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INFLUENCE ON STRENGTH CHARACTERISTICS OF CONCRETE USING WASTE MATERIAL

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ABSTRACT: The consumption of cement in concrete industries has been increasing day by bay to fulfill thepressing needs of infrastructure due to growing population, industrialization and urbanization.The production of cement poses environmental problems due to emission of gaseous pollutants. Huge amount of industrial waste like rice husk ash generation have been causing waste disposal problems. Cow dung is used as fuel for the domestic purpose, which generate solid waste ash. In this study, an attempt was made to replace the cement using rice husk ash and cow dung ash with 10 % of brick aggregate instead of fresh aggregate.Different cube of M25 grade mix is made to check strength criteria. These sets were preparedusing different proportion of cement, rice husk and cow dung ash with brick aggregate. These sets were preparedusing different proportions of cement, fly ash and cow dung ash. Then the cubes were cured forthe period of 7 days, 14 days, 21 days and 28 days. The compressive strengths of all the cubeswere determined using a Universal Testing Machine. Compressive strength of different cubes are different as per the percentage vary of replaced material in each cube. The study revealed that flyash and cow dung ash with brick aggregate can be used as partial replacement of cement and aggregate in concrete. There are someother test we have done in present study like workability, initial setting and finalsetting time and consistency etc.

I. INTRODUCTION

Concrete is a composite material composed of coarse aggregate bonded together with a fluid cement which hardens over time. Most concretes used are lime-based concretes such as Portland cement concrete or concretes made with other hydraulic cements, such as cemented roads, However, road surfaces are also a type of concrete, asphalt concrete, where the cement material is bitumen, and polymer concretes are sometimes used where the cementing material is a polymer. In Portland cement concrete (and other hydraulic cement concretes), when the aggregate is mixed together with the dry cement and water, they form a fluid mass that is easily molded into shape. The cement reacts chemically with the water and other ingredients to form a hard matrix which binds all the materials together into a durable stone-like material that has many uses. Often, additives (such as pozzolans or superplasticizers) are included in the mixture to improve the physical properties of the wet mix or the finished material. Most concrete is poured with reinforcing materials (such as rebar) embedded to provide tensile strength, yielding reinforced concrete.

1) Cement

Portland cement is by far the most common type of cement in general use around the world. This cement is made by heating limestone (calcium carbonate) with other materials (such as clay) to 1450 °C in a kiln, in a process known as calcination, whereby a molecule ofcarbon dioxide is liberated from the calcium carbonate to form calcium oxide, or quicklime, which is then blended with the other materials that have been included in the mix to form calcium silicates and other cementitious compounds. The resulting hard substance, called 'clinker', is then ground with a small amount of gypsum into a powder to make 'Ordinary Portland Cement', the most commonly used type of cement (often referred to as OPC). Portland cement is a basic ingredient of concrete, mortar and most non-specialty grout. The most common use for Portland cement is in the production of concrete. Concrete is a composite material consisting of aggregate (gravel and sand), cement, and water. As a construction material, concrete can be cast in almost any shape desired, and once hardened, can become a structural (load bearing) element. Portland cement may be grey or white. Portland pozzolanic cement is manufactured by the inter grading of OPC clinkers with 10 to 25 percent of pozzolanic material. A pozzolanic material is essentially a silicious or aluminious material, which itself possessing no cementitous properties, and in finely divided for min the presence of water reacts with calcium hydroxide, liberated in the hydration process at ordinary temperature, to form compound possessing cementious properties. The pozzolanic material generally used for manufactured of PPC are calcined clay or fly ash. Portland pozollana cement produces less heat of hydration and offers greater resistance to the attack of aggressive water than Ordinary Portland Cement (Shetty, 1982).

