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EXPERIMENTAL STUDY ON PROPERTIES OF CEMENT MORTAR USING CHICKEN FEATHERES AND EGGSHELL POWDER

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Abstract

The use of waste materials in buildings is an innovative approach towards sustainability. In today's rapid world the natural and biochemical composites have been become very innovative, ecofriendly and economic. The objective of this paper is to study the properties and behavior of cement mortar using poultry waste (as chicken features and eggshells in powdered form). The poultry waste obtained by poultry forms is studied for mechanical property and their suitability as binders. The project initiative is to study the effect of poultry waste blended cement mortar on the strength of mortar and to reduce the emission of CO2. In this research, poultry waste is used in concrete as a partial cement replacement since it has high silica, calcium and fibrous content and other comparable cement constituents. Mechanical properties such as compression strength and split tensile strength of M20 grade concrete is tested for 5% replacement of cement by poultry waste in the concrete and it is compared with the strength of M20 grade conventional concrete. Many scientist and researchers are working on it, and in this

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we have been pileup the data for the properties of composites. And the advantages of making different poultry waste based composite for industrial purpose and the use of poultry waste as an additional material and as a particulate. And at the end we will tell us about that how it is useful in today's technology which will give an ecofriendly and economic result.

1. Introduction

Cement mortar should be made out of cement, sand, and water, and it should be carefully mixed and of the right consistency to provide a dense, homogeneous lining that sticks securely to the material surface. The lining should be cured in such a way that it produces a firm and durable hydrated mortar liner. Mortar is applied in the form of a thick paste that hardens as it cures. It prevents air and moisture from entering a structure by creating a tight seal between bricks.

Cement. Cement is a generic adhesive substance that comes in a variety of forms, but in a merrowed sense, cement refers to the binding materials used in building and civil engineering construction. Cement of this type is pulverised powdered and set to a hard mass when combined with water. A grey powder that hardens when combined with water and let to dry. It is used in construction to adhere bricks or other materials.

Mortar. Mortar is a combination of cement, sand, and water that is used in construction to glue bricks and stones together. Mortar is a substance used in the construction of buildings to glue brick, tile, or concrete blocks together. When correctly placed, mortar hardens into a stone-like mass that evenly distributes the structure's load throughout the bonding surface.

Poultry waste: Poultry or broiler waste is a mixture of chicken excreta, spilled feed, feathers and material used as bedding in poultry i.e., rice husk.

There are also some poultry waste materials are as follows:

1. Chicken feather

2. Egg Shell

1.1 Chicken feather. Chicken feathers are waste products of the poultry industry Jagadeesh gouda and Ishwar Prasad (2014) gave about the mixture of bird's feather with composite. Reddy and Yang (2014) gave about the jute fiber. Sekhar and Rao (2015) gave about the eco- friendly composites contain

chicken feathers as matrix and jute fibers as reinforcement. Tones of kilograms of waste feathers are taken out from industry each year by commercial poultry processing plants which is coming in big issues. Chinta and Yadav (2013) are our researchers which come through this issue and gave a new idea for not waste this feather (Giraldo and Moreno., [5]). Different kinds of feathers mostly available are shown in figure 2. Fraser and Parry [2] are also the other scientist who proposed the birds feather. Sekhar and Raogave.

Figure 1.1. Chicken Feather.

1.2 Egg shells: The egg shell is a thin outer layer of a hen egg. Hamilton it al. (1982) said about the albumen (which is a middle one part) is protected by two shell layers (outer layer and inner layer) and then the eggshell. The chicken eggshell is up to 95% calcium carbonate crystals (Caco3), which is white in colour. And it is stabilized by a protein matrix (Texier T. 2010). The outer shell colour of an egg is telling us about the breed of hen that produces the egg. White hens are produces the white eggs and brown hens are produce the brown eggs. We can use eggshell in many ways-a. First we should have dried up the egg shell and then in the mortar crush it and make in it as a powder form and then mix the powder in with an egg white part and it can be used for a beneficial, skin-tightening facial. Allow the face mask to dry before it will wet. Petersen and Parkinson (1983) suggest about the improve egg shell quality. b. This is used as a gardener fertilizer. In this first crush the egg shell and before planting the plant sprinkle around it and then put the plant over there and after oneweek sprinkle other egg shell. Because it is rich in minerals which will make your garden thrive said by the Fromm et al. [3] International Conference on Mechanical Industrial System Engineering (ICMISE'2018), Graphic Era Deemed to be University, Dehradun, 1st 2nd June'2018. It is also used as a wax candle. Like you take an egg in your breakfast break the egg but do not put the egg shell in to the waste material

take all egg shell and melted wax put in to it and when wax cool down peel of the shell your candle is ready. As you can see in figure 3 and figure 4. Sauter and Petersen (1974) gave about the egg shell quality penetration.

Figure 1.2. Eggshells.

Figure 1.3. Process of making Egg shell powder and mixing it with mortar.

2. Literature Review

1. V. Ashwin et al. (2015) investigated the production of chicken feather fibre reinforced concrete columns in an experimental setting. The traditional steel column is built to the manufacturer's specifications. Cutting the splints of chicken feather culms according to specifications creates the chicken feather fibre reinforced column. The results of compression and axial load tests on a traditional steel column and a chicken feather reinforced column are compared.

