

# USE OF BAMBOO FIBERS IN RECYCLED CONCRETE

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**Abstract :** This study has been undertaken to investigate the bamboo fibers in recycled concrete, as per the government data its says a tons of structure has demolished till now and wasted. For now, it's a great opportunity to doing something to solve this problem. As per the research, recycled concrete is losing its own strength after a certain year. For this, we test a cube sized 15cm X 15cm X 15cm with the criteria of bamboo fibers used in cube. Size of bamboo fiber we have used is 2mm thk, 4cm long & 4mm wide in the manner of alignment. Bamboo fiber is really taking so far ,its helps concrete to prevent from cracks & sudden loads.

**IndexTerms -Recycled concrete, Bamboo fibers, concrete extraction, RCA, Extra ingredients in RCA.**

## I. INTRODUCTION

As per the research, billions of tons aggregate consumption is happening for building construction. And a day is not So far where a minimum amount of material we are having. Construction industry uses maximum natural resources which creates environmental issues. To minimize environmental issue, it requires recycling and reusing of construction materials. But recycling of materials like aggregate, sand or converting concrete as a aggregate its loses its own strength, for the bamboo fibers is a great opportunity to use.

This research aimed to evaluate the use of bamboo fiber to improve the performance of bamboo reinforced concrete at the tension crack area. It was conducted with the object cube size of 15 cm x 15 cm x 15 cm of concrete with reinforcement of bamboo and pumice recycled aggregate The type of bamboo obtained from Vadodara local seller and it's called hard bamboo. The fiber were used 4cm in length. The results were showed that bamboo fiber can reduce the crack-width of concrete and increase cubes post-cracking load-carrying capacity. Besides, the amount of fiber has effect of workability and quality of concrete. However, bamboo fiber can prevent the growth and propagation of cracks.

In terms of strength, synthetic fiber is better than natural fiber. Plants fibers have advantages than synthetic fibers in terms of environmental aspects. The primary advantages of natural fibers over synthetic fibers have been their low cost.

In Tab 1 shows a comparison of the mechanical properties of plant fibers and mineral fibers. It can be seen that bamboo fiber is lighter than glass or carbon fiber, but it has low tensile strength. The tensile strength bamboo fiber is more than the tensile strength of concrete at 5 – 10 MPa.

TABLE 1. Comparison of the mechanical properties of fibers.

Fibers	Density (gr/cm <sup>3</sup> )	Tensile Strength (MPa)	Elastic Modulus (MPa)
Carbon	1.8	3500	200
Glass	2.5	2500	70
Sisal	1.5	600	10
Kenaf	1.5	900	50
Catton	1.5	400	10
Bamboo	1.5	700	10

## BAMBOO WASTE FIBERS

Bamboo grows in the tropical and subtropical area. Due to the cheaper cost, bamboo houses can be built for people in the world. Because of the successful construction of bamboo houses, companies and researchers has observed for using bamboo as structural element of construction, such as bamboo reinforced concrete. Bamboo plants has the potential to develop of innovation in construction. Several studies have been carried out on the use of raw bamboo as reinforcing material to replace conventional steel. Usually, bamboo was used for construction and home furnishings. Bamboo pieces were used for toothpicks, skewers, and the wicker. This furniture manufacturing process produces waste in the form of bamboo fiber. Therefore, bamboo fiber will be observed for repairing cracks in concrete.

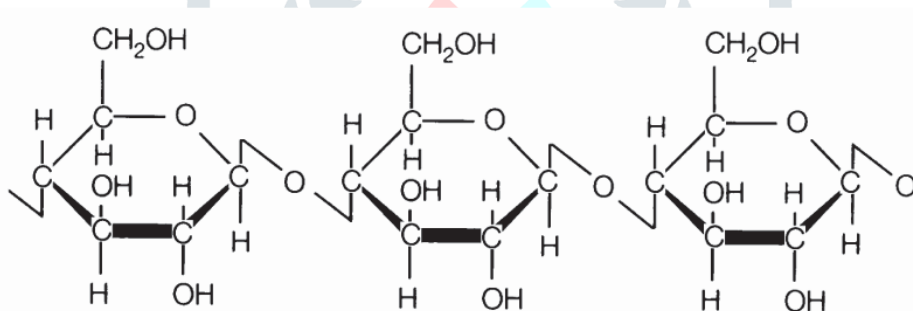


(FIG. 1 BAMBOO FIBERS)



(FIG. 2 EXTRACTION OF FIBERS)

Chemical components of bamboo fiber have same chemical components of wood which consists of cellulose, hemicellulose, lignin and water. Cellulose  $[(C_6H_{10}O_5)_n]$  is a polysaccharide consists of glucose monosacharid. This glucose strong binding hydrogen in stabile crystalline form.



