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Harnessing the potentials of plant fibres into viable cords for weaving

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Abstract

This article describes a mixed method study on harnessing the potentials of plant fibres into viable cords for weaving purposes. The study sought to process and utilize selected plant fibres from two selected regions: Eastern and Upper West Regions of Ghana. It was found that these regions have abundant natural resources which further exposed the researcher to alternative uses of plant fibres for making yarns, cords, and ropes for weaving. Participants recruited for this study were weavers and were also introduced to basic macramé knots which further enhanced their local production of crafts within their communities. It is recommended that the forest regions of Ghana should be encouraged to cultivate some

of these fibrous plants to provide high fibre yielding properties for weaving in addition to their economic benefits for the teeming unemployed youth of Ghana.

Keywords: plant fibres; weaving; viable cords, Daffiama, Manya-Krobo

INTRODUCTION

According to World Book Encyclopedia (1992), macramé is the art of creating practical and decorative articles by knotting cords, ropes or strings. Horst (2013) argues that macramé is the art of joining together pieces of flexible materials such as ropes and forming loops or designs by knotting. Knots are used in everyday activities of mankind, for example, tying of shoe laces, tying simple bows on gift boxes (Schmid, 2006) to mention a few. The art of knotting whether practical or artistic has to be appealing and can become life-long pursuits. The macramé technique is extremely versatile, allowing one to create both utilitarian and ornamental works of art, from useful and decorative plant hangers, hammocks, macramé clothes and jewellery to more purely decorative forms such as wall hangers and fibre art. The next paragraph deals with accessories as used in the fashion industry.

Hebrero, M. (2015) opines that fashion design is the art of the application of design and aesthetics or natural beauty in clothing and accessories. Wanda also explained further that fashion design is influenced by cultural and social latitudes and has varied over time and place. Jones (2012) stated that fashion designers work in a number of ways in designing clothing and accessories. Accessories is used in fashion to enhance the looks of people or for adornment. According to Cumming, Cunnington and Cunnington (2010), fashion accessories are items used to contribute in secondary manners to the wearer's outfit and is often used to complete an outfit and it is chosen specifically to complement the wearer's look. In Victorian fashion, gloves, fans and parasols held

some type of significance for how women experienced gender, race and class (Beaujot, 2012).

According to Leino (2012), in the early 16th century in Italy, men of higher social status wore hat badges as decorative items. Due to these assertions from history, choosing the right accessory to complement a look becomes a difficult situation for a lot of women as they are unsure about the best way to define their status and personality in the area of grooming. Irrespective of what kind of scenario we find ourselves in, one thing that is bound to draw attention to ourselves is our sense of fashion and style, our clothes, make-up, hair, body language and accessories contribute to our personality and how people see us.

METHODOLOGY

This study adopted a mixed method approach, specifically experimental and descriptive research. The first part focused on the experimental research. The experimental method can therefore be understood to mean a research based on the topic in the hope of making a discovery or as a test of the research questions of a particular study. The experimental method was employed mainly to gather data to answer the second research question and also meet the demands of the second objective of this study, thus, selected scientific tests have been conducted towards ascertaining the competence of the identified local fibre as a material for the production of yarn for macramé. Through the experimental method, the researcher screened all plant samples, extracted all the fibres and found out the various properties namely, elasticity, abrasion, resilience, fibre cohesiveness, moisture absorption, fibre extensibility, density, lustre, chemical resistance, thermal characteristics and flammability. Plants that could be used for yarns, cord or rope making which would be suitable for making macramé.

However, the processes, measurements and results are explained vividly by the descriptive qualitative approach.

This second part focuses on the descriptive research component. Descriptive research also involves gathering data that describes events and then organises, tabulates, depicts and describes the data collection (Glass and Hopkins, 1984). The descriptive research method may be defined as the collection of data for the purpose of describing and interpreting existing condition prevailing, practice, beliefs, attitudes, on-going process (Best, 1991). According to Knupfer and Mclellan (2001), descriptive research method also emerges following creative exploration, and serves to organise the findings in order to fit them with explanations, and then test or validate those explanations.

