



# Experimental Study on Sugarcane Bagasse Ash and Robo Sand as a Partial Replacement in Concrete

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## Article Info

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## ABSTRACT

In this generation all the researchers are focusing on the agricultural waste like rice husk, Coconut coir, and sugarcane bagasse ash etc. sugarcane bagasse is an agricultural material after extraction of the juice bagasse remained. In general bagasse is used in place of fuel in industries. In industries byproduct bagasse ash is formed mostly they use for land filling. So here we are using as a partial replacement of cement with different percentage like 0%, 6%, 7%, 8%, 9%, 10%, 11% & 12% respectively. Sugarcane bagasse ash gives the best results up to 12% of weight. Robo sand is produced in the stone quarries. It is partially replaced with sand of different percentages like 0%, 10%, 20%, 30%, 40%, 50%, 60% & 70% of weight respectively. Robo gives the best result for workability and high compressive strength. The w/c ratio for all mixes kept constant as 0.45 for M30 grade. The fresh concrete tests such as compaction factor and slump cones are conducted and also hardened concrete compressive strength tests are done for different ages. Lastly after knowing the individual strength properties for SCBA & ROBO sand. So here we have used the combination of SCBA & RCA got the best results at 12% SCBA & 50% Robo sand.

**KEYWORDS:** Sugarcane bagasse ash and Robo sand

## INTRODUCTION

Concrete plays a major role in the construction industry. It is made up of different types of Materials like cement, fine aggregate and coarse aggregate all together forms concrete and gives the strength to the material. Increasing the population and changing the life style and development of the city are in large scale, so requirements of the building have Increasing day by day so therefore civil engineers are focusing on the agricultural materials and construction materials.

Sugarcane bagasse ash is one of the crops growing in India. Generally sugarcane bagasse ash (SCBA) bagasse is formed after the extraction of the juice the bagasse is remained the farmer won't waste the Bagasse

again they use the bagasse for fire purpose, Atlast ash is formed they used for plants and also they refill in the land. So to reduce the land filling and pollution to the Atmosphere here we are using the ash in place of cement which works as Pozzolanic cement and with various strengths. SCBA doesn't require any super plasticizers and also it gives excellent workability results for fresh concrete as well as hardened concrete.

Robo sand is formed by crushing of gravel and stone. It is manufactured in stone quarries. Generally it is replaced with river sand and also to reduce the river sand consumption and also it has same properties. Generally using robo sand gives the high compressive strength values

## LITERATURE REVIEW:

**Ashish mathur et al** this study shows minimum void content in m-sand as compared to natural sand which further gives lesser drying shrinkage & less cavitations in structure, provides high durability in all types of concrete work

**Dr. Shaik Yajdani et al** It is observed that 60% replacement of natural sand by robo sand is giving better compressive strength, for M20 and M30 grade concrete compared to other proportions of mixes. The slump values of concrete with robo sand were observed to be relatively less when compared to conventional concrete.

**Lavanya M.R et al** they concluded that bagasse ash is a pozzolanic material and it can be used as a partial replacement for cement. It can increase the overall strength of the concrete up to a 15%

**K. Lakshmi et al** found that Partial replacement of cement by SCBA boosts workability of fresh concrete so super plasticizer is not essential concrete with 10%SCBA replacement after 28 days of curing, gives maximum strength compared to concrete of other percentage replacement mixes.

**K Ganesan et al** He concluded up to 20% of ordinary Portland cement can be optimally replaced with well burnt bagasse ash without any adverse effect on the desirable properties of concrete

**Priyanka A. Jadhav et al** The compressive strength of cement mortar with 50% replacement of natural sand by manufactured sand reveals higher strength as compared to reference mix

## METHODOLOGY:

- Literature reviews
- Collection of materials
- Basics tests on materials
- Mix design
- Casting
- Tests and results
- Conclusions

## EXPERIMENTAL PROGRAM:

The physical properties tests have done are shown below

### a) CEMENT

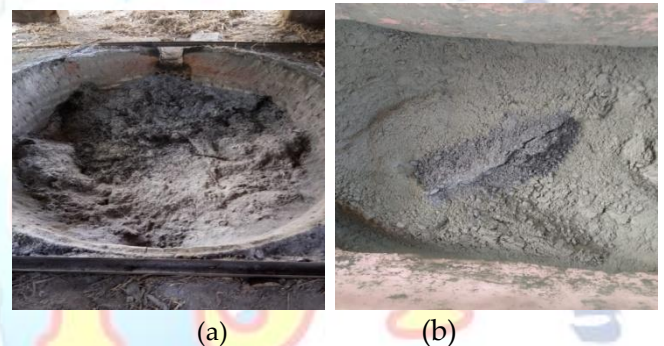
Ordinary Portland cement (OPC) 53 grade was used conforming to IS 12269. The basic properties of cement shown below in table1

