deer.

Plate 14.Juncus*Effusus* (soft rush)

Source: Proven Winners

2. 6 Production Processes of the Juncus

After germination through growth and maturity, the Juncus is harvested, dried, stored, coloured, strengthened, fabricated and marketed. Below is a review of how the stages are executed in other parts of the world.

2.6.1 Harvesting

Mature Juncus are harvested for use but the part to harvest depends on its end-use. The stems are harvested for weaving basket and mats, seeds for medicine, culms for paper production, rhizome for food and as referred to in uses of Juncus. Mode and technology of harvesting vary from country to country. In some instances, Juncus harvesting is a form of cultural practice as affirmed by Sanchez, Caudel and Walkingstick ibid, that gathering Juncus as part of sacramental cycle, renewal of a relationship with a place and a cultural practice that is hundred years old; furthermore, it is not only to honor ancestors

and its economic importance but also includes cultivating a profound respect for the species.

In some instances sorting and washing are done during harvesting while some do sorting after harvesting. According to Traynor (2007), Juncus harvesting treatment normally done by women consists of cutting all stems at the sediment surface using the knife from June to August. Individuals or groups wade into water and cut by hand with care not to bend the stems as shown in Plate15. In South Africa harvesting requires careful monitoring to ensure future supplies. A similar view from Karen (nd) states at Walpole Island, they are gathered in early August and women wade into the water to get the stems selecting the matured rushes of medium size from five (5) – six (6) feet long.

Plate 15. Harvesting Juncus in water by a group of women in Lakple

Source: Field report (2017)

According to Small (2011), that weavers of San José de la Zorra, California, Mexico harvest their Juncus throughout the year, but only during the full moon. She adds that

gardeners say the soil moisture is at its peak during full moon making it easier for weavers to gather Juncus. Similarly' Vassar (2011), a Luiseno basket weaver attests that they harvest at full moon because it is easier and better to pull the Juncus, healthier for the plants and produce better material for weaving (Small, 2011). This clearly indicates that pulling is one of Juncus harvesting techniques as seen in Plate 16.

Plate 16. Pulling method of harvesting Juncus

Lydia ibid again adds that there are advantages of pulling during full moon such as the root system and rhizomes are not disturbed even if you pull hard, chunks of rhizome are not attached to pull out the stalk and helping to stimulate the growth of new stalk. An opinion from Karen ibid says rowboats are taken out to midst of rush area; rushes are grasped with two hands and pulled up carefully not to crush them even though few come with difficulties and also rushes were harvested by the roots or cut off by knife as shown Plate 18 but pulling is better because maximum length is achieved.

Plate 17. Harvesting Juncus by cutting off with a knife

Source: Tim Johnson (2010)

Wright, et al. (2011) agreed that rushes are cut every other year in summer as near the root as possible and affirmed by (Ionxchange ibid); the butt is the strongest and thickest part of the plant.

Plate 18. Juncus Seed harvester

Source: Arbuckle (2012)

Sometimes seeds are harvested as affirmed by (United States Department of Agriculture (USDA), n.d.) that the flowering period is in late May to August and occasionally September. Rippen seeds are collected by hand using a pair of hand shears or tractor seed

harvester as seen in Plate 18. Plate 17 is the cutting method employed in harvesting and is done all year round without any monitoring in the Southern Volta.

2.6.2 Drying

According to Kiniets & Jones (1942, p.526) as cited in (Karen nd) that, cleaning and washing are done during harvesting by swishing the Juncus through the water. Drying is a very important stage in the Juncus industry and care must to taken because the mode, exposure time, weather can have an effect on the quality, colour, and strength of the end product. After careful washing, the stems are kept straight, laid out on the floor for several days to dry Wright, et al. (ibid), as shown in Plate 19 below. In addition, for even drying they must be turned from time to time.

Plate 19. Drying on the floor by spreading

Source: Sanbi (2006)

Barn ibid is of the same view that Juncus *Effusus* growing around ponds are harvested, sorted, arranged and dried in the sun for few days as shown in Plate 20.

Plate 20. Drying in bundle outside

Source: Wright, et al. (2011)

Above is a picture of rushes cut in high summer and are dried outside a Deben rush weaver's factory in Debenham. The picture shows that drying is done in tied bundles. Similar drying styles are shown in Plates 21 & 22.

Grange (2017) is also of the view that bundle drying harvested cuts are transported home each day and stood against hedges to allow sun and wind to dry it over a day. He further mentioned that the weight reduces by 50% during drying.

Plate 21 Plate 22

Farmers Drying Harvested Juncus *Effusus* in Kumamoto Japan

Sources: Getty Image (2016)

Shane et al. (n.d.): P.10 are of different opinion that oven drying is sometimes used for special uses. On the contrary, Wright, et al. ibid, stated that artificial drying is not satisfactory because drying may not be even. As described by the authors above, it is evidently clear that drying is done by spreading individual Juncus on the open floor or tied in bundles to dry. On the other hand mode of drying depends on the end uses. Some effects are achieved from drying which is discussed under Juncus colouring.

2.6.3 Packaging and Storage of Harvested Juncus

Harvested Juncus are either sold fresh or dried from growers or retailers but before storage, the Juncus must be totally dried. They are either tied in bundles or bolts, stand upright in the open but kept away from rain and sun. The size of a bolt is ten (10) feet by three (3) meters high and about forty (40) inches round base (Wright, et al. ibid). Similar opinion from Traynor op cit, is harvesters sell cuts in bundle. During the raining season

the Juncus are left in bundles at thin ends and hanged over poles for air circulation to moulding but on sunny days they are spread on the shed roof, turn over daily; once bleached they can be kept indefinitely before use (Karen, nd).

2.6.4 Juncus Colouring

There was no much literature on the artificial colouring of Juncus for product manufacturing as attest by Densmore (1929, p.163) in Karen (n.d.) that rushes are the hardest material to dye and often requires several dippings before desired shade can be produced. This may be one reason that although vegetable dyes were rich but quiet is done (Boyle, 1898) in (Karen ibid). Grange Farm's ibid. pointed out that, the natural tones, textures, and scent is ideal for interior today. In addition, said that colour of a rush starts from the green but will mellow to golden honey tones as they age. Further explained that variation in weather during drying process naturally produces extraordinary and beautiful shade colour: prolong sun gently bleaches to warm honey tone, a vivid green or blue colour is achieved during windy weather. A similar opinion says native grasses or any other plant material after harvesting should be dried very well in the sun for bleach colour or in the shade to retain the green colour (Bidingal 2013). Another process by Karen (n.d.) reveals an old ivory colour after cooking and drying Juncus in the sun for a week. He again mentioned that during bleaching Juncus is turned several times each day and is collected before sunset because dew causes the Juncus to turn yellow in the bleaching process.

Grange Farms ibid again said there is no use of chemicals at any part of the process. United States Department of Agriculture (USDA) ibid attest that chemical treatment in the Juncus industry is limited by cultural constraints and gave an example that Indian

basket weaver use mouth to split Juncus culms during material processing than other populations. The natural colour of Juncus can also be consciously achieved during harvesting where weaver select time and site to harvest for a particular effect as mentioned by Lydia Vassar quoted in Sanchez, Caudel and Walkingstick ibid that, all basket weavers are interested in gathering Juncus with a deep rust or brown colour at the earth end of the Juncus stalk; on a harvest expedition, richly coloured Juncus were found in wet and swamp areas near elderberry trees. These particular colours are used for intricate designs during weaving as shown in Plate 23 basket below.

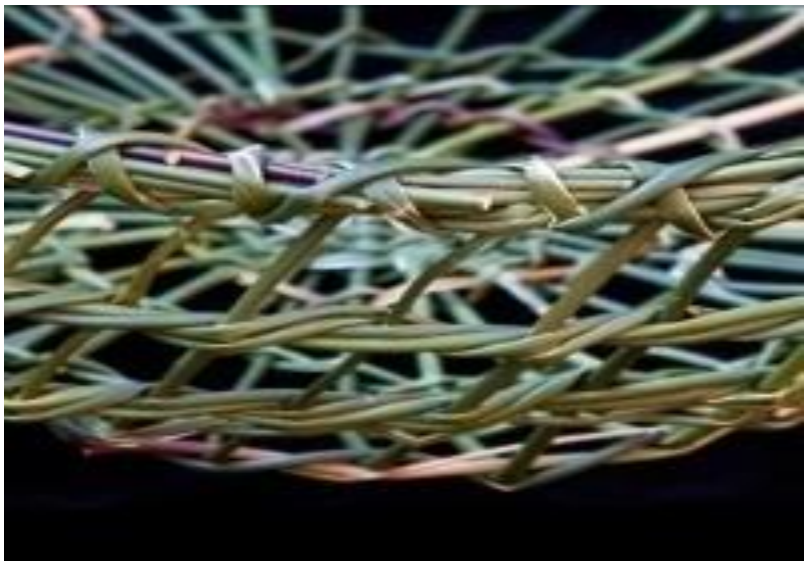


Plate 23. Natural Coloured Juncus for Special Effect

Source: Smalls (nd)

Wright, et al. (2011), are of the opinion that Juncus present problems as well as a charm when handling it; and added that, the colours are beautiful though all will fade in time to uniform soft brown. The stage of maturity can also influence the colour of Juncus as stated by (Barn ibid; Ionxchange ibid; Florida Wildflower Foundation ibid). Turnbaugh and Turnbaugh op cit, as quoted in the United States Department of Agriculture (USDA)

ibid, mentioned mottled yellowish brown as a natural colour of soft rush. According to Karen (n.d.) Mrs. Wadena uses bloodroot (Indian paint, San guinaria canadensis L., Mĭs go ji' bĭk) for dyeing some of her rushes. Nolan (2011) and InternetarchiveBot (2018) confirm bloodroot as a popular red natural dye used by Native American Artists, especially among Southern river cane basket makers. It is a perennial, herbaceous flowering plant native to Eastern, North America, grows from twenty (20) – fifty (50) cm, leaves and flowers sprout from a reddish rhizome with a bright orange sap that grows slightly below the soil. A break in the root reveals a reddish sap which can be used as a dye.

Mrs. Wadame again describes methods of dyeing rush: before preparing the dye bath, blood roots are boiled for twenty (20) minutes for deeper shades. They are later crushed, pounded and boiled with enough water to cover damp rushes in a kettle. Eight (8) or fewer strands of rushes are culled, coiled eleven (11) inches in diameter and tied with basswood bark stips. Each coil is boiled for twenty 20 minutes, turned occasionally and result in the shade is yellow-orange resembling light orange peel.

However, Karen (n.d.) calls the resulting colour red contrary to yellow-orange, Hilger again calls the resultant colour from indelible pencil brown orange and black for black muck. The dyed rushes are drained and kept under a blanket for use. Another method is removing three (3) lead from indelible pencils, broken up, placed in boiling water with half a bundle of rush and boiled for thirty (30) minutes. This gives a bright purple. The same process is used for "black mud" a blue, black clay sometimes occurring at the mouth of springs as authenticated by Densmore (1928 p.370) as cited in (Karen nd). Additionally, Chippewa women buried their rushes in the black earth for few days

accounting for a satisfactory black colour. Two quarters of mud and four (4) strips of walnut bark are boiled in a kettle. Furthermore, other substances such as mahogany give black colour.

Hilger again mentions different methods of dyeing as rushes are swish in ashes, boiled and soak overnight besides some say boiling makes them too soft as Bidingal ibid also mention that over-soaking for hours may damage basket weaving material. Furthermore, dyeing may be achieved by soaking or boiling but gave an example of Suaeda used for black colour, parosela for yellow; sometimes the Hupa chew stems of woodward with alder bark to redden them or blackening through simple burial in mad or ashes.

Karen ibid mentions (Smith, 1932 p.418; Boyle, 1898) that rush must be bleached before successful dyeing can be achieved because the natural colour can conflict the dye colour. In summary, the Juncus is mostly used in its natural colour. However, variations are caused by the maturity stage, habitat, mode of drying and time. On another hand, the use of chemicals is not encouraged in the industry and the natural dyes are highly medicinal an example is bloodroot and Suaeda where both seeds and leaves were eaten by animals, as medicine to human and basket were also dyed with Suaeda. All discussed have a positive impact on sustainability.

2. 6. 5 Fabrication techniques

According to Wright, et al.ibid, the form and type of a basket in any part of the world depends largely on the plants growing in the area. Furthermore, in basketry, the mother of invention is a necessity. In addition pre, iron age rush matting was found at Mere in Somerest. However, there are many techniques used in rush fabrication from time

immemorial. Wright, et al. ibid, continued that, plaiting, braiding, and sewing is ancient techniques used by some large families of European rushes and sedges industries. Similar opinion from McColley and McColley ibid is that a great variety of native materials that grow in or near an area can be utilized in weaving, decorating, coiling or twining; mentioned basketry and related crafts as the products made. But adds dyeing as a technique which is proven by Chhetri, Hynniewtan and Borthakur (2011) that flowers of Juncus species were used in traditional dyeing of fabrics and wool. Juncus stems are used in basket making, mat weaving, twisted or braided into ropes for tying or binding (Ionxchange (ibid); (Anely, et al. 2011).

According to Strike (1994) as quoted by United States Department of Agriculture (USDA) (n.d.) stated that California Indians make larger mats by piercing holes into the Juncus and threading cordage through them. The coiled basketry prevailed among some tribes in Southern California. It further mentioned that the baskets foundation materials were Juncus balticus and Juncus *Effusus* sewn together with Juncus textilis and cattail during product formation. This indicates that other species apart from the three under the scope of the study are incorporated during production including jute as confirmed by Grange Farms ibid, during floor matting.

McColley and McColley (ibid), emphasize that native materials such as Juncus among others can be used in basketry. Furthermore, Grange Farms ibid, organizes training courses using techniques like weaving, twining, coiling, plaiting, knotting, sewing, roping, chair seating to produce mats, bags, hats, baskets, and chair seats.

With a critical analysis of the above statement, the conclusion can be drawn that, Juncus industries and artists used techniques like weaving, sewing, knotting, braiding, plaiting, twining, roping, dyeing, decorating to make mats, bags, tumplines, baskets, and chair sitting.

2. 6. 6 Preparation of Juncus before Fabrication.

The local industry understudied leave the Juncus for weaving under dew overnight, it is beaten with a beater to remove air from the pith and make the culm flat and soft. The dew also makes it flexible and pliable. During the study, water was used to wet the Juncus and kept them under a blanket during weaving for flexibility but will get rotten when kept more than 24 hours.

2.6.7 Mode of Fabrication

Rush mats may be designed or ornamented by colouring and variation in weaving techniques or combination of the two. Dyed rushes may occur in plain stripes with no weave variation which is very common and several colours may appear in alternating bands. Ordinarily, only a few coloured dyed rushes are found in a mat and design weaves are achieved by crossing the rushes over each other between the weft strand forming a zigzag appearance (Karen, nd).

In China, Juncus mats are machine woven (Plant unlimited Naturally 2016). McColley and McColley (ibid), are of the same view but argued that basket woven from hand made native materials are much more expensive than machine woven.

Weavers such as Wright, et al. ibid outlined that there are five (5) categories of making basket: stakes, frame or ribbed, coiled, plaited and twinned.

Plate 24. Mat Weaving Technique

Plate 25. Egyptian mat making using Juncus

Source: Heritage trust

Plate 26

Plate 27

Juncus mat weaving technique

2.6.8 Strength

Rush is a soft material, easily broken when dry but strong when damp (Wright, et al. 2011). Another viewpoint expressed by Allason and Braid (1999), who states that the reason for Juncus kraussii also known as jointed rush is its hardness but easy to bend during weaving as agreed (South African National Biodiversity Institute 2006).

Karen (ibid) mentions that some rushes were not suitable for mat and adds because they were brittle and those that grow at edges of any lake or river are unsuitable. Furthermore, cooking process just after harvesting improves upon the strength. Without this process the rushes become harsh, brittle, less firm with less desirable colours. Juncaceae among four-leaf species with parallel venation and fibres are permeated with large quantities of silicon compounds making them flexible, tough and durable (Anel, et al. 2002). On the other hand, a recycled woollen felt is used as an underlay for rugs and other Juncus

finished items to improve upon the strength (Grange Farms 2017). In conclusion, the strength of Juncus depends on the species, treatment, habitat and uses.

2.6.9 Uses Of Juncus

South African National Biodiversity Institute (ibid) records that, the great physical strength and versatility of rush make it an asset in wetlands, used to prevent erosion and perfect fibre for weaving. United States Department of Agriculture (USDA) (n.d.); Chhetri, Hynniewtan and Borthakur ibid are of the same view rushes are used to prevent erosion.

In Europe, loose fresh rushes are strewn on earthen floors of houses for cleanliness and insulation but were changed two (2) to three (3) times a year and naturally become extremely foul. As a result of that around 16th century, plaided rush matting was used in small rooms of large houses (Wright, et al. ibid). She added that poor people lay on a mattress stuffed with rushes so did the sick, church monuments from 16^{th} – 18^{th} century show noble dead laid on plaided rushes as done by the Ewes (Spieth. 2011).