Thus descriptive research was used in describing and identifying the various plant fibres, to interpret and report the findings and results of the experiment conducted. This includes fibre reaction to the fibre test performed, that is, elasticity, abrasion, resilience, fibre cohesiveness, moisture absorption, fibre extensibility, density, lustre, chemical resistance, thermal characteristics and flammability. Through the descriptive method, the researcher used visual aids such as plates and figures to help readers have first-hand information on how the fibres would work after they had been transformed into ropes, cords and yarns for knotting.

The data needed comprised the use of identified plant fibres and these were twisted into twines, cords and yarns. The actual fibre test was conducted at this stage. This was to find out if the yarns, cords obtained can be used to do the macramé knotting as some of the yarns may not be able to go through the bending, knotting and twisting due to their non-resilience, elasticity and abrasion properties. Only selected plants which could

be twisted from the above samples were used. The populations for the study were final year students of St. Theresa Vocational School in the Upper West Region and selected basket weavers, finally a group of bead makers at Krobo in the Eastern region of Ghana. The target population was 110 though only 69 were accessible during the research which represented 62.7% response rate.

RESULTS

Results from fibre property tests were qualified for cord, yarn or twine making. Table 1 shows the respondents demographics which is a mixture of both males and females with educational levels spanning from senior high school level and tertiary level (post graduate degree).

Table 1: Respondents demographics

Characteristics	**Gender**	**Educational Background**	**Work Experience (Years)**
Traditional Baskets Weavers in Daffiama, Upper East Region	5 Females	MSc	25-30
Students of the St Theresa Vocational School	40 Females	SHS	1-3
Teaching and Non-teaching staff of St Theresa Vocational School	7 Females	Tertiary Level	5-15
Muestem Women Group in Krobo	13 Females	-	5-30
Staff of FORIG	4 Males	Tertiary Level	10-20
Total	69	-	-

For the sake of the study the resultant fibre obtained must be sufficiently flexible to go through repeated bending without significant strength deterioration or breakage. The fibre must be able to undergo slight extension in length, without breakage. In other words, the extension deformation of the fibre must be nearly elastic. Fibres from tree sources were obtained from the wood pulp. Kraft and sulfite also called sulphite refer to the type of pulping process used to remove the lining, bonding the original wood structure thus freeing the fibres for use. Since the valuable fibres are located in the phloem, they must often be separated from the xylem or woody core and sometimes from epidermis, by retting. In the phloem, bast fibres occur in bundles that are glued together by pectin and calcium ions. Often bast fibres have higher tensile strength than other kinds of fibre.

A mallet or beating stick was used for beating the soft woody barks into a pulp. Discarded fufu pestles or mallets were used for this purpose. Sisal leaves when harvested were placed on a hard, regular surface such as a flat stone, a log of wood or a mallet was used to beat the leaves into a soft pulp making sure that the fibres are separated from the pectin. After beating, the fibres were washed and dried. Sometimes the leaves were allowed to be retted. Retting produces a dark coloured fibre, since the leaves were allowed time to decompose. Bleaching thus produces the best colour. For very fine fibres to be used for threading beads, the fibres were combed with a hair comb. They were then plyed and twisted together for use. The fibres were hooked to the big toe and both ends were held, depending on how long the rope to be made is, it was then twisted clockwise till all length was made. The rope was plyed three times by inserting another strand, twisting it anti-clockwise and twining it clockwise around the first two.

The identification of the plants, including major and minor cultivated and wild, indigenous and exotic plants worth exploiting for fibres in Daffiama (Upper West) and Krobo in the Eastern region. The information was gathered through field experience, material collected through various explorations, ethno botanical studies, literature survey and taxonomic identification of materials received through different plant genetic resources activities, formed the basis for identification and authentication of fibre forming plants.

The researcher also identified plants with fibre forming properties based on the bark of the plant with thick walls, long cells and small cavities and using pointed ends. Cellulose is the main component of plant fibres, and the higher the cellulose content of a fibre the greater its value (Brink & Achigan-Dako, 2012).

Another criterion used by the researcher to identify fibre forming plants is its chemical properties in relation to the amount of cellulose, Hamie-cellulose, pectin and lignin in a fibre. Pectin bind fibre cells together. Lignin increases the rigidity of the cell wall, makes it less susceptible to predation and less permeable to water (Brink & Achigan-Dako, 2012). Based on the criteria the researcher identified the following plants.

