Impact Factor (SJIF): 3.632

International Journal of Advance Research in Engineering, Science & Technology

e-ISSN: 2393-9877, p-ISSN: 2394-2444

Volume 3, Issue 4, April - 2016

Experimental Study on Effect of Use Sugarcane Bagasses Ash as Partial Replacement of Cement in Concrete with Hair Fiber and Glass Fibre

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Abstract - The use of alternative cement like Sugarcane Bagasses Ash (SCBA) is a natural step in solving part of depletion of natural element. The investigation on alternative material for concrete making started before half a century. Concrete made from Sugarcane bagasses waste as Cement will be studied for workability, compressive strength. So here in this project, Sugarcane bagasses ash has been used as replacement of Cement by different percentage for making concrete of M-20, with w/c ratio 0.50. The percentage replacement will be 0%, 02%, 04%, 06%, 08%, and 10%, with Hair fibre 0.5% and Glass fibre is 0.5%. For making concrete OPC-53 grade cement is used. Cubes and beams will be casted and tested compressive strength. Optimum replacement of SCBA can be used in structural concrete.

Key words: - *Sugarcane bagasses ash, Hair fibre, Glass fibre, Compressive strength.*

I. INTRODUCTION

Concrete is the widely used first number of structural material in the world today. Concrete is manufacturing involves of ingredient like cement, aggregate. Water. Infrastructure developed across the world created demand for different construction materials. cement are important constituent in concrete. Concrete has been used for many amazing things throughout history, including architecture, infrastructure and more.

Concrete is formed when portland cement creates a paste with water that binds with sand and rock to harden. Cement is manufactured through a closely controlled chemical combination of calcium, silicon, aluminum, iron and other ingredients. Common materials used to manufacture cement include limestone, shells, and chalk or marl combined with shale, clay, slate, blast furnace slag, silica sand, and iron ore. These ingredients, when heated at high temperatures form a rock-like substance that is ground into the fine powder that we commonly think of as cement.

Glass fibres of 12mm length fibres are usually round and straight with diameters of 0.014 mm. They could also be bundled together to produce glass fibres bundles with bundle diameters up to 1.3 mm.

Hair is used as a fibre reinforcing material in concrete for the following reasons: i. It has a high tensile strength which is equal to that of a copper wire with similar diameter. ii. Hair, a non-degradable matter is creating an environmental problem so its use as a fibre reinforcing material can minimize the problem. iii. It is also available in abundance and at a very low cost.

Sugarcane is one of the major crops grown in over 110 countries and its total production is over 1500 million tons. In India sugarcane production is over 300 million tons/year that cause around 10 million tons of sugarcane bagasse ash as an un-utilized and waste material. After the extraction of all economical sugar from sugarcane, about 40-45 percent fibrous residue is obtained, which is reused in the same industry as fuel in boilers for heat or power generation leaving behind 8 -10 percent ash as waste, known as sugarcane bagasse ash (SCBA).

II. MATERIALS

a) Cement.
b) Water.
c) Fine aggregate (sand).
d) Coarse aggregate.
e) Sugarcane baggsses ash.
f) Glass fibres.
g) Hair fibres

a) Cement

Ordinary Portland cement of 53-grade was used as it satisfied the requirements of IS: 269- 1969 and results have been tabulated in table.

Initial setting time		25min.
Final setting time		240min.
Compressive strength	3days	32.3N/mm^2
	7days	41.9N/mm^2
	28days	59.5N/mm^2
Fineness (90µmsieve)		1.7%
Standard consistency		31.5%

Table 1 Properties of cement

b) Water

Portable tab water is used for preparation of specimens and curing of specimens.

c) Fine aggregate

As per IS 383-1970, table4 sand used for experimental program was locally produced and was conforming zone II. The specific gravity of fine aggregate was found to be 2.6.

Gradation	Fall in Zone II
Fine modulus	2.56
Silt content	0.78%
Specific Gravity	2.638
Moisture content	1.4%

Table 2 Properties of Fine aggregate

d) Coarse aggregate

Locally available coarse aggregate passing from 20mm sieve and conforming IS 383-1970 were used in present work. The specific gravity of coarse aggregate was found to be 2.836.

