EXPERIMENTAL INVESTIGATION ON EFFECTIVE UTILIZATION OF COCONUT FIBER IN CONCRETE

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ABSTRACT:

This research describes experimental studies on the use of coconut fiber to enhance tensile property in concrete, as concrete have less tensile properties. For this study, coconut fiber were used as they are freely available in large quantities, eco friendly and leads to the better management of these waste fibers. Addition of coconut fibers significantly improves many of the engineering properties of the concrete, notably workability, tensile strength, flexural strength, binding capacity. The study foundtheoptimumfibercontenttobe1%,2%,3% [by weight of cement], it attains tensile strength of 2.90 with M20,grade of concrete in 2% of replacement. Were place the cement with coconut fiber as its demand is increasing day-by-day and als of fiber attains physical and chemical properties comparing with cement.

KEYWORDS:

Coconut fiber, tensile strength, waste management.

INTRODUCTION:-

Concrete is the most widely used construction material allover the world. With innovations in science and technology in construction industry, the scope of concrete as a structural material has widened. Concrete is strong compression but it is weak in tension and flexure,The utilization of concrete is increasing at a higher rate due to development in infrastructure and construction activities all around the world. However there are some negative impacts of more production of concrete like continuous extensive extraction of aggregate from natural resources will lead to its depletion and ecological imbalance industrial waste to improve the strength properties of concrete and to lead sustainable development. eg: Rice husk, sugarcane bagasse, coconut.

Among all natural fibers. Coconut fibers are capable of taking strain 4-6 times. So, we are

taking coconut fiber. Coconut fiber, termed as coir, when dried contains cellulose, lignin and ash in varying percentage. Coconut fiber possesses certain physical and mechanical characteristics that it can be utilized effectively in the development to reinforced concrete material. Coconut fibers are not commonly used in construction industry and are of ten dumped as agricultural waste and they are obtained from coconut husk, belonging to the family of palm fibers, are agricultural waste products obtained in the processing of coconut oil, and are available in large quantities and also cheap in the tropical regions of the world, most especially in Africa, Asia and southern part of the country and coconut fiber is used to enhance concrete and mortar, and has proven to improve the toughness of the concrete and mortar (Gram,1983, and Ramakrishna,etal.,2005) .However, the problem of long term durability has not yet been solved. It has also been noticed that the degree of enhancement of concrete by coconut fibers depended on the type of coconut species. The purpose of this project is to conduct experimental studies for enhancement of properties of concrete by reinforcing with coconut fibers. The following objectives have been identified:

1) To determine the improvement of flexural strength in concrete after addition of coconut fibers.
2) To determine the improvement of tensile strength in concrete after addition of coconut fibers.
3) To provide an alternate light weight material
4) To elevate the performance of coconut fiber reinforced concrete in reducing cracking. The advantage of using such rural fibers providing generally a low cost construction than using virgin fibers and the elimination of the need for waste disposal in land fills. Utilization of these fibers in concrete leads to an effective solid waste management technique.

MATERIALS AND METHODOLOGY:-

CEMENT:-

Ordinary Portland cement grade53, conforming to I.S11269 1987[12]. Cement must develop appropriate strength:

S.NO	PHYSICAL PROPERTY	TEST RESULTS
1	Standard consistency	29.2%
2	Fineness of cement (%)	7.4
3	Specific gravity	3.14
4	Initial setting time	45 minutes
5	Final setting time	260 minutes

FINEAGGREGATE:-

It should natural sand from Swansea (or) River sand was used as the fine aggregate, conforming to zone-II as per IS383-1970. The sand was air dried and sieved to remove any foreign material, prior to mixing.