Furthermore, Wantonlife (2015) elucidates that, in the 18^{th} century Juncus plant was strewing herb which was scattered (strewn) over the floors of dwelling places and other buildings as an insecticide, fragrance, and disinfectant.

However, in South Africa, Juncus is highly regarded as weaving material among the Zulus a cultural bridal sleeping and sitting mats are presented as a wedding gift from the bride to the husband's family. Beer strainers, wall mats, spoon baskets, calabash lids, foam removers for traditional beer, decorative baskets, table mats, and twine were produced from Juncus karaussi on the other hand, alternative species were not suitable for

weaving sleeping mat and basket (Traynor 2007). Kotce (2001) said wetland plant crafts can have multiple benefits such as lowcost production of utility items and opportunity for social exchange during the production process. Similarly, (Athalye 2016) mentioned the significant role that the handicraft sector in home textile products and country economy by creating employment and generate substantial foreign exchange while preserving its cultural heritage (Sanchez, Caudel and Walkingstick (n.d.).

Babu & Aspinwall (2016), mentioned the massive use of seagrasses in their matting products. El-Sayed (2003) said that Juncus *acutus* plant is a raw material for paper making. Amel et al. (2002) affirm El–Sayed (2004) that plant fibre also known as lignocellulose fibre from Juncus *acutus* was raw material for paper making. The same opinion shared by Abu Hamifa (805) and Ibn El–Beita (1248) as quoted in Abdelsamed, Ayman and Mohmoud ibid state that culms of Juncus *acutus* are used in paper industry but added that, a mat industry of Juncus in Cairo being the centre for rush mat industry.

Moreover, it was found out that Juncus species were found to be rich in fatty acid and amino acid and members of Juncus L have been reported to contain several groups of natural compounds such as flavonoids, coumarins, terpenes, sterols, phenolic acid, stilbenes, dihydro - dibenzoxepin, carotenoids. Furthermore, traditionally the seeds of Juncus are employed in oriental as a remedy for diarrhoea.

Again Fathi et al. (2007) discover that Juncus *acutus* have an anti – inflamation effect of phenathrenoid; similar chemist. Furthermost, Wai Yee Hong (2018) listed Juncus *Effusus* as one of the seven ingredients in Hiu Sup Tea.

Loudon (2017), asserts that soft rush or Juncus *Effusus* is the most ornamental species used and the stem is employed with common rush in making chair buttons, mats and the pith for rushlights (Bedfordshire 2017) that, Juncus are used as rushlight candles by dipping two strands in fat or wax and cordage basketry. Dale and Hones (2008) has a similar opinion and added that in European countries Juncus is used as ornamental, water body protectors, planted around backyard ponds and feed for certain types of animals.

However, Terrain (2012) mentioned that Juncus are used to produce cheap painting brushes. Rushes are popular weaving material for natural basketry (McColley and McColley ibid). Hoffman (2017) concur that, in the course of man history, many cultures have used various species of Juncus as material for weaving basket and mats whilst Plant unlimited Naturally (2016) mention that in China, the Juncus mats are used in arrow and spear training.

According to Barn (2017), Roubo refers to Juncus as a fibrous material used to make polissoir tool for wood finishing process, in addition, Yannick substantiated that, polissoir made from Juncus has a different feel and performance than those from sorghum broom straw. Similarly, Daiku (2014) said he was first introduced to polissoir by Schwarz (2013) who was also introduced to by Don Williams working with A. K. Roubo in his "L'Art du Menuisier" and observed that Juncus was a material used in polissoir construction.

This indicated that there are many uses of Juncus such as ornamental, mats, baskets, medicine, checking soil erosion, food, candle, paper, among others in other countries but in Southern Volta of Ghana mats are mostly made from these grasses. On the other hand,

(Mc Corry & Florence, 2003) discussed that some Juncus was one of the most frequent and abundant plant species that created management problems at certain research sites because it competes other plants.

The gaps found were no colour usage, no combination with other materials like fabrics, beads, no incorporation of traditional symbols, no applique, much was not said about its use as curtains, wall coverings, wall hangings, mirror frames and lampshades.

2.7 Theories and Methods

In order to construct a model for the study, the Aesthetico – Action Research and Engineering Design Process models were reviewed as shown in figs. 1 & 2 respectively. According to Marshal (2010), the Aesthetico – Action Research is a cyclic form, its process involves observe, reflect, plan and create. At the centre of this, observation leads to planning and creation to reflection. While the Engineering Design Process models deal with the definition of the problem, do background research, specify requirement, brainstorm evaluate and choose a solution, develop and prototype solution, test solution, solution meet the requirement / partially or not at all go back to brainstorm evaluate and choose a solution and communicate findings to society.

Again engineering design process is a series of steps that engineers follow to come up with a solution to a problem such as designing a product. However, engineers do not always follow the order because it is very common to design, test, find a problem and go back to do modification or change to your design which is called iteration.

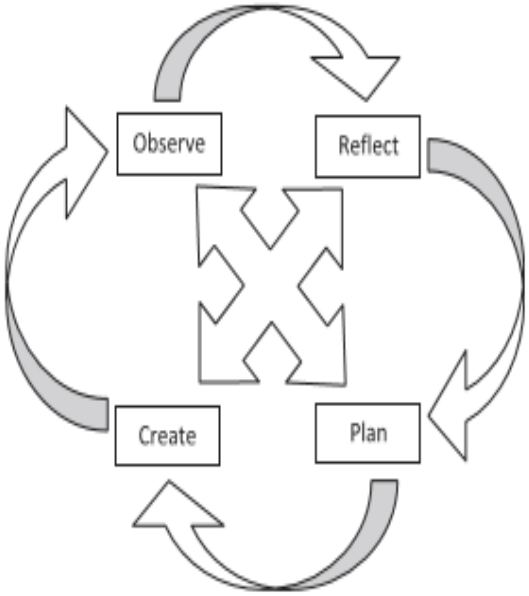


Fig. 1 Aesthetico –Action Research Cyclic

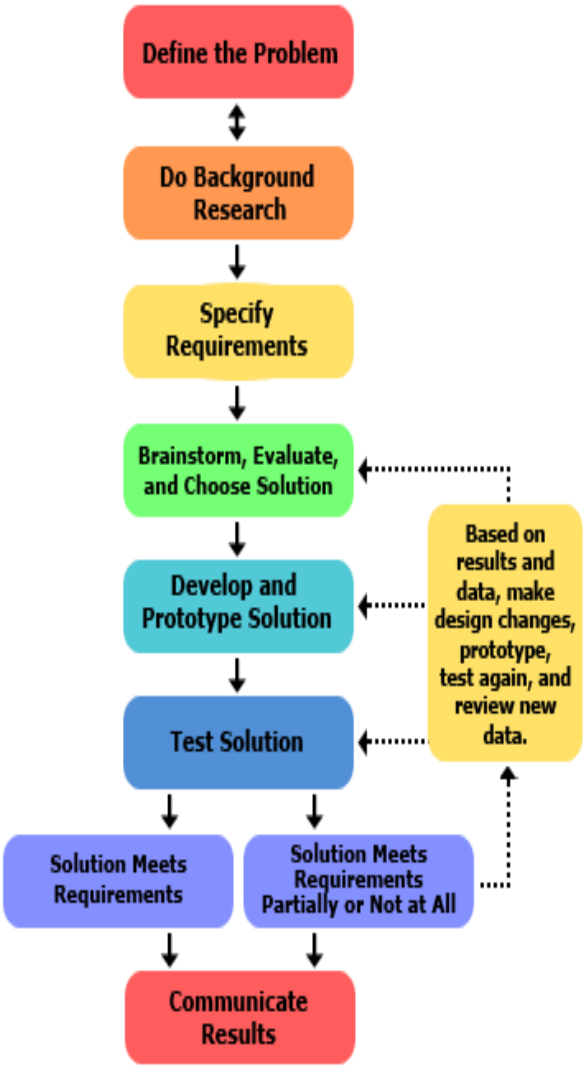


Fig. 2 Engineering Design Process model

The next chapter discusses the research design, methods, model, materials and tools that were used for the study.

CHAPTER THREE

MATERIALS AND METHODS

Overview

This chapter discusses the materials and methods that were used to execute the work. It further outlines the research approach, methods and adopted a suitable model from Aesthetico–Action Research and Engineering Design Process models that were reviewed. However, without appropriate design and use of the research method, it is unlikely to gather quality information and create a shaky foundation for review, evaluation, and recommendation. The philosophy of the study was based on pragmatists believed in order to achieve in-depth data.

3.1 Art Studio Based Approach

The Research Design was Art Studio Based Approach where Marshall (2010) opines that such research poses a rich possibility of contributing to the creative process and the larger body of knowledge. Furthermore, the relevance of such an approach drawn from the fact that it involves the production of a cohesive body of work and a written component referred to as exegesis.

Niedderer and Roworth-Stokes (2007) assert that the term Practice-Based Research and Art-Based Research has been used to describe the kind of degree that includes both a creative work as well as a written thesis.

3. 2 Exploratory Research

This study aims at exploring the frontiers of textile art production in Southern Volta through Juncaceae transformation. To effectively bridge the identified gaps, the researcher used the exploratory research method.

Brain (2012) is of the view that an exploratory research design is the development of hypothesis rather than their testing; he further explains that, it is to identify the boundaries of the environment in which the problem, opportunity or situation of interest are likely to reside.

Kumar (2011) holds the same view that this kind of research seeks to focus on areas where little is known or investigate the possibilities of undertaking a particular study or project as confirmed by (Jackson 2010). He adds that the advantages of exploratory research design increase understanding, concept testing, assistance to researchers, flexible of data source, help find out possible ways to achieve decision-makers goal, better conclusion and provide answers to questions related to administering a big and costly research project. However, cautions that there are disadvantages of exploratory methods including seldom offer adequate answers to research questions.

Bhat (2018) also stipulated that exploratory research would not be able to replace conclusive, qualitative research, have limitations, interpretation of finding is usually bias; it makes use of modest samples that might not be representative since they are not chosen on a probability and the work does not have worth. He further outlined that popular methods of exploratory research design include depth interview, literature search, focus group, case analysis.

3.3 Adopted Model from Engineering Method Steps and Aesthetico–Action Research

The conceptual framework for the study was adopted from the Engineering Method Steps Model and that of Aesthetico-Action, which were reviewed in chapter two. Before selecting an appropriate design, analysis and evaluations were made on a number of issues about the project outcome.

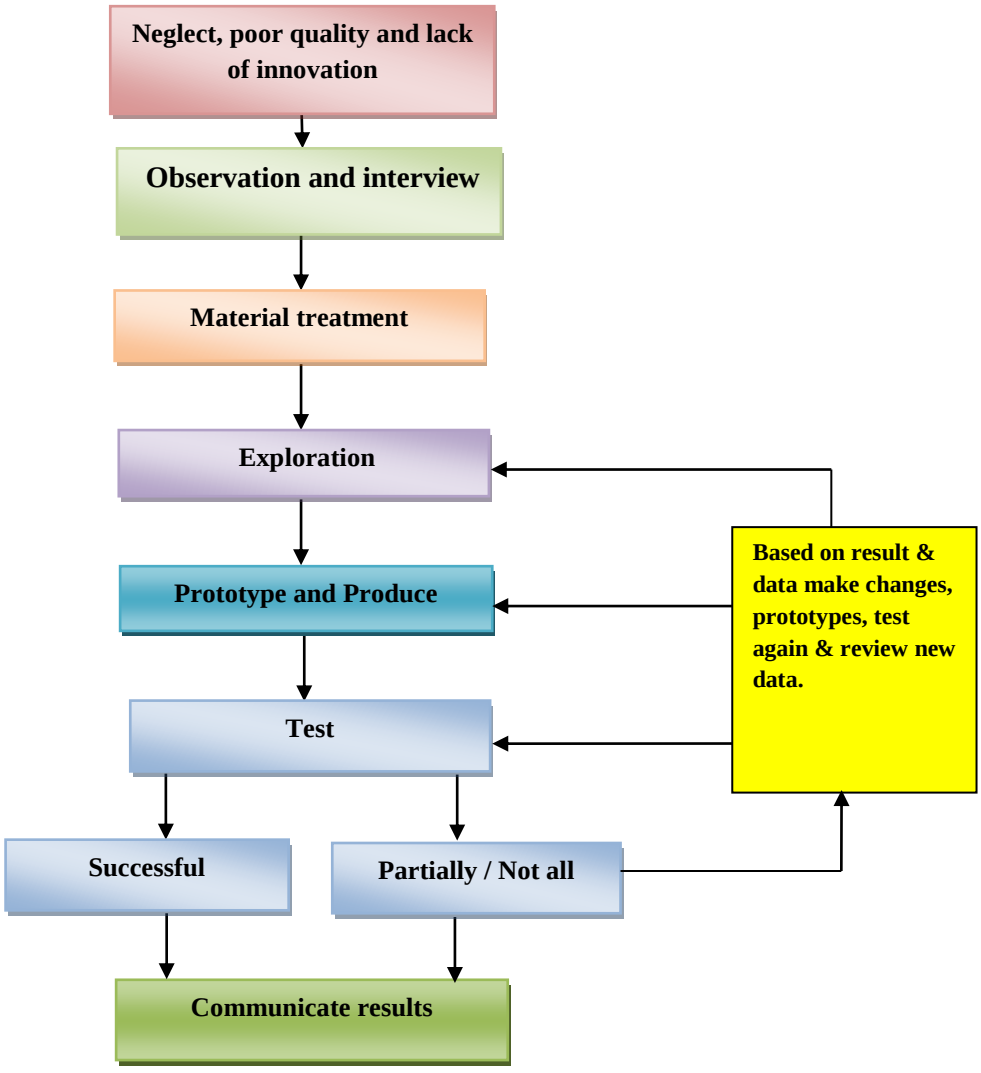


Fig. 3 Adopted Model

Source: Researcher's Concept

3.4 Tools and Materials

Local women own the Juncus mat weaving industry and the transformation has to be gradual considering their financial strength; the researcher used simple, cheap local tools and materials. Below is a table of tools, materials and their uses.

Table 1. Tools and Materials

Tools	**Uses**	**Materials**	**Uses**
Scissors	Cutting & trimming	3 types of Juncus	Weaving
Hammer	For nailing	Rattan and cane	Molding
Knife	Harvesting and cutting	Cotton yarn	Weaving
Locally made wooden Frame	For weaving	Plywood	Installation
Needles and crocheting pin	Weaving and stitching	Wood	Installation
Brushes	Glue & varnish application	Cut off fabric pieces	Colour enhancement
Tape measure	Taking measurements	Adhesives	Bonding
		Sea sand & shells	Decoration

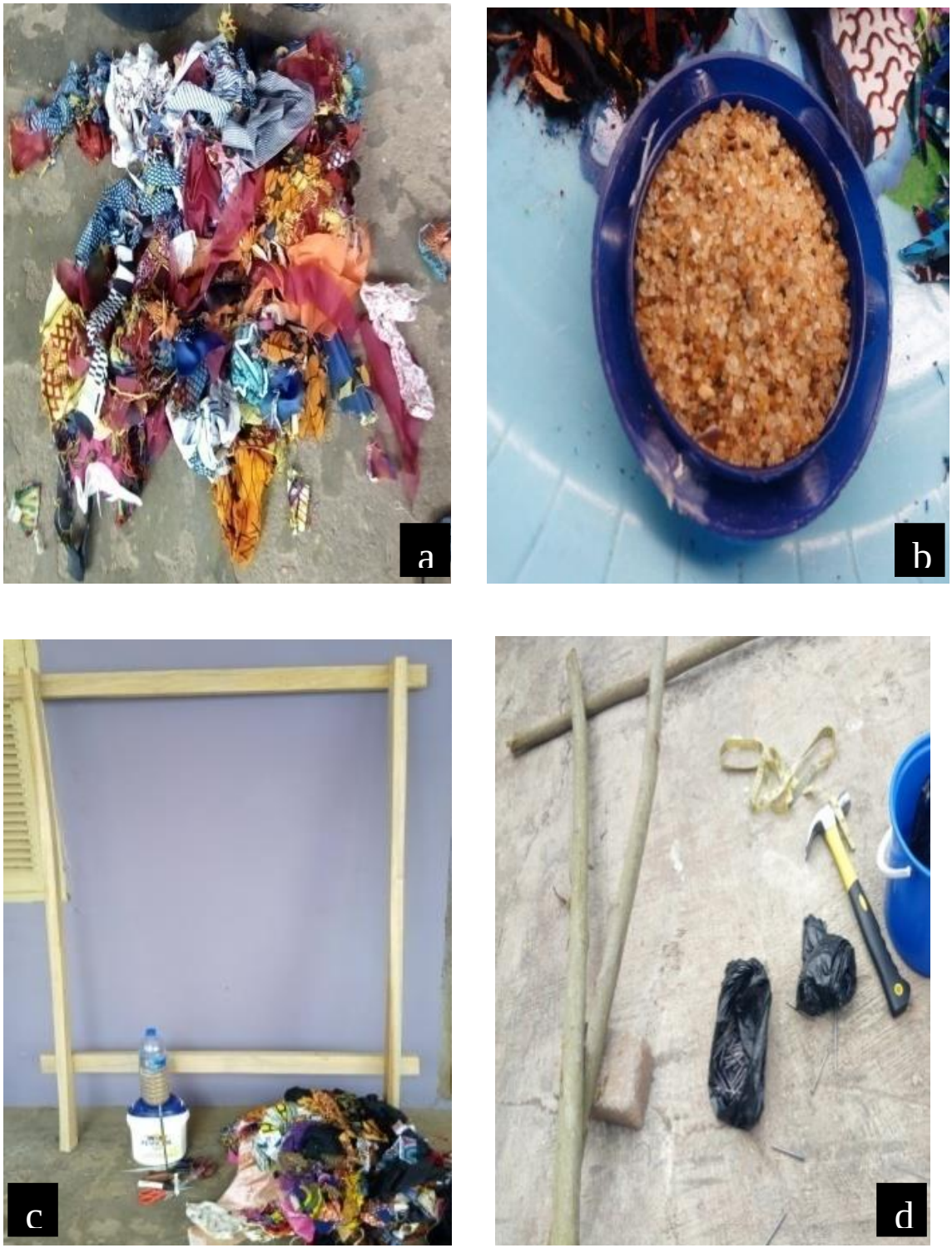


Plate 28. a – d are tools and materials used

The next chapter discusses the results and discussion of findings.

