CHARACTERISATION OF PHYSICAL AND MECHANICAL PROPERTIES OF SANSEVIERIA FIBERS

BY

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Declaration;

I Mayanja Denis declare that this is my original research report and has not been submitted to any University or college for any award.

Signature: .....

Date; 29th/05/2013

MAYANJA DENIS

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RESEARCHER

Approval

This is to certify that I carried out this research solely under the watchful eye of my supervisor and is ready for submission to the academic board of Textile department under Busitema University.

Signature; .....

Date; .....

MR. SAMSON RWAWIIRE

SUPERVISOR

Signature; .....

Date; .....

Ms. NAMUGA CATHERINE

CO SUPERVISOR.

Dedication;

I dedicate this research report to my parents, brothers and sisters, I know they are watching me from where they are and are impressed with my academic achievements.

Secondly to my friends entirely who wish me the best throughout my education career

Acknowledgement

I thank the Almighty God for enabling me carry out this proposal report but also seeing me through the hectic Ugandan Education System, against all odds.

I thank my supervisors Mr. Rwawiire Samson and Madam Namuga Catherine for all their generous contribution towards this entire achievement in my proposal for the final year project, may the Almighty God award them abundantly. I thank them for having diligently given me all the information, direction and advice I needed throughout my research and stay at the University, I recoorganise their expertise and I have truly exploited it to the maximum.

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ABSTRACT

Sansevieria trifasciata fiber is anon conventional lignocelluloses fiber that was extracted from the leaves of the sansevieria plant by a mechanical method of retting and then undergone through the respective preparatory processes up to when they were dry. This method was considered the best method since there was less effect to the fibers during the extraction process. The extracted fibers were then examined or tested for their physical properties such as fiber length, elongation, length and diameter. There was also involvement of the treatment of fibers using caustic soda at various temperatures with an intention of achieving the effect of treatment of the fiber properties. It also encompassed testing of some mechanical properties especially the tensile strength test. Results were recorded down to evaluate the success of sansevieria fibers in relation to other fiber but cotton in particular. The accessing of the treatment on the sansevieria fiber was also realized especially on the mechanical element. Finally, it was realized that untreated fibers of the sansevieria fibers had a greater strength compared to the treated fibers. It was also realized that the treated fibers had a reduction with time as a catalyst was applied on them and also temperature was proved to have an effect on the fiber strength. The fibers were proved fit for textile application such as geotextiles since they were had a greater strength especially the untreated fibers. For the respective application of these fibers included curtains, table mats, ropes, geotextile application and many others.

CHAPTER ONE

1.1 Background

The **Sansevieria trifasciata** is a native of West Africa from Nigeria East to the Democratic Republic of Congo. ***Sansevieria trifasciata*** is a native to tropical Africa and is widely grown as an ornament, e.g. in Indo-China, Indonesia and Malaysia (***Alfarii et al 1989).*** Sansevieria species are primarily known worldwide for their cultivation in gardens, in pots, as indoor plants and on rockeries as ornamentals. Sansevieria are among major foliage ornamentals in the world owing to their succulent leaves, the wide range of leaf shapes and sizes, the variation in color (***Mbugua and Moore 1996)*** that ranges from plain green to variegated and mottled leaves and their ability to tolerate drought and neglect. Other uses of Sansevieria include manufacture of rope, fishing lines, cordage, fine matting, bowstring and clothing (***Everett 1982)***. It has short, slender rhizomes with rosettes of up to 6 leaves 2.5 to 3 ft long and 2 to 2.8 inches wide. Leaves are dark green with silvery green cross banding that is most prominent when plants are growing in bright light. Sansevieria leaves growing in partial shade are taller, more slender and turn dark rather quickly.

In Uganda, ***Sansevieria trifasciata*** plant with a local name of ***makokola*** and found in many areas around the country including bushes, alongside roads and also in people's homes purposely for ornament use. In this case, they are placed in pots, small buckets which are usually placed on home verandas, inside the sitting rooms and others in bed rooms. They have not been grown on large scale such as big plantations in Uganda but are found available in most areas around the country in large quantities but have not yet been put to use for the fiber extraction as yet since people do not have prior knowledge about the entire uses of this plant.

Sansevieria trifasciata is cultivated as a fiber plant in many areas of the world including in Uganda and it easy to grow since it doesn't require critical conditions to sustain its growth. It is a plant that survives in most of the weather conditions unlike other plant species. This makes it a unique plant in terms of growth conditions and environment. Sansevieria is a genus of xerophytic perennial plant that occurs mostly in dry tropical and subtropical habitats. About 70 species are known with a distribution range from Africa, Asia to Burma and the islands of the Indian Ocean. Members of the genus Sansevieria are known by various common names such as bow string hemp, snake plant, zebra lily, mother in law's tongue, leopard lily, devil's tongue, and good luck plant to name a few. ***Sansevieria trifasciata*** is reported to be cultivated for its fiber in the Philippines. This plant was discovered by (***Gustav Bantel)*** of St. Louis, Missouri who patented the plant in 1948. On the patent application ***Mr. Bantel*** stated "The primary object in carrying out this invention was to fix the unusual dark olive green leaves and silver white longitudinal stripes of the leaves,

their slender transversely concave rapier shape, and their nearly vertical stiff erectness, diverging upwardly from a short basal rosette."

