

Influence of Sugarcane Bagasse Ash on Compressive Strength of Mortar

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Abstract: This study investigates the effect of Sugarcane bagasse ash (SCBA) on compressive strength of mortar. The SCBA used in this study was collected from Siddhi sugar and allied industries ltd. latur District, Maharashtra. Directly obtained SCBA was used passing through 150µ. X ray Fluoresces (XRF) test was conducted to evaluate the chemical composition of SCBA. OPC 53 grade cement was replace with (SCBA) at variation of 5%, 10%, 15%, 20%, 25%, and 30% at w/c ratio 0.5. 1:3 mix proportion was used for preparation of mortar. The test result indicated that 5% replacement of SCBA results in better compressive strength of mortar.

Key Words: Key Sugarcane Bagasse ash; Mortar; mix proportion; Compressive strength; X-ray fluorescence

1. INTRODUCTION

Sugarcane is major crop grown in over 110 countries and its total production is over 1500 million tons. Sugarcane production in India is over 300 million tones per year. The processing of it in sugar-mill generates about 10 million tones of SCBA as a waste material. One ton of sugarcane can generate approximate 26% of bagasse and 0.62% of residual ash. The residue after combustion presents a chemical composition dominates by silicon dioxide. [1-2]. The SCBA contains high amounts of un-burnt matter, silicon, aluminum and calcium oxides [2-4]. The main parameter responsible for this improvement was higher silica content. Bagasse ash contains amorphous silica and display good pozzolanic property. Bagasse is often used as a primary fuel source for sugar mills; when burned in quantity, it produces sufficient heat energy to supply all the needs of a typical sugar mill. The dumping of these industrial wastes in open land poses a serious threat to the society by polluting the air and waste bodies. This also adds the no availability of land for public use. [10-14]. SCBA was tested in a various part of the world and found the ash can improve the compressive strength of.

2. EXPERIMENTAL DETAILS

2.1 Materials

Sugarcane bagasse, Ordinary Portland cement (OPC) 43 Grade, And good quality river sand was used as a fine Aggregate. The specific gravity are of SCBA and cement was 3.15, and 2.167. Directly obtained SCBA was used in preparation mortar. SCBA was sieved through 150µ IS

sieve. And quality river sand was sieved through 2.36 mm. The Chemical compositions of Cement and SCBA are given in table below.

Table - 1: Chemical Composition of SCBA

S. No	Chemical composition	% in OPC 43	% SCBA
1	SiO ₂	19.71	87.59
2	SiO ₂ +Al ₂ O ₃ +Fe ₂ O ₃	28.64	88.18
3	Mgo	2.54	1.65
4	So ₃	2.72	0.03
5	Cao	62.91	2.59
6	Na ₂ O	0.25	0.17
7	K ₂ O	0.90	3.64

3. MIXTURE PROPORTIONS AND SAMPLE PREPARATION

Mortar is prepared by using 1:3 cement to sand ratio at water cement ratio of 0.5. Cement in mortar is then replace by volume from 5% to 30% at an increment of 5%. The compressive test was done at 7, 28, 56 and 90 days of curing period. The mortar specimens were cure in a curing tank. Seven different specimens were prepared of mix proportions of 1:3. Total 84 numbers of mortar cubes were casted to find out the compressive strength of mortar. Bagasse ash mortar for 5% replacement was named as (BAM5), similarly up to 30% replacement named as BAM10, BAM15, BAM20, BAM25 and BAM30.

4. EXPERIMENTAL METHODOLOGY

For compressive strength test, cube specimens of dimensions 50 x 50 x 50 mm were casted. The moulds were filled with different proportions of cement and SCBA 24 hours the specimens were demoulded and were transferred to curing tank wherein they were allowed to cure for 7, 28, 56 and 90 days of curing, these cubes were tested on compression testing machine. The compressive strength test was done as per IS: 2250. The failure load was noted. In each category, three cubes were tested and their average value is reported.

The compressive strength was calculated as follows:
Compressive strength (N/mm²) = Failure load / cross sectional area.

5. EXPERIMENTAL RESULTS

The compressive strengths of Mortar mixes with partial replacement of cement by SCBA are presented in figure 1. The replacement of was 5% to 30% of cement by SCBA. It was observed that the 5% replacement gives the better compressive strength than other samples.

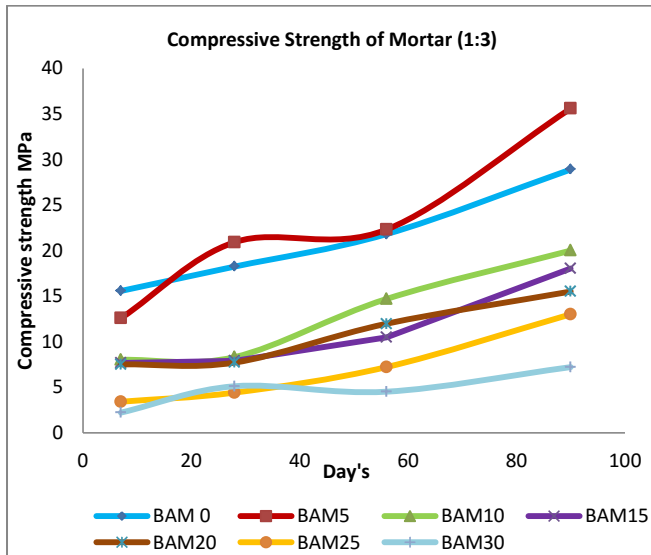


Figure 1 Compressive Strength of Mortar

6. CONCLUSIONS

Based on the results presented above, the following conclusions can be drawn

1. In 1:3 mix proportion, 5% replacement of cement by SCBA lead to greater strength than other samples.
2. In 1:3 mix proportion up to 25% replacement of cement by bagasse ash shows that it can be useful for masonry mortar.
3. High percentage replacement of SCBA in mortar causes very low development of strength.
4. Decrease in strength of mortar is not due to high percentage replacement of cement by SCBA but it's due to decrease in cement content of mortar.
5. By using bagasse ash mortar the expenditure on cement minimizes also it reduces the disposal problem of sugarcane bagasse ash

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