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Evaluation of Compressive Strength of Concrete Using Coconut Coir Fibre

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Abstract*— this research describes the behavioural study of coconut fibre in concrete structure. Addition of coconut fibre in concrete it improve various engineering property of concrete. Because it posses good binding property in concrete. Coir fibre is treated as natural latex when before using in concrete. So that it not affected by moisture in concrete Addition of coconut fibre improves compressive strength flexural strength and tensile strength of concrete. The study found the optimum fibre content to be 1% 2% 3% (by weight of cement). 27 cube ware casted of M25 and M30 Grade concrete the compressive strength of cured concrete evaluated of 7, 14, 28 days. This results show coconut coir concert can be used in construction and coconut fibre is better management of west fibre and it is also eco fondly.

Keywords*— Coconut coir fibre, Compressive Strength, waste utilization, sustainable development

I. INTRODUCTION

Concrete is the most widely used construction material in all over the world. So that concrete is weak in tension and flexure, and it is reinforced with steel reinforcing bars. Satiety efforts have been made world-wide to add various types of fibres in concrete so that it make more strong, durable and economical. Natural fibre such as coconut fibre posses certain physical and mechanical characteristics that it can be utilized effectively in the development of reinforced concrete material. mostly these coconut fibres are dumped as agricultural waste, so that it is easily available in large quantity and also cheap. The purpose of this project is to conduct experimental studies for enhancement of properties of concrete by reinforcing with coconut fibres. The following objectives have been identified:

To determine the improvement of flexural strength in concrete after addition of coconut fibres.
To determine the improvement of tensile strength in concrete after addition of coconut fibres.
To know effect of addition of coconut fibres on compressive strength in concrete.
To provide an alternative light weight material.
To evaluate the performance of coconut fibres reinforced concrete in reducing cracking

Finally it is concluded that fibres recovered from various waste stream are suitable to use as secondary reinforcement in concrete. The advantage of using such rural fibres provides generally a low cost construction than using virgin fibres and the elimination of the need for waste disposal in landfills. Utilization of these fibres in concrete leads to an effective solid waste management technique

The introduction of fibres is a solution to develop concrete with enhanced compressive flexural and tensile strength, which is a new form of binder that could combine Portland cement in bonding with cement matrices.

Fibre Reinforced Concrete, there are four categories namely,

SFRC – Steel Fibre Reinforced Concrete
GFRC – Glass Fibre Reinforced Concrete
SNFRC – Synthetic Fibre Reinforced Concrete and
NFRC – Natural Fibre Reinforced Concrete

II. MATERIALS AND METHODOLOGY

A. *Cement*

Ordinary Portland cement conforming to BS 12, 1971 was used. The fine aggregate was natural sand from Swansea, UK conforming to BS 882 1975, while the coarse aggregate having a maximum size of 20 (smaller size aggregate as suitable for the mould used for casting), also obtained from Swansea The fibres were coconut fibres with diameter ranging between 0.29mm and 0.83mm and length between 6mm and 24mm and approximate mean aspect ratio of 150. Eight fibre specimens were subjected to a

tensile test in order to determine the ultimate strength. A graph of tensile strength against aspect ratio is plotted in.

B. Coconut Coir Fibre

Fibres were collected from the local temples, cleaned, sun dried, removed dust to analyze its properties. Coconut Fibres require no pre-treatment, except for water treatment. Coconut Fibre Coconut has high water absorption. Due to this property, coconut Fibres were pre soaked in potable water for 24 hours.

C. Details of Test

The following tests are performed on concrete blocks reinforced with coconut fibre

Workability

Compressive strength

Split tensile strength

Flexural strength

Three cubes and three cylinders from each mix were tested for compression and splitting tensile strength at day 28. after casting using a GD10A compression testing machine with a maximum capacity of 2500KN

III. TESTING PROCEDURE

A. Mixing Of Concrete with Coconut Fibres

In the previous research by the author, on concrete with coconut fibres the introduction of fibres to the concrete presented problem due to the way the mixer operated. To ensure complete distribution of fibres throughout the concrete mix, sometimes it became necessary to stop the mixer, remove the mixing paddles, sprinkled a layer of fibres onto the concrete surface and reactivated the machine for approximately five revolutions after each addition. In an endeavour to ensure that the fibres were well distributed and randomly orientated, and thus prevent balling or interlocking, the concrete together with the fibres were mixed by hand in this investigation.

