KENAF AS AN ALTERNATIVE FIBRE TO RATTAN FOR BASKETRY PRODUCTS

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Bachelor of Applied Arts with Honours (Design Technology) 2017
KENAF AS AN ALTERNATIVE FIBRE TO RATTAN FOR BASKETRY PRODUCTS

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This project is submitted in partial fulfilment of the requirements for the degree of Bachelor of Applied Arts with Honours (Design Technology)

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PENGESAHAN

Projek bertajuk Kenaf sebagai Gentian Alternatif kepada Rotan untuk Penghasilan Produk Anyaman Bakul telah disediakan oleh Mabelle Tang Qi Fang dan telah diserahkan kepada Fakulti Seni Gunaan dan Kreatif sebagai memenuhi syarat untuk Ijazah Sarjana Muda Seni Gunaan dengan Kepujian (Teknologi Seni Reka).

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PENGAKUAN

Saya mengaku bahawa tiada bahagian daripada penyelidikan dalam disertai ini telah digunakan sebagai bahan sokongan untuk sesuatu ijazah atau kelulusan sama ada kepada universiti ini atau institusi pengajian tinggi lain.

(Mabelle Tang Qi Fang)

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**ABSTRACT**

The purpose of this study is to identify kenaf as a suitable alternative to substitute rattan fibres. Rattan plants are getting scarce all over the world. In Sarawak, the community uses rattan fibres to express a form of art through basketry weaving. Rattan fibre is a strong fibre that has been used all over the world, not only in the art of basketry, but also for furniture. However, rattan takes up around 6 years to grow, and 10 years to fully bloom for it to be able to be cultivated. The kenaf is introduced as an alternative in this research. The kenaf plant takes a lesser time to be planted and cultivated. It only needs roughly 3 months of plantation to be cultivated. It is also a sturdy fibre. Through this research, different ways of scouring and treating of the kenaf fibre was carried out using different types of chemical. Other than that, an experiment on different types of weaving technique was also carried out to ensure which technique compliments the fibre in terms of sturdiness and aesthetic. After the kenaf has been weaved into products, printing of floral motifs were done on the woven products for aesthetic value. The rattan fibre was also introduced in the weaving of the kenaf.

**Keywords:** Kenaf, rattan, alternative, fibre, technique, weaving
ABSTRAK


Kata kunci: Kenaf, rotan, alternatif, gentian, teknik, tenunan
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CHAPTER 1

INTRODUCTION

1.0. Introduction

*Kenaf*, also known scientifically as *Hibiscus Cannabinus L.*, originated from Africa with a history of more than 4,000 years of plantation (Idirs, 2013). Kenaf is classified under the Malvaceae family. It is now known as an alternative medium in the petroleum and forestry industry. Kenaf was introduced to Malaysia in the early 70s'. It was later accentuated as a cheap and alternative root of material for the production of panel products in the late 90s’ (Hazandy, Mohd-Hazimy, Nor-Aini, Baharom, Mohamed-Hanafi, 2009).

1.1. Problem Statement

For centuries, rattan has been used commercially for handicrafts, construction materials, furniture, as well as basketry (Siebert, 2002). Although it is famous for its sturdiness, rattan however takes a long time to be harvested. Rattan takes up to 6 years of plantation in order for it to mature for harvesting, but only bearing in full at about 15 years of plantation (Wan Razali Wan Mohd, Dransfield & Manokaran, 1992). Compared to kenaf, rattan takes a much longer period of time to plant and harvest. The kenaf plant only takes around 5 months to be readily harvested. As such, kenaf reduces the time of harvesting, which in return will reduce the time taken to produce
products. Thus, the kenaf is a suitable alternative for rattan, especially in the field of handicrafts production.

1.2. Research Questions

The research will be based on several questions:

1. Why is kenaf a suitable alternative for rattan?
2. What sort of weaving techniques can be applied on the kenaf fibres?
3. What types of fashion accessories that can be produced using kenaf fibres?