(FIG. 3 CHEMICAL COMPOSITION OF BAMBOO FIBERSO)

## II. LITERATURE REVIEW

Sri Murni Dewi , Ming Narto Wijaya , Christin Remayanti N studied “The Use of Bamboo Fiber in Reinforced Concrete Beam to Reduce Crack” and investigated that the use of bamboo fiber to improve the performance of bamboo reinforced concrete at the tension crack area. To achieve this objective, a series of tests were conducted. The size object of concrete beam is 15 cm x 20 cm x 160 cm with reinforcement of bamboo and pumice stone aggregate. Bamboo reinforcement was coated with sand to become rough of the surface. The type of bamboo obtained from skewer producers in the Cemoro Kandang Malang is called Ori bamboo. The fiber was used vary in length. The fiber coated with paint and covered with sand to prevent the hygroscopic properties and increased the weight to prevent the float of bamboo fibers when mixed in the concrete mixer. The results were showed that bamboo

fiber can reduce crack-width and deflection of concrete and increase beam post-cracking load-carrying capacity. The amount of fiber has effect on workability and quality of concrete. However, bamboo fiber can prevent the growth and propagation of cracks

Salman F. Ghanchibhai , Iliyas U. Rasoolbhai , Tejas H. Pandya studied “A REVIEW PAPER ON USE OF RECYCLED CONCRETE AGGREGATE IN CONCRETE” and investigated Concrete is widely used material in construction of infrastructures like building, dams, bridges, roads, runway etc. In present day construction industry having big role in pollution of environment. Different materials are used in construction having different ratio in environment pollution and concrete is one from them. To solve this problem people are following reusing of concrete in different ways. The use of recycled concrete aggregate (RCA) in concrete as full and partial replacements of natural coarse aggregate (NCA) is growing interest in the construction industry, as it

reduces the demand for virgin aggregate. It helps to reduce negative environment impact of aggregate extraction from rock. This paper represents review of recycled concrete aggregate based on experimental data available from published research till date.

### III. EXPERIMENTAL WORKS

The bamboo reinforced concrete cube with 15cm x 15cm x 15cm was used in this study. The fiber content is used as variation for each specimen. The variations of fiber content are 40 gr/volumes and 150 gr/volumes. The reinforcement ratio for the test specimens are created equal 1%, and the aggregate composition is 1 cement; 2.5 sand; 2.5 aggregateammar.

The control test objects made without the addition of fiber, with the composition of cement: sand: aggregate is 1: 1: 2 and 1% bamboo fiber ratio.

Bamboo fibers where used in this study is hard bamboo from Vadodara by local seller. Fiber used has a variable in length. The size of bamboo fibers are as 4cm in length , 2m thk , 4mm wide.





#### IV. RESULT & DISCUSSION

(TABLE-2 BAMBOO WOOL RECYCLED AGGREGATE TEST RESULT)

<b>Concrete cube test</b>						
<b>BAMBOO WOOL RECYCLED AGGREGATE</b>						
<b>GRADE OF CONC</b>	<b>DOC</b>	<b>AGE DAYS</b>	<b>WT. OF CUBE</b>	<b>F. LOAD</b>	<b>STRENGTH N/MM<sup>2</sup></b>	<b>AVG N/MM<sup>2</sup></b>
M25	10/03/2019	21	8.07 KG	737 KN	32.75	32.75 N/MM <sup>2</sup>
M25	10/03/2019	21	7.925 KG	749 KN	33.31	
M25	10/03/2019	21	7.45 KG	724 KN	32.19	
M25	10/03/2019	21	7.43 KG	742 KN	32.98	
M25	10/03/2018	21	7.46 KG	731 KN	32.52	

Recycling aggregate from the demolished structure is not so good for construction without improving its strength, a normal moulded cube with the ratio as 1:1:2 (M25) without any extra ingredients its not achieving strength as per ratio, it goes below the strength. But with adding extra ingredients like bamboo fibers its amazingly good for construction.

As in the table we can see the average value of compression we have got is 32.75 N/MM<sup>2</sup> and this value is far higher than the ratio we have chosen.

**“It’s a proof that RCA need extra ingredients for better performance”**

#### REFERENCES

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