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Alternative Raw Material for Making 100% Renewable Fiber and Eco-Friendly Paper

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Abstrak

Kurangnya bahan baku pembuatan kertas telah menyebabkan deforestasi yang agresif. Hal ini menimbulkan masalah besar bagi fauna dan makhluk hidup di sekitarnya. Pteridophyta, khususnya Stenochlaena Palustris mungkin bisa menjadi solusi untuk masalah ini. Oleh karena itu kami mencoba memanfaatkan Pteridophyta dari seratnya untuk mendapatkan bahan baku baru pembuatan kertas. Di Indonesia terdapat 3.000 spesies Pteridophyta dari total 12.000 spesies Pteridophyta indonesia. Melimpahnya Stenochlaena Palustris, membuat penulis memiliki inovasi terbaru karena sampai saat ini Stenochlaena Palustris kurang memiliki nilai ekonomis. Mereka dianggap hanya sebagai gulma. Padahal, Stenochlaena Palustris segar memiliki kandungan holoselulosa yang tinggi, yaitu 63,82% (Maftu'ah dan Nursyamsi, 2015), artinya Stenochlaena Palustris berpotensi untuk digunakan sebagai bahan baku kertas pengganti kayu. Inovasi ini dapat membantu kita menyelamatkan lingkungan. Oleh karena itu, kita dapat mempertimbangkan penggunaan Stenochlaena Palustris sebagai bahan baku kertas tulis, art paper, dan kertas olahan lainnya. Langsung buat nilai guna untuk Stenochlaena Palustris. Para peneliti disini memiliki tujuan untuk mengurangi produksi kertas yang terbuat dari pohon kayu. Karena seperti yang kita ketahui bahwa hutan adalah salah satu sumber alam utama kita. Maka dengan penggunaan Stenochlaena Palustris dibuatlah metode alternatif untuk pembuatan kertas.

Kata Kunci : Bahan, Kertas, Alternatif

Abstract

The lack of raw material for paper making has led to aggressive deforestation. This cause a major problem for fauna and living organism around it. Pteridophyta, specifically *Stenochlaena Palustris* might be the solution for this problem. Therefore we tried to utilize Pteridophyta from its fiber to gain a new raw material for making paper. In Indonesia, there are 3,000 species of Pteridophytha out of a total of 12,000 species of Pteridophyta indonesia. The abundance of *Stenochlaena Palustris*, makes the authors have the latest innovations because until this day *Stenochlaena Palustris* have less economic value. They are considered only as weeds. In fact, fresh *Stenochlaena Palustris* have a high holocellulose content, which is 63, 82% (Maftu'ah and Nursyamsi, 2015), meaning that *Stenochlaena Palustris* have the potential to be used as a wood substitute paper raw material. This inovation could help us to save the environment. Therefore, we can consider that the use of *Stenochlaena Palustris* as raw material for writing paper, art paper, and other paper preparations. Directly create a use value for *Stenochlaena Palustris*. The researchers here has a goal to reduce the production of paper made from wood trees. Because as we know that the forest is one of our main natural source. So with the use of *Stenochlaena Palustris*, alternative method are made for making paper.

***Keyword** : Material, Paper, Alternative*

INTRODUCTION

As one of the countries with the largest forests in the world, Indonesia is one of the countries that produces large-scale pulp. Since 2009, there has been a large expansion in the production sector of wood and pulp [1]. Pulp is the main raw material in paper making [2]. According to data from *Forest Watch Indonesia, 2014*, since 2009 Indonesia facing difficulties because of the imbalance between low supply and high demand for paper, resulting aggressive expansion of deforestation. The expansion do not consider the long-term sustainability of material resources [1].

Paper production need wood fibers as the raw materials. In Indonesia itself, every year 5,6 million tons of trees are cut down to make paper which drastically reduces the number of trees due to massive deforestation. Therefore, we need to obtain a sustainable supply of raw materials and this research look for alternative raw materials for pulp and paper making.

Alternatives to pulp and paper raw materials can be obtained from plant fibers that have fiber equal quality to wood fiber. The condition of a fiber equal to wood fiber is the Holocellulose bottle. According to the data Pteridophyta holocellulose is 63, 82% [3]. This means that Pteridophyta is a fiber that has the potential to be used as an alternative to several raw materials such as writing paper, carton, paper bags, art paper, sketch books, and other derivative functions.

The presence of Pteridophyta on jungle is very abundant. This is a real potential for developments in the pulp and paper alternative industries.

According to data from the Agricultural Research and Development Agency recorded in 2016, it was 14.9 million hectares of jungle in Sumatra, Jawa, Kalimantan and Papua [4]. the presence of abundant pteridophytha plants becomes a great potential that will continue to exist in the future

Objectives

The purpose of making this innovation is to find alternative materials for making paper that are Eco-Friendly and 100% renewable fiber, using potential fiber from Pteridophyta, Specificly *Stenochlaena Palustris.*

METHOD

The research method used by the researchers are experimental science study using the Pteridophyta specificly *Stenochlaena Palustris* as the main materials for the experiment. The purpose of this experiment are to proof that there's a alternative raw material for making a paper. The material's that we used are very common to find in Indonesia and the, so we decided to pull out a test for it because it can be processed as an innovation that is rich in benefits and economical.

