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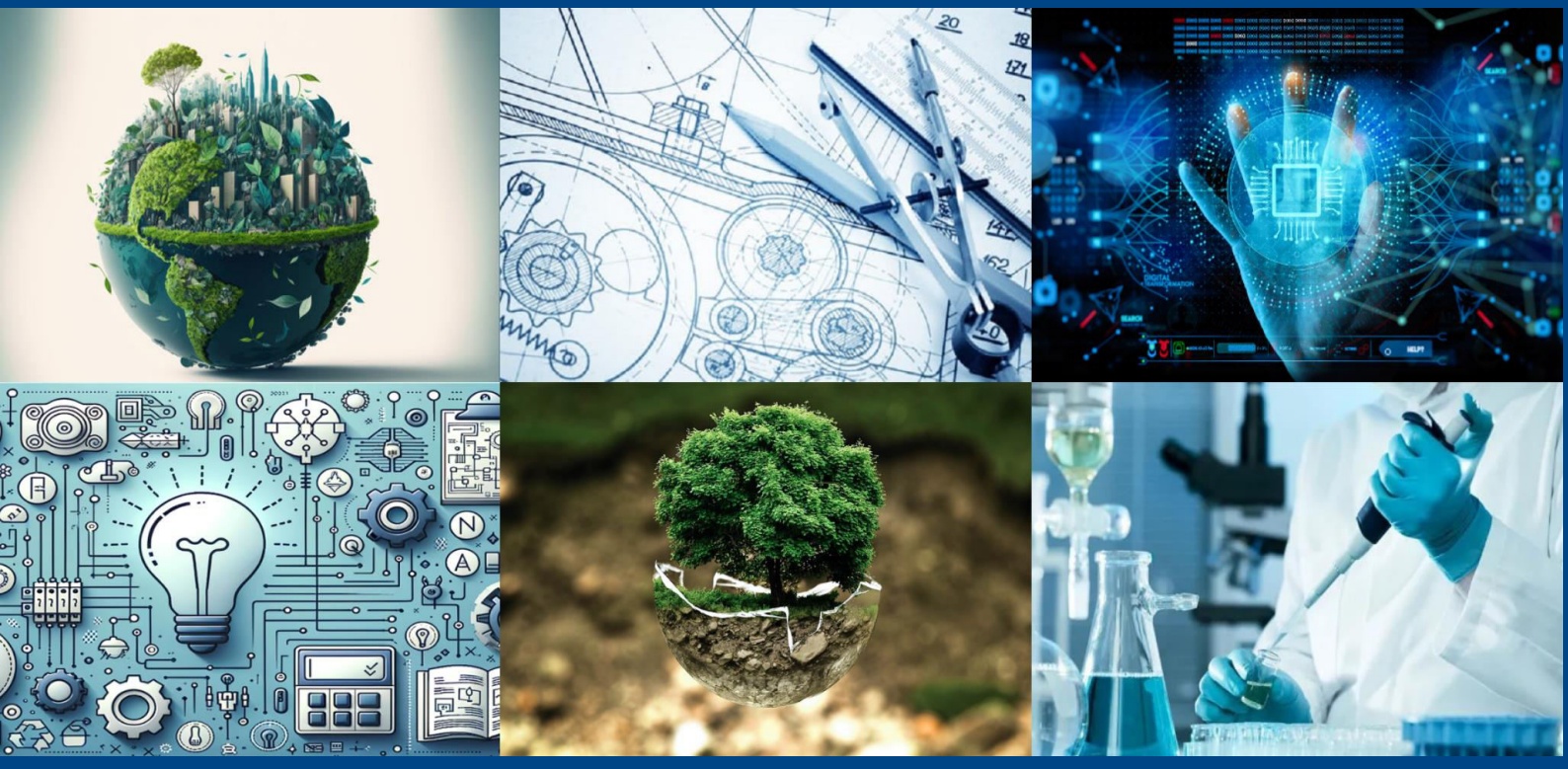

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Metakaolin Improves the Physical Properties of Concrete in an Experimental Analysis using Rice Husk Ash and Sugarcane Bagasse Ash

