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COMPARATIVE STUDY OF AN EFFECT ON CONCRETE BY PARTIALLY REPLACING AGGREGATE AND WASTE MATERIAL

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ABSTRACT

Concrete is the main building material. The main ingredients of concrete are cement, fine aggregate and coarse aggregate. There are lots of studies carried out to use waste material partially as ingredient. This project involve the comparative study on concrete by partially replacing the combination of waste material like rise husk ash, recycle aggregate, coconut shell ,coconut shell ash in concrete. The study will check the different parameter with different replacement, such as economy, effect on compressive strength, workability of concrete, environmental effect. The following combinations are proposed for the study for some particular grade of cement.

- NORMAL CONCRETE
- COCONUT SHELL ASH[5%] + RECYCLE AGGREGATE[10%]
- COCONUT SHELL ASH[10%] + RECYCLE AGGREGATE[20%]
- COCONUT SHELL ASH[5%] + COCONUT SHELL[5%]
- COCONUT SHELL ASH[10%] + COCONUT SHEL[10%]
- COCONUT SHELL[10%] +RECYCLE AGGREGATE[10%]
- COCONUT SHELL[20%] + RECYCLE AGGREGATE[20%]

Keywords: Cement, Sand, coconut shell, coconut shell ash, recycle aggregate, coarse aggregate.

I. INTRODUCTION

Concrete is widely used as construction material for various types of structures due to its durability. For a long time it was considered to be very durable material requiring a little or no maintenance. Many environmental phenomena are known significantly the durability of reinforced concrete structures. We build concrete structures in highly polluted urban and industrial areas, aggressive marine environments and many other hostile conditions where other materials of construction are found to be nondurable.

In the recent revision of IS: 456-2000, one of the major points discussed is the durability aspects of concrete. So the use of concrete is unavoidable. At the same time the scarcity of aggregates are also greatly increased nowadays. Utilization of industrial soil waste or secondary materials has been encouraged in construction field for the production of cement and concrete because it contributes to reducing the consumption of natural resources. They have been successfully used in the construction industry for partial or full replacement for fine and coarse aggregates.

From the middle of 20th century, there had been an increase in the consumption of mineral admixtures by the cement and concrete industries. The increasing demand for cement and concrete is met by partial cement replacement. Substantial energy and cost savings can result when industrial by-products are used as a partial replacement for the energy intense Portland cement. The use of by-products is an environmental friendly method of disposal of large quantities of materials that would otherwise pollute land, water and air. Most of the increase in cement demand will be met by the use of supplementary cementing materials.

The composition of World Cement Consumption in the year 2010 is 3,313 Million Metric Tons. Among that 7.0% in India, 57.7% in China, 9.4% in Developed Countries, 25.9% in Other Emerging.

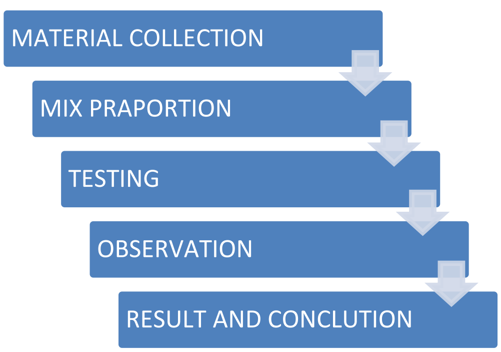
The composition of Coconut Production in India in the year 2009 is 10,894,000 tones. Traditional areas of coconut cultivation are the states of Kerala (45.22%), Tamil Nadu (26.56%),Karnataka (10.85%) and Andhra Pradesh (8.93%).

The aim of this comparative study is to determine the suitability of coconut shell ash (CSA) for use in partial replacement of cement in concrete production. The objectives include ascertaining the optimum replacement level of Portland cement with CSA.

