

# EXPERIMENTAL INVESTIGATION OF LOW COST SLAB USING BANANA STEM FIBRE

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**Abstract** - Our project is providing a low cost slab using banana fibre. In our project the banana fibre is produced from the banana stem. Fibre extraction machine is used to develop high quality banana fibre from banana pseudo stems. Banana fibre is the best fibre with good mechanical properties. Manual extraction of the banana fibre yields better quality of fibre but it is much time consuming. Labor expense is high. Nowadays machines exist for extracting banana fibre with mass production. The number of machines is available in current scenario in India. But quality obtained from that the local machine is not impressive. It is also to investigate the performance of banana fibre reinforced slabs 150mm x 150mm size with varied thickness subjected to compressive and split tensile strength test. The aim is to investigate the behavior of concrete while adding banana fibre as reinforcement. The objective is to reduce the cost of construction and to minimize the overall environmental effects of concrete productions.

**Key Words:** Fibre reinforced concrete, banana stem, extracting machine, slab casting, hardened properties

## 1. INTRODUCTION

The search of sustainable green materials for the construction industry has reached its critical time to mitigate the negative impact of the climatic change. It is critical to study the impact strength characteristics and assess its performance for eco-green construction materials for various potential uses in the building industry. Concretes with natural fibres such as Banana fibres (*Musa Sepientum*) as reinforcement is one of the most promising building materials, represent a variety of an extensive class of composite materials presently widely used in various branches of the industry. There is lack of research investigation been carried out on impact resistance of banana fibre reinforced slab. Impact resistance represents the ability of concrete to withstand repeated blows and absorb energy without adverse effect to cracking and spalling. Impact scenario can also be classified into low velocity impact and high velocity impact.

### 1.1 EXTRACTION OF BANANA FIBRE

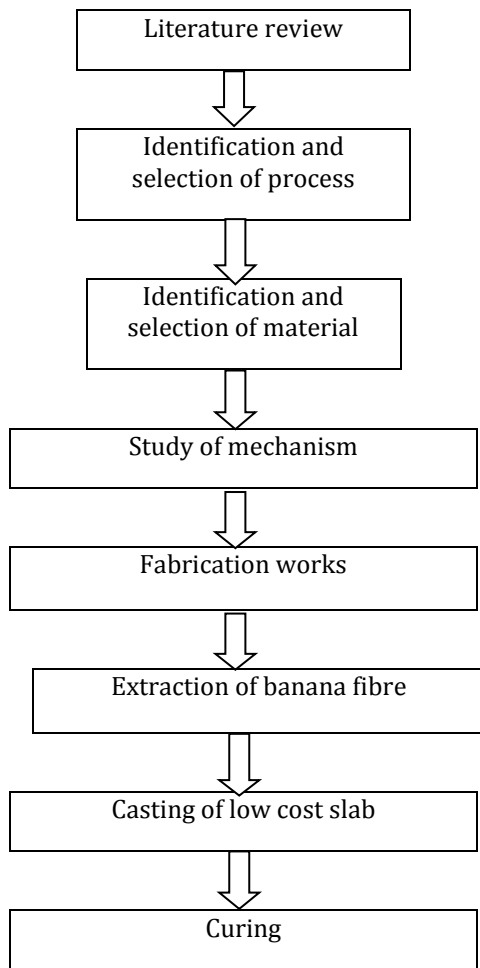
Banana Fibre is environmentally friendly like jute Fibre. It has large export demand from many countries like Japan,

Australia, Germany and many. Fibre 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 Fibre extractor machine, a large amount of Fibre can be obtained which will give rise to additional income. Banana Fibre is the best Fibre with relatively good mechanical properties due to its high alpha cellulose and low lignin percentage. 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 not formation and breaking of Fibres this problem overcome our conceptual design of machine. Impurities in the rolled Fibres such as Pigments, broken Fibres, coating of cellulose etc. were removed manually by means of comb Fibres produced are not of uniform, more Wastages of Fibres, More costly machine, less production, poor Fibre quality, more Time consuming and also major drawback of these types of existing machine complete psuedostem not to be used to extract Fibre, before extraction first separate thin sizes slices from psuedostem 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 properly decided 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 to machine. And two rollers are used to the crushing of banana pulpy part.



Fig -1: Fibre making machine from banana stem

**2. METHODOLOGY**



**3. LITERATURE REVIEW**

**“Sustainable use of low cost building materials in the rural India”**

[Ali Haider Jasvi, D.K. Bera (26 March 2016)]

This paper emphasizes on the methods of using low cost housing technique in India. It provides us a challenge to use the natural materials and their by-product so as to reduce the wastage or bye products obtained from industries and environmental pollution. Various natural materials with their property, advantages disadvantages, and their availability have been discussed. The main challenge is to use the materials in structural component for low cost housing and their adaptation to factors like – technical, social, ecological, physical – through different products. It encounters the idea about the need of housing in rural India and explains different uses of materials and the techniques of building construction for LIG people, urban poor’s in different aspects of building. It covers the use of local materials in the different components of building to make the building low cost and it makes affordable houses for low income people.

