"PARTIAL REPLACEMENT OF CEMENT BY RICE HUSK ASH (RHA)"

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ABSTRACT: *This paper aims of studying and analyzing the various properties of concrete by partially replacement of Cement by Rice Husk Ash (RHA). It obtains from burning of outer cover of rice husk. It consists of non-crystalline silicon dioxide (SiO_2) with high specific surface area and high pozzolanic reactivity. The Rice Husk Ash can be found as natural materials, by-products or industrial wastes chemical properties so far closer to micro silica, silica fume. The result revealed that the compacting factor decreased as the percentage replacement of PPC with RHA increased. Replacement of cement by rice husk asks showed in M25 grade concrete compressive strength improvement at the replacement of 10% in all Ages. From this entire experimental work & studies it is concluded that mix M2 (M0+10%RHA) is the best combination among all mixes, which gives max compression strength over normal concrete.*

1. INTRODUCTION

Rice Husk Ash (RHA) which is an agricultural by-product has been reported to be a good pozzolana by numerous researchers. The need to reduce the high cost of Ordinary Portland Cement in order to provide accommodation for the populace has intensified research into the use of some locally available materials that could be used as partial replacement for Pozzolana Portland cement (PPC) in Civil Engineering and Building Works. The optimized RHA, by controlled burn and/or grinding, has been used as a pozzolanic material in cement and concrete.

Sustainable development of the cement and concrete industry requires the utilization of industrial and agricultural waste components. India is a major rice producing country, and the husk generated during milling is mostly used as a fuel in the boilers for processing paddy, producing energy through direct combustion and / or by gasification. About 20 million tons of RHA is produced annually. This RHA is a great environment threat causing damage to the land and the surrounding area in which it is dumped. Lots of ways are being thought of for disposing it by making commercial use of this RHA. In the present investigation, Portland cement was replaced by rice husk ash at various percentages to study compressive and flexural strength. This research work examined the use of Rice Husk Ash as partial replacement for Ordinary Portland Cement in concrete. It involved the determination of workability and compressive strength of the concrete at different level of replacement.

2. EXPERIMENTALS AND METHODS

2.1. Materials used

2.1.1. Cement

The cement used was Ordinary Portland Cement. It was sourced Wardha and it conformed to the requirements of BS EN 197-1: 2000.

2.1.2. Fine Aggregate

The sand used for this research work was sourced from Wardha. The impurities were removed and it conformed to the requirements of BS 882 (1992).

2.1.3. Coarse Aggregate

The granite used for this research work was 20mm size. It was sourced from a Wardha.

2.1.4. Rice Husk Ash (RHA)

The Rice Husk used was obtained from Gondia. After collection, the Rice Husk was burnt under guided or enclosed place to limit the amount of ash that will be blown off.. The ash was ground to the required level of fineness and sieved through 90µm sieve in order to remove any impurity and larger size particles.

2.1.5. Water

The water used for the study was obtained from a free flowing stream. The water was clean and free from any visible impurities.

2.2. Batching and Mixing

Batching of materials was done by weight. The percentage replacements of Pozzolana Portland cement (PPC) by Rice Husk Ash (RHA) were 0%, 5%, 10%, 15%, 20% and 25%. The 0% replacement was to serve as control for other samples.

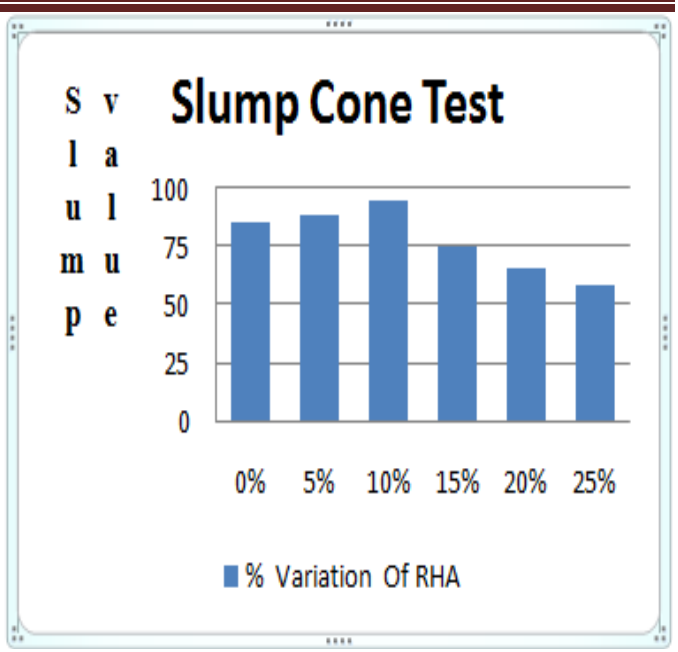
2.3. Concrete Mix Design

The concrete used in this research work was made using cement, sand and aggregate. The concrete mix proportion was 1:2.02:2.70 by weight.

