DALUPANG (Urena lobata L.) BAST FIBERS AS AN ALTERNATIVE ECO-BAG MATERIAL

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ABSTRACT

This study aims to test the Dalupang (Urena lobata L.) bast fibers as an alternative eco-bag material by testing the ultimate tensile strength of the fibers. Dalupang (Urena lobata L.) bast fibers were extracted and set into different solutions (1%, 4%, 7%, 0%). The fibers were soaked in the different solutions of Sodium hydroxide for 62 hours. The ultimate tensile strength of the fibers was tested and solved if there is a significant difference among the treatments using ANOVA. Results show that the ultimate tensile strength of the bast fibers from Dalupang (Urena lobata L.) is much stronger on the fibers soaked with NaOH solution over the negative control (0%). ANOVA revealed that there is no significant difference among the four treatments in terms of their ultimate tensile strength.

CHAPTER I

THE PROBLEM AND ITS SCOPE

This chapter is divided into five parts: (1) Background of the Study, (2) Conceptual Framework, (3) Statement of the Problem/Objectives, (4) Significance of the Study. (5) Definition of Terms, (6) Scope and Delimitation.

Part One, Background of the Study, provides the study's background information and potential contribution.

Part Two, Conceptual Framework, comprises the general statement that serves as the foundation for queries or investigations.

Part Three, Statement of the Problem/Objectives, identifies the objectives or indicates the purpose of your research.

Part Four, Significance of the Study, includes the benefits to be gained from the research study results.

Part Five, Definition of Terms, for ease of understanding, an alphabetical list of definitions of challenging words or phrases used in the research is provided.

Background of the Study

One of the significant sources of environmental pollution is single-use plastic shopping bags (Xanthos & Walker, 2017). Every year, there is an estimate of 10 million tons of plastics leaks into the ocean which causes many different environmental issues (Boucher & Billard, 2019). Because of the direct and indirect negative effects of plastic pollution on ecosystem health and human livelihood, it became an emerging hazard in the aquatic environment (Van Emmerik & Schwarz, 2020), In the study of Prata et al., they recommended to reduce plastic pollution by (1) regulation of production and consumption; (2) eco-design; (3) increasing the demand for recycled plastics; (4) reducing the use of plastics; (5) use of renewable energy for recycling; (6) extended producer responsibility over waste; (7) improvements in waste collection systems; (8) prioritization of recycling; (9) use of bio-based and biodegradable plastics; and (10) improvement in recyclability of e-waste.

The researchers of this study have a goal of reducing plastic usage by developing an eco-friendly bag. Unlike plastics, an eco-friendly bag from plant fibers is a biodegradable bag which is good for the environment.

The plant that is used in this study is Dalupang (Urena lobata L.). The fiber of the plant is similar to jute but they are easier to extract than jute. The fiber of the plant can be used as a rope because it is fairly strong (Stuart, 2019).

To fill the possible research gap, this study aims to determine the potential of Dalupang (Urena lobata L.) bast fibers as eco-bag.

Conceptual Framework

Extracted fibers from bast of Dalupang (Irena lobata L.) plant ultimate tensile strength of the fibers m 0%,strength 1% 4% & 7% solutions of Sodium hydroxide.

