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Studies on Strength Properties of Coconut Fibre Concrete

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Abstract: ***Maximum compressive strength to the tune of 32.1MPa was recorded with 3% coconut fibre. Higher concentrations of coconut fibres recorded negative effect on compressive strength. For tensile strength and flexural strength coconut fibre (3%) recorded beneficial effects in improving the average tensile strength and average flexural strength. Higher concentrations exhibited detrimental impact. Irrespective of different levels of fibres, 28 days curing recorded maximum test values. Study confirmed beneficial effect of 3% coconut fibre as reinforcement for improving compressive, tensile and flexural strength values of concrete.***

Keywords: Compressive strength, Tensile strength, Flexural strength, Coconut, Concrete

I. INTRODUCTION

Reinforcement in the form of fabric or profiled bar (typically steel but may be FRP) of differing gauge or size, or potentially specialist fibres depending on the application, is placed in areas where tensile stresses will occur under load, however pre-stressing in concrete is where an internal stress has been introduced through steel strand impart compression into the concrete. Fibres may be classified as either natural or man-made, and the natural fibres are further divided into different groups. There is currently a great deal of interest in developing the technology for using natural fibre materials in cement composites. Natural fibres exist in reasonably large quantities all over the world and natural vegetable fibres are produced in most developing countries. Natural fibres have been used to reinforce inorganic materials for thousands of years. Examples include straw for bricks, mud and poles, plaster and reeds. During this century other fibres such as coconut, bamboo, wood cellulose fibres, wool or chips, blast fibres, leaf fibres, seed and fruits fibres have been used in cement-sand based products. The main reasons for the use of natural fibres are abundantly available and are comparatively cheap. Natural fibre composites are also claimed to offer environmental advantages such as reduced dependence on non-renewable energy/materials sources, lower pollutant emissions, lower greenhouse gas emissions, enhanced energy recovery and end of life biodegradability of components. These fibres increase the toughness of the material so that the product can withstand handling and a structural load. Coconut 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 America.

Coconut fibres are not commonly used in the construction industry but are often dumped as agricultural wastes.One of the suggestions in the forefront has been the sourcing, development and use of alternative, non-conventional local construction materials including the possibility of using some agricultural wastes and residues as partial or full replacement of conventional construction materials as fibers in concrete serve as crack arrestor which can create a stage of slow crack propagation and gradual failure. Normally, in convectional reinforced concrete we use steel bars which increase the weight as well as the cost of the concrete which cannot be easily affordable to all rulers as well as urban civilians. Number of workers have used coconut fiber for conventional aggregates in the structural concrete production (Olanipenkun et al.2006,Gunasekaran and Kumar,2008,Alida Abdulla et al.2011,Mulinari et al.2011m,Okere,2013,Parbhane and Shinde,2014,Abhijeet et al.2014,Ealias et al.2014).Present investigation was thus carried to study the effect of different percentage natural fibre (coconut fibre) on the compressive, tensile and flexural strength of concrete and to determine the suitable percentage of coconut fibre in concrete where the strength of concrete is maximum.

II. MATERIALS AND METHODS

The present study entitled “impact of polypropylene fibre and natural fibre on the strength of concrete” was carried out at concrete lab, department of civil engineering, sharda university, Greater Noida. Natural river sand of size 4.75mm and below confirming to zone 3 of IS 383-1970 were used as the fine aggregate and natural crushed stone with 20 mm size and 10 mm size were used as coarse aggregate. The coconut fibre used in study was collected from Jagat Farm Greater Noida. The diameter of the fibre ranges between 0.15mm to 0.85mm with the length 6mm to 24mm.

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Coconut fibre was used in various percentages in M35 grade of concrete so as to check the effect of polypropylene and natural fibres on the properties of concrete.Coconut fibre was used in percentages 0%, 1%, 2%, 3%, 4% and 5% and recron 3s fibre used in percentages 0.0%, 0.1%, 0.2%, 0.3%, 0.4%, and 0.5% respectively. These fibre reinforced concrete mixes were checked for compressive strength, tensile strength and flexural strength for a period of 7 days, 14 days and 28 days respectively. The batching of materials done for 7 days, 14 days and 28 days for the compressive strength of concrete. The amount of cement, fine aggregate, coarse aggregate and water remain the same for all the percentages of control mix and fibre reinforced concrete. For compressive strength of concrete cubes were casted and the mixing was done by hand,whereas for tensile strength of concrete cylindrical moulds were casted and for flexural strength of concrete beams were casted and the mixing was done by hand. Mixing was done by adding coarse- aggregates, followed by 25% of total water. Then fibers and sand was added with 25% of remaining water. After thoroughly mixing of aggregates, cement was added and remaining 50% of water was added. For each mix slump test was conducted to measure workability. After the mixture was prepared it was compacted on a vibration table. Remolding was done after 24 hours of casting. Specimens were cured in curing tank. Water immersion method of curing was adopted. Cubes were cured for 7, 14, 28 days. Compressive strength test, Tensile strength test & Flexural strength test were carried by using standard procedures