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ABSTRACT: In the last decades, the use of residue in civil construction, especially in addition concrete, has been subject of many researches due to, besides to reduce the environmental polluters factors, it may lead several improvements of the concrete properties. The world rice harvest is estimated in 600 million tons per year. Considering that 22% of the grain is husk, and 22% A part from this, extraction of natural aggregates This report evaluates how different contents of rice husk ash (RHA) added to concrete may influence its physical and mechanical properties. Samples with dimensions and generation of industrial, agricultural and domestic waste also leads to environment degradation. The use of these waste materials not only helps to reduce the use of natural resources also helps to mitigate the environment pollution. The basic objective of this research is to investigate the effect of Waste Rice Husk (RHA) as partial replacement of fine aggregates and Sugarcane Bagasse ash Ash (SCBA) as partial replacement of cement in concrete. This research work examined the potential use of Sugarcane Bagasse ash Ash (SCBA) as a partial replacement material. SCBA has been partially replaced in the ratio of 0%, 10% ,20% and 30% with and without addition of steel fibre by weight of cement in concrete. M25 Grade of concrete were adopted throughout the study This study primarily deals with the characteristics of concrete, including compressive strength, workability and thermal stability of all concrete mixes at elevated temperature. Twenty five mixes of concrete were prepared at different replacement levels of RHA (0%, 10%, 20%, 30% & 40%) with fine aggregates and SCBA (0%, 5%, 10%, 15% & 20%) with cement. The water/cement ratio in all the mixes was keptat 0.55. The workability of concrete was tested immediately after preparing the concrete whereas the compressive strength of concrete was tested after 28 and 60 days of curing. Based on the test results, a combination of 10% RHA and 10% SCBA is the most significant for high strength and economical concrete. This research also indicates that the contribution of RHA and SCBA doesn't change the thermal properties of concrete.

KEYWORDS: Waste Rice Husk, Sugarcane bagasse ash, OPC cement, Workability, Compressive strength Waste Rice Husk, Sugarcane bagasse ash, OPC cement ,Workability, Compressive strength

I. INTRODUCTION

There has been alarming rate of increase in the price of building materials in the recent past. This has necessitated government, private and individuals to go in research for locally sourced materials to supplement (replace-fully or partially) the conventional materials. The increasing demand for cement and concrete is met by the partial replacement of cement. The whole concept of this idea is to ensure that an average working-class citizen of India will be able to own a house. Concrete is a composite material which consists eccentrically of a binding medium. Concrete is no longer made of aggregate Portland cement and water only. Often but not always it has to incorporate at least one of the additional ingredients such as admixture or cementations material to enhance its strength and durability. Within which are embedded particles or fragments of relative inert filler in Portland cement concrete. The binder is a mixture of Portland cement. The filler may be any of a wide variety of natural or artificial. Fine and coarse aggregate; and in some instances, an admixture. Concrete is presently one of the most popular materials used in building construction and other civil engineering works. When reinforced with steel, it has a higher capacity for carrying loads. Concrete being a

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heterogeneous material. The quality of the constituents and the proportions in which they are mixed, determine its strength and other properties.

II. PROBLEM STATEMENT

1. Workability of concrete test like slump cone test and compaction factor test.
2. Mechanical properties like Compressive strength, Splitting tensile strength and Flexural Strength of concrete.
3. Comparative analysis of Concrete and multi-blended mix concrete with combination of two different admixture materials.
4. In each mixes containing different percentages of Rice husk ash (RHA), and Sugarcane Bagasse Ash (SBA) are partially replacement of cement starting from 0% as normal concrete, i.e. multi-blended mix concrete 5%,10%,15%, 20%,25%,30%,35% and 40 % .
5. In each mixes containing different percentages of Metakaolin and Rice husk ash (RHA), are partially replacement of cement starting from 0% as normal concrete, i.e. multi-blended mix concrete 5%,10%,15%, 20%,25%,30%,35% and 40 % .
6. In each mixes containing different percentages of Metakaolin and Sugarcane Bagasse Ash (SBA) are partially replacement of cement starting from 0% as normal concrete, i.e. multi-blended mix concrete 5%,10%,15%, 20%,25%,30%,35% and 40 % .

III. METHODOLOGY

The aim of this experimental investigation is to study the variation in strength characteristics of concrete structural elements, for the proportion of M25 grade. In each mixes containing different percentages of Rice husk ash (RHA), Sugarcane Bagasse Ash (SBA) and Metakaolin are partially replacement of cement starting from 0% as normal concrete, i.e. multi-blended mix concrete 5%,10%,15%, 20%,25%,30%,35% and 40 % .

