A REVIEW STUDY ON THE USE OF COIR FIBRE, RECRON FIBRE AND STEEL SLAG IN THE CONCRETE

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Abstract: There is currently a great deal of interest in developing technology towards the use of natural fibre materials in cement composites. Natural fibres are present in relatively large quantities all over the world and natural vegetable fibres are produced in most developing countries. Such natural fibres have been used to strengthen non-organic materials for thousands of years. Examples include straw for brick, mud in poles, and plaster with bamboo. In this century, fibres such as those from coconut, bamboo, wood cellulose, wool or chips, bark, leaves, seeds and fruits have been used in sand-based cement products. Fibres can be divided into two categories: natural and man-made. The advantages of using natural fibres are that the materials are readily available, inexpensive and environmentally friendly. The existence of these natural materials can be renewed, so reliance on limited resources or resources that are not environmentally friendly will be reduced. In this paper, the various literature study has been done.

Keywords: Fibre reinforced concrete, Recron fibre, Compressive strength, workability, Mechanical properties

1.1 INTRODUCTION

Concrete made with Portland cement has certain characteristics: it is strong in compression but weak in tension and tends to be brittle. The weakness in tension can be overcome by the use of conventional steel bar reinforcement and to some extent by the inclusion of a sufficient volume of certain fibres. The use of fibres also alters the behaviour of the fibre-matrix composite after it has cracked, thereby improving its toughness. The overall goal for this research is to investigate the potential of using waste and low energy materials for domestic construction, principally in Ghana. The objective of this research is to experiment on the use of coconut fibres as an enhancement of concrete. Coconut fibres are not commonly used in the construction industry but are often discarded as wastes. Coconut fibres obtained from coconut husk, belonging to the family of palm fibres, are agricultural waste products obtained in the processing of coconut oil, and are available in large quantities in the tropical regions of the world, most especially in Africa, Asia and southern America. In Ghana, they are available in large quantities in the southern part of the country. The specific objective of experimenting on coconut fibre as an enhancement of concrete is two fold. Firstly, to assess if the fibres of the species grown in Ghana would improve the mechanical properties of concrete like the species in Latin America and South East

Asia. Secondly, once it was proven that vital mechanical properties of concrete and mortar could be enhanced by coconut fibre from species grown in Ghana, then further investigation would be carried out on improving the long term durability of concrete and mortar with coconut fibres as an enhancement. Ordinary concrete, when subjected to the rigorous test of time and extreme weather conditions, tends to crack and lose its strength. It can lead to seepage and corrosion of primary steel and spooling of concrete. Fiber reinforcement concrete is considered as a material of improved properties and not as reinforced cement concrete wherein reinforcement is provided for local strengthening of concrete in tension reason. Since in fiber reinforcement concrete, fibers are uniformly dispersed (Recron 3s) which has better properties to resist internal stress due to shrinkage. Also reduces segregation and bleeding and also results in a more homogeneous mix. This leads to better strength and reduced permeability which improves durability. During the present research, an attempt has been made to utilize the sludge and Recron 3s fibers for making concrete.

1.2 LITERATURE REVIEW ON COIR FIBRE, RECRON FIBRE AND STEEL SLAG

Adewumi John Babafemi et al (2019) did the study on the concrete with coir fibre. The need to utilize manageable materials for development is developing. This examination explored the impact of joining 0.5 and 1% coir fiber content on the functionality, thickness, compressive quality, parting elasticity, and solidness of cement. The parting elasticity was resolved at 7, 14 and 28 days while the compressive quality was resolved as long as 56 days following applicable code methodology. The toughness of coir fiber strengthened cement was examined by oppressing solidified block examples to 1, 3 and 5% magnesium sulfate answers for 28 and 56 days in the wake of relieving in water for an underlying time of 28 days. The compressive quality misfortune and mass misfortunes were resolved with reference to the control blends. The fuse of coir fiber in concrete decreased its functionality and appeared to have no impact on the thickness. Coir fiber somewhat improved the compressive and rigidity of cement, particularly at 0.5% while its protection from sulfate assault was just improved at 1% coir fiber content.

Neeraj Agarwal et al (2018) did the significant study on the applications of coir fibre in concrete. A FRC is a composite material comprising of a concrete based framework with an arranged or irregular appropriation of fiber which can be steel, nylon, coir polythene and so on. Advancement in innovation upgrades human solaces as well as demolish the eco-framework. FRC is commonly made with high concrete substance and low water content. Plain concrete flops abruptly once the redirection comparing to extreme flexural quality is surpassed, then again, fiber fortified solid keep on supporting extensive loads ever at avoidance impressively in overabundance of the crack diversion of plain concrete. Exploration and formative work in fiber strengthened solid composites started in India in the mid 1970s. Fiber solid innovation is not, at this point limited to research facility tests it is utilized in the creation of precast solid parts and for in situ fortifying and fixes of solid structures.

