EXPERIMENTAL STUDY ON PARTIAL REPLACEMENT OF FINE AGGREGATE WITH RICE HUSK IN CONCRETE

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ABSTRACT

Burning of Rice husk has becoming a major environmental issue. This leads to the raise of greenhouse gases in the environment which ultimately leads to depletion of ozone layer and raise in global temperature. In this project we are investigating the effect of Rice Husk on concrete. Use of this waste material in place of natural resources like Fine Aggregates is a best alternative. We had decided to replace the Fine aggregates with rice husk as 0%, 10%, 15%, 20% and 25% by using M_{20} grade of concrete. We compared the specimens after partially replacing them with fine aggregates. The specimens had been tested for Slump cone, Compaction factor test and Compressive strength at 7, 14, 28 days interval which is kept at room temperature. The main purpose of this experiment is to study the properties of concrete with partially replaced rice husk. By doing so we can conserve the natural resources. Fine aggregates prices are soaring. Replacing Fine aggregates with waste product Rice Husk will not only reduce the cost but also saves the earth by reducing the greenhouse gas emission.

Keywords: Concrete – fine aggregate - rice husk – properties – compressive strength, Etc.

I. INTRODUCTION

Necessity is the mother of all inventions. Which made the mankind survive in this world till now from the beginning? Science and technology influences the way we live our day to day life. Research and development efforts has a new innovation has been creating in the modern environment. Concrete is a construction material w2hich are highly used in for the construction. The main ingredients of concrete are cement; fine aggregate, coarse aggregate, water. Generally Portland cement is highly preferred for the construction. Concrete technology will deals with the applications of concrete and its major effect and how it reacts to the surroundings and how economical to the investors. The foremost steps are to create the conventional concrete and compare it with the rice husk concrete.

II. LITERATURE REVIEW

Pushpa Poudya et.al. (October 2016). The suitability of rice husk as an alternative to sand in concrete production was studied here. Rice husk is an agricultural waste obtained from the rice. For this, various properties of concrete mainly workability, bulk density, water absorption, compressive strength and flexural strength were experimentally determined with the partial replacement of sand by rice husk at 0, 10, 20, 30, 40 and 50 percent respectively. M15 grade of concrete was prepared at 0.60 water cement ratio considering weight batching. The experimental results showed that the workability of the concrete increased with the increase in percent replacement of sand by rice husk. Similarly, the water absorption also increased while the bulk density, compressive strength and flexural strength of the samples decreased with the increasing amount of rice husk content in the mixtures. As the test result shows that the workability and water absorption of concrete increase while the bulk density, compressive strength and flexural strength decrease with the increase in percent replacement of sand by rice husk. It can be concluded that not more than 10 percent replacement of sand with rice husk is suitable for building load bearing and flexural members of the structures.

Tomas U. Ganiron Jr (December 2013). This experimental study aimed to analyze the effect of rice husks as fine aggregate in terms of water-cement ratio, quality and size of coarse aggregate, and consistency of the mixture and determine how rice husk differ with other ordinary concrete mix as fine aggregate in terms of water adsorption, compressive strength, tensile strength and modulus of elasticity. This also aims to help contribute to the industry in saving the environment, to encourage the government to find solutions regarding the disposal to landfills of waste materials and save the environment, to provide new knowledge to the contractors and developers on how to improve the construction industry methods and services by using rice husk, and to sustain good product performance and meet recycling goals. Observations from the tests performed were conducted in the laboratory where precise data were gathered and completely attained.

