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EXPERIMENTAL INVESTIGATION OF PROPERTIES OF NATURAL FIBER REINFORCED CONCRETE WITH PARTIAL REPLACEMENT OF SEASHELL AS FINE AGGREGATE

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ABSTRACT

Seashells are exo-skeleton with hard layered material and so can be molded into solid objects. Seashells are moderately used in concretes as replacement by either coarse or partial replacement.From the various types of seashells,Molluscus are commonly available shell that can be crushed and applicable in construction purposes. Generally sea shells contains calcium carbonate. Seashells are freely and plentily available in coastal areas. The proposed cubes,cylinders and reinforced beams are made up of replacing a fine aggregate by crushed seashells as powder material at varying percentages of 10%,15%,20%,25% were tested for compressive strength, flexural strength and split tensile strength. To compare the strength and durability of the proposed concrete and the nominal concrete of M40 grade.

KEY WORDS: *natural fiber reinforced concrete, sea shell, flexural compressive tensile strength*

INTRODUCTION

In this research work properties of structural concrete when seashells are used as fine aggregate replacement were studied. Most of the waste materials are non-bio degradable and may remain on the environment for hundreds or even thousands of years.Utilizing seashells reduces the storage of marine waste, also reducing exploitation of quarried aggregates and has benefits in adding different materials to a concrete mix design for improved performance (Richardson & Fuller, 2013). Due to the continuous usage of natural resources such as river sand, the demand increases inevitably regardless of usage. The increasing demand will continue in future also.

Marine mollusk shells that are familiar to beachcombers and thus most likely to be called "seashells" are the shells of marine species of bivalves (or clams), gastropods (or snails), scaphopods (or tusk shells), polyplacophorans (or chitons) and cephalopods (such as nautilus and spirula). The shells of marine species also often have more sculpture and more color, although this is by no means always the case.

LITERATURE REVIEW

- **Monita Olivia, RevinaOktaviani, Ismeddiyanto, "Properties of concrete containing ground waste cockle and calm seashells"Procedia Engineering 171(2017) 658 – 663.**

Blood clam or cockle (*Anadaragranosa*) shell is a type of marine by-product that can be used to replace aggregate

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or cement partially in concrete. In this research, the ground cockle seashell was used as a partial cement replacement.

The ground seashells were prepared by burning, crushing, grinding and filtering the cockle using no #200 sieve. The mechanical properties studied were compressive strength, splitting tensile strength, flexural strength and modulus of elasticity of seashell concrete. These properties were compared with those of a control Ordinary Portland Cement (OPC) concrete. Based on the trial mixes using the ground seashell with proportion of 2, 4, 6 and 8% by weight of cement, the optimum compressive strength was achieved for the mix that replaced cement by 4%.

The seashell concrete yielded less compressive strength and modulus elasticity compared to the OPC concrete. It is noted that thetensile strength and flexural strength were higher than those of the OPC concrete, which is advantageous to increase concrete tension properties.

- **N.Devendran – IJCER -ISSN (e): 2250-3005, Volume,07"Experimental study on strengthening of concrete by replacing seashell and fly ash".**

This paper reports the exploratory study on the suitability of the cockle shells as partial replacement for in concrete. In developing countries where concrete is widely used, the high and steadily increasing cost of concrete has made construction very expensive. The high cost of conventional building materials is a major factor affecting housing delivery in world. This has necessitated research into alternative materials of construction and analyzing tensile and compressive strength characteristics of concrete produced using by sea shells as substitutes for conventional coarse aggregate with partial replacement using M30 grade concrete. The main objective is to encourage the use of these products as construction materials in low-cost building.

In this project, cement is partial replacement with Fly ash of about 5%, 10%, 15%. The coarse aggregate is partial replacement with 5%, 10%, and 15% by sea shell. Hardened concrete properties such as compressive strength of the concrete on 7, 14, & 28 days has been achieved. A comparative study was also done based on the obtained results and the variations were plotted.

OBJECTIVES

1. To compare the compressive strength of normal concrete with partial replacement of crushed seashell material.
2. To compare the compressive strength of partial replacement of fine aggregate with crushed seashell material.
3. To compare the split tensile strength of partial replacement of fine aggregate with crushed seashell material.
4. To compare the flexural strength of partial replacement of fine aggregate in RC structure with crushed seashell material.
5. To compare the durability of the normal concrete with partial replacement of crushed seashell material.

