

Literature Review on Mechanical properties of Natural fiber reinforced concrete

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ABSTRACT:-The present experimental investigations is to evaluate the flexural behavior and mechanical properties of low volume natural fibers reinforced concrete of M40 grade with water to cement ratio of 0.4. The natural fibers such as jute, pineapple, steel and sisal fibers with low volume fractions of 0.25%, 0.5% and 0.75% with 22mm and 30mm length of each fiber are used for this investigation. The workability properties of concrete are demonstrated by the test such as slump test, compaction factor. Mechanical properties like compressive, flexural, tensile and shear strength, young's modulus and impact resistance was conducted for 28days with water curing. From the literature review, it observed that mechanical properties like compressive, tensile, flexural strength, young's modulus, shear strength and impact resistance were increased with increasing in the percentage of fibers.

Keywords: Sisal fiber, Jute fibers, pineapple fiber, split tensile strength, compressive strength, flexural strength, Impact resistance, young modulus, shear strength.

1.0 INTRODUCTION

Concrete is a composite material primarily cement, aggregate and water. The cement Portland cement and other materials used as fly ash and slag as a replacement of cement. Aggregate used as crushed rocks such as granite and fine aggregate such as sand. Plain cement concrete have high compressive strength and have very low tensile strength, limited to ductility and low resistance to crack. Internal micro cracks are inherently present in the concrete and its poor tensile strength is due to the propagation of such micro cracks, finally leading to the brittle fracture of the concrete. An addition of small and uniform dispersed fibers in to concrete would act as crack arrester and enhanced the properties in static and dynamic.

Natural fibers are from animal and plant cellulose. Plants fibers are divided into primary and secondary fibers. Primary fibers are grown form plants while secondary fibers are extracted from the waste product plants. Jute fibers are extracted from the ribbon of the stem composed cellulose and lignin. Sisal fiber(*Agave sisalana* Perrine) was extracted from leaves of the plants are crushed between mechanical rollers. Pineapple (*Ananas comosus*) are extracted from raw pineapple leaves All fibers are treated with NaOH solution before adding to the concrete.

2.0 LITERATURE REVIEW

Riya Johnson et al^[1] investigated on flexural behavior of fiber reinforced concrete made with pineapple fibers with weight fraction of 0.75%. It observed flexural strength of concrete was increased by 24% by addition of pineapple fiber.

Dr. Y. K. Sabapathy et al^[2] investigated on mechanical property such as compressive, flexural and tensile strength of the sisal fiber reinforced concrete. Investigation was done for using M20, M30 & M40 grade concrete with a sisal fiber 0.5%, 1.0%, 1.5% & 2% by volume fraction. The compressive, tensile, flexural strength is decreased by increasing in fibers. The compressive strength was increased upto 1% beyond this it was decreased. The tensile and flexural strength improved with increase in volume fraction of fibers.

Athiappan. K, et al^[3] investigated on workability and mechanical properties of concrete reinforced with sisal fiber of length 35mm and volume fraction were used from 0.1, 0.2, 0.3, 0.4 & 0.5%. The workability of concrete conducted by slump test was decreased by increased in addition of fiber. The compressive and split tensile strength was increased and also flexural strength was increased by 20% by addition of 0.3% fiber.

Mohammad Zakaria et al^[4] investigated on mechanical properties of the jute fiber reinforced concrete with volume fraction of 0.1, 0.25, 0.50 & 0.75% and length 10, 15, 20, 25 mm. The compressive strength was increased by 15%, flexural strength was increased by 14% and tensile strength was increased by 35% for 0.1% with 15mm of fiber.

Kawkab Habeeb et al^[5] investigation made on mechanical properties such as compressive, flexural tensile strength, impact resistance by addition of sisal fibers from 0.5 to 1.5%. The workability test on concrete like slump was decreased by increased in fiber. The compressive, tensile, flexural strength and ultrasonic pulse velocity was decreased by increasing in fiber. The impact resistance is increased by increasing in fiber.