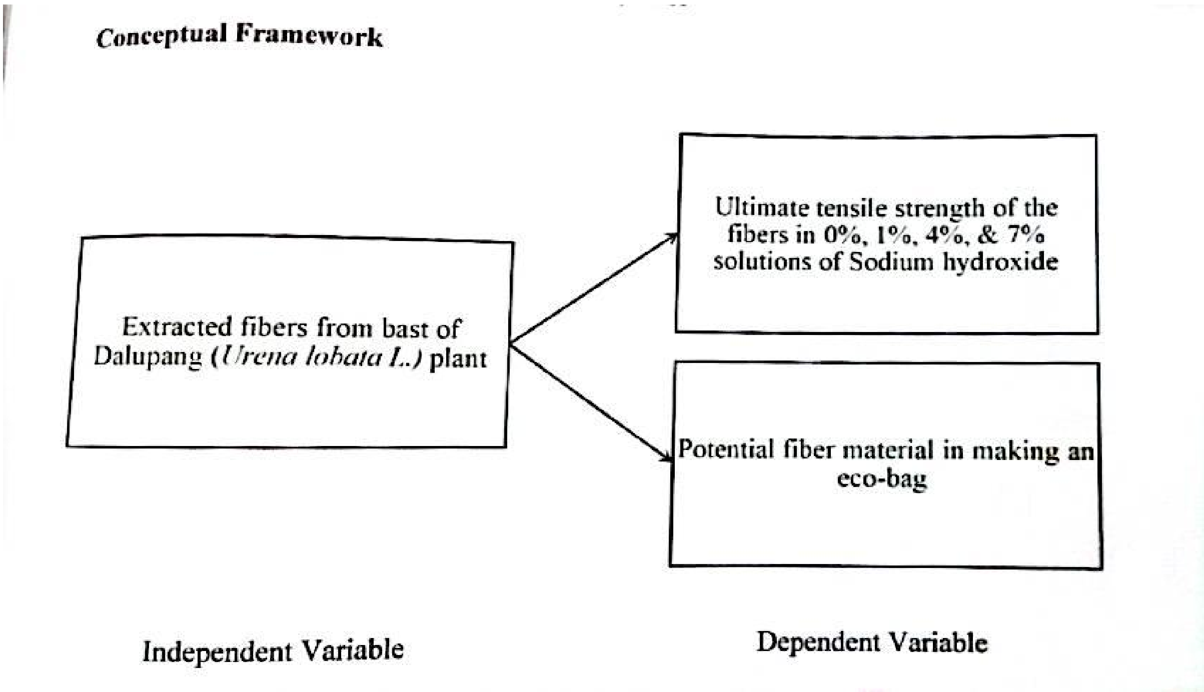

Figure 1.1 Conceptual Framework of the Study

The conceptual foundation for this investigation is depicted in Figure 1.1. It makes use of the Independent Variable-Dependent Variable (IV-DV) Conceptual Framework. The first frame is known as the Independent Variable, as depicted on the diagram. The Extracted fibers from bast of the Dalupang (Urena lobata L.) plant are the independent variable. It will be then processed according to the research methodology of the study which includes the integration of all the components needed to determine the ultimate tensile strength of fibers in different treatments. Three groups of fibers will be treated with 1%, 4%, and 7% solutions of NaOH while one group will not be treated with NaOH. The results will determine if the fibers have the potential as an alternative eco-bag material, which is the dependent variable as indicated in the box.

Statement of the Problem and the Hypothesis

This study aimed to determine the potential of Dalupang (Urena lobata L.) bast fibers as eco-bag.

Specifically, this study sought to answer the following questions:

1. What is the ultimate tensile strength of Dalupang (Urena lobata L.) bast fibers treated in different solutions (0%, 1%, 4%, 7%) of Sodium hydroxide?
2. Is there a significant difference among Dalupang (Urena lobata L.) bast fibers in different treatments in terms of their ultimate tensile strength?

Hypothesis

There is no significant difference among Dalupang (Urena lobata L.) bast fibers in different treatments in terms of their ultimate tensile strength.

Significance of the Study

The results of the study would be beneficial to the following:

Students

This study aims to introduce Dalupang (Urena lobata L.) to the students and its potential for use as an eco-bag material. The study's findings may help students better understand the development of the plant as an alternative material in the construction of an eco-bag and the outcome that may satisfy and demonstrate the effectiveness of this alternative daily.

Environmentalists

The result of the study will broaden the knowledge of environmentalists in terins of protecting the natural environment from harm. The development of the eco bag could help lessen the usage of plastics.

Eco-Bag Manufacturers

The outcome of the study may help manufacturers to learn more about the potential of Dalupang (Urena lobata L.) as a material for eco-bag. This may help the manufacturers calculate the effectiveness and learn the advantages and disadvantages of the fiber material in the manufacturing industry.

Local Community

The development of an eco-bag from the Dalupang (Urena lobata L.) plant may ignite înnovations, new concepts and ideas in the local community. This could result in different textile production from the said fiber.

