International Journal of Engineering and Management Research e-ISSN: 2250-0758 | p-ISSN: 2394-6962
Volume-11, Issue-5 (October 2021)
www.ijemr.net https://doi.org/10.31033/ijemr.11.5.1

Experimental Studies on Sugar Cane Bagasse Ash based Geomaterials

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ABSTRACT

Use of conventional materials is increasing day by day due to rapid infrastructural growth which increases the cost of materials and increases the cost of construction. Hence utilization of Sugar cane bagasse ash waste materials without causing threat to environment solves the problems of disposal and also can provide economical materials. In this study glass fiber, sugarcane bagasse ash and blast furnace slag were used and cement used for binding purpose. Different mix ratio was prepared to understand the effect of addition of glass fibre on sugar cane bagasse ash based materials under compressive loading. The mix ratio was taken 0.2 to 1.0% for the research work. Blast furnace slag was added 10% to weight of sugar cane bagasse ash. The sample were tested for compressive loading for 7, 14, 28 days respectively. The density is most important parameter of materials. It was observed that the density of materials significantly influences with addition of glass fibre. The density of materials decreases with percentage of glass fiber increase. The density of materials varies between 901.1 kg/m^3 to 741.10kg/m^{3}The compressive strength also significantly affected by percentages of glass fibre. The compressive strength ranging 82 kPa to 798 kPa. The compressive strength increases up to certain mix ratio then decrease continuously. The stiffness of sugar cane bagasse ash specimens reinforced with glass fiber at cement 20% more than 15% and 10%.The stiffness also increase with the curing period. The maximum load was observed at 0.6% mix ratio. The stress strain behavior was observed to be nonlinear.

Keywords-- Sugar Cane Bagasse Ash, BF Slag, Compressive Strength, Density, Glass Fibre

I. INTRODUCTION

The sugarcane is core crops cultured around many nations and its total production is 1.5 trillion. In India, sugar cane creation is around 0.3 trillion per years and 10 million tons of SCBA unutilized as waste [10]. Bagasse is the fibrous and tough waste formation later the exclusion of the sugar cane juice from the sugar cane in sugar cane factories. Ash is a excess earned from the burning of bagasse in sugar cane manufacturing factories. The waste of SCBA is deposited in low lying areas cause heaps in that area. The effective use of these garbage solves its dumping problem but also provides an low-cost construction material. This paper focus on performance of improvement of new material using waste as SCBA, BF slag and glass fibre and binder as OPC.

As per American Concrete Institute (ACI) committee, BF slag is non-metallic product [1], mainly consist of silica and aluminosilicates of CaO and of other sources that is produced in a red-hot state at once with iron in a BF slag (blast furnace).The glass describes to materials, generally mixes of metal oxides, mainly silica, which does not crystallize after frozen from the liquid to the solid state [8]. GF are formed in a process called fabrication in that melted glass is extracted in the form of filaments, through the bottomside of a heated platinum container [14].

II. MATERIALS AND METHODS

In this research work effect of addition of glass fibre on sugar cane were analyses. In this research work cube of size 100mm x 100mm x 100mm were used for work. The compressive strength of the specimen were noted after 7, 14 and 28 days were noted.

2.1. Materials

The SCBA treated in the research study had specific gravity (G) of 1.99, hydrometer used for study the percentage sand was 40, slit 45 and clay 5. The standard proctor test method used to to determine the, maximum dry density (γd) of 0.94 g/cc and optimum moisture contain (OMC) was 20%.The bulk density of glass fibre with were found according to ISO 10119 as per pychnometer method 0.78 g/cc they were 12mm in length. The scanning electron microscope analysis were used to get the[14] morphology of sugar cane bagasse ash. Figure 1 shows the photographing sugar acne bagasse ash[1].

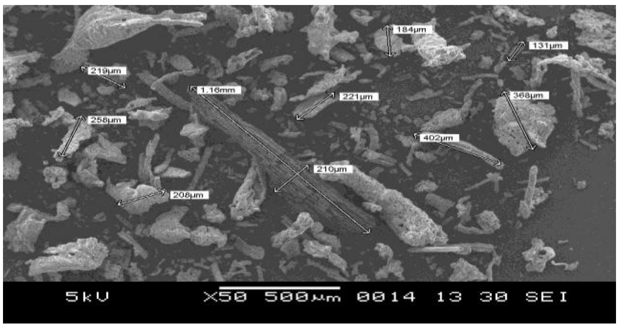

Figure 1: Scanning of Sugar Cane Bagasse Ash

2.2. Equipment

In this study the unconfined compressive testing machine with deformation rate 1mm/minuit were used to understand the behavior of materials. The load

e-ISSN: 2250-0758 | p-ISSN: 2394-6962
https://doi.org/10.31033/ijemr.11.4.1

cell of 50kN capacity with LVDT has 0.01mm accuracy and data loggers to record the data were used.

2.3 Test Procedure

The test samples were dry after curing is over and mass of each cube was note down using an electronics weight balance. Dry weight of sugar cane bagasse ash, cement and BF slag were mixed thoroughly for uniform mass. In the mixture the glass fibre were added after addition of water to avoid lump of glass fibre together[9]. The mix was segregate after one day curing at optimum moisture contain 20%. The mix was not form the uniform mixture till water below 50%. Hence water was added further 50% to weight of SCBA. Then the mix were add up into cube with the help of trowel and then compacted using temping rod.

