A STUDY ON USE OF COWDUNG ASH AND RICE HUSK ASH IN CONCRETE

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Abstract

This paper present the experimental study of CDA and RHA as partial replacement of ordinary portland cement in M:15 mix proportional ratio 1:2:4 is used and tested for consistency limit ,setting time, workability of CDA and RHA with ordinary portland cement .cement was replace with CDA and RHA by weight of 5%,10%,15%,20%,25% respectively in concrete. Compressive strength test was carried out on 150x150x150mm^3 concrete cube after 7, 14, and 28 days curing. It was observed that optimum content of CDA and RHA is 5% at that content maximum compressive strength is achieved. While workability decreases when increasing % of CDA and RHA in concrete and setting time also increases by increasing replacement in cement.

KEYWORDS:- *Cement concrete, Compaction factor, Compressive strength, Consistency Cow dung ash, Rice husk ash, Setting time.*

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INTRODUCTION:-

Developing countries like India, are improving their infrastructure and there is lot of scope in it but there are lot of challenges on their way especially high cost of cement. Consumption of natural raw material by concrete industry is large compared to all other natural raw material like water, sand, gravel and crushed rocks are consumed largely by concrete industry. Out of the total green houses gases emission to the earth atmosphere 7% of it is contributed by global cement industry, due to emissions of poisonous gases like CO2, NO etc by cement production company they have depleted the natural environment, they have caused environment pollution and global warming due to the depletion of ozone layer. Understanding the seriousness of these problem serious steps should be taken in this regard to replace the cement by waste material like cow dung ash and rice husk ash.

Cow dung ash is the undigested residue of plant matter which comes from cows gut. In cow dung nitrogen, calcium, carbon, potassium, and phosphorus have a high content of about 10-15 kg cow dung is produce by a cow in a day, which contain about 28% water in fresh state, 34% of cow dung become ash when it is burned. According to a survey of 2012 there are about 51.2 crore cattle in India. Cow dung is mainly used for cooking food as heat source and also used in biogas plants for making electricity.

India is one of the largest rice producing country and the husk generated during milling is mostly used as a fuel in the boiler.milling of husk from rice is generally done by local people of rural area, this husk can be utilized as a heat source for making food and in industries. When we do milling 76% of weight of paddy is received as rice and the rest 24% of the weight of paddy is received as husk. Asia produce about 770 million tons of husk annually, 200 million tonnes of paddy is produce by India, one ton paddy give 700 kg rice and 300 kg of husk approximately, Every year India produce 48 million tonnes of rice husk.

MATERIAL USED:-

In this study we used CDA and RHA as a replacement of cement in concrete, CDA and RHA shows similar properties as cement in concrete and act as binding material with aggregate.

COW DUNG ASH:-

cow dung was obtained from villages and then it is dried under sun light and then burnt at a temp of 450 to 500^0 C, thus collected is sieved by 300 µm sieve and it is also made sure that the ash stored in a air tied container to protected from absorbing moisture.

Figure : Cow dung ash

RICE HUSK ASH (RHA):-

The rice husk ash used in this study was obtained from gohad in Gwalior this rice husk is burnt under guided temperature of 450 to 600^{0}C. The ash thus collected is sieved through 300 µm sieve in the process to separate large size particles and impurities.

Figure: RHA

CEMENT:-

Cement used in the experimental work is ordinary Portland cement (OPC), 43grade with a specific gravity of 3.15and pass through a 90 µm sieve.

COURSE AGGREGATE:-

Granite after being crushed and passed through 20 mm sieve and retain on 4.75 mm sieve was used as course aggregate for testing purpose, this course aggregate satisfactorily match to the standard specified in IS 383:1970.

A. Specific gravity = 2.14

B. Fineness modulus= 5.612

FINE AGGREGATE:-

Fine aggregate which is used for testing satisfied the required properties of fine aggregate for experimental work the sand conform to zone I as per the IS 383:1970

A. Specific gravity= 2.38

B. Fine modulus= 3.92

WATER:-

The water used for experimental purpose was obtained from underground source through pump, The water thus obtain was free from any impurities including visible and bacterial.

