Effect of Natural Fibre Used in Concrete Roofing Panel

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Abstract

Now a days different fibers had been used to concrete. This assessment critically analyses the use of various natural and synthetic fibres, the treatments executed on some of them to be used in concrete, their power and faults for used some applications. The composite roofing panel in our study has been used to natural weathering bagasse. Since that natural fibres are to be had in considerable quantities in many growing countries, more difficult research ought to be directed in the direction of the diverse issues related to using this fibres. On this study, the durability of natural fibres including sugarcane bagasse used as roofing sheets has been mentioned via undertaking an experimental investigation. This investigation consists of will power of mechanical strength properties along with compressive, tensile, modulus of rupture and flexural homes of the roof panel. Further, it turned into discovered that addition sugarcane bagasse fibre completed strength and durability properties. This research consequently recommends the usage of 5% fibre content with M35 grade of concrete, also test effects for compression, flexural and impact test results with evaluation of conventional concrete.

Keywords: Natural fibre, Concrete, Roofing and Panel

1. INTRODUCTION

The trends in composite cloth after assembly the demanding situationsof aerospace sector have cascaded down for catering to domestic and industrial applications. Composites, the surprise material with mild-weight; high strength-to-weight ratio and stiffness houses have come a long manner in changing the traditional substances like metals, wooden and so on.

1.1 Applications of FRC

It is used on account of the gain of expanded static and dynamic tensile strength and better fatigue strength. FRC is used for:

- Runway, plane parking and Pavements
- Commercial flooring
- Tunnel and canal lining
- Slope stabilization
- Thin shells
- Curtain partitions
- Pipes
- Manholes
- Dams and Hydraulic systems
- Roof tiles
- Composite decks
- Impact resisting structures

1.2 CE Marking of Construction Products

By CE marking of construction products the producer attests that the product complies with all the relevant eu directives. But, CE marking by myself does no longer assure that the product is appropriate for use in Finland.

1.2.1 Concrete Tile Roofing

Today most tiled roofs in Finland are made with concrete tiles. Thanks to the method of manufacture they are dimensionally more correct than clay tiles. Concrete tiles ought to observe the first-rate necessities of European requirements. Concrete tiles are normally of interlocking type.

1.2.2 Roof Pitch

Concrete tile roofing is suitable for all roof shapes as much as a minimum slope of one: five. With clay tiles the minimal pitch is approx. 1:3 depending on kind. The minimal pitch of interlocking type clay tiles is 1:4 . Product-particular pitch limits given by means of the producer have to be accompanied.

1.2.3 Supporting Structure

The real ventilation channel of the roof structure is between the insulation and the underlay. An underlay should usually be mounted below roof tiling independent of its pitch, as in converting climate situations water and snow will input thru connections and joints underneath the roofing.

2. METHODOLOGY

Figure 1 shows the methodology of the study.

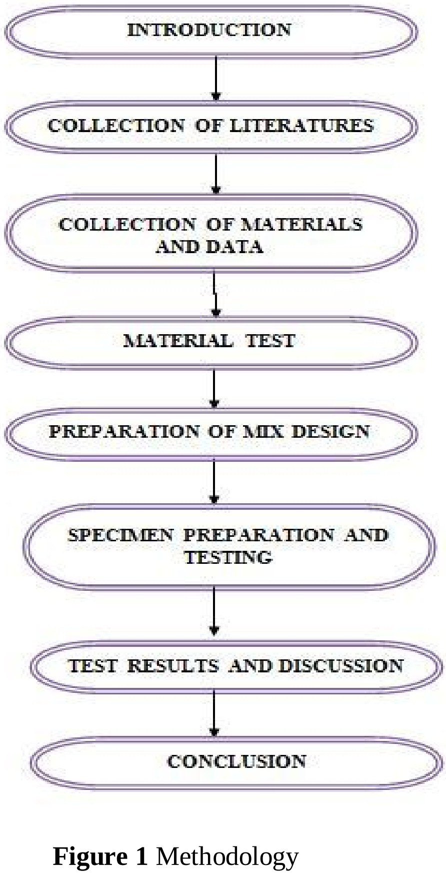

Figure 1 Methodology

3. MATERIAL COLLECTION AND PROPERITIES

3.1 Cement

Ordinary Portland cement of 53 grade of cement is used according to IS: 12269-1987 and conducting test on cement to find out the physical properties and results are given below in Table 1.

