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Experimental Investigation on Ecofriendly Concrete by Using Natural Fibre as Chicken Feather

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ABSTRACT: After the removal chicken feather it is disposed on the land. The major problem of disposing the fines in land leads to various environmental hazards like pollution in air and land. Strength behaviour of concrete with partially added chicken feather. Concrete is prepared with chicken feather in different proportions namely 5%, 10%, 15% and 20%. Strength in compression and weak in tension so increase the tension strength of concrete by using natural fibre as chicken feather. The various tests to be conducted on concrete such as compression strength, flexural strength and tensile strength at 7 days, 14 days and 28 days. The test values are computed and compared with the conventional concrete. Chicken feather is removed from poultry form.

KEYWORDS: Natural fibre, chicken feather, Poultry form

I. INTRODUCTION

Concrete, as a constructive material, has been used in construction industry for about two centuries. Approximately, the whole bulk of the concrete is used in one year is more than one ton apiece. Therefore, doing research about using modern technologies in production concrete is of great importance. Furthermore, one of the most critical problems of the world has been related to remove the wastage and reusing of it. In all countries, large amount of wastage is produced annually. Most of this wastage are not reusable or if they are, their recycling leads to wasting energy and pollution which in turn increase the risk of these materials for the environment. Moreover, a good strategy to achieve the two purposes of removing the wastage material and also obtaining the positive qualities of concrete tile and constructive chicken feather are among the most commonly used materials in structures. The chicken feather waste from poultry farm and construction industries is a major contribute to construction and demolition waste, representing a serious environmental, technical and economic problem of society nowadays

Globally 24 billion chickens per year are killed across the world which is discarding four billion pounds of poultry feather. This huge amount of productions has caused them to be among the most commonly consumed materials in the world. Usually, The wastage related to tile and sanitary ware are created in different forms some of which are produced in companies during and after production process due to errors in either construction, human activities, and also inappropriate raw materials. Some others are produced in transportation and distribution procedures and finally, the most bulk of them are created as a result of destroying constructions. It is predicted that almost 3 to 7 percent of daily production of chicken feather change into wastage and this amount reaches to millions ton per year. The properties of

These materials are in a way that they are unusable in other cycles of production. Therefore, they are useless in practiced and cause damages to environment. Align all, the hard physical structure of these materials and also their chemical structure make them a good and suitable choice to be used in concrete.

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In another study, the effect of chicken feather electrical insulator as coarse aggregate in concrete was studied. In this study no negative effect was reported. Furthermore, the use of these materials in non- structural concretes was performed in a study in which the only problem reported was the high water absorption of the materials. Some researchers were also done in which the use of the materials in concrete as a substitute or cement were investigated. However, no comprehensive study has yet done in which the use of the materials as sand and coarse aggregate in wide ranges and then determining the ideal percent of substitution have not been achieved either. Therefore, in this experimental study, first the cut the waste chicken feather and then its grading were done in a way that the tile grading curve of the natural aggregates used in control concrete was completely in compatible with the ceramic aggregates. After that, experiments including chemical analysis, unit weight, water absorption, and Los Angeles test were done on coarse aggregates. Having been ready, in the first stage of the study, the chicken feather with percentages of 5, 10, 15, and 20 were substituted for 10% of the total weight of cement. After that, a comparison was made between the comprehensive strength, water absorption, slump and also the unit weight of new concrete and the control sample.

II. RELATED WORK

Chinta S.K. Landageet.al. The nonwoven is manufactured by using chicken feathers which are available at very low cost. So the end product too. The advantage is that there is a wide range of application of chicken feathers in textiles field. The nonwoven which is prepared by chicken feather as very versatile and a wide application in the field of technical textiles.

