Mechanical and Durability Properties of Concrete Mixed With Shredded a Tablet Cover Fibers

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***Abstract*— Conventional Concrete is strong in compression and weak in tension in order to overcome weakness steel reinforcement is being provided. Introducing synthetic fibers such as polypropylene, Asbestos, Steel fibers are also used to overcome weakness. So we can use the Tablet Cover Fiber instead of steel reinforcement for reducing construction cost. The present research design to check the workability and strength of Tablet fiber concrete with different percentage of fiber addition. The fibers mixed with 0.25%, 0.5%, 0.75% and 1% in M_{25} mix design and cast in cubes, prism and cylinders. The obtained specimens were subjected to test aimed to check the Compressive Strength, Split Tensile Strength, Flexural Strength and Durability Test like Acid Attack Test, Sulphate Attack Test, Alkaline Attack Test and Sea Water Test to be find out in this project.**

Keywords*— Compressive Strength, Split Tensile Strength, Flexural Strength, Tablet Cover Fiber, Durability Test

I. INTRODUCTION

Concrete is the most widely used man made construction material in the world. Many aspects of our daily life depend directly or indirectly on concrete. Concrete is prepared by mixing various constituents like cement, aggregate, water etc. which are economically available. Concrete is unique among major construction materials because it is designed specifically for civil engineering projects. Concrete is a composite material composed of granular materials like coarse aggregates embedded in a matrix and bound together with cement or binder which fills the space between the particles and glues them together. The main aim of the project is to study the behavior of the concrete structure by using Tablet cover fiber subjected to compressive strength, Split tensile strength, Flexural strength and Durability Test of concrete to add in fiber various volume of friction like 0.25%,0.5%,0.75% and 1%.To study the characterization of Tablet cover fiber and to study the performance on Tablet cover fiber on Reinforced concrete. Increase the strength concrete using Tablet cover Fiber. To compare the strength between in Tablet Cover Fiber concrete and Conventional concrete. To control expenditure of project cost, Reduced permeability and Shrinkage, Increases Resistance to chemical attack and Durability.

II. METHODOLOGY AND MIX DESIGN

A. Constituent Materials

The cement is used 53 grade OPC, Coarse aggregate is greater than 4.75mm size of the aggregate. Fine Aggregate passing through 4.75mm is used in this project. Portable tap water available in the laboratory with pH value of 7 was used for the mixing of concrete and curing the specimen. Length of Tablet cover fiber is 25 to 30mm, Breath of Tablet cover fiber is 2 to 3mm and Aspect Ratio is 12.5 to 15. The shape of Tablet cover fiber is rectangular.

Table 1 Material Test Results

PROPERTIES	RESULTS
Fineness test on cement	1%
Specific Gravity of cement	3.11
Specific Gravity of Coarse Aggregate	3.05
Specific Gravity of Fine Aggregate	2.692
Zone	I
Water Absorption test on Coarse aggregate	0.399%
Water Absorption Test on Fine Aggregate	0.99
Standard Consistency test	32%
Initial Setting time	40minutes
Final Setting Time	10 hours
Slump Cone Test	178mm
Compaction Factor Test	0.94

B. Mix design

Water cement ratio 0.45, weight of cement is 425.77kg/m^3 , weight of Fine aggregate is 587.99 kg/m^3 and weight of Coarse aggregate is 1321.44kg/m^3. A mix ratio is **1:1.38:3.103:0.45**

C. Result and Discussion

The cube compressive strength of concrete in determined by conducting tests on 150mm x 150mm x 150mm cube in specimen at 7 days test shown in figure 1 ,14days test shown in figure2 and 28 days test shown in figure 3. The cubes are placed in the Universal Testing Machine.

The specimen will be cylindrical in shape in 150mm diameter and 300mm long.