Balasubramanian et al^[6] investigation made on mechanical properties of sisal fibers in structural concrete with volume fraction 0.5, 1, 2%. The compressive strength was increased for 1.5% volume fraction with aspect ratio of 300 when compared to conventional concrete. Tensile strength was increased for 0.5% and flexural strength was increased upto 1% for aspect ratio 300 when compared with conventional concrete.

Bharathi Murugan.R et al^[7] investigation experimentally on behavior in fresh state and compressive strength of jute fiber reinforced concrete with weight fraction 0.5, 0.6 & 0.7%. Workability of concrete like slump was decreased with increased in jute fiber and compressive strength was increased by increase in fiber.

Abass Abayomi Okeola et al^[8] investigation made on the workability and mechanical property such as compressive and split tensile strength on sisal fiber reinforced concrete with volume fraction 0.5, 1.0, 1.5 & 2%. The workability and split tensile strength decreases by increase in fiber. Compressive strength was increases by increase in fiber.

M. Aruna^[9] investigation made on the mechanical properties such as compressive strength of the sisal fiber reinforced concrete with weight fraction 1, 2 & 3% and the length 10 -30 mm. Addition of fiber to concrete reduces the compressive strength by 21.36% for 1% of fiber and workability of concrete was decreases with increases in fiber.

Dr. G. Ramakrishna et al^[10] investigation made on the mechanical properties of conventional concrete and compare with 0.5% sisal fiber reinforced concrete. The compressive, split tensile and flexural strength increased gradually with respect to conventional concrete.

P.Loganathan, et al^[11] investigation made on the mechanical properties such as compressive, flexural and split tensile strength of sisal fiber reinforced concrete with length of 25mm and steel fiber of 50mm and with an aspect ratio of 67 with weight fraction of 0.5, 1.0 & 1.5%. For 0.5% of sisal fiber and 1.5% of steel fiber the compressive, split tensile and flexural strength increased by 30.76%, 50% & 38% respectively.

Gopi Raval et al^[12]; investigation made on the mechanical properties such as compressive, split tensile strength of jute fiber reinforced concrete with weight fraction from 0.5, 1 & 2% . The compressive and split tensile strength increased by 33% and 10% respectively. But increase in the fibers proportion in the concrete decrease in compressive and split tensile strength.

Linto Mathew et al^[13] investigation made on mechanical properties such as compressive , split tensile and flexural strength of the pineapple fiber reinforced concrete by weight fraction 0.05%, 0.1, 0.15, 0.20 and 0.25% of the quantity of cement. The compressive strength was increased 20% and 18% for 7 days and 28days respectively for 0.1% addition of fibers.

Ashit Sarkar et al^[14] investigated experimentally on sisal utilized as a part of cement in concrete and tested compressive strength, split-elasticity, and rigidity modulus of M40 grade concrete with volume fraction of 0.1, 0.2, 0.3, 0.4, and 0.5%, with ideal length of 35mm. It was observed that workability of the concrete decreased with increase in percentage of fiber in concrete and for 0.3% fiber reinforced concrete gives maximum compressive strength.

M.Dilipan, S.Ramkumar et al^[15] investigation experimentally use of composite fibers such as jute f and banana fiber in concrete with different ratios from 0.5 to 1.5%. It was observed that the use Jute fiber and Banana fiber significantly improves the compression as well as tensile strength in initial stage but addition of more fiber decrease the strength when compared to initial stage and also compressive, split tensile and flexural was maximum at 0.5% of addition of fibers.

Vijaya Kumar P et al^[16] investigation made on the mechanical properties such as compressive, split tensile and flexural strength. Jute fiber of 0.5% by volume fractions and replacing of cement by rice husk ash at various dosage from 10 to 30% and length of the fiber used are 30mm with aspect ratio 150-300. The compressive, split tensile and flexural strength for 10% of rice husk ash at 28 days are 14.56, 21.89 and 24.26% respectively.

3.0 CONCLUSION: Based on the Literature review the following conclusions are drawn.

Development of reinforced concrete made with natural fibers enhances the mechanical properties like compressive strength, split tensile strength, flexural strength, impact resistance, shear strength and young modulus of concrete based on the length, type and percentage of fiber are added to the concrete.

4.0 REFERENCES

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