A Project Report

On

Preparation of Fiber paper from banana Stem

Supervised By

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Submitted By

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Department of Nutrition of food Engineering

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Date of Submission: 12-08-2021

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LETTER OF TRANSMITTAL

Date: 12-08-2021

To,

Dr. Sheikh Mahatabuddin

Associate professor and Head

Department of Nutrition and Food Engineering

Faculty of Allied Health Sciences

Daffodil International University

Subject: Submission of project report

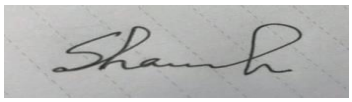
Dear sir,

It is a great pleasure and honor for me to having the opportunity to submit project report as a part of the nutrition and food engineering (NFE) Program curriculum.

I have prepared this report based on the acquired knowledge during my thesis period in our lab. It is great achievement to work under my active supervisor. This report is based on, studies on **Preparation of Fiber paper from banana Stem.''**

I express my gratitude for your kind supervision, and I hope that you wound kind consider my mistakes.

Sincerely yours



Shahporan Hossain

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LETTER OF AUTHORIZATION

Date: 12-08-2021

To,

Dr. Sheikh Mahatabuddin

Associate Professor and Head

Department of Nutrition of Food Engineering

Daffodil International University

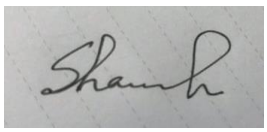
Subject:-Declaration regarding the validity of the project report.

Dear sir,

This is my truthful declaration that the **"project report"** I have prepared is not a copy any thesis report previously made any other student.

I also express my honestly confirmation in support to the fact that the said thesis report has neither been use before to fulfill my other course related not it will be submitted to any other person a authority in future.

Sincerely yours



Shahporan Hossain

Department of Nutrition of Food Engineering

ID No.:- 171-34-628

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Letter of Recommendation

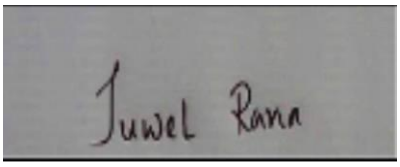
Certifies the internship report entitle **"Project work report''** preparation of the report **"Preparation of Fiber paper from banana Stem"** at our analytical and food processing lab. The report submitted assessment to Examination committee by Shahporan Hossain and id: 171-34-628, Department of Nutrition and Food Engineering (NFE), Faculty of Allied Health Sciences, Daffodil International University.

I am Pleased to declare that this report is entirely written by the author this work have been conducted by the project work under my supervision **"Juwel Rana''** Lecturer Daffodil International university Faculty of Allied Health Sciences. This is piece of original work not have been submitted or published fair evaluation of project work.

I strongly recommended the approval the report by the authority and also pursuer a positive and fair evaluation of work.

I wish him all the success in life.

Sincerely yours,



Juwel Rana

Lecturer

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CERTIFICATION OF APPROVAL

We are happy to certify that the project report on "**Preparation of fiber paper from banana Stem"** conducted by Shahporan Hossain, bearing ID No: 171- 34-628 of the department of Nutrition and Food Engineering has been approved for presentation and defense/viva-voice. We are pleased to hereby certify that the data and finding presented in the report are the authentic work of Shahporan Hossain. We recommended the report presented by Shahporan Hossain for further academic recommendations and defense/viva-voice. Shahporan Hossain bears a strong moral character and a very pleasant personality. It has indeed a great pleasure working with him. We wish him all success in life.

Sheikh Mahatabuddin, Ph. D.

Associate professor and Head

Department of Nutrition and Food Engineering

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I would like to acknowledge the encouragement and assistance give to me by a number of people during the preparation of this report. At first, I would like to express my gratitude to almighty Allah for enabling me the strength and opportunity to complete the report in the schedule times successfully. I am taking this privilege to deliver my gratefulness to each and every people who are involved with me in every phase of my lives.

I am grateful to my parents without whom I cannot be here. Without the support of my parents, I could not be able to achieve my objectives and goals.

My deep gratitude and sincere thanks to the honorable Head, Department of Nutrition and Food Engineering**, Sheikh Mahatabuddin, Ph. D**. for this kind cooperation and to acceptthis Degree.

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I would like thanks **Md Reaz Mahamud** , Assistant Technical officer , dept. of Nutrition and Food Engineering, faculty of Allied health sciences , Daffodil International University. I would like thanks **Md Alahi**, Assistant Technical officer, Daffodil International University. It would have been very difficult to prepare this report up to this mark without their guidance.