2. "Study on the behaviour of chicken feather reinforcement using egg shell powder as aggregate concrete in compression members of various lengths," International journal general of innovation research in engineering and management, volume 3, special issue-1, April-2015. In this study, short

columns of varying lengths were investigated. Columns with replacement egg shell powder with chicken feather reinforcement and columns with replaced course aggregate with still reinforcement were compared to columns with conventional concrete with still reinforcement. With increasing length, the column's ultimate weight bearing capability decreases.

3. Ogunbiyi et al. We conducted a comparative analysis of the strength of chicken feather fibers and reinforcing bars in building construction. The 10mm, 12mm, 16mm, 20mm and 25mm bars are made of high strength mild steel. We have produced chicken feather columns with sizes of 10 mm, 12 mm, 16 mm, 20 mm and 25 mm. Tensile tests are performed on all three test pieces with different diameters. From the results obtained, it can be concluded that chicken feather fibers have very low tensile strength, are susceptible to brittle fracture, and are stressed by a small bearing capacity. It is used as a replacement for partitions and roofs in other parts of lightweight structures, but is not recommended for engineering work.

4. Jigar K. sevalia, Nirav B. siddhpura, Chetan S. agarwal, Deep B. shah、hai。 V. Kapadia, "Study on Chicken Feather Fiber as Reinforcing Bars in Cement Concrete", International Engineering Research and Applications in General, Volume 3, Issue 2, April 2013, p. 11811190. In this study, chicken feather fiber as a reinforcing material for concrete parts. In this study, chicken feather fiber was used as an untreated reinforcement. Based on experimental studies, the following conclusions were drawn.

5. P. Sharma, K. Dhanwantarian, S. Mehta, Chicken Feather Fiber as a Building Material, International Journal of Civil Engineering Research Volume 5, Number 3 (2014), pp. 249 254 Played an important role in human growth. It is used for a variety of everyday purposes, both as wood and as food. It is the backbone of much of the world's rural life and will continue to do so as the population grows. Due to its properties as a high quality building material and the increasing availability of chicken feather fiber in our country, it will be possible to use chicken feather fiber for general construction. It is quality consumption that not only promotes economic development, but also conserves jungle resources and protects our ecological environment as an alternative to timber.

3. Methodology and Experimental Study

These are method for doing this experimental study. We are first collected the resources, We Are Use Composite Material Like Sand, cement aggregate, chicken feather fiber, egg shell powder and water in a grade of M25 and mix the 0.25, 0.50, 0.75, 1.00, 1.25, 1.75 % of Chicken Feather fiber. Now sieve the all composite material and specific gravity test on coarse and fine aggregate, and mix the all material is dry form then fill the cubes and start tamping and doing tamping in a three layers. Casting of cube and cylinder with normal mix design and design mix. Now start the compression test, split tensile test and flexural strength test after initial test 7 days, 14 days and 28 days of curing. All days of compressive test is calculated. Now compare the results of normal mix design with design mix. Concluding the above results and verifying the usage of Chicken Feather as fiber inconcert design. Providing a theoretical report of the project with the Tabulation of the results.

3.1. Materials. The used composite material like sand, cement, aggregate, chicken feather fiber, egg shell powder and water in a grade of M25 and mix the 0.25, 0.50, 0.75, 1.00, 1.25, 1.75 % of Chicken Feather fiber.

3.2 Mix Design. In this study, we used a fiber-reinforced concrete cube with 15 cm x 15 cm x 15 cm chicken wings. Fiber content is used as a variation of each sample. The reinforcement ratio of the test piece is equal to 0.25, 0.50, 0.75, 1.00, 1.25, 1.75%, and the composition of the aggregate is 1 cement. 1 piece of sand; 2 aggregates. Fiber length varies from 25 to 500 mm.

3.3 Casting, Curing and Testing. The properties of the concrete mixture were tested after 7, 14, 28 days for each mixture. Six cubes measuring 15 cm x 15 cm x 15 cm, the cubes were cast and compressed with a vibrator. One or more samples were kept at laboratory ambient temperature for 24 hours. After 24 hours, the sample was placed in water and cured for 28 days. Then calculate the strength of the concrete after 7, 14, and 28 days.

4. Results

4.1 Compressive Strength Test. According to IS:456-2000, Weget calculate the compressive strength test of concrete in conventional PCC after 7days of curing is 16.22N/mm2, 14 days of curing 22.96 N/mm2, and 28 days

of curing is 28.80 N/mm2, And Minimum strength of concrete in 1.50% proportion of CF fiber after 7days of curing 14.49 N/mm2 , 1.50% proportion of CF fiber after 14days of curing 15.99 N/mm2, and 1.50% proportion of CF fiber after 28days of curing 17.50N/mm2. And Maximum strength of concrete in 0.75% of CF fiber after 7days of curing is 23.47N/mm2, 1.00% proportion of CF fiber 14days of curing 28.97N/mm2, and 1.00% proportion of CF fiber after 28 days of curing is 35.82/mm2. Bar chart of compressive strength test is given below.

