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TRIPLE BLENDING OF CEMENT CONCRETE WITH FLY ASH, RICE HUSK ASH, SUGARCANE BAGASSE ASH

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Abstract: Bagasse ash (BA), the residue obtained after the burning of sugarcane bagasse as a fuel, has nearly pozzolanic properties with the potential to use as a supplementary cementitious material (SCM). Use of Bagasse ash (BA) as a mineral admixture needs to be established, especially in India, where sugarcane cultivation is widespread, to reduce land required for its disposal and cement consumption in construction industry. Hence, to encourage commercial use of BA with minimum processing, an evaluation of the physical, chemical and morphological characteristics of a locally available BA and its effect, as SCM on properties of structural concrete was taken up.

This research work describes the feasibility of using the Fly Ash (FA) Rice Husk Ash (RHA) and Sugarcane Bagasse Ash (SCBA) waste in concrete production as a partial replacement of cement. Present work deals with the effect on strength and mechanical properties of concrete using triple blending of cement concrete using FA, RHA and SCBA instead of cement. The cement hasbeen replaced by rice husk ash, accordingly in the range with 0%, 10%, 20% and 30% by weight. Concretemixture of M20 and M25 and M30, were produced, tested and compared in terms of compressive strengths with theConventional concrete. These tests were carried out to evaluate the mechanical properties for the test results of7, 14, 28, 56 and 90 days for Compressive strengths and Tensile & Flexural Strengths at 28 days. The durability aspect of the samples for Acid attack,Alkaline attackand *Sulphate* ***attack wasalso tested. The result indicates that the FA, RHA and SCBA improvethe Compressive Strength and durability of triple blended concrete.***

Keywords: compressive strength, triple blending, M20, M25, M30, Durability, FA, RHA, SCBA etc.

I. INTRODUCTION

The scientists are considering distinctive agro-based waste materials in the present days. The significant amounts of waste created from agrarian sources incorporate sugarcane bagasse, rice husk, and coconut husk. In the present situation, the most major issue of mankind on this planet is the earth tainting which causes ecological clumsiness. There are various reasons which convey characteristic tainting. In the improvement business the essential material/settling used for the formation of value in bond will be concrete. There will be bundle of release of carbon dioxide in the midst of the age of concrete. The key tried and true industry for the radiation of carbon dioxide is the bond business, in light of the fact that the age of one ton of Portland concrete releases plus or minus one ton of CO_2 into the earth There are two remarkable wellsprings of carbon dioxide release in the midst of the making of concrete, the greatest source to work rotational furnace is the Combustion of non-renewable energy sources andthe other one is the manufactured method where lime is calcinated through limestone in the concrete oven which furthermore makes carbon dioxide. In 2014 around 3980 crores tremendous measures of carbon dioxide are released on the planet and in that around 7% of carbon dioxide release is contributed from India.

Fly ash: Fly ash is a byproduct obtained from pulverized coal burnt in electric generation power plants. It is in the form of fine powder which has some sort of pozzolanic properties due to presence of luminous and siliceous materials that behaves like cement in the presence of water. Fly ash is an economical material and used as a partial replacement for Portland cement in concrete. Usage of Fly ashimproves strength, segregation, and ease of pumping concrete.

RICE HUSK ASH: Rice husk is a farming buildup which represents 20% of the 649.7 million tons of rice delivered yearly around the world. The consumed side-effect buildup of Rice Husk in the processing plants makes a risk environment and contaminates the natural air.

SUGARCANE BAGASSE ASH: Sugarcane Bagasse, a liberally created horticultural waste, is the deposit of sugarcane that is obtained after extraction of juice. The sugarcane Bagasse comprises of around 45-half of cellulose, 26% of hemicellulose and 23% of lignin alongside hints of different mixes.

OBJECTIVE OF THE STUDY: Depending on the suitability of Bagasse ash, it can be used as resource material in the following applications:

- Silica source as it contains high amount of silica in it.
- Brick production as BA used as additive in making bricks that have high compressive strength and low water absorption bricks.
- Farm fertilizer as it contains traces of potassium and phosphorus compounds etc.
- To compare the tests results of fly ash, rice husk ash, and sugarcane Bagasse ash with the normal concrete.
- To find the optimum usage of the percentage replacement of the fly ash, rice husk ash, baggage ash to the concrete.

II. LITERATURE REVIEW

TONY SUMAN KANTH D[1], K U MUTHU[2]. The analysts are contemplating distinctive agro-based waste materials in the present days. The significant amounts of waste created from agrarian sources incorporate sugarcane bagasse, rice husk, and coconut husk. In the present situation, the most difficult issue of mankind on this planet is the earth tainting which causes ecological cumbersomeness. There are various reasons which convey normal pollution. In the improvement business the essential material/settling used for the production of value in concrete will be bond. There will be package of release of carbon dioxide in the midst of the age of bond. The crucial tried and true industry for the spread of carbon dioxide is the bond business, because the age of one ton of Portland concrete releases plus or minus one ton of CO2 into the earth There are two one of a kind wellsprings of carbon dioxide release in the midst of the production of bond, the greatest source to work turning oven is the Combustion of fossils. The main problem world confronting today is the earth sullying. In development field principally by bond generation which releases poisons realize condition tainting. Utilization of modern waste we can diminish the pollution affect.

