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Experimental study on bamboo reinforcement concrete beam by using fibers

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ABSTRACT
This paper is based on bamboo reinforcement. . From the ancient days the bamboo is used for construction in reinforcement. In today scenario in world construction industry consumes high percentage of natural resources. It is a major issue for sustainable development. To satisfy the demand naturally available alternative construction material can be used. Bamboo is a natural product and it is easily available and it is economical. This project compare the strength between steel reinforcement and bamboo reinforcement. The strength of the bamboo reinforcement is improved by wrapping fibres. The replacement of steel reinforced with bamboo reinforced is an important factor as it improves economical aspect as well ecological benefits. To analyse the strength of the bamboo reinforcement beam in the size of 700 x 150 x 150 mm. This project is designed by using basics of shearing and deflection. In this project we used two types of fibre glass fibre and basalt fibre. Glass fibre is used in the concrete beam to increase the strength and durability of concrete. Glass fibre increases the compressive strength, tensile strength , split strength of the concrete. The strength of the beam is increased by wrapping glass fibre a around the beam and strength is calculated.The benefit of the basalt fibre which is made by igneous rock is not corrosive in nature. It is good for reinforcing concrete structure which is exposed to de ionising sarimelt and also concrete exposed to marine environment. This experimental test shows the increasing strength and ductile of concrete beam. Finally the outcome of the project is analysed by compressing conventional steel and bamboo reinforcement beam over the bamboo reinforcement beam with the experimental valuue.

1. INTRODUCTION

The world timber demand is increasing at a rapid rate but the timber supply is depleting. It's been found through research that bamboo can suitably replace timber and other materials in construction and other components which are cost-effective and can be successfully utilized for structural and non-structural applications in construction.

Bamboo is one of the oldest traditional building materials used by mankind.The bamboo culm, or stem, has been made in to an extended duiversity of products ranging from domestic household products to industrial applications. Bamboo is quite common for bridges, scaffolding and housing but it's usually used as a temporary exterior structural material. In many overly populated regions of the tropics,

Certain bamboos supply the one suitable material that is sufficiently cheap and plentiful to meet the extensive need for economical housing. With the advancement of science and technology and the tight supply of timber, new methods are needed for the processing of bamboo in to various kinds of composite products. Bamboo has a several unique advantages like ability to grow fast with a high yield and also it matured quickly. Additionaly bamboo can be grown abundantly and that too at a lower cost which makes it is more Economical.

1.1 SCOPE

1) It iseco friendly.
2) It is economical.
3) It helps to control steel manufacturing pollution.
4) It will not corrode.

1.2 OBJECTIVE

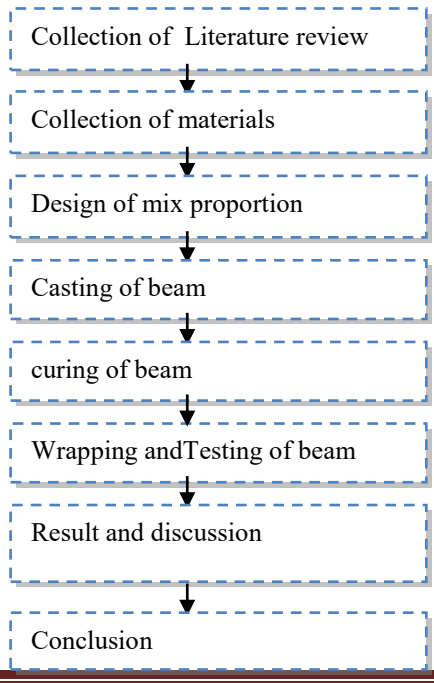
1) To study the effect of replacement of steel reinforcement by bamboo reinforcement

2) To conduct flexural strength test on steel reinforced beam and bamboo reinforced beam

3) To develop a non ferrous hybrid reinforcement system for concrete beams by using continuous wrapping of fibres mats around bamboo reinforcement.

4)To compare the flexural strength of different fibre bamboo reinforced beams and the different fibres are e-glass fibre ,carbon fibre and basalt fibre.

2. METHODOLOGY



3. MATERIALS

3.1 Cement

Cement is the most important ingredient and act as a binding material.PPC is used for casting concrete. The Physical Properties of Cement are shown in table 1.

Table1.Physical Properties of Cement

Name of the tests	Tested value
Standard consistency test	33 %
Initial setting time	35 min
Fineness	6 %
Specific gravity	2.92

3.2 M-Sand

M-sand is also termed as Manufactured sand. The sand was sieved to remove pebbles.The sand was tested as per IS:2386 (Part III) -1963.The physical properties of fine aggregate are shown in table 2.

