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"ENHANCING THE PROPERTIES OF CONCRETE BY USING BANANA FIBER".

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ABSTRACT :- *A The demand for sustainable building materials at low cost is growing as social, economic, and environmental issues evolve in today society. In this report the term "Enhancing the properties of concrete by using banana fiber" is use as a generic name to cover a wide range of building materials. It increases the utilization of local material and reduces the transportation cost as the production is in situ, makes quality housing available to more people, and generates local economy rather than spending for import materials*

KEYWORD:- *Silica fume, Fly Ash and Banana fiber, Admixtures.*

I. INTRODUCTION

The utilization of biomass for the processing of novel composites has attracted growing interest because of its eco-friendly and renewable nature. Indeed enormous interest in the development of new composite materials filled with natural fibers has been shown by important industries such as the automotive, construction or packaging industry. Composites have encompassed almost all material domains. All synthetic polymers (thermoplastics, thermosets, and elastomers) can be used as matrices. As fillers, besides inorganic powders, extensive use has been made of inorganic manmade fibers such as glass, silicium carbide, or organic fibers like carbon and aramid, in the form of individual fibers (chopped or continuous), mats, or 2D-3D fabrics.

Compared to inorganic fibers, natural fibers present some well-known advantages such as lower density and lower price. They are less abrasive to the processing equipment, harmless, biodegradable, renewable, and their mechanical properties can be comparable to those of inorganic fibers. Natural fibers are gaining progressive account as renewable, environmentally acceptable, and biodegradable starting material for industrial applications, technical textiles, composites, pulp and paper, as well as for civil engineering and building activities. Natural fibers reinforced composites combine acceptable mechanical properties with a low density. Such composites offer a number of well-known advantages which include low cost, availability of renewable natural resources, biodegradability, etc.

II. LITERATURE REVIEW

i. 12th GLOBAL CONGRESS ON MANUFACTURING AND MANAGEMENT, GCMM 2014. "**Fabrication and Property Evaluation of Banana-Hemp-Glass Fiber Reinforced Composites**."
ii. International Journal of Theoretical & Applied Sciences, A review on electrical properties of fiber reinforced polymer composites by D. Pathania and D. Singh (2009).
i. Effect of Chemical Surface Modifications on the Properties of Woven Banana-Reinforced Unsaturated Polyester Composites by M. JANNAH, M. MARIATTI* AND A. ABU BAKAR (2009).
ii. Research Journal of Engineering Sciences Natural Fiber as a substitute to Synthetic Fiber in Polymer Composites by Begum K. and Islam M.A. (2013).

III. OBJECTIVE

The overall goals of this research is the study of admixtures (Fly ash, Silica fume) and banana fiber on properties of concrete and comparing the result of concrete regard compressive strength.
To reduce the Percent of cement in concrete with increase the strength

i. To learn the developments in materials, production method and mechanical properties and their uses.
ii. To compare the results between plain concrete, fiber concrete and mineral admixture mixed concrete.

iii. To study the functions of admixtures.
iv. To achieve a concrete mix of greater strength than conventional mix strength Conclusions will be formulated based on these results.

IV. MATERIAL USED

i. Concrete

The word concrete comes from the Latin word "concretus" (meaning compact or condensed), the perfect passive participle of "concrescere", from "con-" (together) and "crescere" (to grow).

Concrete is a composite material composed of coarse aggregate bonded together with a fluid cement which hardens over time.

ii. Cement

Cement was first invented by Egyptians. The manufacturing of cement was started in England around 1825.

The first cement factory was installed in Tamilnadu. Our country is the 2nd largest production of cement in the world Cement is a binding material used in construction. It has property of setting and hardening when mixed with water to attain strength.

The properties of cement are depending upon chemical composition, the processes of manufacture and the degree of fineness of cement grains.

iii. Fly Ash

A by-product of coal-fired electric generating plants, it is used to partially replace Portland cement (by up to 60% by mass).