III. RESULTS AN DISCUSSION

The slump test which is used to ensure uniformity for different batches of concrete under field conditions, and to ascertain the effects of plasticizers on their introduction revealed that

that concrete without fibre recorded maximum slump value (83mm) where as concrete with 1% coconut fibre recorded highest slump value (50mm). Proportionate increase in concentration of fibres showed decline in slump value from 50mm to 19mm with coconut fibre (Figure 1). The slump test results conclude that the workability of coconut fibre mix goes on decreasing as the fibre content is increased in the concrete mix. Nandish *et al.* (2015) also reported similar impact of coconut fibre and polypropylene fibre on concrete mix for sump test. Adeyemi (1998) reported that coconut fiber can be used as a good replacement of coarse aggregate to produce structural concrete in the construction industry.

Compressive strength of concrete with coconut fibre after 7days, 14days and 28 days is presented in Table 1 and Figure 2,3,4,5. Study confirmed that the natural fibre (coconut fibre or coir) increases the compressive strength of the concrete when 3% fibre was used. Coconut fibre was used in percentages from 0% to 5% by volume of concrete. The compressive strength of concrete increased from 27.76MPa for control mix having 0% fibre content to 32.1MPa for 3% fibre content showing an increase of 15.6%. Increase in fibre concentration (above 4%) recorded decline in average compressive strength by 26.57% (from 32.1MPa to 25.26MPa). Maximum compressive strength was observed with 3% coconut fibre after 28 days (36.4MPa) followed by 14 days (34.7MPa) and 7 days (25.2MPa). Sadiqul et al. (2012) from his studies revealed that even though the results show that the compressive strength of concrete decreased with the increased percentage of coconut fibre however conventional concrete specimens were fully crashed when they reached their ultimate failure load but the specimens in case of 1% and 3% of coconut fibre by the total volume did not crash when they reached their ultimate failure load. Thus it was observed that coconut fibre reinforced concrete can enhance higher toughness. Similar results have also been reported (Okere ,2013)

For coconut fibre proportional increase in tensile strength from 2.65MPa (conventional concrete mix) to 3.14MPa was achieved with 3% (Table 2, Figure 6, 7, 8, 9). However, higher concentrations of coconut fibre (above 3%) exhibited negative effects on tensile strengths. Highest concentration (5%) recorded least tensile strength (2.4MPa) showing a decline of 9.4% over conventional concrete. For coconut fibre 28 days curing was observed to give desirable results for all the levels under study. Maximum tensile strength (3.56MPa) was achieved after 28 days for concrete mix with 3% of coconut fibre. Similar impact of fibres as reinforcement material for improving tensile strength have been reported (Prasad *et al*. 2013, Disale and Sisode, 2015)

Higher levels of coconut fibre (>3%) recorded decline in average flexural strength from 6.43MPa achieved with 3% coconut reinforcement to 5.7MPa achieved with 5% coconut fibre. 28 days curing of concrete mix with 3% coconut fibre recorded highest value for flexural strength (7.48MPa) after 28 days. Best concentration also recorded significant superiority after 7 days and 14 days curing. Flexural strength got increase by 17.9 % with 3% coconut reinforcement(Table3,Figure 10,11,12,13). Parveen *et al*.(2013) ,Prasad *et al.* (2013), and Disale and Sisode (2015) also recorded similar results for flexural strength achieved through fibre reinforcement.

IV. CONCLUSION

The workability of the fibre reinforced concrete has been found to decrease with an increase in the concentration of coconut fiber in the concrete mix.

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REFRENCES

[1] Adeyemi, A.Y.(1998).An investigation in to the suitability of coconut shells as aggregates in concrete production. J. Env. Desighn Manag.1:17-26
[2] Desale, sunil V and Sisode, Bhagyashri.(2015). "Use of industrial waste and recron 3s fibre to improve the mechanical properties of concrete. Indian Journal of Research. IV.ISSN No: 2250-1991.
[3] Nandish, S. C., Ajith, B. T.and Chandrashekara, A.(2015).Impact of coconut fibre and polypropylene fibre (recron 3s) on concrete mix including admixture. International Journal of Engineering Research & Technology (IJERT).4(6): ISSN: 2278-0181.
[4] Okere., Chineye and Elizabeth.(2013). Strength properties of coconut fibre ash concrete".. Journal of research in architecture and civil engineering (ISTP-JRAC).
[5] Praveen and Ankit Sharma.(2013)."Structural Behavior of FibrousConcrete Using Polypropylene Fibers",International Jornal for research in applied sciences and engineering technology..3(3) pp-1279-1282,
[6] Prasad, M., Rajive,C and Grover,Rakesh.(2013).A comparative study of polypropiline fiber reinforced silca fume concrete with plane cement concrete. International Jr of engineering research and science & technology.12(4):127-136.
[7] Sadiqul, Hasan Noor Md., Sobuz, Habibur Rahman., Sayed Md. Shiblee and Md. Saiful Islam.(2012). " The use of coconut fibre in the production of structural lightweight concrete. Journal of applied sciences. 12: 831-839.