Table 2 Compressive Strength of Concrete 7 Days

% of fiber	Compressive Strength (N/mm²)
0%	8.145
0.25%	17.746
0.50%	17.233
0.75%	13.049
1%	15.68

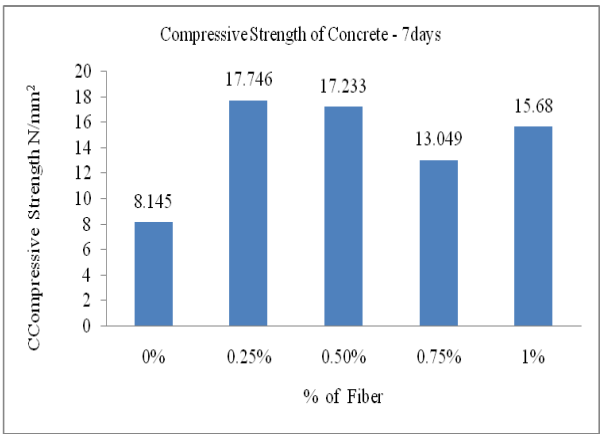

Figure1- Compressive Strength of Concrete 7 days

Table 3 - Compressive Strength of Concrete 14 Days

% of fiber	Compressive Strength N/mm²)
0%	12.767
0.25%	21.671
0.50%	21.147
0.75%	19.213
1%	21.18

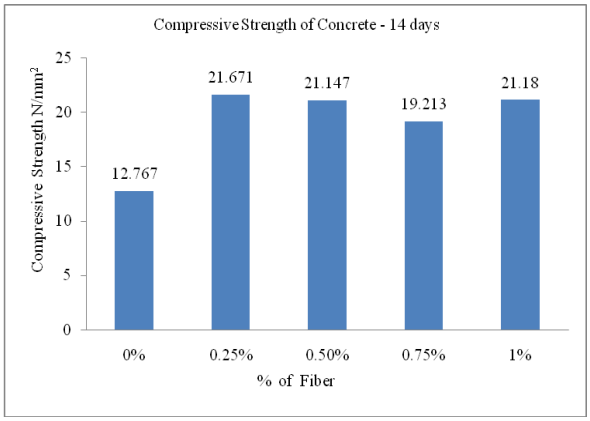

Figure 2- Compressive Strength of Concrete 14 days

Table 4- Compressive Strength of Concrete 28 Days

% of fiber	Compressive Strength (N/mm²)
0%	26.57
0.25%	34.9
0.50%	35.62
0.75%	31.375
1%	28.86

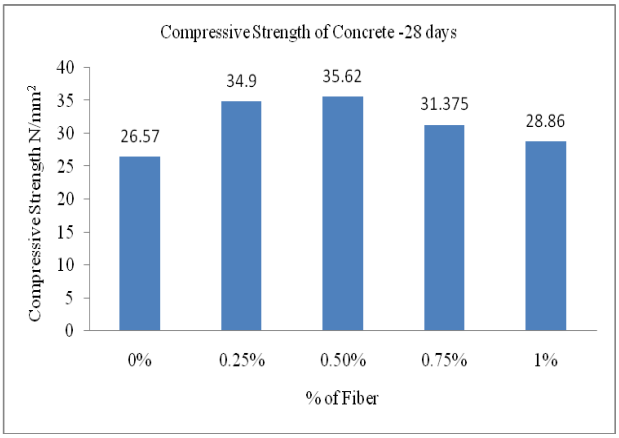

Figure 3- Compressive Strength of Concrete 28 days

Figure 4 shows the Split Tensile strength of concrete by using Tablet Cover Fiber in 28 days. The concrete is not usually expected to resist the direct tension because of its low tensile strength and brittle nature. Direct tensile strength of concrete is determined to difficulty in preparation of test specimen and applying truly axial tensile load Split tensile strength is and indirect method of finding out the tensile strength of concrete.

Table 5 -Split Tensile Strength of concrete 28 days

% of fiber	Split Tensile Strength (N/mm²)
0%	13.958
0.25%	10.562
0.50%	13.579
0.75%	11.503
1%	11.505

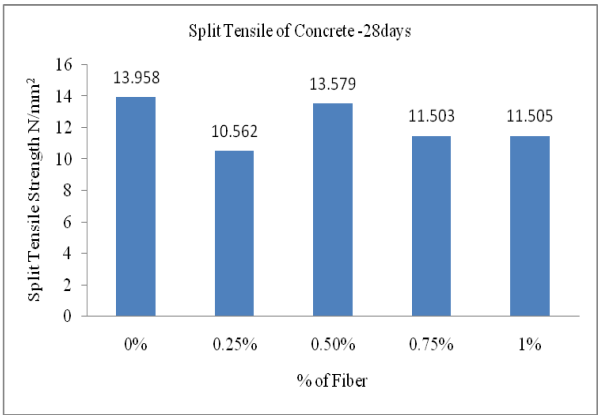

Figure 4 - Split Tensile Strength of Concrete 28 days

The prism specimen of size 500mm x100x100mm are used for the determination of the flexural strength as shown in figure 5. The bearing surface of the supporting and loading rollers are wiped clean and any other loose fine aggregate from the surface of the specimen where they are to make contact with the rollers. The specimen was then placed in the machine and Central point load (Two point load) is applied. Load is increases until the specimen failed and the load at failure is recorded and the flexural strength is determined.