Research Tools and Materials :

1. Manual Paper Screen
2. Stove
3. Pan
4. Scale
5. Stirrer
6. Beaker
7. Knife
8. Beater Hollander
9. Pteridophytha, specificly *Stenochlaena Palustris*
10. Water (H_2O)
11. Natrium hidroksida (NaOH)
12. Hydrogen peroksida (H_2O_2)

The experiments are divide into 5 work steps :

1. Preparation of ingredients (*Stenochaena Palustris*)
2. Preparation of Natrium Hidroksida (NaOH) solution (20% and 30%)
3. Cooking of Pteridophyta/Pulping Pteridophyta

4. Bleaching Fiber with Hydrogen peroksida (H_2O_2)
5. Printing process using manual techniques

The chemical composition of the Pteridophyta plant fiber, based on the results of lab tests:

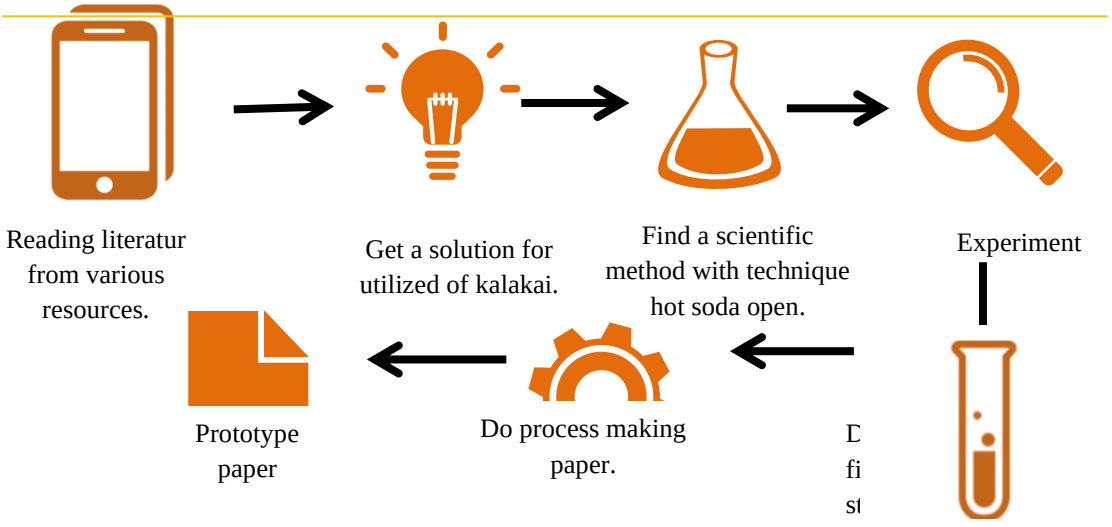
Material type	Rate (%)		
	Lignin	holoselulosa	Water Rate
Fresh S.Palustris	35,76	63,82	8,780
Pulp S.Palustris	27,58	68,47	5,586

The Experiments carried out was a test of fiber dimensions with parameters of fiber length, fiber diameter, lumen diameter, and fiber wall thickness. Derivative test of fiber dimensions with runkel number parameters, muhlstep number, flexibility ratio, felting, and fiber stiffness. Finally, the test of chemical component composition with the parameters of acid-insoluble lignin, holocellulose, alpha cellulose, hemicellulose, extractive, and moisture content.

According to our research we found out that the level of holocellulose in the Pteridophyta specificly *Stenochlaena Palustris* plant are capable to make a paper by having 63,82% of fiber level. The minimum quality of making paper are 40% which mean that this material have a potential in terms of utilization into several products including Paper. Later, improving quality can continue to be improved by utilizing the use of more sopiscated technologies.

Utilization of Pteridophyta specificly *Stenochlaena Palustris*, not only as a raw material for paper, because the fibers from Pteridophyta have greater potential in the future to become pulp and other derivative uses. So that, this research will continue to be developed to get maximum results. The sustainability of this research continues to be pursued so that the quality obtained from Pteridophyta pulp production continues to increase.

Paper from Pteridophytha



CONCLUSION

Paper from Pteridophytha specificly *Stenochlaena Palustris* is alternative sources, because it can meet the raw material supply sustainable. Increasing capacity of the domestic pulp and paper industry increase, because the world's paper needs are increasing by an average of 2.1% per year [5]. Until now Indonesia still imports raw materials, for pulp and paper

production [6]. This innovation is very important to be developed for long term. Availability od alternative raw materials to replace wood and the lungs world protectors.

Utilization of Pteridophyta specificly *Stenochlaena Palustris* as an alternative raw material for making paper, can reduce the use of wood portions. The aims of this invention to reduce the production of wood-based paper, and look for alternative roads with Pteridophyta specificly *Stenochlaena Palustris* as the raw material for making paper and derivative product.

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