Table 1: Effect of different levels of coconut fibre (%) on compressive strength after 7 days,14 days and 28 days of curing.

S.No	Percentage Of coconut fibre (%)	Compressive Strength (MPa)			Average Compressive Strength (MPa)
		7 days	14 days	28 days	
1	0	21.3	29.5	32.5	27.76
2	1	21.5	29.7	32.72	27.97
3	2	22.3	30.1	33.2	28.53
4	3	25.2	34.7	36.4	32.1
5	4	20.1	32.8	34.9	29.3
6	5	18.0	26.4	31.7	25.36

Table 2:Effect of different levels of coconut fibre as reinforcement (%) on tensile strength (MPa) after 7 days, 14 days and 28 days of curing

S.No	Percentage of recron 3s used in M35 grade of concrete (%)	Tensile strength of concrete MPa recorded			
		7 days	14 days	28 days	Average tensile strength (MPa)
1.	0	2.03	2.82	3.1	2.65
2.	1	2.16	3.02	3.14	2.8
3.	2	2.35	3.14	3.41	3.0
4.	3	2.58	3.28	3.56	3.14
5.	4	2.21	3.09	3.48	2.93
6.	5	2.05	2.11	3.01	2.4

Table 3:Effect of different levels of Recron 3s fibre reinforcement (%) on flexural strength (MPa) after 7 days, 14 days and 28 days of curing

S.No	Percentage of recron 3s used in M35 grade of concrete (%)	Flexural strength of concrete MPa recorded			
		7 days	14 days	28 days	Average flexural strength (MPa)
1.	0	4.85	5.51	6.01	5.45
2.	0.1	4.98	6.06	6.66	5.9
3.	0.2	5.11	6.86	7.02	6.33
4.	0.3	5.13	7.1	8.25	6.83
5.	0.4	4.7	6.4	7.15	6.08
6.	0.5	4.5	6.04	6.78	5.7

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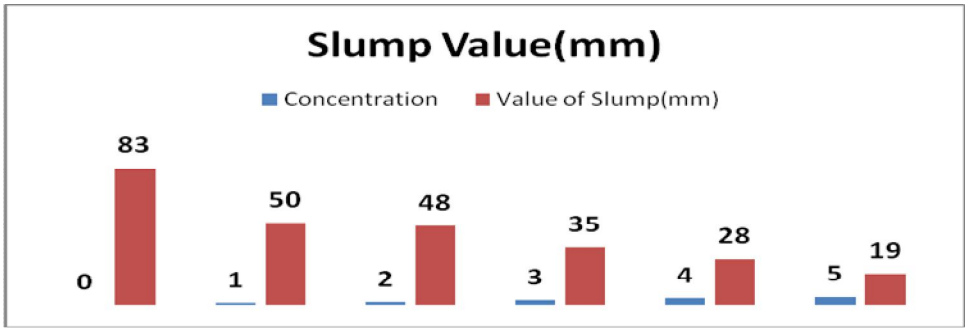


Fig 1 : Slump values for different percentages of coconut fibre in a concrete mix.

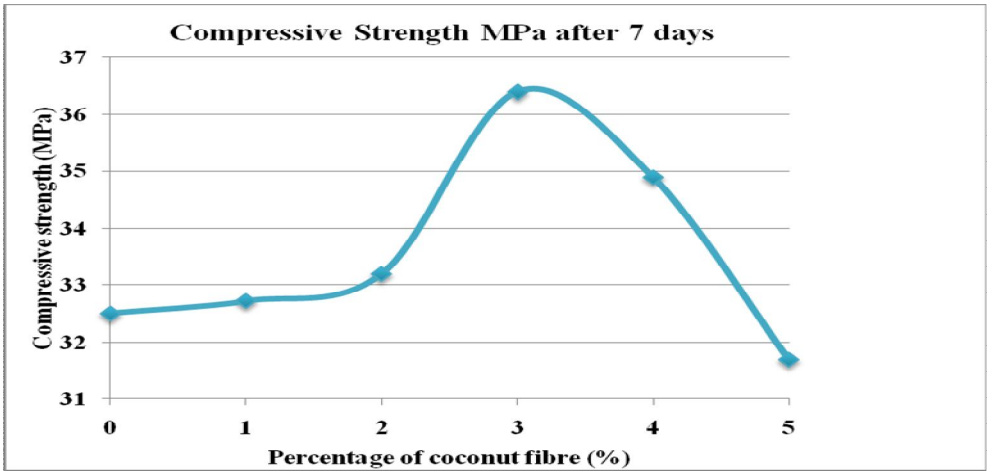


Fig 2: Compressive strength of coconut fibre reinforced concrete after 7 days of curing