METHOD USED:-

For the preparation of concrete above material are first batched and then mixed in a proper proportion for M15.

BATCHING AND MIXING OF MATERIAL:-

Batching of material was done by weight the percentage of ordinary Portland cement (OPC) by cow dung ash and rice husk ash were 5%, 10%, 15%, 20%, 25%. We use machine mixer for making concrete.

CONCRETE MIX DESIGN:-

The concrete used in this research work was made using binder, sand, crushed stone (gravel). The concrete mix proportion was 1:2:4 by weight and water-cement ratio 0.55

CASTING OF SAMPLE:-

Cement, sand, aggregate, and RHA, CDA was mix, placed and compacted in three layers in a mould for size 150mm. The sample were demolded after 24 hour and were kept in a curing tank for 7,14 and 28 days as required, casting was done under a standard temperature or pressure condition in a MITS concrete lab.

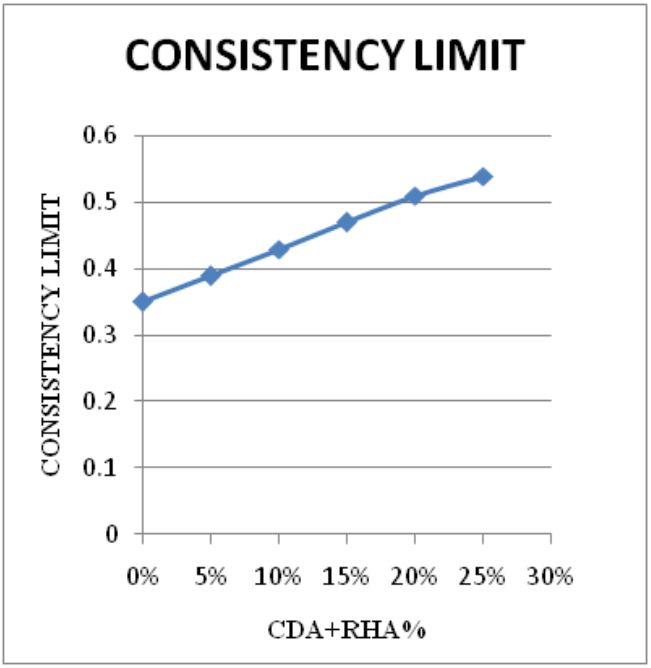
RESULT AND DICUSSION:

CONSISTENCY LIMIT:-

Consistency limit test is done to determine the standard water requirement for setting time, the test was done under standard condition as mention in IS: 4031-1988.the cow dung ash and rice husk ash are mixed with cement paste as a percentage of weight of cement. Table show the results for consistency test, test result show that the more water is required to achieve the desired consistency as the percentage of cow dung ash and rice husk ash increase. Fig 4.1 shows the curve of consistency limit.