S.NO	PHYSICAL PROPERTY	TEST RESULT
1	Specific gravity	2.7
2	Fineness modulus	2.73
3	Bulk modulus(kg/m^3)	1650
4	Water absorption	0.25

COCONUT COIR FIBER:-

Fibers were collected from the local temples, cleaned, sundried, removed dust to analyze its properties. And the coconut fibers with diameter ranging between 0.29mm and 0.83mm and length between 6mm and 24mm and approximate mean aspect ratio of 150mm. Eight fiber specimen in order to determine ultimate strength.

S.NO	PHYSICAL PROPERTIES	TEST RESULTS
1	Specific gravity	2.6
2	Fineness modulus	2.83
3	Bulk modulus	1600

COARSEAGGREGATE:-

Coarse aggregate consists of 50% of self weight of concrete and70% of volume of concrete. While the coarse aggregate having a maximum size of 20 (smaller size aggregate as

S.NO	PHYSICAL PROPERTY	TEST RESULT
1	Specific gravity	0.87
2	Water absorption	10
3	Bulk density	1825
4	Aspect ratio	105

WATER:-

Water used was normal water, from the tap which was free from the salt and conforming the requirement of IS : 456-2000

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MIXPROPORTIONANDMIXDESIGN:-

In this experiment the mix proportion is calculated for M20 grade of concrete for w/c ratio of 0.50 respectively by using IS: 10262: 2009 method of mix design maintaining a constant w/c ratioforcontrolmixandbyreplacing0, 1%, 2% and3%ofcoconutcoirinconcreteasshowninthetable

MIX NO:	MIX DESIGN	W/C RATIO	CEMENT (kg)	FINE AGGREGATE (kg)	COCONUT COIR (kg)	COARSE AGGREGATE	WATER (lit)
M1	CONVECTIONAL CONCRETE	0.5	1.95	4.1	0	5.44	0.97
M2	1% OF COIR&99%OF OPC	0.5	1.9305	4.1	0.0195	5.44	0.97
M3	2% OF COIR & 98% OFOPC	0.5	1.911	4.1	0.039	5.44	0.97
M4	3% OF COIR & 97% OF OPC	0.5	1.8915	4.1	0.0585	5.44	0.97

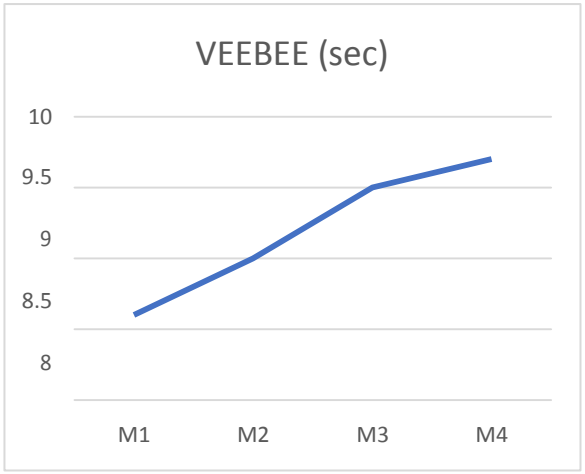
RESULT AND STRENGTH:-

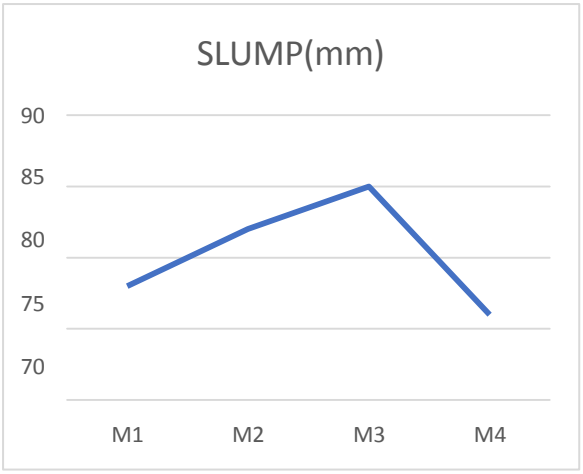
FRESH CONCRETE:-

The test for the fresh concrete are slump cone test, compaction factor, vee bee consistency and flow test. Below table is shown for this experimental investigations and the results as follows