III. MATERIALS

Duration of curing	No. of cubes	Materials (Kg&lit)	Mix Proportion				
			0%	10%	15%	20%	25%
		Cement	2.944	2.944	2.944	2.944	2.944
		Coarse Aggregate	8.832	8.832	8.832	8.832	8.832
		Fine Aggregate	4.416	3.974	3.753	3.532	3.312
		Water	1.324	1.324	1.324	1.324	1.324
		Rise Husk	0	0.441	0.662	0.883	1.104
		Cement	2.944	2.944	2.944	2.944	2.944
		Coarse Aggregate	8.832	8.832	8.832	8.832	8.832
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		Rise Husk	0	0.441	0.662	0.883	1.104

S.NO	Materials	Quantity
1.	Cement	44.16 kg
2.	Fine Aggregate	56.966 kg
3.	Coarse Aggregate	132.48 kg
4.	Rise Husk	9.273 kg
5.	Water	19.872 lit

IV. MATERIAL TESTING

The most common of all the tests on hardened concrete is the laboratory test of concrete in construction should be prepared to calculate. Here the mix ratio of M_{20} grade and W/C ratio of 0.45. The size of the cube is (150 x 150 x 150) mm.

Fig (1): Concreting

Fig (2): Casting

Fig (3): Demoluding

Fig (4): Demoluding

Slump Cone Test

Fig (5): Slump Cone Test

Table No: 1

S. no	Weight of cement in g	Water cement ratio	Water added in cc	Slump in mm
1	3722	0.45	1674.9	55
2	**3722**	0.46	1712.12	60

Result: The slump value is 55mm for water cement ratio of 0.45

Compaction Factor Test

Fig (6): Compaction Factor

Table No: 2

S. no	W/C ratio	Empty weight of cylinder in g	Weight of cement ing	Weight of partially compacted concrete in g (w_p)	Weight of fully compacted concrete in g (w_f)	Compaction factor (w_p/w_f)
1	0.45	5600	3722	10610	12700	0.85
2	0.46	5600	3722	11910	13350	0.86

Result: The compaction factor value is 0.85 for water cement ratio of 0.45

International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 06 Issue: 08 | August - 2022 Impact Factor: 7.185 ISSN: 2582-3930