2.4. Casting of samples

Cubic specimens of concrete with size 150 x 150 x 150 mm were cast for determination of all measurements. Six mixes were prepared using different percentages of 0, 5, 10, 15, 20 and 25 RHA. The concrete was mixed, placed and compacted in three layers. The samples were remolded after 24 hours and kept in a curing tank for 3, 7 and 14 days as required

3. Slump Cone Test



Workability of steel reinforced concrete mixes were tested by slum cone test. The result of that shown in fig. 1.The slump value shows gradual increase and decreased as the percentage of Rice Husk Ash (RHA) increases. From above graph degree of workability of most of the samples lies in between 50 to 90 mm that means the degree of workability is medium as per standard criteria

The slumped concrete takes various shapes, and according to the profile of slumped concrete, the slump is termed as true slump, shear slump and collapse slump. If a shear or collapse slump is achieved, a fresh sample should be taken and the test repeated. A collapse slump is an indication that the mix is too wet.

4. RESULT ANALYSIS

Sr. No.	Cement	%RHA	Compressive strength (N/mm^2)		
			3 Days	7 Days	14 Days
1	100 %	0 %	11.11	17.36	25
2	95 %	5 %	8.44	18.22	22.2
3	90 %	10 %	14.14	20	30.13
4	85 %	15 %	9.82	14.25	15.18
5	80 %	20 %	6.93	8.92	10.06
6	75 %	25 %	4.35	6.32	9.70

Figure 2: Effect of RHA on 3, 7 & 14 day's compressive strength

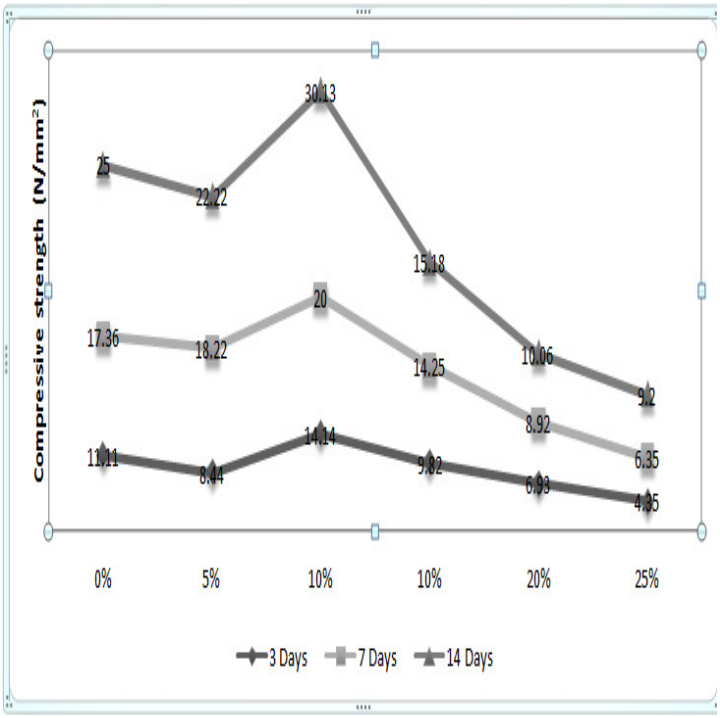


Figure3: Effect of RHA on 3, 7 & 14 days compressive strength

From graph, as the replacement of cement by RHA in concrete increases, the workability of concrete decreases. From the result of compressive strength at 3, 7 and 14 days, it has found that maximum compressive strength is obtained at 10% addition of Rice Husk Ash (RHA) which is greater than nominal concrete (0%) and that is the peak value and it said to be modified concrete.

5. CONCLUTIONS

1. Due to addition of rice Husk ash, concrete becomes cohesive and more plastic and thus permits easier placing and finishing of concrete. It also increases workability of concrete.

2. The bulk density of RHA concrete is reducing with increase in RHA content.

3. As the replacement of cement by RHA in concrete increases, the workability of concrete initially increases and then decreases.

4. From the entire experimental work it is concluded that mix M2 (M0+M10%RHA) is the comparatively best combination among all the mixes, which gives 20.52 % more compression strength over normal concrete for 14 days.

6. REFERENCES

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