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"MECHANICAL PROPERTIES OF FIBER REINFORCED CONCRETE BY PARTIAL REPLACEMENT OF FINE AGGREGATE WITH SEA SHELLS"

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ABSTRACT

Now a day's concrete is one of the richest material in all high raised structures. Increase in the demand of conversional concrete in day to day life for urbanization causes reduction in natural resources. The main constituents of concrete are sand, rock and cement. The present study evaluates the variation of mechanical properties of partially replaced concrete with conventional concrete. This paper presents the effects of replacement of natural fine aggregate with sea shell aggregate and addition of steel fiber on workability tests and mechanical tests. For this study different samples were prepared by partially replaced the fine aggregate by 0%, 10%,20%,30%,40% and 50% with sea shells and adding 0% and 1.5% of fibers as reinforcement. Total test samples were prepared by maintain the water-cement ratio of 0.45 and conducted workability test on fresh concrete and compressive strength test, spilt tensile strength test at curing ages of 7 days and 28 days. Finally, the strength results were obtained from seashell fiber reinforced concrete, compared with the conventional concrete.From this experimental investigation, possibility of ten percentage of fine aggregate can be replaced with sea shellsand 20% of fine aggregate can be replaced with sea shells with addition of 1.5% of polyester fiber as reinforcement

Keywords: Sea Shells, Compressive Strength Test, Spilt Tensile Strength Test.

I. INTRODUTION

In these days the concrete is subjects lot of demand in developing countries. The demand is fulfilled by producing economical concrete by using concrete constitutes, i.e. cement as bonding material, natural sand as fine aggregate and rock as course aggregate with sufficient water cement ratio. Aggregates are called as filler material in concrete. While using river sand in concrete causes the scarcity of future constructions. This scarcity can only avoid by using alternative material as fine aggregate. Recent experiments were done to save the natural aggregates by partially or fully replaced with some of the solid waste. Sea shells are one of the major solid disposal into landfills. Utilization of sea shells leads to minimize the land pollution, as well as saves the nonrenewable land resources. The new trend of construction by utilizing these type of solid wastes will produce the economical construction. Cement produced in industries by converting the clay and lime into clinkers then converted into fine powder which acts as glue, which binds the aggregates together to ensure strength properties to the hardened concrete. Fibers are one of the reinforcement materials, sometimes used to strengthen the all mechanical properties of concrete. Water-cement ratio is the main controlling parameter. Lower value in w/c

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ratio, decelerate the workability where as higher w/c ratio increases the porosity which makes concrete endurable.

The main goal of this study to improve the tensile strength and flexural strength Polyester fiber reinforced concrete has been produced. The unreinforced concrete is a brittle material having lower tensile strength and lower strain capacity. The distribution of fiber in concrete randomly builds bridge in concrete produces some post cracking ductility. The incorporation of this fiber optimizes the failure of concrete in tension.

II. MATERIALS

2.1 Material used

Polyester is very important fiber produces good binding property.

Properties of polyester fibers

Specific gravity	Elongation (%)	Elastic modulus E N/mm^2	Elasticity
1.53	26	95	good

Table.1 Properties of polyester fibers

The Portland cement of 53 grade was used to cast and evaluate the mechanical properties of concrete specimen. the cement has been testedas per IS: 4031-1988.

S.No	Characteristics	Values
1	Initial setting time	105 minutes
2	Final setting time	310 minutes
3	Fineness	3200 cm^2/g
4	Specific gravity	3.18

Table.2 properties of cement

2.2 Aggregate

The natural river sand passing through IS 4.75mm sieve, the specific gravity of fine aggregate is 2.78. the natural course aggregate with specific gravity of 2.69 and passing through IS 20mm sieve and retaining on IS 4.75 mm sieve.

	Water (liters/m^3)	Cement (kg/m^3)	Fine aggregate (kg/m^3)	Course aggregate (kg/m^3)
Ratio	0.45	1	2.38	4.24
Quantity	147.6	328	780	1391

Table.3 mix design and quantities of materials.

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2.3 Characteristics ofShells

Sea shells are available waste material which are suitable for placement material, collected from sea shore containing 90% of calcium carbonate. Fine powder of sea shellshas obtained from crushing in laboratory. It has good and comparable strength properties equals to the fine aggregate. The gain size distribution is done manually by sieve shaker. The sieve shaker dishes are arranged from 90 microns to 4.75mm sieve vertically upwards. The fineness modulus of sea shells fine aggregate is 6.25.