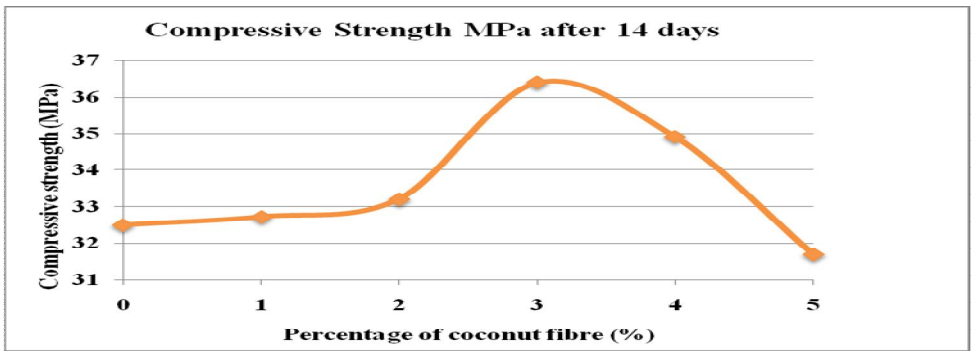


Fig 3: Compressive strength of coconut fibre reinforced concrete after 14 days of curing

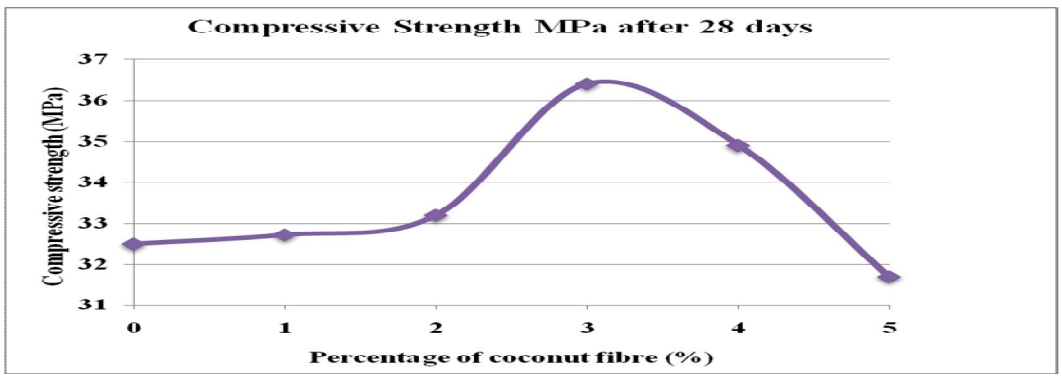


Fig 4: Compressive strength of coconut fibre reinforced concrete after 28 days of curing

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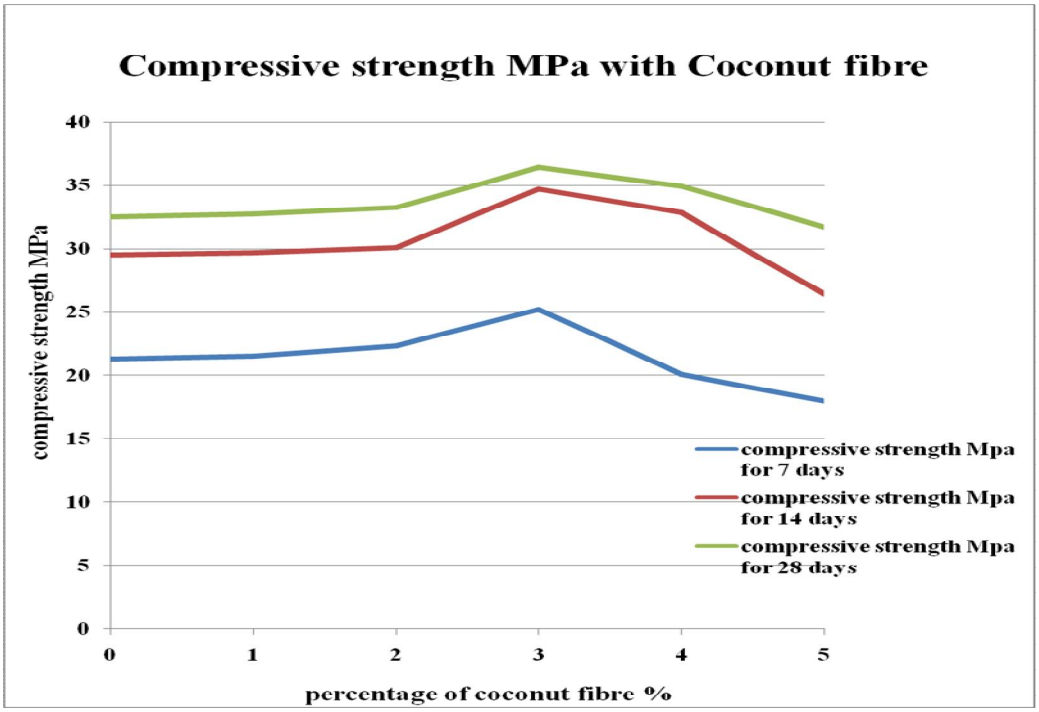