B Venkat Narsimha Rao et al (2016) stated the use of recron fibre in the construction of roads. This paper clarifies on recron fiber reinforced concrete pavements, which is an ongoing progression in the field of fortified solid asphalt plan. FRC asphalts end up being more proficient than ordinary RC asphalts, in a few perspectives, which are clarified in this paper. The plan strategy and clearing activities of FRC are additionally talked about in detail. A nitty gritty contextual investigation of Polyester fiber squander as fiber fortification is included and the aftereffects of the investigation are deciphered. The paper additionally incorporates a concise examination of FRC asphalts with ordinary solid asphalt. The benefits and negative marks of FRC asphalts are additionally talked about.

M.Prabu et al (2019) studied on the properties of concrete by using recron fibre. In this examination, Recron fiber is added to concrete in the extent of 0%, 0.25%, 0.50%, and 1% by the heaviness of concrete. This examination is done in 4 unique evaluations of cement, for example, M20, M25, M30 and M35. For quality boundaries, each evaluation of cement for each extent, 3D shapes are casted for 7 days, 14 days and 28 days and crystals and chambers are casted for 28 days. The compressive quality, flexural quality and split pliable quality are found and analyzed. Inside miniaturized scale breaks are intrinsically present in the solid and its poor elasticity is because of the spread of such miniaturized scale breaks, in the end prompting weak break of the solid. It has been perceived that the expansion of little, firmly dispersed and consistently scattered strands to cement would go about as split arrester and would considerably improve its static and dynamic properties. This kind of cement is known as Fiber Reinforced Concrete. Fiber Reinforced Concrete is the composite material containing strands in the concrete grid in an efficient way or haphazardly circulated way. Its properties would clearly, rely on the effective exchange of worry among grid and the filaments, which is to a great extent subject to the sort of fiber, fiber calculation, direction of strands, blending and compaction strategies and size of aggregates.

Bhagyashri Sisode et al stated the use of industrial waste in the concrete to enhance the strength of the concrete in the structures. In the current situation, squander materials from different ventures and admixtures are added to the blend. More than 400 million tons of waste materials are being created by different enterprises each year. Utilization of industry squander like fly debris to somewhat supplant establishing material in solid framework tends to the manageability issues and its transformation will empower the solid development industry to become more reasonable. Consequently it very well may be utilized as an efficient structure cementations material in this manner diminishing the removal what's more, air contamination issues brought about by the business. Recron-3s is a polypropylene monofilament, discrete, intermittent short fiber that can be utilized in cement to control and capture breaks. During the current investigation, an endeavor is made to contemplate the different mechanical properties of cement containing muck and Recron 3s filaments. Fly debris was utilized as a substitution to solidify. Substitution rates utilized during the current examination were 10%, 20%, 30%, 40%, half. For every supplanting level of concrete with, 0.0%, 0.2%, 0.3%, 0.4% of Recron 3s strands were included and examples were cast to decide the mechanical properties. Compressive qualities of 3D

squares were found on the seventh day and 28th day. The seventh day and 28th day split rigidity of the examples was found on the chambers. The flexural quality of the examples was found on the seventh day and 28th day. It is discovered that expansion of fly debris and Recron 3s filaments has useful impacts on the mechanical properties of cement.

Rohit Hooda stated the applications of recron fiber in concrete. Elite Concrete is utilized to clarify concrete with extraordinary properties. Prior HPC was known to be a solid with high quality. However, headway in concrete innovation has made another definition for HPC. Engineered fiber (i.e Recron fiber) in different rate i.e 0.0%, 0.1%, 0.2%, 0.3% and 0.4% to that of all out weight of cement and projecting was finished. At long last, unique level of silica rage 0%, 10%, 20%, 30% and 40% with the substitution of concrete keeping steady fiber substance and cement was casted. In the current work two kinds of concrete, Portland Slag Cement and Ordinary Portland Cement have been utilized to get ideal outcomes. Extraordinary size mortar, 3D shapes, chamber and crystal were projected. Finally compressive test, parting test, flexural test are directed. Likewise to acquire such exhibitions that can't be acquired from traditional cement and by the current strategy, an enormous number of preliminary blends are required to choose the ideal blend of materials that meets exceptional execution. It is seen from the research that 0.2% Recron fiber and 20% SF is the ideal mix to accomplish the ideal need.

S. Satish Kumar et al did the study on the strength properties of concrete by using Recron Fibre, Coir Fibre and Steel slag in concrete. The principle goal of this trial study is to research the quality presentation of Recron fiber strengthened cement of M30 grade delivered by supplanting concrete with Egg Shell Powder in different rates like 5%, 10%, 15% and 20% both in OPC and PSC and furthermore expansion of Recron strands in various rates like 0.2%, 0.3%, 0.4% and 0.5%. The Ideal level of ESP in OPC and PSC can be resolved what's more, it very well may be utilized for deciding Compressive and Split Tensile quality tests by including various rates of Recron filaments. The quality attributes of Conventional OPC and Recron fiber strengthened cement and the Conventional PSC and Recron fiber strengthened cement are thought about. And furthermore the quality attributes of Recron Fiber fortified cement of OPC are contrasted and Recron Fiber strengthened cement of PSC at the age of 7 to 60 days. In this examination, Cube and Cylinder examples are ready for Compressive and Split Tensile quality tests furthermore, they were tried at the age of 7, 28 and 60 days.

