

Suitability of Bamboo as Reinforcement in Column

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Abstract: During past few years, several researchers working on alternative option of different construction materials such as sand, cement, aggregate, steel and water. All of these materials are basic and essential elements of concrete. But in construction industry steel is very costly and prices are influence nowadays with demand. So it is highly essential to find optional substitute to steel at least for small or low cost of project. Bamboo is natural fiber product having tremendous economic advantages, as it not only reaches its full growth but also maximum mechanical resistance within a few months. The tensile strength of bamboo is relatively high and can reach up to 135MPa [1]. This makes bamboo an attractive alternative to steel in tensile loading application. In this project we can utilize the bamboo as construction material in various manners and it would rather be effective and economical.

Keywords: *Bambusoideae, Productivity, seasoning.*

1. INTRODUCTION

In India, The growth of construction industry is leading to rapid environmental degradation. Steel, cement, synthetic polymers different chemicals and metal alloys used for construction activities are energy intensive as well as harmful to environmental during their entire life cycle. To address this issue, research on eco-friendly materials have been taken up in the recent years. The shortage of housing and increasing cost land in developing countries motivates the search for low cost materials that can be applied in the construction of affordable houses for poor peoples. In this research, use of bamboo which is fast growing and ecologically friendly materials for structure application especially in a tropical regions like India is being considered as quite appropriate. Although bamboo has an immense potential, standardization and a definition of a correct construction practice still present some difficulties [8].

Bamboos are giant grasses belonging to the family **Bambusoideae**, is an open-culm type bamboo species. Usually it is native of Asia and South American country [7]. It is use as construction material from ancient time. As it is grass and growing very rapidly which gives availability of bamboo on construction site as per demand. Many researchers work on the reinforcing ability of bamboo which is directly proposed to replacement of steel. The thicker culms or strands are placed for load bearing materials such as parts of trusses, girder, and vertical members as a part of wall. In its natural condition as solid culms, halved culms or as longitudinally split strips, bamboo has been used in almost all parts of house construction. Bamboo can be used for foundation, mud wall, flooring, roofing and scaffolding. The use of bamboo restricted for foundation but it is use in case of raised platforms as foundation.

Thus the problem of managing resources available which is used in conventional methodology is quite difficult. We need to find some different materials which show impact on quality as well as economy of construction. Therefore complete construction management system including productivity, reuse and recycling of resources and management of those sources which is available locally. By utilizing bamboo culms it reduces some portion of the steel quantities and also the cost of construction with respect to time, speed of execution, material and equipment& provides maximum strength to the structures.

2. TESTING OF BAMBOO STRIPS FOR YEILD STRENGHT

2.1 PROPERTIES OF BAMBOO

Bamboo is natural fibers product.
Properties of these fibers are as follows [8]:
Specific density [Kg/m3] = 1158
Water absorption [%] = 145
Torsion = Not good when it became mature
More prone to insect attacks.
Low cost.

2.2 PREPARATION OF BAMBOO SAMPLE

Bamboo culms are cut in two distinctive sizes then bamboo strips are kept for flavoring at any rate for 2 weeks before test led. In the first place test is of 600mm long, around 10mm width and 8mm thick. Second example is of same length, 12mm width and 10mm thick. All example having most extreme 3 hubs. Attempt to set hubs inside focal gage. Test third is secured with layer of plastic. The third example has 1 meter length and other two measurements are same as second specimen.

METHODOLOGY FOR TENSILE TESTING

1. Take the bamboo culms and fix it in position in UTM machine.
2. Mark the specimen with specific designation.
3. Bamboo sticks are rigidly fixed within jaws of upper and lower moveable arms of UTM.

Bamboo culms are replaced with different sizes and note down the readings.

3. BASIC MATERIALS FOR COLUMN

This construction require some of the basic materials which ensures a stable, eco-friendly structure and also results in cheap construction as compared to conventional method. Materials used for casting are:

- Sand
- Cement
- Coarse aggregate
- Bamboo culms
- Water
- Binding wires
- Black Japan bituminous paints (conforming IS 341-1937).

METHODOLOGY FOR COLUMN CASTING

1. Prepare 3 samples of column with bamboo in different percentages i.e. 2.5%, 3% and 3.5% of gross area [5].
2. Take the bamboo culms and arrange with the stirrups.
3. Mark the position of stirrups and tie with culms using binding wires.
4. Complete the frame work of column and make ready for casting of column.
5. Bamboo culms are coated with black Japan bituminous paint (conforming IS314-1973) which reduces water absorption of culms. This coating applying on culms 48hrs before the day of casting.
6. Now lay the frame on formwork with appropriate effective cover.
7. Then formwork is rest on table vibrator and fills with concrete. Do not give over compaction which may leads to minor cracks.
8. Immersed the column section in curing tank for 28days.

4.RESULTS

A) FOR TENSILE STRENGTH

Sr. no.	1A	1B	2A	2B	3
Area (mm ²)	80	80	120	120	120
Ultimate Load (kN)	1.89	1.2	5.1	10.6	0.4
Stress (MPa)	23.6	15	42.5	88.3	3.3
Avg. Stress (MPa)	19.3		65.4		3.3

B) FOR AXIALLY LOADED COLUMN TESTING [5]

Sr. no.	1	2	3
% bamboo	2.5%	3%	3.5%
Area (mm ²)	22500	22500	22500
Test values (KN)	181.2	142.8	180.5



Fig no.1: Testing of Bamboo



Fig No.2: preparation of bamboo sticks



Fig No. 3 : bamboo cage



Fig.No.4 casting of column section

CONCLUSION

1. Utilization of inventive materials, for example, bamboo strips can have significant rigidity which demonstrates the capacity to substitution of steel.
2. The quality yield anxiety is low when contrasted with routine strengthening material yet can be use for expansion the quality of PCC.
3. The bamboo strips has smooth surface which bring about the slipping out from jaws. To keep this some imperviousness to slipping of strips is required.
4. The bamboo strips getting fizzled at the edge not at focus which is typically getting for steel bars.
5. Bamboo strips can bring about the green development by sparing vitality and assets, minimizing the expense, having noteworthy operational funds and expanding work place profitability.
6. On the premise of test qualities bamboo can be utilized as a fortification for segment area.

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