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USE OF NATURAL WASTE (RHA & COIR FIBERS) FOR CONCRETE PAVEMENTS

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Abstract – *Proper disposal of natural waste results in the less impact on environment in order to reduce the loss due to improper disposal of the waste. This paper provide a information about use of Rice Husk Ash and Coir fibers as a partial replacement of cement content in concrete matrix to improve the tensile strength and flexural strength of concrete which can become useful to provide concrete pavement of desired quality. Rice husk ash a waste material, contain Silicon dioxide use for their characteristic like optimum strength, good durability. RHA is suitable natural waste for cement as it is a byeproduct from paddy industry obtained by controlled burning of rice husk. RHA is a highly reactive pozzolanic material. Coir (coconut fiber) has excellent physical and mechanical properties and can be utilized more effectively in the development of composite materials. Various proportions of convetional concrete material (cement,fine aggregate ,coarse aggregate) and RHA and Coir fibres(with partial replacement of cement)are taken and their experimental investigation is done to study the effect of partial replacement of cement with RHA and Coir fibers to improve the flexural and tensile strength of cement concrete. It is observed that though the flexural strength and split tensile strength of cement concrete goes on Increasing after the 16.5% and 4% addition of RHA and Coir fibers respectively gives the maximum strength(tensile and flexural to be used as useful proportion for the construction of qualitative, strong, durable concrete pavement.*

***Key Words*: RHA, Coir fibers, split tensile strength ,flexural strength.**

1. INTRODUCTION

Approximately 68 millions of tons of RHA is produced annually worldwide. This RHA is a great environment threat causing damage to the land and the surrounding area In which it is dumped. The outer shell of rice grain, often called as rice husk. So for every 500 kgs of paddy milled , about 100 kgs (20 %) of husk is produced , and when this husk is burnt in the boilers , about 23 kgs (23 %) of RHA is generated.

The aim of this review is to spread awareness of coconut fibers as a construction material in civil engineering. The versatility and applications of coconut fibers in different fields is discussed in detail. Coconut fibers are reported as most ductile and energy absorbent material. It is concluded that coconut fibers have the potential to be used in composites for different purposes.

1.1 MATERIAL SPECIFICATION

A) Cement: The use cement ordinary Portland cement 53 Grade OPC (IS 12269-2013).

B) Aggregates: Materials obtained aggregate passing from 12mm and retained on 4.75 were used as coarse aggregate.

C) Crush sand: When crushed through machine, huge amount of powder form was obtained which included all mix ingredients from concrete waste material passing from 2mm IS sieve was taken as crush sand.

D) Rice Husk Ash : Rice husk ash is burning of rice husk over 625 º c temperatures in a power plant as a fuel. Rice husk ash passing through Seive of 45 micron is used as partial replacement of cement

Fig. No -1: RHA

E) Coir (Coconut Fibers): Coir, or coconut fiber, is a natural fiber extracted from the husk of coconut. brown fibre extracted from matured coconuts and white fibres extracted from immature coconuts. Brown fibres are thick, strong and have high abrasion resistance.

1.2 MIXTURE PROPORTIONS FOR CONCRETE PAVEMENT

1) RHA 22% And COIR FIBERS 4% With Replacement of Cement

2) RHA 16.5% And COIR FIBERS 4% With Replacement Of Cement

3) RHA 11% And COIR FIBERS 4% With Replacement Of Cement

2. TESTS ON HARDENED CONCRETE

2.1 TEST RESULTS FOR RHA 22% COIR 4%

- **TENSILE STRENGTH (N/mm²)**

Sr.No.	Tensile Strength	Avg Tensile Strength
Cylinder 1	3.74	3.504
Cylinder 2	3.29	
Cylinder 3	3.46	

- **FLEXURAL STRENGTH (N/mm²)**

Sr.No.	Flexural Strength	Avg Flexural Strength
Beam 1	3.35	3.503
Beam 2	3.46	
Beam 3	3.70	

2.2 TEST RESULTS FOR RHA 16.5% COIR 4%

- **TENSILE STRENGTH (N/mm²)**

Sr.No.	Tensile Strength	Avg Tensile Strength
Cylinder 1	5.51	5.069
Cylinder 2	4.95	
Cylinder 3	4.73	

- **FLEXURAL STRENGTH (N/mm²)**

Sr.No.	Flexural Strength	Avg Flexural Strength
Beam 1	5.12	5.067
Beam 2	5.15	
Beam 3	4.92	

2.3 TEST RESULTS FOR RHA 11% COIR 4%

- **TENSILE STRENGTH (N/mm²)**

Sr.No.	Tensile Strength	Avg Tensile Strength
Cylinder 1	4.10	4.011
Cylinder 2	4.03	
Cylinder 3	3.91	

- **FLEXURAL STRENGTH (N/mm²)**

Sr.No.	Flexural Strength	Avg Flexural Strength
Beam 1	4.45	4.45
Beam 2	4.34	
Beam 3	4.56	

Fig. No-2: Split tensile test

Fig. No-3:Flexural Strength

2. Tensile strength and Flexural strength results for 16.5% RHA and 4% COIR FIBERS in partial replacement with cement in cement concrete for (7,14,21,28 days):

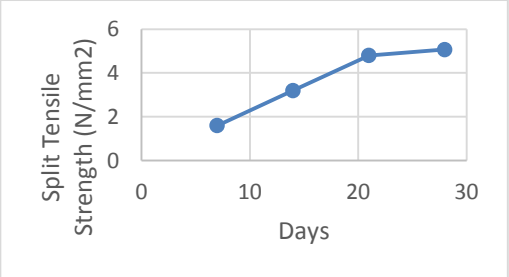

Chart -1: Split tensile strength for 16.5% RHA and 4%Coir fibers cement concrete for 7, 14 , 21 , 28 days.

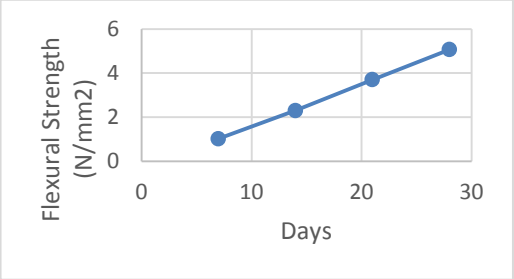

Chart-2 : Flexural strength for 16.5% RHA and 4%Coir fibers cement concrete for 7, 14 , 21 , 28 days.

4. CONCLUSIONS

1) Split tensile strength and Flexural strength of cement concrete increases with the partial replacement of cement in cement concrete with the percentage of Rice Husk Ash and Coir fibres up to of 16.5% by weight of cement.
2) Rice husk ash contains more silica, and hence we prefer rice husk ash use in concrete to increase the strength.

3) Following table shows the final test readings according to which the proportion of 16.5% RHA & 4% COIR gives more strength than M40 Conventional Concrete.

4) Rice Husk Ash is a waste product which is harmful for environment but can be available at cheap cost as it is difficult to dispose, can be used as a effective cementitious material.

5) Coconut Fibers are reported as most ductile and energy absorbent material. It is concluded that coconut fibers have the potential to be used in concrete composites for improvement to prevent cracking and spalling types of disteresses in concrete pavement.

Type of test	Split tensile test	Flexural Strength
M40 CONVENTIONAL CONCRETE	4.477 N/mm^2	3.3782 N/mm^2
RHA 22% & COIR 4%	3.504 N/mm^2	3.507 N/mm^2
RHA 16.5% & COIR 4%	5.0693 N/mm^2	5.067 N/mm^2
RHA 11% & COIR 4%	4.011 N/mm^2	4.453 N/mm^2

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