International Journal of Innovative Research in Engineering
Volume 4, Issue 3 (May-June 2023), PP: 263-266.
www.theijire.com ***ISSN No: 2582-8746***

Experimental Investigation on Green Concrete by Using Natural Fiber as Chicken Feather

S.Prabhavathi[1], R.Gokul[2], M.Mohanraj[3], I.C.Sugavaneshwran[4]
[1]Head of The Department Civil Engineering, The Kavery Engineering College, Mecheri, TamilNadu, India.
[2,3,4]Final Year Department Of Civil Engineering The Kavery Engineering College, Mecheri, TamilNadu, India.

How to cite this paper:
S.Prabhavathi[1], R.Gokul[2], M.Mohanraj[3], I.C.Sugavaneshwran[4]," Experimental Investigation on Green Concrete by Using Natural Fiber as Chicken Feather", IJIRE-V4I03-263-266.

https://www.doi.org/10.59256/ijire.2023040385

Abstract: *After the removal chicken feather it is disposal on the land. The major problem of disposing the fines in land leads to varies environmental hazards like pollution in air and land. Strength behavior of concrete with partially added chicken feather. Fly ash 20%, 25%and 30%. Fine aggregate partially replaced by 50% of M- sand and partially replaced by 50% of coarse aggregate to recycled aggregate. concrete is prepared with chicken feather in different proportions namely 0.5%,0.75%and 1% concrete is strong in compression and weak in tension so increase tensile strength of concrete by using natural fiber as chicken feather. The various tests to be conducted on concrete such as compression strength, flexural strength and split tensile strength at 7 days, 14 days, 28 days. The test value are compared with the conventional concrete. Chicken feather is removed from poultry form. The mix design M40 has designed as per IS 10262:2009. The optimum percentage of chicken feather in found out from test results.*

Key word: *Chicken feather fiber Compressive Strength, Split tensile strength, Flexural Strength.*

I.INTRODUCTION

Concrete as a constructive material, has been used in construction industry for about two centuries. Therefore, doing research about using modern technologies in production concrete is of great importance. Further more , one of the most critical problems of the world has ben related to remove the wastage and reusing of it. in all countries, large amount of wastage is produced annually. Moreover, a good strategy to achieve the two purposes of removing the wastage material and also obtained the positive qualities of concrete tile and constructive chicken feather are among the most commonly used material in structure. The chicken feather waste from poultry farm and construction in industries is a major contribute to construction and demolition waste, physical structure of these material and also their chemical structure make them a good and suitable choice to be used in concrete Indian chicken feather production is 100 million tons per year.in poultry industry, about 15% to 30 % waste material generated from the total production. This waste is not recycled in any form at present. However, the chicken feather waste is durable ,hard and highly resistant to biological, chemical, and physical degradation forces. This leads to serious environmental and dust pollution and occupation of a vast area of land especially after the removal dries up so its necessary to dispose the chicken feather waste quickly and use in the construction industry. as the chicken feather waste is piling up every day, there is pressure on poultry industries to find solution for its disposal. Some of previously studies have investigated the use of chicken feather.

wastage in concrete as send or coarse aggregate. Lopez observed that this substitution process would increase slightly the compressive strength. Besides, torgall and jalali also calculated that using chicken feather wastage as send and coarse aggregate can slightly enhance compressive strength and durability of concrete.. furthermore, the use of these material in non – structural concretes was performed in a study in which the only problem reported was the high water absorption of the material. 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 substation have not been achieved either. 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 representing a serious environmental, technical and economical problem of society nowadays. this waste is not recycled in any from at present. However, the chicken feather waste is durable, hard and highly resistant to biological, chemical and physical degradation forces. as the chicken feather waste is piling up every day, there is pressure on the poultry form to find a solution for its disposal 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. EXPERIMENTAL PROGRAM

The experimental work was carried out by casting cubes of size 150 x 150 x 150mm to find the compressive

strength cylinder of 100mm diameter and 200mm height were casted to obtain the stress strain curve. The SIFCON specimens (say F1,F2,F3,F4,F5) and without fibre (only slurry,say (S1,S2,S3,S4,S5) were casted and TECHNOLOGY 2 compared with the conventional concrete (say C) of grade M40 to study the compressive strength and flexural strength. The edges of the mould were sealed with plaster of paris to prevent the leakage of slurry. The fibre is dispersed in a random manner to the volume fraction. Compaction by table vibrator was used to ensure complete penetration of the slurry into the fiber pack. Twenty four hours after casting, the cubes were demoulded and cured in water for 7 and 14 and 28 days.

III.MATERIALS USED

- Cement
- Fine Aggregate
- Coarse Aggregate
- Chicken Feather Fiber

Cement

Cement is made by heating limestone (calcium carbonate) with small quantities of other materials (such as clay) to 1450 °C in a kiln, in a process known as calcinations, whereby a molecule of carbon 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. 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). Oridinary 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.