Table2.Test results of M-sand

Description	M-sand
Specific gravity	2.64
Water absorption	1%
Sieve analysis	Conforming to zone III
Fineness modulus	3.90%

3.3 Coarse Aggregate

Hard granite broken stones of 20mm size were used as coarse aggregate conforming to IS 383:1970. The physical properties of coarse aggregate are shown intable 3.

Table3.Test results of coarse aggregate

Description	Coarse aggregate
Specific gravity	2.68
Water absorption	0.65%
Fineness modulus	6.19%

3.4 Concrete mix proportion

The mixes were designated in accordance with IS 10262-2009 mix design method. Based on the results, the mix proportions M 25 was designed. Concrete mix with w/c ratio of 0.47 was prepared. The details of mix proportions for $1m^3$ of concrete are given in Table 5.

Table 4.Material required for $1m^3$ of Concrete (Kg/m^3)

Grade	Cement (kg)	FA (kg)	CA (kg)	Water (lit)
M25	420	790	1010	197

3.5About Bacteria

Bacteria cereus is a large Gram positive rod-shaped, facultative aerobic bacterium. It was first successfully found in 1969 from a case of fatal pneumonia in a male patient.*B.Cereus*is a mesophillic, growing at the temperature 20° c and 40°c, and is capable of adapting to a normal of environment conditions.

4. VARIOUS TYPES OF FIBRE USED IN CONCRETE

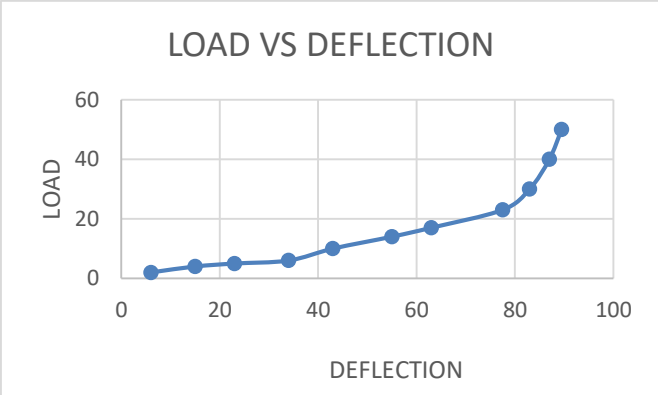
1) E-Glass fibre
2) Basalt fibre

5.TESTING RESULTS

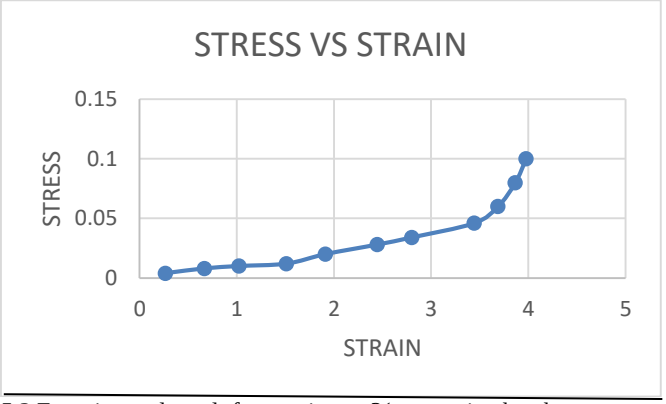
5.1 Flexural strength test

5.1 Experimental result for specimen -1(Conventionl steel reinforced)

Graph-5.1.1

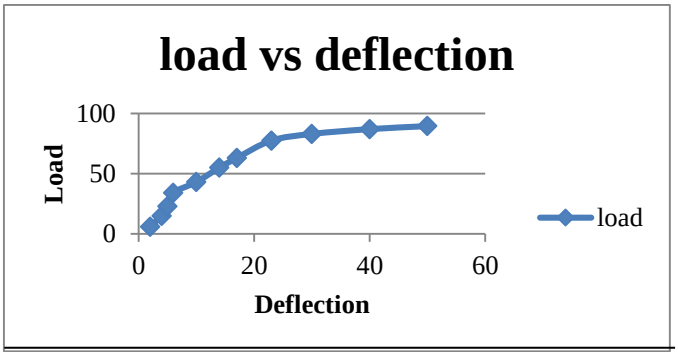


Graph-5.1.2



5.2 Experimental result for specimen -3(convention bamboo reinforced)

Graph5.:2.1(load vs deflection)



