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A REVIEW ON USING COCONUT SHELL FIBRE IN CONCRETE

Abhay Sharma[1], Sahil[2], Shivani Devi[3]

[1,2]Student (UG) HIET, Shahpur, India.

[3]Assistant Professor HIET, Shahpur, India.

ABSTRACT

Processed Coconut fibre (coir) is one of the Natural fibers abundantly available in tropical regions, and is extracted from the husk of coconut fruit. The waste material obtained from the coconut fruit is utilized and used in constructions. The use of coconut fiber in concrete will reduce the massive amount of the waste produced and also increases the tensile properties in the concrete. Coconut fibre is cheap and has more resistant to thermal conductivity. The addition of coconut fibre significantly improved many of the engineering properties of the concrete like, toughness and tensile strength. It also has the ability to resist to cracking and spalling of concrete. From previous studies observed that mixing of coconut fibre in concrete a significant rise in tensile strength is observed and restraining the development of crack,

Keywords: Fiber reinforced concrete, coconut fiber, compressive strength, tensile strength, torsion and toughness.

1. INTRODUCTION

The present research was undertaken in perspective of the huge production of non-decaying coconut waste and the fast depletion of natural aggregate sources. One alternative to this problem is to use this waste coconut shell and coir fibre in helpful products such as concrete manufacturing. The experimental study intended to investigate the feasibility and option of partial substitution of standard crushed coarse aggregate by recycled coconut shell and the inclusion of coir fibre by cement content for concrete manufacturing.

2. LITERATURE REVIEW

Research work previously done in the field of utilization of waste material to replace conventional coarse aggregate was the starting point for the present work. It gave insight into the waste disposal problem and the potential of using suitable waste material as the replacement of depleting conventional crushed coarse aggregate

S. Thrilokanatha Reddy,(2022)

Carried out experimental study to know the compressive strength and split tensile strength of coconut fiber reinforced concrete. The cement was partially replaced with six percentages say 0%, 1%, 2%, 3%, 4%, 5% of coconut fiber by weight of cement. The compressive strength and split tensile strength of cured concrete is evaluated for 7days, 28 days. It was observed that compressive strength values increase with increase in curing days but the values decrease with the percentage coconut fiber replacement. The initial strength values of the concrete are very low compare with the concrete of only OPC but the strength of 1% and 2% coconut fiber are closer to that of concrete with only OPC at 28 days. And it also reported that compressive strength decreased with the increase in the fiber content

K. Gunasekaran, (2015) in his experimental study shows the durability efficiency of the coconut shell in three curing conditions (full water immersion, intermittent watering, and full air drying) was investigated and the strength and resistance at elevated temperatures (100, 200, 300, and 400°C) were examined. The durability properties examined incorporate the absorption, absorptivity, volume of permeable voids, rapid chloride penetrability, and chloride concentration profile. The mix design proportion used for the production of Coconut Shell Aggregate Concrete (CSAC) was 1:1.47:0.65:0.42 by weight of cement. The test outcome showed that CSAC durability characteristics are similar to that of other standard lightweight concrete, and for CSAC to achieve better durability its efficient curing is essential. They concluded that coconut shells can be a reasonable elective material for aggregate for concrete production.

Ralf Winterberg, (2010) presents a paper that gives a thorough diagram of the conceivable outcomes and capability of fibre-reinforced concrete. The researchers infer that progressing research and constant advancement on fibre reinforced concrete made modern and cost-effective structure material today. The utilization of filaments can accomplish significant time and cost reserve funds by diminishing the cost-concentrated work required to get ready, place and control common reinforcement.

Anthony Nkem Ede and Joshua Olaoluwa Agbede,(2015) studies the effect of coconut fibers on the strength of concrete which includes the compressive and the flexural strength of normal concrete. The fibers were used in different percentages (0%, 0.25%, 0.5%, 0.75%, and 1.0%) of the weight of the fine aggregates. The results showed that the compressive strength of coconut fiber-reinforced concrete increased with curing age and with increasing

percentage of coconut fiber up to 0.5% then gradually began to decrease from 0.75% to 1.0%. The percentage strength gained at 28 days for 0.25%, 0.5%, 0.75% and 1.0% fiber contents with respect to the control sample are 4.58%, 38.13%, 8.56% and -2.42% respectively. The results for the flexural strength of concrete showed that strength gained at 28 days for 0.25%, 0.5% and 1.0% of coconut husk fiber were 28.82%, 22.15% and 0.42% respectively.