The properties of fly ash depend on the type of coal burnt. In general, siliceous fly ash is pozzolanic, while calcareous fly ash has latent hydraulic properties.

iv. Banana Fiber

Banana, as a natural fiber, has inherent advantages like silky luster, high tensile strength, Low extensibility, considerable heat and fire resistance and long staple lengths. Banana fiber can be used in many different areas, and has been receiving increasing attention from industry. Their interests focus not only on the traditional uses of banana fiber, but also on the production of other value-added products such as, pulp and paper, geo-textiles, composites and home textiles etc.

Fig. Banana Fiber

v. Fine Aggregate

Aggregate of maximum Size 4.75 mm are used as a fine aggregate the Experimental program was locally procured And conformed to grading zone 3 as per IS: 383-1970.

Properties	Observed value
Specific gravity	2.5
Fineness modulus	2.48
Bulk density	1585 kg/m3
Loose density	1461 kg/m3
Percentage of bulking	32 %
Percentage of lumps	0.65 %
Water absorption	1.20 %

vi. Coarse aggregate

Properties	Observed value
Specific gravity	2.73
Fineness modulus	6.86
Bulk density	1532 kg/m3
Loose density	14579kg/m3
Aggregate crushing value	30.21
Aggregate impact value	34.15
Maximum size of aggregate	12.5
Flakiness index	23.22 %
Elongation index	30.43 %
Water absorption	0.69 %

The coarse aggregates are locally available was used having maximum size of 20 mm.

vii. MOULDS

Here we used 2 types of moulds for checking strength at various proportions of replacement.

Cubical: - The size of each mould is 150*150*150 mm was used for preparing the concrete specimens for determination of compressive strength of concrete.

Cylindrical: - cylinder size 300 mm in Height and 150 mm in Diameter was used to prepare the Concrete specimens for determination of Splitting Tensile Strength of concrete.

V. METHODOLOGY

i. Conduct the test on aggregate:

- Sieve analysis test (IS 2720 Part IV - 1985)
- Aggregate crushing strength (IS 2386 Part IV - 1963).
- Impact value test (IS 2386 Part IV - 1963).
- Abrasion value test (IS 2386 Part IV - 1963).
- Flakiness index test (IS 2386 Part I - 1963).
- Elongation index test (IS 2386 Part I - 1963).

ii. Conduct the test on water:

- PH value of water

iii. Conduct the test on cement

- Consistency of cement.
- Setting time test.
- Then design of concrete mix in which the strength of concrete will increase and it also reduce the required quantity of cement concrete becomes economical than conventional concrete.

iv. Method Used

- Trial method
- Error method

v. Important Criteria:

- High strength is achieved if the particle packing is dense with minimum voids. For this high paste volume is essential.
- Mineral and chemical admixtures are used.
- Two batches of concrete were prepared: one without super plasticizer one with super plasticizer.
- In this experimental work for each mix of composite, a total 33 specimen of following Type were prepared.
- For compressive strength test, 3 cube of each proportion having size 15X15X15 cm.
- All above specimens were prepared with various fibers with replacement of cement by the 10 % - 30% of its weight.

Test	As per the IS code method	Value obtained
Specific gravity	le-chatlier`s flask method	3.137
Fineness of cement	(As per I.S 269-1976)	97.606 %(retained less than 5%)
Initial and final setting time test on cement	(As per IS: 4031 part5)	1.Initial setting time of cement: 71 min (not less than 30min) 2.Final setting time of cement : 401 min (not more than 600min)
Normal consistency test	(As per IS:4031 part4)	29% (ranges from 26% to 33%).
soundness test of cement	(As per IS:4031-part3)	1mm

VI. MIX DESIGN

The design of concrete mix is not a simple task on account of the widely varying properties of the constituent materials , the conditions that prevail at the site work, in particular the exposure condition that are demanded for a particular work for which the mix is designed . Design of concrete mix requires complete knowledge of various properties of these constituent material, the implications in case of change on these condition at site the impact of properties of plastic concrete. The concrete mix design was prepared according to IS code 10262-2009 to control concrete. The grade M-30 and w/C ratio is 0.55 which is constant for all mix design.

