Gurikini Lalitha Int. Journal of Engineering Research and Applications www.ijera.com
ISSN : 2248-9622, Vol. 4, Issue 8(Version 3), August 2014, pp.148-151

RESEARCH ARTICLE OPEN ACCESS

Experimental Study on Performance of Concrete M30 with Partial Replacement of Coarse Aggregate with Sea Shells and Coconut Shells

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ABSTRACT
In this research work experiments have been conducted with collection of materials required and the data required for mix design are obtained by sieve analysis and specific gravity test. Sieve analysis is carried out from various fine aggregates (FA) and coarse aggregates (CA) samples and the sample which suits the requirement is selected. Specific gravity tests are carried out for fine and coarse aggregate. The various materials used were tested as per Indian standard specifications. On the basis of the experimental studies carried out on M30 grade concrete as partial replacement of coarse aggregates with sea shells and coconut shells, the following conclusions are drawn from the above experiment we conclude that comparing to traditional concrete, compressive strength of 10% (5% + 5%) of coconut shells (5%) and sea shells (5%) increased. whereas the compressive strength of the concrete cubes has gradually decreased from addition of 10% (5% + 5%) of coconut shells and sea shells. Hence for economical view 10% is preferable and in the perspective of compressive strength 10% is suggested. Thus, 10% replacement coconut shells and sea shells are recommended for both heavy weight and light weight concrete production.

***Keywords*:** aggregate, coconut shells (c s), compressive strength, sea shells (s s),

I. INTRODUCTION

In the ancient period the structures are made in the naturally occurring gaps and spaces between the mountains and hills generally known as caves. As the time is passing people are increasing and number of caves is occupied. So as to protect from the nature construction of structures have been started. Initially buildings are constructed with the stones and cemented them with mud, lime, gums. After due course time passing stones were used in the foundation and super structure was constructed with the bricks made of lime. The lime bricks were casted in the moulds made of wood, they made a mix of stone, sand, sea-shells, lime stone and jaggery. Recent investigation of Indian Coconut shells and sea shells has indicated greater scope for their utilization as a construction material. Greater utilization of Coconut shells and sea shells will lead to not only saving such construction material but also assists in solving the problem of disposal of this waste product. In present generation as the population is increasing rapidly and construction work is also increasing so to replace the old process the new bricks like fly ash bricks came in to field replacing the old lime bricks, whereas the cementing material like mud, lime paste and gums is replaced by the Cement of different kinds in different construction. As the status of living is increasing their needs for maintenance is also increasing more structures and more vivid types of structures have come to world. So the need for the replacement of the present material that is the concrete manufacturing has to be changed to meet the needs of the structures. So the most economical, ecological, light – weight and increasing the ease of work construction of the structure is important in the present economy. So the role of the light – weight concrete has come into the field. As modern engineering practices become more demanding, there is a corresponding need for special types of materials with novel properties. Scientists, engineers and technologists are continuously on the searching for materials, which can act as substitute for conventional materials or which possess such properties as would enable new designs and innovations resulting in to economy, so that a structure can be built economically. Many attempts have been made to develop new materials, which is the combination of two or more materials. Such materials are called composite materials. Concrete can be concluded as a composite material as it is a mixture of different materials. For reducing the cost of concrete, greater use of pozzolanic materials like fly ash and blast furnace slag was suggested for the cement, sea shells, glass and ceramic material are used in case of fine aggregates, when coming to case of course aggregates palm kernel shells, coconut shells and sea shells. The use of these materials as the substitute material in concrete would reduce the

disposal problem now faced by thermal power plants and industrial plants, agricultural areas and at the same time achieving the required strength of concrete. Already many investigations have been going on the partial replacement of coconut shells in place of coarse aggregate. In the present investigation coconut shells in combination with sea shells has been used as partial replacement of coarse aggregate. Coconut shells are available in large quantities in the country as a waste product from agriculture. Seashells are also available in large quantities. **M. Sekar, L.M. Poornima[1]** has described as the experimental results of four beams, two each in CS and the NWC are presented in this paper. 1. The comparison of mechanical properties and structural behavior of the NWC and CS beams is discussed. 2. The crack width, deflection, ultimate strength, concrete and steel strains are analyzed and compared for both beams. 3. Based on the results, the following conclusions may be drawn. The overall flexural behavior of reinforced PKSC beams used in this study closely resembles that of equivalent beam made with NWC. **Gunasekaran[2]** studied the properties of concrete using coconut shell as coarse aggregate were investigated in an experimental study. Compressive, flexural, splitting tensile strengths, impact resistance and bond strength were measured and compared with the theoretical values as recommended by the standards. The bond properties were determined through pull-out test. Coconut shell concrete can be classified under structural lightweight concrete. **O.T. Olateju [3]**in his paper reports the exploratory study on the suitability of the periwinkle shells as partial or in concrete works. Physical and mechanical properties of periwinkle shell and crushed granite were determined and compared. A total of 300 concrete cubes of size 150 × 150 ×150 mm with different percentages by weight of crushed granite to periwinkle shells as coarse aggregate in the order 100:0, 75:25, 50:50, 25:75 and 0:100 were cast, tested and their physical and mechanical properties determined. A.**P. Adewuyi and T. Adegoke[4]**