Aggregate Impact value	12.4
Aggregate Abrasion Value	16.3
Specific Gravity	2.836
Water Absorption	1.06%
Combined Flakiness Index, Elongation Index	22.9%

Table 3 Properties of Coarse aggregate

e) Sugarcane bagasses ash

Sugarcane bagasses ash (SCBA) generated from sugar mills is fibrous waste-product usually delivered to landfills for disposal.Using of sugarcane bagasses ash in concrete is an interesting possibility for economy and conservation of natural resources.chemical properties and mechanical properties of sugarcane bagasses ash as below.

compound	Percentage of weight
Calcium oxide(Cao)	4.71
Silica dioxide(Sio_2)	76.93
Aluminum oxide(Al_2O_3)	2.92
Ferric oxide(Fe_2O_3)	4.89
Loss on ignition(LoI)	1.93

Table 4 Chemical Properties of Sugarcane bagasses ash

Property	Cement	SCBA
Fine modulus % passing 45µ	82	91
Specific gravity	3.15	1.82

Table 5 Mechanical Properties of Sugarcane bagasses ash

f) Hair fibres

Human hair is strong in tension; hence it can be used as a fibre reinforcement material.Hair Fibre (HF) an alternate non-degradable matter is available in abundance and at a very cheap cost.It also creates environmental problem for its decompositions.

g) Glass fibres

Glass fibre is a material consisting of numerous extremely fine fibres of glass.It is significantly less brittle when used in composites.Glass fibres are used as a reinforcing agent for many polymer products**.**

2.1 Mix design

The mix was designed as per IS 10262:2009 for M20 grade concrete with 0.5 water cement ratio. Concrete mixes are prepared by partial replacement of cement by sugarcane bagasses ash with different percentages (0%, 02%, 04%, 06%, 08%, 10%) respectively and adding fixed percentage of glass fibres and hair fibres (0.5% of weight of cement) for every mix.

MIX	Cement(%)	SCBA(%)	FA (%)	CA (%)	HF (%)	GF (%)
A	100	0	100	100	0	0
B	98	2	100	100	0.50	0.50
C	96	4	100	100	0.50	0.50
D	94	6	100	100	0.50	0.50
E	92	8	100	100	0.50	0.50
F	90	10	100	100	0.50	0.50

Table 6 Mix Design Proportion

2.2 Test Specimens and Test Procedure

Cement, sand and aggregate were taken in mix proportion as per mix design M20 grade of concrete respectively. The 150mm x 150mm x 150mm size concrete cubes were used as test specimens to determine the compressive strength, split tensile respectively. Cast the cubes with different mix proportion and put in water curing tank for 28days. After complete curing done the compressive and tensile strength.

III. RESULTS AND DISCUSSION

3.1 Slump Test

Slump test is done before casting of each mix, Slump of concrete is increase respectively increase of PCA in concrete. Reason of slump increase was less water absorption of plastic aggregates and plastic fibres. The slump test results are shown in figure 1.

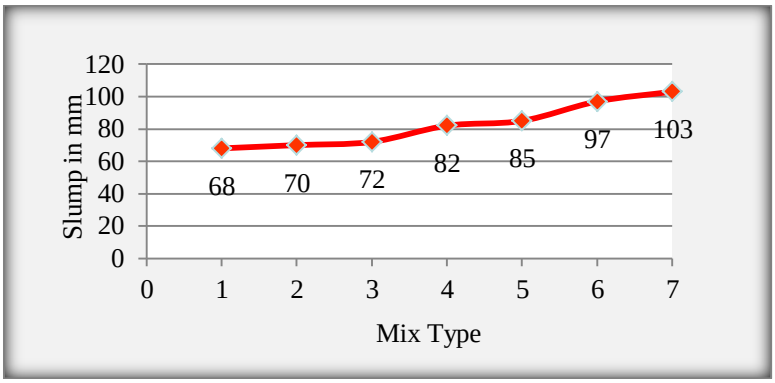

Figure 1 slump test results

3.2 Compressive Strength

The compressive strength results of different mixes are given by table3 and fig2.In the present investigation compressive strength of concrete produced by replacing cement by sugarcane bagasses ash with addition of glass fibre and hair fiber is goes on increasing up to 10% replacement of SCBA. In compressive strength results mix2 increase compressive strength because of using glass fibres and hair fibres, after mix2 strength decreasing because of increases SCBA content in concrete. The percentage in the compressive strength at this 0% to 10% replacement of SCBA found to be seen in table 7 and fig2.