**“Impact Resistance Behaviour of Banana Fibre Reinforced Slabs”**

[Zakaria Che Muda, Agusril Syamsir, Kamal Nasharuddin Mustapha, Muhamad Rifdy Samsudin, Sivadas Thiruchelvam, Fathoni Usman, Salmia Beddu, Nur Liyana Mohd Kamal, Md Ashrafal Alam, Ahmed H Birima, O S Zaroog (2017)]

This paper investigate the performance of banana fibre reinforced slabs 300mm x 300mm size with varied thickness subjected to low impact projectile test. A self-fabricated drop-weight impact test rig with a steel ball weight of 1.25 kg drop at 1 m height has been used in this research work. The main variables for the paper are to find the relationship of the impact resistance against the BF contents and slab thickness. A linear relationship has been established between first and ultimate crack resistance against BF contents and slab thickness by the experiment. The linear relationship has also been established between the service (first) crack and ultimate crack resistance against the BF contents for a constant spacing for various banana fibre reinforced slab thickness. The increment in BF content has more effect on the first crack resistance than the ultimate crack resistance. The linear relationship has also been established between the service (first) crack and ultimate crack resistance against the various slab thickness. Overall 1.5% BF content with slab thickness of 40 mm exhibit better first and ultimate crack resistance up to 16 times and up to 17 times respectively against control slab (without BF).

**“Design and Fabrication of Plantain (BANANA) Fibre Extracting Mechanism”**

[Mahendra K C, Virupaksha Gouda H (2016)]

Objective of this paper is to design and fabrication of banana fibre extraction equipment to develop high quality banana fibre from banana pseudo stems. Banana fibre offers good mechanical properties. This plant fibre has long been a better source for high quality textiles industries in many parts of the world, especially in Japan and Nepal. Manually extraction of the banana fibre requires proper procedure and its time consuming. Labor expense is also high. Now day’s machines exist for extracting banana fibre with mass production. The number of machines is currently available nowadays, but quality obtained is not up to the optimum level. This can be overcome by fabricating the designing of an extracting mechanism of banana fibre from plant’s pseudo-stem, designing a rotor assembly which consisting of two disks on which six blunt blades are mounted, and a shaft design to drive this rotor assembly and the pulley and powering system for the machine. This paper specifies the new model of machine and its working operation.

#### 4. CASTING OF CONCRETE USING BANANA STEM FIBRE

##### 4.1 MATERIALS USED

###### Cement:

Ordinary Portland Cement (OPC) of 43 grade and M20 were used.

###### Coarse aggregate

Aggregate having the maximum size of 20 mm and fineness modulus of 8.75 is used..

###### Fine aggregate:

The sand sieved through 4.75 mm sieve and retain in 600 microns sieve is used and fineness modulus of 2.5 is used.

###### Water:

The water used was distilled water. 0.50% water cement ratio were used.

###### Banana Fibre

The banana fibre are produced mechanically and dried. Banana fibre length of 40mm and diameter 1mm were used. Density of coconut fibre is 1.35g/cc.

##### 4.2 PRELIMINARY TEST

###### 4.2.1 SPECIFIC GRAVITY TEST

Table -1: Specific gravity test on aggregate and cement

Property	Result
Specific gravity for coarse aggregate	2.66
Specific gravity for fine aggregate	2.60
Specific gravity for cement	3.15

###### 4.2.2 SLUMP TEST

Slump for the given sample= 28.5 mm. True slump.

##### 4.3 CASTING PROCEDURE

The procedure followed was wet mix. The proportioned ingredients were weighed, batched and then mixed in the following order. Aggregates were spread on the mixing platform. Sand was then spread over the aggregates. Fibres dressed and weighed were then the fragments were separated from the lumps and spread over the mix. Then everything was mixed evenly and it was ensured that the fibres were mixed properly. When it is visibly understood that the fibres are mixed well cement is added slowly and then again mixed. Water is measured and added slowly with continues mixing. When all the concrete is mixed well

with water the same is used to cast the cubes. In case of plasticizers the plasticizer is mixed in water and then added.



Fig -2: Casting of concrete

##### 5. HARDENED PROPERTIES

###### 5.1 COMPRESSIVE STRENGTH TEST

Compressive strength tests were conducted at 28 days of cube (150 X 150 X 150 mm) specimens.

Table -2: Compressive strength of FRC

S.no	% of fibres	28 days compressive Strength (N/mm <sup>2</sup> )
1	0	24.15
2	10	25.70
3	20	16.43
4	30	11.52

###### 5.2 SPLIT TENSILE STRENGTH TEST

Split tensile strength of concrete were conducted at 28 days of cylinder (150 X 300 mm) specimen.

Table -3: Split tensile strength of FRC

S.no	% of fibres	28 days compressive Strength(N/mm <sup>2</sup> )
1	0	3.57
2	10	3.82
3	20	2.54
4	30	1.55

## 6. CONCLUSION

The Experimental investigation on the characteristics strength of the concrete increased with banana fibres are reported. The Engineering properties of the concrete notably compression and tensile strength is significantly improved by the addition of banana fibres. The banana fibre reinforced concrete resist cracking and spalling. However the addition of fibres poorly affected the compressive strength as expected, due to its difficulties in compaction which consequently leads to increase of voids. Despite its excellent properties as enhancement of concrete are unlikely to replace the steel for majority of the structures.

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