Filipinos

The result of the study may give the Dalupang (Urena lobata L.) exposure to Filipinos and may be used as an ideal trademark.

Environment

The outcome of the study may have taken effect in reducing the use of plastic bags which are very threatening to our environment. The reusability of this eco-bag will benefits both humans and the environment. Furthermore, the material is decomposable and will act as soil nutrients in a matter of time.

Future Researchers

Future researchers might use the study's findings as a guide Having said that, this study could help future researchers to develop their study by using this staly as a reference

Definition of Terms

For purposes of clarity and understanding, the following terms were specified in their conceptual and operational definitions

Eco-bag. A brand name for a bag for carrying things you have bought that can be used many times and does not harm the environment (Cambridge, 2022)

In this study, eco-bag refers to a bag that is made from Urena lobata L. (Dalupang) stem fibers

Bast fibers. Stem fiber or Bast fiber (also known as phloem fiber or skin fiber) is a type of plant fiber obtained from the phloem (the "inner bark, also known as "skin") or Isast surrounding the stem of certain dicotyledonous plants (Grover, 2022)

In this study, it refers to the medium to be tested for its ultimate tensile strength and the material to be used in making the eco-bag.

Tensile strength. Tensile strength can be defined as the maximum stress that a material can bear before breaking when it is allowed to be stretched or pulled (Pal & Kar, 2022).

In this study, it refers to how much stress the Urena lobata L. (Dalupang) stem fibers could take before it breaks.

Urena lobata L. An upright shrub that can reach a height of 10 feet. The plant has a single stalk and bushy-appearing stems that freely branch out. It is a member of the Malvaceae family, which also contains hibiscus and rose mallows, and has a pretty pink blossom (IFAS, 2022),

In this study, it refers to the plant where stem fibers will be used as the natural material for producing the eco bag.

Scope and Delimitation of the Study

This study aimed to determine the tensile strength of Dalupang (Urena lobata L) bast fibers and their potential as an alternative eco-bag material. The variables are Dalupang (Urena lobata L.) bast fibers untreated and treated in different solutions, the tensile strength, and the effectiveness of each treatment whether it can be used as material for eco-bag or not. Selected members from the group were assigned to gather at least one kilogram of Dalupang (Urena lobata L.) at Cabatuan, Iloilo. Because the plant is an invasive species, the whole plant was taken. All parts of the plant were not used in the experiment, only the selected part which is the bast. The remaining parts was composted.The study is delimited to the use of Dalupang bast in extracting fibers. This study was conducted in April 2023 at Cabatuan, Iloilo.

CHAPTER II

REVIEW OF RELATED LITERATURE

This chapter includes the review of related literature that the researchers have perused to shed light on the topic under the study. It provides information on the variables used in the study. This includes the taxonomic classification, morphological structure, habitat, and distribution of the Dalupang (Urena lobata L.) plant. It also identifies the characteristics of the plant's stem fibers. Lastly, this chapter discusses the definition, types, and categories of eco-bags.

Dalupang (Urena lobata L.)

The Urena Lobata L's taxonomic classification is the Kingdom: Plantae, Subkingdom: Viridiplantae, Infrakingdom: Streptophyta, Division: Tracheophyta, Subdivision: Spermatophytina, Class: Magnoliopsida, Superorder: Rosanae, Order: Malvales, Family: Malvaceae, Genus: Urena L. (Dorr, 2023). Commonly known as Caesar weed, Congo jute, and Bur mallow in English. Palisin, Molopolo, Kulut-kulutan, Kulotan, and Dalupang in Tagalog (Stuart, 2019). This information is vital for the readers to understand more about the plant.

Urena lobata L. is a subshrub that grows 0.6-3 meters with a basal diameter of up to 7 meters (Babu et al., 2016). The stem is a stellate-haired, typically cylindrical, woody. full stem with an upright posture. It has branches and may grow to a diameter of 2 cm. The leaves are simple, alternating, and have a white downy lamina on the bottom face.