Table 2 Locally identified Plants in Ghana with the potential of producing fibre

SN	Local Name (Krobo/ Daffiama) English Name	Part of Plant that Contain Fibre	Scientific Name
1	*Hatso* (Krobo)/Congo Jute	Stem	*Urena Lobata*
2	*Kpokpotso*	Stem	*Hildegardia Barteri*
3	*Ho*	Stem	*Veronia Auriculifera*
4	*Nyabatso*	Stem	

5	*Torkojo*/False Baobab	Stem	*Sterculia Africana*
6	Paper Mulberry	Stem	*Broussonetia papyrifera*
SN	**Local Name (Krobo/ Daffiama) English Name**	**Part of Plant that Contain Fibre**	**Scientific Name**
7	*Bu*	Leaves	*Sansevieria Atheopica*
8	*Blefota*	Leaves	*Ananas Comusus*
9	*Kutsa*-Tatɛɛ	Stem	*Acacia Kamerunensis*
10	*Bigre*/Kenaf	Stem	*Hibiscus Cannabinus*
11	Rice	Leaves	*Orzya Sativa*
12	Banana(*Koduu*)	Stem	*Musa Sapientum*
13	Plantain(*Madaa*)	Stem	*Musa Paradisaca*
14	Raffia(*Tonto*)	Leaves	*Raffia Fernifera*
15	Corn Husk (*Blefoba*)	Leaves	*Zeamays*
16	Bu (Mother-In-Laws tongue)	Stem	*Sansevieria Aethoiopica*
17	Palm	Leaves	*Arccaceae*
18	Fan Palm (*Womla*)	Leaves	*Filifera (Washintonia)*
19	Oil Palm	Leaves	*Elaeis Guineensis*
20	Coconut Palm	Leaves	*Cocus Nucifera*
21	Sisal	Leaves	*Agave Sisalana*
22	Guinnea Grass (*Chacha*)	Leaves	*Panicum Maximum*

***Source*: Field Research (2015)**

Having identified the above plants it can be deduced that the extraction process for all identified plants have similar processes. Such as harvesting, peeling from the stem and beating into pulp to obtain the deserved fibres.

1. Bigre has to be harvested only after the leaves of the plant have been harvested for food and its seeds are drying up. For the remaining plants total harvesting is not done, rather the portion needed for yarns can be taken off even as the plant is still growing.
2. All the plants identified grow in the wild and as such do not need any special cultivation care.
3. All the fibres identified were very strong but not elastic enough to qualify for a yarn suitable to make macramé knots.
4. On the issue of durability, the fibres identified depend mostly on the way a particular fibre was used such as if the fibre was exposed to the weather, that is rain and sunshine, it wears off easily thus not making it durable.
5. All fibres were very strong due to the way the locals used them such as tying of animals, as ropes for drawing water from wells, tying of fences and using as pegs for farm produce, making of stretchers for relaxing and carrying bodies.
6. Similarly, all the fibres are plant based; they can be cultivated and also grow in the wild and are found in the tropics.
7. Apart from the fibre source of all the identified plants they all serve as food, for both human and animals and medicine.
8. From the findings, it is evident that all the fibres identified can be used for tying and therefore be explored for macramé knotting.

9. From the findings it can be deduced that since all the fibres identified can be used for tying; they can therefore be explored for macramé knotting. Having identified and described plants with fibre forming properties the study goes on to examine and experiment with the extracted plant yarns under the following headings. Resistance to chemicals, lustre, strength and to pulling, absorption of moisture, flammability of fibre elasticity when stretched and finally its affinity to dyes.

DISCUSSIONS

Description of the identified plants

Plate 1: Acacia Kamerunensis
Source: Field Research (2015)

Acacia Kamerunensis
Family Name: Mimosaceae
Synonyms: *Acacia Pennata*
Local Name: *Kutsa-Tatɛɛ*
Locality: Odumase Krobo

Acacia grows in the wild with a long rough bark, curved prickles, greyish in colour and grows up to 5 metres tall. It is a climber which attaches itself to trees. Its leaves alternate with its flowers being bisexual. The stem yields a strong fibre.