Concluded The strength of periwinkle shell concrete is determined based on the properties of the shells and various percentage replacements; Concrete with 35.4% and 42.5% periwinkle shells inclusion can still give the minimum 28-day cube strength values of 21 N/mm2 and 15 N/mm2 expected for concrete mixes 1:2:4 and 1:3:6, respectively. Concrete having up to 50% periwinkle shells inclusion can still be regarded as normal weight concrete. Savings of about 14.8% and 17.5% can be achieved by adopting 35.4% and 42.5% periwinkle inclusion for 1:2:4 and 1:3:6 concrete mixes, respectively.

II. EXPERIMENTAL SET UP

In this stage collection of materials required and the data required for mix design are obtained by sieve analysis and specific gravity test. Sieve analysis is carried out from various fine aggregates (FA) and coarse aggregates (CA) samples and the sample which suits the requirement is selected. Specific gravity tests are carried out for fine and coarse aggregate. The various materials used were tested as per Indian standard specifications.

II.1 Materials

Raw materials required for the concreting operations of the present work are cement, fine aggregate, coarse aggregate (CS a SS) and water.
Cement**:** Bharathi cement of 43 Grade ordinary Portland cement was used whose specific gravity is 2.98

II.2

S.No.	property	test results.
1	Normal consistency	35%
2	Specific gravity	2.98
3	Initial setting time	32.33 min
4 .	Fineness of cement (Dry sieving method)	98%
5	Compressive strength cement	
	At 7day	28.89 N/mm^2
	At 28 days	32.22 N/mm^2
	Specific gravity =	2.62
	Fineness modulus =	2.39

II.3 Coarse Aggregate

The material whose particles are of size as are retained on retained on I.S. sieve no. 4.75 mm is termed as coarse aggregate. The size of coarse aggregate depends upon the nature of the work The coarse aggregate that is the CS and SS used in this experimental investigation is 20mm size, crushed and angular in shape. The aggregates are free from dust before used in the concrete.

The CS and SS are obtained for the experiment is from the coconut farms and the prawns ponds.

Specific gravity	=	2.83
Fineness modulus	=	8.6265

II.4 Water

Water to be used in the concrete work should have following properties:

It should be free from injurious amount of oil, acids, alkalis or other organic or inorganic impurities. It should be free from iron, vegetable matter or other any type of substances, which are likely to have adverse affect on concrete or reinforcement. It should be quite satisfactory for drinking purpose which is used in mixing of concrete.

Material	**kg/cum**	**ratio**
Water	191.58	0.425
Cement	450.77	1
Fine aggregate	638.17	1.42
Coarse aggregate	1493.7	3.33

II.5 Compressive strength values with replacement for coarse aggregates by cs and ss

III. FIGURES AND TABLES

Figure 1 Coconut shells

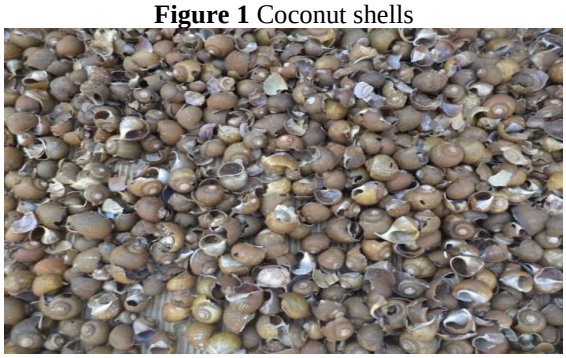


Figure 2 Sea shells

Figure 3 Broken form of coconut

Figure 4 Broken form of sea shells

Figure 5 cubes of concrete replaced with coconut and sea shells aggregate

Table 1: 3 -Days Compressive Strength Results

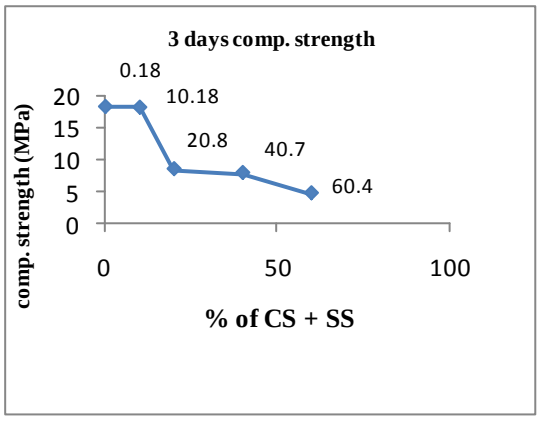
S No.	**Total Replacement By CS + SS in percentage**	**Compressive Strength (Mpa)**
1	0	18.23
2	10(5%+5%)	18.12
3	20(10%+10%)	8.46
4	40(20%+20%)	7.86
5	60(30%+30%)	4.67

