Banana Fibre Reinforced Cementatious Concrete

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Abstract- ***This paper presents a summary of research work published in the field of banana fiber reinforced cementatious with special references to the structure, physical and mechanical properties of the composites.***

I. INTRODUCTION

The attraction in utilizing natural fibre, for example, distinctive wood fibre and plant fibre as support in plastics has expanded drastically throughout last few years. Concerning the ecological viewpoints if natural fibers might be utilized rather than glass fibers as fortification in some structural provisions it might be extremely intriguing. Natural fibers have numerous points of interest contrasted with glass fibre, for instance they have low thickness, and they are biodegradable and recyclable. Also they are renewable crude materials and have generally great strength and stiffness.

- Materials and methodology

This chapter clearly narrates the important materials used and the methodology adopted to achieve the objectives of research work.

- General

The present study deals with the strength characteristics of cement matrix using Banana fibres. In this study, an attempt is being made to check the feasibility of banana fibres as reinforcing material in the cement matrix and to check the strength characteristics.

- Materials

The materials used in this research work confines to various Indian Standard Specification. The materials used are listed below, Cement. Fine aggregate: Washed M-Sand. Banana fibres of 1cm length, Diameter 1 micron meter, Aspect Ratio100

Processed Banana fibres of length 1 feet Banana fibres

- Methodology involved Basic properties of Materials used

The Physical properties of fine aggregates are to be determined as per various Indian Standard Specifications. The chemical composition and properties of the banana fibres are to be found according to the “National Standard Method of India” (GB5889-86).

Test on Standard consistency, Initial and Final setting time, Fineness of Cement are to be carried out and the detailed procedure is explained below.

- Mechanical Properties of BFRCC Compression test

The mortar cubes of size 70mm x 70mm x 70mm are to be cast, oil is applied along the inner surface of the metal mould. Ratio of cement to sand of 1:3 is considered with 85mL of water. Mortar is poured in 3 layers and tamped 25 times in each layer. The top surface is finished with hand trowel. After 24 hours of casting the specimens are de-moulded and placed

in curing tank. 7days, 14days and 28days compressive strength of the mortar cube is to be found out. The capacity of the Compressive Testing Machine is 2000KN. The same procedure is followed for casting the cubes with addition of 0.2%, 0.4%, 0.6%,0.8% and 1.0% of Banana fibres into the composite.

The materials and apparatus used for Compression Test are shown in figure 3.5 and The CTM used to find the strength is illustrated in Figure 3.6.

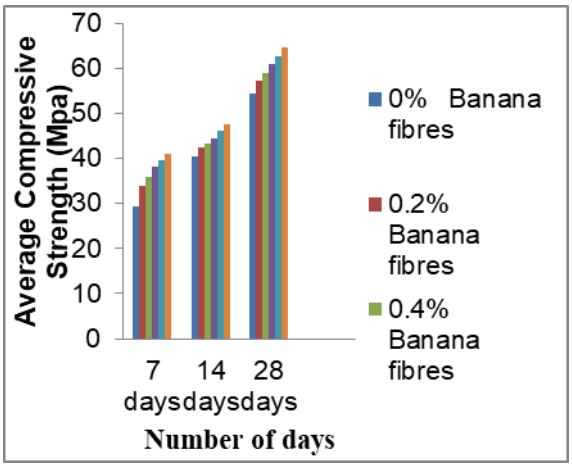
- Flexuretest

The mortar beams of size 100mm x 100mm x 500mm is to be cast, oil is applied along the inner surface of the metal mould. Ratio of cement and sand is 1:3 with 1160mL of water. Mortar is poured in 3 layers and vibrated using a vibrator. The top surface is hand trowelled. After 24 hours of casting the specimens are demoulded and are palced in curing tank. 7days, 14days and 28days flexural strength of the mortar beam is to be found out by carrying the flexural strength test using two point loading. The capacity of the Flexural Testing Machine is 100KN. The symmetrical two point loading creates a pure bending zone with constant bending moment in the middle third span and thus the modulus of rupture obtained is not affected by shear, as in the case of a single concentrated load acting on the specimen. The same procedure is followed for casting the beams with addition of 0.2%, 0.4%, 0.6%, 0.8% and 1.0% of Banana fibres into thecomposite.

II. RESULTS AND DISCUSSION

- Compression test

To ascertain the structural strength of the cement composite cubes cast using Banana fibres, Compressive strength test was conducted at the end of 7, 14 and 28 day curing.. It can be observed from the graph that for the five different proportions of fibres added, a considerable increase in compressive strength is obtained when compared to that of control cube. However it could be observed that the results obtained for 0.2% addition of banana fibres is 2.7 times more than the control cube for 28 days of curing period. Further, it could be observed that the strength of both control as well as cubes cast with 0.4%, 0.6%, 0.8% and 1.0% has increased with increase in curing period. Rate of Hydration influences Compressive Strength. Complete hydration is probably one of the reasons for increase in the compressive strength of the composite. The presence of fibres in the composite enhances the toughness and this leads to increase in Compressive Strength.The presence of Lignin content in Banana fibre influences Compressive Strength of the Composite. Lignin Content helps in binding of the fibres in the composite and thereby helps in crack arresting

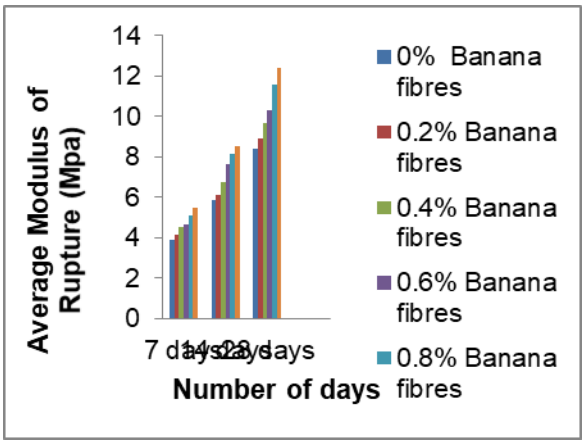


Compressive strength results

III. FLEXURAL TEST

To ascertain the structural strength of the cement composite beams cast using Banana fibres, Flexural strength test using two-point loading was conducted at the end of 7, 14 and 28 day curing.. It can be observed from the Figure that for the five different proportions of fibres added, there is considerable increase in flexural strength when compared to that of control beam. However it could be observed that the results obtained for 0.2% addition of banana fibres, the flexural strength was 0.50 times more than that of the control beam for 28 days of curing period. Further, it could be observed that the strength of both control as well as beams cast with 0.4%, 0.6%, 0.8% and 1.0% increased with increase in curing period. Aspect Ratio also influences the flexural strength. If the aspect ratio is smaller, the flexural strength obtained will be more as there will be uniform dispersion and no balling of fibres in the composite. The random alignment of fibres in composite increases the ductility which there by helps in

increasing the flexural strength



Flexural strength results

CONCLUSIONS

Based on the literature cited, analysis made and results obtained, the following conclusions may be drawn.

- From this study it has observed that the incorporation of natural banana fibres into the Composite shows significant improvement in the mechanical properties of the composites.
- The Compressive strength of the Banana Fibre Reinforced Cementitious Composite increased by 19% when compared to that of the control cube. This clearly indicates that with the increase in the concentration of fibres there is a gradual increase in the compressive strength
- The Flexural strength of the Banana Fibre Reinforced Cementitious Composite increased by 47.5% when compared to that of the control beam. This clearly indicates that with the increase in the concentration of fibres there is a gradual increase in the flexural strength

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