Fine Aggregate

The M sand is manufactured by crushing the quarry stones into required grain in size & after washing, grading the crushed cubical shape with rounded edges, it turned as construction material. The cleaned aggregates are placed into the primary crusher to crush the aggregates into fine aggregate. It passes through 4.75mm sieve. In fact utilization of M sand in construction is appreciated because it is eco friendly. The type of sand used in this project is M sand

Coarse Aggregate

Aggregates are the most mined materials in the World. The coarse aggregate is the important material to be added in concrete. The aggregates of size greater than 4.75mm are generally termed as coarse aggregates. The types of coarse aggregates are, • Crushed Aggregates • Uncrushed Aggregates Mostly uncrushed aggregates are not used in concrete due to their smooth surface. The strength value decreases with the usage of this aggregate. The crushed aggregates have high strength compared to uncrushed aggregates. Workability of Crushed aggregate is very much lesser compared to uncrushed aggregate. The size of the aggregate used in this project is 20mm.

Chicken Feather Fiber

Over the years, extensive research has been carried out to find viable alternatives for synthetic fibres. Among the bio natural fibre composites, Chicken Feather Fiber (CFF) is considered to be a good substitute for the synthetic variants. CFF is a by- product of poultry farming and the lack of standardized extraction methods makes it difficult to analyse, treat and post-process the CFF. A composite material is a combination of more than one material with diverse physical and chemical properties. The composite material consists of a material matrix reinforced with different fibers. Fibers can be aligned either in a proper manner or in a randomly oriented fashion. They possess extremely high stiffness, directional strength and weight to strength ratio.

IV.TESTING OF MATERIAL

Cement

In this project, Oridinary Portland Cement of 53 Grade conforming to Indian standards available in local market of standard brand is used for casting cubes, cylinders for M40 concrete mixes. The cement used was fresh, uniform colour and without any hard slumps .Testing of cement was done as per IS: 12269- 1987.

Fine Aggregate

The locally available M sand was used as fine aggregate in the present investigation. The sand should be devoid of impurities like clay matter, salt and organic matter and is tested for different properties as per IS383-1970 such as specific gravity, fineness modulus, water absorption etc., Sieve analysis is carried out and it is passing through 4.75 mm sieve.

Coarse Aggregate

Machine crushed angular granite metal of 20mm size from a local source was used as coarse aggregate. It is from impurities such as dust, clay particles and organic matter etc., The coarse aggregate is also tested for its various properties. The aggregates of size greater than 4.75mm are generally termed as coarse aggregate. Testing of coarse aggregate is done as per IS: 383-1970.

Chicken Feather Fiber

The chicken feather fiber used in this concrete as volume fraction the chicken feather fiber increases tensile strength of the concrete. The test results are tabulated below.

Water

Water is the least expensive but most important ingredient of the concrete. The water used for making concrete should be clean and free from deleterious impurities like oil, alkalinities, acids etc., In general, the water fit for drinking is ideal for concrete making. In this project, potable tap water in the laboratory was used for the concrete preparation and for the curing of specimens.

Fresh Concrete Test

Though fresh state is transient, its condition seriously affects the behavioral properties of the final product. Poor compaction and improper curing will lead to porous concrete with low strength and high permeability. Fresh concrete is freshly mixed material which can be moulded into any shape. The relative quantities of cement, aggregate and water mixed together control the properties of concrete in wet state as well as in hardened state.

Properties Of Fresh Concrete

- Compatibility
- Mobility
- Stability
- Consistency
- Segregation
- Bleeding
- Curing
- Workability

Workability

Workability Is Defined As The Ease To Placement With Resistance To Segregation. According To ACI:116R-90 workability is defined as the property of freshly mixed concrete or mortar which determines the case and homogeneity with which it can be mixed, placed, consolidated and finished. According to ASTM: C125 workability is the property of determining the effort required to manipulate a fresh mixed quantity of concrete with minimum loss of homogeneity. Therefore, the workability of concrete is associated with terms such as flow ability, mobility, stability, resistance to segregation, and palpability. Workability is necessary to compact concrete to the maximum possible density

Slump Test

Slump is a measure indicating the consistency or workability of cement concrete. It gives an idea of water content needed for concreteto be used for different works. A concrete is said to be workable if it can be easily mixed and placed, compacted and finished. A workable concrete should not show any segregation or bleeding. Segregation is said to occur when coarse aggregate try to separate out from the finer material and a concentration of coarse aggregate at one place occurs. This results in large voids, less durability and strength. Bleeding of concrete is said to occur when excess of water comes up at the surface of concrete. This causes small pores through the mass of concrete and is undesirable.

Result:

Type of collapse: shear slump
Slump value: 50 mm from top

Compaction Factor Test

It gives an idea of degree of compaction and can be defined as the ratio of the density actually achieved in the test to the density of fully compacted concrete. The degree of compaction in this test is high. The degree of compaction in this test is achieved by allowing the concrete to fall from standard height to the container. This test is more sensitive and precise when compared to slump test and particularly useful for concrete mixes of very low workability as are normally used when concrete are insensitive to slump flow.

