

Properties of Concrete Reinforced With Bamboo Fibre

M.Brindha¹, K. Salman Khan², S. Siva Sathiya Narayanan³, A.M. Sathis Kumar⁴, V. Vivek⁵

Assistant Professor, Department of Civil Engineering, Sethu Institute of Technology, Virudhunagar,
Tamil Nadu, India¹

UG Student, Department of Civil Engineering, Sethu Institute of Technology, Virudhunagar Tamil Nadu, India^{2,3,4,5}

ABSTRACT: Concrete is an extensively used construction material for its various advantages such as low cost, availability, fire resistance etc. But it cannot be used alone everywhere because of its low tensile strength. Today construction industries are facing problems of cracking and tensile strength problems, for that we have to add something in concrete to improve concrete to increase tensile capacity. For that fibre is most commonly used in construction industries. Fibres are generally used as resistance of cracking and strengthening of concrete. Normally various fibres are used in the concrete mix to enhance the tensile strength and resistance recently. In this study, the bamboo fibre is incorporated to concrete to enhance the tensile properties.

KEYWORDS: Bamboo fibre, Properties of material, Mix design, casting and moulding determine the properties of concrete.

I. INTRODUCTION

The plain concrete possess a very low tensile strength, limited ductility, and little resistance to cracking. In plain concrete and similar brittle material structural crack (micro crack) develop even before loading particularly due to drying shrinkage or other causes of volume change. Hence to overcome to all these type problems the alternate ways like fibre reinforced concreting method has been used. Fibre reinforced concrete is a composite material containing fibre in the cement matrix in an orderly manner or randomly distributed manner its properties would obviously depend upon the efficient transfer of stress between matrix and the fibres, which is largely depend on the type of fibre, fibre geometry, fibre content and distribution of the fibres, mixing and compaction techniques of concrete, size and shape of the aggregate. Bamboo is one of the oldest building materials used by mankind. The bamboo culms or stem has been made into an extended diversity of products ranging from domestic house hold products to industrial applications. In Asia bamboo is quite for bridges scaffolding and housing, but it is usually temporary exterior structural material. In many overly populated regions of the tropics certain bamboo supplies, the one suitable material i.e. sufficiently cheap and plentiful.

In response to global warming issues and sustainable society, the manufacturing using natural material has become actively in developing countries. Bamboo is low cost, fast growing and broad distribution of growth is expected to contribute significantly in earthquake-resistant construction and seismic retrofit technology.

II. RELATED WORK

Santosh shivapuji et.al[1].investigated that the modulus of elasticity of bamboo is found to be much lower than the steel reinforcement. By calculating flexural strength it concluded that doubly reinforced beam has performed more elastically than singly reinforced beam.volume 03 issue 5 may 2016. Nominal mix strength is 34.93% by adding fiber content strength decreases.

Kavitha.s et.al[2]. India (ISSN 0974-5904), volume 09,No.03 concluded that the addition of bamboo fibres make the concrete very resistive in flexural and improvement in 28 days strength was observed to be 7.5 N/mm. Hence addition

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of fibre content increase the flexural strength. for nominal mix 28 days compressive strength is 32.8 N/mm². upto 1% there will be a increase in strength. from 1.25 % there will be decrease in strength Dr.Shakeel Ahmad et.al[3]. 2nd International conference March 21-22,2014 investigated that the modulus of elasticity of concrete increases by addition of bamboo fibre. The strength of concrete cubes wet fibres does not show much improvement upto 28days but surpriseling strength become double in 50days testing. The natural fibre reinforced concrete performance. for plain concrete it has been found to be 23.30KN/mm². Where for fibres reinforced concrete it gains as high as 47.62KN/mm². Ajinkya Kaware et.al[4]. Volume 2 issue 6, june2013 water absorbtion of bamboo is quite high to reduce this effect seasoning or other suitable treatment should be given tensile strength of bamboo is good for M20 grade 0% of slag 0% of steel fiber compressive strength is 26.33N/mm². For 20%slag 1%steel fibre strength will be decreases. for M40 grade nominal mix strength is 44.59%. for 20% slag&1.5% of steel fibres 45.67N/mm². For M30 grade nominal mix flexural strength is 6.07N/mm². for 20% slag 1.5% of steel fibers flexural strength will be increases 7.61N/mm². Our paper invetigated that the compressive strength increases upto 1% more than 1% there will be decreases. split tensile strength increases step by step adding the bamboo fibre.

III. MATERIAL AND THEIR PROPERTIES

Cement: The cement used in the concrete in ordinary Portland cement 43grade. Specific gravity of cement is 3.15.
Fine aggregate: the fine aggregate which is taken from river is used to manufacture the concrete Specific gravity of fine aggregate is 2.74, Fine modulus of fine aggregate is 3.41
Coarse aggregate: coarse aggregate is used which is passed in 20mm sieve and retained on 15mm sieve Specific Gravity of Fine aggregate G is 2.7, water absorption of coarse aggregate is 0.49%
Bamboo fibre : Bamboo fibre is the natural fibre which is drawn from the stem of the plant
Fibre aspect ratio: The ratio between the length of the fibre to the diameter of the fibre is known as fibre aspect ratio

IV. EXPERIMENTAL RESULTS

Concrete Mix Design: 1:1.3:2.2 (M40) grade concrete
Mixing process: The bamboo fibre reinforced concrete (cement, fine aggregate, coarse aggregate) fabricated by following process Initially chopped fibres of 6cmlength. Next half of the total amount of cement required was added to wet bamboo in that container with constant stirring to obtain bamboo cement slurry. The bamboo cement slurry was then slowly poured into the pan for well mix. The remaining amount of water, sand aggregate was then added and the pan and make it a well mix. The fresh cement concrete thus obtained was cast immediately in mould and allowed to setting. All the specimens were demoulded after 24 hours of casting and water cured for 7 days, 28 days respectively. At the specified date they were removed from water, surface dried and tested. Each test result represented the mean of at least three specimens.