Fig 5: Comparative study on compressive strength of coconut fibre reinforced concrete after 7 days, 14 days and 28 days of curing

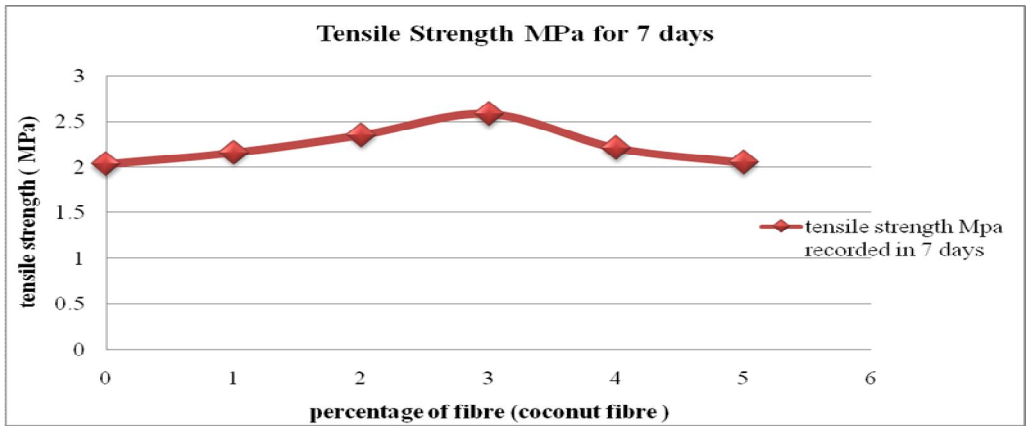


Fig 6: Tensile strength of concrete with coconut fibre reinforcement after 7 days of curing

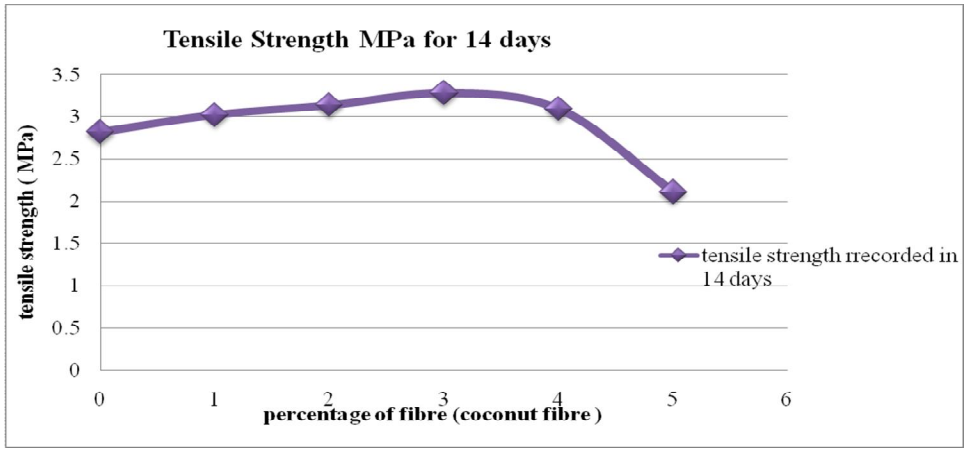


Fig 7: Tensile strength of concrete with coconut fibre reinforcement after 14 days of curing

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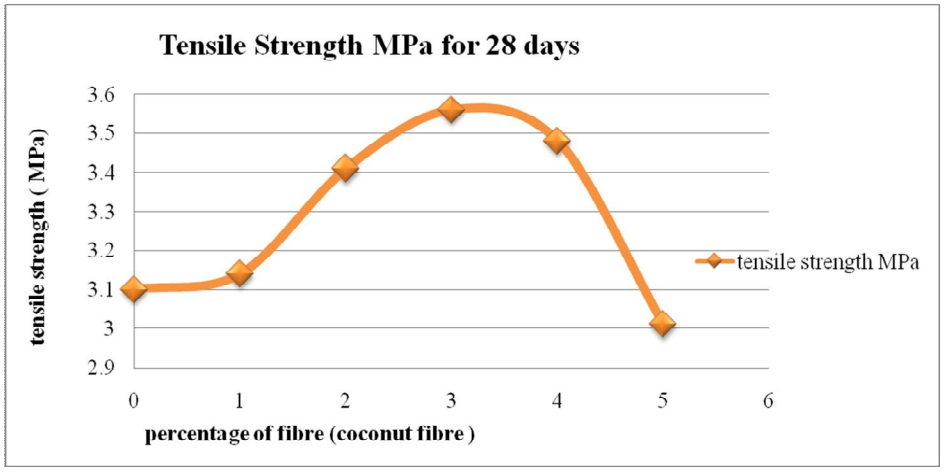