Workability Value

Compaction factor = 0.81
Compaction type =Medium
MIX DESIGN: M40
Concrete mix has been designed based on Indian Standard Recommended Guidelines IS10262:2019

WATER	CEMENT	FINE AGGREGATE	COARSE AGGREGATE
148	370	699.86	1197.90
0.4	1	1.63	3.23

Test on Hardened Concrete

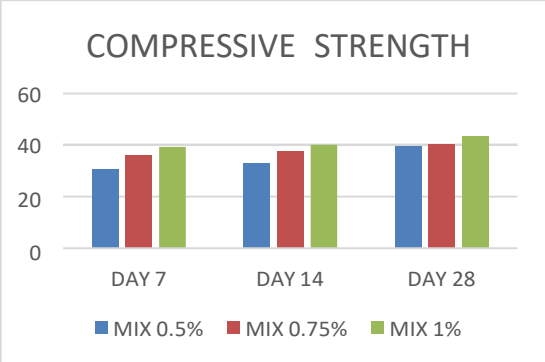
The following tests are conducted
Compressive strength test
Split tensile strength test

Compressive Strength Test

For compressive strength test cube specimens of dimensions 150 x 150 x 150 mm are cast using M30 grade of concrete with different percentage of polypropylene and steel fibers taken the volume of concrete. The top surface of the specimen was leveled and finished. After 24 hours, the specimens were de moulded and transferred to curing tank where in they were allowed to cure for 14 and 28days. After curing, these cubes were tested on compression testing machine. The failure load was noted. In each category, three cubes were tested and their average value is reported.

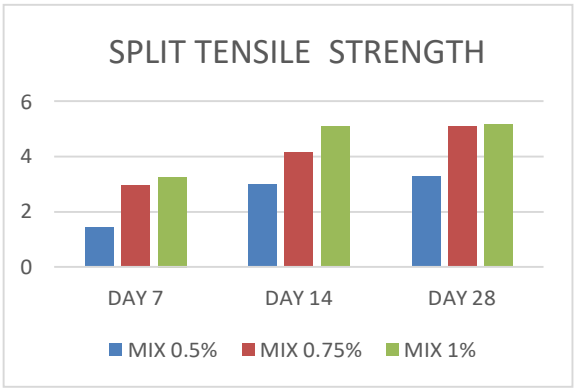
Then compressive strength determined by

= Load / Area. = P/A (N/mm2)



Split Tensile Strength Test

For 3 specimens of cylindrical shape of diameter 150mm and length 300 mm were tested under a compression testing machine of 2000Kn capacity under a compressive load across the diameter along its length till the cylinder split tensile strength. The tension develops in a direction at right angles to the line of action of the applied load. The split tensile strength was calculated as follow.



V.CONCLUSION

1. By adding natural fiber as chicken feather in concrete increases the workability of concrete up to 20% replacement and there on goes decreasing.
2. Compressive strength of concrete mixes up to 15% adding with chicken feather waste fines is greater than conventional concrete mix and there are goes decreasing. Maximum compressive strength was obtained for 15% adding mix.
3. Flexural 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 flexural strength was obtained for 15% of replacement mix.
4. 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% of replacement mix.
5. Modulus of elasticity of concrete mixes up to 15% adding with chicken feather waste fines is greater than conventional concrete mix and there goes on decreasing. Maximum modulus of elasticity was obtained for 15% of adding mix.

References

1. *Chinta S.K.1,Landag S.M.2, Yadav Krati3 Research Named "Application Of Chicken Feather In Technical Textiles" Volu.2, Issue 4, April 2013*
2. *Amith Kumar Sharma Research Named "Chicken Feather As A Substitude Of Fine Aggregate In Mortar" Vol.3,Issue 6, December 2016*
3. *Narendra Reddy, Yiqi Yang Research Named "Structure And Properties Of Chicken Feather Barbs As Natural Protein Fibers" 2007*
4. *Krishna Priya Kota , Sabiha Sultana Shaik, Rohini Krishna Kota , Abraham Peele Karlapudi Research Namrd 'Bio Plastic From Chicken Feather Waste" 2014 Pages: 373-375*
5. *Debora D.Belarmino , Rasiah Lachumananandasivam, Loilde D. Belarmino , Julina R. De M.Pimentel , Brismark G.Da Rocha , Alcione O.Galvao, Sania M.B.De Andrade Research Named Phisical And Morphological Structure Of Chicken Feather (Keratin Biofiber) In Natural, Chemically And Thermally Modified Forms" 2012,3 Pages 887-893*
6. *N.Prasanthi, S.Bhargavi, P.V.S.Machiraju Research Named "Chicken Feather Waste –A Threat To Theenvironment" Vol.5,Issue*