Table 1: Physical properties of cement (53 grade)

Sl. No	Material Properties	Obtained Values
1.	Initial Setting Time	46 minutes
2.	Final Setting Time	320 minutes
3.	Specific Gravity	3.12

3.2 Fine Aggregate

Mixture fillers River sand passing via a four.seventy five-mm IS sieve turned into received from a locally to be had supply; it conforms to grading area-III of IS 383 (1970) as given underneath in table 2.

Table 2: Physical properties of fine aggregate

Sl. No	Material Properties	Obtained values
1.	Specific Gravity	2.40
2.	Water Absorption	2.4%
3.	Fineness Modulus	2.6
4.	Zone	III

3.3 Coarse Aggregates

Table 3 shows the properties of coarse aggregates.

Table 3: Properties of Coarse Aggregates

Properties	Coarse Aggregate
Particle shape	**Angular**
Particle size	**20mm**
Specific gravity	**2.75**
Bulk density	**1340kg / m^3**
Fineness modulus	**4.18**

3.4 Materials

The raw materials used on these studies are ordinary Portland cement, satisfactory aggregate and coarse combination (OPC), River sand, Bagasse fibre and water. They were all received in india.

3.5 Fibres

The sugarcane was dried in sunlight used for dry this material after used. Table 4 shows the properties of the fiber.

Table 4: Properties of the Fiber

Properties Of Fiber	Sugarcane
Diameter	**1.5 Mm**
Aspect Ratio	**30,60% 90**
Specific Gravity	**0.52**
Water Absorption	**286.6**
Density In Kg/M^3	**260**
Young's Modulus (GPa)	**27.1**
Tensile strength (MPa)	**222**
Elongation (%) Sugar cane bagasse fibre	**1.1**

Figure 2 shows the sugarcane fiber.

Figure 2 Sugarcane fiber

4. MIX DESIGN

4.1 Design Stipulations

Grade Designation M-35
Type of cement O.P.C-53 grade
Fine Aggregate Zone-I
Sp. Gravity Cement 3.12
Sp. Gravity Fine Aggregate 2.4
Sp. Gravity Coarse Aggregate 2.75

4.2 Calculate Of Water Content

Water content =186 kg (As per Table No. 4, IS: 10262)
=197.17(Consider Slump Difference)
% of fine Aggregate = 35%

4.3 Sand Content

Consider fine aggregate zone-I
Sand content = 35+1.5% = 36.5%

4.4 Calculate the Cement Content

Cement content = water content/w/c ratio
= 197.17/0.35
= 563.34 kg/m^3

4.5 Mix Proportion

Table 5 shows the mix proportion.

Table 5: Mix Proportion

Cement (kg)/m^3	**FA (kg)/m^3**	**CA (kg)/m^3**	**Water (liter)/m^3**
563.34	527.59	1051.71	197.17

4.6 Adding Material Ratio

Sugarcane fiber adding of 5 %
Total volume of concrete = 2339.81
= 2339.81 x (5/100) =116.99

5. TEST PROCEDURE

5.1 Compressive Strength

Compression check is performed on the give up of 7^{th} and 28^{th} day of casting the specimens. The burden turned into implemented without any shock and constantly until the failure of the specimens. The utmost load is applied to the specimens until failure is recorded.

fc= load/ Cross sectional area

5.2 Flexural Strength Test:

Follow the burden statistics fee that continuously will increase the maximum stress till rupture takes place. The fracture suggests inside the tension floor with within the center 0.33 of span length. The flexural strength was received the use of the formula (R)

$$R = Pl/bd^2$$

5.3 Impact Test

An impact test a look at is a technique for figuring out the conduct of material subjected This test is designed to determine how a specimen of a acknowledged material will respond to a unexpectedly implemented strain. The test a look at ascertains whether the fabric is tough or brittle. It's miles mainly used to test the durability of metals, but comparable assessments are used for polymers, ceramics and composites.