CHAPTER FOUR

RESULTS AND DISCUSSION

Overview

In this chapter, three things are involved – present, discuss, and outline the main findings based upon the set objectives and following the steps in the model. The issues discussed were interconnected to address the motivation for the study and objectives include the production process of the various Juncus mats, strength and colour improvement of the Juncus, production of durable and innovative interior decoration products and promoting Volta identity through material culture.

4.1 Objective One: To Access the Production Process of the various Juncus Mats

With reference to the first step on the adopted model in chapter three that is neglect, poor quality and lack of innovation as seen below.

Neglect, poor quality and lack of innovation

The research began from problem identification where the raw material, which is Juncus, covers a vast land in the Southern Volta. It was revealed from the literature that Juncus was used in diverse ways in other countries as discussed under the uses of Juncus but given no importance in Southern Volta as affirmed in Ketu South Municipal Assembly 2017 Medium Term Development Plan for (2018 – 2021). Thus, natural resources, economic activities, trade, and industries were discussed under the Municipal profile with less attention given to the Juncus mat weaving industry. Two types of mats were woven -

Aba and *Tsatsa*. Lastly, weave structures are only plain weave and running stitches. It was also noticed that very few people are aware of the three (3) different types of Juncus found in the Southern Volta, which exhibits the degree of neglect.

Plate 29. A view of Juncus at Avalavi

Source: Field report (2017)

4.1.1 Participant Observation and Interview

In order to have an in-depth understanding of the identified problems the researcher did participant observation and interview as seen below attested by Kumar (2011: p.125) that, participant observation is one of the tools for information gathering by developing a close interaction with a group or living in the situation of study.

Participant observation and interview

Therefore, observation and review of related literature were used to study the Juncus matured stage, time and mode of harvesting, drying, storage, colouring, preparation for weaving, mode of weaving and marketing.

Besides, the information was collected through other methods such as informal or unstructured interviews, group discussions, researcher participation in activities, previous document and oral history. However, the use of multiple methods enhance the quality of information collected but if care is not taken you may introduce your own bias. Below were some steps taken to gather data.

4.1.2 Population for the Study

The Juncus is available in Keta, Akatsi, Ketu North and Ketu South districts.

Material population: three types - namely Juncus *Acutiflorus*, Juncus *Inflexus,* and Juncus *Effusus.*

Human population (sampling) – sixty-five (65) weavers were observed and interview from seven (7) communities based on skills in production and marketing strategies as shown in Table 2.

Table 2. Results from the studied population

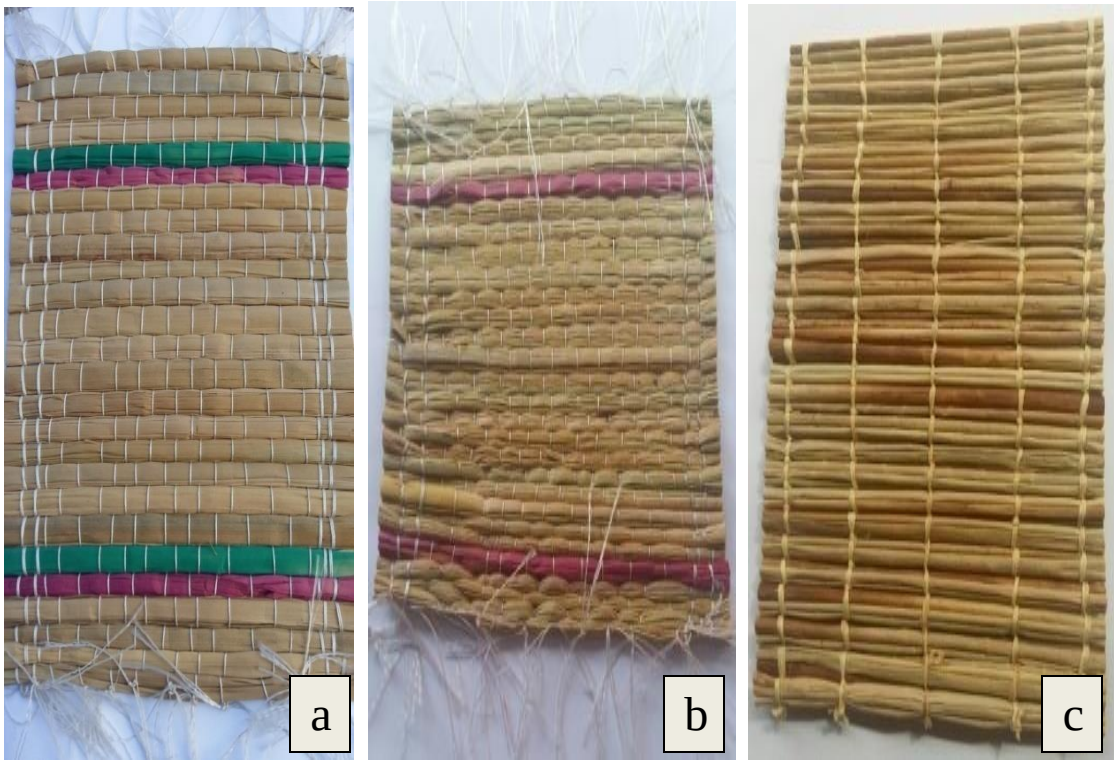
Community	**No. of weavers**	**Findings**
Akame	14	Weave thick mat from improper harvested soft rush.
Agbozume	10	Weave thick mat from harvested and bought Juncus.
Agbogbome	15	Weave light mat from bought Juncus and sell mats in Togo
Atito	5	Weave light mat, sell soft rush and mat inn & outside region.
Avalavi	10	Major sellers of Juncus and weave light and thick mats.
Dabala	5	Weave light mat and sell Juncus.
Yame	6	Weave thick mat from harvested and bought Juncus.

4.2 Objective Two: To Examine the Materials and Improve upon their Strength and Colour

Results from the previous step and review in chapter two indicated that the poor quality of the end products started from the material treatment; from harvest to the storage of the finished product.

Material treatment and skill training

Therefore, the stages of material treatment were discussed into detail under exploration and the skills were acquired through participation and observation as shown in Plate 30 a-c below the results.



Plates 30 a-c. Researcher's Practice-led samples

Source: Field report (2017)

The table below shows the characteristics of the various mat, weaving technology and uses.

Table 3. Characteristics of the mats

Type of mat	**Type of Juncus used**	**Technology**	**Characteristics and feels**	**Weave Structure**	**Used**
Light mat	Blue arrow	Woven on four by six feet wooden frame	Lightweight, hard and noisy	Plain weave	Sleeping and curtains
	Jointed rush	Woven on four by six feet wooden frame	Lightweight, hard and noisy	Plain weave	Sleeping and curtains
	Soft rush	Woven on four by six feet wooden frame	Soft and cool, well define bricks structure and silent.	Plain weave	Sleeping and curtains
Heavy mat	Jointed rush	Woven on the floor with the use of hands and feet	Heavyweight, hard and noisy.	Running stitch	Sleeping and floor insulation for cement packing
	Blue arrow	Woven on the floor with the use of hands and feet	Medium weight, rough and noisy	Running stitch	Sleeping
	Soft rush	Woven on the floor with the use of hands and feet	Lightweight, soft and cool	Running stitch	Most comfortable sleeping mat.
Sometimes the Juncus are mixed together in a single mat to blend the characteristics and decoration.					

Other results were achieved through exploration as discussed in the next paragraph.

4.2.1 Exploration

Harvesting

The approach to the research is exploratory as discussed earlier. In order to expand the frontiers and transform the Juncus industry, the researcher explored areas under the mode

of harvesting, drying, storage, colouring, preparation for weaving, mode of weaving and marketing.

Experiment and Exploration

For empirical evidence, the researcher went on harvesting expedition with the weavers in three (3) different sites at Atito, Avalavi, and Akame as seen in Plates 31 and 32.

Plate 31. Harvesting in water at Atito

Plate 32. Harvesting on land at Avalavi

Source: Field report (2017)

It was observed that every community understudy has one major species and another one as minor. Table 4 shows the distribution of natural resource and the quality of harvesting.

Table 4. Distribution of the Juncus and quality of harvest.

Community	Type of Juncus	Quality of Harvesting
Akame	Jointed rush	Very bad
Agbozume	Blue arrow, jointed rush	Partially harvested and good
Agbogbome	Not found	Not found but is the second biggest mat weaving community
Atito	Soft rush	Very good
Avalavi	Jointed rush	Very good
Dabala	Jointed rush, blue arrow	Very good
Yame	Not found	Buy or harvest from Akame, which was done badly.

The matured Juncus plants were harvested for use but the parts (stem, seed, culms, or rhizome) depends on the use. In Southern Volta, the stems were harvested for mat weaving. The modes of harvesting vary from country to country, results from the literature review, and field study reveals that there are two common types namely cutting and pulling. Each comes with advantages and disadvantages as shown in table 5. Cutting was common to both local and international industries. A sharp knife was used to cut the stem close to the roots or rhizome as in Plates 16 & 18. Tractors were also used in the United Kingdom to harvest seeds. Though the advantages of pulling are the same, as the

disadvantage of cutting the local industry under studies prefers cutting as time is valuable resource in the industrial setup.

Table 5. Advantages and Disadvantages of Cutting and Pulling harvesting

Advantages of cutting	**Disadvantages of cutting**	**Advantages of pulling**	**Disadvantages of pulling**
It is fast.	Length of the stalk is reduced. Partial cut marks all over the stem. Natural stem colours were left closer to the root. Chunks and rhizomes attached to the stalk. Time spent on sorting. The growths of new stalks were destroyed.	Chunks and rhizomes do not attach to stalk. Help to stimulate the growth of new stalk. Maximum length achieved. Colour enhancement. Selection time is eliminated. Harvested plants are clean.	It is time-consuming.

Drying was done at home, harvesting site or by the roadside as shown in Plate 33 a-c. The freshly harvested Juncus are spread in a pie shape for easy collection, left for four (4) – seven (7) days to dry because of the weight and distance most of them dry at the harvesting site. These grasses are left in the rain, dew, and dust until the day of the collection which has a negative effect on the colour and strength as in Plates 33 b & c.

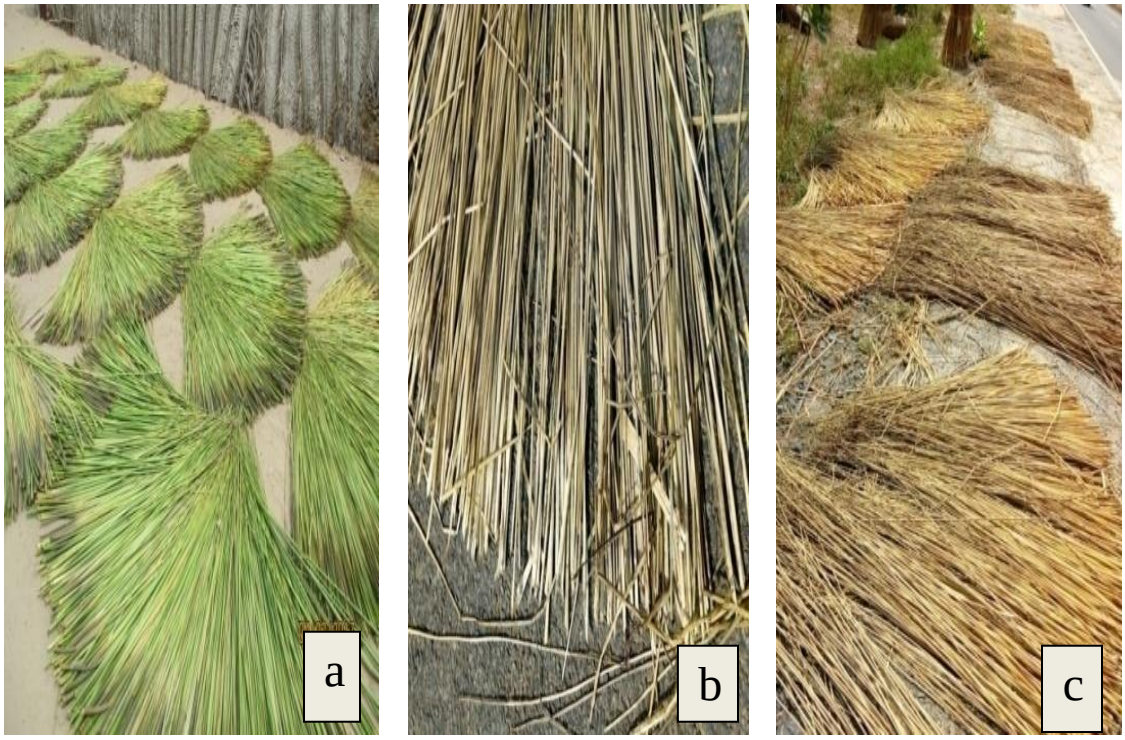


Plate 33 a-c. Juncus Drying

Source: Field report

Drying is also another critical stage and must be controlled by mode, exposure time and weather because they can have an effect on the quality, colour, and strength of end product. Related literature reviewed reveal that washing is done before drying while no or little attention is paid to that during participant observation. The mode of drying was spreading the individual grasses on the floor or shed roofs, small bundles were made to stand upright against walls for support and oven drying for a special purpose. While

participant observation revealed that, drying was done at harvesting site, by the roadside, and at home with an interesting style which makes collection easier as seen in Plate 34 below. This was different from those reviewed.

Plate 34. Drying at Atito

Source: Field Report (2017)

The following were the disadvantages of site and roadside drying:

- Forget the exact place for drying since they harvest in a vast the area.
- Juncus collected by a different harvester intentional or accidentally.
- Grazing cows walk over the Juncus.
- Air from speedy cars distorts the arrangement.
- Possibility of a road accidents.
- Floods wash away Juncus.
- Fire outbreak during the dry season.
- Drying is left at the mercy of the weather that affects the strength and colour.
- Exposure to dirt.

Exposure time is the number of days the Juncus dry thoroughly if not so moulding will take place at the same time over-drying also affects the strength and colour four (4) – seven (7) days during the dry season and more days during the raining season. Literature recommended collection before sunset every day and re-dried the next day to prevent contact with dew and unexpected rain. Participant collected dried Juncus even after two or three weeks because they did not have time and turning was not done. Proper drying management was poor due to the amount of Juncus harvested in a day or week. Again, weather was paramount to drying, as literature mentioned but harvesting in Southern Volta is uncontrolled and done all season due to ignorance and poverty.

Packaging and Storage

Harvested Juncus were sold fresh or dried bundle sold to other weavers. As discussed in chapter two, they are tied at the smaller ends and hanged over poles for air circulation during the raining season. In the case of participants, Juncus were left on the ground in the rain and collected after several days. This affected the colour and strength negatively. Plates 35 & 36 were storage from two different weaving communities under the study. The skill and competence were exhibited even in material handling. Reviewed literature and study, there was no mention of termite attack on Juncus but the researcher's Juncus materials were attacked as seen in Plate 37. Though chemical treatment is not allowed, with the application of insecticide the material is free from termite attack.

Plate 35. Improper storage

Plate 36. Proper storage

Plate 37. Termite attack

Source: Field Report (2018)

Colouring

In reference to objective two, colour improvement was paramount and as a result, the researcher made an in-depth exploration to achieve successful results. During the participant observation, it was noted that the Juncus were mostly dyed in red, green and violet sudin in all the communities and the explanation they gave was "*those were the only colours that beautify the thin mat as shown in Plate 38, there were the colours their grandmothers used".*

Plate 38, Decorated mat

Source: Field report (2017)

Plates 39 a-c show process of drying. First between fifteen (15) and twenty (20) strands ofwetJuncus were tied in balls as in Plate 39 a, they were then immersed into a sudin dye solution, salt added and boiled on fire at 100 ^{0} C for 30 minutes see Plate 39 b and stored for weaving as in Plate 39 c.