M IX NO:	SLUMP (mm)	COMPACTION FACTOR (%)	VEE BEE (sec)	FLOW%
M_1	78	0.87	8.6	37
M_2	82	0.84	9	36
M_3	85	0.88	9.5	34
M_4	76	0.86	9.7	32

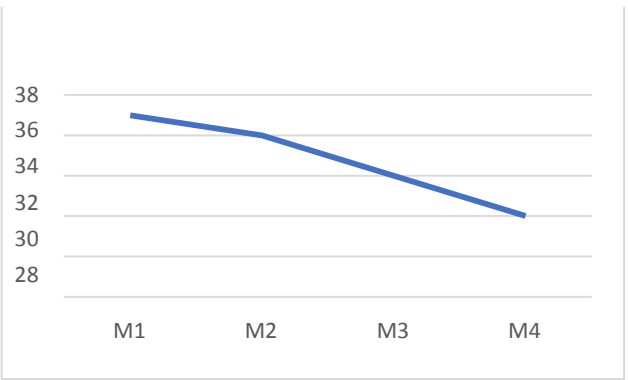
FRESH CONCRETE TEST RESULTS





VEE BEE TEST

SLUMP CONE TEST



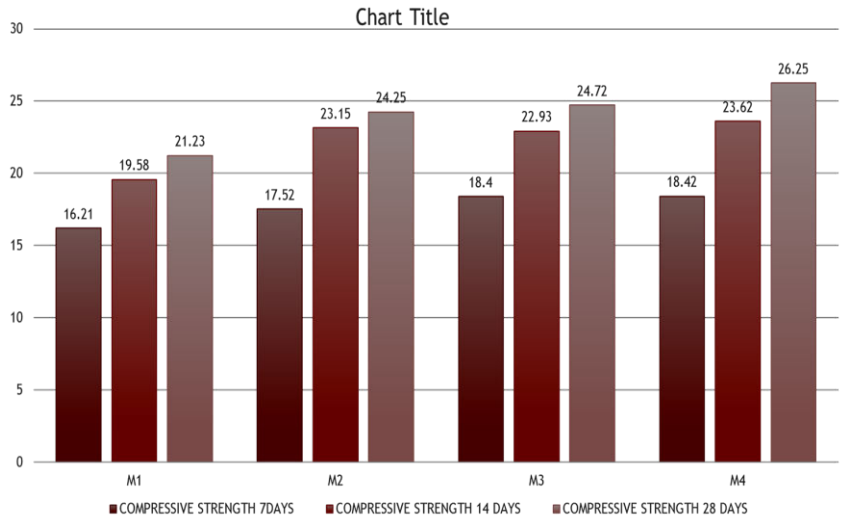
COMPACTION FACTOR

FLOW TABLE

HARDENED CONCRE TETEST:-

To find the strength of the concrete 150 mm cube size of specimen is casted and tested for compression test.

CURING DAY	CONVENTIONAL CONCRETE	1% OF COIR	2%	3%
7	16.21	17.25	18.40	18.40
14	19.58	23.15	22.90	23.62
28	21.23	24.25	24.72	26.25



COMPRESSION TEST

CONCLUSION:-

1) Coconutfiberbeinglowindensityreducestheoverallthefiberreinforcedthusincanbeuse dasastructurallightweightconcrete

2) Byreinforcingtheconcretewithcoconutfiberswhicharefreelyavailable,wecanreducethe environmentalwaste

3) Coconut fiber increased the slump value and compaction factor value of concrete

4) Flexural strength increases in case of 3% fiber mix. Thus, economy can be achieved in construction

5) Since, 5% & 7% fibers do not show favorable

6) Coconut fiber being low in density reduces the overall weight of the fiber reinforced concrete thus it can be used as a structural lightweight concrete.

7) By reinforcing the concrete with coconut fibers.

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