2) Rice husk

Rice milling generates a by-product known as husk. This surrounds the paddy grain. During the milling of paddy about 78 % of weight is received as rice, broken rice and bran. The rest 22 % of the weight of paddy is received as husk. This husk is used as fuel in the rice mills to generate steam for the parboiling process. This husk contains about 75 % organic volatile matter which burns up and the balance 25 % of the weight of this husk is converted into ash during the firing process, which is known as rice husk ash (RHA). Rice husk was burnt approximately 48 hours under uncontrolled combustion process. The burning temperature was within the range of 600 to 850 degrees. The ash obtained was ground in a ball mill for 30 minutes and its color was seen as grey. This RHA in turn contains around 85%-90% amorphous silica. So for every 1000 kg of paddy milled, about 220 kg (22%) of husk is produced, and when this husk is burnt in the boilers, about 55 kg (25%) of RHA is generated. 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. Physical properties and chemical composition of RHA is given in Table 1.1 and 1.2.Table 1.1: Physical Properties of Rice Husk Ash

Physical State	Solid – Non Hazardous
Appearance	Very fine powder
Particle Size	25 microns – mean
Color	Grey
Odour	Odourless

Table 1.2: Chemical Properties of Rice Husk Ash

SiO_2	93.80%
Al_2O_3	0.74%
Fe_2O_3	0.30%
TiO_2	0.10%
CaO	0.89%
MgO	0.32%
Na_2O	0.28%
K_2O	0.12%
Loi	3.37%

Applicatins of rice husk ash in different areas

On the basis of the characteristics features, the rice husk ash can be used in different areas like;

- Civil Engineering
- RHA in Steel industry
- RHA in Ceramic and refractory industry
- RHA as Silica Source
- RHA in cement and construction industries
- As a Fuel in Power Plant
- Insulating fire brick using RHA
- Production of sodium silicate films

3) Cow dung ash

The cow dung ash is the undigested residue of plant matter which comes from cows gut, which is dried in sunlight in the form of cake. In many parts of the developing world, caked and dried cow dung is used as fuel. According to a survey of 2012 there are about 51.2 crore cattle in India.The fuel ash is obtained in the form of black color. Dung can be used to produce biogas to generate electricity and heat. Cow dung is an optional ingredient in the manufacture of mud brick housing. Cow dung is a nitrogen rich material, potassium, phosphorous and calcium 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. The use of cow dung ash as supplementary cementing material in mortar and concrete (Rayaprolu and Raju, 2012).

Chemical composition of cow dung ash

Cow dung is a nitrogen rich material, potassium, phosphorous and calcium. (Smith and Wheeler, 1979). Cow dung has a relatively high carbon to the nitrogen ratio. Chemical composition of the cow dung revealed that while there was no difference in the organic matter (OM), nitrogen (N) and manganese (Mn).

Content	Percentage
calcium(Ca),	10.8
phosphorus (P),	8.0
zinc (Zn)	84.1
copper (Cu)	21.7

Physical properties of cow dung:

a) It is bulky

b) It has large ash content

c) It has low volatile content after burning

d) Carbon content is low

5) Aggregate

The aggregate for load bearing concrete should be hard, stone non-porous, free from friable, elongated and laminated particles and should be suitable for purposed required. Stones absorbing more than 10% of their weight of water after 24 hours immersion are considered porous. Porous materials corrode reinforcement. A friable aggregate will produce a concrete of similar nature.Elongated or laminated particals are weak in shear. Stones granite,quartzite,trap and blast and those with rough non-glossy surface are considered best. All sand-stone tend to be porous.Aggregate must be clean and free from clay, loam, vegetable and other organic material. Clay or dirt coating on aggregate prevents adhesion of cement to aggregate, slow down the setting and hardening of the cement and reduce the strength of the concrete (khanna, 1994).