Fig 8: Tensile strength of concrete with coconut fibre reinforcement after 28 days of curing

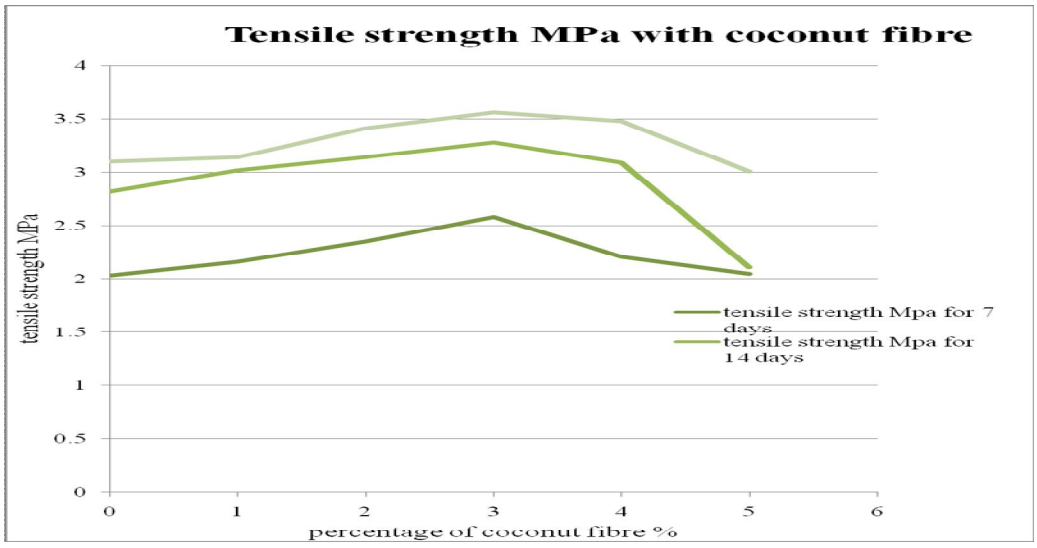


Fig 9: Comparative study on tensile strength of concrete with coconut fibre reinforcement after 7 days, 14 days and 28 days of curing

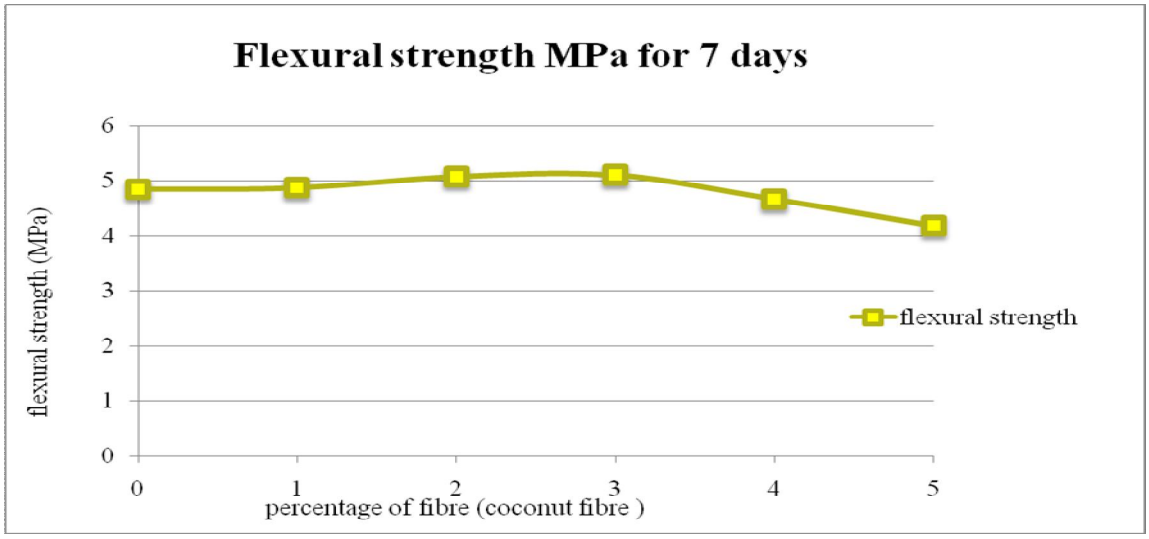


Figure 10: Flexural strength (MPa) of concrete with coconut fibre after 7 days of curing