B. Mixing Procedure

The dry cement and aggregates were mixed for two minutes by hand in a 0.1m3 laboratory mixer pan. The mixing continued for further few minutes while about 80% of the water was added. The mixing was continued for another few minutes and the fibres were fed continuously to the concrete for a period of 2–3 min while stirring. Finally, the remaining water along with super plasticizer was added and the mixing was continued for an additional two minutes. This ensured a complete distribution of fibres throughout the concrete mix. For each mix, a total of six cylinders with

C. Method of Compaction

The moulds with half filled fresh concrete were vibrated vertically on the vibrated table while casting for about 30 seconds. The moulds were then fully filled with fresh concrete and vibrated further for about 60 seconds. This method of compaction was to align the fibres normal to the direction of vibration

D. Curing

The specimens were stripped from the moulds 24 hours after casting and submerged in water until testing. Some of the specimens were removed from the water after 7, 14, and 28 days of submersion in water for testing the7,`14 and 28-day strength

IV. TEST RESULTS

A. Compressive Strength

Compressive strength is defined as resistance of concrete to axial loading. Cubes were placed in Universal Testing Machine (U.T.M), and load was applied. The readings were recorded and compressive strength was calculated. The results of Compressive strength are shown in Table-1 and Table-2.

Calculations: Compressive Strength = Maximum load/Cross Sectional Area = P/A

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Table-1

Compressive Strength of M25 Grade Concrete with Coconut Coir Concrete (N/mm2)

Cursing Day	0 %	1 %	2 %	3%
7 Day	19.11	19.77	20.40	20.88
14 Day	24.44	25.11	25.77	26.22
28 Day	26.77	26.44	26.85	27.46

Compressive Strength of M30 Grade Concrete with Coconut Coir Concrete (N/mm2)

Cursing Day	0 %	1 %	2 %	3%
7 Day	22.4	22.7	22.85	23.05
14 Day	28.5	28.75	28.95	29.1
28 Day	30.6	30.95	31.14	31.27

Bar Charts: The bar charts are drawn for compressive strength results. These are drawn between compressive strength and percentage addition of coconut coir fibre concrete at 7, 14 and 28 days to observe the variation of results.