In this perspective the geo polymer solid comes to part i.e., in the present investigation to set up the geo polymer concrete the typical Portland bond is totally supplemented with fly cinder, sugarcane Bagasse powder and rice husk slag. Soluble fluid is used for the authoritative of materials. The fluid used in this investigation for the polymerization is the arrangement of sodium silicate and sodium hydroxide. Unmistakable level of sugarcane Bagasse fiery remains and rice husk cinder is used has the folios with fly slag. Fly powder is supplemented by including 0%, 10%, 30% and half of Bagasse fiery debris and rice husk cinder which is the bi result of sugarcane industry and rice process individually. The mechanical properties, for example, compressive split tractable and flexural quality of geopolymer is realized in this answer to know the pretended by supplementing fly cinder covers in part by sugarcane Bagasse slag and rice husk fiery debris on the quality parameters of geopolymer concrete.

Geopolymer concrete with the substitution of Bagasse cinder or rice husk slag up to 10% that is the ideal rate can be used. One of any can be utilized relying upon the accessibility plausibility, if both are of same probability or having comparable availability chances than proceeding for the substitution of Bagasse slag is superior to anything the rice husk fiery remains.

It energizes andthe other one is the engineered system where lime is calcinated through limestone in the concrete oven which also makes carbon dioxide. In 2014 around 3980 crores colossal measures of carbon dioxide are released on the planet and in that around 7% of carbon dioxide release is contributed from India.

C BATVEERA[1], P. NTMJTYONGLKUL[2]. This examination is directed to grow new sorts of pozzolanic materials from other horticultural squanders separated from rice husk and rice straw. The examination researched the utilization of coconut husk, Corn cob and nut shell fiery remains as pozzolana. The properties of CHA, CCA and PSA to be specific particular gravity, fineness, compound synthesis and the quality action record with Portland bond were resolved.

For properties of glue, just standard Portland concrete and 30% PSA were examined for ordinary consistency and introductory and last setting time. CCA mortars have bring down compressive quality than the controlled mortar (0% CCA) while PSA mortars demonstrated higher compressive quality than the controlled mortar (0% PSA).Among the four mortars tried for concoction assault, PSA mortars indicated higher opposition against sulfate append and RHA against acidic assault.

III. COLLECTION OF MATERIALS

CEMENT: Bond is a folio, a substance utilized as a part of development that sets and solidifies and can tie different materials together. The customary Portland bond of 53 Grade is utilized as a part of agreement with IS: 12269-1987. Properties of this concrete were tried and recorded here. Fineness of concrete = 5%, Specific gravity if bond = 3.15, Standard Consistency of bond = 33% Initial setting time = 30 minutes, Final setting time = Not over 10 hours.

COARSE AGGREGATES: Smashed stone total of 20mm size is brought from close-by quarry. Totals of size in excess of 20mm size are isolated by sieving. Tests are conveyed keeping in mind the end goal to discover the Specific gravity = 2.9 Fineness modulus = 7.5.

FINE AGGREGATES: Locally available fresh sand, free from organic matter is used. The result of sieve analysis confirms it to Zone-II (according to IS: 383-1970).The tests conducted and results plotted below. Specific gravity = 2.3. Fineness modulus = 3.06.

FLY ASH: Fly fiery remains are a fine powder which is a side-effect from consuming pummeled coal in electric age control plants. At the point when blended with lime and water it shapes a compound like Portland concrete.

RICE HUSK ASH: Rice husk fiery remains (RHA) is the cinder which is acquired from consuming the secured external front of Rice called husk. It comprises of non-crystalline silicon dioxide ($SiO2$) with high particular surface zone and high pozzolanic reactivity.

SUGAR CANE BAGASSE ASH: The sugarcane bagasse 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 lingering fiery debris. Despite being a material of hard corruption and that presents couple of supplements, the fiery debris is utilized on the ranches as manure in the sugarcane harvests. In this trial think about sugarcane bagasse slag was gatheredfrom the J.M.S Sugar Cane Suppliers, 7-2-1862, Near Victory Function Hall, Erragadda, Sanath Nagar, Hyderabad, Telangana 500018.

WATER: By and large consumable water ought to be utilized. This is to guarantee that the water is sensible free from such polluting influences as suspended solids, natural issue and disintegrated salts, which may antagonistically influence the properties of the solid, particularly the setting, solidifying, quality, strength, pit esteem, and so forth.

