

AN EXPERIMENTAL STUDY ON PARTIALLY REPLACEMENT OF CEMENT BY LIME POWDER AND FINE AGGREGATE BY GROUNDNUT SHELL IN CONCRETE

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Abstract - Concrete is the most undisputable and indispensable material being used in infrastructure development throughout the world. This experimental work highlights about the feasibility study for the utilization of groundnut shell as replacement of fine aggregate and lime powder as replacement of cement in construction applications. In this investigation, fine aggregate partially replaced by groundnut shell in the percentage of 5,10,15,20 and lime powder partially replaced in standard ratio of 20 percentage. Specimens will be cast and test at the 7,14 and 28 days. The test results obtained from groundnut shell and lime powder replacements will be compared with conventional concrete and final report will be presented.

Key Words: groundnut shell, lime powder, compressive strength, flexural strength and tensile strength.

INTRODUCTION

Concrete may be defined as a mixture of cement (binding material), aggregates (both coarse and fine), and water, which when placed in suitable forms and allowed to cure under appropriate conditions, hardens like stone. The chemical reaction between cement and water (hydration) resulting into bind the aggregate to form “concrete” cement, water and sand forms mortar and fill the voids in coarse aggregate particles. The word concrete comes from the Latin word “concrete”, which mean “Hardened” or “Hard”.

The interest of the construction community in using waste or recycled materials in concrete is increasing because of the emphasis placed on sustainable construction, the groundnut shell from in the oil mill is bored as waste and disposed as landfill. It is a organic matter. Since the demand in the concrete manufacturing is increasing day by day, the utilization of river sand as fine aggregate leads to exploitation of natural resources, lowering of water table, sinking of the bridge piers, etc as a common treat. Attempts has been made in using groundnut shell as fine aggregate in partial replacement of river sand in the ratio of 5, 10,15, 20 percentage. And also the addition of the standard ratio of natural lime powder of 20 percentage by the cement in concrete.

MATERIALS:

Cement

In the present work, Portland pozzolona cement(PPC) unit sample was to obtain the following characteristics of the specific Gravity 2.88 and Standard consistency 34%. The cement bag should not keep open so not to lose the properties of cement.

Coarse Aggregate

In the present research, the locally available trampled stone aggregate of size 20mm and down, was used and various tests carried out on the aggregate such as specific gravity, fineness modulus and water absorption are recorded as 2.49, 5.17 and 1.5

Fine Aggregate

In the present research, the river sand, which was available at salem, was used as fine aggregate and the test value on specific gravity 2.39 and Fineness modulus 16.

Groundnut shell

In the present research, the locally available in the season of groundnut shell is partially crushed by the grinder mill in oil mill is taken for the research. Fine aggregate partially replaced by groundnut shell in the percentage of 5,10,15,20 in concrete and its specific gravity is1.54.

Natural Lime powder:

The natural lime powder is normally available in coal seam fires and volcanic ejecta. In ancient days, this material was used to make constructions. It has a good adhesive property. In Engineering sector it has been using mortar, concrete, cement. Natural lime can arrest the moisture content itself. So then it is reduce the curing age. In our project the lime powder contributes 20% of partially replacement of cement content and its specific gravity 2.67.

EXPERIMENTAL PROCEDURE

Mix proportioning of concrete

The Mix design for M40- grade of concrete done by the calculation from the testing of materials required.

Mix	C:S:A	w/c	% Groudnut shell (Added)	% Lime powder (Added)	Cement (kg/m ³)	Sand (kg/m ³)	Aggregate (kg/m ³)
M40	1:0.99:1.6	0.34	(5-20)	20	579	575	899

Compression test

The compression test was done for the cubes of size 15 x 15 x 15cm after preparing the specimens these specimens were kept in the testing machine and slowly the load was increased until the failure of cube happened.

S. NO	Cur ing period	Conven tional concret e	Replac ement of 5%	Replac ement of 10%	Replac ement of 15%	Replac ement of 20%
1	7 day s	11.1	10.5	7.1	9.7	1.32
2	14 day s	21.33	24.25	10.51	13.92	2.66
3	28 day s	40	40.10	29.92	25.18	5.61



Fig 1



Fig 2

Split Tensile Strength

For tensile strength test, cylinder specimens of dimension 15cm diameter and 30cm length have taken. these specimens were kept in the testing machine and the load increased until the maximum load applied to the specimen which tends to split the specimen during the test.