4.2 Split Tensile Test. According to IS:456-2000, we get calculate the split tensile test of concrete in conventional PPC after 7 days of curing is 2.15N/mm2, 14days of curing 2,55N/mm2, and 28 days of curing is 2.90N/mm2, And Minimum strength of concrete in 1.25% proportion of CF fiber after 7days of curing is 1.81N/mm2, 1.25% proportion of CF fiber after 14 days of curing 1.90N/mm2 and 1.50% proportion of CF fiber after 28 days of curing is 2.08N/mm2. And Maximum strength of concrete in 0.75% proportion of CF fiber after 7 days of curing is 2.62N/mm2, 0.75% proportion of CF fiber after 14 days of curing 2.99N/mm2 and 0.75% proportion of CF fiber after 28 days of curing is 3.13N/mm2. Bar chart of split tensile strength test is given below-

Figure 4.1. Compressive strength of concrete.

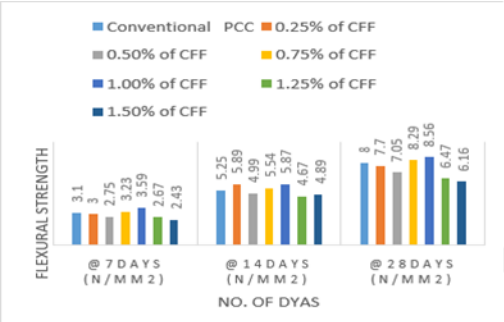

Figure 4.2. compressive strength of concrete Graph (Source by Self) (Source by Calculation).

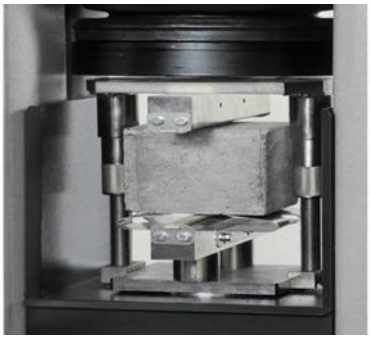

Figure 4.3. Split tensile test of concrete.

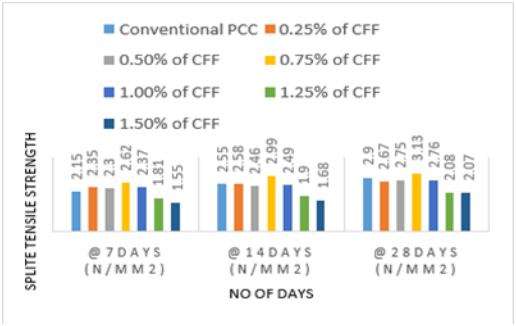

Figure 4.4. Split tensile test of concrete Graph (Source by Self) (source by Calculation).

4.3 Flexural Strength Test. According to IS:456-2000, we get calculate the flexural strength test of concrete in conventional PPC after 7 days of curing is 3.10N/mm2, 14 days of curing 5.25N/mm2 and 28 days of curing is

8.00N/mm2.Minimum strength of concrete in 1.50% proportion of CF fiber after 7 days of curing 2.43N/mm2, 1.25% proportion of CF fiber after 14 days of curing 4.67N/mm2 and 1.50% proportion of CF fiber after 28 days of curing is 6.16N/mm2. And Maximum strength of concrete in1.00% proportion of CF fiber after 7 days of curing is 3.59N/mm2, 5.89% proportion of CF fiber after 14days of curing 5.89N/mm2 and 0.75% proportion of CF fiber after 28 days of curing is 8.56N/mm2. Bar chart of Flexural strength test is given below.

Figure 4.5. Flexural strength test of concrete (Source by Calculation).

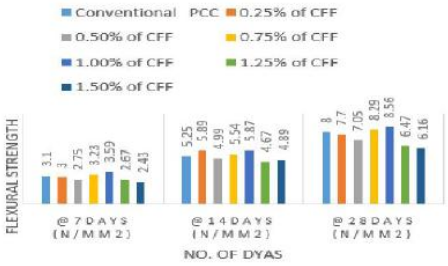

Figure 4.6. Flexural strength test of concrete Graph (Source by Self).

Conclusion

As per the above conclusion research we have done and looking after each and every data we come to conclusion that:

1. Chicken feather and Egg shell can be used effective due to water and it increase the strength and some other properties of mortar, which are necessary for the construction.

2. Chicken feather shows more compressive and flexible strength as compare to Eggshell. The fibrous part can only be used.

3. At Eggshell contain calcium we can't use it in access amount because it results in disturbing the binder property of mortar and it get failed. So we use eggshell in lesser amount in powder form only.

4. Compressive and flexural property was decreased by increasing the amount of eggshell powder.

Future scope

[1] In future the chicken feather and egg shell is very important material for making building construction, due to global worming the temperature is so high it reduce the temperature.

[2] Chicken feather is economy in nature.

[3] We can use the chicken feather in the construction without waste it.

[4] We can use the egg shall in the construction purpose after use egg collect the shall and use it.

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