IV. MIX DESIGN AND QUANTITY OF MATERIALS

1. **Mix Proportion for Trail M20is 1: 1.81:2.82at w/c ratio of 0.50**

Grade of Cement Concrete	Cement OPC53(Kg)	Fly Ash (Kg)	Rice Husk ash (Kg)	Sugar Cane bagasse Ash (Kg)	Fine Aggregate (Kg)	Coarse Aggregate(Kg)	Water Content
M20	196	11.468	11.468	11.468	416	648	99
Addition of Extra10 %	215.6	12.614	12.614	12.614	457.6	712.8	108.9

2. **Mix Proportion for Trail M25 is 1: 1.19: 2.63 atw/c ratio of 0.43**

Grade of Cement Concrete	Cement OPC53 (Kg)	Fly Ash (Kg)	Rice Husk ash (Kg)	Sugar Cane bagasse Ash (Kg)	Fine Aggregate (Kg)	Coarse Aggregate (Kg)	Water Content
M25	230	13.462	13.462	13.462	320	708	116
Addition of Extra10 %	253	14.808	14.808	14.808	352	778	127.6

3. **Final trial mix for M30 grade concrete is 1:1.64:2.55 at w/c of 0.45**

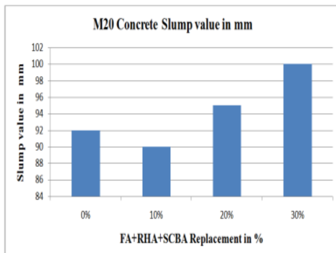
Grade of Cement Concrete	Cement OPC53 (Kg)	Fly Ash (Kg)	Rice Husk ash (Kg)	Sugar Cane bagasse Ash (Kg)	Fine Aggregate (Kg)	Coarse Aggregate (Kg)	Water Content
M30	215	12.431	12.431	12.431	413	642	114
Addition of Extra10 %	236	14.808	14.808	14.808	454.3	706.2	125.4

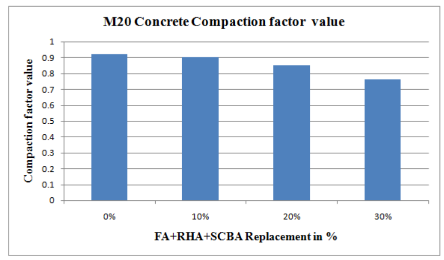
V. RESULTS AND DISCUSSIONS

1. M20 GRADE OF CONCRETE RESULTS

SLUMP CONE TEST & COMPACTION FACTOR TEST

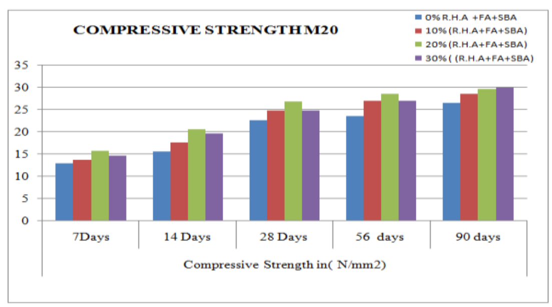
M20 Results			
S.no.	% Replacement (R.H.A+FA+SBA)	Slump value In (mm)	Compaction factor
1	0%	92	0.92
2	10%	90	0.90
3	20%	95	0.85
4	30%	100	0.76





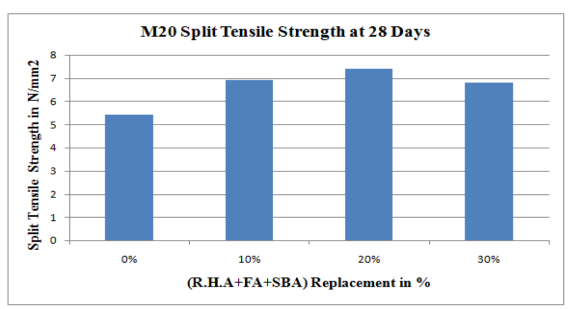
COMPRESSIVE STRENGTH RESULTS

S.no	Type of Mix (R.H.A+FA+SBA)	M20Compressive Strength in (N/mm2)				
		7 Days	14 Days	28 Days	56 Days	90 Days
1	0%	12.85	15.52	22.56	23.45	26.42
2	10%	13.6	17.52	24.62	26.85	28.42
3	20%	15.62	20.52	26.7	28.4	29.5
4	30%	14.5	19.52	24.62	26.8	29.8



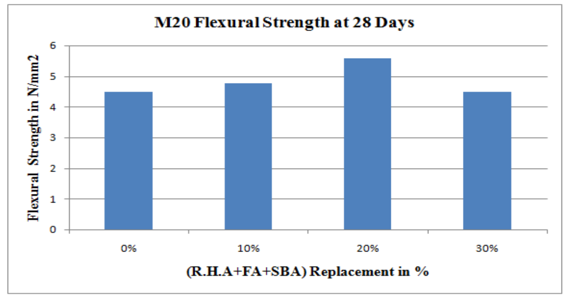
SPLIT TENSILE STRENGTH TEST RESULTS

S.no	Type of Mix (R.H.A+FA+SBA)	M20 Split Tensile Strength in (N/mm2)
		28 Days
1	0%	5.42
2	10%	6.92
3	20%	7.42
4	30%	6.8