Graph:5.3.2(stress vs strain)

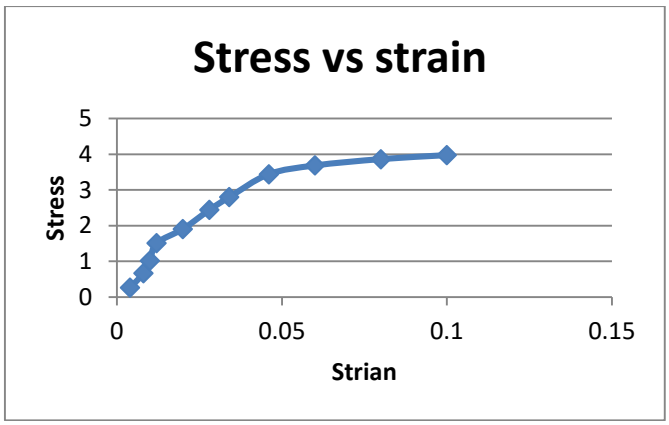
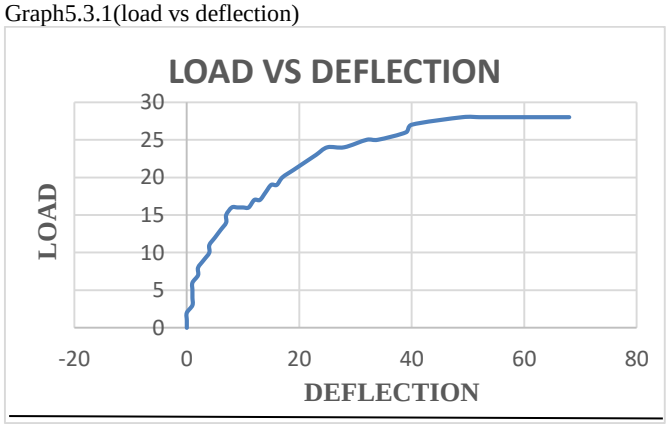
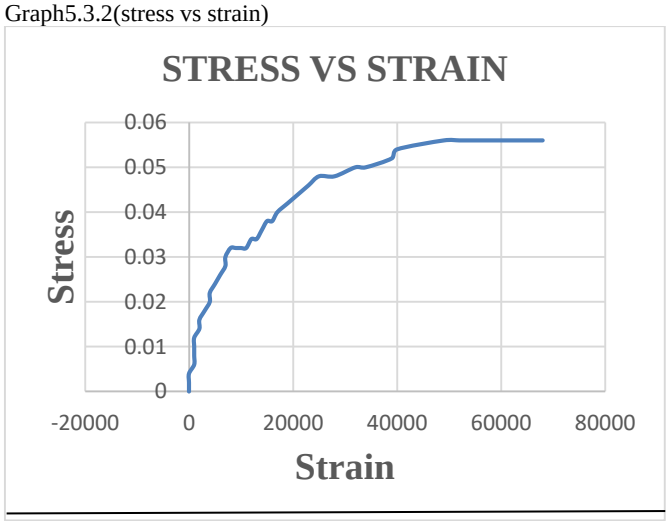


Table 5.3 Experimental result fot specimen-4(conventional bamboo reinforced)

Graph5.3.1(load vs deflection)

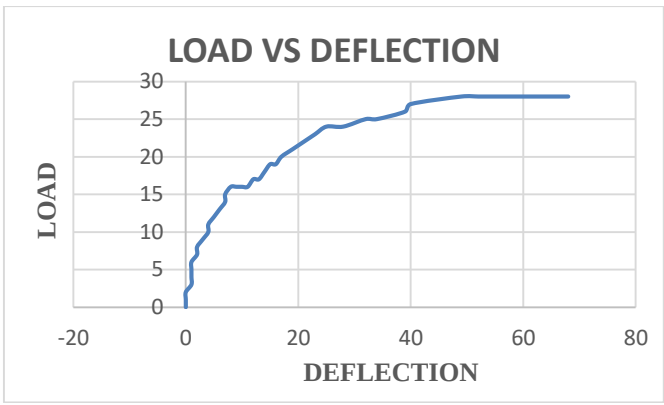


Graph5.3.2(stress vs strain)