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ABSTRACT

Paper has played a vital role throughout human history. It may be used for a variety of tasks such as writing, packing, and printing. Paper was traditionally made from cellulose fibers, which were obtained from a variety of plant species, both woody and non-woody, in the conventional manner. This procedure was carried out via the use of different kinds of chemical treatment, which is very hazardous to the environment. Whatever the case, it is critical to guarantee that the paper-making process and the raw materials used are environmentally friendly, so that they do not do damage to the surrounding environment. Discharge from banana waste produces a foul odor and causes a variety of issues, including pollution of the environment, filthiness of the environment, and the production of a foul odor. In order to mitigate these issues, a paper produced from the banana plant may be used as an alternative to traditional packaging materials. Due to the fact that it is produced from banana fiber, this study was primarily conducted to replace traditional paper with a new developed paper that is eco-friendly, non-chemical based, and cost efficient.

Kew words: Banana fiber, packaging, Eco-friendly, safety etc.

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CHATER 01

INTRODUCTION

The natural materials are renewable, quasi, and bio-degradable, have high heat value, have great mechanical characteristics and may be combusted for low densities and cost-effectiveness. This excellent environmentally friendly characteristic makes the materials in engineering sectors like automobile and building industries extremely popular. (Boopalan et al., 2013 and Ramesh et al., 2013)

Over the decades, the efficient use of forest wood for the manufacture of paper has been caused by its economic efficiency and availability. This creates the ecological issue. This leads to the quest for alternative and cost effective sources for the manufacture of paper. The waste natural materials such as banana peel may also be utilized for the production of paperboard. Paper is one of the most significant wood-based products and depends largely on the forest's resources. It creates global warming and environmental deforestation problems. In recent days, non-woods have been extensively utilized in different nations for the manufacture of pulp and paper. Most nations go towards the sources of non-wood fiber. The non-woods have certain shortcomings compared to the woods.

Paper is a one kind of competent material. Paper is mainly produced through the process of moist fibers together which mainly cellulose fiber. These fibers are derived from grasses, woods, and ragsand then the fibers are dried to make sheets. Bamboo, various types of chemicals, cotton linters, silk etc. are the things which are used in paper making or paper proper production. Initially the paper pulp is gotten from wood through the separation of lignin and the color, resign and chalk are used for sizing, for the high finishing silicate is used. (Motoi et al., 1998)

Various types of additives and binders are also used to increases the shelf-life of the paper. Raw materials which are used in paper production are not so harmful for environment but the process in which the chemicals are used in the fiber treatment is harmful for environment. But the other resources which are available are more eco-friendly.(Joseph, S., 2002)

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The resources are fruits and vegetables cellulose, in this process lignin are boiled to dissolve after that the pulp are bleached to make the colorless paper but this process courses unwanted reduction of the fiver composition. Hydrogen provided sodium hypochlorite and calcium hypochlorite are mostly used belching agents.Paper production are goes through various types of chemical process like sodium hydroxide are used to wash the fiver, titanium dioxide are used to acquire discharged from houses.(Reddy, N. and Yang, Y., 2009)

This study was mainly done to produce paper by using residuals. This residuals are leftover fruits and vegetable like orange pulp, lime pulp, guava pulp, cabbage, potato, etc. paper which is produced by using this residuals can contain good qualities than traditional produced paper. This newly invented process had on aversive effect on the environment. (Augustia et al,.2018)

Sustainable banana paper manufacturing will help to reduce impact on forest resources. Today, environmentally friendly composites are very important due to their great strength, use and cheap cost.

Objective of this Research Work:

- To reduced the cost of the paper production.
- To reduced the environment pollution
- To reduced the use of chemical
- To increases the use of non-wood plant as a raw materials.

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CHAPTER 02

"REVIEW OF LITERATURE"

Banana (scientific name: Musa acuminate) produces not only delicious fresh fruit but also textile fabric, banana fiber. It grows quickly as new shoots are produced and most often seen in warm tropical regions. All types of banana plants contain plenty of fibers. These fibers are acquired after harvesting the fruit and fall within the bast fiber category. After the fruit production, the banana plant trunk i.e. the pseudostem is mostly discarded as agricultural waste. These pseudostems may be used efficiently in banana fiber manufacturing since, every year, about 1,5 million tons of dry banana fibers from the outer sheath of pseudostem can be generated. A rich source of natural fibers, biomass (pseudostem) waste, a pseudostem, may be used profitable for many applications and production of different goods. (Vigneswaran et al., 2015)

Pseudo stems and other useless portions are fallen and thrown in the fields of bananas because the plant can only be picked once, and the stem is frequently attacked by fungus (Hussain and Tarar, 2014). Clearing the left to plant fresh crops is an expensive planting method (Baldwin, 2016). The leftovers of bananas are usually kept on the ground to breakdown into organic matter since the plant cannot produce fruits more than once (Li et al., 2010). The breakdown of this major waste biomass leads to the production of greenhouse gas (GHG) (CO_2) (Hussain and Tarar, 2014).