VII. RESULTS

i. **Determination of compressive strength**

Compression is the most common test conducted on hardened concrete partly because it is an easy test to perform.

The cube specimen is of size (15x15x15) cm. the largest size of aggregate does not exceed 20mm, 10cm size cubes may also be used alternative the compressive strength test specimen.

determine following formula:

Compressive Strength (MPa) = Load carried in N /Bearing area in mm^2

ii. Compression Testing Machine (CTM)

Operation of the machines is by hydraulic transmission of load from test specimen to separately housed load indicator. the hydraulic system is ideal since replaces transmission of load through levers and knife edges.

iii. Result Table

- **Result Of Compression**

%Replacement of cement by banana fiber	0%	Average	5%	Average	10%	Average	15%	Average
7 days(Mpa)	16.5	17.54	16.5	18.25	15.5	16.43	14.5	20.75
	17.85		18.98		16.89		13.8	
	18.29		19.29		16.90		13.2	
14 days (Mpa)	26.97	27.17	27.98	27.16	25.98	25.46	21.29	21.80
	26.98		26.25		26.12		22.83	
	27.58		27.25		24.29		21.29	
28 days (Mpa)	30.28	30.89	31.28	34.15	24.28	27.58	27.9	27.25
	31.20		35.28		29.20		26.89	
	31.21		35.89		29.28		26.97	

Test Compressive Test

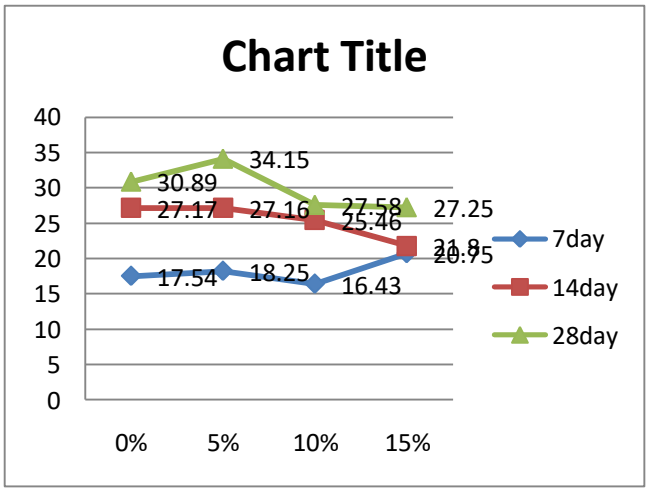

Fig. Compressive Test

VIII. CONCLUSION

- Great Increase in strength.
- Banana fiber gives more flexural strength as compare to OPC.
- It is Economical because banana fiber can found in banana plants because it's a waste product.
- It has been observed that by the incorporation of banana fiber as adding to cement in fresh and plain concrete increases workability when compared to the workability with reference to concrete made without banana fiber.
- The mix with adding banana fiber (5%) has shown good strength properties like compressive and tensile .This may be due to the fact that the CSH gel formed at this percentage is of good quality and have better composition.
- The mix with adding banana fiber (10%) has shown good flexural strength.
- It has also been observed that by using banana fiber can go up to 15% safely although the strength values are less.

IX. FUTURE SCOPE IN INDIA

- Low cost high performance fibre offers the potential to solve the largest problem in the cement and concrete industry i.e. cracking and structural failure of concrete.
- This can be increase due to use of cement in construction for making concrete and mortar.
- The main effect is green house effect. Due to increase in green house gasses it affects the ozone layer and this caused the rise in temperature of earth.
- This project is being economical because of using waste materials having low cost.
- Also these are environment friendly materials.
- In future point of view this will be a great advantage for the people and environment.
- Also the recycling of waste material is done simultaneously so it reduces a pressure of disposal of such waste which creates healthy nature.

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