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An Experimental Study on M-35 Grade of Concrete with Partial Replacement of Cement with Coconut Fiber

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***Abstract*— The addition of coconut fibers in concrete improve various properties of concrete mix such as toughness, flexural strength, tensile strength and impact strength as well as mode of failure. The purpose of using coconut fiber is it tends to bind the concrete mix together, slows the settlement of coarse aggregate and reduces the bleeding which means a slower rate of drying thus less shrinkage. In hardened concrete, coconut fibers act crack arresters like any other secondary reinforcement, the fiber stop cracks from propagating by holding the concrete together so cracks cannot spread wider or grow longer. However, since coconut fibers are distributed throughout the concrete, they are effective close to where cracks start at the aggregate paste interface.The proportion of coconut fibre are varied in the percentage of 0%, 0.5%, 1.0%, 1.5% and 2.0%**

***Index Terms*— M-35 Grade, Coconut Fiber.**

I. INTRODUCTION

Since the plain, unreinforced concrete is a brittle material, with a low tensile strength and a low strain capacity. Sometimes concrete structures have to survive in adverse conditions under chemical attacks like chloride attack, sulphate attack and acid attack. These chemical attacks affect the durability of concrete structure. For hardened reinforced concrete chloride attack is considered as a cause for corrosion. Chemicals percolate through the cracks developed in the concrete structures and corrode the reinforcement provided in the concrete and thus the deterioration of structure starts and the durability of structure get affected.

The use of fibres in concrete is from ancient times, to increase the tensile strength and flexure strength of concrete various researchers investigate the effect of fibres on various properties of concrete. Since then Fibres such as steel, glass, carbon and coconut are use in concrete. Addition of fibre in concrete also influences its brittle behaviour and ductility.

II. LITERATURE REVIEW

Majid Aliet. Al., (1) He studied the mechanical and dynamic properties of coconut fibre reinforced concrete (CFRC. He investigated thon the mix proportions of 2%, 3% and 5% fibre contents by mass of cement and fibre lengths of 2.5, 5 and 7.5 cm is investigated.

Domke P. V et.al (2)had investigated the use of natural and agricultural waste products like coconut fibers and rice husk ash to enhance the properties of concrete and their studies describes the strength of the concrete.

Liu et al. (3)studied the influence of 1%, 2%, 3% and 5% at fibre lengths of 2.5,5 and 7.5 cm on properties of concrete. For a proper analysis the properties of plaincement concrete was used as reference. It was seen that damping of CFRC beamsincreases with the increase in fibre content. It was observed that CFRC with a fibrelength of 5 cm and fibre content of 5% produced the best results. In this study theoptimum percent of coconut fibre added was 5%,which made us to adopt addition of4%,5% and 6% coconut fibre by weight of cement in our research work.

Keller et. al (4) investigated the shear behavior of reinforced concrete beams strengthened by the attachment of different configurations and quantities of carbon fibres. The study revealed that the strengthening by using carbon fibres increased the Resistance to shear and also spalling of concrete.

(Chouwe and his team.(5) studied the viability of using coconut-fibre ropes as verticalreinforcement in mortar-free low cost housing in earth quake prone regions. The ropeanchorage is achieved by embedding it in the foundation and top tie-beams. The bondbetween the rope and the concrete plays an important role in the stability of the structure and the rope tensile strength is also found to be fairly high. The rope tension generated due to earthquake loading should be less than both the pull out force and the rope tensile load to avoid the structure collapse. The study concluded that the pull out energy increases with an increase in embedment length, rope diameter, cement and fibre content in the matrix.

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III. RESULT AND DISCUSSION

Table No. 1 Slump with Coconut Fiber

S. No.	Coconut Fiber %	Slump (mm)
		M35
		80
		78
		75
		72
		70

Table 2 Compressive strength of M35 grade

CoconutFiber %	Compressive Strength(N/mm^2)		
	7 Days	**14 Days**	**28 Days**
0.0	19.60	26.50	37.67
0.5	20.41	26.12	38.47
1.0	21.50	28.46	40.84
1.5	22.80	29.47	41.79
2.0	21.71	28.76	40.60