5) Brick aggregate

This often a good material suitable for plain concrete works but not for reinforced concrete due to its porous nature.Great care should be exercised in choosing bricks contain sulphur and un-slaked lime.Brick aggregate should be saturated with water before use to avoid absorption of the mixing water which is necessary for the hydration of cement and for the setting and hardening of the concrete. Coarse aggregate of porous nature with a percentage increase of over 10% for cement concrete and 25% for lime concrete on dry weight, after immersion in water for 24 hours, should not be used. Brick aggregate is more fire resistant then broken stone but is not suitable for water-proof construction. In locating where good quality stone is not available, hard-burnt varieties and of non-porous nature of brick ballast may be used for reinforced work where stresses are not high(khanna, 1994).

Objective

(i) To replace cement with rice husk ash and cow dung ash in different proportions during the preparation ofconcrete cubes.

(ii) To determine the compressive strengths of concrete based on rice husk, cow dung ash and brick aggregate cubes to assess its suitability.

(iii) To determine various property of cement by replacing it with rice husk ash and cow dung ash.

II. METHODOLOGY

In this study, rice husk ash and cow dung ash were used for preparing concrete cubes by replacing different amount of cement percentage. The cement was replaced by 25%, 50%, and 75% with rice husk ash with cow dung ash (equal amount) and percentage of brick aggregate is 10%. In concrete, brick aggregate was used in replace with aggregates was used. The materials used for the preparation of concrete cubes are as under.

1. Cement
2. Sand
3. Aggregate
4. Brick aggregate
5. Rice husk ash
6. Cow dung
7. Water

Material collection

1)Cement: Ordinary Portland cement (OPC) is by far the most important type of cement. The OPC was classified into three grades namely, 33 grade, 43 grade and 53 grade depending upon the strength of the cement at 28 days when tested as per IS 4031-1988. Ordinary Portland cement of 53 grade of ULTRATECH cement is used in this experimental work and collected from nearby market.

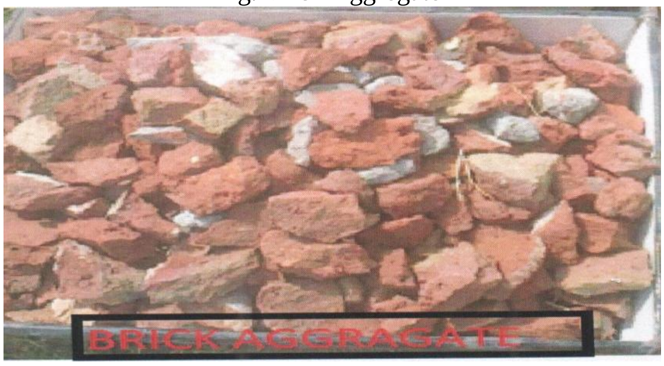
Fig. Cement

2) Aggregate: It should be hard, strong, dense, durable and clean. It must be free from vein, adherent coatings and injurious amount of disintegrated pieces, alkalis, vegetable matters and other deleterious substances. It should be roughly cubical in shape. Flaky pieces should be avoided. It should confirm to IS 2838(I). Collected from nearby construction

Fig. Fresh aggregate

3) Brick aggregate: Brick aggregate was collected from nearby construction. After collection it was broken into small pieces as per the requirement

Fig. Brick Aggregate



4) Rice Husk ash: Rice milling generates a by-product known as husk. Rice ash was taken from rice mill of Ganderbal Kashmir and sieved with a size of 75µm.

Fig. Rice Husk Ash

4) Cow dung ash: The cow dung ash is the undigested residue of plant matter which comes from cows gut, which is dried in sunlight in the form of cake. It was collected from near by Gaushala Ganderbal Kashmir

5) Water: Water should be free from acids, oils, alkalies, vegetables or other organic impurities. Water has two functions in a concrete mix. Firstly, it reacts chemically with the cement to form the cement paste in which the inert aggregates are held in suspension until the cement paste has hardened. Secondly, it serves as a lubricant in the mixture of fine aggregates and cement. Collected from tank of concrete lab.