FLEXURAL STRENGTH TEST RESULTS:

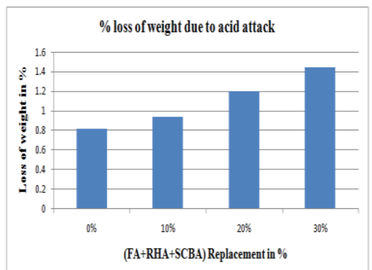
S.no	Type of Mix (R.H.A+FA+SBA)	M20 Flexural Strength in (N/mm2)
		28 Days
1	0%	4.52
2	10%	4.8
3	20%	5.6
4	30%	4.52

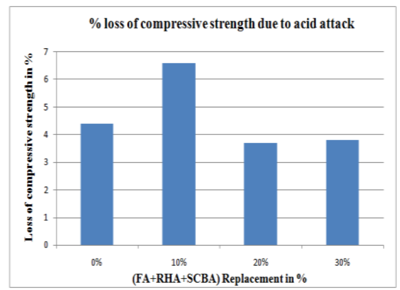


DURABILITY TESTS

M20 ACID ATTACK

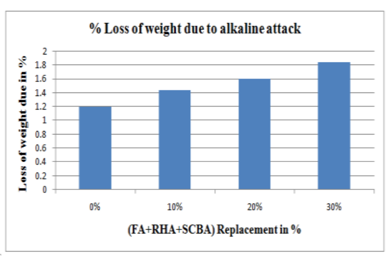
Sl.no	% Replacement (R.H.A+FA+SBA)	Initial weight of cube after 28days curing in grams	Final weight of cubes after 90days curing in grams	% loss of weight due to acid attack	Compressive strength of cube after 28days curing	Compressive strength of cubes after 90days curing	% loss of compressive strength due to acid attack
1	0.00%	2261	2242	0.82	26.8	22.4	4.4
2	10.00%	2340	2318	0.94	28.2	21.6	6.6
3	20.00%	2351	2323	1.2	29.3	25.6	3.7
4	30.00%	2234	2202	1.44	27.6	23.8	3.8

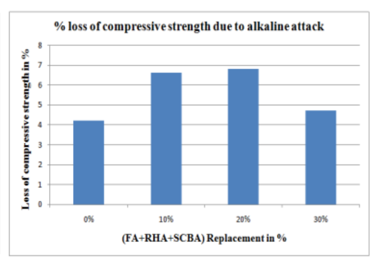




M20 ALKALINE ATTACK

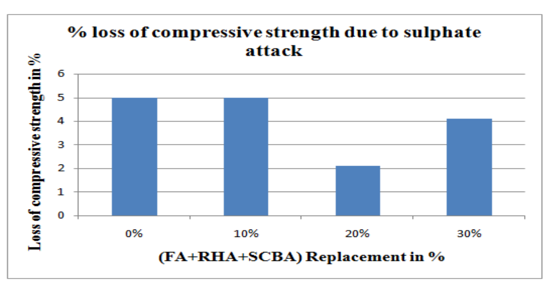
Sl. No	% Replacement (R.H.A+FA+SBA)	Initial weight of cube after 28days curing in grams	Final weight of cubes after 90days curing in grams	% loss of weight due to alkaline attack	Compressive strength of cube after 28days curing	Compressive strength of cubes after 90days curing	% loss of compressive strength due to alkaline attack
1	0.00%	2286	2259	1.2	26.8	22.6	4.2
2	10.00%	2340	2306	1.44	28.2	21.6	6.6
3	20.00%	2280	2244	1.6	29.3	22.5	6.8
4	30.00%	2310	2268	1.84	27.6	22.9	4.7





M20 SULPHATE ATTACK TEST

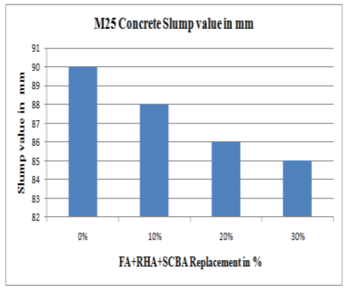
Sl.no	% Replacement (R.H.A+FA+SBA)	Compressive strength of cube after 28days curing	Compressive strength of cubes after 90days curing	% loss of compressive strength due to sulphate attack
1	0.00%	26.5	21.5	5
2	10.00%	27.5	22.5	5
3	20.00%	28.6	26.5	2.1
4	30.00%	24.6	20.5	4.1