The isolated plant leftovers often grow a vector of illness (e.g. fruit flies and mosquitoes) that improves the proliferation and the production of poor esthetics by pests (e.g. rats, snails). Banana plant is a fast-growing plant that may be investigated for its potential for production of P&P (Gonzalez et al., 2010). Nearly any component remaining of the processing of the banana plant is useful for the manufacture of paper. The beneficial utilization of this waste biomass is thus in some way influencing the social, environmental, geographical and technical elements of the nation.

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Paper is very important and needed things in our life. The demand of paper is increasing day by day. The increasing demand rate is 2.8% per years. (McNutt and Rennel, 1997)

The increasing rate creates high demand for pulp which causes destruction of forest. Use of wooden pulp is also expensive. The use of non-wood plant for paper making reduces the cost of paper production. (Sabharwal and young, 1996)

During the last twenty-five years the use of non-wood pulping is significantly increasing. (Atchison, 1996). In the 1970 rate of using non-wood pulp was 6.7%, in 1993 the rate was 10.5% and in 1998 the rate was 11.3% (Atchison, et al.,1996).

During the 90s a research was done by the united nation Industrial Development Organization (VNI Do) International Agro-fiber Research paper Industrial Research institute of Chania (PIRIC) central pulp and paper Research institute (CPPRI) to find out the quality full pulp containing pulp. In this research a number of non-wood fiber were identified as potential raw materials for paper making industry. From the founded non wood fibers, a number of non-wood fibers are already used by many countries. These are mostly straws, bagasse and bamboo. (Sabharwal and young, 1996; judt, 1991 c; judt, 1993; Assumpcao, 1992)

The use of non-wood pulp increases the capacity of paper making in China. Their used 99% pulp are came from non-wood plant. Chinese non wood paper industry wood therefore provide us with a good view of the problem and opportunities faced by the use of non-wood plant fiber in pulp and paper industry.

Non-wood fibers are successfully used in paper making industry. The mostly uses straw, bagasse and bamboo. A good number of mills or paper industry are using bagasse as a rawmaterials. Strawis a great source of non-wood fibers. But there has been found a special problem in straw that straw contains silica.

Which creates problem in washing the pulp and also in the recovery of spent liquor. Straw have also in major focus of research for bleaching, pulping and handling. One very promising raw materials has been found in research is kenaf. It’s containing very low lignin and higher cellulose. Another raw materials is found in research in hemp. (Yilmaz, 1995; Brink, 1988).

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For 90% of it's existence of almost 2000 years, paper has been exclusively made from non-wood raw materials. The first true paper is made from true hemp. Hemp and china gas fiber are used in first paper making. Due to the increase of the demand of paper research has been started to found the suitable raw materials. China found the inner bark of mulberry as a suitable raw fibers and another one in bamboo.(Kokta et al, 1993; Pande, 1996; Mittal and Masehhwari, 195b).

Total 20,957,000 metric tons of non-wood plant fiber pulpproduced in 1995 and 15,957,000 metric tons were produced in china. This account for over 76% total word non-wood plant fiber pulp production and over 83% of total chines pulp production. (Xing, 1996)

The pulping capacity of the non-wood plant increasing faster than the pulping capacity of the wood plant. The annual rate of increasing non-wood pulp is 6% and the wood pulp in 2%. Over 76% are the total world non-wood plant fiber production and over 83% are the total chines pulp production. Wood plant fiber is replaced by the non-wood plant fiber due to high labor cost and economics of supply. (Atchison, 1992 a).

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CHAPTER 03
METHOD AND MATERIALS

3.1.1 Method and Materials:-

The research was carried out of the Department of Nutrition and Food Engineering (NFE) Daffodil International University, Daffodil Smart City, Ashulia Dhaka. In our food processing lab and Analytical lab

3.1.2 Methodology

The following tools, materials and utensils were used in the study on the production.

3.1.3 Apparatus and Equipment:

1. Use a Blender
2. Electrical Balance
3. Knife
4. Stove
5. Spoon
6. Muslin Cloth
7. Net
8. Tray
9. Bowl
10. Roller etc.

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3.2 Collection and preparation

3.2.1 Raw material collection:-

- Collect the raw materials (banana tree) from banana tree plant.

- In the experiment only one sources is used at a time with the incorporation of banana tree. Banana tree gives the paper strength and better shelf life, cotton is also playsa important role in paper making as it gives the strength to the paper.