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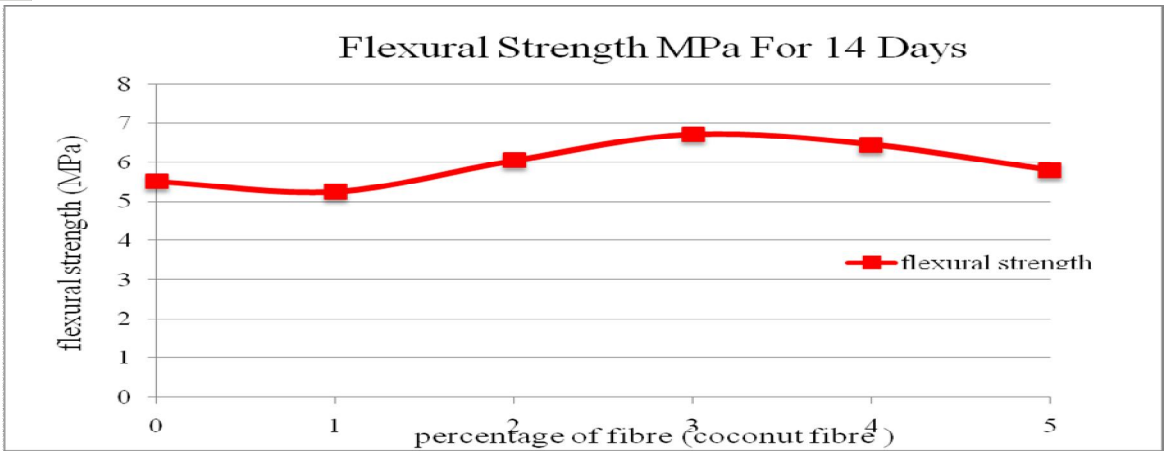


Figure 11: Flexural strength (MPa) of concrete with coconut fibre after 14 days of curing

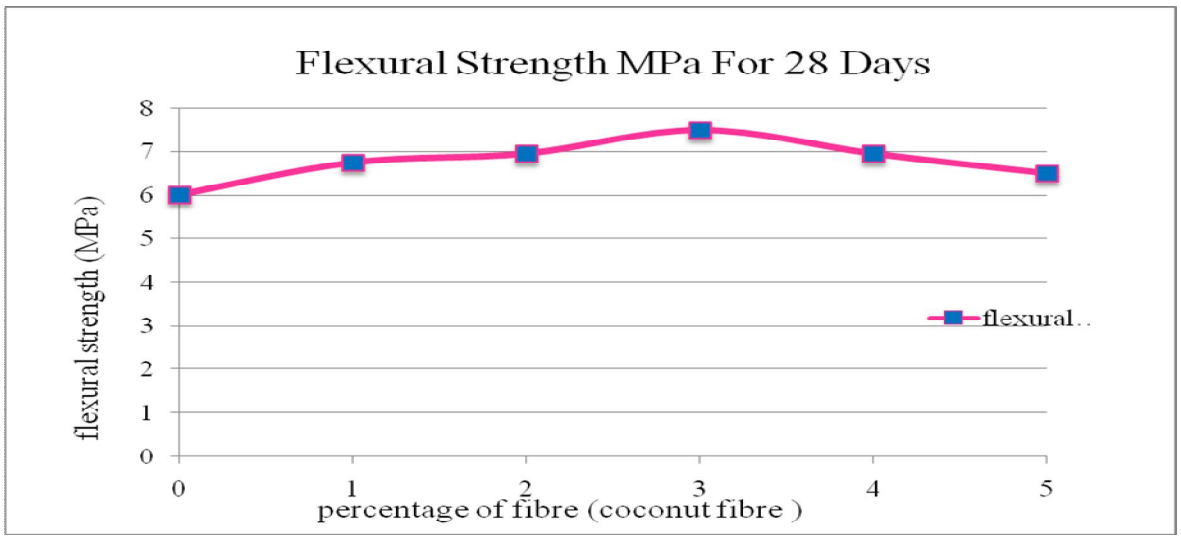


Table 12:Flexural strength (MPa) of concrete with coconut fibre after 28 days of curing

