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Experimental Investigation of M20 and M30 Concrete's Compressive Strength by Substituting Sugarcane Bagasse Ash for Cement

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ABTRACTS

India is the world's second-largest producer of sugar after Brazil. Consequently, the quantity of bagasse, a by-product of the sugar mill, has increased. The waste product of burning bagasse for energy in sugar refineries, sugar cane bagasse ash is readily available and reasonably priced. Ash from sugar cane bagasse is dumped in landfills and is currently harming the environment. Concrete cubes, cylinders, and beams of M-20 and M-30 grade were cast and tested as part of these trial assessment projects in order to examine various concrete parameters, including workability, compressive strength, flexural strength, and split tensile strength test. According to test results, sugarcane bagasse ash can replace up to 15% of cement by weight without significantly reducing cement strength.

Keywords: Sugarcane Bagasse ash (SCBA), concrete, Sustainable development, eco friendly environment

I. INTRODUCTION

A.Sugarcane bagasse ash-an Indian scenario

One of India's well-established sectors that benefits farmers is the sugar industry. There are currently about 538 sugarcane plants operating in the nation, according to data from the Indian Sugar Mill Association. Through a variety of strategies, the majority of India's sugar businesses have become self-sufficient in this century. It is one of the sectors that produces electricity and uses the power grid to export the excess to the government. One of India's main kharif crops, sugarcane is grown extensively throughout the nation. India is now the world's second-largest producer of sugarcane. Over the past five years, India has produced between 300 and 350 million tons of sugarcane on average.

Fig. 1.1 Sugarcane bagasse ash

II. REVIEW OF LITERATURE

In contrast to concrete without SCBA, R Srinivasan and K. Sathiya found that blended SCBA in concrete had greater compressive, tensile, and flexural strengths.The researchers concluded that SCBA can substitute cement to a degree of up to 10%.They even came to the conclusion that adding additional SCBA would reduce the density of the concrete and result in the production of low-weight concrete.

The behavior of High Performance Concrete (HPC), the most popular kind of concrete in the building sector, was investigated by M. Vijaya Sekhar Reddy and I.V. Ramana Reddy. Supplementary cementing materials (SCM), such as fly ash, silica fume, and metakaolin, were used in place of cement.

Hussein, Asma Abd Elhameed et al. The usefulness of sugar cane bagasse ash (SCBA) as a substitute for cement in the manufacturing of concrete is examined experimentally in this study. The impact of sugar cane bagasse ash on the workability, compressive strength, and microstructure of the Interfacial Transition Zone (ITZ) of concrete was investigated by substituting 0, 5, 10, 15, 20, 25, and 30% of regular Portland cement with bagasse ash, respectively.

III.SCOPE OF THE WORK

- To assess the new properties, such as workability, of M20 and M30 grade concrete by substituting sugarcane bagasse ash for some of the cement.
- To investigate how sugarcane bagasse ash affects the hardened concrete's compressive, split tensile, and flexural strengths at 7, 21, and 28 days.
- This study's goal is to find substitute materials that can either completely or partially replace naturally occurring materials in building.
- Reducing the use of traditional materials to make concrete is the primary goal of this investigation.

IV. MATERIALS AND METHODOLOGY

Materials that are used for making concrete for this study will be tested before casting the specimens. The preliminary tests will be conducted for the following materials.

- Cement
- Fine aggregate
- Coarse aggregate
- Water
- Bagasse ash

A. METHODOLOGY

1] Mix design (M 20&M30 grade) as per IS 10262:2009

[2] Preparation of specimens

- Concrete Cube of size 150x150x150
- Concrete Cylindrical columns of Dia 150mm and length 300 mm.
- Concrete beams 0f size 150x150x700 mm.

[3] Workability Test .

[4] Testing of cubes for compressive strength.

[5] Testing of beams for flexural strength.