Sr.No.		**01**	**02**	**03**	**04**	**05**	**06**	**07**
Mix		**A**	**B**	**C**	**D**	**E**	**F**	**G**
Compressive strength results (N/mm^2)	**7 days**	14.65	15.63	15.03	14.69	14.07	13.62	13.40
	14 days	18.36	19.26	17.62	17.85	17.92	17.26	16.73
	28 days	26.50	27.40	27.03	26.81	26.59	25.03	23.85

Table 7 compressive strength results

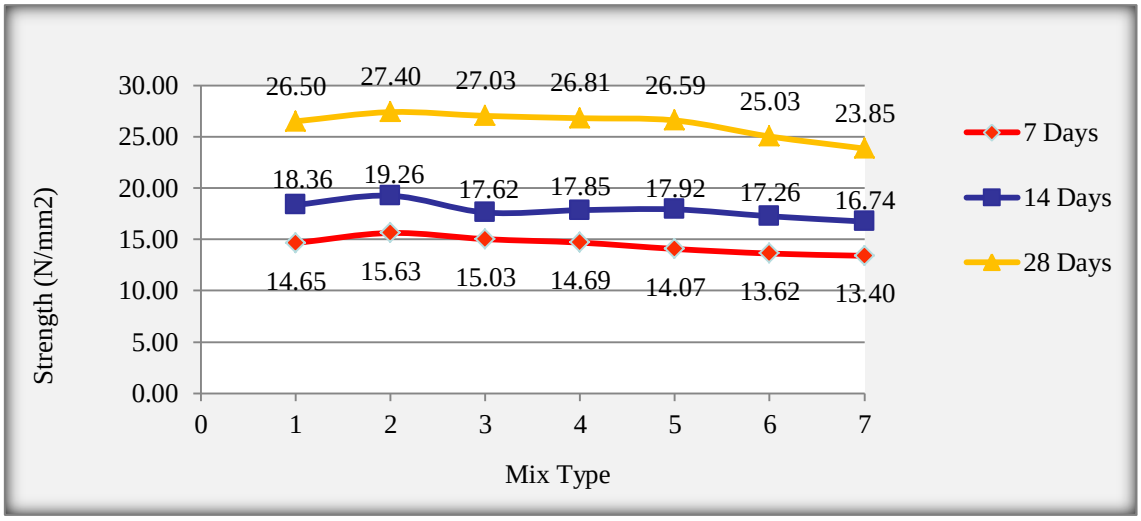

Figure 2 compressive strength results

IV. CONCLUSION

- It is identified that sugarcane bagasses ash can be using them as construction materials in concrete.
- The workability property of concrete was affected by SCBA, slump reduce with respect to increase the persentage of SCBA.
- Increase the Compressive Strength 3.40% Compare to normal concrete due to 0.5% addition of fibres.

- However Strength noticeably decreased when the SCBA content was more than 8% as cement in concrete With compoare to Reference Concrete.
- Density of concrete is reducing due to use of SCBA in concrete.
- From this experimental investigation, the composites would appear to be low cost materials which would help to resolve some solid waste problems and preventing environment pollution.

ACKNOWLEDGEMENT

The writers express their sincere thanks to Mr. Priyank Bhimani (Asst. Prof. At Civil Dept. HJD Institute), Dr. Kalpana Maheshwari (HOD Civil Dept. HJD Institute), Dr. Rajesh Patel (Principal HJD Institute), Mr. Bipin Pindoriya, Mr. Govind Dhanani, Mr. Dhaval Ganatra, under graduate students, HJD Institute–Kera (Kutch), Gujarat, India, for their laborious effort in this investigation.

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