Amit Kumar Sharma et.al. An experimental investigation aimed to determine the viability of chicken feathers as substitute for fine aggregates for concrete was conducted. Chicken feathers collected from slaughter houses (waste material) were utilized after previous studies conducted revealed that chicken feathers possess good durability and resistance to degradation because of the extensive cross-linking and strong covalent bonding within its structure. In the investigation conducted, the chicken feathers content ranged from 1% to 7% of the total volume of fine aggregates. The aggregate-cement ratio was 1:6 and 1:3 cement was held constant with varying water-cement ratio in every mixture. Specimens were grouped according to their number of days of curing as follows; 3, 7 and 14 days

Narendra Reddy and Yiqi Yang The structure and properties of chicken feather barbs makes them unique fibers preferable for several applications. The presents of hollow honeycomb structures, their low density, high flexibility and possible structural interaction with other fibers when made into products such as textiles provides them unique properties unlike any other natural or synthetic fibers. No literature is available on the physical structure and tensile properties of chicken feather barbs. In this study, we report the physical and morphological structure and the properties of chicken feather barbs for potential use as natural protein fibers. The morphological structure of chicken feather barbs is similar to that of the rachis but the physical structure of the protein crystals in chicken feather barbs is different then that reported for feather rachis keratin. The tensile properties of barbs in terms of their strength and modulus are similar but the elongation is lower than that of wool. Using the cheap and abundant feathers as protein fibers will conserve the energy, benefit the environment and also make the fiber industry more sustainable.

Krishna priyakota, et. al. The feather is highly micro crystalline, very durable and resistance to both mechanical and thermal stress because of the presence of protein keratin. Keratinase is the enzyme which is used to degrade feather waste and in the production of animal feed, fertilizers. The present study screened for the ability to hydrolyse keratin in feather meal broth. Keratinase activity of bacillus subtilis maximum concentration was 1.23(IU/mL) on 7 days respectively. The objectives are to increase the biodegradability of conventional biodegradable plastic and to utilize the chicken feather waste effectively.

Debore D. belarminor, et.al On the other hand, the CF, was shiny, black, and showed a higher amount of porosity with open micro-pores and micro-tubes. From the XRD analysis of the KF, CF, KF, NaOH, SCFC and SCFD presented semi-crystalline structure, with the following indices of crystallinity, 20.09%, 18.93%, 17.97%, 15.02% and 14.31%,

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respectively . the CF presented smaller size crystallites, in between the micro particulates, around 27 nm and the KFNaOH with larger size around 74 nm .from this study it was concluded that micro-porous carbon material from chicken feather (KF) could be efficiently obtained through pyrolysis.

III. METHODOLOGY

We collect journals which are related to our title. Then we collect the materials we are going to use in this project. After collection, materials are allowed to test. Mix proportion will be prepared. After this mix proportion specimens are casted. After one day mould as removed and allowed to curing for 7 days, 14 days and 28 days. After curing test will be conducted. Admixtures in the range of 5%, 10%,15% and 20%. For fresh concrete slump test, compaction factor test and vee- bee consistometer test are conducted and for hardened concrete compressive strength, split tensile strength and flexural strength are conducted. After finishing the result will be displayed.



Fig No: 1 Chicken Feather

IV.MIX DESIGN

The mix design of concrete has been made as per IS 10262-2009.the materials specification done through test on materials.

Table 1-Materials for 1 m³ concrete

Mix Designation	% of chicken feather waste	Cement (kg)	Fine Aggregate (kg)	Coarse Aggregate (kg)	Water (kg)
MIX 1	0	498.48	598.633	1145.18	199.39
MIX 2	5	498.48	598.633	1145.18	199.39
MIX 3	10	498.48	598.633	1145.18	199.39
MIX 4	15	498.48	598.633	1145.18	199.39
MIX 5	20	498.48	598.633	1145.18	199.39

V.TESTS ON CONCRETE

WORKABILITY

Fresh concrete or plastic concrete is freshly mixed material, which can be moulded into any shape. The relative quantities of cement, coarse aggregate, fine aggregate and water mixed together, control the concrete properties

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in the fresh state. Workability is defined as the ease with which concrete can be compacted. It is the property of concrete which determines the amount of useful internal work necessary to produce full compaction. The workability of various mixes was assessed by determining the slump value and compacting factor according to IS 1199:1959 specification.