Figure 2: Mixing of SCBA, BF Slag and glass fibre

For the research work different mix ratio percentage were used. The cement used in different proportion for 10, 15 and20 % for 7, 14 and 28 days curing. The mix proportion of blast furnace to sugar cane bagasse ash were kept constant for all mix ratio. The different mix ratio preparation for different percentages shown in table1.

Table 1: Different mix ratio preparation in the experiment

Mix ratio %	Cement %	Mix Proportion of BF slag
0.2	10,15,20	10
0.4	10,15,20	10
0.6	10,15,20	10
0.8	10,15,20	10
1.0	10,15,20	10

III. RESULTS AND DISCUSSION

The result was observed after 7, 14 and 28 days curing. The density, compressive strength and strain behavior of the materials were noted of the materials.

3.1. Density

The density of the materials was noted after 7, 14 and 28 days. The specimen after curing air dry for period and mass of the specimen were noted. From the figure 3 the density of materials decreases as mix ratio increase. The density of materials ranging between 901.1kg/m^3 to 741.10kg/m^3.The percentages of decrease in density is 17.75% from 10% cement to 20% cement. However, the densities of materials increase with percentages of cement.

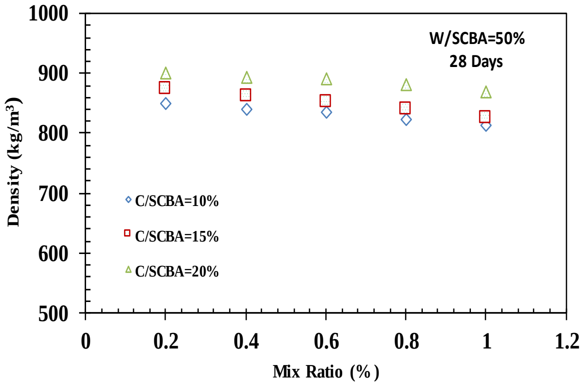

Figure 3: Density of materials for 28 days with mix ratio

3.2. Compressive Strength

The compressive strength was noticeably affected with the curing duration, glass fibre and mix ratio value. The compressive strength of materials with addition of glass fibre increase up to certain level then fall down. The compressive strength of materials is ranging between 82 kPa to 798 kPa. The compressive strength for cement to sugar cane bagasse ash ratio 20% is higher than 15 and 10% cement for all mix ratio as shown in figure 4.

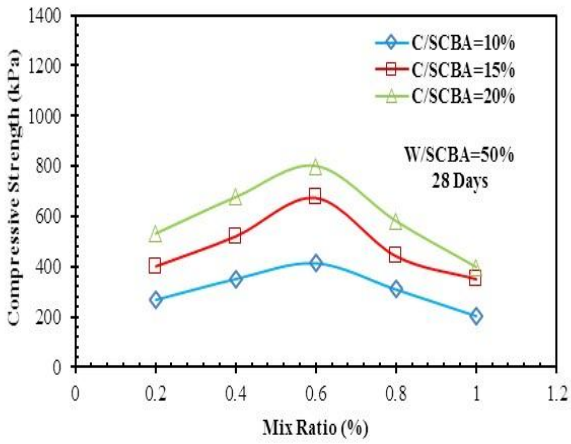

Figure 4: Compressive strength for 28 days curing with mix ratio

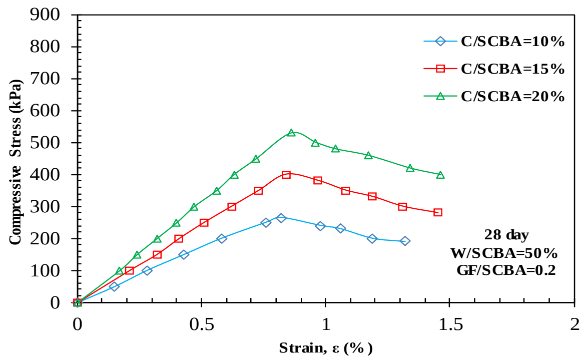

Figure 5: Stress strain behavior for 0.2 mix ratio for 28 days curing

IV. CONCLUSION

Effect of glass fibre addition on compressive strength of material density and strain strain relationship were note for all curing period.

1. The density of materials significantly affected by addition of glass fibre. The density of materials reduced by addition of glass fibre. The percentage of decrease in density is 17.75% as mix ratio increase.
2. The density of materials raging from 901.1 kg/m^3 to 741.10kg/m^3. As the percentages of cement increase density is increased for all mix ratio.
3. The compressive strength of materials substantial affect with addition of glass fibre. The compressive strength of materials increase up to certain mix ratio then decrease continuously.
4. The compressive strength of materials ranging between 82 kPa to 798 kPa. The compressive strength is increased as curing period increase from 7 to 28 days.
5. The stress strain relation is found to be nonlinear for all mix ratio.

ACKNOWLEDGEMENT

We are thankful to staff, who helped support various aspects until this research was carried out successfully.

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