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A Review Paper on Design and Fabrication of Banana Fiber Extraction Machine and Evaluation of Banana Fiber Properties

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ABSTRACT: The present paper is aimed to design and fabrication of banana fiber extraction machine to develop high quality banana fiber from banana pseudo stems. Banana fiber is a best fiber with good mechanical properties.Manually extraction of the banana fiber better quality of fiber but it much time consuming. Labor expense is high. Now day's machines exist for extracting banana fiber with mass production. The number of machines are available in current scenario in India. But quality obtained from that the local machine is not impressive. This paper explains the new model of machine and its working. The new machine will overcoming like breakage in fiber, knot formation and discontinuous length of fibers.

KEYWORDS: Banana Fiber, Extraction machine, Fiber property, Banana extraction.

I. INTRODUCTION

The Banana fiber project creates a lot of employmentopportunities in urban and rural sectors as a wealth from wasteconcept Banana fiber is eco-friendly and biodegradablecomparing to all other synthetic fibers. Fiber is extracted fromthe leaf sheath or pseudo stem of the banana plant the use of"Banana" fiber for textile and other purpose as natural materialis a new concept for India. In the recent past, banana fibre had avery limited application and was primarily used for makingitems like ropes, mats and some other composite materials.With the increasing environmental awareness and growing importance of unfriendly fabrics, banana fibre has also been recognized for all its good qualities and now its application is increasing in other fields too such as apparel garments and home furnishings. However, considerable research work has been done by textile research organizations and it has been found that banana fiber can be a very promising source of natural fiber in the coming period. The mechanical properties of the fiber is good compared to other fibers.Banana fiber is a best fiber with relatively good mechanical properties due to its high alpha cellulose and low lignin percentage.

II. BANANA FIBER

Banana Fiber is environmentally friendly like jute Fiber. It has large export demand from many countries like Japan, Australia, Germany and many. Fiber can be obtained from whole banana plant. After the fruit is obtained, the plant is thrown away giving rise to increase in waste. The proper disposal of this plant is another problem. By using a good Fiber extractor machine, a large amount of Fiber can be obtained which will give rise to additional income. Banana Fiber is a best Fiber with relatively good mechanical properties due to its high alpha cellulose and low lignin percentage.

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Figure :1 Banana fiber

III. EXTRACTION MACHINEs

Major component of machine are rotating roller, stationary roller, feeding gear mechanism, motors, and belt is provided for transfer of motion and torque and whole system is supported by frame. But in present machines there are knot formation and breaking of Fibers this problem overcome our conceptual design of machine. Impurities in the rolled Fibers such as Pigments, brokenFibers, coating of cellulose etc. were removed manually by means ofcomb Fibers produced are not of uniform, more Wastages of Fibers, More costly machine, less production, poor Fiber quality, more Time consuming and also major drawback of these types of existing machine complete psedostem not to be used to extract Fiber, before extraction first separate thin sizes slices from psedostem in this area more labour required. Unnecessary delay of process and directly effect on production spatially in rainy season there are shortages of labour. We are survey manufacturer, dealer and customer they are get interesting to overcome these problem.For the ease and comfort of operator, the height of machine should be properlydecided so that he may not get tired during operation. The machine should be slightly higher than the waist level. Enough clearance should be provided from ground for cleaning purpose., 4 hacksaw blades, 0.5hp motor are used .motor is used to provide input power tomachine. And two roller are used to the crushing of banana pulpy part.

Figure: 2 Extraction machine

SPECIFICATION

Machine Height=760mm
Machine Length =650mm
Width =480mm
Roller length=395mm

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Roller width =51mm
Cutter length=395mm
Cutter Diameter=89mm
Pulley diameter =300mm
Blade length=30mm
Belt size= A51
Motor=0.5Hp
Bearing type=6202

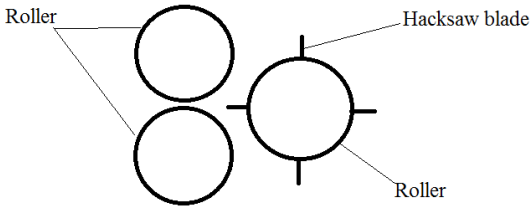

Figure: 3 Roller form in machine

IV. WORKING

It is simple machine consisting of single roller which rolls on fixed support. The roller is provided with horizontalhacksaw blades. Generally, 4 hacksaw blades are used. 0.5Hp motor is used to provide input power tomachine. The motor is runs and the rollers are rotates the banana pseudo stems. The machine reduces labour work and increases fiber production compared to manualprocess. In this process, cut stems of banana plants of 100-200 cm in length are crushed between two rollers. Due to crushing the pulpy part is removed and fiber is obtained. And the fiber are taken to the machining process. The lengthy fibers are taken.