Sangeetha G, (2016) prepared two mixes with coconut shell and clay. In this examination, they focus on the substitution of aggregate by coconut shell and concrete by mass. 0 percent, 10 percent, 20 percent, and 30 percent substitution by coconut shell and clay by the amount of coarse aggregate created. For all the concrete, the 0.50 water cement proportion is kept up. M20 grade of concrete was prepared. However, the outcome demonstrated a decrease in concrete compressive quality as the rate substitution expanded. It is reasoned that in reinforced concrete development, it is conceivable to utilize coconut shells and clay in concrete. Its utilization is cost-effective and environment-friendly

Saravana Raja Mohan, (2012) researched an investigation embraced in improving properties of fly ash concrete composites with Coconut fibre. A composite with fly ash concrete and treated coconut fibre, tentatively explored the impacts of substitution of 43 grade Ordinary Portland Cement (by weight) with various rates (10%, 15%, 20%, 25%, and 30%) of fly ash and the impacts of the expansion of prepared regular coconut fibre having 40 mm length with various rates (0.15%, 0.30%, 0.45%, and 0.60%) on structural properties were taken up. They reported that the fly ash-based coconut fibre strengthened concrete demonstrates a superior execution than ordinary concrete

P. Kala et.al. (2024), experimental study on coconut fibres grains using partial replacement method. The coconut fibre grains are replaced with fine aggregate by a percentage replacement of 1 %,3 %,5 % and 7 %From the experimental investigation, the specimens with 5 % replacement of coconut fibre grains by fine aggregates gained maximum compressive strength, split tensile strength and flexural strength compared to other replacements and concrete with 0 % replacement. The use of coconut fibre grains as a partial replacement of fine aggregate should be encouraged for sustainable and economic construction.

Rama Krishna et.al (2005), This study invested on the variation of chemical composition and tensile strength for all four natural fibers , i.e, sisal, jute ,coconut, hibiscus, cannabinus fiber was continuous immersion for 60days in water and subjected to alternate wetting and drying, continuous immersion was found to be critical due to loss of tensile strength. Among all the fibers, coconut fiber gives the best result for retaining a good percentage of tensile strength in all tests conditions. He carried an experimental on impact resistance of slabs. For all four different fiber content of 0.5%, 1.0%, 1.5% and 2.5%. By the weight of cement and their different length of 20, 30, 40mm. A fiber context of 2% and length of 40mm of coconut fiber which gives the best result by absorbing 2.5 and 3.5 J impact energy.

Sai uday (2017), "Studied on the behavior of the coconut fiber in concrete structure the CFRC". The coconut fiber reinforced concrete improves the various engineering properties of concrete. The adding of coconut fiber improves the compressive strength, flexural strength and split tensile strength of concrete. He conducted an experiment on high strength concrete with the fiber content of 1%, 2%, 3%, 4%, 5% by cement weight. The split tensile strength compressive strength of cured concrete evaluated for 3days, 7days, 28 days. This research found that the optimum fiber content to be at 1% (by cement weight). This result shows that the coconut fiber can be used in the construction.

Ienamul Hasan Ali et al (2018), Experiment study on the coconut fiber reinforced concrete. This paper presents the versatility of the coconut fiber is one of the natural fiber is easily available in the tropical region in which coconut fiber are used as reinforcement. The researches in few last decades was carried research on the fiber reinforced concrete were presented in this paper. The flexural strength of coconut fiber reinforced concrete increases for 1%,2%, 3% of fiber content for M20 grade used . When compared with plain concrete. The coconut fiber reinforced concrete is more effective than plain concrete. The main aim of this paper is to spread awareness of coconut fibers as a construction material.

3. CONCLUSION

Based on the results of literature survey, the following findings could be taken:

- Large output of non-decaying coconut waste leading to the issue of disposal. Coconut shell properties make it appropriate material for concrete manufacturing and its use for concrete can assist with the issue of disposal.
- Coconut shells can be used to build low-cost residential societies, as well as coir fibres can be used in concrete manufacturing to improve the mechanical characteristics of concrete. Both are cost-effective as well.
- Coconut waste can add to the economic manufacturing of concrete while also reducing the issue of waste disposal.
- From the above researches, it also found that coconut shell and coir fiber both can be used in concrete individually. But, we can utilize both the materials together to observe the effectiveness and properties of concrete

- Coconut fiber reinforced concrete helps in reduction of cracks and decrease in the crack width

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