III. METHODOLOGY

General:This chapter elaborates entire procedure of this paper.

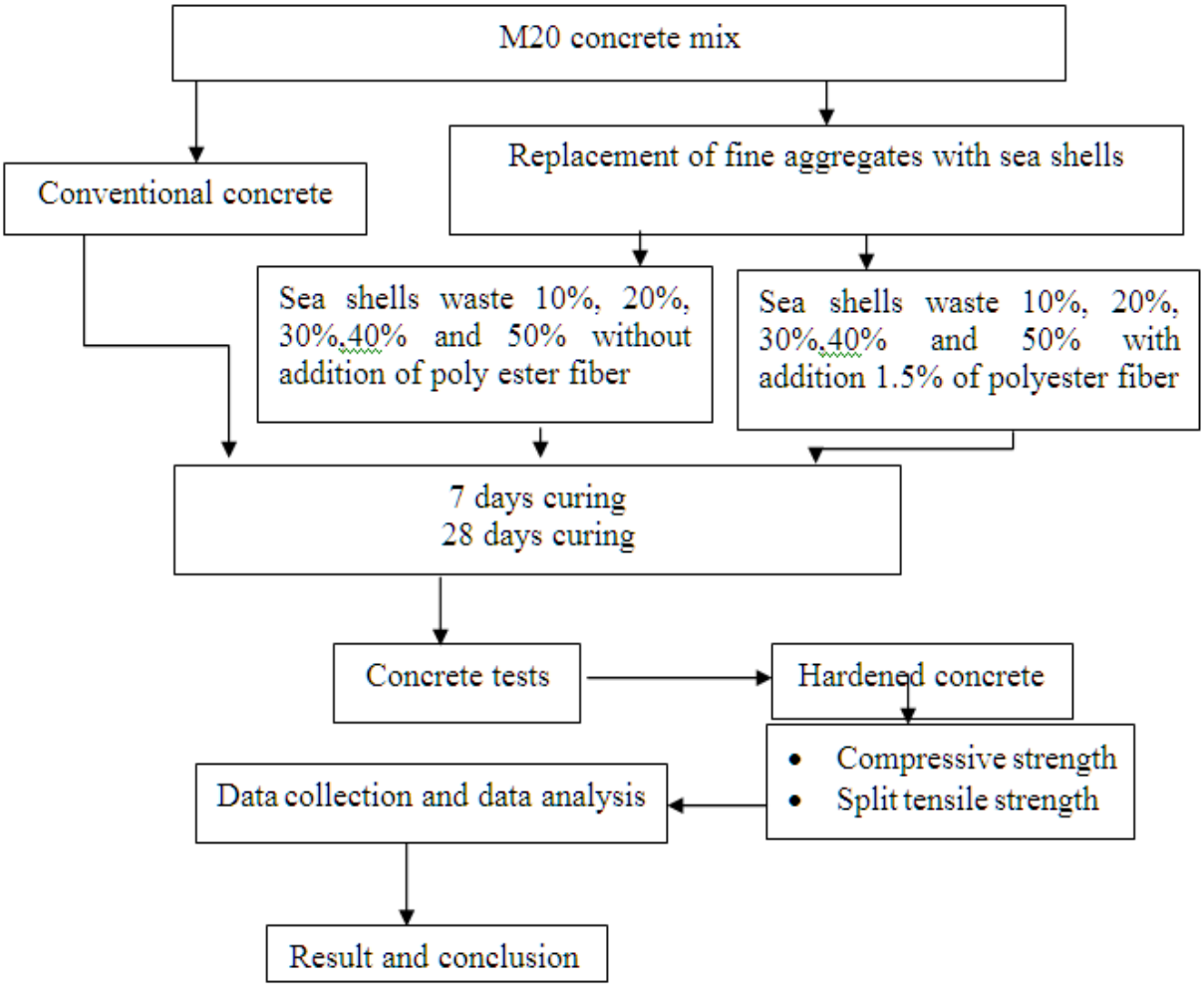

Fig.1 Shows the metrology of present study.

From figure 1, shows the M25 grade concrete mix produced by partial replacement of fine aggregate with sea shells with addition of 1.5% of polyester fiber and control specimen. Cubes and cylinders were cast by partial replacement of 10%, 20%, 30%, 40% and 50% of sea shells with addition of 1.5% of polyester fiber. The tests on hardened concrete have been conducted i.e. compressive strength test, split tensile strength test. Data collection, analysis and test results and final conclusion has been presented.