Test Methodology

1)Tests on cement with partial replacement of waste material

Tests on Portland pozzolona cement with rice husk ash and dung ash as an additive in various percentages are:

- Consistency test
- Soundness test
- Setting time test
- Specific gravity test

Four Samples of0, 25, 50 and 75% of rice husk ash and cow dung ash in equal amount is used as partial replacement of cement is prepared as shown below:

Sample Composition

Sr. No.	Sample Name	% weight of cement in sample	% weight of Rice husk ash and dung ash in sample
1	SAMPLE 1	100	0
2	SAMPLE 1	90	12.5 RHA 12.5 CDA
3	SAMPLE 1	80	25 RHA 25 CDA
4	SAMPLE 1	70	37.5 RHA 37.5 CDA

Consistency Test

The basic aim is to find out the water content required to produce a cement paste of standard consistency as specified by the IS: 4031 (Part 4) – 1988. The principle is that standard consistency of cement is that consistency at which the Vicat plunger penetrates to a point 5-7mm from the bottom of Vicat mould.

Apparatus- Vicat Apparatus Conforming to IS: 5513-1976, Balance of capacity 1Kg and sensitivity to 1gram, Gauging trowel conforming to IS: 10086-1982.

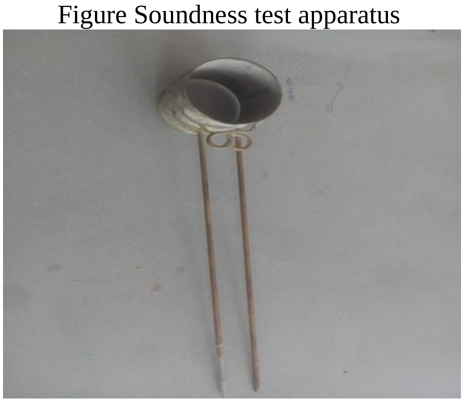
Figure Vicat apparatus

Soundness of Specimens

Cement of good quality does not contain the impurities like free lime, magnesia and sulphates, so this should be checked before use. When it contains the impurities named above, it can expand after reacted with the water, which will result in the unwanted results like, cracking, unwanted expansion of the dimensions and lower strength.

Le-Ch-atelier's Apparatus is the standard apparatus prescribed as per IS: 5514 -1969 to check the presence of the impurities in cement. Cement is said to be sound when the expansion is below 10 mm. Apparatus used are Le- Ch-atelier's Apparatus, Weighing balance, measuring cylinder, trowel, mixing pans heater, thermometer. Test is performed as per IS: 4031 (Part - 1) – 1988.

Figure Soundness test apparatus



Initial and Final Setting Time

Initial setting time is that time period between the time water is added to cement and time at which 1 mm square section needle fails to penetrate the cement paste, placed in the Vicat mould 5 mm to 7 mm from the bottom of the mould.

Final setting time is that time period between the time water is added to cement and the time at which 1 mm needle makes an impression on the paste in the mould but 5 mm attachment does not make any impression. The initial and final setting times of cement is calculated as per IS: 4031 (Part 5) 1988. Apparatus used are Vicat apparatus conforming to IS: 5513-1976, Balance of capacity 1kg and sensitivity 1 gram and Gauging trowel conforming to IS: 10086-1982.

Initial Setting Time

Immediately place the test block with the non-porous resting plate, under the rod bearing the initial setting needle. Lower the needle and quickly release allowing it to penetrate in to the mould. In the beginning the needle will completely pierce the mould. Repeat this procedure until the needle fails to pierce the mould for 5 +0.5mm. Record the period elapsed between the times of adding water to the cement to the time when needle fails to pierce the mould by 5 +0.5mm as the initial setting time.

Final Setting Time

Replace the needle of the vicat apparatus by the needle with an annular ring. Lower the needle and quickly release. Repeat the process until the annular ring makes an impression on the mould. Record the period elapsed between the time of adding water to the cement to the time when the annular ring fails to make the impression on the mould as the final setting time. Report the initial setting time and final setting time in minutes.