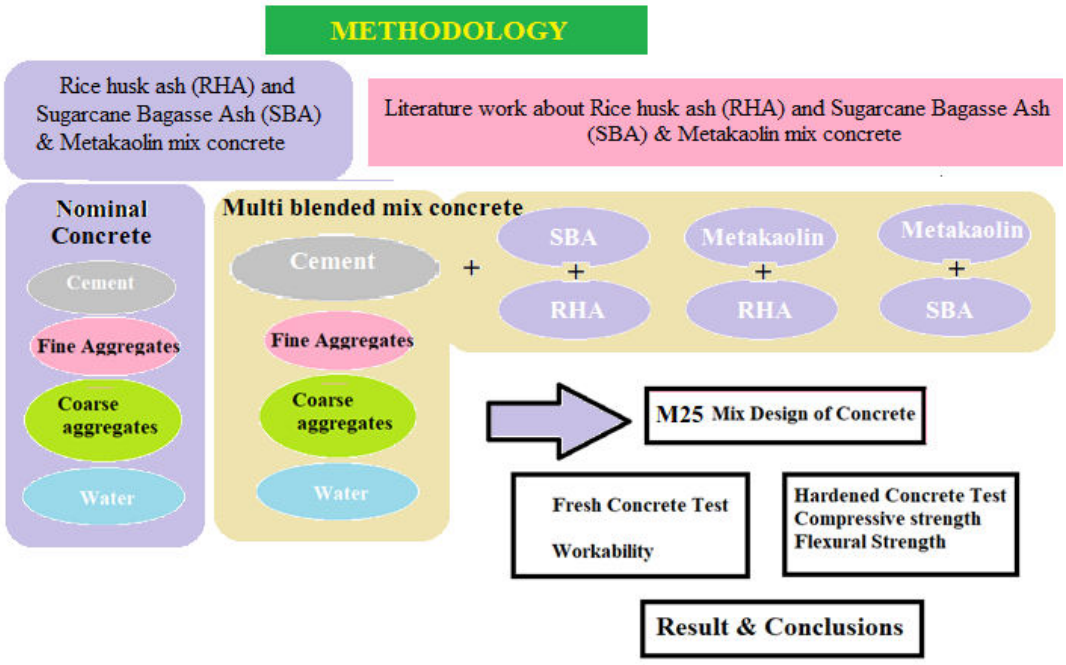

Figure no. 1; Chart of Methodology in Rice Husk Ash (RHA), Sugarcane Bagasse Ash (SBA), and Metakaolin Mix Concrete

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IV. RESULTS AND DISCUSSION

Table no. 1 ; Mix design ratio M25 Grade of concrete

Cement	Fine Aggregate	Coarse Aggregate	Water
383.20	797.70	1014.97	192.00
1	2.08	2.64	0.50

Table no. 2 ; Mix design ratio M25 Grade of concrete With Rice husk ash (RHA), Sugarcane bagasse ash (SCBA), Metakaolin Powder (MP) in Quantity (Kg/m3)

