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Behaviour of Green Concrete (Blended Concrete) using Agro-Industrial Waste AS Partial Replacement of Cement

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Abstract: ***Today Looks Into Everywhere Throughout The World Are Concentrating On Methods For Using Either Agricultural Or Industrial Wastes As A Wellspring Of Source Materials For The Development Of Construction Sector. These Wastes Use Would Not Exclusively Be Practical, Yet May Likewise Make A Feasible And Contamination Free Condition. The Usage Of Agricultural And Mechanical Waste Delivered By Modern Procedures Has Been The Focal Point Of Waste Decrease Inquire About For Financial, Natural And Specialized Reasons. The Agro Waste And Industrial Waste Such As Sugar-Cane Bagasse Ash, Rice Husk Ash And Saw Dust Are Causing Serious Pollution Related Problems, Which Needs Immediate Ways Of Handling The Waste Materials. The Research Work Will Be Carried First To Obtain Blended Cement Using Agro-Industrial Waste And Determining The Properties Of The Best Blended Cement From Various Mix Proportions. Then The Green Concrete Will Be Developed For M30 Grade Using Blended Cement. Experimental Investigation Will Be Carried Out To Assess The Workability And Mechanical Properties At The Age Of 7days And 28 Days. Potential For Energy Saving In Concrete Will Be Assessed.***

Key Words: Sugarcane Bagasse, Saw Dust, Blended Cement, Rice Husk Ash, Agro-Industrial Waste

I. INTRODUCTION

The modern and financial development saw in late decades has carried with it an expansion in the age of various kinds of waste (urban, mechanical, development and so forth.) regardless of the waste administration approaches which have been embraced broadly and universally the act of dumping or potentially the deficient administration of waste from the different assembling segments have notably affected the getting environment[1-10]. Simultaneously, these practices speak to a financial expense.

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In any case if waste is overseen accurately it very well may be changed over into an asset which adds to investment funds in crude materials, protection of normal assets and the atmosphere, and advances economical improvement. Advancement of new solid added substances could deliver a more grounded, increasingly functional material while decreasing the measure of concrete required and the subsequent CO2 emissions[9,10]. Cement is utilized in such huge sums since it is, essentially, an astoundingly decent building material for fundamental street development as well as for rather increasingly alluring projects.

The exploration work will be conveyed first to acquire mixed concrete utilizing Agro-mechanical Waste and deciding the properties of the best mixed bond from different blend extents. At that point the green solid will be created for M30 evaluation utilizing Agro Waste at a few substitutions. The present investigation was done on SCBA acquired, which was secured from K.C.P. SUGAR INDUSTRIES CORPORATIO0N LTD., VUYYURU, KRISHNA DISTRICT, Rice Husk Ash is gathered from a sweet shop close Vijayawada and Saw Dust is gathered from industry. This examination breaks down the impact of Bagasse Ash, Rice Husk Ash and Saw Dust Ash in cement by in part substitution of concrete at a few proportions by weight. The exploratory investigation distinguishes the best blends and looks at the compressive quality, spilt rigidity and flexural quality of mixed cement. The primary fixings comprise of Blended concrete, waterway sand, coarse total and water. In the wake of blending, concrete specimens were casted and therefore all test examples were restored in water at 7 days, 28 days and 90 days.

II. MATERIALS AND ITS PROPERTIES

2.1 Ordinary Portland cement:

Standard Portland bond is utilized for general developments. The crude materials required for assembling of Portland concrete are calcareous materials, for example, limestone or chalk and argillaceous materials, for example, shale or mud. The production of concrete comprises of pounding the crude materials, blending them personally in specific extents relying on their immaculateness and creation and consuming them in an oven at a temperature of about 1300^{0}C to 1500^{0}C at which temperature, the material sinters and incompletely breakers to frame nodular formed clinker. The clinker is cooled and ground to a fine powder with expansion of around 2 to 3% of gypsum. The item framed by utilizing the system is a "Portland concrete".

Table 2.1 Physical properties of cement

S. No	Property	Test results
1	Normal consistency	29%
2	Specific gravity	3.15
3	Initial setting time	92 mins
4	Final setting time	195 mins

2.2 Fine aggregate (sand):

The size of the fine total is underneath 4.75mm. Fine totals can be normal or fabricated. The evaluation must be all through the work. The dampness substance or ingestion qualities must be intently checked. The fine aggregate utilized is common sand acquired from the waterway Godavari complying with Grading Zone-II of table 3 of IS: 10262-2009. [11,12,13]

Table 2.2A Physical properties of fine aggregate

S. No	Property	Value
1	Specific gravity	3.08
2	Fineness modulus	3.48
3	Bulk density: Loose Compacted	 $14 kN/m^3$ $15 kN/m^3$
4	Grading	Zone-II

Table 2.2B Sieve analysis of fine aggregate

Sieve size	Retained	% retained	Cumulative % retained	%passed
4.75	-----	----	-----	100
2.36	6.5	0.65	6.5	99.3
1.18	80.5	8.7	87	91.3
600	149	23.6	236	76.4
300	733	96.9	969	3.1
150	15	98.4	98.4	1.6
Pan	16	100	1000	0

Fineness Modulus =3.48

2.3 Coarse aggregate:

The material whose particles are of size are held on IS strainer of size 4.75mm is named as coarse total and containing just so a lot better material as is allowed for the different kinds depicted in IS: 383-1970 is considered as coarse total. Totals ought to be of uniform quality as for shape and reviewing. The size of coarse collected relies on the idea of the work. The coarse aggregate utilized in this test examination is 20mm and 10mm size, squashed and precise fit as a fiddle. The aggregate are free from residue before utilized in the solid [11,13].