Tests on Concrete with partial replacement of cement by rice husk ash, cow dung ash with brick aggregate in different percentage

Tests on concrete with rice husk, cow dung ash with brick aggregate as an additive in various percentages are:

- Slump test
- Compressive strength test

Four Samples of 0, 25, 50 and 75 % of rice husk ash dung ashin equal amount with brick aggregateof 10 % is used as partial replacement of cement and aggregate is prepared. In this research, the concrete will mixed using concrete mixer and for each mixes, cubes will cast. The sample will be cured until the day of testing. The cubes and beams will be tested at ages of 7, 14, 21 and 28 day to study the development of the compressive strength.

Workability of Concrete Specimens

Workability is the property of freshly mixed concrete that determines the ease with which it can be properly mixed, placed, consolidated and finished without segregation. Workability depends on water content, aggregate, cement content and age and can be modified by adding chemical admixtures. The workability of fresh concrete was measured by means of the conventional slump test as per IS: 1199-1989. Before the fresh concrete was cast into moulds, the slump value of the fresh concrete was measured using slump cone.Workability is also tested at each proportion to determine the ease with which glass powder can be used in concrete.

Slump Test

- The workability (ease of mixing, transporting, placing and compaction) of concrete depends on wetness of concrete (consistency) i.e., water content as well as proportions of fine aggregate to coarse aggregate and aggregate to cement ratio.
- The slump test which is a field test is only an approximate measure of consistency defining ranges of consistency for most practical works. This test is performed by filling fresh concrete in the mould and measure the settlement i.e., slump.

Procedure:

The test is carried out using a metal mould in the shape of a conical frustum known as a slump cone that is open at both ends and has an attached handle. The tool typically has an internal diameter of 100 mm at the top and of 200 mm at the bottom with a height of 300 mm. The cone is placed on a hard non-absorbent and plane surface. This cone is filled with fresh concrete in three stages. Each time, each layer is tamped 25 times with a 600 mm long bullet-nosed metal rod measuring 16 mm in diameter. At the end of the third stage, the concrete is struck off flush with the top of the mould. The mould is carefully lifted vertically upwards with twisting motion, so as not to disturb the concrete cone.

The concrete then subsides. This subsidence is termed as slump, and is measured to the nearest 5 mm.

III. RESULTS AND DISCUSSION

Separate set of concrete cube samples were prepared using coarse aggregate as rock and brick materials. Cement was replaced by Rice husk ash (R.H.A) and cow dung ash (C.D.A.) in different proportions. Local river sand and potable water was used during preparation of concrete cubes. The cubes were cured for the period of 7 days, 14 days, 21 days and 28 days. Then the compressive strength of cured samples was determined using Universal Testing Machine.

Calculation for determining compressive strength:

Area of the concrete cubes:- 150×150mm = 22500mm2

Take the reading of load at failure point of block (KN) and convert it into Newton (N)

Compressive strength = load/area = N/mm2

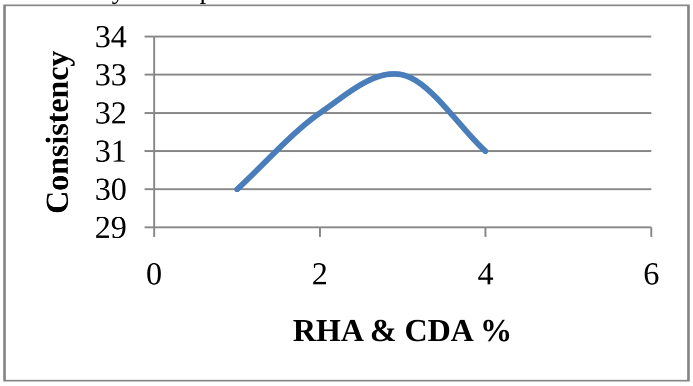
Consistency Test Results-

Normal consistency tests, for the blended cements, are conducted, by Vicat apparatus, to observe the changes in water requirement of pastes due to the presence of rice husk ash and dung ash. Test result on cement paste replaced with rice husk ash and dung ash is show in table given below. In present study no. of sample casted are big in number so it is decided to nomenclature each sample with particular code. As the no. of sample is more so we denote MX0, MX1 up to MX4 to sample. MX0 means rice husk ash (RHA) 0% & cow dung ash (CDA) 0% , MX1 means RHA 12.5% & CDA 12.5%.

