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# A Review on Strength of Bamboo Reinforcement in RCC Beam

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**Abstract:** *Bamboo is a natural material which is obtained from plant family. This plant is fast growing, light weighted, environment friendly and renewable. Bamboo material is very useful for construction field. Bamboo has very good in tension, from the study it is found that bamboo has 20 times more strength than steel. Bamboo and steel have quite same property, that's why this topic is very important. This is right time to substitute steel with bamboo. India can't fulfill the its necessity of steel that's why its very big importer of steel from China and Japan. This topic will help India to became "Atmanirbhar Bharat".*

## 1.INTRODUCTION:

Use of bamboo is rapidly increasing so as demand and the supply is depend upon many things like producer and consumers. Many countries are facing trouble to make low cost house but due to lack of knowledge they don't use proper material. Bamboo is oldest construction material which is use for making houses, bridges and scaffolding but this type of construction is not for long life they are temporary structures. In this modern world we need new and innovative techniques to increase durability of bamboo. Many papers are publish on bamboo and many different methods are use to treat bamboo. With proper treatment bamboo can be use for long time. Some chemicals are used to improve strength and some chemicals are use to increase bonding with concrete in construction of structures. Nodes of bamboo are the main difficulty to bond with concrete, chemical treatments is used to increase bonding.

## 2. CHARACTERISTICS OF BAMBOO:

Bamboo is the grass like plant but some people commonly believed that bamboo is tree. It is proven that bamboo has more strength than most of the timber. Height ad age is very important in bamboo because strength of bamboo is depend upon these factors. Strength of bamboo is increase by age, it is proven that optimum strength of bamboo is obtained in 2.5 – years and due to nodes of bamboo it is prevent from cracking.

## 3. LITERATURE REVIEW:

In this paper, they have obtained advanced bamboo reinforcement techniques instead of as usual steel reinforcement. This is a good idea for a low-cost economical structure. Like steel reinforcement bamboo also used as the main as well as distribution bars, because it is very cheap compare to the steel reinforcement technique. Many research papers have been proven that the bamboo reinforcement technique is clearly cheaper than steel reinforcement especially for single-story structure [1].

A tension test performed on the Bamboo strip revealed elastic behavior. Both Singly and Doubly Reinforced Beam has shown elastic behavior while performing flexural tests on them. Within the middle third region of the beam. This type of failure

is proof existence of a pure moment without any shear [2].

Thin layer of bitumen used to provide the better bonding strength in bamboo structure. Improve the performance of bitumen coated bamboo reinforcement cement concrete beams on the use of jute fiber rope are wrapped over the coated bitumen bars and provide 4 stirrups of nylon thread wire to increase its flexural strength. The moisture content of the coated bamboo sample and the uncoated bamboo sample is observed is quite less. This will improve the bonding strength behavior of coated bamboo reinforcement in concrete. The result of this study can give vital importance for bamboo structures have to provide low construction cost building structures. Because of low cost, they are growing the economy of the country and reduce the steel framing cost and the excess use of mild steel [3].

It is been found that bamboo within the vertical position is more durable than in horizontal. Bending of bamboo may be permanently bent if heat, either dry or applied the pressure. The sort of coating will depend upon the seasoning material is employed. A brush coat or dip coat of emulsion is helpful for treatment of bamboo. Bamboo concrete beam design is analogous to steel reinforcing design [4].

## 4. BONDING BETWEEN BAMBOO AND CONCRETE:

The behavior of bamboo is different than the Steel in reinforced cement concrete in bamboo major problem is absorption of water and find expand because of expansion of bamboo the concrete is result into cracks and when curing is stop the bamboo get shrink and produce voids within the inner side it affects condition the bonding of bamboo and strength of concrete.

Bamboo is very different than steel it has very different property than steel. After putting these bamboos into concrete it shows some problems, like absorption of water and get expand, due to expansion of bamboo concrete can be cracked.

## 5. BAMBOO USED AS THE CONSTRUCTION MATERIAL:

Among all materials glass fibers, Steel has proven itself as honest stuff for the RCC construction. Unfortunately in some part shortage of steel is occur and in most of the countries which are developed or developing the value of steel is high. And asbestos fibers are often used as reinforcement in concrete sheets pipes and boards but the pathological state related to it is now well known so that in such scenario bamboo is employed for construction material whenever it possible and suitable.

The enduringness of bamboo is over the opposite Timber material so it's suitable for ferroconcrete. Thanks to its low modulus of elasticity bamboo can be tracked under some conditions. We all know that also contains a corrosion problem which's why it needs protection. As compared to steel bamboo is extremely lightweight and bamboo can available in every tropical and subtropical region bamboo can increase the strength of the building which is under-reinforced.

## 6. STRENGTH OF BAMBOO REINFORCEMENT CONCRETE:

The strength of the section is rely upon the reinforcement because it gives durability thereto strength to that section behavior of bamboo is different than steel and also its capacity of resisting load is poor due to this inter zonal stress occurs more. We use bamboo and glass fibers reinforcement polymer (GFRP) for brittle reinforcement material but reinforcement Failure isn't acceptable does over reinforced sections are prescribed [5].

To satisfied equilibrium and strain compatibility requires providing force to its element the common enduringness of Guadua Angustifolia bamboo is 20 GPA. [6]

It's observed that in Asian countries use of bamboo is more that other countries after reading many papers on bamboo reinforced concrete. MIT if Germany has performed early experimental studies [7] Italy [8].

Mainly bamboo splits are use in reinforced concrete but it can be used as bar whole Culm. In earliest time bamboo only used in outer construction, in that time reinforced concrete concept is not available. In the time of world war many countries are interested in bamboo for rapid and easy construction [9]. In this paper they conclude some results from the design and the test result, main points of the topic on construction principle of reinforced concrete are ductility, deflection and brittle failure as compared to Steel reduced ultimate loading capacity. Bonding between bamboo and concrete is affected due to cracking and swelling of bamboo, it is also depend upon coating of bamboo. After many studies Brink and Rush gives the design methodology [10]. For the construction of bamboo reinforced concrete allowable stress is consider by ACI318 [11].

After researching many papers it has been observed that they only focus on the structural strength of bamboo and basic other details and methodology. [12].

In this paper factor of safety for failure is 7 and for cracking is 2 are recommended design capacity for unreinforced section. [13].

## 7. ADVANTAGE OF BAMBOO:

1. Bamboo could be a flexible material.

2. Bamboo is very light in weight

3. Bamboo gives very good strength and deflection as per the price.

4. Bamboo has also slightly vibration resistance.

5. Bamboo can be easily available and as well as economical.

## 8. DISADVANTAGE OF BAMBOO:

1. Bamboo has less bonding property and its durability is also low.

2. Water contact and moisture content is very dangerous to bamboo.

3. Bamboo is not fire-resistant material.

4. Bamboo strength is depending upon the age of bamboo when the age goes increase the strength will decrease.

## 9. CONCLUSION:

Bamboo has water absorption property so that it is necessary to coat bamboo with proper material and the tensile strength is also low so by using chemicals it can be increase and used as low cost reinforcement in RCC structure. Bamboo cannot be use in heavy structures because it can't resist that much load. Bamboo has weakness, from the node it can be fail and break. Bamboo can work well in vertical condition as compare to the horizontal. Due to low elastic property it get crack when it subjected to rolling condition. When we give proper bond between bamboos and concrete it somehow resist the cracking behavior. Bamboo is organic material that means it can be disintegrate so it needs to be treat before using [14].

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