Plate 2: A*gave Sisalana*
Source: Field Research (2015)

Agave Sisalana
Family Name: *Agavaceae*
Synonyms: *Agave Rigida*
Local Name: *Sisal, Hemp* or *Tangme*
Locality: Daffiama and Odumase Krobo

Agave is a robust monocarpic, perennial herb which grows to about 9 metres tall before flowering. Its leaves are crowded in a dense rosette and arranged in an ascending spiral. The leaves are dark green but covered with a white waxy layer. The leaves yield the fibres for use.

Plate 3: Hibiscus Cannabinnus
Source: Field Research (2015)

Hibiscus Cannabinnus
Family Name: *Malvaceae*
Synonyms:*Hibiscus Sabdariffa*
Local Name:*Kenaf, Bigre, Guinea Hemp,*
Locality: Daffiama (Upper West)

Hibiscus Cannabinnus grows naturally on grassland as a weed. It is an annual herb which grows up to 2 metres tall in the wild and 5 metres when cultivated. It has an erect stem, slender and cylindrical. Its leaves are simple and flowers are bisexual. Its stem yields fibre for weaving.

Plate 4.4: V*ernonia Auriculifera*
Source: Field Report (2015)

Vernonia Auriculifera
Family Name: *Asteraceae*
Synonyms: *Vernonia Biafrae*
Local Name: *Hu, Ho*
Locality: Odumase Krobo

Vernonia is a small tree which grows up to 9 metres tall. It grows in the open grassland where plantations are abandoned. It sprouts wherever it is cut. The stem, leaves and flowers yield dye. It also improves the soil and gives shade to nursery crops. The erect stems yield a strong fibre.

Plate 4.5: S*terculia Africana*
Source: Field Research (2015)

Sterculia Africana
Family Name: *Sterculiaceae*
Synonyms: *SterculiaTragacantha, Triphaca*
Local Name: *False Baobab, Tokokzo, Tokojo*
Locality: Odumase Krobo

Sterculia is a deciduous, monoecious small to medium sized tree which grows up to 12 metres tall. The wood is soft not too strong and lightweight when dry. The stem contains gum thereby making it very sticky when fresh. But its fibre is fairly strong and used for domestic purposes.

Plate 4.6: Sansevieria Aethiopica
Source: Field Research (2015)

Sansevieria Aethiopica
Family: *Dracaenaceae*
Synonyms: *Sansevieria Desert*
Locally Called: *Mother in Law's Tongue, Bow-String, Hemp, Bu*
Locality: Odumase Krobo

Sansevieria Aethiopica is a perennial rhizomatous herb without stem. Its leaves are in a rosette with narrow, linear blades. It bears flowers which are bisexual. The leaves bear strong fibres which can be used.

Plate 4.7: BroussonetiaPapyrifera
Source: Field Research (2015)

Broussonetia Papyrifera
Family: *Moraceae*
Synonyms: *Morus Papyrifera*
Locally Called: *Paper Mulberry, Ghana Yorke, Deer's Tree*
Locality: Odumase Krobo

Broussonetia Papyrifera is a dioecious medium sized tree which grows to about 35 metres tall. Its leaves alternate, simple, slightly rubbed and hairy. It is a fast growing tree with often abundant sucker formation and grows annually. Its bark yields tough interlacing fibres which can be extracted in broad layers.

Plate 4.8: Urena Lobata
Source: Field Research (2015)

Urena Lobata
Family Name: *Malvaceae*
Locally Called: Hatso, Congo Jute,
Hibiscus Bur
Locality: *Odumase Krobo*

This plant is an annual and perennial shrub which spreads its branches until about 2-3 metres tall. Its leaves are simple and alternate. The plants are propagated by seeds and its bark yields a strong fibre competing with kenaf and jute.

CONCLUSIONS

Although this study was conducted in a basic Art studio with no conventional laboratory equipment for processing the plant samples, the study is significant for enriching the extraction and processing of natural plant fibres in Ghana. It is also relevant for developing creativity in non-formal educational settings.

The purpose of this project has been to explore the natural reserves, identify plants from which fibres can be extracted and applied to the production of macramé. This task was accomplished by means of assisted visits to various locations to identify, photograph and collect samples of the plants for the experiments; interviews with some indigenous weavers and observation of traditional processing techniques and uses of the fibres; and experiments to explore the fibre yielding properties, possibilities in extracting fibre from the identified plants under basic art studio conditions, and their suitability for macramé knots. The aim was to seek ways to expand the raw material base to sustain and provide yarn variety; making indigenous knowledge available to teachers and students; and creating awareness for the potential in such art projects, and employable skills that could be gained by students, teachers and the general public.