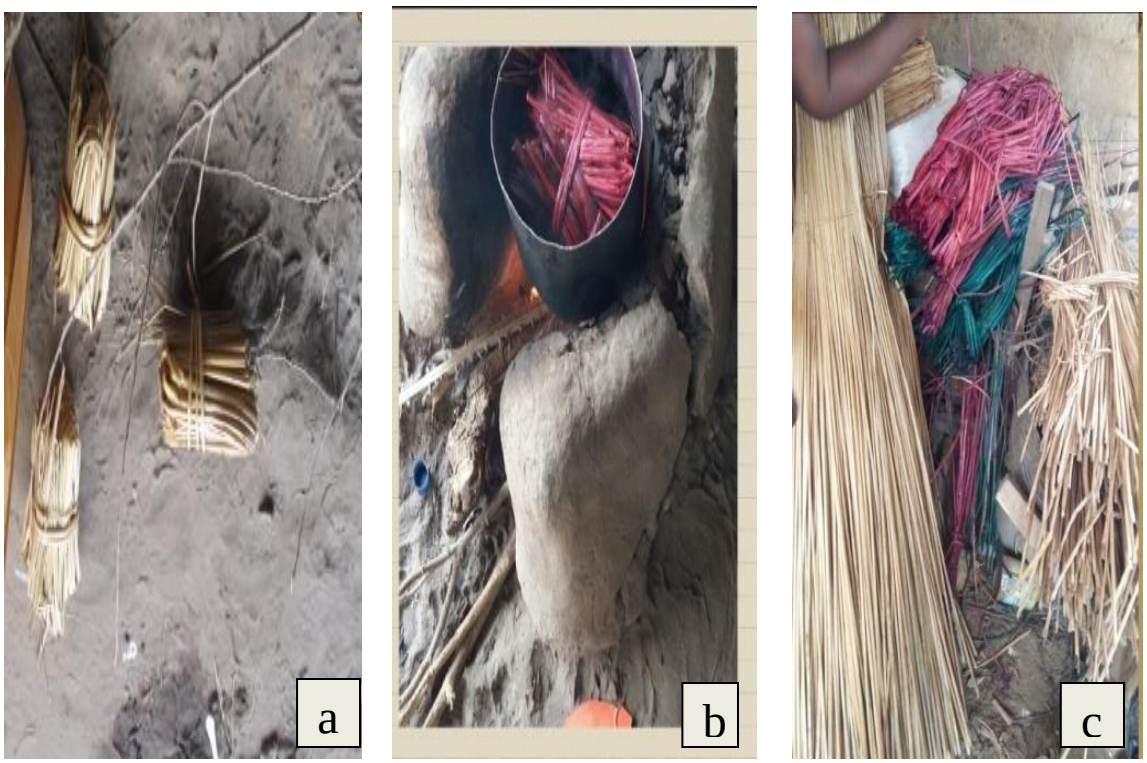


Plate 39 a – c. Dyeing process

Source: Field Report (2017)

As pragmatists believe that, the value of an idea is measured by the consequences it produces when it is translated into action. They also believe in the common saying: the end justifies the means (Oti-Agyen) ibid. The researcher then explored by experimenting with other colours of sudin, vat dye, reactive dye, acrylic print paste, Acrilex, fabric paste, and water base print paste since they are mostly used in textile printing. The outcomes are discussed.

Sudin Exploration

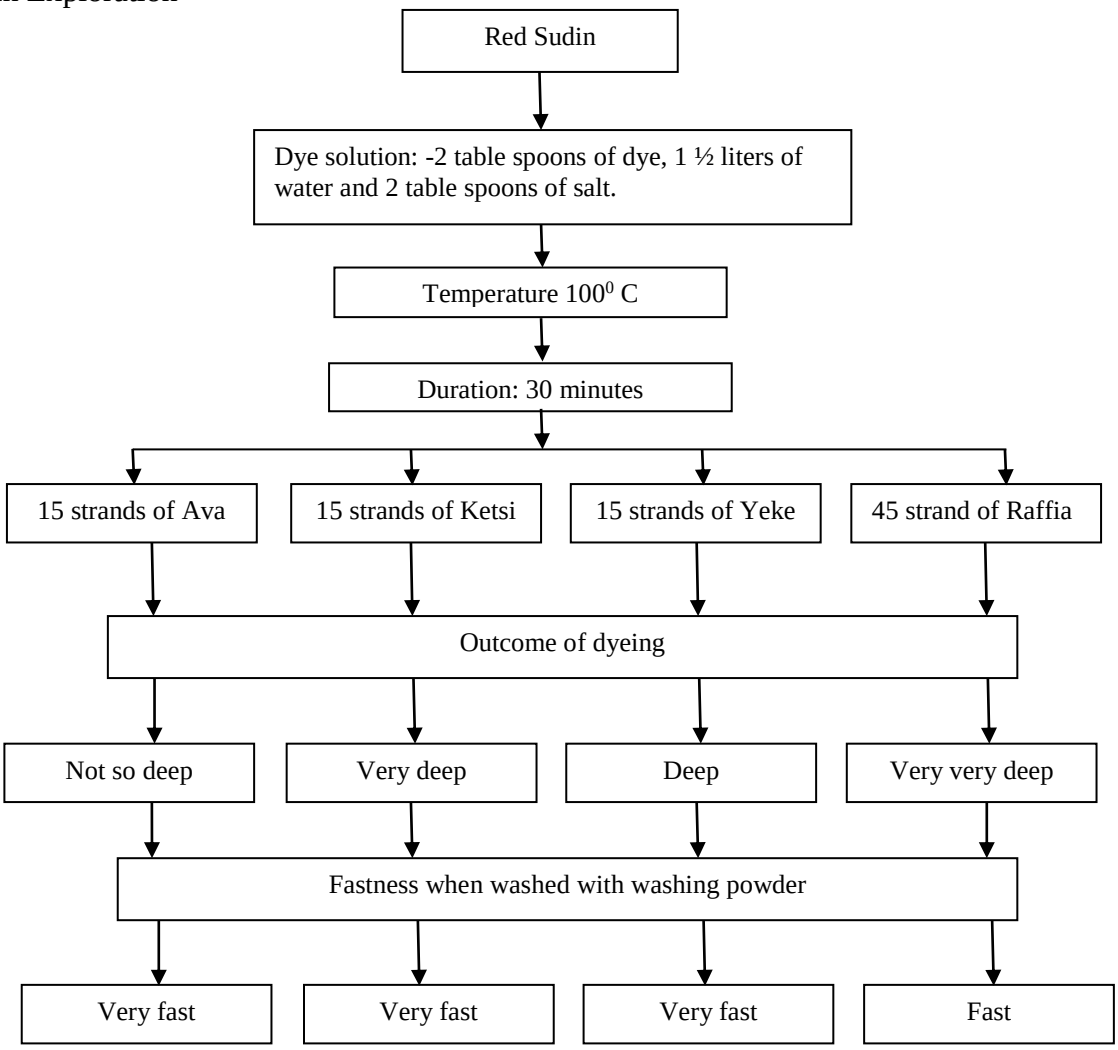
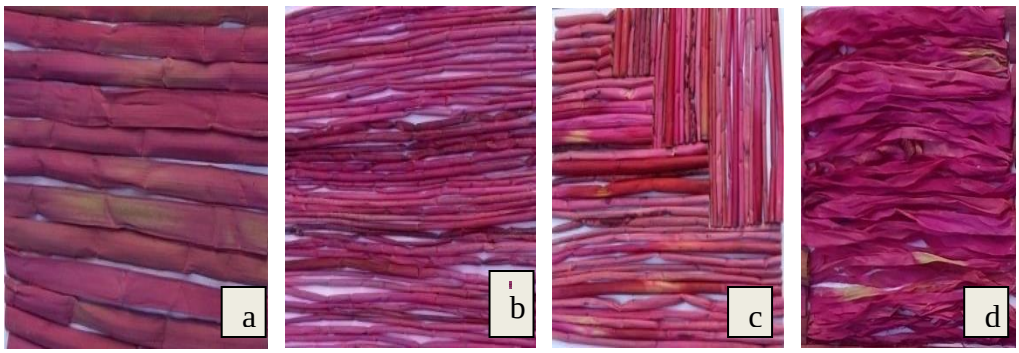


Fig. 4 Experiment with red sudin dye on Juncus



Plates 40 a-d Outcomes of red sudin respectively

Source: Field report 2017

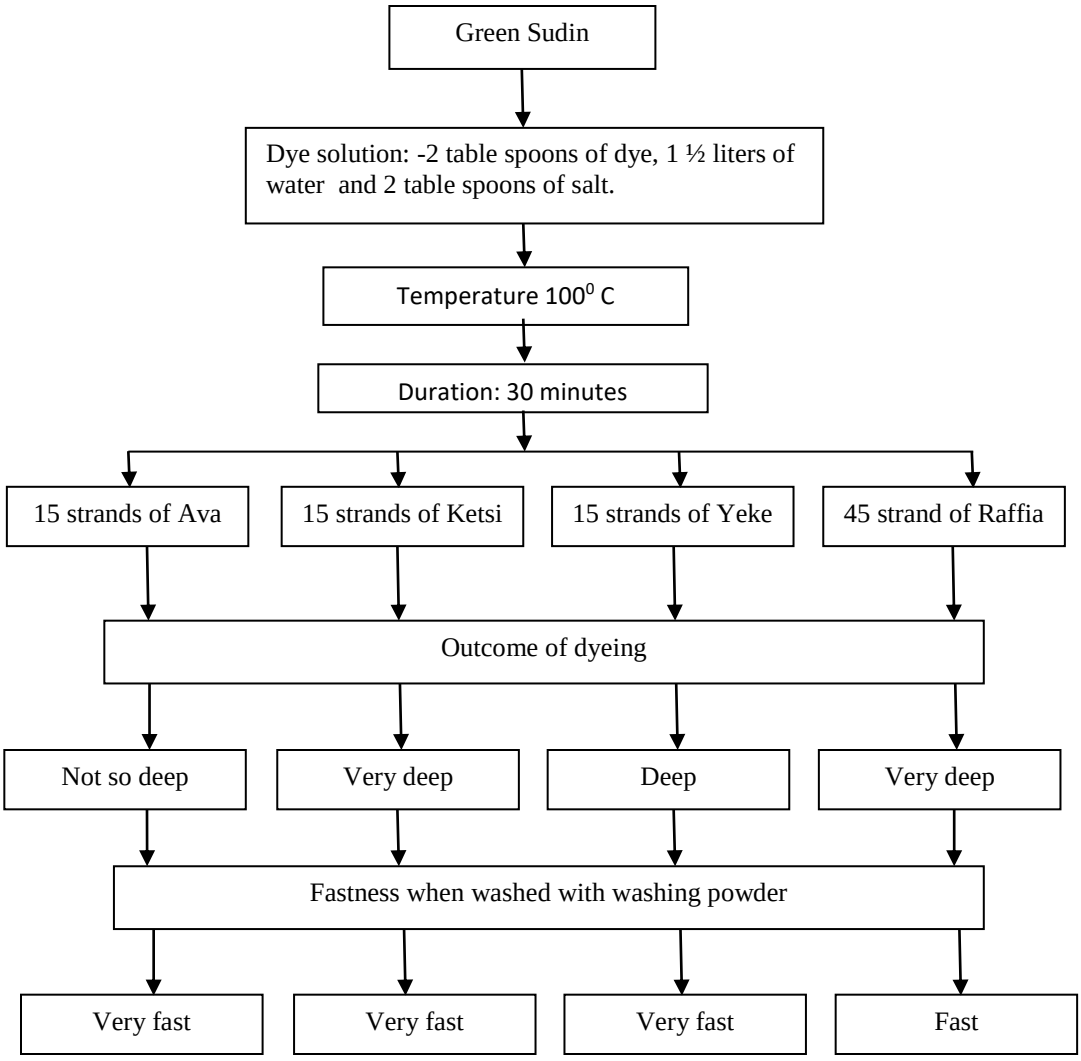
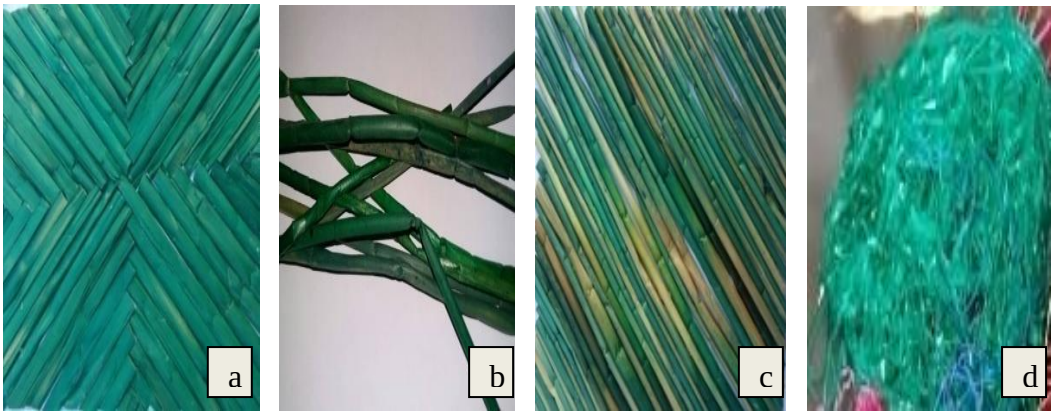


Fig. 5 Experiment with green sudin dye on Juncus



Plates 41 a-d. Outcomes from green sudin respectively

Source: Field report 2017

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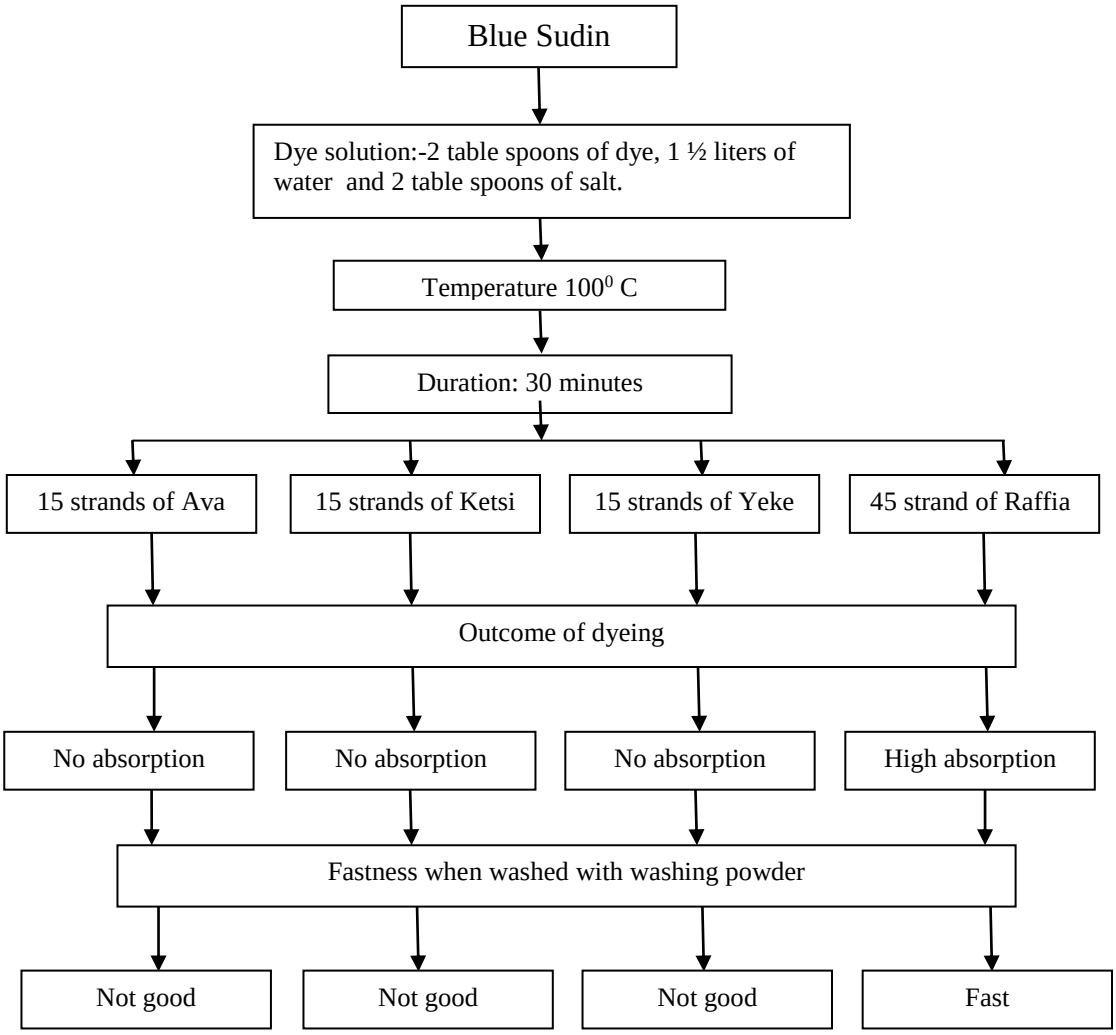