- Oil and gas
- Aerospace
- Power generation
- Automotive
- Nuclear

6. TEST RESULT

6.1 Compressive Strength Test

Table 6 shows the compressive strength test results.

Table 6: Compressive Strength Test Result

Mix Design	% Of Replace ment	Compressive Strength(N/Mm^2)		
		7days	14 Days	28day s
M_{35}	0	25.6	30.8 5	38.54
	5 %	27.5	37.9	43.16

6.1.2 Model Calculation

Strength $= \frac{Load}{Area}$ N/mm^2

$= \frac{576000}{150 \, x \, 150}$

= 25.6 N/mm^2

Figure 3 shows the compression test graph results.

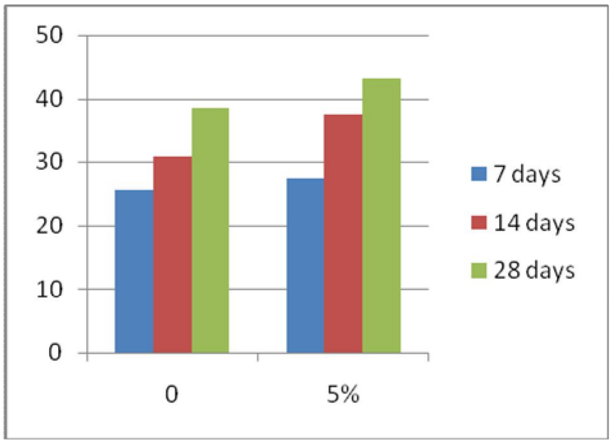

Figure 3 Compression Test Graph Result

6.2 Flexural Strength Test

Table 7 shows the flexural strength test results.

Table 7: Flexural strength test results

Mix Design	% Of Replacement	Flexural Strength Test (N/Mm^2)		
		7 Days	14 Days	28 Days
M_{35}	0	3.1	4.85	5.99
	5 %	3.68	5.25	6.89

6.2.1 Model Calculation

Flexural strength R $= Pl/bd^2$

$= 14946.43x\ 700/150x150^2$

$= 3.1\ N/mm^2$

Figure 4 shows the flexural strength graph results.

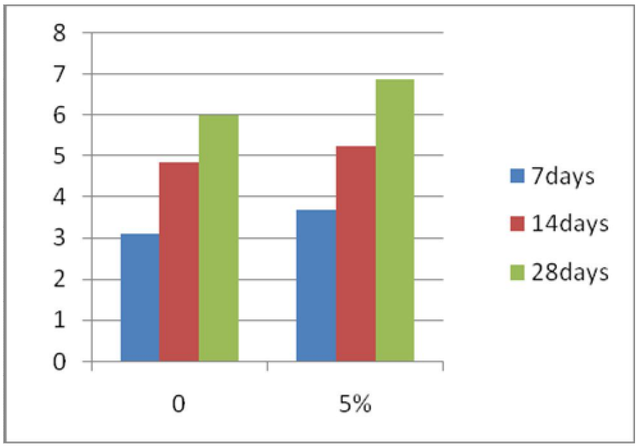

Figure 4 Flexural Strength Graph Result

6.3 Impact Test Result

Table 8 shows the impact test results.

Table 8: Impact test results

S.NO	Slab Identification	First Crack Load (kN)	Ultimate Failure Load (kN)	Deflection (mm)	
				At First Crack	At Ultimate Failure
1	Roof panel with 0.5% bagassefiber	0.428	0.478	1.46	5.62

7. CONCLUSION

From the outcomes acquired from the compression take a look at, it's miles placed that there may be a development in strength with the addition of sugarcane bagasse fibres whether or not dealt with or non-treated in assessment with simple cement concrete.

- There may be 10.5 % rise in compressive energy for sugarcane bagasse fibres reinforced concrete than conventional concrete.
- Compressive strength was most obtained for sugarcane bagasse fibre bolstered concrete in 43.16N/mm^{2}at 28days compared to standard concrete.
- Flexural strength could be increases at five% replacement of sugarcane bagasse fibre at 6.89 N/mm^2.
- From impact check end result Roof panel with 0.5% bagasse fiber with 5.62mm deflection at 0.478 kN.

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