V. RESULTS

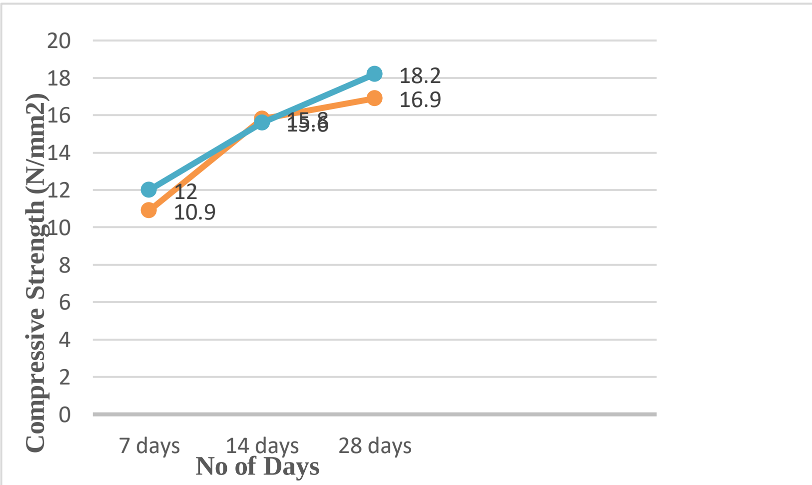
Compressive Strength Test

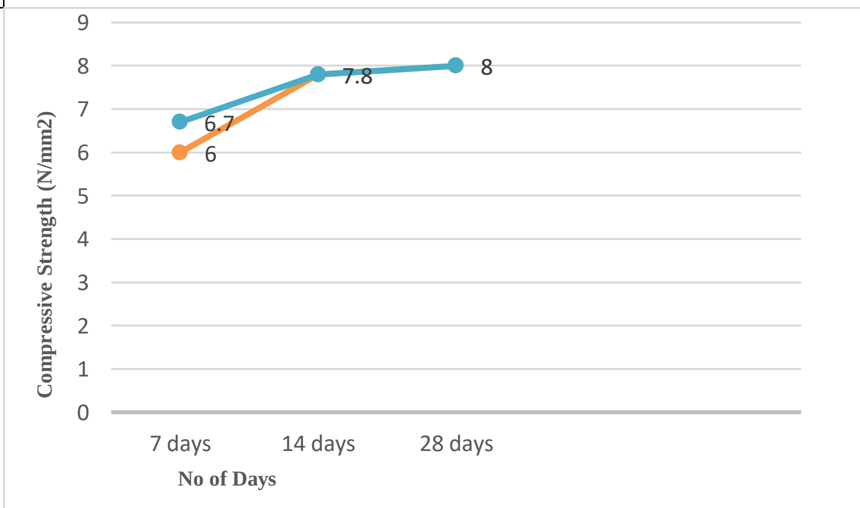


Fig (7): Compression testing machine **Fig (8):** Load at the cracking

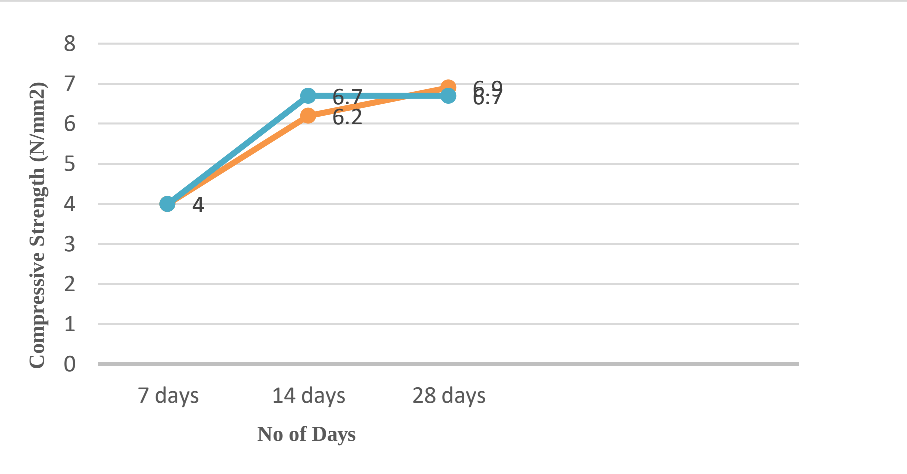
Table No: 3

0%	7 Days (N/mm²)	14 Days (N/mm²)	28 Days (N/mm²)
Specimen - 1	10.9	15.8	16.9
Specimen - 2	12	15.6	18.2
10%	**7 Days (N/mm²)**	**14 Days (N/mm²)**	**28 Days (N/mm²)**
Specimen - 1	6	7.8	8
Specimen - 2	6.7	7.8	8