Fig. 6 Experiment with blue sudin dye on Juncus

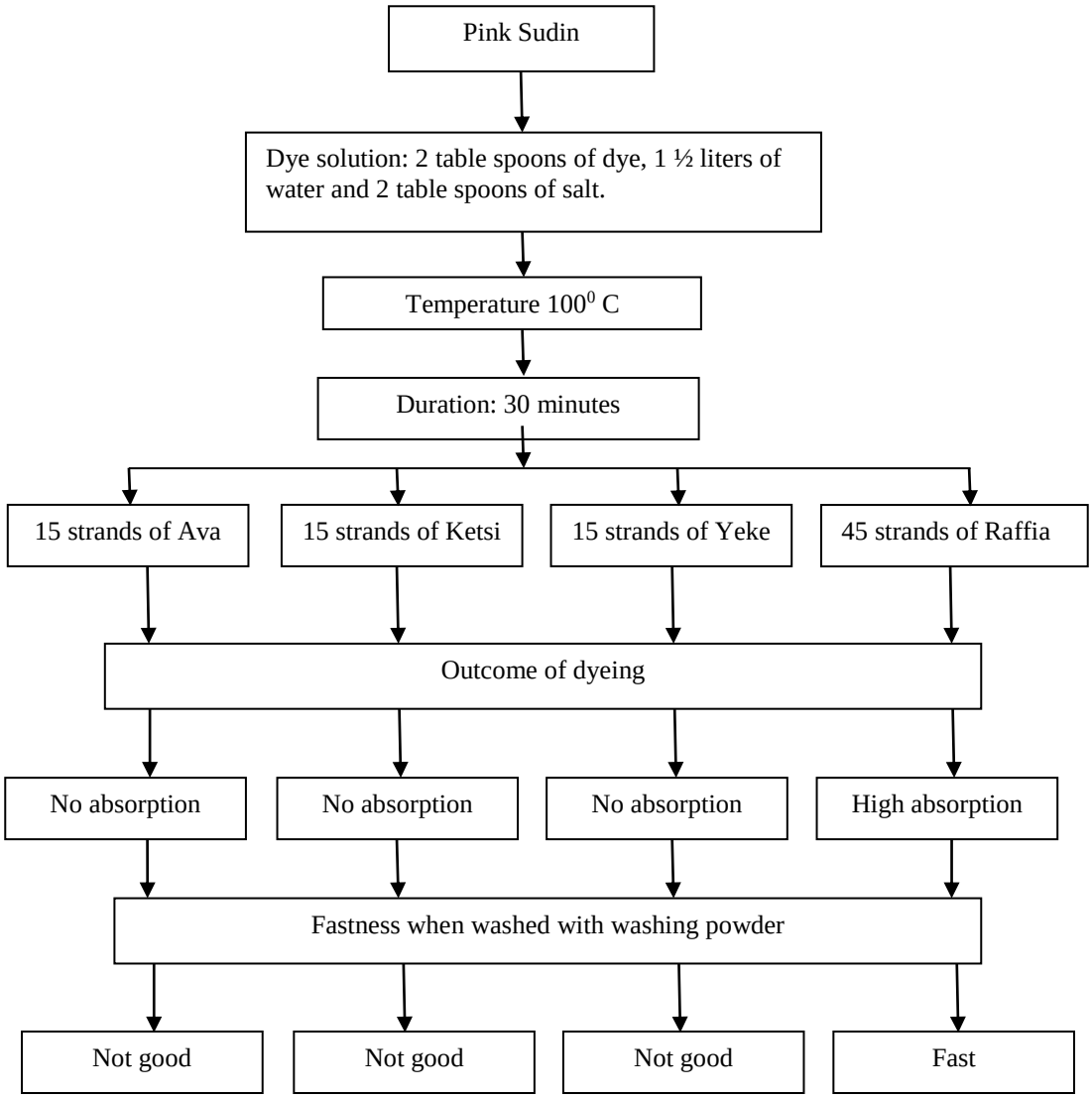


Fig. 7 Experiment with pink sudin dye on Juncus

Plates 42 a & b. Outcome from pink sudin dye on the 3 types of Juncus

Vat Dye

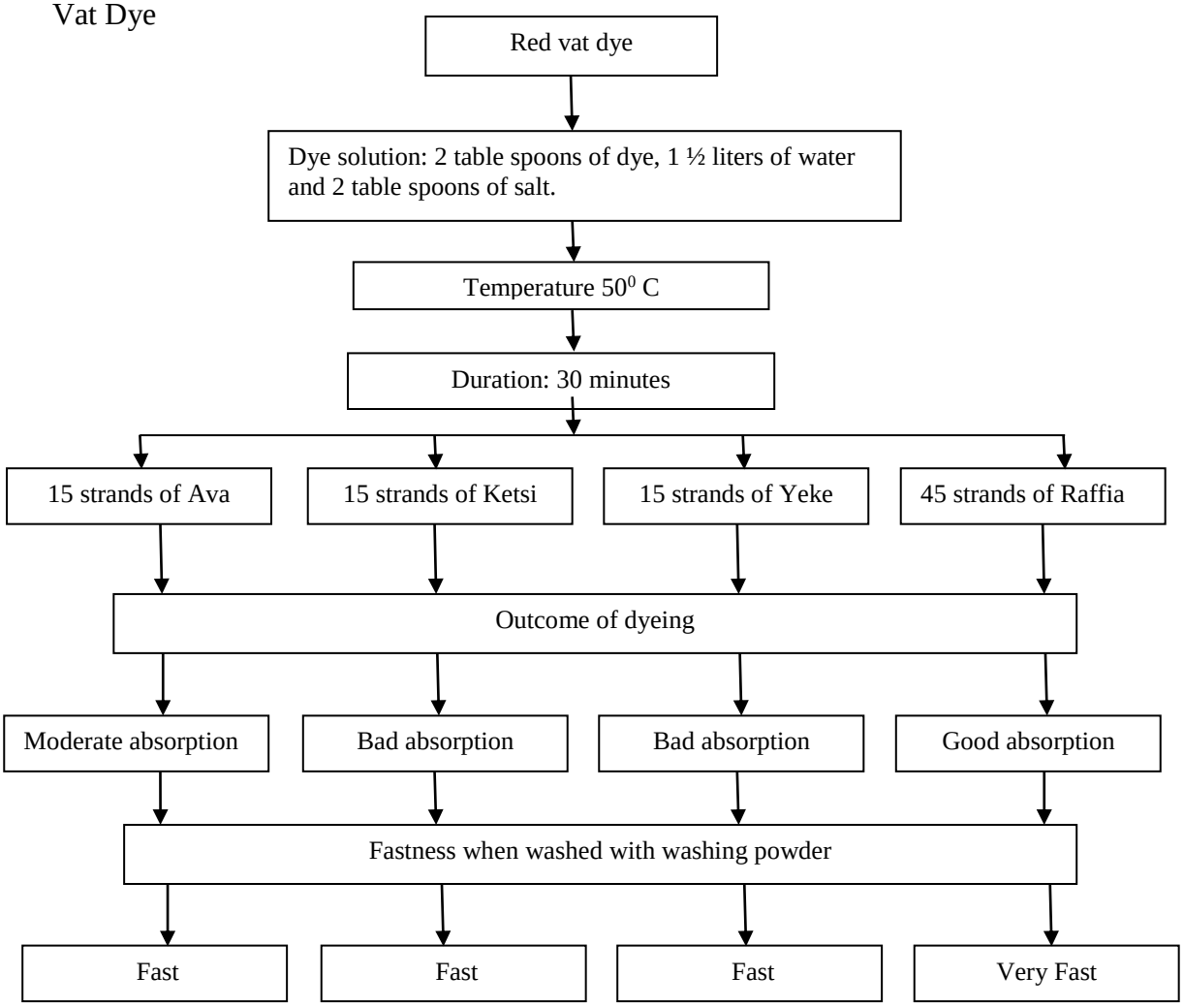


Fig. 8 Experiment with red vat dye on Juncus

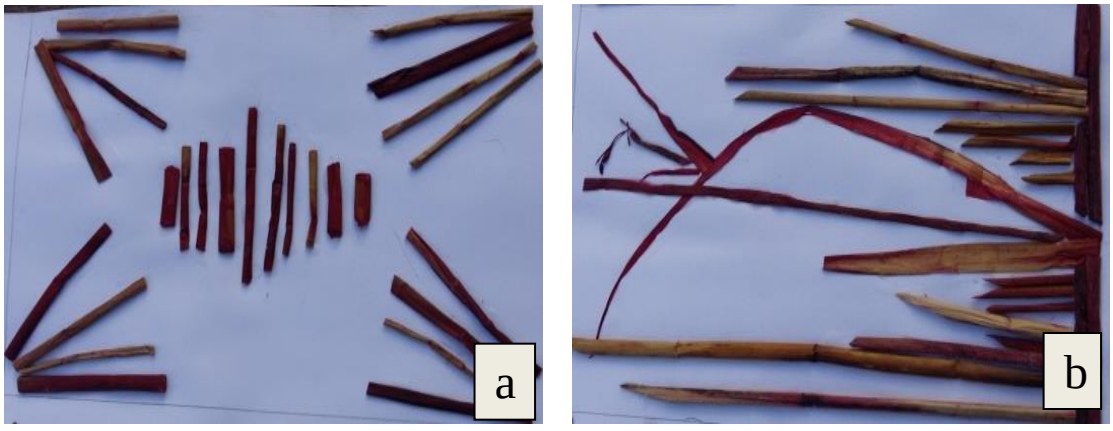


Plate 43 a & b. Outcome from red vat dye on the 3 types of Juncus.

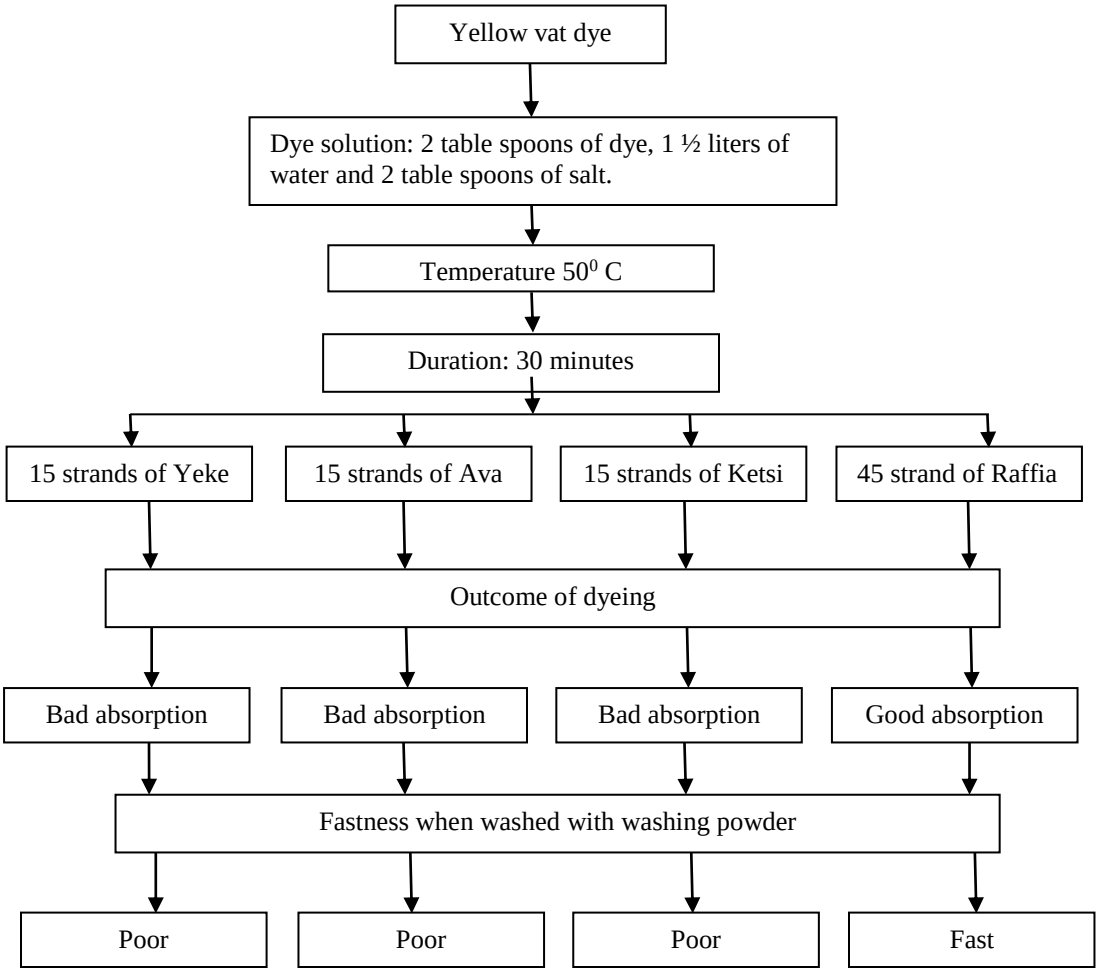


Fig. 9 Experiment with yellow vat dye on Juncus

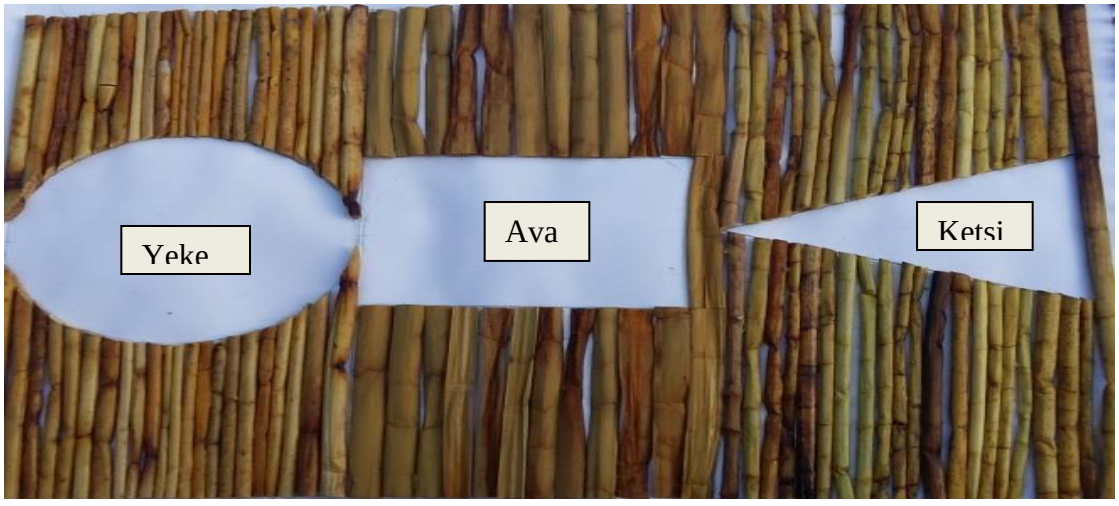


Plate 44. Outcomes depicted by shapes respectively.