II. MATERIALS USED

- Cement
- Fine aggregate
- Coconut shell ash
- Coarse aggregate
- Coconut shell
- Recycle aggregate

III. METHODOLOGY



- We are performed following tests:

-> Test on cement

1. consistency
2. Initial and final setting time

-> Test on aggregate

1. Sieve Analysis
2. Aggregate impact value
3. Aggregate crushing value

-> Test on fresh concrete

1. Slump Test

We are using M25grade concrete

Content name	Mass (Kg)	Proportion
Water	191.58	0.44 %
Cement	436.00	1 %
F.A.	563	1.29 %
C.A.	1149	2.64

Quantities per 1 bag of cement

Content name	Mass
Water	21.50 lit.
Cement	50 kg
F.A.	65.795 kg
C.A.	131.21 kg

We are working for following combination:

- NORMAL CONCRETE
- COCONUT SHELL ASH[5%] + RECYCLE AGGREGATE[10%]
- COCONUT SHELL ASH[10%] + RECYCLE AGGREGATE[20%]
- COCONUT SHELL ASH[5%] + COCONUT SHELL[5%]
- COCONUT SHELL ASH[10%] + COCONUT SHEL[10%]
- COCONUT SHELL[10%] +RECYCLE AGGREGATE[10%]
- COCONUT SHELL[20%] + RECYCLE AGGREGATE[20%]

COMPRESSION TEST

AIM

To determine the compressive strength of concrete specimens as per IS: 516 - 1959.

APPARATUS

FIG 5.6: COMPRESSION TESTING MACHINE

i) Compression testing machine conforming to IS: 516 - 1959

AGE AT TEST

Tests should be done at recognized ages of the test specimens, usually being 7 and 28 days. The ages should be calculated from the time of the addition of water to the drying of ingredients.

NUMBER OF SPECIMENS

At least three specimens, preferably from different batches, should be taken for testing at each selected age.

PROCEDURE

i) The specimens, prepared according to IS: 516 - 1959 and stored in water, should be tested immediately on removal from the water and while still in wet condition. Specimens when received dry should be kept in water for 24hrs. before they are taken for testing. The dimensions of the specimens, to the nearest 0.2mm and their weight should be noted before testing.

ii) The bearing surfaces of the compression testing machine should be wiped clean and any loose sand or other material removed from the surfaces of the specimen, which would be in contact with the compression platens.

iii) In the case a of cubical specimen, the specimen should be placed in the machine in such a manner that the load could be applied to the opposite sides of the cubes, not to the top and the bottom. The axis of the specimen should be carefully aligned with the centre of thrust of the spherically seated platen. No packing should be used between the faces of the test specimen and the steel platen of the testing machine. As the spherically seated block is brought to rest on the specimen, the movable portion should be rotated gently by hand so that uniform seating is obtained.

iv) The load should be applied without shock and increased continuously at a rate of approximately 140kg/sq.cm/minute until the resistance of the specimen to the increasing load breaks down and no greater load can be sustained. The maximum load applied to the specimen should then be recorded and the appearance of the concrete and any unusual features in the type of failure should be noted.

Also have done spilt tensile test.

IV. RESULTS

Table 1 and figure 1 shows the initial and final setting time.
Table 2 and figure 2 shows the compressive strength of normal concrete for 7 , 14 , 28 days.
Table 3 and figure 3 shows the compressive strength of combination of CSA+RA for different percentage of replacement for 7 , 14 , 28 days.
Table 4 and figure 4 shows the compressive strength of combination of CSA+CS for different percentage of replacement for 7 , 14 , 28 days.
Table 5 and figure 5 shows the compressive strength of combination of CS+RA for different percentage of replacement for 7 , 14 , 28 days.
Table 6 and figure 6 shows the compression of NORMAL CONCRETE , CSA+RA , CSA+CS , CS+RA for different percentage of replacement for 7 , 14 , 28 days.
Table 7 shows the compression of CSA+RA , CSA+ for different percentage of replacement for 7 , 14 , 28 days.
Table 8 and figure 8 shows the result of split tensile test for all combination for 7 , 14 , 28 days.