S. NO	Cur ing period	Conven tional concret e	Replac ement of 5%	Replac ement of 10%	Replac ement of 15%	Replac ement of 20%
1	7 day s	1.697	1.06	0.63	0.275	0.665
2	14 day s	2	1.62	1.13	0.49	0.26
3	28 day s	2.4	2.66	1.90	0.77	0.35



Fig 3



Fig 4

Flexural Strength

In the flexural strength of concrete beam of size 10cm x 10cm x 50cm are selected. After preparing the specimens, they were placed in loading frame and tested for flexural strength. The load increased until the maximum load applied to the specimen which tends to break the specimen during the test.

S. N O	Cur ing period	Conven tional concret e	Replac ement of 5%	Replac ement of 10%	Replac ement of 15%	Replac ement of 20%
1	7 day s	5	3.875	2.125	1.25	0.875
2	14 day s	6.75	4.75	3.875	2.75	1.625
3	28 day s	8.5	8.75	6.5	4.5	2.25



Fig 5



Fig 6

RESULTS & DISCUSSIONS

Compressive Strength of Cube Groundnut Shell Concrete

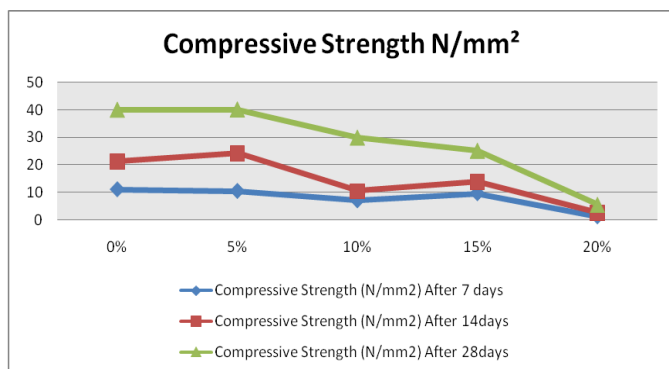


Fig 7

From the above figure, it concluded that the compressive strength of the cube maintained at 0% to 10% of Groundnut shell by weight of fine aggregate. Groundnut shell with the addition of more than 10% decreased. When compared to Nominal concrete there is maintained

Split Tensile Strength Test of Groundnut Shell Concrete

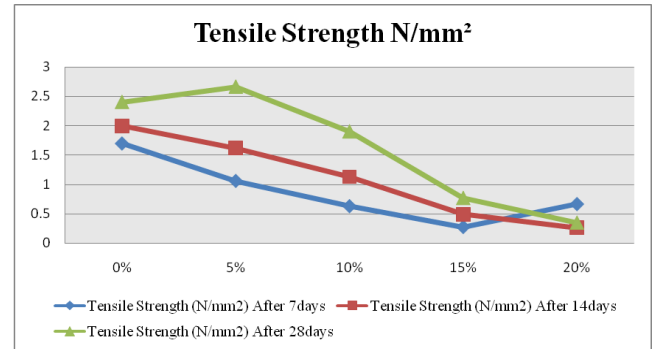


Fig 8

From the above figure, it concluded that the tensile strength of the cube increased at 0% to 5% of Groundnut shell by weight of fine aggregate. Groundnut shell with the addition of more than 5% decreased. When compared to Nominal mix the groundnut shell achieves good split tensile strength.

Flexural Strength Test of Groundnut Shell Concrete

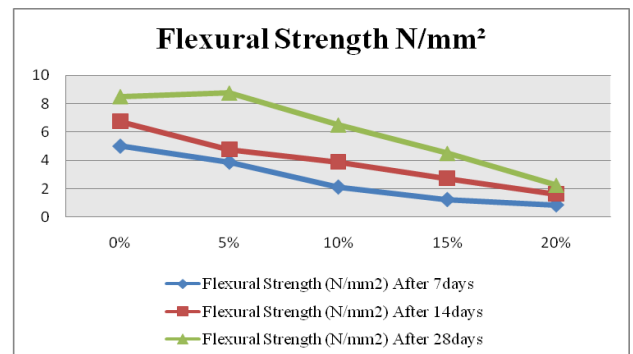


Fig 9

From the above figure, it concluded that the flexural strength of the cube increased at 0% to 5% of Groundnut shell by weight of fine aggregate. Groundnut shell with the addition of more than 5% decreased. When compared to Nominal mix the groundnut shell achieves good flexural strength.

CONCLUSIONS

1. Compared to ordinary concrete groundnut shell concrete achieves more strength. The following quantity of groundnut shell 5% to 10% added in concrete and their strength compared with normal mix concrete.

2. As per the study of experimental results show that there is strength between 10% replacement after which the value is decreases.
3. The partial replacement of groundnut shell and lime powder as fine aggregate and cement in varying percentage gains optimal in compressive strength, Split tensile strength and Flexural strength.
4. This study relates the groundnut shell and lime powder in cement concrete for upto 10% and standard lime powder for 20% which is considered as optimal mix in this investigation.

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