The form and proportions vary greatly: lower leaves are bigger, suborbicular, and have 3 to 5 broad lobes, higher leaves are narrower and smaller, becoming narrowly oblong to elliptic. The blooms have a very short stem, are pink with a purple center, and can be found alone or in groups near the base of the leaves. The fruits are triangular, fuzzy, bristled, dry, spherical, composed of five globular parts, and shaped like an anchor boat. The seed is 4.2 mm long and 2.6 mm broad and can be trigonal, globular, or obovate. It is still in the mericarp (WIKTROP, 2023). This information is vital for the readers to identify the appearance of the plant.

Urena lobata L. invades perennial crop plantations, eroded areas, pastures, and disturbed areas (Connor, 2014). A weed of disturbed sites in tropical and subtropical regions, waterways (i.e. riparian vegetation), forest margins, swamps, roadsides, open woodlands, and waste areas (Australia, 2016). This information is important so that the reader will know where this plant can be found.

Urena lobata L. was originally discovered in the eighteenth century by European voyagers and later introduced in the Caribbean region as a fiber crop and medicinal herb because of its curative properties (IFAS, 2022). The species can be found in the wild in tropical and temperate zones of North and South America and Asia, including Indonesia, the Philippines, and Africa. Cultivated crops are mostly found in the Congo Basin and Central Africa, with smaller plantings in Brazil, India, and Madagascar (Babu et al., 2016).

Characteristic of Urena lobata L. stem fibers. Freshly cut stems generate 5-5.5(-7)% retted bast fiber. It is milky white or muted yellow in color and is matched by the fiber's fineness, softness, flexibility, and luster. Compared to other jute alternatives like kenal (Hibiscus cannabimus L.) and roselle, it is more similar to jute (H. sabdariffa L.). It may be spun on jute machinery without requiring any modifications to the equipment or requiring operators to have prior knowledge of Urena lobata L. The length and diameter of the final fiber cells are (0.8-)1.4-1.8(-5.9) mm and (9-)12-19(-34) mm, respectively. There is a significant range in the contents of cellulose (63-87%) and lignin (7-12%), according to information on the fiber composition. In contrast to the average length of roughly 2 meters of fiber from cultivated plants, wild plant fiber is often only about 1 meter long (Ong. Escobin, & Widodo, 2016).

Eco-bag

It is a type of shopping bag for carrying purchases that can be reused and do not harm the environment (Cambridge, 2023). Eco bag is not only recycled material but also eliminate the need for single-use plastic bags.

Plastic bags can take hundreds of years to decompose, and most of the plastics do not biodegrade, they break into smaller particles known as microplastics which cause many environmental and health hazards when they are deposited in water or soil. The burning of plastics also releases harmful gases into the air. The production of plastic also relies on unsustainable, non-renewable sources of energy (Zaheer et al., 2021). People feel plastic bags are light and easy to carry. Their shape and structure aid people to have such a feeling about them. Also, they are found to be cheaper in cost when compared to paper bags (Muthu et al., 2009). While eco bags are biodegradable, can be recycled and decomposed easily. Eco bags, which are renewable, are good for the environment because they are both recyclable and degradable (Li, 2013).

Eco bags can be paper, woven, fabric, or any bag that doesn't harm the environment. Paper bags are biodegradable and made from a renewable resource. It is the most used eco bag in the supermarket and malls. Woven and fabric eco bags are mostly used by the youth. They use this as a bag for their everyday use, one example is a tote bag. Cotton is a renewable resource, and cotton bags are biodegradable. They can be used again because they are powerful and long-lasting.

Related studies

Based on the study that aims to examine the effectiveness of the plant fibers in the production of eco-bag. The produced eco-bag from the plant fibers is durable despite the traditional process it went through and with lacking materials (Anggaan, et al., 2021). More recently than their synthetic equivalents, natural fibers have drawn more interests for use as reinforcement in polymeric composites. This is due to the increased availability of natural fibers. In comparison to synthetic fibers, which are commonly used as reinforcements in polymer matrix composites, natural fibers are less expensive, biodegradable, recyclable, lightweight, and non-toxic. Natural fiber-reinforced polymer composites have been used to create a variety of technological materials, including seatbacks, dashboards, headliners, and door panels for cars (Daramola et al., 2020).