[6] Testing of cylindrical columns for Split tensile strength

V.RESULTS AND DISCUSSION

A.Workability test

Slumps of M-20 and M-30 with sugarcane bag ash

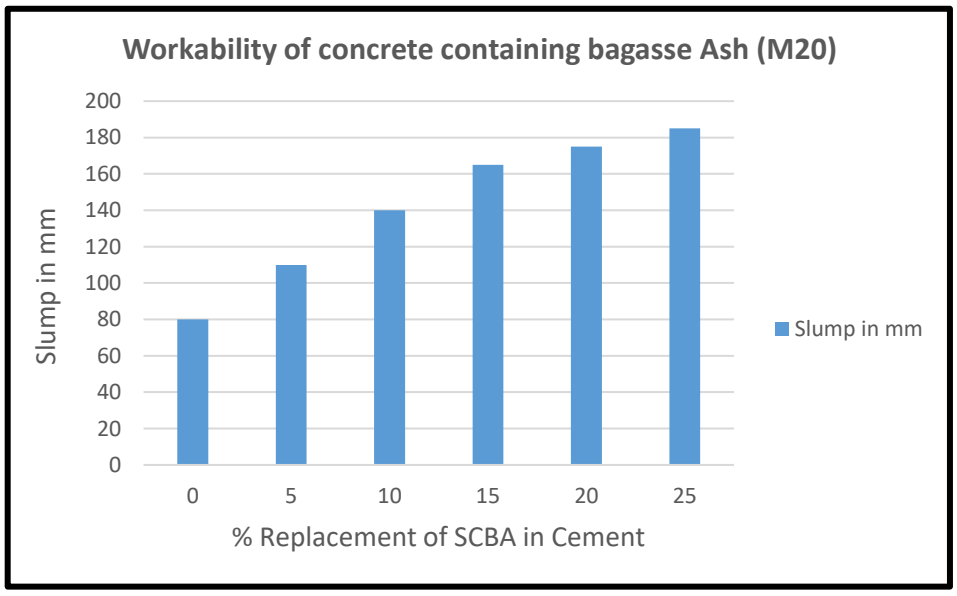

Fig. 1 Slumps of M-20 at different percentage SCBA

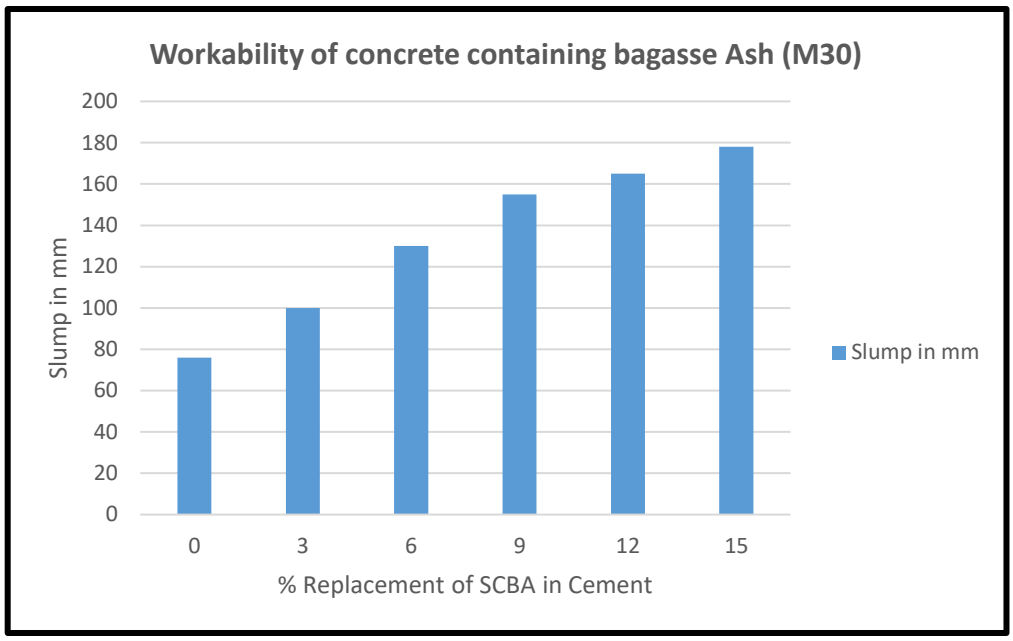

Fig. 2 Slumps of M-30 at different percentage SCBA

From the above graph, it was found that slump value increases from sample CC to R15 for M20 and M30 grade of concrete

B.COMPRESSIVE STRENGTH

The effect of Sugarcane bag ash used in the present study on compressive strength of concrete for M30 &M20 grade of concrete with varying dosages as 0%, 3%,6%,9%12% and 15% of Sugarcane bag ash