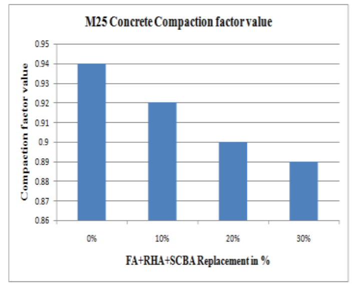


2. M 25 GRADE OF CONCRETE RESULTS

Slump& Compaction Factor of M25 Concrete

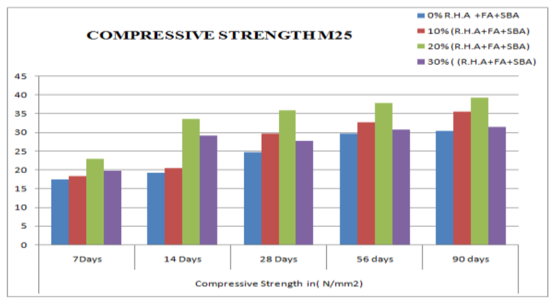
M25 Results			
S.no.	% Replacement (R.H.A +FA+SBA)	Slump value In (mm)	Compaction factor
1	0%	90	0.94
2	10%	88	0.92
3	20%	86	0.90
4	30%	85	0.89





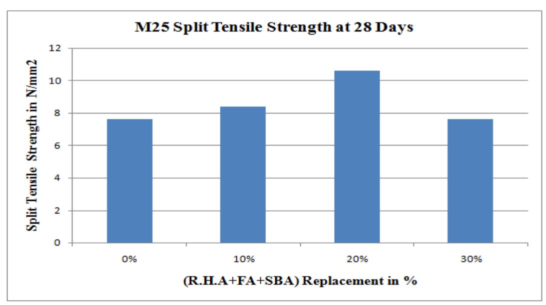
COMPRESSIVE STRENGTH RESULTS

S.no	Type of Mix (R.H.A+FA+SBA)	M25 Compressive Strength in (N/mm2)				
		7Days	14 Days	28 Days	56 Days	90 Days
1	0%	17.56	19.26	24.8	29.82	30.52
2	10%	18.5	20.56	29.8	32.8	35.6
3	20%	23	33.7	35.9	37.89	39.4
4	30%	19.8	29.32	27.84	30.85	31.5



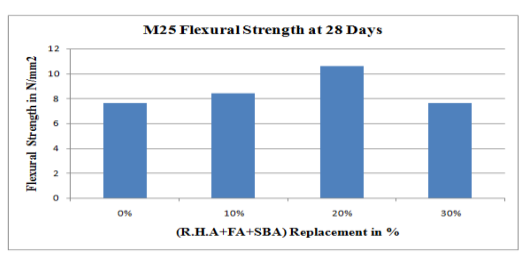
SPLIT TENSILE STRENGTH TEST RESULTS

S.no	Type of Mix (R.H.A+FA+SBA)	M25 Split Tensile Strength in (N/mm2)
		28 Days
1	0%	7.62
2	10%	8.4
3	20%	10.62
4	30%	7.62



FLEXURAL STRENGTH TEST RESULTS:

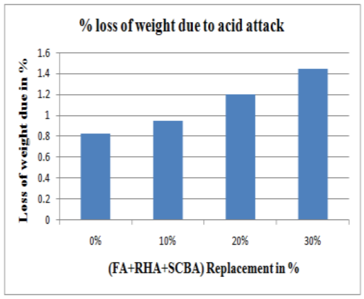
S.no	Type of Mix (R.H.A+FA+SBA)	M25 Flexural Strength in (N/mm2)
		28 Days
1	0%	8.52
2	10%	10.8
3	20%	12.56
4	30%	8.52

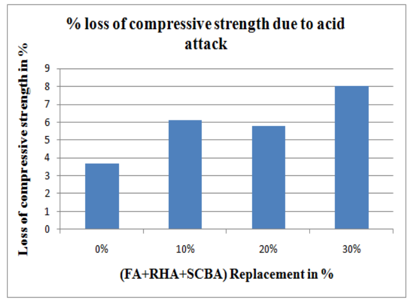


DURABILITY TESTS

M25 ACID ATTACK

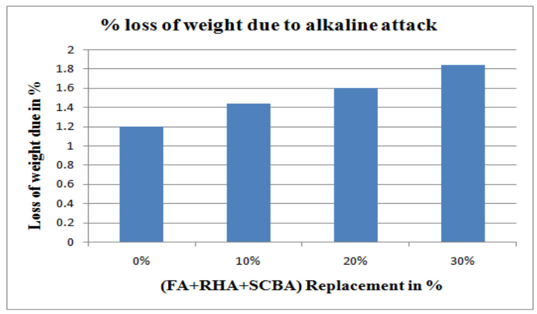
Sl.no	% Replacement (R.H.A+FA+SBA)	Initial weight of cube after 28days curing in grams	Final weight of cubes after 90days curing in grams	% loss of weight due to acid attack	Compressive strength of cube after 28days curing	Compressive strength of cubes after 90days curing	% loss of compressive strength due to acid attack
1	0.00%	2261	2242	0.82	38.2	34.5	3.7
2	10.00%	2340	2318	0.94	39.6	33.5	6.1
3	20.00%	2351	2323	1.2	42.6	36.8	5.8
4	30.00%	2234	2202	1.44	38.5	30.5	8