SLUMP TEST

It is one of the most commonly used methods of measuring consistency of concrete. The mould is placed on a smooth, horizontal, rigid and non-absorbent surface. The mould is then filled in four layers. Each layer is tamped 25 times using tamping rod. The concrete at the top of the mould is levelled using a trowel. The mould is removed from the concrete immediately by raising it in the vertical direction. This allows the concrete to subside. This subsidence is referred as the slump of concrete. The difference in level between the height of the mould and that of the highest point of the subsided concrete is measured. This difference in height in mm is taken as Slump of Concrete.

COMPACTING FACTOR TEST

It is more precise and sensitive than the slump test and is particularly useful for concrete mixes of very low workability. The test works on the principle of determining the degree of compaction achieved by a standard amount of work done by allowing the concrete to fall through a standard height. The degree of compaction, called the compacting factor is measured by the ratio of the density actually achieved in the test to density of same concrete fully compacted

Table 2 -IS Specifications for Slump and Compacting Factor Test

Type of Workability	Slump Value(mm)	Compacting Factor
Extremely Dry	-	-
Very Stiff	-	0.70
Stiff	0 – 25	0.75
Stiff Plastic	25 – 50	0.85
Plastic	50 – 75	0.90
Flowing	75 – 150	0.95

VI.TESTS ON HARDENED CONCRETE

COMPRESSIVE STRENGTH TEST

In most of the structural applications, concrete is used primarily to resist Compressive stresses. So Compressive Strength is used to denote the overall quality of concrete. Compression test on cube is the most common test conducted on hardened concrete because it is an easy test to perform and most of the desirable properties of concrete are comparatively related to its compressive strength. The compression test was carried out on a cubical specimen of size 150mm in a compression testing machine of capacity 2000 KN at a loading rate of 14 N/mm² per minute. The compressive strength is calculated based on the maximum load taken by the specimen in N/mm².

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Fig No: 2 Compression test on cubes

Table: 3 Compressive strength of cubes at 7, 14 and 28 days

% OF REPLACEMENT	7 DAYS	14 DAYS	28 DAYS
0	20.07	30.41	33.21
5	19.95	29.10	36.23
10	20.13	29.08	36.36
15	21.03	30.73	38.37
20	19.92	28.81	36.29

MODULUS OF ELASTICITY TEST

Modulus of Elasticity is the ratio of Stress to Elastic Strain of concrete. It is also a measure of resistance of material to deformation. It was determined by subjecting cylinder specimen having 150mm diameter and 300mm height to uniaxial compression. Cylinder specimen is fitted with the compress meter for measuring deformation under the compression applied. The gauge length of the compress meter was 20cm. Dial Gauge of compress meter gives the deformation under each increment of loading. The strain is obtained by the ratio of dial gauge reading and gauge length. Also stress is determined by the ratio of load applied and the area of cross section. A series of readings were taken and the stress-strain graphs were plotted for various mixes. From the graph Modulus of Elasticity of concrete was determined.



Fig No: 4 Split Tensile Strength of Concrete

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Table: 4 split strength of cylinders at 7, 14 and 28 days

% OF REPLACEMENT	7 DAYS	14 DAYS	28 DAYS
0	1.41	2.99	3.06
5	2.96	4.66	5.09
10	3.27	4.57	5.16
15	3.29	4.40	5.23
20	2.91	4.52	5.06

FLEXURE TENSILE STRENGTH TEST

Flexure strength test is a test to determine the modulus of rupture of concrete. The specimen was taken from the curing tank and the surfaces were cleaned. The centre supports and one-third distance from either the supports were marked. The specimen was placed in the flexure testing machine and the load was applied at the rate of 1.8 kN/min without shock. The breaking load was noted and flexure strength was calculated.