Sodium hydroxide is the most commonly used chemical for bleaching or cleaning the surface of plant fibers and it also changes the fine structure of native cellulose I to cellulose II, with depolymerization and the production of short length crystallites (Chand & Mohammed, 2021).

The treatment of naturally-occurring fibers chemically helps to clean up the fiber surface making them rougher; reduces moisture absorption; and increases fiber-matrix adhesion. In the study. Urena lobata L. fibers produced by natural water retting for use as composite reinforcements were subjected to alkaline-treatment with Sodium hydroxide solution. The transformations that occurred in the structures and morphologies of the fibers were checked using scanning electron microscopy (SEM).

Tests were done on several bundles of the Urena lobata L. fibers so as to understand how the chemical treatments had effects on the tensile behaviors of the fibers. The results obtained reveal enhanced mechanical behaviors of the treated Urena lobata L. fibers in comparison to the untreated ones. The chemical treatment with 6% NaOH solution yielded the best mechanical behaviors for ductility, elastic modulus, and tensile strength amongst other alkaline-treated fibers (Njoku et al., 2019).

In the study by Daramola et al. (2021), the Urena lobata L. composites with varying fiber weights were successfully studied for their physical and wear qualities. In comparison, to untreated fiber composites, alkaline treated fibers composites shown improvements in density, specific gravity, wear resistance, and thermal stability. However, compared to PP and untreated fiber composites, the alkaline treated fiber composites absorbed more water. As the fiber loading increased over the course of seven weeks, the maximum water uptake for the treated fiber composites ranges from 3.6%-18.8%, while for the untreated fiber composites ranges from 2.6%-12.32%. According to the study, the treated and untreated fiber composites maximum water absorption and diffusion coefficient were higher than those of the unreinforced PP.

Description of Study Variables

Dalupang (Urena lobata L.) plant. One kilogram (20 strands) of dried fibers from the stem of the Urena Lobata L. plant untreated and treated in different solutions of Sodium hydroxide (1%,45%,7%) was used in the study. In addition, the plant that was used in the study should also be free of insect bites or infestations

Tensile strength. The tensile strength is the maximum stress given to the Dalupang (Urena lobata L.) bast fibers just before it breaks.

Gathering and Preparation of Materials

Early in the morning, samples of Dalupang (Urena lobata L.) plant were retrieved. The plant retrieved was brought to the Department of Agriculture to confirm its species and the name. After confirming, one kilogram of Dalupang (Urena lobata L.) was gathered at Cabatuan, Iloilo early in the morning to ensure that it will not be damaged by sunlight. The stem that has been obtained and other parts of the plant were decomposed.

Extraction of Fibers

Methods of fibre extraction include dew retting, water retting, osmotic degumming, enzymatic retting, steam explosion, and mechanical decortication to decompose pectin, lignin, and hemicellulose to remove them from the stem with varying efficiency (Zimniewska, 2022). In this study, water retting and chemical retting is used to extract Dalupang (Urena lobata L.) bast fibers. For water retting, the harvested stems of Dalupang (Urena lobata L.) are submerged in water for one week. Chemical retting is done by submerging the bast fibers in an alkali treatment.

Application of treatments

Twenty strands of Dalupang (Urena lobata L.) bast fibers are divided into four groups. The researchers then prepared three treatments of NaOH solutions (1%, 4%, 7%). To prepare 1% NaOH solution, two grams of sodium hydroxide pellets was dissolved in 100 milliliters distilled water and then make up the solution to 200 milliliters. In 3% NaOH solution, six grams of Sodium hydroxide pellets was dissolved in 100 milliliters of distilled water and then make up the solution to 200 milliliters. Fourteen grams of Sodium hydroxide pellets was dissolved in 100 milliliters of distilled water and then gradually add water until it reaches the 200 milliliters mark to make a 7% NaOH solution. Then three groups of fibers are soaked with different NaOH solutions (1%, 4%, 7%) and one group is soaked with water for 62 hours. The fibers are cleaned using distilled water. Rinse again with water to ensure a pH 7.