1.3. Objectives of the Study

The objectives of the research are:

1. To identify the types of scouring agent and dyes which are suitable to lighten and dye kenaf fibre.
2. To experiment various weaving techniques using kenaf fibre suitable to produce baskets.
3. To design and produce a collection of baskets using kenaf fibre.

1.4. Scope of the Study

The study will involve treatment of the kenaf fibres, dyeing of the kenaf fibres and experiments on how to weave kenaf fibres into beautiful and marketable products. The research location will
be mainly at University of Sarawak Malaysia (UNIMAS) under the Faculty of Applied and Creative Arts (FACA). The faculty provides many suitable equipments as well as space for experimentation on the kenaf fibres.

1.5. Significance of Study

The research is to study on the potential use of kenaf as well as for the purpose of minimizing the time used for plantation and the harvesting of the crops for commercial use. The aim of the research is to be able to produce more woven products at a shorter period of time. At the same time, it is hoped that this study will be able to help to improve the lives of villagers on the rural areas of Sarawak economically. This study also aims to broaden the usage of kenaf for a wider market, as well as maintaining the sustainability of rattan fibres.
CHAPTER 2

LITERATURE REVIEW

2.0. Introduction

In Chapter 2, the literature reviewed was written based on the journals and books from Google Scholar as well as from CAIS (The Centre of Academic Information Services) located in UNIMAS. The journals and books read were written into Chapter 2 based on the researcher’s knowledge of the research as well as how much the literature read is related to the research done.

2.1. Kenaf

According to Hassan, Hanafi et al. (2011), kenaf is also known for its scientific name, *Hibiscus Cannabinus* L., from the Malvaceae family. It is cultivated for its fibre. Kenaf originated from Africa where it can grow up to a height of five to six meters within three months of plantation, depending on its variety. It is a very promising plant for its potential commercial applications in a diversity of industries. The paper and fibre-based industries can optimize the use of kenaf as a source of raw material (Basri, Abdu, Junejo, Hazandy, Abdul Hamid & Khalil Amed, 2014).
2.2. Factors that Contribute to Kenaf Plantation in Malaysia

Kenaf is commonly planted in tropical climates (Basri et al., 2014). According to Idris Mohd Salleh (2013), the kenaf plant needs rainfall for around 60mm to 120mm per month during its three to six months of plantation. The best temperature to ensure a successful plantation is around 25°C to 28°C and sunlight of 12.5 hours. This is the first factor where Malaysia is a country with the proper weather conditions for the plantation of kenaf.

The second factor is the soil needed for plantation. Kenaf has to be planted on a flat surface with a slanting of not more than 12°. This is to ensure that during harvesting, the heavy machineries used in the process will have easy access to harvest the kenaf plants. Besides that, kenaf can be planted conterminously to other plants such as, seedlings of rubber tree plants and also palm oil seedlings (Mohd Idris Salleh, 2013). This is crucial as Sarawak has a large growing economy of the palm oil plantation. Although kenaf can adapted to a wide range of soil types, kenaf plant grows in better quality and quantity when planted in medium textured clay or loamy, well drained fertile soils (Basri et al., 2014). Soils such as, alluvial soils, mineral soil, sandy clay loam, sandy loam, clay and sandy soil, are the best types of soil for kenaf to be planted on (Idris Mohd Salleh, 2013).

2.3. Characteristics of Kenaf Fibres

According to Akil, Omar, Mazuki, Safiee, Ishak and Abu Bakar (2011), kenaf plant is composed of many useful components and these components have their own usable portions. The kenaf plant is able to produce 30% fibres on its bast and 70% core from its bark.
be separated by using chemicals or enzymatic retting (Akil et al., 2011). According to Akil et al. (2011), kenaf fibres contain 5% - 20% lignin, 60% - 80% cellulose, and 20% moisture.