Table 2:7-days compressive strength results

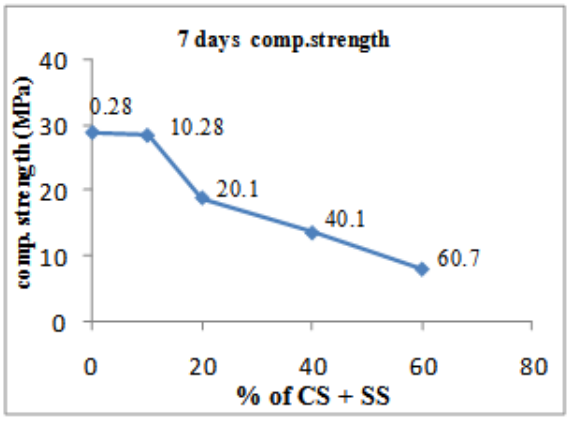
S No.	**Total Replacement By CS + SS percentage**	**Compressive Strength(Mpa)**
1	0	28.77
2	10(5%+5%)	28.32
3	20(10%+10%)	18.78
4	40(20%+20%)	13.44
5	60(30%+30%)	7.89

Table3: Compressive Strength Results for Replacement of Coarse Aggregates by CS & SS

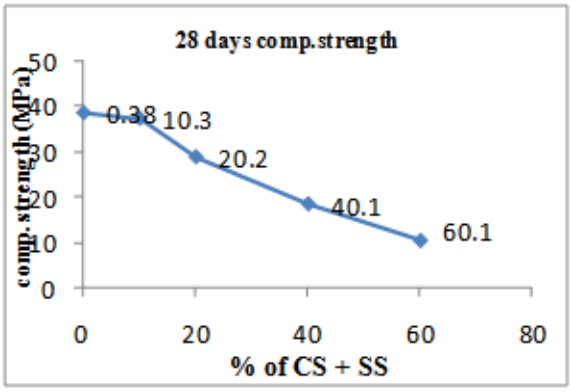
S No.	**Replacement By CS + SS percentage**	**3 Days**	**7 Days**	**28 Days**
1	0	18.23	28.77	38.67
2	10	18.12	28.32	37.42
3	20	8.46	18.78	28.91
4	40	7.86	13.44	18.53
5	60	4.67	7.89	10.43



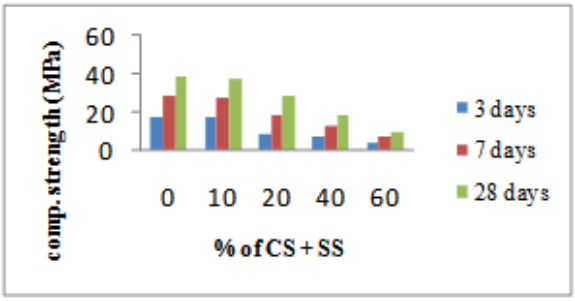
Graph1:l representation of compressive strength values for replacement of coarse aggregates by cs & ss for 3 days



Graph2:l Representation of Compressive Strength Values for replacement of Coarse Aggregates by CS & SS for 7 Days



Graph3: Representation of Compressive Strength Values for Replacement of Coarse Aggregates by CS & SS for 28 Days



Graph4: Representation of Compressive Strength Values.

IV. Results and discussion

From graph1,2 and 3 as the percentage of coconut and sea shells are increasing the compressive strength decreases for three days, seven days and even for 28days.Graph 4 shows the the compressive strength values for three days seven days and 28 days.

V. Conclusion

On the basis of the experimental studies carried out on M30 grade concrete as partial replacement of coarse aggregates with sea shells and coconut shells, the following conclusions are drawn:

From the above study we conclude that the compressive strength of the concrete cubes has gradually decreased from addition of 10% (5% + 5%) of coconut shells and sea shells. Whereas comparing to traditional concrete, compressive strength of 10% (5% + 5%) of coconut shells (5%) and sea shells (5%) increased. Hence for economical view 10% is preferable and in the perspective of compressive strength 10% is suggested.

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