V. RESULT AND DISCUSSION

Compressive Strength, Tensile Test Results

After 28 days curing period, the specimen are ready for test. The standard CTM (Compression Testing Machine) was use to test the specimen to determine the compression and tensile properties.



Fig1. Experimental results (a)Demoulding (b)compression strength(c)split tensile(d)curing(e)After testing

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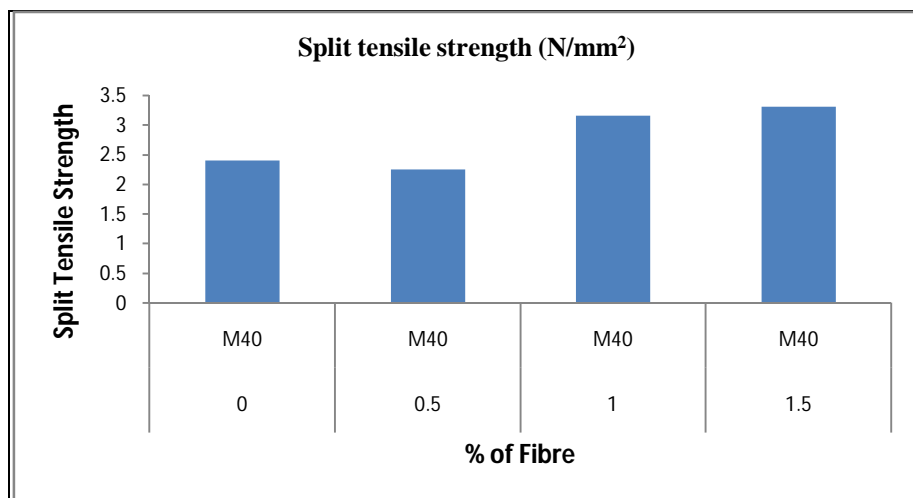
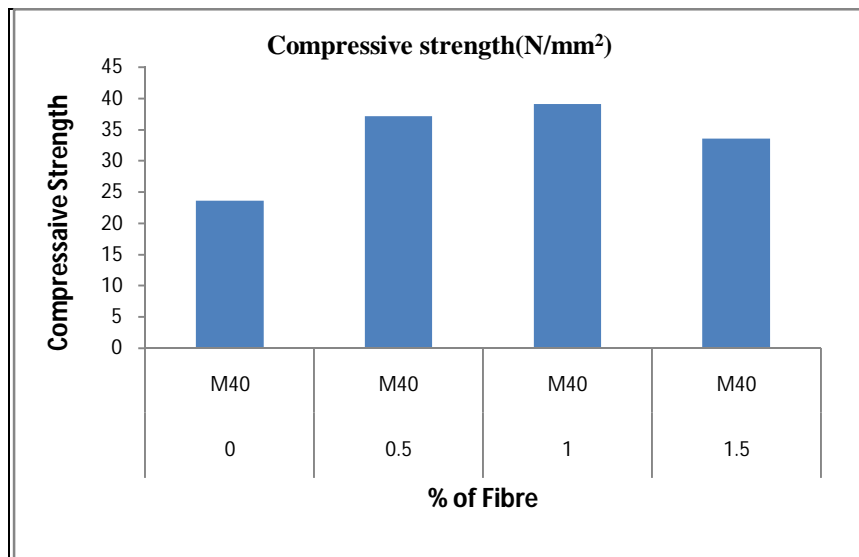
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Table2 Compressive & Split tensile strength

% of fibre	Grade	Compressive strength(N/mm ²)	Split tensile strength (N/mm ²)
0	M40	23.67	2.40
0.5	M40	37.08	2.25
1	M40	39.10	3.15
1.5	M40	33.51	3.31



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VI. CONCLUSION

1. This paper investigated the strength properties of concrete containing bamboo fibre of 0.5%,1.0%,1.5%.
2. The investigation primarily determines the feasibility of bamboo fibre in concrete for sustainable construction development.
3. The results so far have yielded some benefits. The compressive strength of cubes is increased with addition of bamboo fibre up to 1.0% and further any addition of bamboo fibre the compressive strength decreases.
4. The split tensile strength of cylinder is increased with the addition of bamboo fibre up to 1.5%.
5. We have put forth a simple step to minimize the cost for construction with usage of bamboo which is freely available.
6. Compressive strength may be increased up to 65 % with the addition of 1% of bamboo fibre. After 1%, there was a decrease in compressive strength with the addition of bamboo fibre.
7. The problem of decrease in compressive strength may be addressed with the use of admixtures.
8. Addition of bamboo fibre up to 1.5 % exhibits an increase of 37.91% in case of split tensile strength when compared to nominal mix.

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