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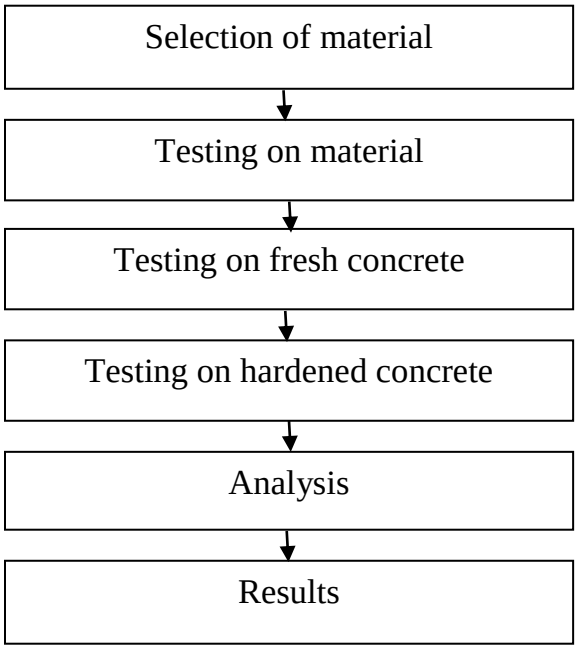
METHODOLOGY



MIX DESIGN

MIX PROPORTIONS

Cement	=	425 Kg/ m^3.
Water	=	197 litre
Fine Aggregate	=	619.63 Kg/ m^3.
Coarse Aggregate	=	1,122.75 Kg/ m^3.
Water-cement ratio=		0.4

Ratio for M40 grade is **1:1.46:2.64**

RESULTS

1.Cube: The cube moulds of size 150mm×150mm×150mm.

Compressive strength(mpa)				Average Compressive Strength(mpa)
	7 days	14 days	21 days	
0%	21.28	23.46	24.02	22.92
5%	20.53	21.02	24.00	21.85
10%	18.14	18.36	20.42	18.97
15%	16.83	18.60	19.02	18.15

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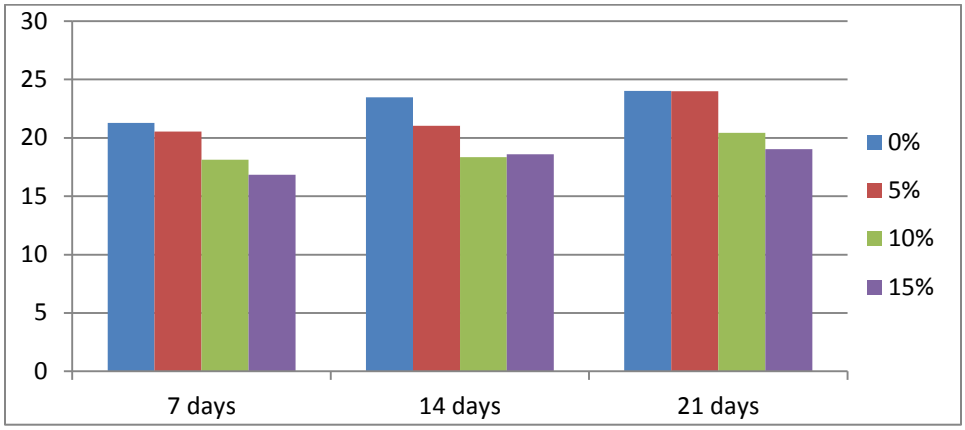
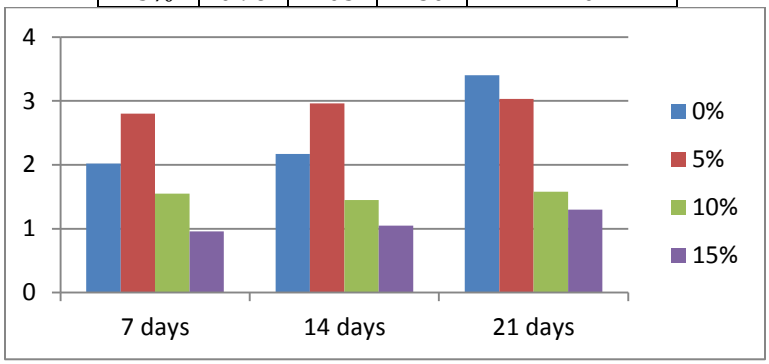


2.Cylinder: The cylinder moulds of size 150mm diameter and 300mm height.

Split tensile strength(mpa)				Average Split tensile Strength(mpa)
	7 days	14 days	21 days	
0%	2.02	2.17	3.40	2.53
5%	2.80	2.96	3.03	2.93
10%	1.55	1.45	1.58	1.52
15%	0.96	1.05	1.30	1.10



3.RC Beam: The beam moulds of size 150mm×150mm×750mm.

% of sea shell replaced	28days
0%	5.74
5%	4.78
10%	6.39
15%	4.53

CONCLUSION

1. The addition of sea shell powder increases as decrease the workability.
2. The compressive strength of cube reached highest strength is 22.92mpa at 0% of sea shell replacement and the lowest strength is 18.15mpa at 15% of sea shell replacement.The split tensile strength of cylinder reached highest strength is 2.93mpa at 5% of sea shell replacement and the lowest strength is1.10mpa at 15% of sea shell replacement.The flexural strength of RC beam

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reached highest strength is 6.39mpa at 10% of sea shell replacement and lowest strength is 4.53mpa at 15% of sea shell replacement.

3. As the percent of sea shell increased from 0% to 15%, it was observed that minimum strength was observed at 15% replacement in all compressive, split tensile and flexural tests.

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