Table 2.3A Physical properties of coarse aggregate

S. No	Property	Value
1	Specific gravity	2.8
2	Fineness modulus	3.02
3	Bulk density Loose Compacted	 $14 KN/m^3$ $16 KN/m^3$
4	Nominal maximum size	20 mm

Table 2.3B Sieve analysis of coarse aggregate

Sample 10kg

Sieve size	Retained	% retained	Cumulative % retained
20mm	3.78	37.8	37.80
16mm	3.74	37.4	75.20
12.5mm	1.42	14.2	89.40
10.0mm	1.0	10.7	100
480	0	0	100
240	---	---	100
120	---	---	100
Total	10		302.4

$$\text{Fineness Modulus} = \frac{\text{Cumulative \% reatained}}{100}$$

$$= 302.4/100 = 3.02$$

2.4 Sugarcane Bagasse ash:

The sugarcane bagasse slag comprises of around half of cellulose, 25% of hemicelluloses and 25% of lignin. Every ton of sugarcane produces around 26% of bagasse (at a dampness substance of half) and 0.62% of leftover fiery debris. The buildup after burning presents a concoction arrangement overwhelms by silicon dioxide (SiO2

Fig.2.1 Sugarcane Bagasse Ash

Table-2.4 Chemical composition of Bagasse Ash

Components	**Mass %**
Silica as SiO_2	72.4
Calcium as CaO	3.99
Potassium as k_2O	13.11
Iron as Fe_2O_3	2.11
Sodium as Na_2O	3.82
Aluminum as Al_2O_3	1.36
Magnesium as MgO	4.68
Titanium as TiO_2	< 0.06

2.5 Rice Husk Ash:

Around 20 million tons of RHA is delivered every year. This RHA is an incredible domain risk making harm the land and the encompassing zone where it is dumped. Loads of ways are being thought of for arranging them by utilizing this RHA.

Fig. 2.2 Rice Husk Ash

Table-2.5 Chemical composition of Rice Husk Ash

Components	**Mass %**
Silica as SiO_2	86.91
Calcium as CaO	1.04
Potassium as k_2O	3.16
Iron as Fe_2O_3	0.87
Sodium as Na_2O	0.69
Aluminum as Al_2O_3	0.5
Magnesium as MgO	0.85
Titanium as TiO_2	< 0.06

2.6 Saw Dust:

Sawdust or wood residue is a result or waste result of carpentry activities, for example, sawing, processing, planing, directing, penetrating and sanding. It is made out of fine particles of wood. These activities can be performed by carpentry apparatus, convenient power devices or by utilization of hand instruments. Wood residue is likewise the result of specific creatures, winged animals and bugs which live in wood, for example, the woodpecker and craftsman insect. In some assembling ventures it very well may be a huge flame danger and wellspring of word related residue introduction. Sawdust is the primary segment of particleboard. Wood residue is a type of particulate issue, or particulates. Research on wood dust wellbeing risks comes extremely close to word related wellbeing science, and investigation of wood residue control comes surprisingly close to indoor air quality designing.

Fig. 2.6 Saw Dust

Table-2.6A Physical Properties of Saw Dust Ash

Properties	**Values**
Specific Gravity	2.54
Colour	
Density(gm/cm$^{3)}$	1.04
Moisture Content	0.30 %

Table-2.6B Chemical composition of Saw Dust Ash

Components	**Mass %**
Silica as SiO_2	65.75
Calcium as CaO	9.62
Potassium as k_2O	2.43

Iron as Fe_2O_3	2.09
Sodium as Na_2O	0.06
Aluminum as Al_2O_3	5.23
Magnesium as MgO	4.09

III. EXPERIMENTAL WORK

In this chapter, concepts of experimental work are presented. Objective of testing, i.e. ordinary Portland cement, fine aggregate, coarse aggregate, potable water and blended concrete process of manufacturing of concrete, workability of fresh concrete and testing of hardened concrete procedures are explained in details**.** Various proportion of saw dust ash, Rice husk ash and Sugarcane baggasse ash combination ranging from 0% to 20% were used. Equal proportions of waste materials were used in all the mixes

IV. TEST RESULTS

4.1 Slump cone test:

Fig 4.1 shows the slump value for different concrete specimens and it is clear that slump value for conventional concrete is higher than all others mixes.