2.4. Growth Rate of the Kenaf

As a herbaceous plant, the kenaf produces up to 30% long fibers from its bast and 70% short fibres from its core (Idris, 2013). The kenaf plant is able to grow to an altitude of more than 3m and a 3-5cm base diameter within 3 months (Akil et al., 2011). The plant will be harvested 75-120 days after plantation. The seeds of the kenaf plant are then taken out after they have matured, which takes roughly around 135-150 days after harvesting. Kenaf can be harvested around 20 ton per hectare (Idris, 2013).

2.5. Treatment Process of the Kenaf Plant into Fibres

Before the fiber is taken to treatment, the plant is first separated and dried. Typically in the industry, the kenaf is dried under the dryer for 8 to 10 hours but still sustaining its moisture of around 8% to 12%. The temperature of the dryer is kept at 40°C. After that, the kenaf is cleaned using a separating machine. After the kenaf is separated, the fibre from the kenaf is taken to be treated (Idris Mohd Salleh, 2013). According to Akil et al. (2011), reagents, which are capable of bonding with the natural fibres of the hydroxyl group are used in the chemical modification of kenaf. Alkaline treatment, silane treatment, isoylanate treatment and acetylation are other treatments that can be used on kenaf fibres. The effects on the fibres differ on the treatment used.
2.6. Products made from Kenaf

In the olden days, kenaf fibres were woven into ropes, canvas and sacking (Akil et al., 2011). Nowadays, the kenaf has become a substitute for raw material in the pulp and paper industries. According to Basri et al. (2014), the seed oil produces by the kenaf is considered edible for humans. The oil from the kenaf seed is reported to be cytotoxic to leukemia and cancer cells (Basri et al., 2014). Other than that, sleeping problems may be cured by filling pillows with kenaf decorticated fibers. Kenaf has also been used to produce accessories and crafts but to a minimum supply. Examples of accessories made from kenaf are traditional bracelets and bags. Other than that, in order to steer clear from harming the forests, kenaf is used in the paper industries as a substitute for natural resources in place of wood. The long fibres found in the bast of the kenaf are appropriate for paper, textiles and rope.

2.7. Surface Treatment of Kenaf Fibres

According to Hashim et al. (2016), although using alkali treatment of surface on the natural fibres was broad, the difference in the setting of the conditions of the treatment will produce a difference in the result of the characteristics of the fibres. In an experiment, Hashim et al. (2016) explained that kenaf fibres are immersed in different chemical percentage solution, time as well as temperature. The calculations used in the experiment were of w/v%. The results of the experiment showed that the best solution used were 2% sodium hydroxide solution, at a temperature of 100°C for duration of 30 minutes. The results also show that the tensile strength in the fibre has indeed decreased.
Although the study conducted by Hashim deemed that the best surface treatment for kenaf fibres was at 2% sodium hydroxide solution, with a temperature of 100°C for duration of 30 minutes, the experiment done by Fiore, Di Bella and Valenza showed different results. According to Fiore, Di Bella and Valenza (2015), the best solution for the surface treatment of kenaf fibres was using a sodium hydroxide solution for 5% immersed for 48 hours in room temperature solution. The results from Fiore’s experiments showed that the fibres showed no signs of impurities due to the bleaching effect of the NaOH. The tensions on the fibre texture as well as its structure were not affected.

Both studies done by Hashim and Fiore were done using sodium hydroxide (NaOH). However, another study done by Wei et al. (2015), were done using borax (Na2B4O7), formaldehyde (HCHO) and silicic acid (NaHSiO3). The result of the study showed that the use of the borax in the solution helped to stop the fibres from decaying by taking up frictional heat. The experiment was done with a solution of 10 wt% solution with a duration of 4 hours in room temperature (Wei et al., 2015).

2.8. Mordanting and Dyeing

Natural dye from fruit and plants are considered as safer for the environment as well as the human body (Ajmal et al., 2014). According to Ajmal et al.’s research, the experiment used aluminium, copper sulphate, chrome and tannic acid for pre-mordanting and post mordanting on degummed silk fabrics. Both pre and post mordanting were done at a temperature of 50°C with duration of 40 minutes. The experiment done by Faiz (2011), using cotton and silk fabrics were