The leaves of Agave plants have been reported to be rich in textile fibers that belong to the class hard fibers ***(Lewin and Pearse, 1985; Verloove, 2005; Msahli et al., 2007; Cruse, 2008).*** There is an increase in research interest on the availability of xenophytes and new and uncommon ones are being discovered due to the role played by these plants in improving mans' economy ***(Clement and Foster, 1994, Verloove, 2005),***

The local names of Sansevieria were based on morphological features, habitat preferences and the use of Sansevieria species that occurred in the area. However, some of the names had no apparent meaning. ***(Kakudidi 2004)*** found this to be true for various plant species in his folk plant classification in Uganda. Several of the local names of Sansevieria species given by the respondents were related to the use of Sansevieria for rope ***(Leighton 1917 ba b)***. This could be an indication that use of fiber was regarded as the most common and well known use for the genus. Some common names are related to the ecology of the plants and show that local people are aware of the ecological aspects of Sansevieria habitats in the world. The respondents had knowledge that distinguishes the genus Sansevieria from other plants, with exceptions of isolated cases **where sisal was mistaken for Sansevieria.**

Table 1: Different varieties of the Sansevieria trifasciata plant discoveries

Horticulture name	Discover individual	Plant patent no.	Date patent granted
Sansevieria trifasciata"Hahnii"	William W.Smith	470	June 3rd 1941
Sansevieria trifasciata "Nelsonii"	Oscar nelson	633	July 4th 1944
S.trifasciata "Bantel's Sensation"	Gustav E.Bantel	796	April 20th 1948
S. trifasciata "Silver Hahnii"	Sylvan F.Hahn	1220	October 13th 1953
S.trifasciata "Golden Seam Hahnii"	Sylvan F.Hahn	1221	October 13th 1953
S.trifasciata "Golden Hahnii"	Sylvan F.Hahn	1224	October 27th 1953

Most people especially the botanists are familiar with important roles that plants play in our lives by taking in carbon dioxide from air and producing oxygen. The air quality is just more than just carbon dioxide and oxygen levels though, but thanks full plants play an important role in helping in with air pollution too by taking in most of the toxins.

In China, Sansevieria trifasciata was kept as a treasured houseplant because the Eight gods bestowed their eight virtues on those who grew them. These virtues include long life, prosperity, intelligence, beauty, art, poetry, health and strength. The plants were kept near the entrances inside the home so that the eight virtues could pass through in a manner pre-FengShui. These plants also were placed in fine restaurants, herbalists, acupuncturists, doctor's offices, accountant's offices, banks, shrines, monastaries, and even in rice paddies. Sansevieria was grown and cherished well before the Chinese ti plant (Dracaena spp.) also known as the Good Luck Bamboo!

The Sansevieria is also referred to as a dragon for its many unique qualities. As with many Asian martial arts techniques, the strength comes from within. The Sansevieria has been known to split large earthen pots upon reaching larger sizes. Many qualities from within the plant makes it very well kept and cherished. The mere presence of this plant is said to bestow the eight essential qualities upon you. So many times this plant is kept at the entrance or reception or foyer area of a home or place of business. The Chinese have usually kept this plant potted in a pot within a ceramic pot often ornated with dragons and phoenixes. The attraction of this plant towards dragons is said to be magnetic.

In 80's and 90's, NASA followed studies and gave a list of good house plant choices that are both easy to care for indoors and act as air cleaners. They recommended mother in law's tongue (Sansevieria trifasciata), spider plant (chlorophytumcomosum), a few good palms and others by ***NASA group and Wolverton Environmental Service.***

1.2 Problem statement

The ecological aspect is gaining credence now days since people are more and more pollution conscious today than in the older days. Rapid industrialization and advancement in technology have added pollutants both to the product and to the environment. The situation has become so grave that our environment can no longer tolerate the deposition of pollutants. The research project is aiming at initiating new fibers (Sansevieria) that are eco or environmentally friendly to both environment and human nature ***(NASA)***, though it has not been utilized efficiently in our Country since most individuals use them for decoration purposes in homes.

1.3 Objectives

1.3.1General objective

- To characterize the mechanical and physical properties of the Sansevieria fibers.

1.3.2 Specific objectives

- Study of the physical and mechanical properties of the fiber
- Investigating the effect of fiber treatments on the mechanical properties
- Comparison of the sustainability of the fibers in relation to other natural fibers.

1.4 Justification/ significance

Among the various polluting industries, textile industries have contributed to the major portion due to chemicals they use rampantly at different stages from the fiber to the fabric formation. This has necessitated a research on one of the ecofriendly fibers that in cooperates no use of chemicals in their extraction process. As a cellulosic, it is going to allow the utilization of environmentally friendly raw materials. It is going be used in diversified fields that have yet been denied a chance of being utilized in the textile field yet it is very fast growing, renewable, no pesticides used, no fertilizers applied, no irrigation in its cultivation, biodegradable (***Wolver ton Environmental Science)*** Sansevieria plants is to act as good air purifiers especially around human environment.

Sansevieria trifasciata and other species are readily available within our environment including Busitema, Shaule, in Tororo and many parts of the country thus stopping worries about the scarcity of the plant.

For the local people are to engage in farming that is to earn them a living at the end of the day especially those who have the free vast land to carry out Sansevieria plantation farming. Varieties of the textile fabrics on market are going to increase in quantities thus creating diversity in the industry.

1.5 Scope of the project.

The whole project involved the cultivation of the Sansevieria plant, the extraction of the Sansevieria fibers was done from the Sansevieria plant and was carried out in Busitema University. Since it is among the leaf natural plant based that do exist in most of the environments, it was extracted by mechanical or hand means without any use of chemicals thus environmentally friendly. After the extraction, the different mechanical and physical properties were identified and then tested. The different tests were carried out in Busitema University Textile Laboratory, NYTIL's mechanical and chemical laboratory industry.

1.6 Hypothesis

Do Sansevieria fibers have superior textile properties than other natural or synthetic fibers?

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