TABLE CONSISTENCY LIMIT FOR DIFFERENT MIX RATIO OF CDA, RHA IN CEMENT PASTE

CDA+RHA%	CONSISTENCY LIMIT
0%	0.35
5%	0.39
10%	0.43
15%	0.47
20%	0.51
25%	0.54

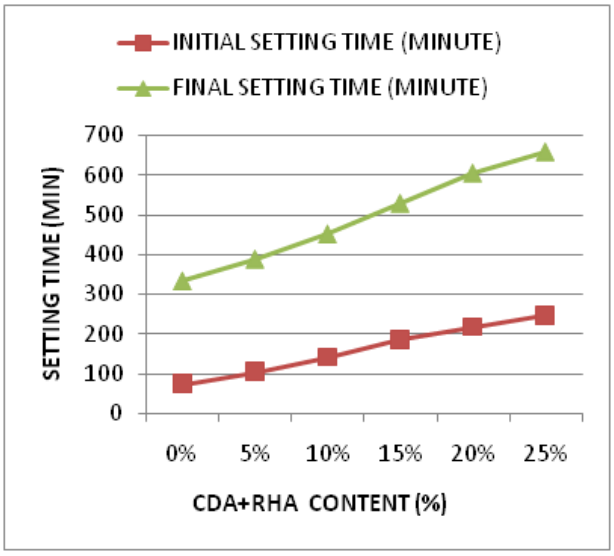


SETTING TIME:-

Calculation of the initial and final setting time is done as per IS 4031(PART 5)-1988, initial and final setting time is determine for different percentage of CDA and RHA by adding it to cement paste, water equivalent to 0.85%of consistency limit each for 5%,10%,15%,20%,25% of CDA and RHA for used .Result show that as the percentage of CDA and RHA increase initial and final setting time also increase, this show that addition of CDA and RHA causes retardation of setting time blended cement paste. This type of admixture can be used as retarding agent for a concrete.fig 4.2 show the relation of initial and final setting time with different percentage of CDA and RHA cement paste.

TABLE SETTING TIME OF DIFFERENT CDA, RHA MIX RATIO

CDA+RHA%	INITIAL SETTING TIME (MINUTE)	FINAL SETTING TIME (MINUTE)
0%	74	261
5%	105	285
10%	142	311
15%	186	344
20%	217	389
25%	247	412

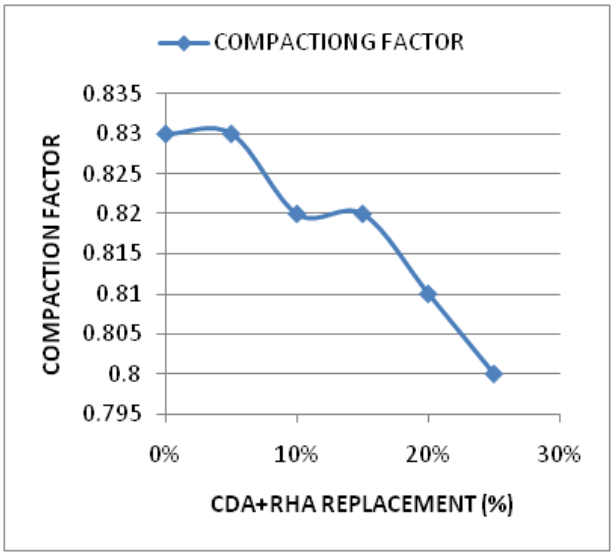


WORKABILITY:-

workability is determine using compaction factor test as per IS: 1199-1959.result show that the compacting factor value decreases as the CDA and RHA replacement increases, it also show that the concrete become less workable due to increase amount of silica present in mix, required more water to make the mix workable. This type of concrete is used where

COMPACTION FACTOR VALUE OF CDA+RHA CONCRETE

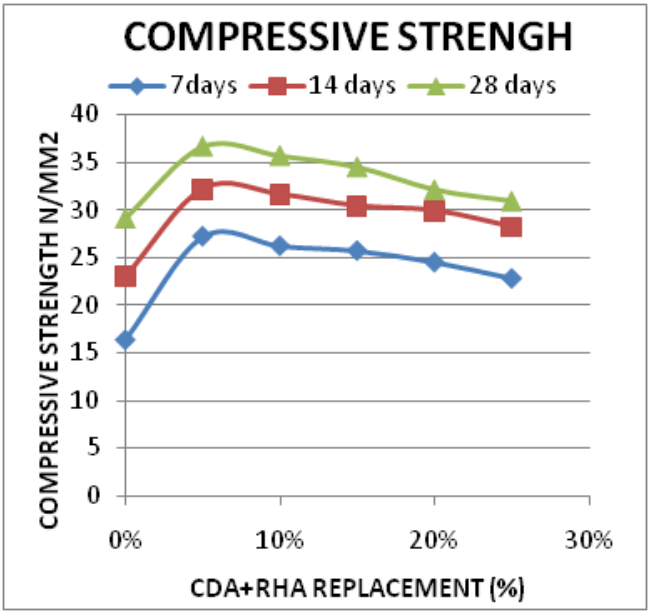
REPLACEMENT OF RHA +CDA %	COMPACTIONG FACTOR
0%	0.83
5%	0.83
10%	0.82
15%	0.82
20%	0.81
25%	0.80