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TABLE 1: RESULT OF INITIAL AND FINAL SETTING TIME

INITIAL SETTING TIME	FINAL SETTING TIME
105 MINIT	211 MINIT

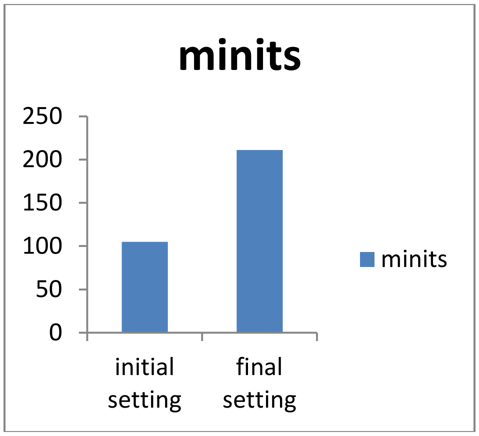


FIGURE 1: INITIAL AND FINAL SETTING TIME

TABLE 2: RESULT OF NORMAL CONCRETE

7 DAYS	14 DAYS	28 DAYS
18.7	23.77	26.55

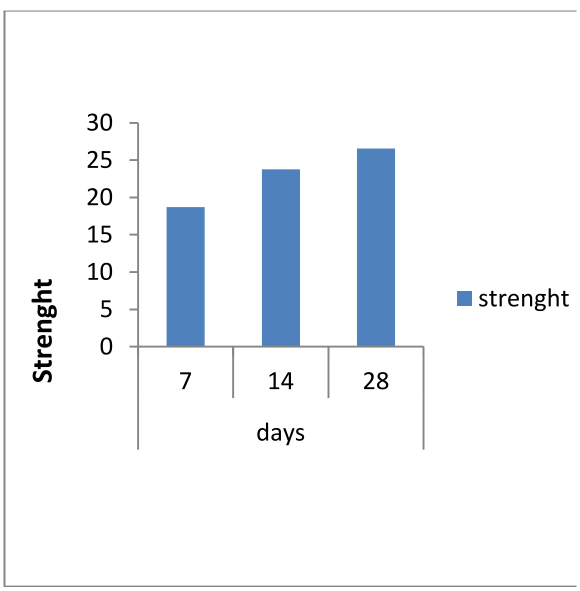
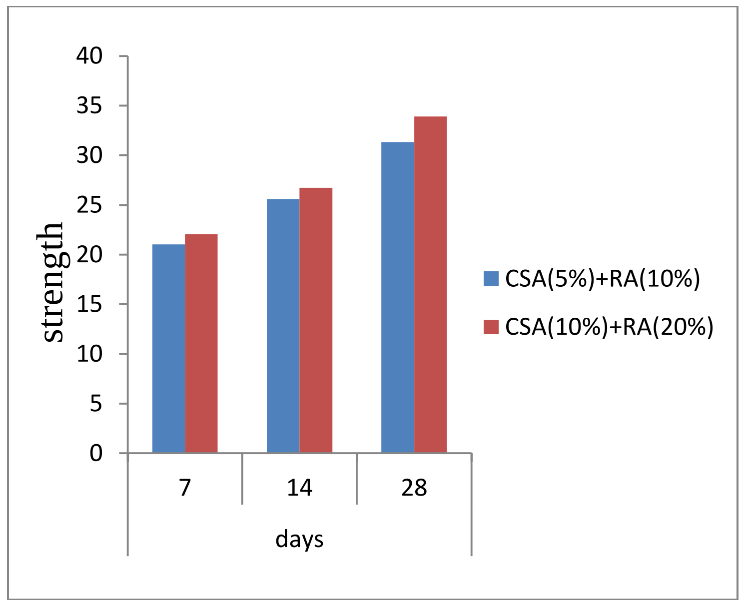