Consistency of Rice Husk & Dung ash Based Cement Pastes

S. No.	Code	Consistency (%)
1	MX 0	30
2	MX 1	32
3	MX 2	33
4	MX 3	31

From the above table we find there is variation on cement paste up to 75% of addition of rice husk ash and dung ash and after more addition there is no change in consistency. The above change in consistency at initial stage is due the particle size of rice husk ash and dung ash. The particle size of rice husk ash and dung ash is less as compare to cement so it fill maximum voids of the paste, which help in increase in consistency of the paste.



Consistency graph

Initial and Final Setting Time of Rice Husk Ash and Dung Ash Based

Cement Pastes

S. No.	Code	Initial setting Time (minutes)	Final Setting Time (minutes)
1	MX 0	40	262
2	MX 1	63	258
3	MX 2	84	250
4	MX 3	81	246

The above table shows a little variation in initial and final setting time of cement. This variation is up to 75% of rice husk ash and dung ash and after furthest addition of rice husk ash and dung ash there is decrement in initial and final setting time of cement. The above change in final setting time is due to the particle size of rice husk ash and dung ash.

The particle size of rice husk ash and dung ash is less as compare to cement, it help to make the cement paste less permeable which further decrease the setting time of paste.

Soundness of cement paste with rice husk ash and dung ash

S. No.	Code	Soundness (mm)
1	MX 0	1 mm
2	MX 1	1 mm
3	MX 2	1 mm
4	MX 3	0.5 mm

The above result shows no change in soundness in cement paste due to the particle size of rice husk ash and dung ash till 75 % addition of rice husk and dung ash. Due to less particle size of rice husk ash and dung ash it help to make the cement paste less permeable which further decrease the setting time of paste.

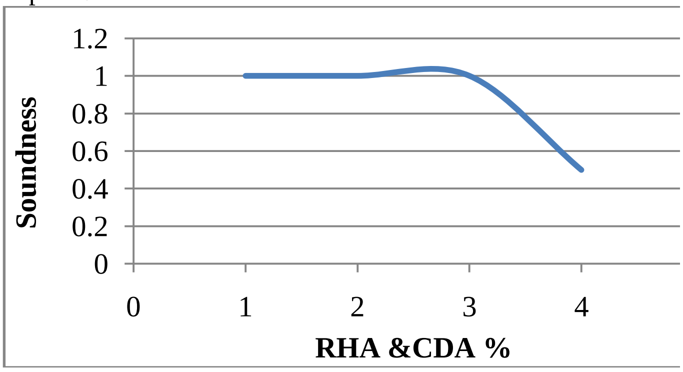


Fig. Soundness test graph

Specific Gravity test:-

The ratio of the density of a substance to a density of a standard substance, usually water for a liquid or solid and air for gas. Specific gravity of cement is depending upon the particle size of cement. The test is done as per IS: 2386. The test result calculations are done given below.

Table: Specific Gravity of Rice Husk Ash and Dung Ash

Types of Soil/ Admixture	Specific Gravity
Cement	3.07
RHA	2.02
Dung Ash	2.18

From the above calculation we find the specific gravity of rice husk ash and dung ash is less then specific gravity of cement. All these value are in permissible limit.