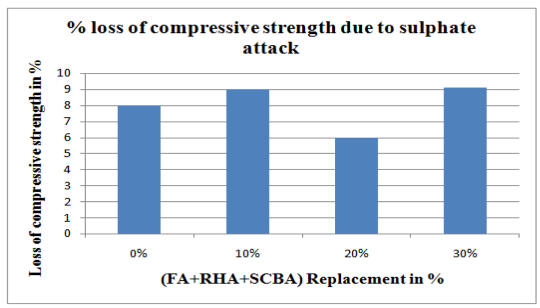
M25 ALKALINE ATTACK

Sl.no	% Replacement (R.H.A+FA+SBA)	Initial weight of cube after 28days curing in grams	Final weight of cubes after 90days curing in grams	% loss of weight due to alkaline attack	Compressive strength of cube after 28days curing	Compressive strength of cubes after 90days curing	% loss of compressive strength due to alkaline attack
1	0.00%	2286	2259	1.2	29.5	22.6	6.9
2	10.00%	2340	2306	1.44	31.5	21.6	9.9
3	20.00%	2280	2244	1.6	32.5	26.5	6
4	30.00%	2310	2268	1.84	29.6	22.9	6.7



M25 SULPHATE ATTACK

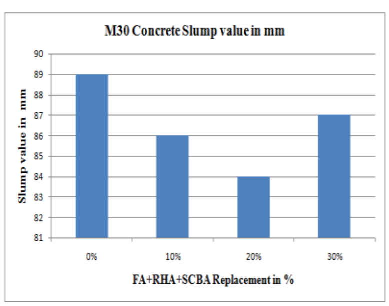
Sl.no	% Replacement (R.H.A+FA+SBA)	Compressive strength of cube after 28days curing	Compressive strength of cubes after 90days curing	% loss of compressive strength due to sulphate attack
1	0.00%	29.5	21.5	8
2	10.00%	31.5	22.5	9
3	20.00%	32.5	26.5	6
4	30.00%	29.6	20.5	9.1

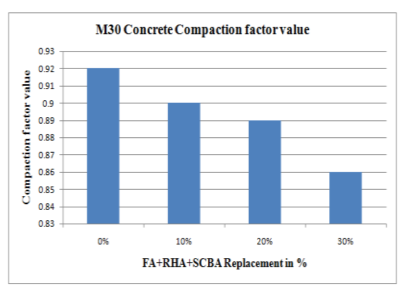


3. M30 GRADE OF CONCRETE TEST RESULTS

Slump & Compaction Factor of M30 Concrete:

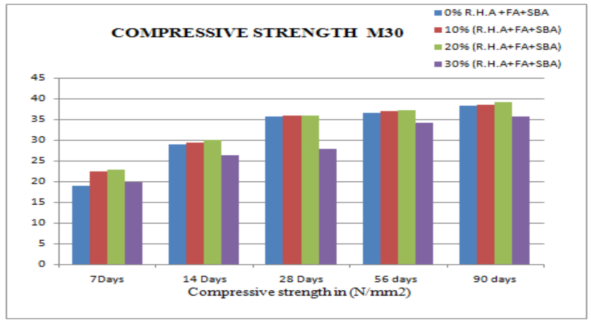
M30 Results			
S.no.	% Replacement (R.H.A +FA+SBA)	Slump value In (mm)	Compaction factor
1	0%	89	0.92
2	10%	86	0.90
3	20%	84	0.89
4	30%	87	0.86





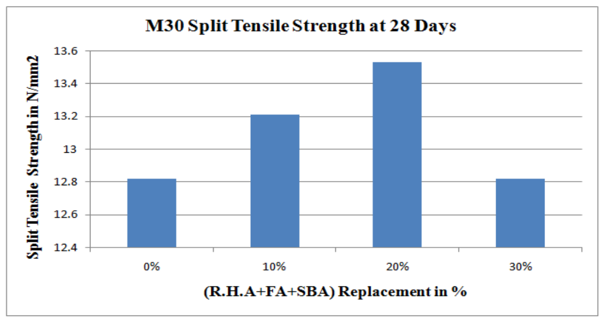
COMPRESSIVE STRENGTH RESULTS

S.no	Type of Mix (R.H.A+FA+SBA)	M30 Compressive Strength in (N/mm2)				
		7 Days	14 Days	28 Days	56 Days	90 Days
1	0%	18.98	28.91	35.6	36.42	39.3
2	10%	22.4	27	31	33.5	36.8
3	20%	23	33.7	35.9	37.25	39.2
4	30%	19.8	29.32	27.84	34.25	35.6