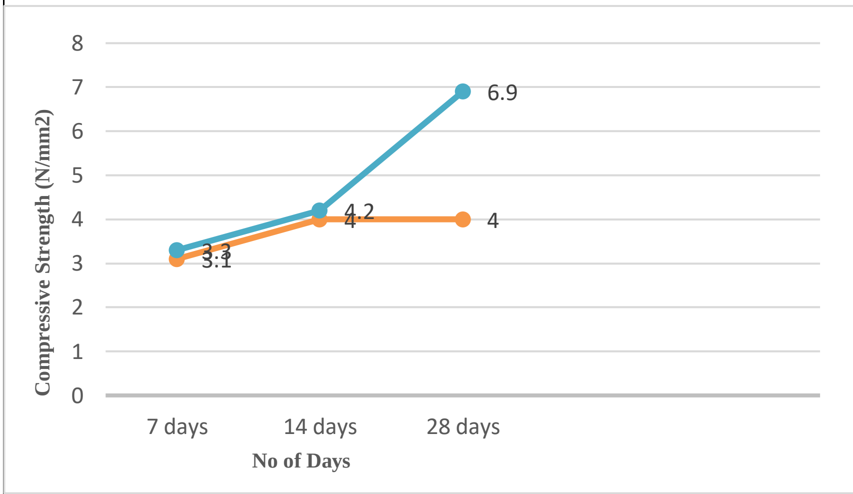




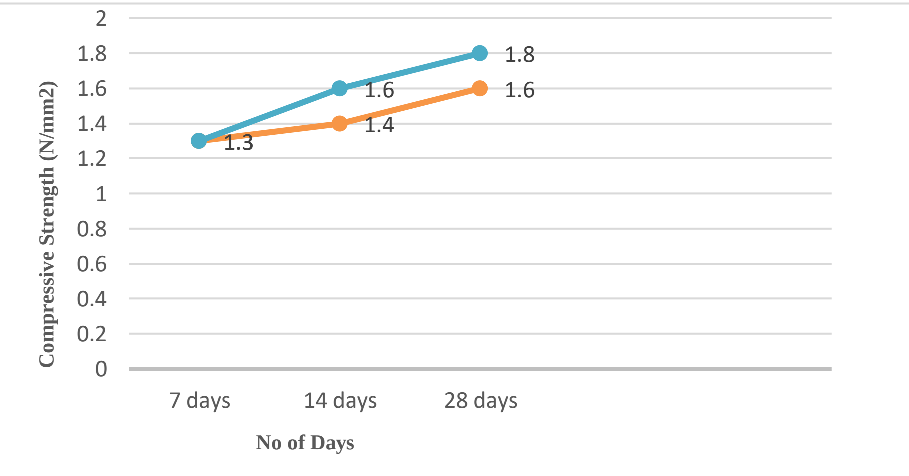
15%	7 Days (N/mm²)	14 Days (N/mm²)	28 Days (N/mm²)
Specimen - 1	4	6.2	6.9
Specimen - 2	4	6.7	6.7



20%	7 Days (N/mm²)	14 Days (N/mm²)	28 Days (N/mm²)
Specimen - 1	3.1	4	4
Specimen - 2	3.3	4.2	6.9



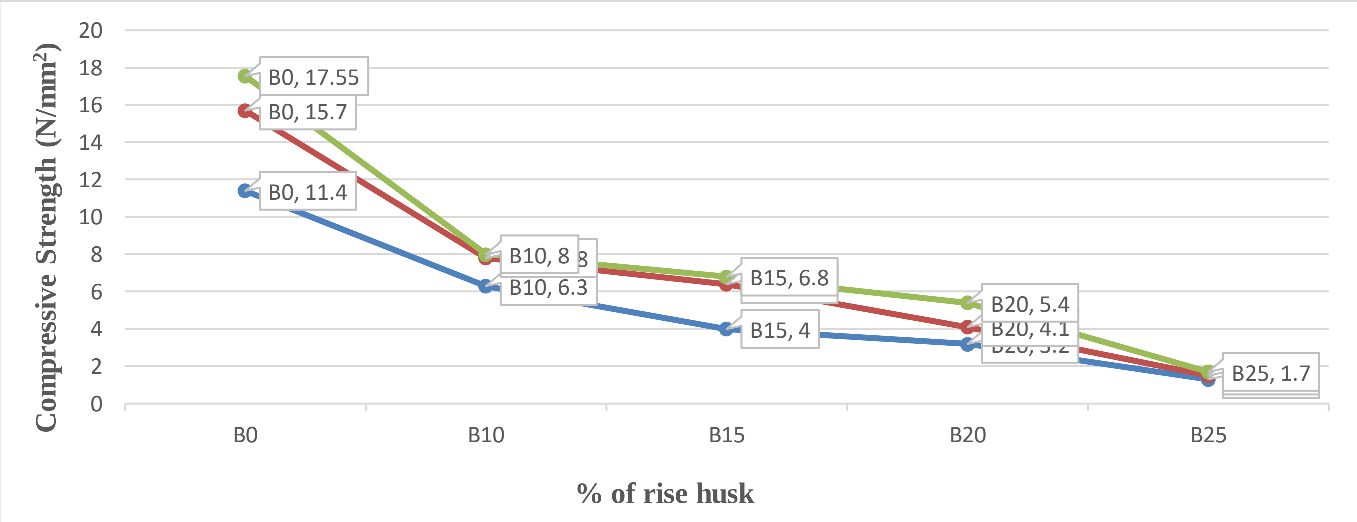
25%	7 Days (N/mm²)	14 Days (N/mm²)	28 Days (N/mm²)
Specimen - 1	1.3	1.4	1.6
Specimen - 2	1.3	1.6	1.8