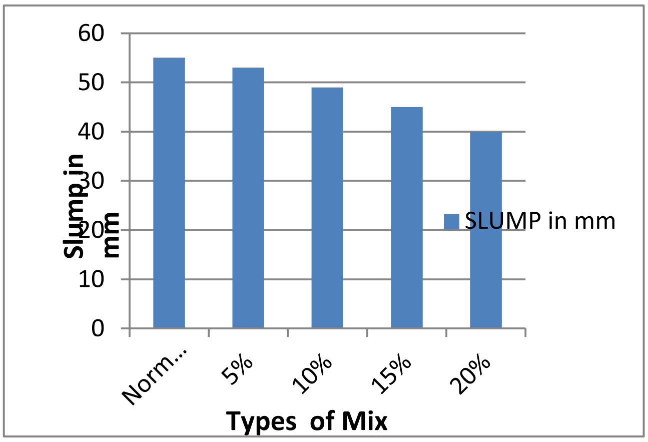


Fig 4.1 Slump test Vs Mix

4.2 Compressive strength:

Fig 4.2 shows the compressive strength results of concrete specimens exposed to 7 days and 28 days of curing.

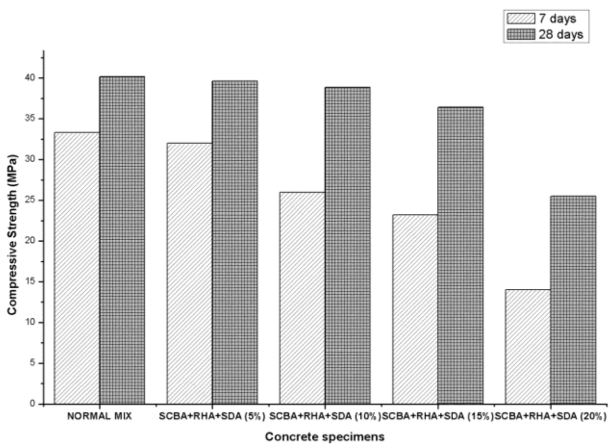


Fig 4.2 Compressive Strength of Concrete Specimens

4.3 Split tensile strength:

Fig 4.3 shows the Split tensile strength results of concrete specimens exposed to 7 days and 28 days of curing.

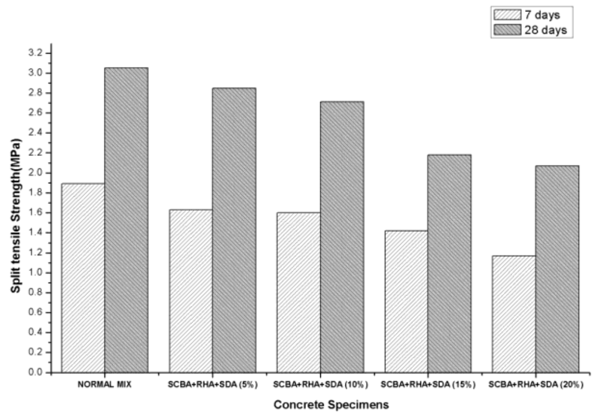
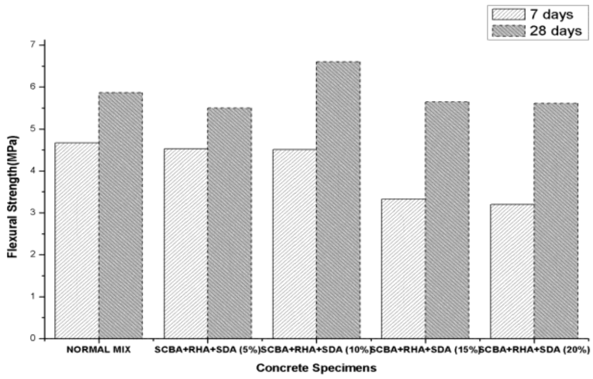


Fig 4.3 Split Tensile Strength graph of Concrete Specimens

4.4 Flexural strength:

Fig 4.4 shows the Flexural strength results of concrete specimens exposed to 7 days and 28 days of curing



Graph 4.4 Flexural Strength of Concrete Specimens

V. CONCLUSIONS:

Based on the study, following conclusions were made.

- The slump value of 20% replaced SCBA, RHA and saw dust combination showed minimum workability in comparison with other values
- There is no significant reduction in compressive strength values of 5% , 10% SCBA, RHA and saw dust ash combinations in comparison with conventional concrete mix
- The compressive strength values of 15% and 20% replaced combinations showed very less strength values than all other concrete mixes.
- The split tensile strength of 5% and 10% replaced concrete mixes shows better tensile strength than 15% and 20% replaced concrete samples.
- The flexural strength of 10% replaced concrete samples showed highest strength values than all other mixes. 20% replaced concrete samples showed least strength values.
- Beyond replacement level of 15% , mechanical properties of concrete was reduced drastically

- It has been seen in this investigation, 10% substitution (SCBA, rice husk fiery remains and saw residue cinder) can be utilized as a partial replacement of cement material with specialized and ecological advantages. for example, sugar businesses, cement industry and significant government institutions, ought to be made mindful about this potential concrete substitution material and advance its institutionalized generation and use.

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