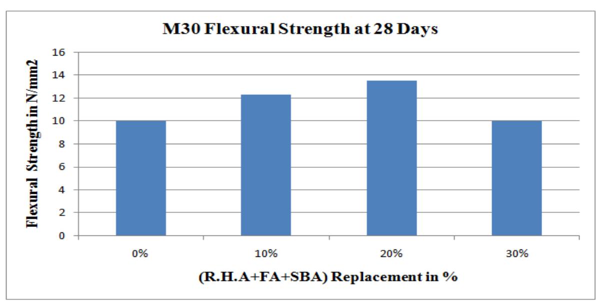
SPLIT TENSILE STRENGTH TEST RESULTS

S.no	Type of Mix (R.H.A+FA+SBA)	M30 Split Tensile Strength in (N/mm2)
		28 Days
1	0%	12.82
2	10%	13.21
3	20%	13.53
4	30%	12.82



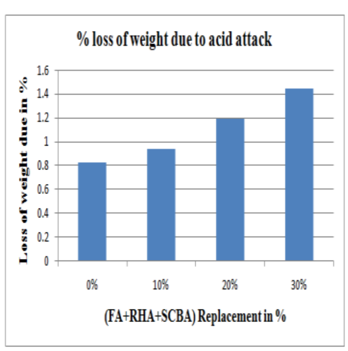
FLEXURAL STRENGTH TEST RESULTS

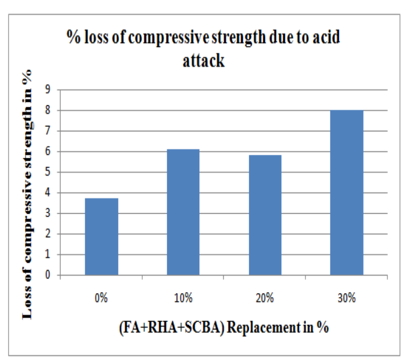
S.no	Type of Mix (R.H.A+FA+SBA)	M30 Flexural Strength in (N/mm2)
		28 Days
1	0%	10
2	10%	12.26
3	20%	13.5
4	30%	10



M30 ACID ATTACK

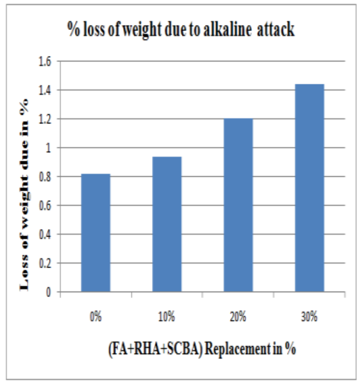
Sl.no	% Replacement (R.H.A+FA+SBA)	Initial weight of cube after 28days curing in grams	Final weight of cubes after 90days curing in grams	% loss of weight due to acid attack	Compressive strength of cube after 28days curing	Compressive strength of cubes after 90days curing	% loss of compressive strength due to acid attack
1	0.00%	2261	2242	0.82	38.2	34.5	3.7
2	10.00%	2340	2318	0.94	39.6	33.5	6.1
3	20.00%	2351	2323	1.2	42.6	36.8	5.8
4	30.00%	2234	2202	1.44	38.5	30.5	8

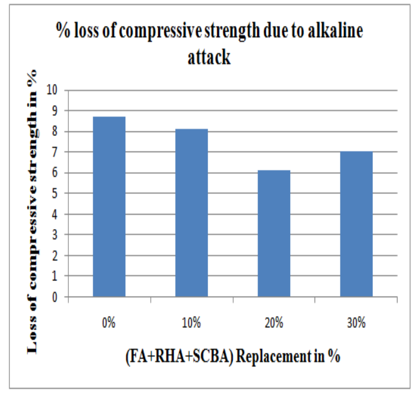




M30 ALKALINE ATTACK

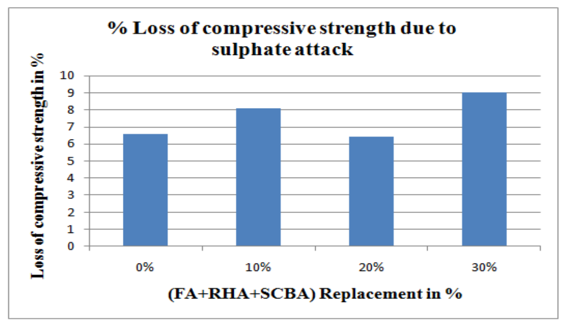
Sl.no	% Replacement (R.H.A+FA+SBA)	Initial weight of cube after 28days curing in grams	Final weight of cubes after 90days curing in grams	% loss of weight due to alkaline attack	Compressive strength of cube after 28days curing	Compressive strength of cubes after 90days curing	% loss of compressive strength due to alkaline attack
1	0.00%	2261	2242	0.82	38.2	29.5	8.7
2	10.00%	2340	2318	0.94	39.6	31.5	8.1
3	20.00%	2351	2323	1.2	42.6	36.5	6.1
4	30.00%	2234	2202	1.44	38.5	31.5	7