**TABLE 1: PHYSICAL PROPERTIES OF CEMENT**

S.NO	PROPERTIES	RESULTS
1	Specific gravity	3.12
2	Fineness	96%
3	Standard consistency	32%
4	Initial setting time	34min
5	Final setting time	266min

### b) SUGARCANE BAGASSE ASH

Bagasse ash is replaced in place of cement and the ash is sieved in 90micron. The properties are shown in table2



**FIG1. (A) BAGASSE ASH, (B) CEMENT+BAGASSE ASH**

**TABLE 2: PHYSICAL PROPERTIES OF FINE AGGREGATE**

S.NO	PROPERTIES	RESULTS
1	Specific gravity	2.31
2	Fineness	98%
3	Standard consistency	34%
4	Initial setting time	36min
5	Final setting time	260min

### c) FINE AGGREGATE

The locally available river sand is procured and it is conformed to its specifications IS 383-1970 and the river sand belongs to zone-II. The physical properties are shown in table3

**TABLE 3: PHYSICAL PROPERTIES OF COARSE AGGREGATE**

S.NO	PROPERTIES	RESULTS
1	Specific gravity	2.68
2	Fineness modulus	3.08

3	Water absorption (%)	0.5
4	Compacted Bulk density (gm/cc)	2.0
5	Loose Bulk density (gm/cc)	1.8

#### d) ROBO SAND (M-SAND)

The term sand is referred to the small size particle. M-sand is manufactured by crushing of rocks and gravels. The material is used which is less than 4.75mm. The following properties are shown below in table 4



**FIG2.ROBO SAND**

Coarse aggregate retained on Is 4.75mm sieve and its maximum nominal size is 20mm used in the concrete for 70% & remaining 30% coarse aggregate used is 10mm tests are conducted as per is 383-1970. The properties are shown in table4

**TABLE 4: PHYSICAL PROPERTIES OF ROBO SAND**

S.NO	PROPERTIES	RESULTS
1	Specific gravity	2.71
2	Fineness modulus	2.21
3	Water absorption (%)	0.25
4	Compacted Bulk density (gm/cc)	1.5
5	Loose Bulk density (gm/cc)	1.25

#### e) COARSE AGGREGATE

Locally available coarse aggregate are used in this program, which are having maximum size of 10mm & 20mm. The properties are shown in table 5

**TABLE 5: PHYSICAL PROPERTIES OF COARSE AGGREGATE**

S.NO	PROPERTIES	RESULTS
1	Specific gravity	2.68
2	Fineness modulus	7.8
3	Water absorption (%)	0.6
4	Compacted Bulk density (gm/cc)	27
5	Loose Bulk density (gm/cc)	10.3

#### WATER

Portable water conforming to IS456-2000 are used for mixing, casting and for curing purposes

#### 5. EXPERIMENTAL PROCEDURE

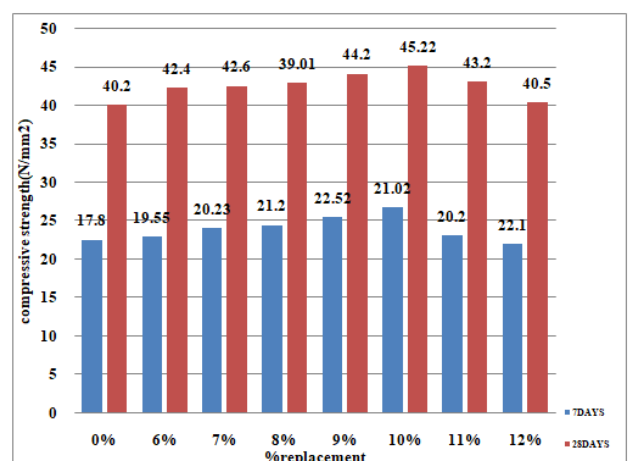
M30grade of concrete is mixed according to the guidelines of IS10262:2009 with replacement of sugarcane bagasse ash and copper slag. The mix obtained is 1:1.80:2.13(C: F.A:C.A).The water cement ratio for all the mixes is 0.45.The mix details is shown in table6

The sugarcane bagasse ash is replaced in cement with different percentage are 0%,6%,7%,8%,9%,10%,11%&12% by weight and robo sand is restored in fine aggregate with different percentage are 0%,10%,20%,30%,40%&50% by weight. The compressive strength specimens are casted and cured in water for 7days & 28 days.