Result of compressive strength

The result of compressive strength at different curing period is given in the following tables:

Compressive strengths of cubes at 28 days curing

	Rock Aggregate		Brick Aggregate	
Block no.	Load (KN)	Strength(N/mm^2)	Load (KN)	Strength(N/mm^2)
1	222	9.58	180	7.80
2	212	9.22	170	7.35
3	190	8.25	152	6.55
4	178	7.94	126	5.41

Compressive strengths of cubes at 21 days curing

	Rock Aggregate		Brick Aggregate	
Block no.	Load (KN)	Strength(N/mm^2)	Load (KN)	Strength(N/mm^2)
1	210	9.13	172	7.45
2	203	8.82	162	6.99
3	175	7.58	144	6.20
4	158	6.82	118	5.04

Table Compressive strengths of cubes at 14 days curing

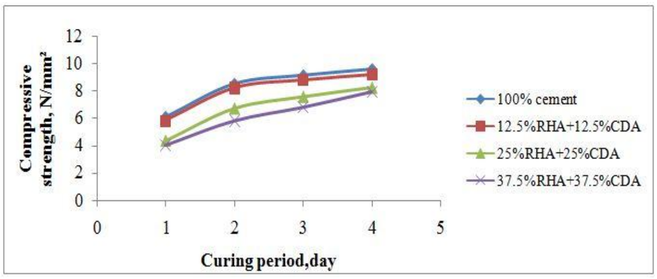
	Rock Aggregate		Brick Aggregate	
Block no.	Load (KN)	Strength(N/mm^2)	Load (KN)	Strength(N/mm^2)
1	196	8.51	166	7.13
2	190	8.24	152	6.55
3	156	6.73	136	5.84
4	136	5.84	110	4.70

Table Compressive strengths of cubes at 7 days curing

	Rock Aggregate		Brick Aggregate	
Block no.	Load (KN)	Strength(N/mm^2)	Load (KN)	Strength(N/mm^2)
1	140	6.09	120	5.14
2	136	5.83	105	4.47
3	102	4.37	92	3.89
4	96	4.07	78	3.29

Compressive strength of fresh aggregate cubes

Compressive strength of concrete cubes increased as the curing periods increased It was observed that as the percentage of rice husk ash and cow dung increased, the strength decreased even after increase in curing period. The compressive strength of cubes prepared only by the cement was the highest at 28 days of curing. There were no significant differences in the strength of concrete prepared only by the cement and by 12.5% of rice husk ash and 12.5% of cow dung ash on any day of curing indicating that replacing cement by rice husk ash with cow dung ash up to 12.5 % is suitable. Ojedokun et al. (2014) prepared the concrete cubes by replacing the cement with cow dung ash by weight (10%, 20% and 30%) and cured for the periods of 7, 14, 21 and 28 days. Based on the test of compressive strength they are recommended using the cow dung ash in concrete up to 12.5%.

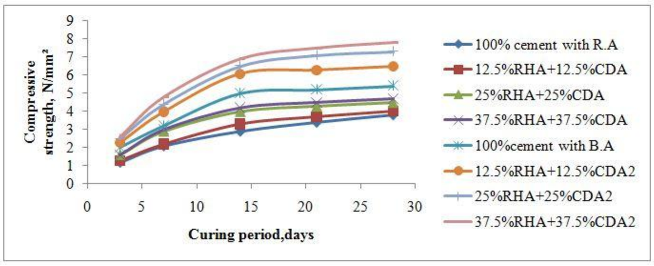


Compressive strength at different curing periods for fresh aggregate

Comparison of compressive strength of fresh and brick aggregate

The comparison of compressive strengths of cubes of rock aggregate (R.A.) and brick aggregate (B.A.) with curing period were made (Fig.4.4). Compressive strength of cubes prepared with rock aggregate at 100% cement and 25% rice husk ash with cow dung ash are higher than the strength of brick aggregate at all the curing periods.

