

# Effect of Sugarcane Bagasse Ash And Rice Husk Ash As Partial Cement Replacement In M20 Grade Concrete

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**Abstract-** This study investigates the compressive strength of concrete using Sugarcane Bagasse Ash (SBA) and Rice Husk Ash (RHA) as partial replacements for cement in M20-grade concrete. Concrete cubes were produced with varying proportions of SBA and RHA (0%, 10%, 20%, 30%) and tested at 7, 14, and 28 days. Results demonstrate substantial improvements in compressive strength at optimal replacement ratios and highlight avenues for cost-effective and sustainable construction

**Keywords:** Rice husk ash, Sugarcane Bagasse Ash, Cement replacement, Compressive strength, Workability, Sustainable concrete

- **SBA and RHA:** Produced per documented methods, sieved, and characterized for pozzolanic suitability.



## I. INTRODUCTION

Rising costs and environmental concerns drive the search for alternative building materials in concrete production. Using agricultural byproducts like RHA and SBA as partial cement substitutes not only reduces environmental impact but also leverages locally available resources, fostering sustainable development in the constructios

## II. LITERATURE REVIEW

Many studies document the pozzolanic activity and engineering properties of RHA and SBA for concrete. Prior investigations reveal enhancements in compressive strength, improved workability, and superior durability from judicious use of these mineral admixtures, particularly in developing nations with abundant agri-waste materials<sup>1</sup>.

## III. MATERIALS AND METHOD MATERIALS

- **Cement:** Ordinary Portland Cement 53 Grade IS 8112 1989 .
- **Fine Aggregate:** River sand, zone II grading.
- **Coarse Aggregate:** 20 mm maximum size, angular, per IS 383 1970
- **Water:** Potable quality, per IS 456 2000.

## Mix Design and Experimental Program

Concrete cubes of size 150 150 150 mm were cast with the following replacement ratios:

Mix Code	SBA %	RHA %	Curing (days)	No. of Samples
M1	0	0	7,14,28	9
M2	0	10	7,14,28	9
M3	0	20	7,14,28	9
...	...	...	...	...
M10	15	15	7,14,28	9

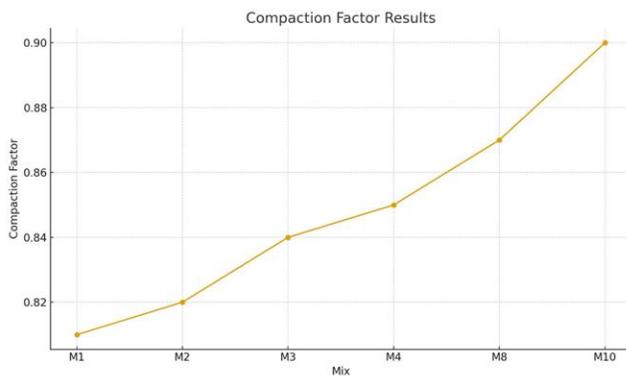
## Testing and Workability Workability Slump Test)

Mix Code	Slump (mm)
M1	38
M2	42
M3	43

M4	45
M8	47
Mix Code	Slump (mm)
M10	48

**Compaction Factor Test**

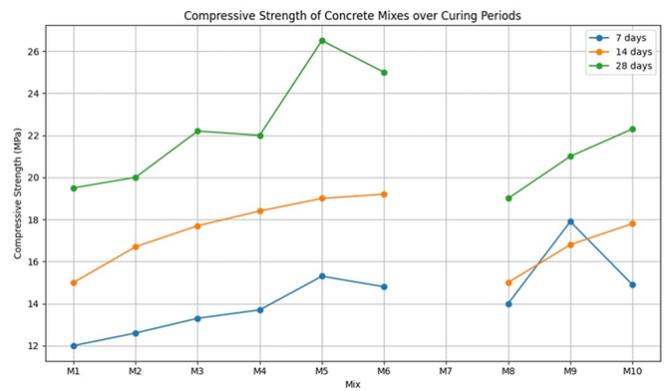
Mix Code	Compaction Factor
M1	0.81
M2	0.82
M3	0.84
M4	0.85
M8	0.87
M10	0.90



**IV. RESULTS**

**Average Compressive Strength at 28 Days**

Mix Code	SBA %	RHA %	Avg Strength N/mm <sup>2</sup>
M1	0	0	19.3
M2	0	10	21
M3	0	20	22.3
M4	0	30	23
M5	10	0	25.5
M6	20	0	24
M7	30	0	23.5
M8	5	5	26.5
M9	10	10	27.5
M10	15	15	24.5



**Graph: Compressive Strength vs. Replacement Percentage**

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**Cost Analysis**

Replacing cement by up to 30% with SBA/RHA can save approximately 30% of the cement cost per cubic meter, resulting in significant economic savings for larger projects

**Discussion**

Increases in SBA and RHA content generally improved compressive strength and concrete workability up to optimal replacement levels. Beyond the optimum, further increases led to reduced strength and a need for careful mix design to balance workability, durability, and mechanical properties

**V. CONCLUSIONS**

- Partial replacement of cement with SBA and RHA enhances compressive strength and workability up to an optimum level (especially at 10% SBA/RHA each).
- The approach is cost-effective and promotes sustainability in the construction industry.
- Beyond certain thresholds of replacement, strengths diminish due to porosity and dilution of binder content.

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