An Experimental Study on Partial Replacement of Cement by SBCA for M-30 concrete

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Abstract:- India is the second largest country of sugar production after Brazil. As a result of which, there is an increase in the amount of bagasse as a by-product from the sugar mill. Sugar cane bagasse ash is the waste product of the combustion of bagasse for energy in sugar factories due to which it is easily available and cheap. Sugar cane bagasse ash is disposed of in landfills and is now becoming an environmental burden. In this experimental research work concrete cubes, beams and cylinders of M30 grade were casted and tested to examine various properties of concrete like workability, compressive strength, split tensile strength, and flexural strength. Sugar cane bagasse ash was partially replaced with cement at 3, 6, 9 and 12 % by weight of cement in concrete.

I.INTRODUCTION

Recently sugarcane bagasse ash, has been tested in some parts of the world for its pozzolanic property and also improves the properties of mortar and concrete like compressive strength and water tightness in certain percentage of replacement and fineness. The silicate content of sugarcane bagasse ash is the reason behind its pozzolanic property. Depending on the burning and other properties of the raw materials like the soil on which soil is grown, the silicate content in the ash may vary from ash to ash.

Now a days, different materials are being used as a replacement for cement at a certain percentage. Most of these cement replacement materials are byproducts of different industries and agricultural waste for eg. blast furnace slag, silica fume, fly ash, rice husk etc.

. Mr Prashant O Modani has obsereved that the partial replacement of SBA through fine aggregates gave positive results with the replacement of about 10% to 20%. In this research, the partial replacement of cement by SBA with varying percentages that is 3%, 6%, 9% and 12% respectively.

Bagasse is a cellulose fiber which remains after the extraction of juice from sugarcane. The bagasse ash is about 8-10% of the bagasse and contains unburned matter, silica and alumina.

The SBA used in this present study was taken from **Maa Rewa Sugar factory which is located in Shahpura, Jabalpur district of MP State, India.** For this study, fresh SBA taken from the furnace was used. It was cooled in air by applying a small quantity of water.

II.MATERIALS AND METHODOLOGY

1.CONCRETE :- In this experimental work a design mix of M-30 grade was used for making the reinforced concrete specimens for 55 mm slump, The slump cone test was performed to determine the workability of concrete for desired slump

2. CEMENT :- For making concrete OPC 43 grade cement (JP cement) was used.The specefice gravity of cement used was 3.15 and the fineness modulas was 2940 Normal Consistency 29.5%, Vicat initial setting time (minutes) 75, Vicat final setting time (minutes) 370 and soundness was 2mm.

3. FINE AGGREGATES:- The fine aggregates used in this investigation was Narmada River sand passing through 4.75 mm sieve with specific gravity of 2.64.

4. COARSE AGGREGATES :- Machine crushed broken stone angular in shape was used as coarse aggregates. Two fraction of coarse aggregates were used, 20mm size having specific gravity of 2.85, and 10mm size having specific gravity of 2.85.

5. WATER :- Ordinary tap water clean, potable free from suspended particles and chemical substances was used for both mixing and curing of concrete.

6. SUGARCANE BAGASSE ASH:- After the bagasse combustion, a new by-product Sugar Cane Bagasse Ash (SCBA) is formed and can be used as a pozzolona and substitute cement. The chief constituent of SBA is SiO_2, Al_2O_3, Fe_2O_5, Cao and K_2O.

The following laboratory tests were performed on aggregates as per relevant IS code and mix design of M25 grade of concrete. The laboratory test programmed is summarized below.

1. Physical properties of coarse aggregates (20mm and 10mm size)
- Sieve analysis and fineness modulus
- Specific gravity
- Water absorption
2. Physical properties of cement
- Fineness

III. RESULTS

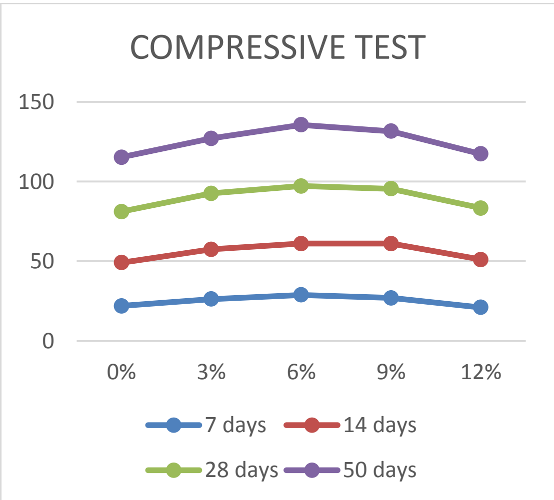

FIG 1. COMPRESSIVE STRENGTH WITH PARTIAL REPLACEMENT OF CEMENT (0%, 3%, 6%, 9%, 12%) WITH SBCA.

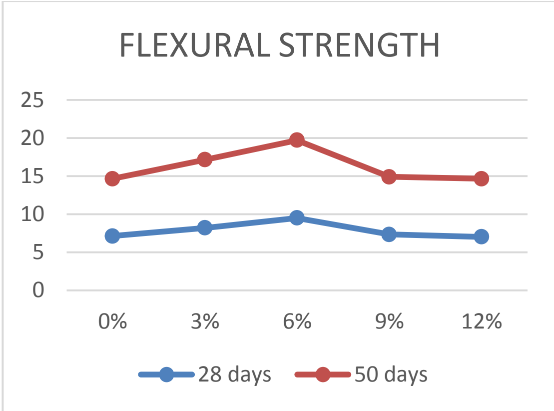

FIG 2. FLEXURAL TENSILE WITH PARTIAL REPLACEMENT OF CEMENT (0%, 3%, 6%, 9%, 12%) WITH SBCA.

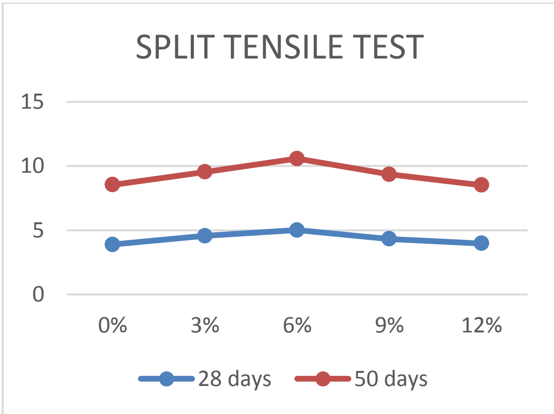

FIG 3. SPLIT TENSILE WITH PARTIAL REPLACEMENT OF CEMENT (0%, 3%, 6%, 9%, 12%) WITH SBCA.

IV. CONCLUSION

After performing the tests on M30 concrete with partial replacement of cement (0%, 3%, 6%, 9%, 12%) with SBCA, it has been observed that the compressive strength, flexural strength and split tensile increases with increase in percentage of SBCA and it is maximum for 6% and then starts decreasing.

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