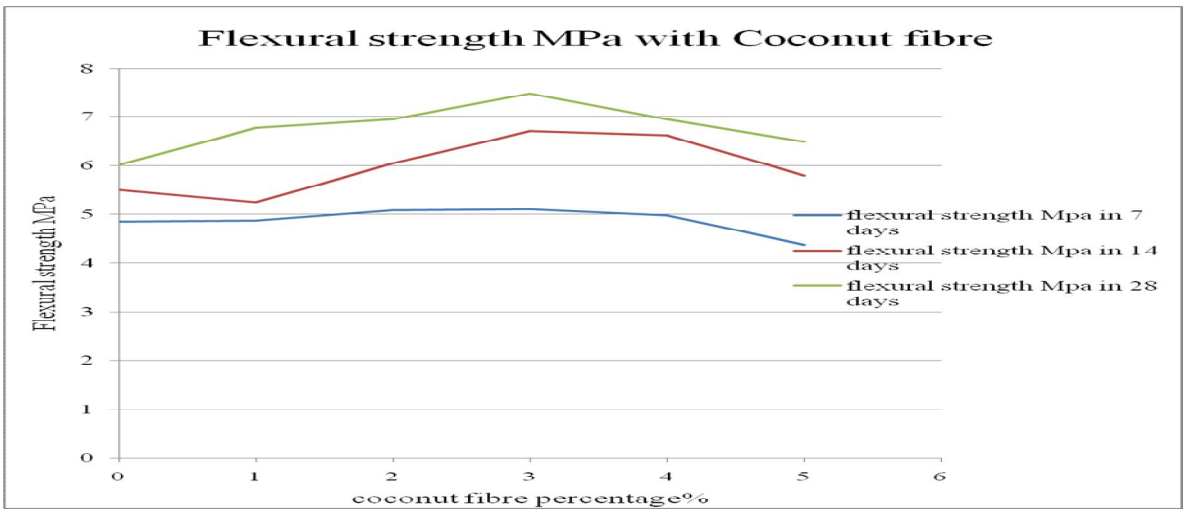
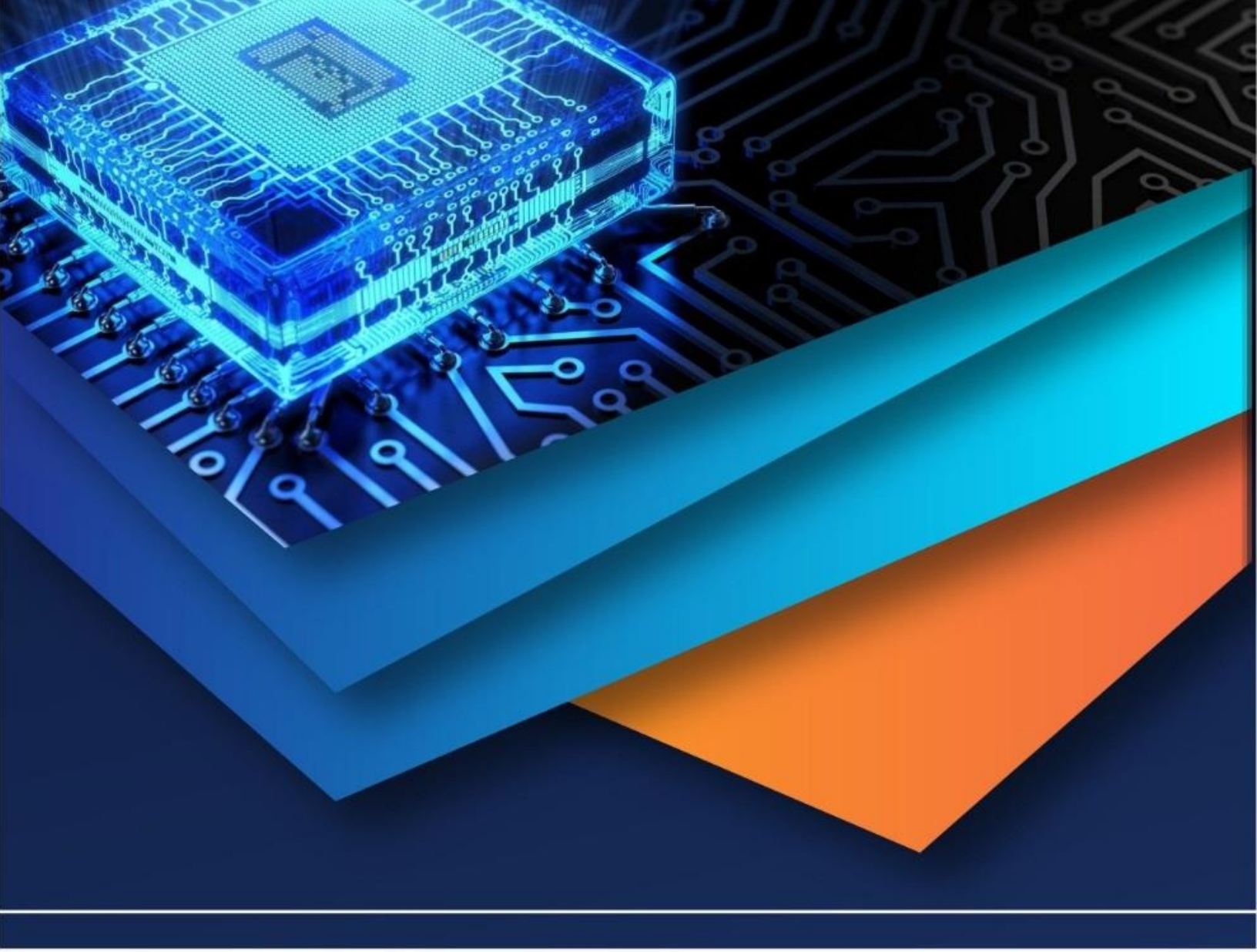


Figure 13: Comparative study on flexural strength (MPa) of concrete with coconut fibre after 7,14 and 28 days curing

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