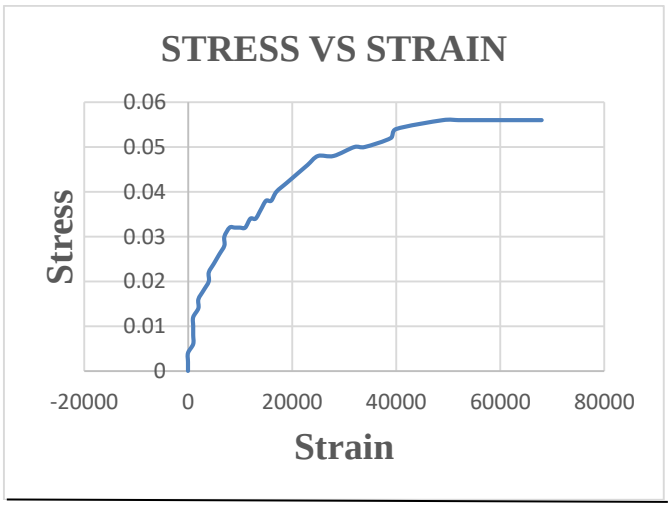


5.4 Experimental result for specimen 5(e-glass wrapped beam)

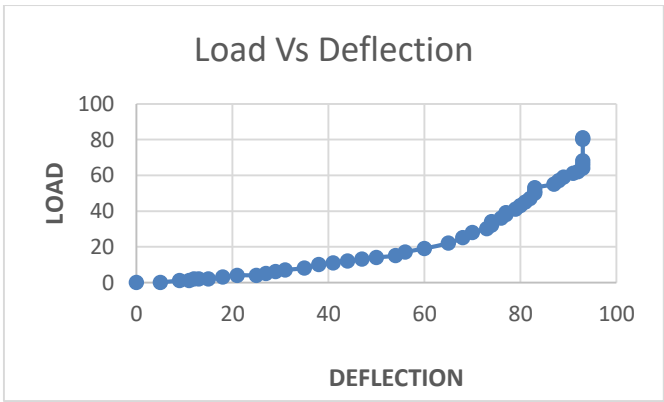
Graph-5.4.1(load vs deflection)



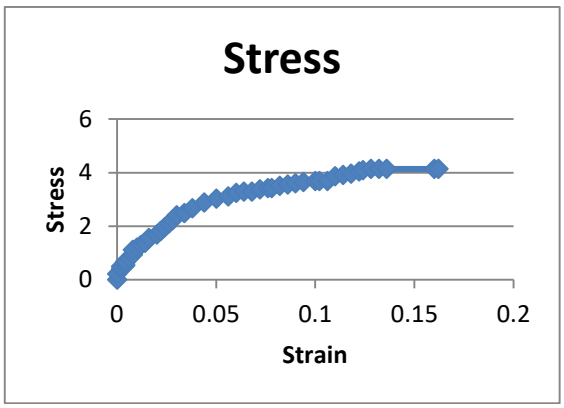
Graph-5.4.2(stress vs strain)



5.5Experimental result for specimen 6(Basalt fibre wrapped beam)
Graph-5.5.1(load vs deflection)



Graph-5.5.2(stress vs strain)



5.6 FLEXURAL STRENGTH TEST

The determination of flexural strength is essential to estimate the load at which the concrete member may crack. The flexural tests were carried out on beam specimen under standard four point loading was done conforming to IS516-1959. The flexural strength determine by testing standard test specimens of 150mmx150mmx700mm under four point loading. Load vs deflections measurements are observed. The ultimate load at failure was noted.

Two concentrated load at one –third span were applied on beams. The flexural depends on the dimentions of the beam and manner of the supporting span that is spaced at 666.67mm center to center or on either side of beam was place perpendicular to the applied force without eccentricity. There LVDT having a least count of 0.01mm is fixed at the middle, one fourth of the span and under the load point of the set up.

At the end of each load increment, observation and measurement were recorded for load point deflection, midpoint deflection and crack development and propagation on the beam surfaces. The load at first crack, ultimate load, type of failure etc..., were carefully observed and recorded. The specimens were loaded continuously at a constant rate till failure.

6.CONCLUSION

The experimental study shows that concrete wrapped with the fibres increase the strength of the concrete.

i) The use of bamboo for environmentally friendly construction material , more quickly implemented and added value in terms of cost

ii)It is a environmental sustainability is very intresting to further studied

iii)It is economical

iv)The beam is tested by flexural strength test

v)By wrapping the fibres around the bamboo reinforced beam gives high strength and durabilitys

vi)It is observed that e-glass fibre and basalt fibre wrapped around the bamboo reinforced beam gives high strength.

vii)When compared to basalt fibre, e-glass fibre gives more strength.

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