H.S.Chore, et.al, determined the compressive strength of fibre reinforced fly-ash concrete using the regression model. The compressive strength of the fibre reinforced concrete containing flu-ash was predicted by creating a mathematical model using statistical analysis for the concrete data obtained from the experimental work.

Ashish Kumar Dash, et.al, used Recron 3s fibre and silica fume for making concrete. The compressive strength and the flexural strength of the concrete specimens were determined. The optimum strength was obtained at 0.2% fibre content.

Machine Hsie, et.al, used polypropylene hybrid fibre for making concrete. It was reported that the strength of concrete with polypropylene hybrid fibre was better than that of the single fibre reinforced concrete.

R.Srinivasan, et.al, determined the optimum percentage replacement of cement with hyposludge. The optimum replacement percentage was found to be 30%.[4]A Sivakumar and Manu Santhanam found that among hybrid fibre combinations, only the steel polypropylene combination performed better in all respects compared to the mono-steel fibre concrete.Qian and Stroeven studied the fracture properties of concrete reinforced with polypropylene fibre and three sizes of steel fibres with fibre content ranging from 0 to 0.95% by volume of concrete.

Wu, Li and Wu compared the mechanical properties of three different types of hybrid composite samples prepared by using the combinations of polypropylene- carbon, steel-carbon and polypropylene- steel fibres. Mechanical properties of hybride composites produced by using carbon and aluminum whiskers in addition to polypropylene fibres were studied.

Banthia and Sappakittipakron investigated three fibre hybride with carbon and polypropylene micro fibres added to macro steel fibres and showed that steel macro fibers with highly deformed geometry produce better hybrids than those with a less deformed geometry. Also composites with a lower volume fraction of fibre reinforcement were seen as having a better prospect for hybridization than composites with a high volume fraction of fibres.

Venkat Rao et al carried out an investigational study on durability of high strength self-compacting concrete (HSSCC). The sulphate attack effect on concrete and confrontation of concrete to the attack had been experienced in the laboratory, by immersing specimens of concrete cubes in the solution which encloses 5% sodium sulphate. The chemical attack effect had been estimated by taking adjustment of mass in to consideration. The sulphate attack effect on performance and properties of concrete were acknowledged. Even from the optical surveillance, the intensity of sulphate attack on cracking and the impact of breakdown were noticed.

Vijaya Sekhar Reddy et al The test specimens of 15 15 cm cubes were immersed in 5 % of sodium×15 cm×cm hydroxide solution over a period of 90 days. The effect of alkali attack on performance and properties of concrete were found out. Percentage decrease in weight after 28 days was found to be 10.32 %.

Desai et al. conducted a study on durability properties of fibre reinforced concrete on marine structures. In this study the properties of fibre reinforced concrete were compared with those of conventional concrete and also its environmental effects on durability of concrete. Results showed that the addition of polypropylene triangular fibres improved the durability of concrete. Compressive strength of concrete increases with increase in fibre dosage up to 0.3%, then it starts diminishing. So the best possible percentage fibre found from experiment was 0.3%.

Kokseng Chia et al. accomplished an investigational study on the water permeability and chloride permeability of high strength light weight concrete (LWC) in comparison to that of normal strength concrete with or without silica. Results were compared with LWC and NWC (Normal Weight Concrete) at a normal strength of about 30-40MPa. The water penetrability of the LWC with a w/c of 0.55 was lower than that of the equivalent NWC, when the concrete was subject to a pressure of 4MPa when the strength level reached 30-40MPa. The water penetrability of the high-strength LWC and NWC with a w/c of 0.35 was of the same order regardless whether silica fume was incorporated. The results point out that the resistance to the chloride dissemination does not seem to be concurrent to the water permeability of the concrete.

CONCLUSION

Following are the various conclusions drawn after the test performance on cube samples of concrete by using coir fibre, Recron Fibre and Steel Slag:

1. The compressive strength of concrete increases by the addition of coir fibre, Recron fibre and steel slag.
2. The split tensile strength of concrete increases by the addition of coir fibre, Recron fibre and steel slag.
3. The literature study concludes that the flexural strength and compressive strength increases with the coir fibre and Recron fibre in the concrete.
4. With the increase in coir fibre, recron fibre and steel slag in concrete, the workability of concrete also increases.
5. The cost of forming concrete can be reduced by using coir fibre, recron fibre and steel slag in it.
6. By using coir fibre, recron fibre and steel slag, we can make environment more sustainable.

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