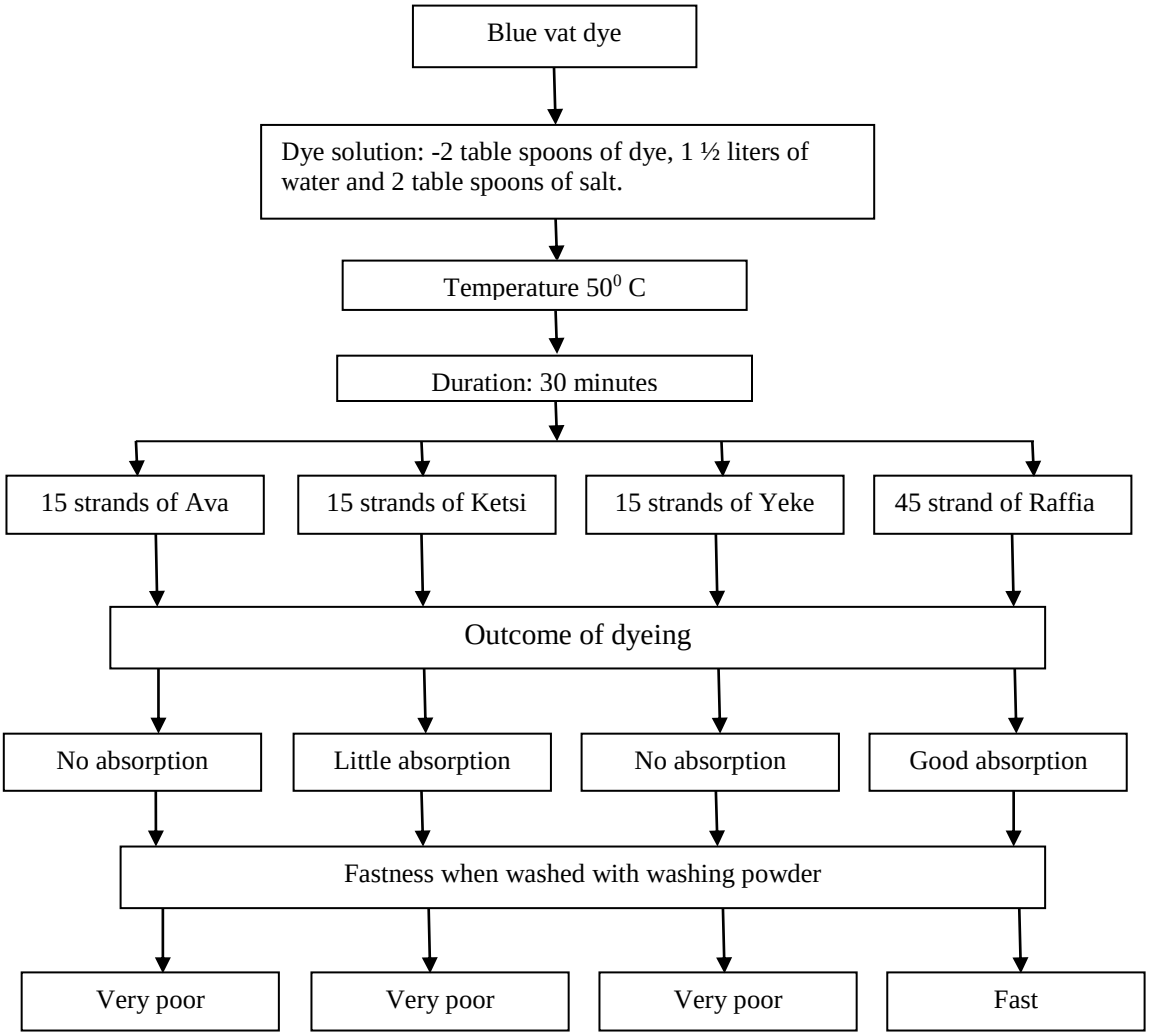
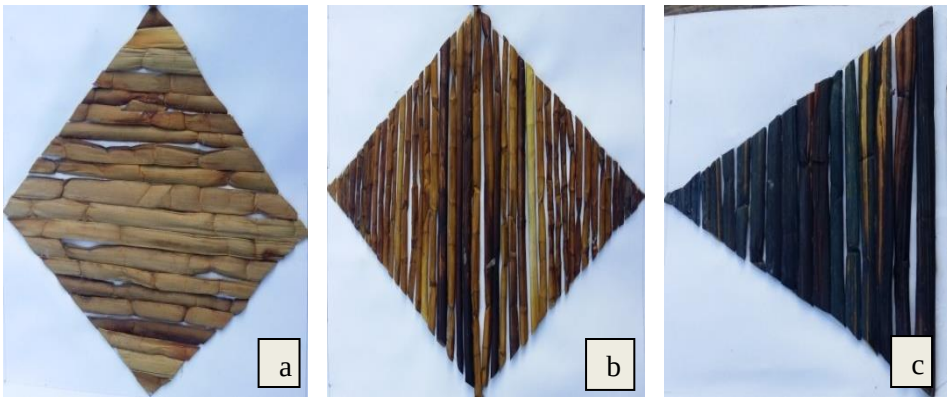


Fig. 10 Experiment with blue vat dye on Juncus



Plates 45 a & b Outcomes on Ava & Ketsi respectively.

However, there was moderate absorption on sandpapered surface of Yeke as seen in Plate 45 c but lost strength.

Reactive Dye

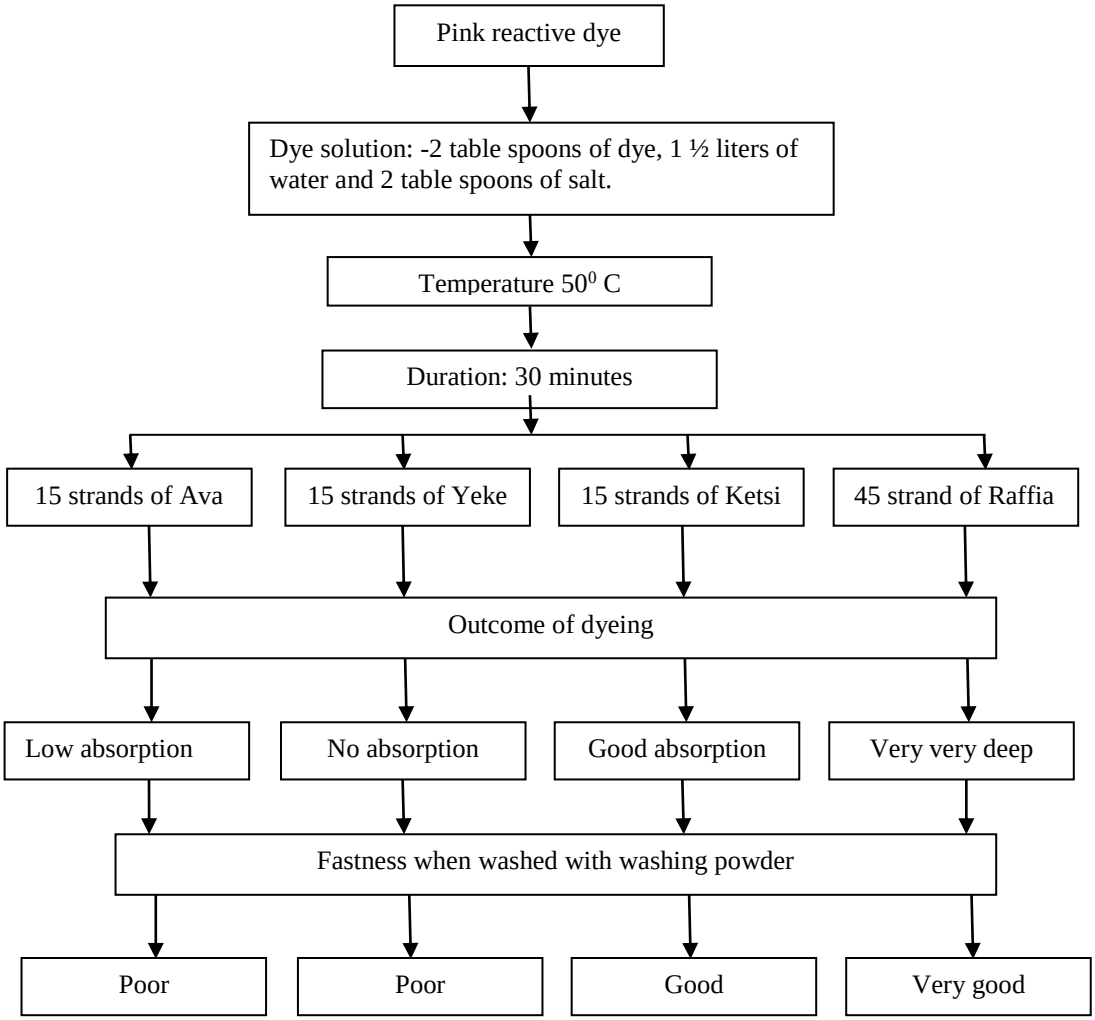


Fig. 11 Experiment with red reactive dye on Juncus

Plate 46 a. Outcomes of cold dyeing and b for hot dyeing

Upon a rise in temperature at 100^0 C the Ava had excellent absorption in the spongy pith as in Plate 46 b above.

Printing Paste

Acrylic print paste, Acrilex, fabric paste, water base print paste, oil paint and spray paint were also explored to enhance the colour of the Juncus and the results are discussed in table 6 and Plate 47 a – i below.

Type of print paste	**Type of Juncus**	**Surface condition**	**Fastness**	**Result Plate**
Yellow water base	Ava	Natural	Bad	A
Yellow water base	Ava	Sand papered	Good	B
Violet Acrilex	Yeke	Natural	Bad	C
Violet Acrilex	Yeke	Sand papered	Moderate	D
Silver stone fabric paste	All types	Natural	Moderate	E
Gold spray paint	All types	Natural	Good	G
Pink fabric paste	Yeke	Sand papered	Moderate	F
Oil paint	Yeke	Sand papered	Moderate	H
Green Acrylic	All types	Natural	Very good	I

Table 6. Experiment with print paste

Plate 47 a - i Outcomes from print pastes

It was also observed, that the painted Juncus hold dust particles even after drying and this may lead to poor quality of finished products.

Colour plays a very important role in the work of art and Juncus mat was no exception. There is not much literature on Juncus colouring as attested by (Karen, ibid) that they are hard to dye. Grange ibid is also of the view that the natural colour, texture, and scent are ideal for 21st century interior decoration. The natural colours achieved by drying under shade ranges from shades of green to cream as shown in Plate 48 b and brown to yellowish-cream from sun-drying as in Plate 48 c. However, contact with moisture and dew for a long time develop mould leaving black spots on the grass as in Plate 48 a.

Plate 48 a-c. Colours from drying

Source: Field report

Chemical treatment is prohibited in Indian basket industries. During the study, mats were normally woven with the natural colour of Juncus and occasionally decorated with few

strands of red, green and violet sudin dye. There was little absorption with reactive dye and acrylic paint. Furthermore, fabric cut off were also explored to enhance the colour and result shows that cotton fabrics adhere better than polyester and satin. Different types of coloured cotton yarns were used for colour in all the products. Both the literature and study confirm the reasons why the mats were woven in raw colour. However, there is a new immerging colouring trend from Togo where the colours are painted on the mat surface though it is not fast but makes it attractive as shown in Plates 49 a & b.

Plate 49 a & b Immerging colour trend from Togo

Source: Field report (2019)

Fabric Exploration

Fabric cut-offs were used to cover the Juncus as a form of colour enhancement. It came out that polyester (pink) and satin (green) cut-offs do not hold firm around the Juncus as seen in Plate 50 below. However, cotton cut-offs have excellent adhesion as in Plate 51.

Plate 50. Polyester and satin wrapped around

Plate 51. Cotton fabric wrapped around

Source: Field report (2017)

Adhesive Exploration

This came up during fabric exploration. White glue, glue stick, bonding glue, and paper glue were used; their effectiveness varies. White glue was found to be the best followed by glue stick but has to use electricity.

Based on results & data collected changes were made, prototypes, tests again and review of new data.

This aspect of the model is cyclic and it goes back to experiments and exploration through to testing. Below are some of the steps taken to make changes from material preparation for weaving.

Based on result & data make changes, prototypes test again & review new data.

Material Preparation for Weaving

The local industry understudied leave the Juncus for weaving under dew overnight, it is beaten with a beater to remove air from the pith and make the culm flat and soft. The dew also makes it flexible and pliable. During the study, water was used to wet the material and kept them under the blanket during weaving for flexibility but will get rotten when kept more than 24 hours.

There was a gap in quality of finished product and therefore washing was done before use as seen in Plate 52 and Plate 53. It was released that the washing removes a lot of dirt, leaves, rhizome, and brings out the natural glossy look on the surface of the Juncus which probably prevent colour absorption.

Plate 52. Washing of Juncus

Plate 53. Washed Juncus

Source: Field report (2018)

Main findings

Below are what can be done to improve upon the strength and colour of the Juncus.

- Harvesting at the right time (immature and over matured) affects the strength and colour.
- Drying under shade for shades of green colour.
- Drying under the sun and collect them at sunset to maintain shades of cream to brown.
- Clean Juncus before weaving removes the dirt and reveal the glossy look. However, if not dried properly fungus infection will be high.
- Cotton fabric pieces wrapped over Juncus improves colour and strength.
- Several ply of yarns, weave structure and uses of end product also improve the strength.

- Dyes and print paste fastness were poor with reactive dye, vat dye, water base print paste, fabric paste, acrilex and acrylic but red and green sudin has excellent fastness.
- However, cotton fabric cut-offs adhere to Juncus than polyester, satin, and nylon.

4.3 Objective Three: Production of Durable, Innovative and Interior Decoration Products and Incorporate Southern Volta Identity through Material Culture.

The researcher made a lot of innovations and the following were some of the possibilities:

- Variation in weave size results into other end user for example, a strip could be joined together as a wall divider, table-cover, centre table top .as shown in Plates 54 (c & f).
- Incorporate the characteristics of kente cloth in the products – joining stripes together, multiple designs in one product, larger size mat.
- End-use of product increases the durability that is a wall cover, sliding window and mirror frame will last longer than a sleeping mat as shown in Plates 54 (d & h).
- Woven mats have multi-purpose which is economical and innovative.
- A special technique was innovated by take-up of woven mat around the frame resulting in any weave length desired as shown Plates 54 (a & b)
- Packaging is very portable as in Plate 54 b.
- The materials used portray Volta identity *Ayigbe kete* Ewe mat, however, volta symbols were incorporated such as the *Gongon and* pot as seen in Plates 54 (c & h).

- Cut-offs from the edges were used as stuffing material leading to 3-D product and waste management as in Plate 54 d & e.
- Less Juncus was used to produce an object.
- Combine different types of weave structures and techniques in a single design.


c


d


e


f

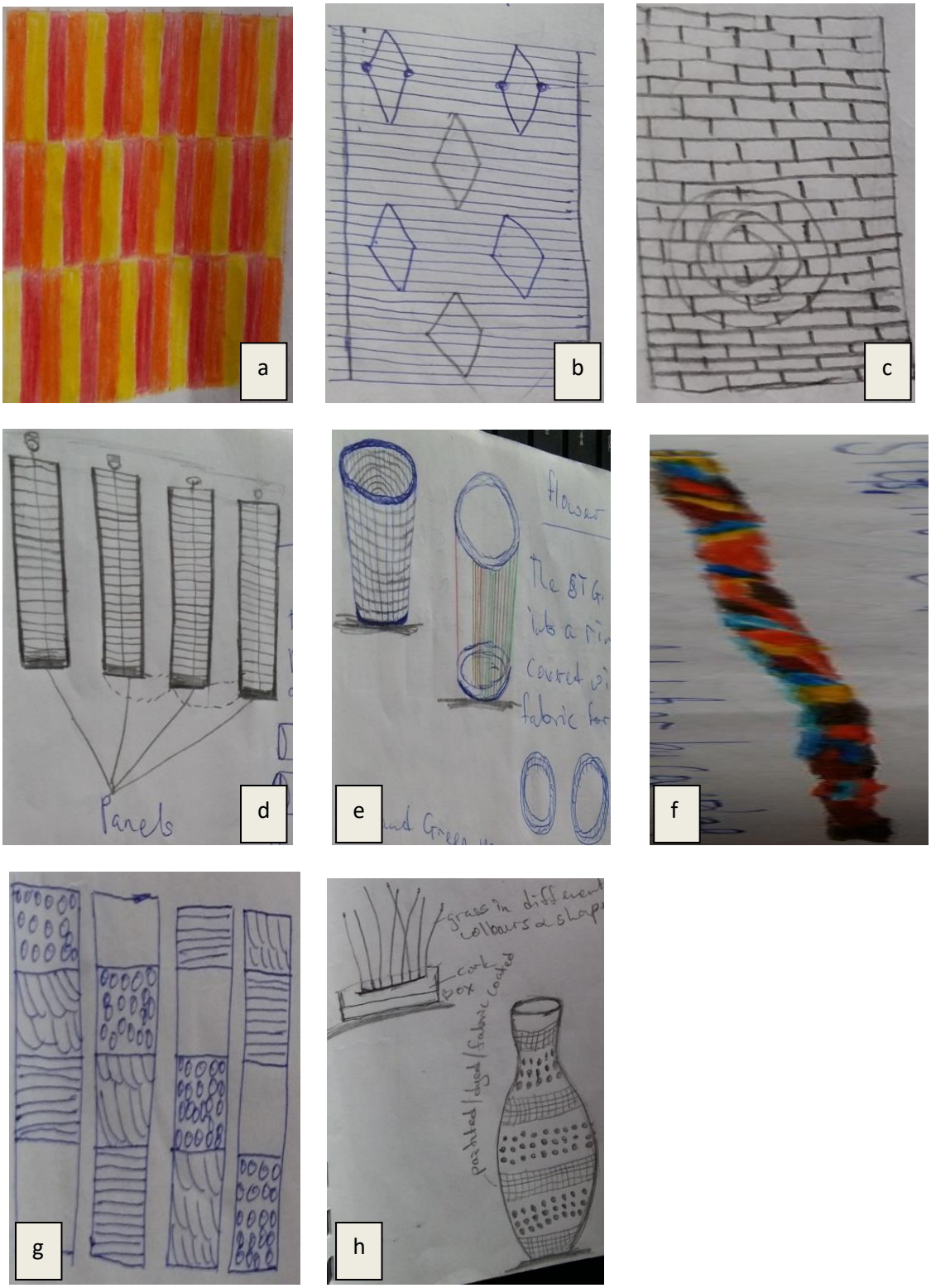
Plates 54 a - h. Novelties

4.3.1 Prototyping and Produce

According to Buttigieg (2014), first designs or models are referred to as prototypes which are very important steps in product development and should be done with a thorough evaluation of the materials, structure testing as well as design.

Prototype and Produce

During the participant observation, the researcher acquired the mat weaving skill that is also the first objective of the study and came out with the prototypes in Plate 30 (a-c).



Plates 55 a – h are idea sketches.