Air drying

After extracting the Dalupang (Urena lobata L.) bast fibers, they are dried in the shade or air dried to avoid being damaged by direct sunlight.

Experimental layout

There are four (4) treatments and five (5) replications. The experimental design that was used in the study is Completely Randomized Design (CRD). The assignation of treatments per replicate was done using lottery method.

R4T4	R4T4	R4T4	R4T4	R4T4
R2T2	R2T2	R2T2	R2T2	R2T2
R2T3	R2T3	R2T3	R2T3	R2T3

R1T3 RIT4	R1T3 RIT4	R1T3 RIT4	R1T3 RIT4	R1T3 RIT4

Table 3.1. Experimental design and layout.

Legend:

T1-7% of NaOH solution	RI-Replication 1
T2-4% of NaOH solution	R2-Replication 2
T3-1% of NaOH solution	R3-Replication 3
T4-0% of NaOH solution Negative Control (-)	R4-Replication 4
	R5-Replication 5

Gathering of Data

The ultimate tensile strength of each treatment was determined by subjecting a single strand of fiber in each treatment in stress until it breaks. It can be calculated by measuring the force that the fiber can withstand divided by its cross-sectional area. To measure the weight it can withstand, the fiber was stretched by gradually increasing force until it breaks. In finding the cross-sectional area of the fiber, it was computed by measuring its diameter using a micrometer caliper.

Data Analysis

Mean. The researchers computed the mean of each treatment to determine the ultimate tensile strength of Urena lobata 1. (Dalupang) bast fibers in different solutions (0%, 1%, 4%, 7%) of Sodium hydroxide

ANOVA. The researchers used ANOVA to determine if there was a significant difference in treatments or setup. Microsoft Excel analysis Tool Pak was used and the alpha level of significance was set at 0,05.

CHAPTER IV

RESULTS AND DISCUSSION

This chapter presents the results of the data gathered from the conducted experiment followed by the discussion and interpretation of data.

Results showed that the ultimate tensile strength of the bast fibers from Dalupang (Urena lobata L.) is much stronger on the fibers soaked with NaOH solution over the negative control. When a lower NaOH solution (1% NaOH) was applied, the stronger its strength. Among the three experimental treatments that were applied, Treatment I with 7% NaOH solution is the weakest. The Dalupang (Urena lobata L.) bast fibers has the potential to be used as an alternative eco-bag material as it can be compared to the tensile strength of the jute fiber that ranges from 393-800 MPa

Table 4.1 The Ultimate Tensile Strength (in N/m²) of Urena lobata L. (Dalupang) Bast Fiber Soaked in Different Solution of Sodium hydroxide.

Bast Fiber Soaked in Different Solution of Sodium hydroxide.

Treatment	The Ultimate Tensile Strength (in N/m²) *Urena lobata L.* (Dalupang)						
	Replication I	Replication II	Replication III	Replication IV	Replication V	Total	Mean
7% Sodium hydroxide solution	384,989,994.8	1,269,189,697.0	420,327,968.3	171,671,576.1	247,151,411.1	2,493,330,647.0	498,666,129.4
4% Sodium hydroxide solution	538,514,302.9	509,682,556.0	1,116,671,196.0	867,025,855.6	1,254,285,162.0	4,286,179,073.0	857,235,814.5
1% Sodium hydroxide solution	502,225,255.3	757,416,836.4	412,027,439.2	172,784,180.7	2,673,567,826.0	4,518,021,538.0	903,604,307.6
Distilled Water (-)	818,323,128.0	73,697,384.8	624,610,414.3	216,268,793.3	318,944,218.4	2,051,843,939.0	410,368,787.8
Grand Total						13,349,375,197.0	
Grand Mean							2,669,875,039.0

ANOVA revealed that there is no significant difference among the four treatments in terms of their ultimate tensile strength. It indicates that the tensile strength of bast fibers from Urena lobata L. soaked in different NaOH solution are comparable of that of the negative control.