Mix Designation	Quantity (Kg/m^3)						
	Cement	Rice husk ash (RHA)	Sugarcane bagasse ash (SCBA)	Metakaolin Powder (MP)	Fine aggregates	Coarse aggregates	Water
NM-1	383.20	0.00	0.00	0.00	797.70	1014.97	192.00
M-R0-S40-M0	229.92	0.00	153.28	0.00	797.70	1014.97	192.00
M-R5-S35-M0	229.92	19.16	134.12	0.00	797.70	1014.97	192.00
M-R10-S30-M0	229.92	38.32	114.96	0.00	797.70	1014.97	192.00
M-R15-S25-M0	229.92	57.48	95.80	0.00	797.70	1014.97	192.00
M-R20-S20-M0	229.92	76.64	76.64	0.00	797.70	1014.97	192.00
M-R25-S15-M0	229.92	95.80	57.48	0.00	797.70	1014.97	192.00
M-R30-S10-M0	229.92	114.96	38.32	0.00	797.70	1014.97	192.00
M-R35-S5-M0	229.92	134.12	19.16	0.00	797.70	1014.97	192.00
M-R0-S0-M40	229.92	0.00	0.00	153.28	797.70	1014.97	192.00
M-R0-S5-M35	229.92	0.00	19.16	134.12	797.70	1014.97	192.00
M-R0-S10-M30	229.92	0.00	38.32	114.96	797.70	1014.97	192.00
M-R0-S15-M25	229.92	0.00	57.48	95.80	797.70	1014.97	192.00
M-R0-S20-M20	229.92	0.00	76.64	76.64	797.70	1014.97	192.00
M-R0-S25-M15	229.92	0.00	95.80	57.48	797.70	1014.97	192.00
M-R0-S30-M10	229.92	0.00	114.96	38.32	797.70	1014.97	192.00
M-R0-S35-M5	229.92	0.00	134.12	19.16	797.70	1014.97	192.00
M-R40-S0-M0	229.92	153.28	0.00	0.00	797.70	1014.97	192.00
M-R35-S0-M5	229.92	134.12	0.00	19.16	797.70	1014.97	192.00
M-R30-S0-M10	229.92	114.96	0.00	38.32	797.70	1014.97	192.00
M-R25-S0-M15	229.92	95.80	0.00	57.48	797.70	1014.97	192.00
M-R20-S0-M20	229.92	76.64	0.00	76.64	797.70	1014.97	192.00
M-R15-S0-M25	229.92	57.48	0.00	95.80	797.70	1014.97	192.00
M-R10-S0-M30	229.92	38.32	0.00	114.96	797.70	1014.97	192.00
M-S5-S0-M35	229.92	19.16	0.00	134.12	797.70	1014.97	192.00

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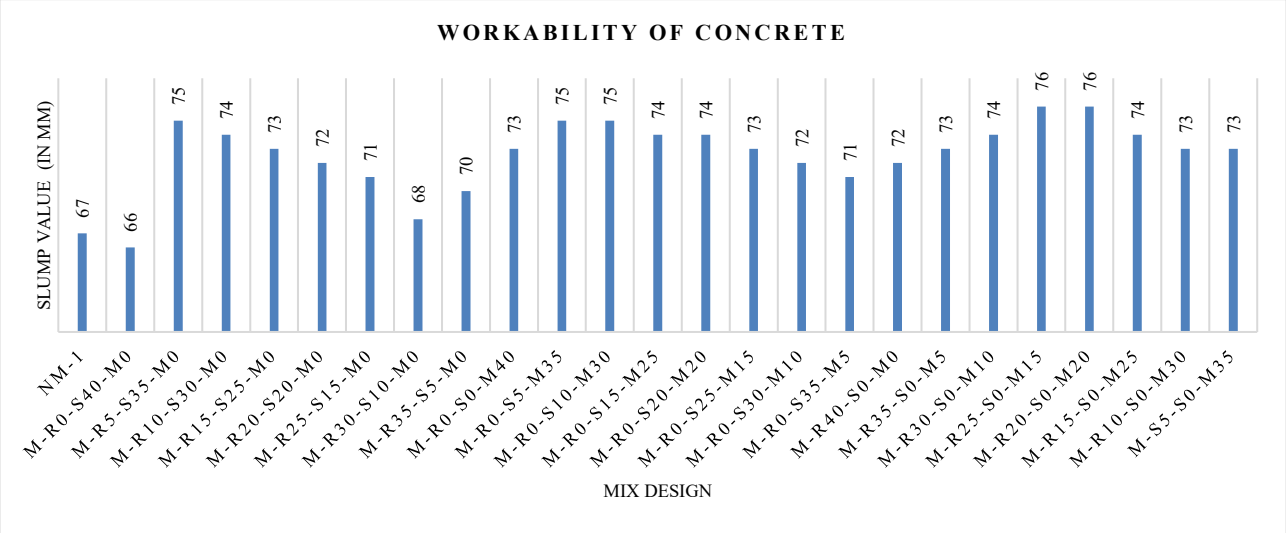
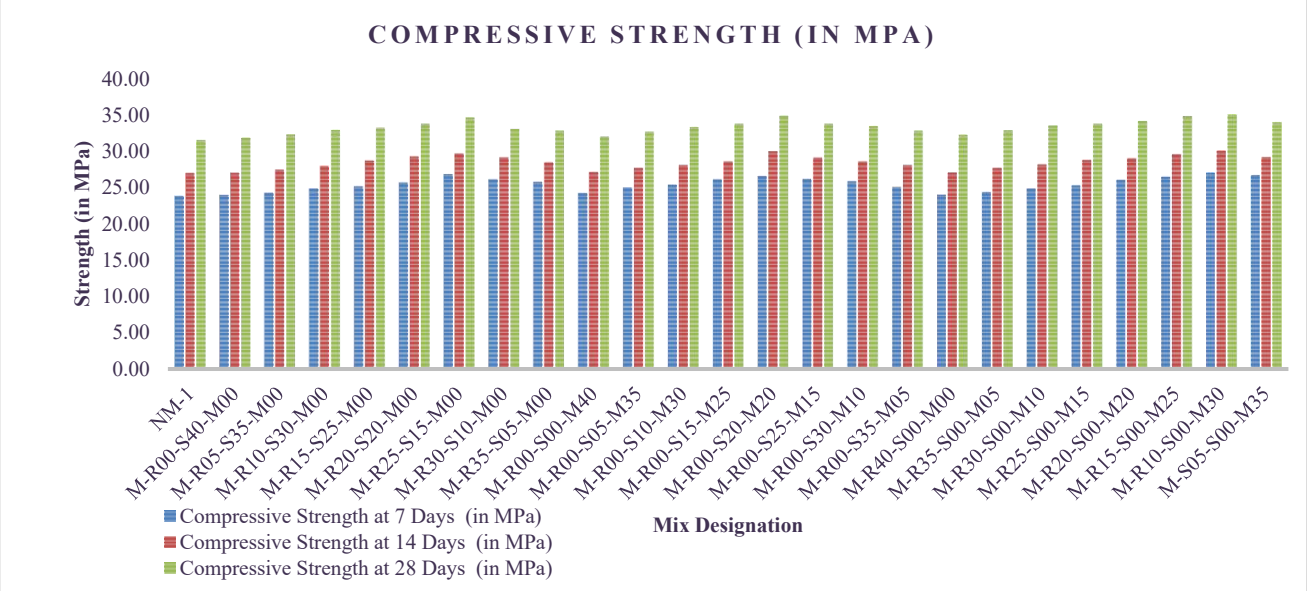
4.2 Workability of nominal nix concrete and rice husk ash, sugarcane bagasse ash and Metakaolin Mix concrete