M30 SULPHATE ATTACK

Sl.no	% Replacement (R.H.A+FA+SBA)	Compressive strength of cube after 28days curing	Compressive strength of cubes after 90days curing	% loss of compressive strength due to sulphate attack
1	0.00%	38.2	31.6	6.6
2	10.00%	39.6	31.5	8.1
3	20.00%	42.6	36.2	6.4
4	30.00%	38.5	29.5	9



DISCUSSIONS

Comparisons in M20 design mix Vs Samples

At 7,14,28,56 days the compressive strength values increase with increase in replacement of cement up to 20% and decrease at 30%.At 90 days the Compressive strength values increase with increase in replacement of cement from 0% to 30 %.It is observed that 20 % replacement of cement is ideal at point of testing the M20 grade concrete specimens.

Comparisons in M25 design mix Vs Samples

At 7 days the compressive strength values increase with increase in replacement of cement up to 20% and decrease at 30%.At 14,28,56,90 days the compressive strength values significantly increases with increase in replacement of cement up to 20% and suddenly decreaseswith 30% replacement.It is observed that 20 % replacement of cement is ideal at any point of testing the M25 grade concrete specimens.

Comparisons in M30 design mix Vs Samples

At 7 days the compressive strength values increase with increase in replacement of cement up to 20% and decrease at 30%.At 14,28,56,90 days the compressive strength values decreases with increase in replacement of cement up to 10% and decreases with 30% replacement.It is observed that 20 % replacement of cement is ideal at any point of testing the M30 grade concrete specimens.

VI. CONCLUSIONS

Below is the list of Observations & Conclusions of the current experimental project undertaken, based on the Materials chosen, Methodology adopted, Procedures followed and Test results obtained:

1. Based on the present experimental results, the physical and chemical composition of the Bagasse Ash and Rice Husk Ash is essentially responsible for the later hydration process. Their fineness and specific surface area coverage are highly suitable for the workability of concrete which was more than expected
2. The Slump value is decreasing with grade of concrete due to mineral admixtures which absorb the water content.
3. The compaction Factor is decreasing with increasing in the replacement of cement quantity.
4. Positive results were obtained by subjecting these recommended concrete mixes to additional compressive strength tests, flexural strength tests, tensile strength tests, and durability tests.
5. There is a significant increase in the compressive strength, Split Tensile strength and Flexural Strengths due to the addition of mineral admixtures up to 20% and thereafter it is decreasing.
6. Bagasse Ash and Rice Husk Ash, contributes to useful disposal of these waste materials, and reduces consumption of cement, thus lowering adverse effects on the environment.
7. The Concrete thus obtained by partial replacement of cement with natural admixtures are durable in long term use.
8. At 20 % to 30 % replacement there observed a change in the decreased rate of strengths and in Flexural Strengths and compressive strengths than the rate of change at 10 % to 20%.
9. The Compressive Strength and Durability values are increasing with the age of concrete specimen which is observed in graphs from 56 days to 90 days values.

FUTURE SCOPE OF STUDY

- Increasing the quantity of the replacement of cement with more proportion of Sugarcane Bagasse ash and testing for the better reducing of cement quantity.
- The design mixes with increasing in the quantity of Sugarcane Bagasse ash alone up to 20%, 30% keeping it constant and changing the Rice husk proportionately varying in higher grades M35 and M40 Design mixes.
- With this project, the optimum proportion of mineral admixtures is favorable for strength and Durability at 20% (FA+RHA+SBA). Therefore there can be a future scope to find out the exact proportion in between 20% and 30% at which the strength and durability values aredecreasing in various grades of design mixes.
- As fly ash has become the most well popular admixture, Rice Husk Ash and Bagasse Ash are also need to be popularized with its effective usage in the concrete industries.
- More designated tests can be done for the accurate results in Compressive Strength, Flexural Strength and Durability properties.
- More admixtures can be selected along with bagasse ash and hence understanding the test results suitability for our requirements.
- Combination of these mineral admixtures along with other type of admixtures due to their properties abundant availability and easy processing as a constituent of concrete, experiments can be made with higher grade of concretes such as M35 & M40.
- This project with Triple blended concreted can be increased with other mixtures under controlled methods and following IS standards, calling as tertiary blended and poly blended concretes as an experimental projects.
- For smaller constructions if these blended concretes are set to be adapted, then huge quantity of cement utilization can be reduced and thereby cost of the construction is reduced along with ecology balance.

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