The findings continue to lead to other ideas such as the type of cord weavers used (fish line thread) in weaving which frays and difficult to untie when it entangles. Cotton threads were plied for weaving and it has a wide range of colours to come out with other mat designs as a prototype as in Plate 56 a – i.

Plate 56. Prototype

4.3.2 To Produce Durable and Innovative Interior Decoration Products

As Buttigieg (2014) stated that, prototyping is very important in product development and it was done to evaluate and test the materials and structures. Some of the designs were selected while others were modified to create the products. As part of the research design model that requires production after prototyping the researcher made initial sketches on the theme transformation.

Project one: Difficulties, challenges faced and solutions

The results from exploration with fabrics and adhesives were affirmed as non-cotton fabrics did not adhere to the surface. Again, the use of other adhesives did not yield good results. Therefore, cotton fabric cut-offs pieces and white was used. Supporting the surface (mat) was a big challenge because spreading it on the floor during work created unnecessary body movement.

Generation of the Concept of Idea and Sketches

Project one: Mural in the Round

Theme: Transformation is a progressive change or modification from one state to another again a complete characteristic of something especially so that they are improved by Smartzwed (2016). Again, when we talk about transformation in art, we are referring to the transformation of material or transformation as a theme. The work was based on transformation. That is the stage of life in human beings and transforming the Juncus into a mural in the round. Colours were used to depict the stages. Brown for formation in the womb, white for joy at birth, green for growth, yellow for wealth, blue for love and brown for death where we go back to the soil. There are human embryo and chameleons in the middle signifying the changes.

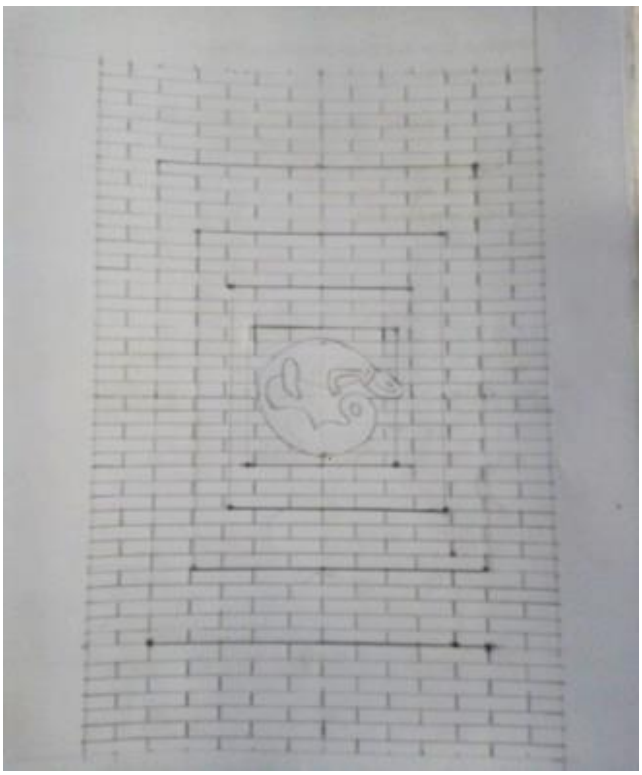


Plate 57. Sketch of idea

Plate 58 a & b. Tools and Materials

- Materials –pieces of fabrics, Juncus mat, white glue, scissors and wooden frame as in Plate 58 (a & b). Plate 59 is a close-up of the mat surface texture.

- Technique: Appliqué

Procedure

- Sorted out cut off fabrics into stages of life colours (red, white, green, yellow and blue).

- With the use of white glue-covered each brick texture see Plate 59 on the mat with a piece of fabric.

- Arrange them in order of stages of life.

- Mounted the mat on a frame as a mural in the round.

Main finding:

The novelty of the production of the mural in the round with the use of Juncus lies in the appliqué technique and the mounting of an already woven mat on a frame.

It also addresses the use of biodegradable material in the work of art, utilizing fabric pieces as preventing environmental pollution and generating employment.

Plate 59. Close-up view of the mat surface texture

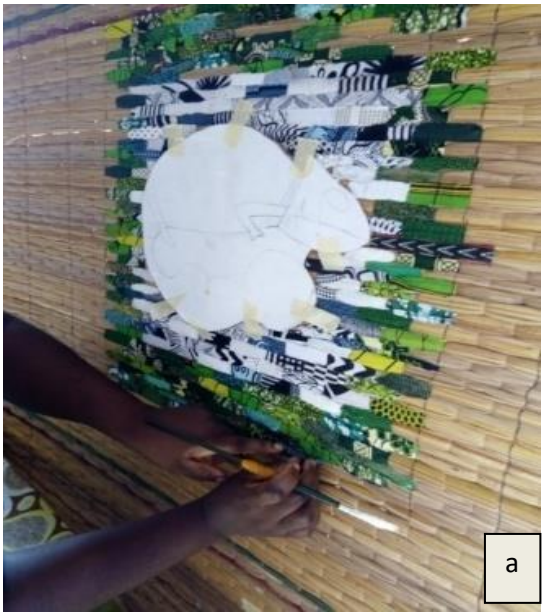


Plate 60 a. Work progress.

Plate 60 b & c. Work progress

Plate 61. Final work (Mural in the Round).

Project two: Difficulties, challenges faced and solutions

The Juncus mat is normally woven in a rectangular shape but the design of the lampshade required a convex shape mat. This challenge was overcome as discussed in the procedure.

Project two: Giant Lampshade

Materials – Jointed rush, rattan, cotton yarns, kente cut-offs, raffia and bamboo

Technique: Weaving and Molding

Theme: The Giant Lampshade

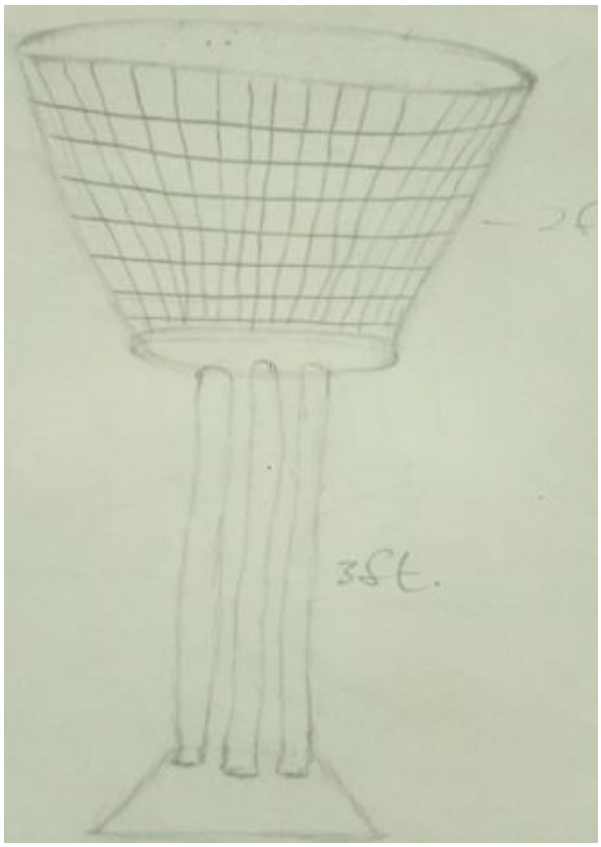


Plate 62. Sketch of idea

Plate 63. Warp preparation

Plate 64. Weft yarn

Procedure

- Cleaned Juncus very well and cut into 25 inches long.
- The technique of weaving heavy mat was employed but the novelty was creating a concave mat.
- First, the Juncus were arranged in bundles of 8 strands as in Plate 63. They were put together by plies of yarns from the edge as in Plate 64 on the next running stitch the bundles are tied in 7 strands, the next running stitch tied in 6 strands until it got to 1strand and shape was formed as in Plate 65 b.

Main finding

The novelty of the production of the giant lampshade with Juncus is weaving a convex-shaped mat, a seven feet tall, the light is directed to the ceiling and casting a shadow downwards.

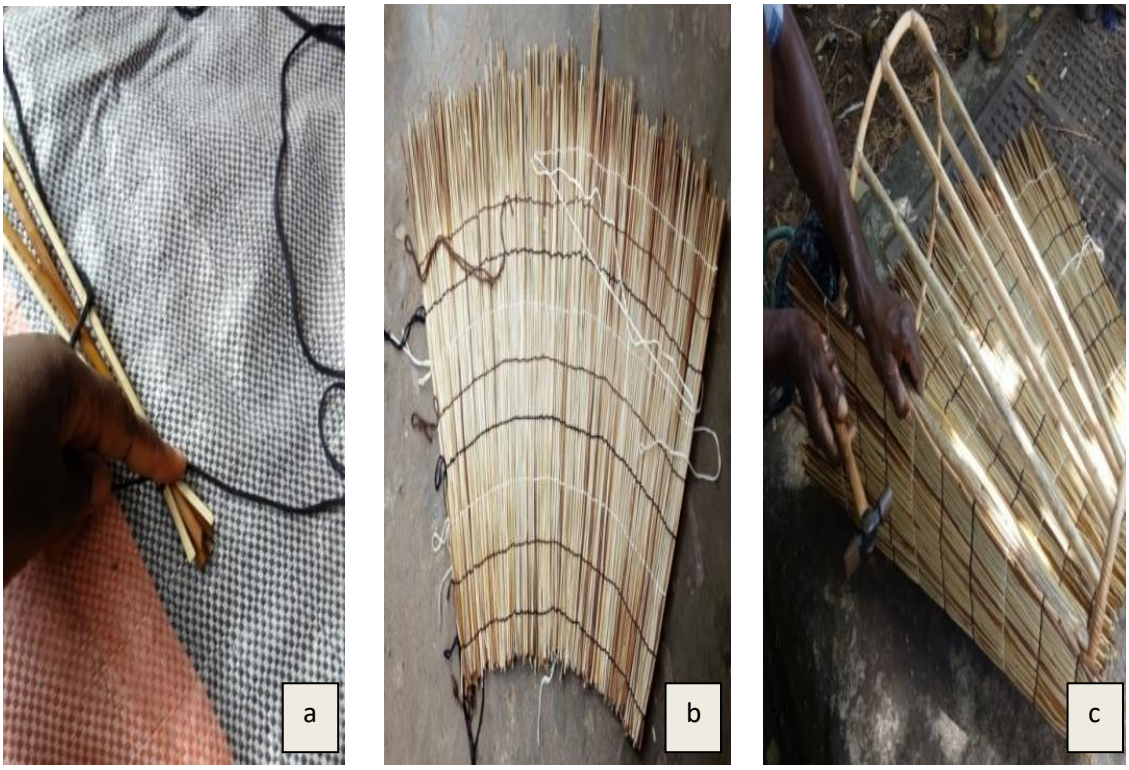


Plate 65. Progress of work

- The mat was molded around a rattan amateur mounted on a bamboo supported by rattan foot.
- Finishing was done by trimming edges, lacquering the stand, decorated by kente, shells and sea sand as incorporating Southern Volta identity.
- A lampshade cannot be complete without fixing electrical components.

Plate 66. Final Work (Giant Lampshade)

Project three: Difficulties, challenges faced and solutions

Juncus mats are always 2-D but the design of the lampshade is in 3-D.

Project three: Lampshade

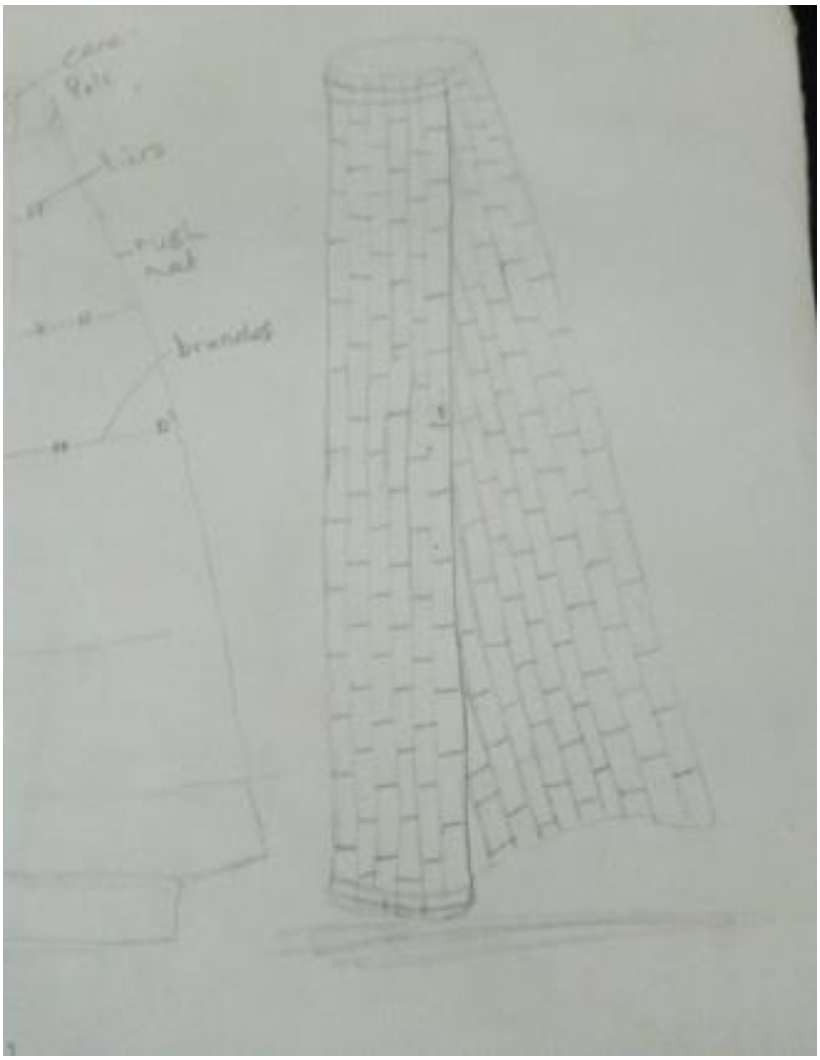


Plate 67. Sketch of idea

- Materials – Pieces of fabrics, Juncus mat, white glue, sea sand, shell, bamboo
- Technique: Appliqué and molding
- Theme: Flexibility in rigidity

Plate 68 a - c. Progress of work

Procedure

- Wrap a woven mat around the bamboo stand.
- Finish the top with pieces of fabric and down with sea sand and raffia.
- Fix electrical components.

Main finding

The novelty of the production of the lampshade with the use of Juncus lies in the flexibility in rigidity. Transforming the 2-D into 3-D and the use of fluorescent four feet bulb in a lampshade.

Plate 69. Final Work (Lampshade)

Project four: Difficulties, challenges faced and solutions

The diamond-shaped twill weave structure depicts how settlements are scattered but the weave structure was weak owing to less connectivity Plate 70 c shows a modified design the settlements through unity is strength.

Project four: Multi-purpose wall cover

- Materials – Jointed rush and cotton yarns
- Technique: Weaving
- Theme: Work and settlement.

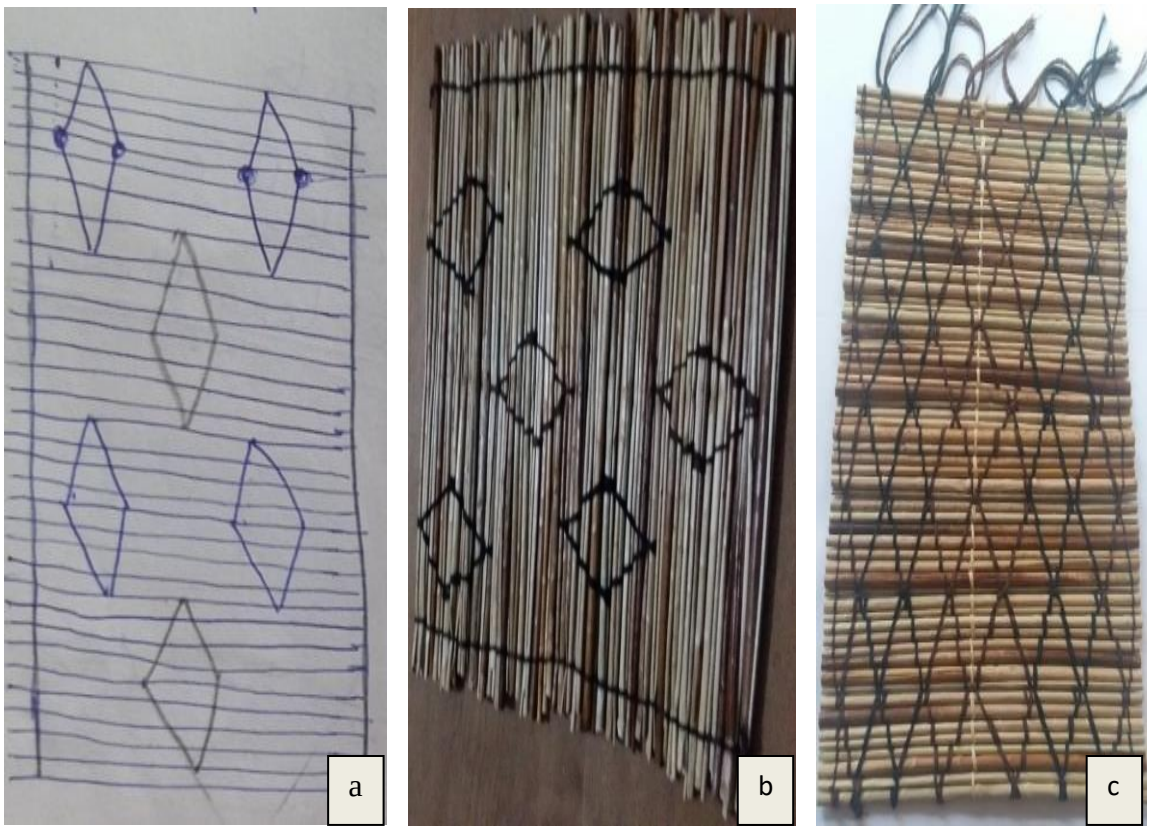


Plate 70 a - c. Idea development

Procedure

- Secure jointed rush on frame with 3 warp yarns at intervals.
- Weave V-shape and reflect it at the top to form a diamond-shaped twill weave structure as in Plate 70 c.
- Repeat all over the mat.
- Trim edges to finish.
- Plate 70 (a, b& c) are users of the multi-purpose wall cover.