Table 4.2 ANOVA in CRD of the Ultimate Tensile Strength (in N / m * 2) of Urena lobata L. Bast Fibers 62 Hours after Application of Treatments ANOVA.

Table 4.2 ANOVA in CRD of the Ultimate Tensile Strength (in N/m2) of *Urena lobata L.* Bast Fibers 62 Hours after Application of Treatments ANOVA.

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Treatments	9.32E+17	3	3.11E+17	0.872949	0.475599	3.238872
Error	5.69E+18	16	3.56E+17			
Total	6.62E+18	19				

CV=24.82% Note: ns- Not significantly different at 0.05 level of significance.

CHAPTER V

SUMMARY, CONCLUSION AND RECOMMENDATION

Summary

This study aimed to determine the potential of Dalupang (Urena lobata L.) bast fibers as an alternative eco-bag material. It was conducted at Cabatuan National Comprehensive High School on April 2023. The Dalupang plant was gathered at Cabatuan, Hoilo, and underwent water retting to make the plant's bark soft and after that. the plant's bast fibers were extracted after seven days. There were four treatments 7%. 4%, 1%, and 0% and there were five replications in each treatment. Treatment 1 (7% of NaOH), treatment 2 (4% of NaOH), treatment 3 (1% of NaOH), and treatment 4 (distilled water). Results revealed that the mean ultimate tensile strength of treatment 1 (7% of NaOH) was 554073477.2 N/m^2, in treatment 2 (4% of NaOH) was 952484238.4 N/m^2, in treatment 3 (1% of NaOH) was 1004004786 N/m^2 and in treatment 4 (distilled water) 455965319.7 N/m^2. Results show that the ultimate tensile strength of the bast fibers from Urena lobata L. treated by NaOH is much stronger than the negative control (0%). While treatment with a lower NaOH solution (1% NaOH) was applied, the stronger its strength. Among the four treatments that were applied, Treatment 4 (negative control) is the weakest. The Dalupang (Urena lobata L.) bast fibers has the potential to be used as an alternative eco-bag material as it can be compared to the tensile strength of the jute fiber that ranges from 393-800 MPa. ANOVA revealed that there is no significant difference on the four treatments in terms of their ultimate tensile strength.

Conclusion

The results showed that the ultimate tensile strength of Dalupang (Urena lobata L.) hast fibers soaked with NaOH (1%, 4%, 7%) solutions is much stronger than the negative control. While as the amount of NaOH added in the solution increases, the ultimate tensile strength of Dalupang (Urena lobata L) bast fibers decreases. The Dalupang (Urena lobata L.) bast fibers has the potential to be used as an alternative eco-bag material as it can be compared to the tensile strength of the jute fiber that ranges from 393-800 MPa. ANOVA proves that here is no significant difference among Dalupang (Urena lobata L.) bast fibers in different treatments in terms of their ultimate tensile strength.

Recommendation

The researchers recommend to reduce the soaking time of the fibers in Sodium hydroxide solution. It is also recommended to use other alkali treatment other than Sodium hydroxide. The researchers suggest to develop an eco-bag from Dalupang (Urena lobata L.) bast fibers. It is also suggested that this study should be further conducted to determine the potential of Dalupang (Urena lobata L.) bast fibers as an alternative eco-bag material.

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APPENDICES

APPENDICES

APPENDIX A

CALENDAR OF EVENTS

April 2023						
Mon	Tues	Wed	Thu	Fri	Sat	Sun
					1	2
3 Purchase of Sodium hydroxide	4 Gathering of Dalupang (*Urena*	5 Water retting of Dalupang	6 Water retting of Dalupang	7 Water retting of Dalupang	8 Water retting of Dalupang	9 Water retting of Dalupang

APPENDIX B

EXPENDITURES

Materials	Quantity	Price Per Item	Total Cost
Distilled Water	5L	Php 63.05	Php 63.05
Distilled Water	5L	Php 58.50	Php 58.50
Sodium Hydroxide Pellets	500 g	Php 950	Php 950
Surgical Gloves (7.0)	2 pairs	Php 23.25	Php 45.50
Surgical Gloves (7.5)	1 pair	Php 23.25	Php 23.25
Surgical Gloves (7.0)	1 pair	Php 25	Php 25
Round Tupperware	20 pcs	Php 7.06	Php 141.20
Newspaper	½ kg	Php 35	Php 35
	Total		Php 1341.5