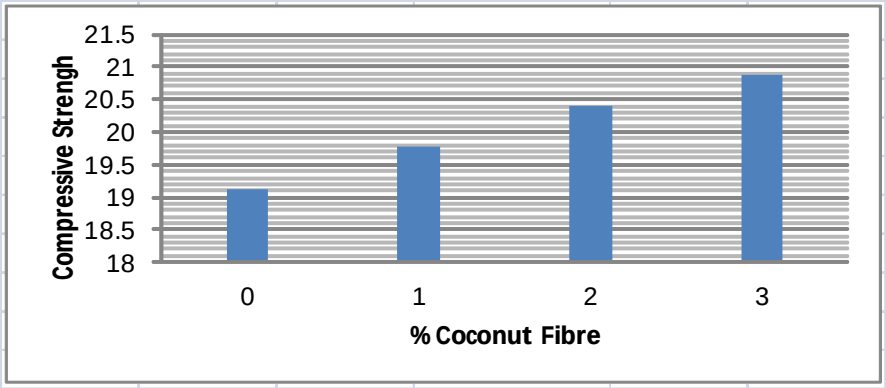

Fig 1 –Compressive Strength of 7 days for M25

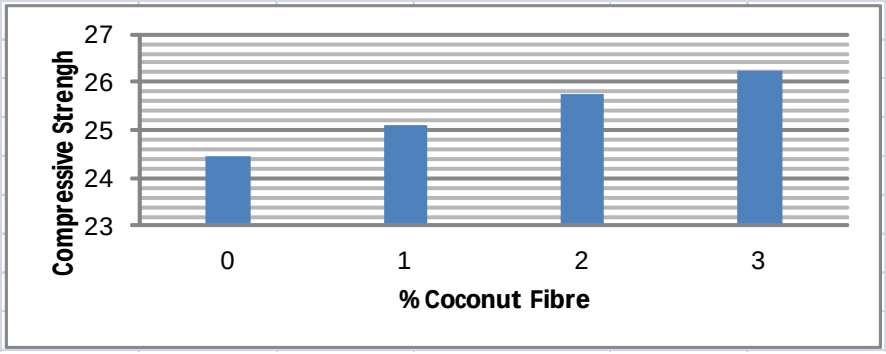

Fig 2 – Compressive Strength of 14 days for M25

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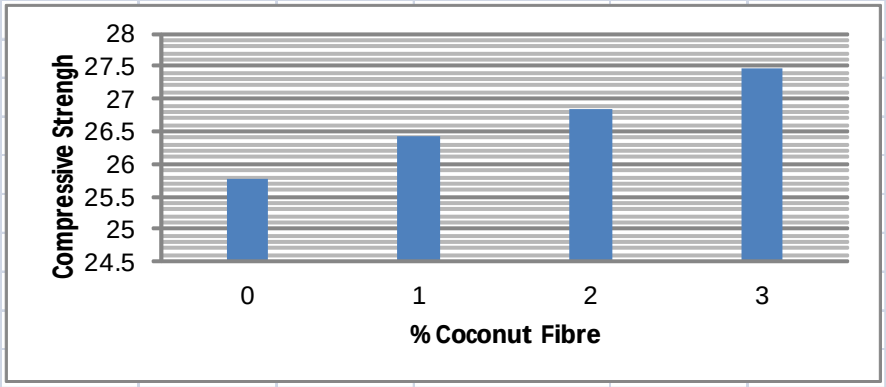

Fig 3 – Compressive Strength of 28 days for M25

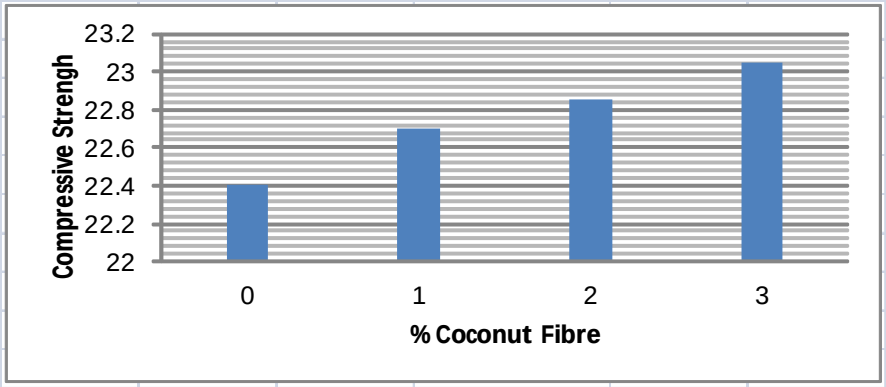

Fig 1 –Compressive Strength of 7 days for M30

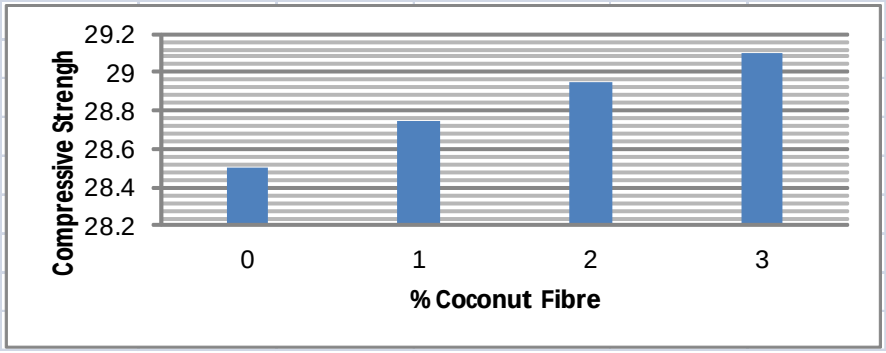

Fig 2 – Compressive Strength of 14 days for M30

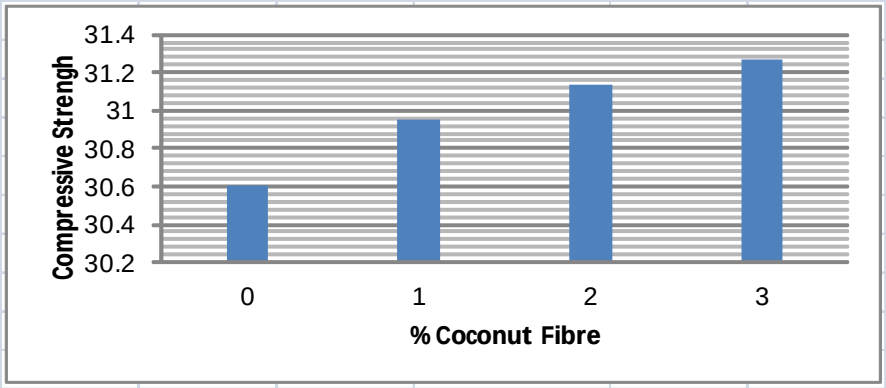

Fig 3 – Compressive Strength of 28 days for M30

V. CONCLUSION

Coconut fibre being low in density reduces the overall weight of the fibre reinforced concrete thus it can be used as a structural light weight concrete.

By reinforcing the concrete with coconut fibres which are freely available, we can reduce the environmental waste.

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

Since, 1% & 3 % fibres do not show favourable results, it can be concluded that fibre content should not be used beyond 3%.

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