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A REVIEW OF USING BANANA FIBERS TO INCREASE THE PROPERTIES OF CONCRETE

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Abstract: *In 21st Century, the most important challenge was sustainable development of built environments in many countries. It was one of best way to use local Materials in both urban and rural areas as in construction industry to facilitate sustainable development. As there were many Local materials (fly ash, banana fibers and admixtures) used in the concrete to enhance its properties. In today society the growing of Social, economic and environmental problems evolved at low cost as the demand of sustainable building Materials. To cover the building materials through wide range the general term was used as "using banana Fibers to Increase the Properties of Concrete". The Fibers was used locally and its utilization was increased. Moreover due to its production at site its transportation was reduced. In addition this provide economical houses to more people instead of importing Materials.*

***Key Words*:** *Banana Fibers, Fly Ash, admixtures, Sustainable development, building material*

I. Introduction:

All over the world in today society, the sustainable building materials having low cost, growing environmental, social and economic issues**.** It was the fact that in developing nations more than one billions of peoples were living in which either were house less and more were living in poor houses. Due to low cost and availability of earth more people were living on earth. It was the need of all level of peoples to live in house but the need was badly affected the ability of people to reside in poor hosing or without house by the huge cost of labor, transportation and materials [I]. Compressive brick blocks were used faster and easier construction with low cost and friendly environment process [II].
There were large numbers of benefits relative to environment by using binders in concrete. This study mainly focused on traditionally used binder which replaced in concrete such as Banana Fibers (waste which was not utilized). In more than 160 Countries, banana plantation over 10 million hectares having average of 1500 plants per hectares which produced large number of waste in tons. After throwing it in to waste, it was decomposed after long time which creating carbon di oxide and methane gas which badly affected the environment which became a key source of increasing global warming every years. Every year due to waste of banana half ton of carbon di oxide was emitted in air [I]. Natural fibers instead of inorganic fibers having low price and low density. As compared to inorganic fibers, nature fibers were abrasive to the processing equipment's, biodegradable and renewable [III].

II. Objectives of study:

The main objectives of this review are

1. To study the compressive strength of concrete and its uses by adding the banana fibers with replacement of cement in concrete.
2. Includes learning of different methods and its uses.
3. Included the comparison of plain and fiber concrete results.

III. Used Materials:

There were different materials used as binders in concrete such as

1. **Cement:** The invention of cement was initiated in Egypt. In 1825 in England the cement manufacturing was started while in Tamilnadu the first factory was installed. In construction industry cement was used as binding materials in concrete mixture. In order to gain strength when mixed with water having property of setting and hardening.

2. **Banana Fiber**: There are many inherent benefits present in banana fibers such as low density, including high tensile strength, silky luster and low extensibility, high disposability and renewability, appropriate stiffness and mechanical properties. In addition biodegradable and recyclable was also important benefit of Banana Fibers. In many industries these fibers receiving much more attention to be used.

Figure: 01 View of Banana Fibers

3. **Fine aggregates:** According to ASTM C33 the particles passed on sieve having size 4.75mm was said to be fine aggregates. Also same was used in this paper.
4. **Fly Ash:** The Particles driven from fired coal boilers combine with fuel gases, the particles composed of fine particles and burned fuel. This material was used by mass up to 60%as a replacement of cement in concrete mixtures [IV].

Figure: 02 View of Fly Ash

5. **Moulds:** In this paper two types of moulds were used to check the compressive strength of various percentage of replacement.

a. Moulds having Cubical Shape: In this type of moulds the compressive strength of specimen was determined having size of 6"x6"x6" (150x150x150mm).

b. Moulds Have Cylindrical shape: In this type of moulds the compressive strength of specimen was determined having size of 1ft (300mm) in height and 6inch (150mm) diameter.

IV. Methodology to determination of Compressive strength of Concrete Using Banana fibers:

In order to know the strength of Concrete Mix design Method was used. Proper and technical knowledge was required to know the constituents Materials of concrete. For this purpose 0.55 water cement ration and M 30 materials were used [V].

To Know the strength of hardened concrete, a test was conducted because of its simple performance was known as compressive strength. In this paper cubes having size of 6"x6"x6" was used for finding the compressive strength of Concrete using aggregate size not more than 20mm and following formula ,Compressive Strength (Mpa): F/A

Where F: Force or load at point of Failure in Newton and A: initial cross sectional Area of specimen in mm^2.

Compressive testing machine (CTM) was used to conduct the test by placing the cube specimens in the machine and load was applied gradually until failure occurred. The maximum force at point of filature was recorded and used [VI].

Figure: 02 View of Compressive testing Machine

V. Results:

Table 01, 2 and 3 was used to indicate the compressive strength of concrete at 7, 14 and 28 days having various percentage of banana fibers

Table 01: 0 & 5% Replacement of Banana Fibers [III]

%age Replacement of Banana fibers with Cement	0% Banana Fibers	Average	5% Banana Fibers	Average
7 days (Mpa)	16.50	17.78	16.50	18.26
	17.85		18.98	
	19.00		19.29	
14 days (Mpa)	26.97	26.84	27.98	27.16
	25.98		26.25	
	27.58		27.25	
28 days (Mpa)	30.28	30.56	32.28	34.15
	30.20		35.28	
	31.21		34.89	

Table 02: 0 & 15% Replacement of Banana Fibers [III]

%age Replacement of Banana fibers with Cement	0% Banana Fibers	Average	15% Banana Fibers	Average
7 days (Mpa)	16.50	17.78	20.50	20.76
	17.85		21.58	
	19.00		20.21	
14 days (Mpa)	26.97	26.84	21.29	21.80
	25.98		22.83	
	27.58		21.29	
28 days (Mpa)	30.28	30.56	27.90	27.25
	30.20		26.89	
	31.21		26.97	

Table 03: 0 & 10% Replacement of Banana Fibers [III]

%age Replacement of Banana fibers with Cement	0% Banana Fibers	Average	10% Banana Fibers	Average
7 days (Mpa)	16.50	17.78	16.15	16.85
	17.85		16.50	
	19.00		17.90	
14 days (Mpa)	26.97	26.84	25.98	25.46
	25.98		26.12	
	27.58		24.29	
28 days (Mpa)	30.28	30.56	24.28	27.59
	30.20		29.20	
	31.21		29.28	

VI. Conclusions:

From above table following observations were concluded as given below

a) The compressive Strength was increased
   i. using 5% and 15% banana fibers instead of OPC at 7 days Mpa
   ii. Using 5% only at 14 days
   iii. Using 55 only at 28 days

b) Banana was a waste product so it was economical to be used as replacement of ordinary Portland cement.

c) The Workability of Concrete was observed to be increase with presence of banana fibers instead of simple concrete using OPC.

It was also observed that as the value at 15% was less as compared to Mixtures strength with OPC but went safely up to 15% including banana Fibers in mixture.

Besides the above results, in many countries (including Pakistan) using of banana fibers with replacement of cement having following advantages

a) The Manufacturing of cement was directly affect the ozone layer due to evaluation of greenhouse gases so instead of Cement, banana fibers shall be used.
b) Because of its low cost, local availability and waste, it was an economical materials to be used.
c) Use of banana fibers will make the environment friendly as compared to cement.
d) Use of banana fibers will also reduce of waste in country which will lead positive affect on the health conditions of peoples.
e) To Solve the Issue of Cracking and failure of concrete in construction industry, high performance and low cost banana fibers will be used.

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