- Other raw materials are also used for bleaching, soaking, and binging.

Picture: Rraw materials

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3.2.2 Cutting:-

- Cut all the raw materials through the use of knife or scissors.
- The raw materials size is between 1.0 inch to 1.5 inch.
- It is very important to cut the raw materials uniformly for smooth paper pulp.

Picture: Cut the banana tree 1inc to 1.5inc

3.2.3 Soaking:-

- After having cut off all the raw materials. Then soaking them into the mixture of baking soda and cold water for one hours.
- Baking soda helps to lose the fibers present in the raw materials and Banana tree.

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3.2.4 Boiling:-

- After having soaked the all materials are boiled in the stove at 100 C for 25-30 minutes.
- Then added the sodium hydroxide, per kg of banana tree 1grm of sodium hydroxide are added.
- Materials are boiled to break down of cell which makes easy to gotten up fine pulp and smooth.

Picture: Boiling the Raw materials

3.2.5 Bleaching:-

- It is a very crucial part in this process of paper making. Boiled material are bleached through the use of hydrogen peroxide which helps to lightend the color of the paper.
- Hydrogen peroxide is not effective in bleaching though it is used as it contain non-chlorinated agent which is harmless.

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3.2.6 Preparing binder:-

- Binders are very important in paper making.
- It’s mainly bind the fiber together and it gives strength to the paper.
- Binders are prepared by using corn flour and aloe vera. Corn flour is blended with transparent part of aloe vera. Anti-microbial fact of the aloe vera gives longer shelf life to the paper and it also protects the paper from fungal and bacterial growth.
- Stickiness of the paper which is provided by corn flor which contain starch.

3.2.7 Blending:-

All the materials are blended together and added water of the banana tree pulp through the use of mixture.

Picture: Blending the banana stem

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Picture: The pulp after the blending

3.2.8 Beating:-

- After being blended the mixture are undergoes for beating.

3.2.9 Spreading:-

- After beating water are removed by the use of muslin cloth. Then spread it for drying. Laminated material can also be used for drying process.

3.2.10 Drying:-

- Then the sheet of paper are placed under the sun for drying.

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3.2.11 Pressing:-

- Before being completely dry the pulp are processed in semi- dry condition by using a small roller. This process makes the paper flat and straight.

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CHAPTER O4
RESULT AND DISCUSSION

Table 4.1. Result of paper made from different source

Sample No	Raw Materials	Chemicals	Result
1	Raw Banana steam	NaOH	This paper is Soft.
2	Dry Banana steam	NaOH	This paper is sun dry and it's Hard.
3	Dry & Raw steam	NaOH	This paper are Oven dry and it's soft
4	Dry & Raw steam	Soda	This paper is sun dry and it's hard.

4.1.1 Paper made from Raw Banana steam:

This type of paper made from raw banana steam. In this type of paper making raw banana steam are treated with Sodium Hydroxide. This paper is very soft and applicable for packaging.

Picture 4.1.1 Raw tree paper

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4.1.2 Paper made from Dry Banana steam:

This type of paper made from dry banana steam. In this type of paper making raw banana steam are treated with Sodium Hydroxide. This paper is very hard and applicable for packaging.

Picture 4.1.2 Dry Banana tree paper

4.1.3 Paper made from Raw and Dry banana steam:

This type of paper made from Raw and dry banana steam. In this type of paper making raw banana steam are treated with Sodium Hydroxide. This paper is very soft and applicable for packaging.

Picture 4.1.3 Paper made from Raw and Dry banana steam

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4.1.4 Paper made from Raw and Dry banana steam using soda.

This type of paper made from Raw and dry banana steam. In this type of paper making raw banana steam are treated with Soda. This paper is very hard and applicable for packaging.

4.1.4 Paper made from Raw and Dry banana steam using soda.

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CHAPTER 05

CONCLUSION

In addition, the study revealed that banana waste leftovers, which are routinely thrown away after harvesting, have adequate cellulose quantities combined with low lignin levels, making them an excellent low-cost alternative resource for paper making. The banana papers that were created showed acceptable empirical results even when no strengthening or binding chemicals were used to serve as glue, as shown in the laboratory. Raw material that is found in the nature there is no use of chemicals so this type of paper making and there is no use of chemical compounds as a result there is no environment pollution. However, important things must be addressed, such as the reduction of wastages as well as conserving water and energy, and helping to reduce environmental pollution in the nation. Our ability to create our own technology that is appropriate for our country's economy and climatic circumstances will allow us to expand the usage of natural fibers such as bagasse and banana fiber in addition to recycled wastepaper as we progress in our development. It has been shown that the banana fiber shown the promising way to prepare the paper with enhanced properties.

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