Table 6 - Flexural Strength on concrete 28 days

% of fiber	Flexural Strength (N/mm²)
0%	3.25
0.25%	3.48
0.50%	4.38
0.75%	3.466
1%	3.606

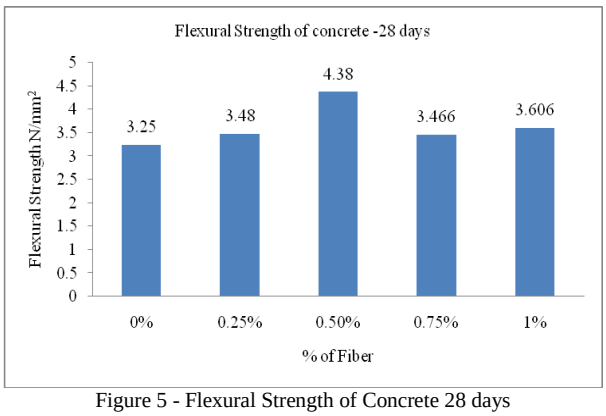

Figure 5 - Flexural Strength of Concrete 28 days

D. Durability test on concrete

A. Acid attack test

The concrete cube specimens of various concrete mixtures of size 150 mm were cast and after 28 days of water curing, the specimens were removed from the curing tank and allowed to dry for one day. The weights of concrete cube specimen were taken. The acid attack test on concrete cube was conducted by immersing the cubes in the acid water for 90 days after 28 days of curing. Hydrochloric acid (HCL) with pH of about 2 at 5% weight of water was added to water in which the concrete cubes were stored.

The pH was maintained throughout the period of 90 days. After 90 days of immersion, the concrete cube was taken out of acid water. The specimen was taken to compressive strength. The resistance of concrete to acid attack was to found by the % loss of weight of specimen Shown in Figure-6 and the % loss of compressive strength on immersing concrete cubes in acid water.

Table 7 – Acid Attack Test

Acid Attack Test	
% of Fiber	% of Weight Loss
0%	0.13
0.25%	0.152
0.50%	0.193
0.75%	0.105
1%	0.07

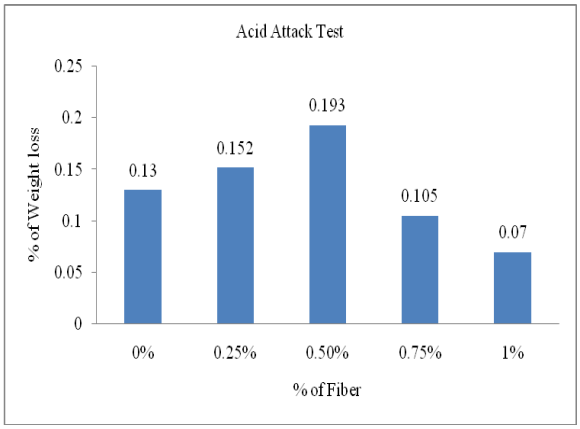

Figure 6 –Acid Attack test for 60 days

B. Alkaline Attack Test

To determine the resistance of various concrete mixtures to alkaline attack, the residual compressive strength of concrete mixtures of cubes immersed in alkaline water having 5% of sodium hydroxide (NaOH) by weight of water was found. The concrete cubes which were cured in water for 28 days were removed from the curing tank and allowed to dry for one day. The weights of concrete cube specimen were taken. The cubes were immersed in alkaline water continuously for 90 days. The alkalinity of water was maintained same throughout the test period. After 90 days immersed in concrete the cubes were taken out of alkaline water. The resistance of concrete to Alkaline attack was to found by the % loss of weight of specimen Shown in

Figure-7

Table 8 - Alkaline Attack Test

Alkaline Attack Test	
% of Fiber	% of Weight Loss
0%	0.075
0.25%	0.041
0.50%	0.0767
0.75%	0.0612
1%	0.0693