From the figure, it is observed that strength of cubes of brick aggregate at 100% cement for the curing period of 7 days are higher than the strength of rock aggregate. The cubes strengths of brick aggregate prepared with 12.5 % rice huskash with 12.5 % cow dung ash are higher than that of rock aggregate at the curing period of 7 days, 14 days and 21 days. The physical properties of materials might have shown variations in strengths at different curing periods.



Comparison of compressive strength of fresh and brick aggregate

Workability Test Result

Workability is affected by every component of concrete and essentially every condition under which concrete is made. A list of factors include the properties and the amount of cement, grading, shape, angularity and surface texture of fine and coarse aggregates, proportion of aggregates, amount of air entrained, type and amount of pozzolana, type and amount of chemical admixture, temperature of the concrete, mixing time and method, and time since water and cement are in contact. These factors interact so that changing the proportion of one component to produce a specific characteristic requires that other factors be adjusted to maintain workability In this experiment slump of all mixes with constant water to cementious material (w/cm) ratio for the same group were measured to get information about workability changes due to the addition of rice husk ash and cow dung ash with brick aggregate.

Slump Test Result

S/No.	Mix Designation	Percentage of RHA	Percentage of CDA	Slump(mm)
1	MX0	0	0	70
2	MX1	12.5	12.5	65
3	MX2	25	25	62
4	MX3	37.6	37.5	58

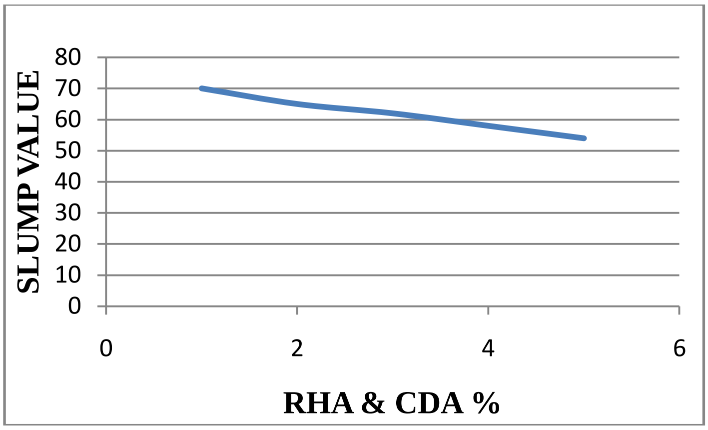


Fig. Graph for Slump Value

CONCLUSIONS

The cubes prepared with fresh aggregate and cement showed the highest compressive strength at 28 days of curing but no significant difference in compressive strengths of cubes prepare by cement and 12.5 % of rice husk ash 12.5 % cow dung ash were observed on any day of curing indicating that cement can be replaced by 25% of these materials.

The compressive strength of cubes prepared by cement and brick aggregate was the highest at 28 days of curing. The differences in compressive strengths of cubes prepared by cement and 12.5 % of rice husk ash with 12.5 % cow dung ash did not show significant differences at 21 days and 28 days of curing indicating that cement can be replaced by 25 % of these materials along with the brick aggregate.

The comparison of strengths of cubes prepared by fresh and brick aggregate were made. It was found that fresh aggregate had higher strength at 100% cement and 12.5 % rice husk ash with 12.5 % cow dung ash than the strength of brick aggregate at all the curing periods. The strength of cubes of brick aggregate at 100% cement for the curing period at 7 days and 14 days are higher than the strength of fresh aggregate. The cubes strengths of brick aggregate prepared with 12.5 % rice husk ash plus 12.5 % cow dung ash are higher that fresh aggregate at the curing period of 7 days, 14 days and 21 days. The study revealed that rice husk and cow dung ash being waste materials can be utilized for the concrete preparation. The study also suggests that utilization of waste materials in concrete production will not only save the cement used in concrete industry but will also protect the environment by controlling the emission of CO2 from the cement industry as well as providing a technique for the safe disposal of solid wastes such as rice husk and cow dung ash.

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