APPENDIX C

COMPUTATIONS

Table 3.2 ANOVA in CRD of the Ultimate Tensile Strength (in N/m^2) of Dalupang (*Urena lobata L.*) Bast Fibers 62 Hours after Application of Treatments

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*p-value*	*F crit*
Between Groups	9.32E+17	3	3.11E+17	0.872949	0.475599	3.238872
Within Groups	5.69E+18	16	3.56E+17			
Total	6.62E+18	19				

CV=24.82% Note: ns-Not significantly different at 0.05 level of significance.

Grand Mean = 2,669,875,039.0

Error Mean = $4.39281x10^{17}$

$$CV = \frac{\sqrt{ErrorMs}}{Grand\ Mean} x100$$

$$CV = \frac{\sqrt{4.39281x10^{17}}}{2\,669\,875\,039.0} x100$$

$$CV = \frac{\sqrt{662\,782\,769}}{2\,669\,875\,039.0} x100$$

CV = 0.24824 x 100

CV = 24.82%

$$\text{Ultimate Tensile Strength} = \frac{Force\ (N)}{Cross\text{-}sectional\ area\ (m^2)}$$

$$\text{Ultimate Tensile Strength} = \frac{Force\ (N)}{(\pi\ x\ (Diameter \div 2)^2}$$

APPENDIX E

PICTORIALS

Plate 1. Dalupang (*Urena lobata L.*)

Plant

Plate 2. Dalupang (*Urena lobata L.*)

Stem

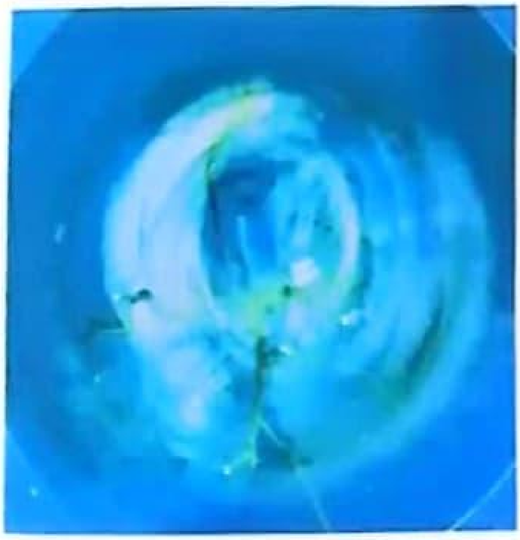

Plate 3. Water Retting

Plate 4. Composting of the Other Parts

of the Plant

Plate 9. Round Tupperwares with Different Treatment Solutions

Plate 10. Soaking of Dalupang (*Urena lobata L.*) Bast Fibers in Different Solutions of NaOH

Plate 11. Measuring of the Diameter of the Fibers

Plate 12. Measuring the Weight the Bast Fibers with Different Treatments

Plate 5. Extracted and Air-Dried Bast Fibers

Plate 6. Sodium hydroxide Pellets

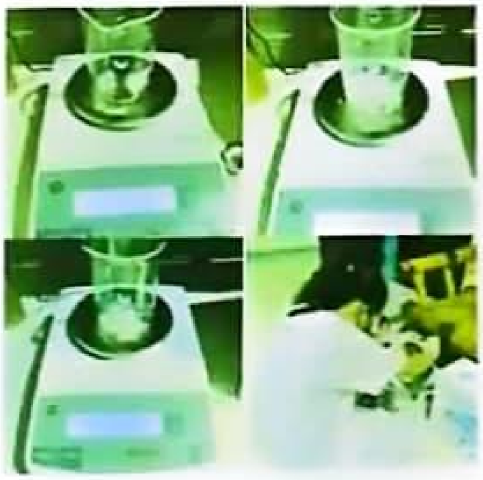

Plate 7. Weighing of Treatments

Plate 8. Different NaOH Solution