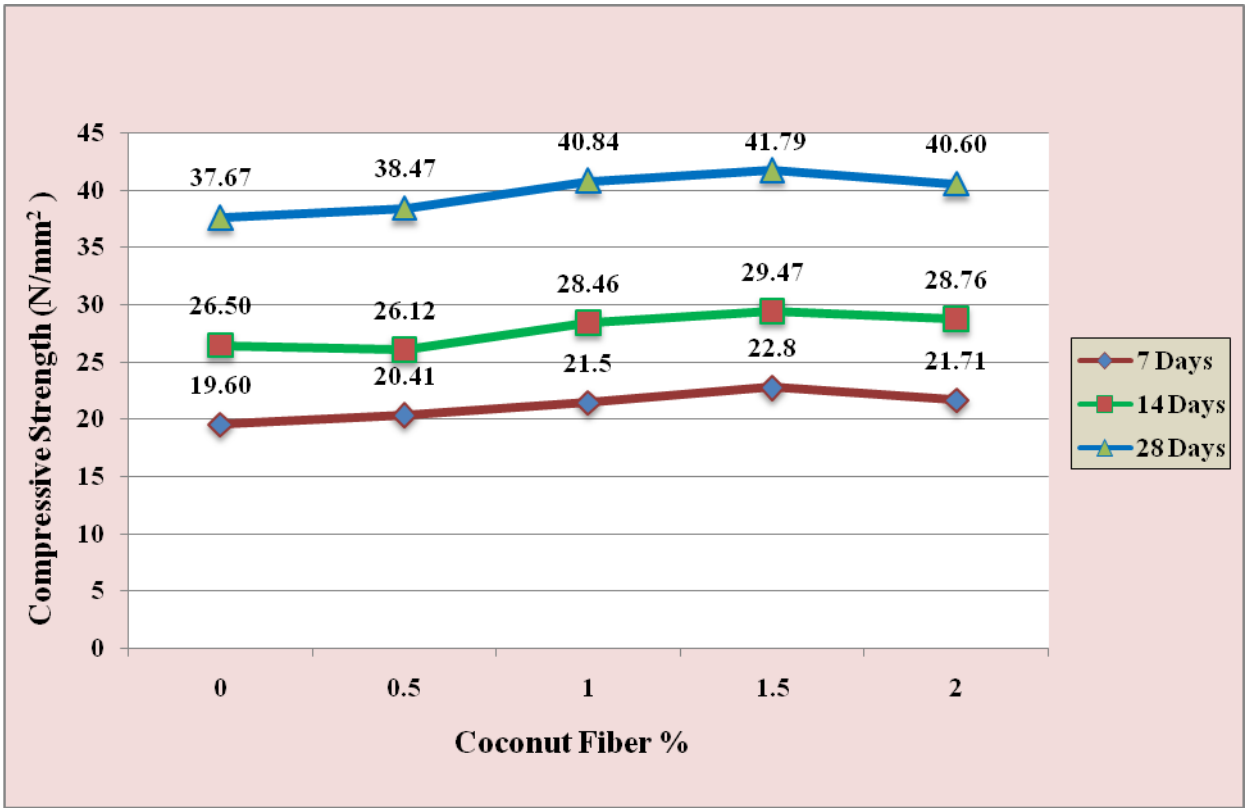

Fig 1 Comparative Compressive Strength of M35 Grade

Table 3 Splitting Tensile Strength of M35 grade

CoconutFiber %	Splitting Tensile Strength(N/mm^2)		
	7 Days	14 Days	28 Days
0.0	1.99	2.97	3.33
0.5	2.42	3.33	3.97
1.0	2.51	3.48	4.12
1.5	2.22	3.29	3.64
2.0	2.04	3.06	3.41