Main finding

- The novelty of the production of the multi-purpose wall cover with the use of Juncus designed with a diamond-shaped twill weave structure and the technique of take-up of the woven mat onto a beam. This enables a weaver to produce a continuous length of the product without any joint or break as in Plate 71 c.

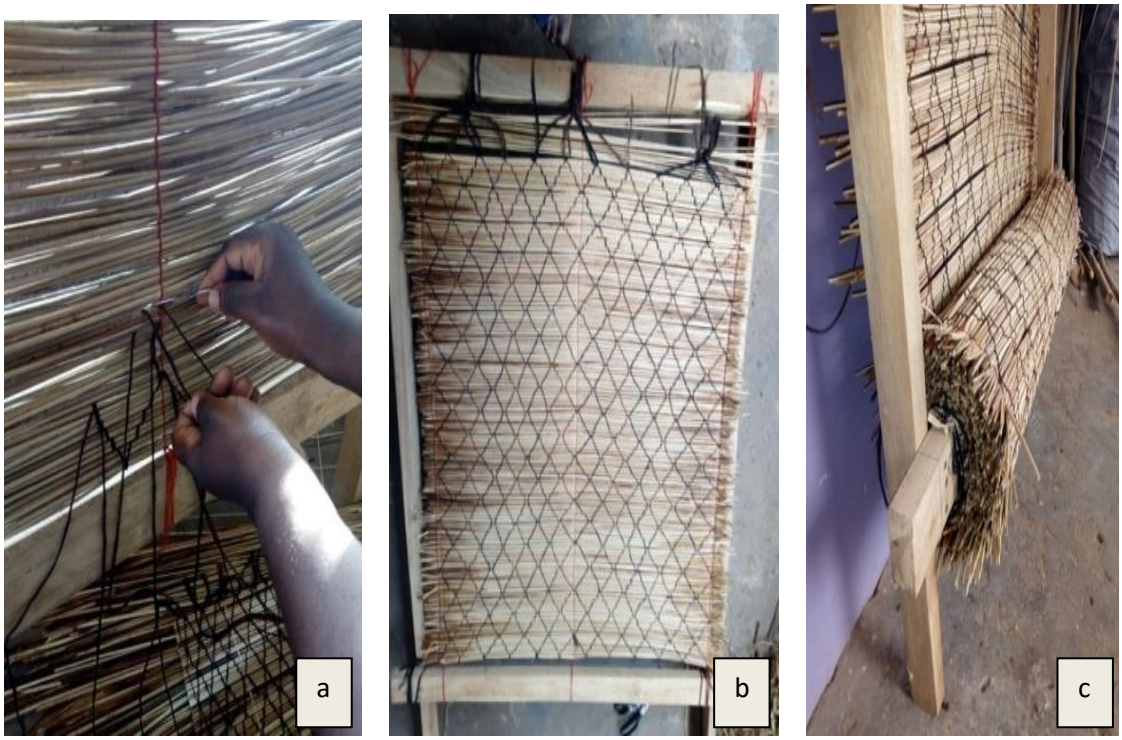


Plate 71 a - c. Progress of work

Plate 72 a. Final work (Multipurpose wall cover)

Plate 72 b & c. Final work (Multipurpose wall cover)

Project five: Difficulties, challenges faced and solutions

As discussed earlier, mats are in 2-D and woven in plain or running stitch weave. The design of wall hanging requires a relief effect and cannot be sewn under a sewing machine. The researcher then combines the two types of weave structures and glued and *Gongon* stuffed with Juncus cut off pieces to achieve the 3-D effect.

Project five: 3-D Wall Hanging

- Materials – soft rush, Juncus cut off pieces and cotton yarns.
- Technique: Weaving and appliqué
- Theme: Communication, there are different ways of communication among Voltarians. This project seeks to communicate to the world about their unique art and material through a 3-D wall hanging made from Juncus.

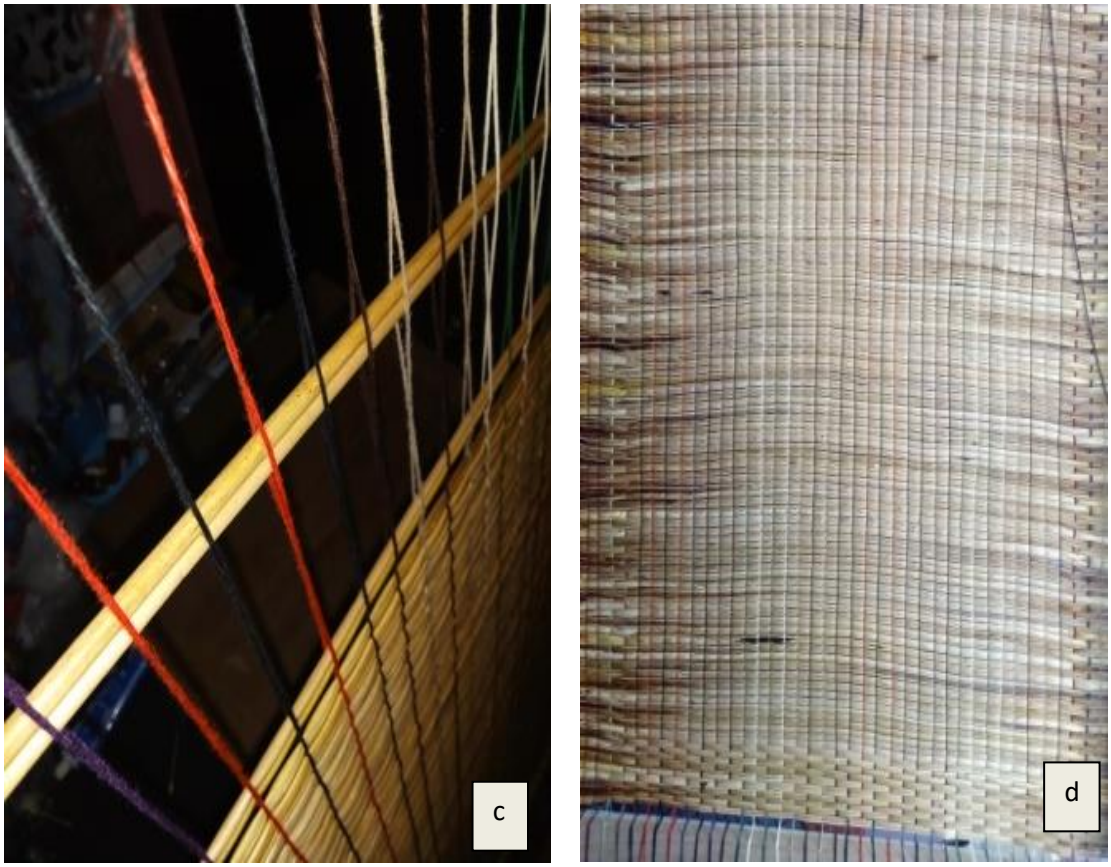


Plate 73 a – d. Progress of work

Procedure

- Warp was laid in different colours as in Plate 69 b.
- The boarders were woven in plain weave and the main body in running stitches as in Plate 73 d.
- Kente fabric pieces were sewn into a Gongon shape.
- The edges of the were trimmed and used to stuff the Gongon creating a 3-D effect.
- It was mounted on a frame for hanging as in Plate 74.

Main finding

The novelty of the production of 3-D wall hanging and of Juncus is the combination of the two types of mat weave structure into one work, creating a 3-D effect and utilizing Juncus cut off pieces for environmental protection and employment. Again combine weaving and appliqué in the work. Communicating Volta identity through material culture.

Plate 74. Mounted hanging

Rikke & Siang (2018) state that, prototypes are often used in the final testing face in design thinking process in order to review new solutions to the problem or find out whether the implementation solutions have to be successful. Objective 3 is to produce durable and innovative interior decoration products.

Test

The testing of some of the results was a failure, successful and partial. Results from exploration, prototype, and testing led to changes at these three stages. Such as using the natural colour of the product, types of material used and designing.Plate 76 (a& b) depicts tested lampshades.

Plate 75 a&b. Testing of lampshades

4.4Objective Four: Communicate Findings to Society, Visual Art Students and Ghanaians.

The fourth objective was to communicate findings of the research to the community and students.

Communicate results society and others

However, it is in line with the research model's last aspect and the researcher found out the following.

- Communication was done through society participation.
- Society was impressed with awareness and innovation.
- Weavers and students were ready to adopt the innovations.
- The reaction or readiness of educated youth was impressive than that of uneducated people. This implies that unemployment can be reduced among the youth in the future. Again they suggested how to stitch the strips together.

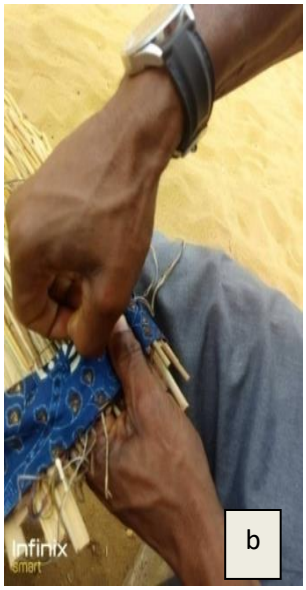
Objective 4 was to incorporate the Southern Volta identity through material culture. Southern Volta is being identified by the Juncus mat literally called *Ayigbe kete.* Findings during an informal interview at the participant-observation stage show that society has no interest in the Juncus which covers vast land around them. Therefore it is necessary for the researcher to communicate findings to mat weavers, visual art students, artists, and others. The communication channels used were teaching practice, community participation during the study, word of mouth, showing images of works as in Plates 77 (a – f) were mode of communication. The significance of the study is to address 7 out of 17 UNDP sustainable Development Goals namely:

- 1 – No poverty (participants were paid as a form of motivation).
- 2 – Zero hunger (as paid there was money for food).
- 5 – Gender equality (both men and women were involved).
- 8 – Decent work & Economic growth (raw materials were bought from society).
- 9 – Industry, innovation, and infrastructure (transformed the industry).
- 10 – Reduce inequality (women are independent reducing inequality).
- 13 – Climate action (materials used are bio-degradable).

Plate 76. UNDP Sustainable Development Goals

Source: UNDP (2019)

Interaction with visual art students



Interaction with a kente weaver

Interaction with an individual

Family participation

Interaction with Kenyan artists

Interaction with Juncus mat weavers

Plate 77 a – f. Channels of communication to the public, individuals, and students.

THE FOLLOWING ARE THE MAIN FINDINGS OF THE STUDY

- Two types of mats were woven - *Aba* and *Tsatsa* and weave structures were only plain weaves and running stitches respectively. It was also noticed that very few people were aware of the three (3) different types of Juncus namely Juncus *Acutiflorus,* Juncus *Inflexus* and Juncus *Effusus* were found in the Southern Volta which exhibits the degree of neglect.

- Harvesting at the right time (immature and over matured) affected the strength and colour, drying under shade for shades of green colour but in sun but collect them at sunset to maintain shades of cream to brown. Cleaning Juncus before weaving removed the dirt and reveal the glossy look however if not dried properly fungus infection will be high, cotton fabric pieces wrapped over Juncus improves colour and strength, more ply of yarns, weave structure and uses of end product also improve the strength. Dyes and print paste fastness were poor with reactive dye, vat dye, water base print paste, fabric paste, acrilex and acrylic but red and green sudin has excellent fastness, however, cotton fabric pieces adhere to Juncus than polyester, satin and nylon.

- Variations in weave sizes result into other end used, for example, a strip could be joined together as a wall cover, table-cover, centre tabletop and others, incorporate the characteristics of kente cloth in the products – joining stripes together, multiple designs in one product, larger size mat, end-use of product increases the durability that is a wall cover or sliding window will last longer than a sleeping mat, woven mats have multi-purpose which is economical and innovative. A special technique was innovated by rolling the woven mat around the frame resulting in any weave length desired, a 2-D transformed into 3-D packaging is very portable.

- Materials used portray Volta identity *Ayigbe kete* Ewe mat; however, Volta symbols were incorporated such as the *Gongon,* earthenware - cooking stove and pot. Juncus cut off pieces from the edges were used as stuffing material leading to no waste, less Juncus was used to produce an object, combine different types of

weave structure and techniques in a single design. The neglect of the Juncus was due to ignorance and lack of innovation in the industry. Awareness was created by communicating through society participation, weavers and students were ready to adopt the innovations and the reaction and readiness of educated youth were impressive than the of uneducated people. This implies that unemployment can be reduced among the youth in the future. They suggest how to stitch the strips together.

The next chapter deals with the summary, conclusion, and recommendations.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

Overview

This final chapter seeks to summarize the entire research, its conclusions and further provide recommendations of the study.

5.1 Summary

Transformation is a progressive change or modification from one state to another, again it is a complete change in the characteristic of something especially so that they are improved. Again, when we talk about transformation in art, we are referring to the transformation of material or transformation as a theme. The research focused on transforming Juncaceae into varied artifacts by exploring the frontiers of textile art production in Southern Volta.

The objectives of the study were to access the production process of the various Juncus mats, examine the materials and improve upon their strength and colour, produce durable and innovative interior decoration products and incorporate the Southern Volta identity through material culture. Exploration and experiments were used to address the set objective based on a conceptual framework adapted from Engineering Method Steps Model and Aesthetico-Action model.

5.2 Conclusion

The quality of Juncus Arts is affected by all stages of the production process and therefore needs critical attention.

The natural colour of Juncus is very attractive when drying, cleaning and storage are done properly. However, cotton fabric wrapped around or acrylic paint can also be used.

Neglect of the Juncus was due to ignorance and lack of innovation in the industry. Innovative produce can make the industry vibrant and promote the use of biodegradable materials in interior decoration and create employment too.

Communication through word of mouth, exhibitions, society involvement during work is very important and Southern Volta will gain its cultural identity back.

5.3 Recommendations

Due to the insignificant economic importance of Juncus, they are always neglected and suggest that more studies in the field in order to save the species (Abdelsamed, Ayman, & Mohmoud, 2012).

- Visual art departments in SHS should encourage students to use Juncus for practical work.
- The weavers should be encouraged to attend trade shows both local and international, made in Ghana fair, district trade shows to display the unique art and culture. To increase their sales through international markets.

- Juncus artefacts should be done closer to the raw material due to the cost of transportation.
- Other researchers should explore the Juncus in the field of energy, agriculture, and fashion as in Plate 78.

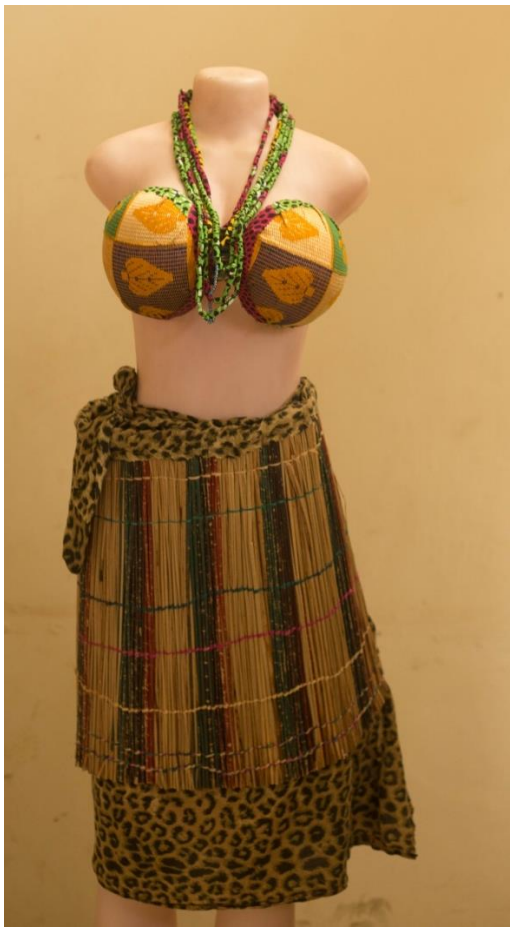


Plate 78. Cultural costume

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