Fig No: 4 Flexural Strength of Concrete

Table No: 5 Flexural strength of Prism at 7,14 and 28 days

% OF REPLACEMENT	7 DAYS	14 DAYS	28 DAYS
0	9.46	13.33	18.26
5	8.66	13.73	21.33
10	8.66	16.00	18.33
15	12	18	19.33
20	8.66	20	16.66

VII.RESULT AND DISSCUSSION

The test results are compared with various percentages of 5%, 10%, 15%, 20% chicken feather concrete. It is shown that 15% replacement of chicken feather gives the optimum percentage of replacement in concrete.

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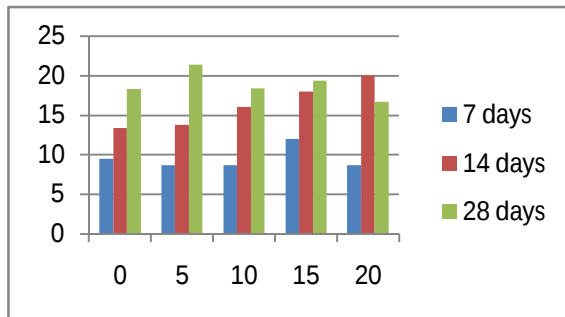


Fig.no:5 Flexural strength

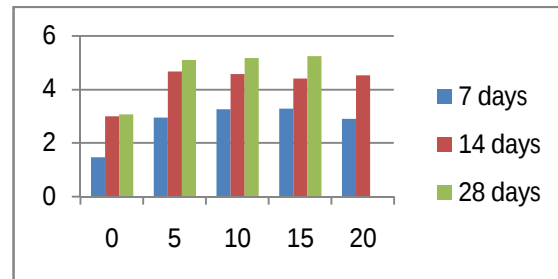


Fig.no:6 Split tensile strength

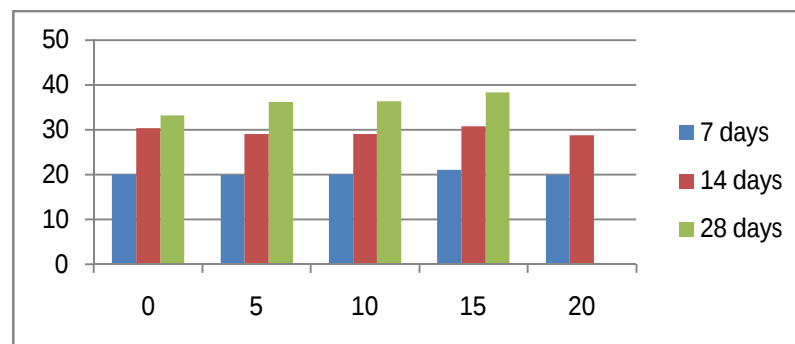


Fig. no:7 Compressive strength

VIII.CONCLUSION

By adding natural fibre as chicken feather in concrete increases the workability of concrete up to 20% replacement and there on goes decreasing. Compressive strength of concrete mixes up to 15% adding with chicken feather waste fines is greater than conventional concrete mix and after that it was on goes decreasing. Maximum compressive strength was obtained for 15% adding mix. Split tensile strength of concrete mixes up to 15% adding with chicken feather waste fines, is greater than conventional concrete mix and there goes on decreasing. Maximum split tensile strength was obtained for 15% adding mix. Flexural strength of concrete mixes up to 15% adding with chicken feather waste fines is greater than conventional concrete mix and after that it was on goes decreasing. Maximum flexural strength was obtained for 15% adding mix. Optimum percentage of chicken feather added to the concrete was 15% and increase the mechanical properties of concrete. Modulus of elasticity of concrete mixes up to 10% adding with chicken feather waste fine is greater than conventional concrete mix and there on goes decreasing. Maximum modulus of elasticity was obtained for 15% adding mix.

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