COMPARISON RESULT FOR ALL CUBES

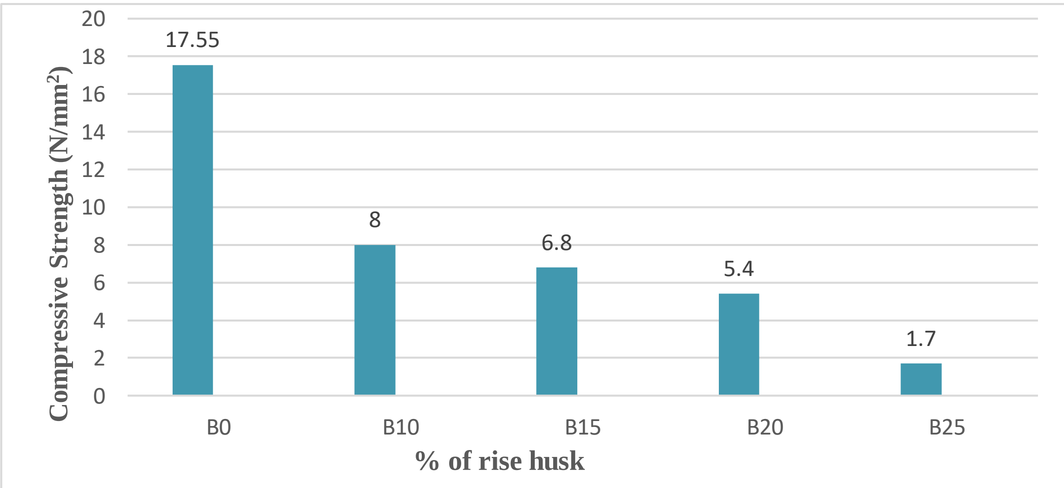
Table No: 4 (Comparison of all cubes)

CUBES	0% (N/mm^2)	10% (N/mm^2)	15% (N/mm^2)	20% (N/mm^2)	25% (N/mm^2)
7 DAYS	11.4	6.3	4	3.2	1.3
14 DAYS	15.7	7.8	6.4	4.1	1.5
28DAYS	17.55	8	6.8	5.4	1.7



Graph for comparison of all cubes

Average compressive strength for 28 days



VI. CONCLUSION

Based on the analysis of results, Rise Husk has the less bonding property with the M_{20} grade concrete. In present investigation, concrete cubes were made by partial replacement of fine aggregate were added with Rise Husk in 10%,15%,20%,25%. Compressive strength of the cubes was calculated for control concrete and Rise Husk concrete.

- In the present experimental investigations, 30 cubes (150 mm x 150 mm x 150 mm), with w/c ratio of 0.45 were casted with combination of Rise Husk in weight fraction as 10%,15%,20%,25% for Fine aggregate.
- It was observed from the experimental results that rise husk replacement provides declining in compressive strength up to **15.85 N/mm²** as compared to corresponding properties of control concrete.
- The compressive strength for the replaced rise husk has been decreased compare to the natural fine aggregate as the percentage is increasing.
- For 10% of fine aggregate replacement with rise husk the compressive strength is decreased when compare with conventional concrete for **9.55 N/mm²**.
- For 15% of fine aggregate replacement with rise husk the compressive strength is decreased when compare with conventional concrete for **10.75 N/mm²**.
- For 20% of fine aggregate replacement with rise husk the compressive strength is decreased when compare with conventional concrete for **12.15** N/mm².
- For 25% of fine aggregate replacement with waste rise husk the compressive strength is decreased when compare with conventional concrete for **15.85 N/mm²**.

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