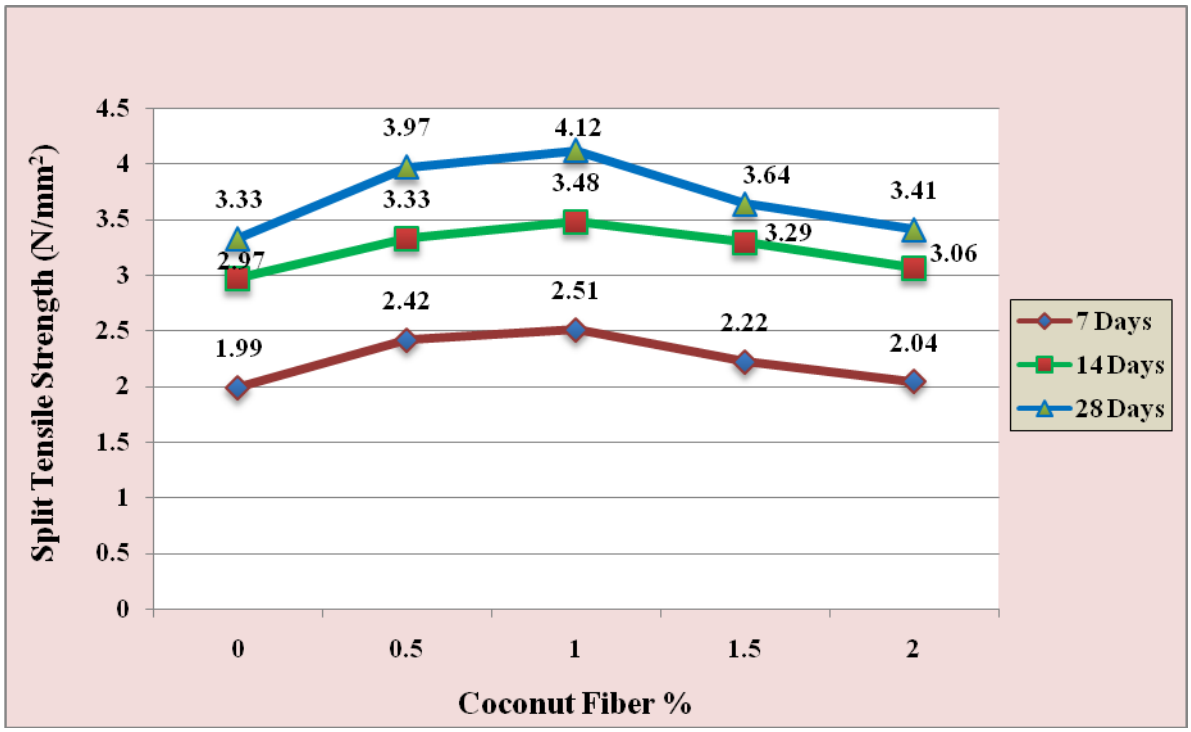

Fig 2 Comparative Splitting Tensile Strength of M30 Grade

Table 4Flexural Strength of M30 grade

CoconutFiber %	Flexural Strength (N/mm^2)	
	7 Days	28 Days
0.0	1.64	2.70
0.5	1.81`	2.97
1.0	2.06	3.38
1.5	1.98	3.26
2.0	1.93	3.12

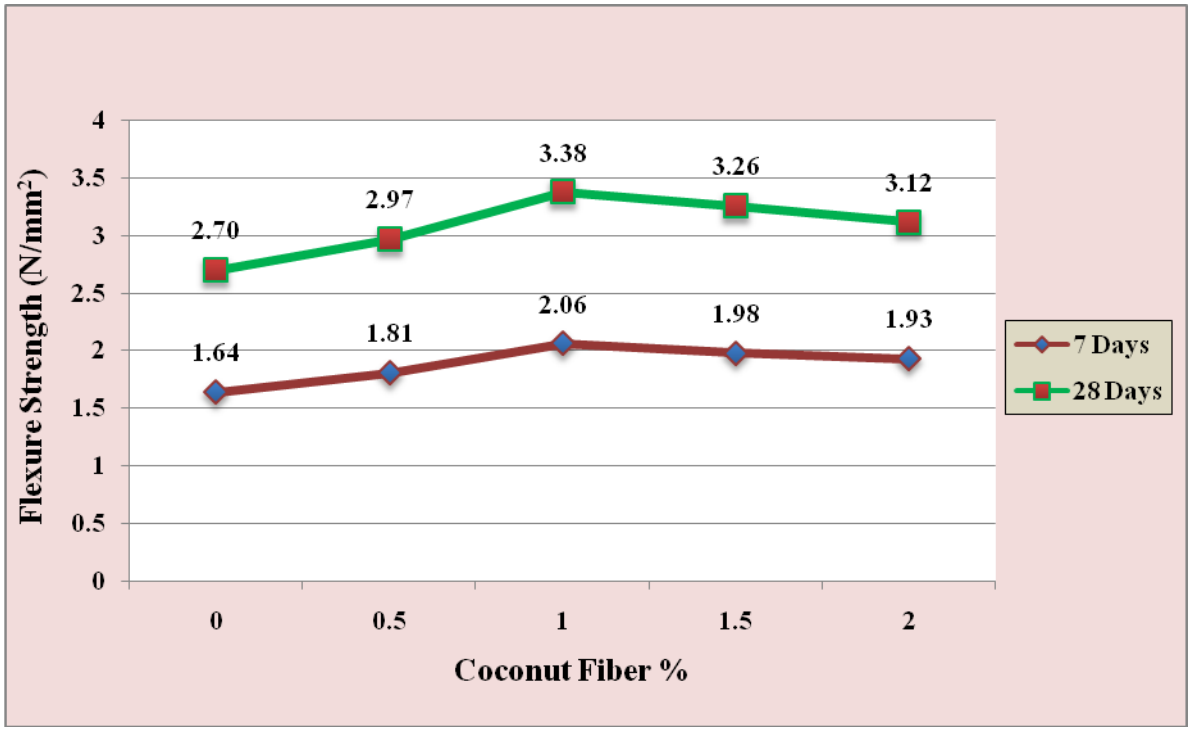

Fig 3 ComparativeFlexural Strength of M35 Grade

IV. CONCLUSION

Accomplish Compressive strength test, split tensile test and flexural strength on concrete of grade M35 having different Percentage (0%, 0.5%, 1.0%, 1.5% and 2.0%) of coconut Fiber

1. Compressive Strength:

The results revealed that minimum compressive strength was obtained at 0% addition of coconutfiber while optimum compressive strength was obtained at 1.5% addition of coconutfiber for both 14 days and 28 days curing period of cubes. It was concluded that optimum percentage increment in compressive strength of concrete was 12.61% at 28 days of curing respectively.

2. Split Tensile Strength:

It was concluded that optimum percentage increment in split tensile strength of concrete was 23.72% at 28 days of curing respectively.

3. Flexure Strength:

It was noted that minimum flexural strength was obtained at 0% while optimum flexural strength was obtained at 1.0% addition of coconut fiber at 14 and 28 days or curing respectively.

It was observed that optimum percentage increment in flexural strength of concrete was 25.18 % at 28 days curing.

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