FIGURE 2: COMPRESSIVE STRENGTH OF NORMAL CONCRETE

TABLE 3: COMPRESSION OF COMPRESSIVE STRENGTH OF COMBINATION OF CSA+RA

DAYS	7 DAYS	14 DAYS	28 DAYS
CSA(5%)+RA(10%)	21.03	25.61	32.77
CSA(10%)+RA(20%)	22.06	26.71	33.89



FIGUER 3: COMPRESSION OF COMPRESSIVE STRENGTH OF COMBINATION OF CSA+RA

TABLE 4: COMPRESSION OF COMPRESSIVE STRENGTH OF COMBINATION OF CSA+CA

DAYS	7 DAYS	14 DAYS	28 DAYS
CSA+CS(5%)	21.56	27.41	34.51
CSA+CS(10%)	23.46	28.49	35.79

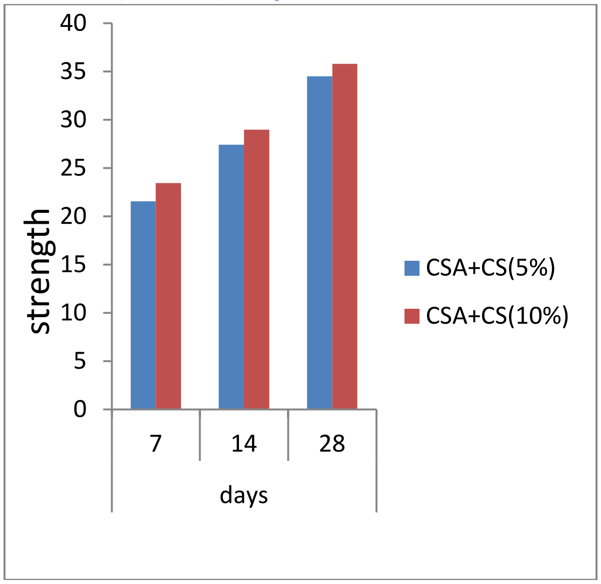


FIGURE 4: COMPRESSION OF COMPRESSIVE STRENGTH OF COMBINATION OF CSA+CA

TABLE 5: COMPRESSION OF COMPRESSIVE STRENGTH OF COMBINATION OF CS+RA

DAYS	7 DAYS	14 DAYS	28 DAYS
C5+RA(10%)	22.02	24.09	28.12
CS+RA(20%)	20.2	22.09	26.08

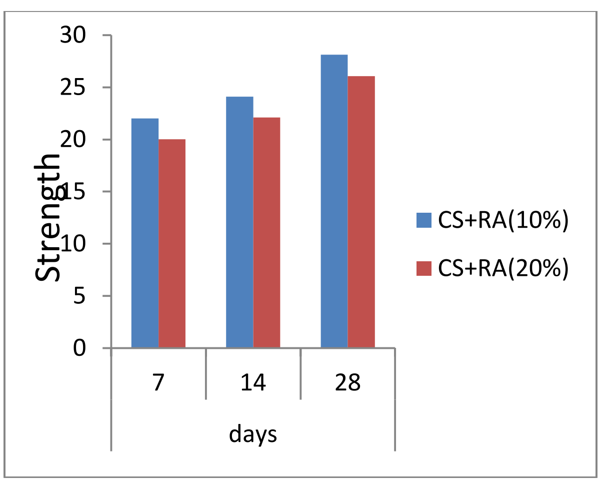


FIGURE 5: COMPRESSION OF COMPRESSIVE STRENGTH OF COMBINATION OF CS+RA

TABLE 6: COMPRESSION OF COMPRESSIVE STRENGTH OF COMBINATION OF NORMAL CONCRETE, CSA+RA, CSA+CS, CS+RA

DAYS	7 DAYS	14 DAYS	28 DAYS
NC	18.7	23.77	26.55
CSA(10%)+RA(20%)	22.6	26.71	33.89
CSA+CS(10%)	23.46	28.49	35.79
CS+RA(10%)	22.02	24.09	28.12