The extensive nature of plant fibre, however, demands in-depth research and chemical analysis in order to understand the properties of the identified and extracted fibres, their reaction with particular mordants. Nonetheless, the results of this investigation hold promise for expanding the raw material base of the macramé for students and women in Ghana.

In addition, evidence from the study also revealed a lot more than just natural fibres which was the prime objective. The results lay bare the potentials of local plant fibre extracts that can be used as macramé cord and textiles. It is, however, imperative for the macramé and textile industry to develop effective strategies for incorporating this experiment on plant fibre extraction into their core research and development business so that they can explore other plants and come up with more scientific ways of producing and preserving these plant fibres for extensive use.

The study further highlights the need to tap the existing indigenous knowledge and understanding of plants to promote art education and technical skills development so that traditional values can be incorporated in the schools and colleges curricula towards creative educational development particularly in the vocational subjects. This exercise also offers opportunity for researchers to get firsthand information about the nature of the plants, their characteristics, local and botanical names, medicinal value, fibre yielding qualities, and their uses in Ghana and other parts of the world.

Since the fibre extraction and application project involves visits to nature reserves and the indigenous textile production centres where plant fibres are traditionally used on a large scale, the students will be knowledgeable in using fibres extracted from plant source to sustain life and generate employable skills. This will also offer opportunities for students to learn skills in tie-dye, batik, printing, dyeing of yarns for macramé, and crocheting at little or no cost and only buy synthetic yarns when necessary, for weaving.

RECOMMENDATIONS

In this view it should not be a case of just felling the trees to harvest the barks before usage. The focus should be on growing them on a sustainable basis. The indigenes must liaise with the Forestry Commission to help them undertake this all-important assignment for the future. As part of the Government of Ghana's initiative on Planting

for Food and Jobs, a holistic approach must be made for most of the teeming unemployed youth to go into tree planting for fibre production as the plants do not necessarily have to be overly matured.

The forestry sector is reported to be dying and we need to adopt pragmatic measures to help reverse the trend, of course with the Ministry of Lands and Natural Resources leading the way. A holistic approach with the sector ministry, its appendages, timber men, environmentalists and other stake holders as active participants in the planning, formulation and implementation of forestry policies and programmes should be a step forward. In the case of fibre generation, producers of plant fibre should have the ready market for it; thus, encouraging them to grow more for sustenance. Apart from the macramé craft weavers, other craftsmen can also introduce the usage of plant fibres.

The importation of foreign goods and materials should be minimized, if not banned. As part of industrialization, Ghanaians should learn to appreciate their own products, "made in Ghana goods", using their own local materials for work.

REFERENCES

Beaujot, A. (2012). *Victorian fashion accessories*. Illustrated edition. Berg Publishers. ISBN 1847886825.

Brink M. and Achigan-Dako E G. (2012). Volume 16 of plant resources of tropical Africa. PROTA. ISBN 9789290814818

Cummings, V., Cunnington, C. W., & Cunnington, D. E. (2010). *The Dictionary of Fashion History*. ISBN 978-1-84788-533-3.

Glass, G. V., & Hopkins, K. D. (1984). Statistical methods in education and psychology.

Hebrero, M. 2015. *Fashion buying and merchandising: from mass market to luxury retail.* USA-CreateSpace. ISBN 9781517632946.

Horst, D., (2013). An experimental study: comparing a pattern approach to a creative approach in teaching macramé (Doctoral dissertation).

Jones, T., (2012). Design and fabrication of segmented, slotted waveguides for electro-optic modulation. *Applied Physics Letters*, *91*(14), 143109.

Knupfer N N. and McLellan H. (2001). *An outline of Chapter 41: descriptive research methodologies*. EME 7939.

Leino, M. (2012). Fashion, Devotion and Contemplation: The Status and Functions of Italian Renaissance Plaquettes. Riter Lang, ISBN 978303911068.

Schmid, T., (2006). Promoting health through creativity: for professionals in health, arts and education. John Wiley & Sons.

World Book, (2001). *The World Book encyclopedia.* Juvenile audience : English ed. Chicago: Chicago : World Book, ©2001.