Use of Coconut Fibre In Concrete: A Review

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Abstract- *There is currently a grade deal of interest in developing technology towards the use of natural fibre material in cement composite. Natural fibre are present large quantity in the world. Such natural fibre has been used to improve strength of concrete. The major advantage of the material are easily available, inexpensive and environment friendly. Coconut fibre is low in density and it reduce the overall the fibre reinforcement concrete thus it can be used as a structural light weight concrete. Coconut fibre has the ability to resist cracking and spalling.*

Keywords- Coconut fibre, composite, construction material, cement and concrete.

I. INTRODUCTION

Coconut fibre is extracted from the outer shell of a coconut. The common name, scientific name and plant family of coconut fibre is coir. Coconut cultivation is concentrated in the tropical belts of Asia and East Africa.

There are two types of coconut fibre, brown fibre and white fibre. Brown fibre are put out from mature coconuts and white fibre is put out from immature coconuts. Coconut fibre stiff and tough and have low thermal conductivity. Coconut fibre are available in three forms, bristle, mattress decorticated.

Coir is the natural fibre of the coconut husk where it is a thick and coarse but durable fibre. It is relatively water proof and has resistance to damage by salt water and microbial degradation.

This paper gives a review on coconut fibre composite with different proxy resins and focuses on the mechanical properties of coconut fibres.

II. LITERATURE REVIEW

V. Sai Uday[1] present that the compressive strength of 1% coconut fibre reinforcement concrete was slightly higher than plane concrete. In addition of coconut fibre, the compressive strength goes on decreasing. Tensile strength was found at 1% of coconut fibre which is found to be slightly higher than the plane mix concrete.

Parmeshwarlal Sahu[2]Experimented by 3% addition of coconut fibre with water cement ratio of 0.48, compressive strength tests yielded best results.

Ashish Kumar Dash[3] Used Recron 3s fibre and silica fumes for making concrete. The compressive strength and the flexural strength of the concrete specimens were determined. The optimum strength obtain at 0.2% fibre content.

Mohamed Elchalakani[4] Describe an experimental investigation of the cyclic in elastic flexural behaviour of concrete field tubular (CFT) beams mud of cold form circular hollow section and filled with normal concrete. Cyclic bending test were perform using a constant amplitude loading history on different CFT specimens with diameter to thickness ratio (D=t) ranging from 20 to 162.

H.S.Chore[5] Determine the compressive strength of fibre reinforced fly ash concrete using the regression model. The compressive strength of fibre reinforced concrete containing fly ash was predicted by creating a mathematical model using statistical analysis for the concrete data obtained from the experimental work.

III. EXPERIMENTAL STUDY

The experimental investigations was carried out on test specimen using one basic mix proportions with three variations of aspect ratio of coconut fibres, and different weight fraction of coconut fibre.

IV. MATERIALS USED AND METHODS

Coconut fibres: Coconut fibre were collected from shop that came from India, Sri Lanka etc. It was obtain from after the oil extraction the factory from the outer periphery of the coconut fruits. Fibres were chopped with sharp scissors maintaining in length from 15 to 35 mm. Chopped fibres were ovendried at 80 $^{\circ}C$ for 5 hours and used desiccators for cooling.

Aggregates: The coarse aggregates from crust granite was collected from igneous origin. The particles size used ranges between 5 to 20 mm. River sand as fine aggregate was used to mix the concrete according to the ASTM Standard C33 (2006). All particles passing through ASTM Sieve No. 4 aperture 4.75 mm but retained on sieve No. 230, aperture 63µm.

Cement and Water: Ordinary Portland cement type whose properties confirm into the requirement of ASTM Type I was used for mixing of concrete and water was collected from the laboratory stand post.

Preparation of the test specimens: Concrete cubes sizes of 100×100×100 mm and prisms having dimension of 100×100×300 mm were cost for both plane and coconut fibre reinforced concrete for the determination of different properties of concrete. The mix proportion of 1:2:3 the weight of ordinary Portland cement, rivers sand, crushed and coconut fibre were used to cost the specimen. The water/ cement ratio were used 0.4 for the mix. All ingredients were mixed properly with use of coconut mixture machine. Fresh concrete workability was investigated immediately after the final mixing of the concrete using slump test.

Compressive strength test: The compressive strength of coconut fibre, like many natural materials, can very widely depending on factors such as the type of coconut fibre, its processing, and its density. Generally the compressive strength of coconut fibre range from 0.5 MPa to 10 MPa, but it can be even lower or higher inspecific cases. Several factors influence the compressive strength of coconut fibre such as fibre type, processing, density, moisture content, binding agents, thickness and geometry.

Tensile strength test: Split tensile test perform on standard cylinders 15 cm diameter and 30 cm depth samples for both ordinary concrete, and reinforced concrete was poured with coconut fibre (raw and processed fibres) with varying proportions of fibres (1.2%, 0.6%).

V. CONCLUSION

When fibres are added in concrete, it results in the marginal increase in compressive strength properties. A better performance can be achieved for 3% coir fibre reinforced concretes. Similarly the compressive strength and split tensile strength and properties are improved by adding coir fibre along the concrete. Addition of coir fibre results in good strength properties as compared to conventional concrete. Coconut fibre proved to a good source of natural plants based fibre whose optimum replacement percentage being 5%. And also by using coir fibre and steel slag, we can make environment more suitable.

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