Figure:4 Banana fiber extraction machine

I. BANANA FIBER PROPERTIES

The single fiber testing machine is used to this tensile testing of the banana fiber ASTM D3822 standard are using to the tensile testing of the single fiber. This test method covers the measurement of tensile properties of

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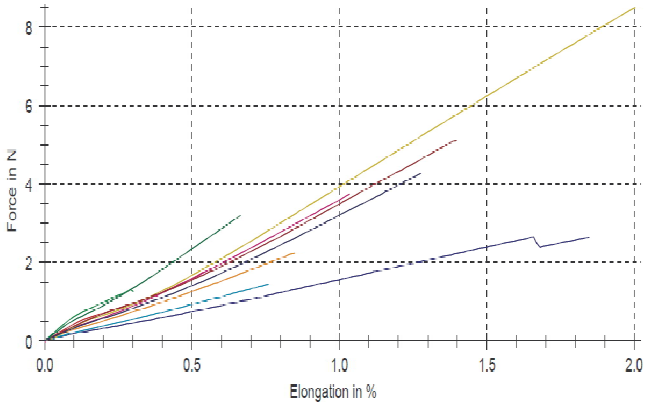
natural fiber and man-made single fibers of sufficient length to permit mounting test specimens in the single fiber tensile testing machine



TENSILE TEST

The fiber is fixed to the holding gribs and the load is applied to the fiber. ASTM D3822 Standard device is used to the testing. The tensile test results are noted to the table

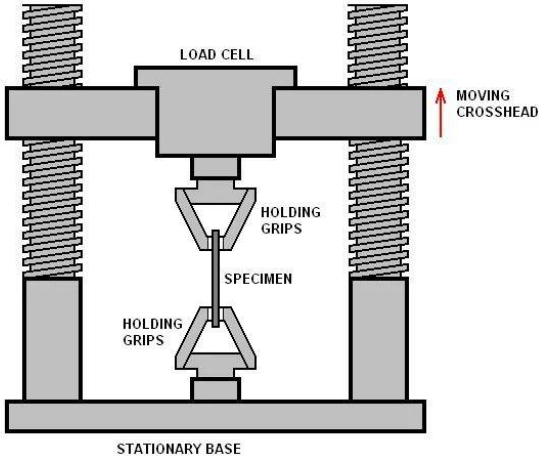


Figure:5 Tensile test

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Test speed : 10 mm/min
Grip to grip separation at the start position : 100.00 mm

Test results:

No.	Specimen ID	J_0 cN/tex	F_H N	ε_H %	T_u J/g	F_B cN
1	Banana fibre	1370	1.75	0.54	0.153	175
2	Banana fibre	1880	1.30	0.29	0.0699	126
3	Banana fibre	525	2.65	1.7	0.693	264
4	Banana fibre	774	2.23	0.85	0.296	223
5	Banana fibre	921	3.75	1.0	0.579	375
6	Banana fibre	609	1.44	0.76	0.174	144
7	Banana fibre	1310	8.51	2.0	2.59	851
8	Banana fibre	1180	5.11	1.4	1.08	511
9	Banana fibre	1340	3.20	0.67	0.333	320
10	Banana fibre	937	4.27	1.3	0.810	427

Statistics:

Series n = 10	J_0 cN/tex	F_H N	ε_H %	T_u J/g	F_B cN
$\bar{x}$	1090	3.42	1.0	0.677	342
s	412	2.18	0.53	0.745	219
v	37.99	63.75	50.93	110.00	64.01

J_0	cN/tex	Youngs Modulus
F_H	N	Maximum tensile force
ε_H	%	Elongation at maximum tensile force
T_u	J/g	Breaktenacity
F_B	cN	Force at break

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V. CONCLUSION

The new banana fiber extraction machine can be designed with higher efficiency. This machine will reduce manualwork and is suitable for mass production. Compact structure and easy disassembling will be another advantage. Theproblem of impurities and knots can be solved with this kind of design. The factors affecting quality of fiber are roller speed feed angle and clearance also affect the production quantity of fiber. By choosing these factors,correctly quality and production of fiber can be increased. By the application automatic feeder and conveyor time and effort can be saved.

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