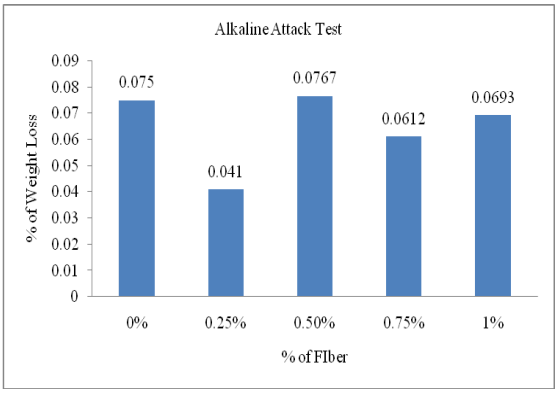

Figure 7 – Alkaline Attack test for 60 days

C. Sulphate Attack Test

The concrete cube specimens of various concrete mixtures of size 150 mm were cast and after 28 days of water curing, the specimens were removed from the curing tank and allowed to dry for one day. The weights of concrete cube specimen were taken. The acid attack test on concrete cube was conducted by immersing the cubes in the acid water for 90 days after 28 days of curing immersed in 5% sulphate (Na_2so_4) and 5% Magnesium sulphate ($MgSo_4$) by weight of water to be taken. The specimen was taken to compressive strength. The resistance of concrete to Sulphate Attack was to found by the % loss of weight of specimen shown in Figure 8 and the % loss of compressive strength on immersing concrete cubes in sulphate water.

Table 9 - Sulphate Attack Test

Sulphate Attack Test	
% of Fiber	% of Weight Loss
0%	0.033
0.25%	0.106
0.50%	0.114
0.75%	0.21
1%	0.075

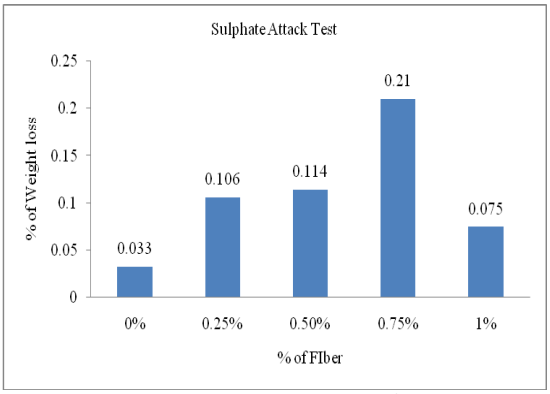

Figure 8 – Sulphate Attack test for 60 days

D. *Sea water Test*

The concrete cube specimens of various concrete mixtures of size 150 mm were cast and after 28 days of water curing, the specimens were removed from the curing tank and allowed to dry for one day. The weights of concrete cube specimen were taken. The acid attack test on concrete cube was conducted by immersing the cubes in the acid water for 90 days after 28 days of curing immersed in 5% sodium chloride (Nacl) by weight of water to be taken. The specimen were taken to compressive strength. The resistance of concrete to sea water was to found by the % loss of weight of specimen shown in Figure 9 and the % loss of compressive strength on immersing concrete cubes in sea water.

Table 10 - Sea water Test

Sea water Test	
% OF FIBER	% OF WEIGHT LOSS
0%	0.103
0.25%	0.041
0.50%	0.032
0.75%	0.168
1%	0.025

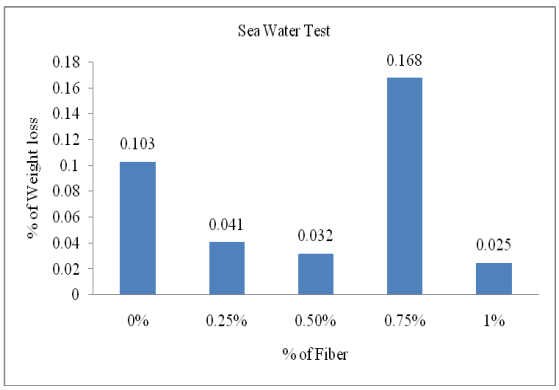

Figure 9 – Sea Water test for 60 days

III. CONCLUSION

Mechanical properties test like Compressive Strength, Split Tensile Strength, Flexural Strength for various percentages of 0.25%,0.5%,0.75%,1% of fiber are done and also Durability test like Acid Attack Test, Alkaline Attack Test, Sulphate Attack test, Sea water test are done. The results show that 0.5% of fiber addition gives efficient result when compared to other percentage and conventional concrete.

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