Graph no. 1 ; Slump cone test of nominal nix concrete and Rice Husk Ash, Sugarcane Bagasse Ash and Metakaolin Mix concrete

4.3 Compressive strength of nominal nix concrete and rice husk ash, sugarcane bagasse ash and Metakaolin Mix concrete at 7 , 14 and 28 Days



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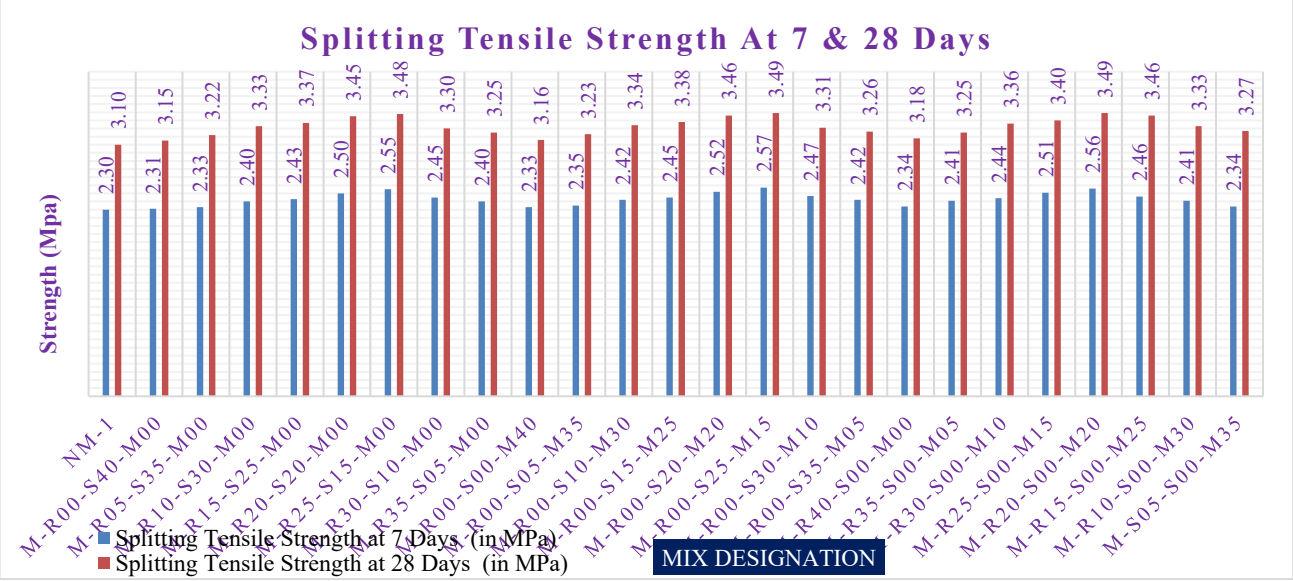
4.4 Splitting Tensile strength of nominal nix concrete and rice husk ash, sugarcane bagasse ash and Metakaolin Mix concrete at 7 and 28 days