**TABLE.6.Mix proportions obtained from mix design of M30**

Water (kg/m <sup>3</sup> )	Cement (kg/m <sup>3</sup> )	Fine Aggregate (kg/m <sup>3</sup> )	Coarse regate (kg/m <sup>3</sup> )
197.16	390.55	705.96	833.5
0.45	1	1.80	2.13

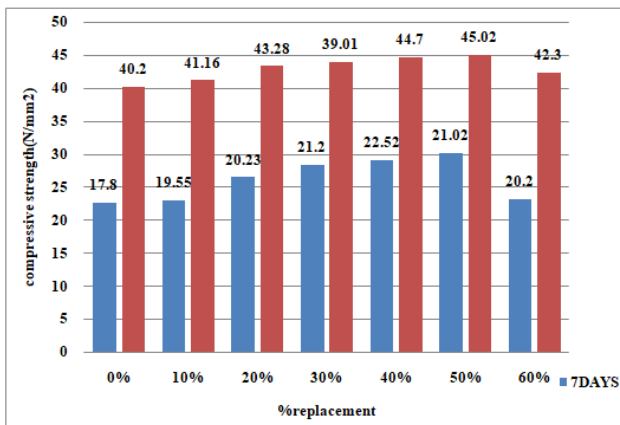
#### RESULTS & DISCUSSION



**GRAPH.1. VARIATION OF COMPRESSIVE STRENGTH USING SCBA**

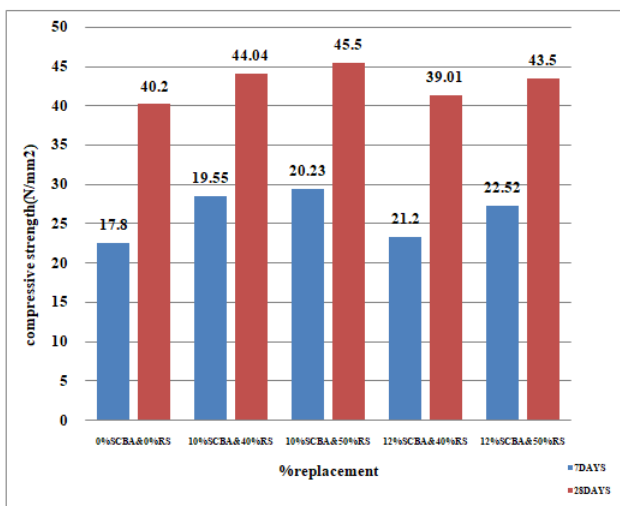
From the graph1.Using SCBA in place of cement we got the extreme compressive strength at 10% for 7days and 28days are 45.22 N/mm<sup>2</sup>&21.02N/mm<sup>2</sup> compared

with nominal mix for 7days & 28days are 17.8 N/mm<sup>2</sup>& 40.2 N/mm<sup>2</sup>



**GRAPH.2. VARIATION OF COMPRESSIVE STRENGTH USING (ROBO SAND)RS**

From the graph.2.Using RS in place of Fine aggregate we got the highest compressive strength at 50% for 7days and 28days are 45.02 N/mm<sup>2</sup>&22.52N/mm<sup>2</sup> compared with nominal mix for 7days & 28days are 17.8 N/mm<sup>2</sup>& 40.2 N/mm<sup>2</sup>



**GRAPH.3. VARIATION OF COMPRESSIVE STRENGTH USING SUGARCANE BAGASSE ASH (SCBA) & (ROBO SAND) RS**

From the graph.3.Using the combination SCBA &Robo sand we got the highest strength for 7days & 28 days are 29.5 N/mm<sup>2</sup> & 45.5N/mm<sup>2</sup> at 10%SCBA & 50%Robo sand

## CONCLUSIONS

From the experimental investigation the following results are concluded

- SCBA can improve the strength properties of concrete at explicit level. It also reduce the hydration of heat and upgrade the concrete durability
- Robo sand gives eternal workability of concrete and higher strength with substantial durability.
- By replacing cement with SCBA greater compressive strength collate with nominal mix
- By removing fine aggregate with robo sand at particular level gives the higher compressive strength compared with nominal mix
- The maximum value gained for 7days & 28days are 26.8N/mm<sup>2</sup> & 45.22N/mm<sup>2</sup> at 10% replacement with SCBA
- The supreme value get as far as for 7days & 28 days are 30.12N/mm<sup>2</sup> & 45.02N/mm<sup>2</sup> are at 50% replacement with robo sand
- After reaching the highest of both the mix and we used the combination for SCBA &Robo sand .we got the highest strength for 7days & 28 days are 29.5 N/mm<sup>2</sup> & 45.5N/mm<sup>2</sup> at 10%SCBA & 50%Robo sand

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