COMPRESSIVE STRENGTH TEST ON CONCRETE CUBE:-

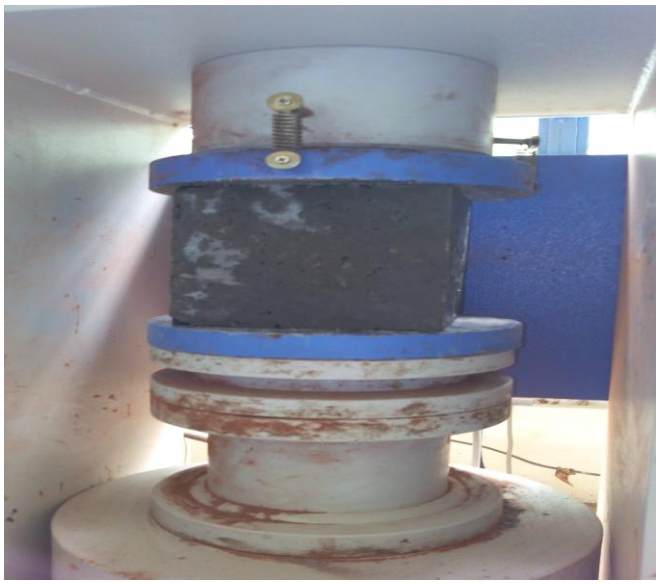
The result of the compressive strength test on concrete cube as shown in table and fig.

CDA+RHA REPLACEMENT %	COMPRESSIVE STRENGTH (N/MM^2)		
	7days	14 days	28 days
0%	16.4	23.0	29.1
5%	27.2	32.2	36.7
10%	26.2	31.6	35.7
15%	25.7	30.4	34.5
20%	24.5	29.9	32.1
25%	22.8	28.2	30.9



COMPRESSIVE STRENGH:-

The compressive strength of cube is calculated as per IS: 456-2000. By adding various percentages of CDA+RHA to cement the strength of concrete is decreases as the percentage of ash increases. The compressive strength also increases as the number of days of curing increases for each percentage of CDA+RHA replacement. The strength achieved at different ages of 7, 14, 28 days for control concrete is shown in table 4.4. It is clear that with time strength of concrete increase .The rate of increase of strength is higher at curing period up to 28 days. The result shows that optimum content of cement replacement is 5% and max strength nearly 37 mpa is achieved for 28 days curing, fig 4.4 shows the compressive strength behaviour of concrete each for 7, 14, 28, days curing.



CONCLUSION:

1. This paper mainly highlights the significance and necessity of consumption of the waste material for manufacturing of sustainable concrete for construction.
2. These materials are locally available and they can also reduce the cost of producing concrete
3. It was observed that CDA and RHA with admixtures and plasticizers can be used for increasing the workability and strength of concrete with partial replacement of cement.
4. CDA and RHA concrete will have perform better in long term as compared to control concrete.
5. The use of CDA and RHA offer lightness of weight and low thermal conductivity in concrete.
6. The optimum addition of CDA +RHA as partial replacement for cement is in the range of0-25%.
7. Compressive strength of concrete cube increase by 30% increase by adding 5%of CDA and RHA.
8. Compressive strength of concrete cube increases by increasing days of curing.
9. The workability of concrete had been found to be decrease with increase of CDA+RHA in concrete.
10. Maximum strength is attained at 5% after that strength starts decreasing thus the optimum content is 5%.

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