Compressive Strength of Different Mix of M-20 Concrete at Normal water

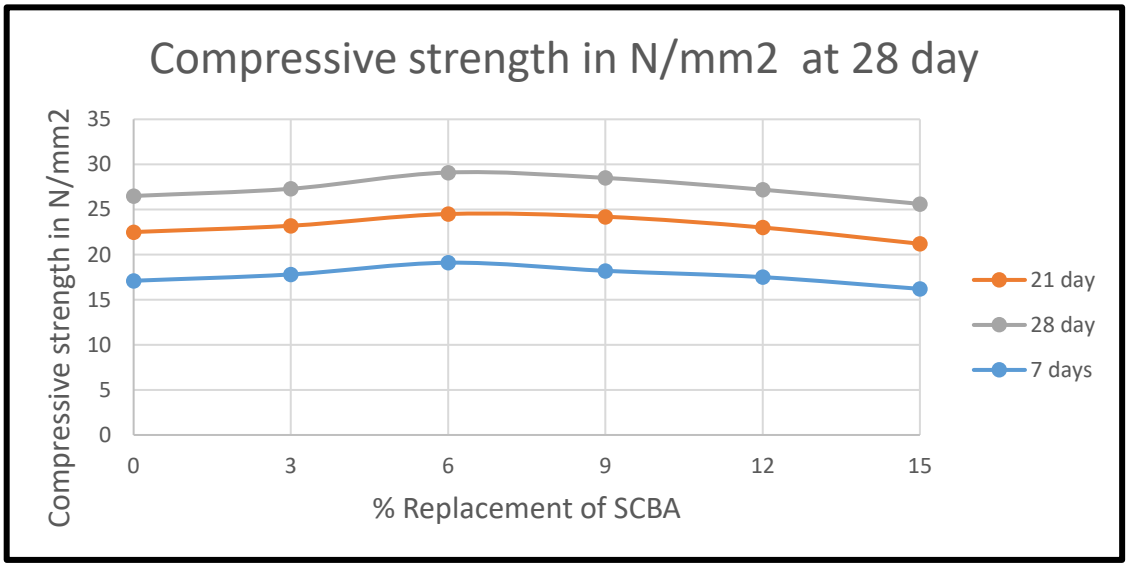

Fig. 3 Effect of SCBS on compressive strength of concrete at 7-days, 21-days and 28 days

From the above table is seen that the compressive strength in M 30 &M20 grade of concrete at 7, 21, and 28 days increases when the percentage of the SCBA from 0% to 6%. At 6% replacement ofSCBA strength observed to be maximum and after strength is decreasing. The strength increase at 28 days is up to 9.8%,for M20 grade of concrete ,After 6 % of SCBA Replacement compressive strength decrease ,

Compressive Strength of Different Mix of M-30 Concrete at Normal water

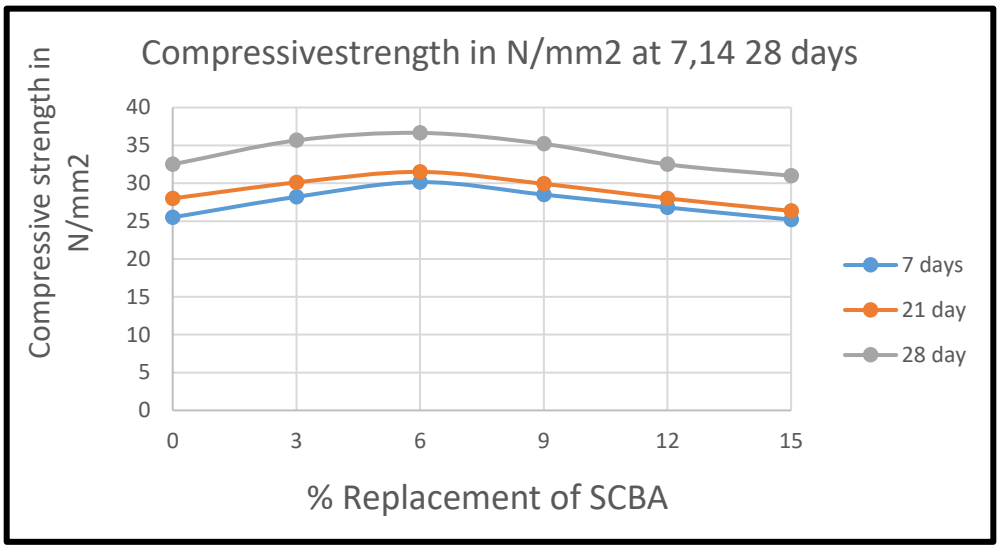

Fig. 4 Effect of SCBS on compressive strength of concrete at 7-days, 21-days and 28 days

From the above table is seen that the compressive strength in M 30 grade of concrete at 7, 21, and 28 days increases when the percentage of the SCBA from 0% to 6%. At 6% replacement ofSCBA strength observed to be maximum and after strength is decreasing. The strength increase at 28 days is up to 9.8%,for M30 grade of concrete , As the percentage of sugarcane bagasse ash increases the compressive strength of concrete tends to increase up to certain percentage and then start's decreasing with the increase of ash content . This increase in strength in Sugar cane bagasse ash concrete is due to presence of Silica in Sugar cane bagasse ash. Silica in Sugar cane bagasse ash react with residual CH after the formation of C-S-H gel, and increase the amount of C-S-H gel and results in increase the strength

VI.CONCLUSION

- As we increase the percentage of SBA workability of concrete also increases for M-20 and M-30.
- From the above Experiment is seen that the compressive strength in M 30 &M20 grade of concrete at 7, 21, and 28 days increases when the percentage of the SCBA from 0% to 6%. At 6% replacement of SCBA strength observed to be maximum and after strength is decreasing. The strength increase at 28 days is up to 9.8%,for M20 grade of concrete ,After 6 % of SCBA Replacement compressive strength decrease ,

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