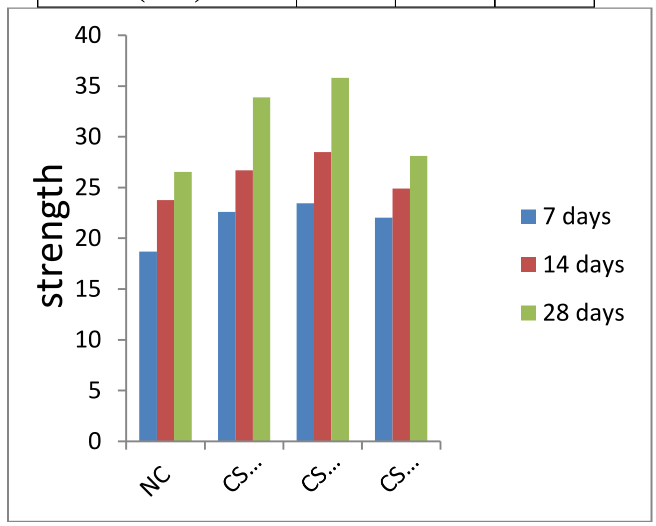


FIGURE 6:COMPRESSION OF COMPRESSIVE STRENGTH OF COMBINATION OF NORMAL CONCRETE, CSA+RA, CSA+CS, CS+RA

TABLE 7: COMPARISSION OF COMPRESSIVE STRENGTH OF COMBINATION OF CSA(10%)+RA(20%) AND CSA+CS(10%)

DAYS	7 DAYS	14 DAYS	28 DAYS
CSA(10%)+RA(20%)	22.06	26.71	33.89
CSA+CS(10%)	23.46	28.49	35.79

TABLE 8 RESULTS OF SPLIT TENSILE STRENGTH.

DAYS	7 DAYS	14 DAYS	28 DAYS
NC	5.22	7.86	12.37
CSA(10%)+RA(20%)	7.49	8.48	13.41
CSA+CS(10%)	8.1	8.9	13.72
CS+RA(10%)	6.9	8.15	12.41

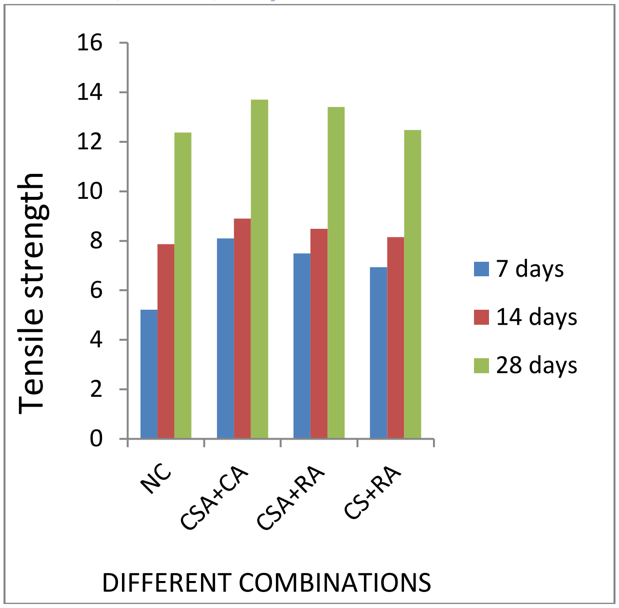


FIGURE 8: SPLIT TENSILE STRENGTH

V. CONCLUSION

The result shows that the 10% replacement of CSA+CS gives the highest strength with low cost. It also reduces environmental effects.
The strength of CSA+CS is 35.79 kN/m^2 which is1.79kN/m^2 greater than the combination of CSA+RA.
The strength of CSA+RA is35.79kN/m2 which is 9.24 kN/m2 greater then normal concrete .

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