V. CONCLUSIONS & FUTURE SCOPE

The result of study shows that there are good prospects of using the Use of Rice Husk Ash and Sugarcane Bagasse Ash Metakaolin partially replacement of OPC Cement to Improves the Physical Properties of Concrete.

1. Workability of the Nominal concrete NM-1 Slump Value is 65mm and Mix Concrete with RHA & SBA M-R25-S15-M0 Slump Value is 75mm and Mix Concrete with SBA & MK M-R0-S25-M15 Slump Value is 79mm and Mix Concrete with RHA & MKM-R15-S0-M25 Slump Value is 77mm.
2. Comparative analysis of Nominal concrete Cube no. MC-1 Mix Designation NM-1 Compressive Strength is 23.80 MPa and Mix Concrete with RHA & MK Cube no. C-23 Mix Designation M-R10-S0-M30 Compressive Strength is 27.05 MPa with 13.66 % Increase in strength at 7 days of curing.
3. Comparative analysis of Nominal concrete Cube no. MC-2 Mix Designation NM-2 Compressive Strength is 26.95 MPa and Mix Concrete with RHA & MK Cube no. C-71 Mix Designation M-R10-S0-M30 Compressive Strength is 30.05 MPa with 11.50 % Increase in strength at 14 days of curing.
4. Comparative analysis of Nominal concrete Cube no. MC-3 Mix Designation NM-3 Compressive Strength is 31.60 MPa and Mix Concrete with RHA & MK Cube no. C-47 Mix Designation M-R10-S0-M30 Compressive Strength is 35.10 MPa with 11.08 % Increase in strength at 28 days of curing.
5. Comparative analysis of Nominal concrete Cylinder no. MCy-1 Mix Designation NM-1 Splitting Tensile Strength is 23.80 MPa and Mix Concrete with SBA & MK Cylinder no. Cy-14 Mix Designation M-R00-S25-M15 Splitting Tensile Strength is 2.57 MPa with 11.74 % Increase in strength at 7 days of curing.
6. Comparative analysis of Nominal concrete Cylinder no. MCy-2 Mix Designation NM-2 Splitting Tensile Strength is 3.10 MPa and Mix Concrete with SBA & MK Cylinder no. Cy-38 Mix Designation M-R00-S25-M15 Splitting Tensile Strength is 3.49 MPa with 12.58 % Increase in strength at 28 days of curing.
7. Comparative analysis of Nominal concrete Beam no. MB-1 Mix Designation NM-2 Flexural Tensile Strength is 4.83 MPa and Mix Concrete with SBA & MK Beam no. B-23 Mix Designation M-R10-S00-M30 Flexural Tensile Strength is 5.70 MPa with 18.01 % Increase in strength at 28 days of curing.

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VI. FUTURE SCOPE

1. The main objective of the present investigation is to evaluate the suitability of An Experimental Analysis with the Use of Rice Husk Ash and Sugarcane Bagasse Ash Metakaolin Improves the Physical Properties of Concrete.
2. The integration of these agricultural waste materials as supplementary cementitious materials (SCMs) presents several advantages that can significantly impact the construction industry.
3. Investigating the effects on workability, setting times, and other fresh concrete properties will be essential for practical applications in various climates and construction scenarios.

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