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III. EXPERIMENTAL DATA

3.1 Test samples and name of mix with partial replacement of fine aggregate with sea shells

Test Sample	% of Fine Aggregate Replacement with Sea Shells	% Addition of Polyester Fibers with Cement	Name of Mix
MIX-1	0%	0%	M1
MIX-2	10%	0%	M2
MIX-3	20%	0%	M3
MIX-4	30%	0%	M4
MIX-5	40%	0%	M5
MIX-6	50%	0%	M6
MIX-7	0%	1.5%	M7
MIX-8	10%	1.5%	M8
MIX-9	20%	1.5%	M9
MIX-10	30%	1.5%	M10
MIX-11	40%	1.5%	M11
MIX-12	50%	1.5%	M12

Table.4 mix proportions and name of the mix.

3.2 Experimental values

CONCRETE SPECIMEN (MIX)	Compressive strength of concrete (N/mm^2)		Spilt tensile strength in N/mm^2	
	7 days	28 days	7 days	28days
M1	24.65	36.35	2.152	3.25
M2	22.69	33.25	1.82	3.19
M3	21.5	29.89	1.75	3.08
M4	18.02	26.56	1.71	2.89
M5	11.78	24.68	1.66	2.47
M6	9.5	19.6	1.52	2.38
M7	28.35	41.36	2.785	3.86
M8	25.34	36.20	2.652	3.45
M9	24.57	35.75	2.45	3.21
M10	21.0	31.75	2.38	2.98
M11	18.95	29.41	2.11	2.76
M12	13.49	25.12	1.98	2.51

Table.5 compressive and spilt tensile strengths values of mix at 7days and 28 days curing period.

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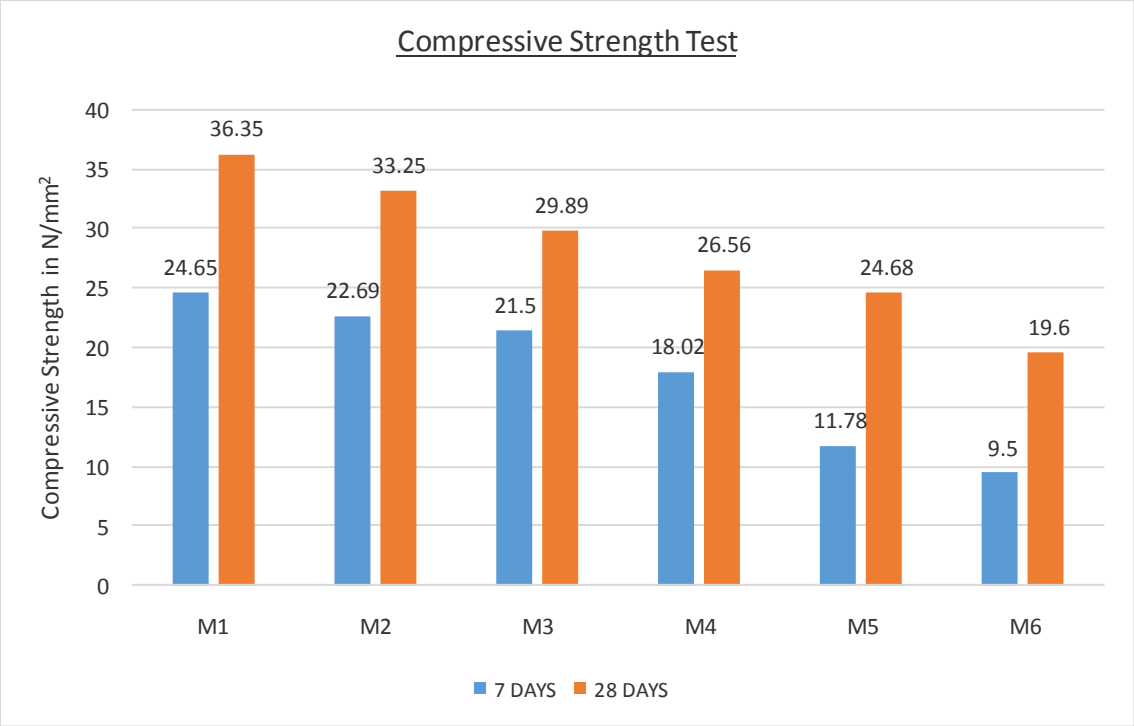

Fig.2 Compressive Strength values of concrete for replacement of fine aggregate with sea shells at curing ages of 7 days and 28 days.

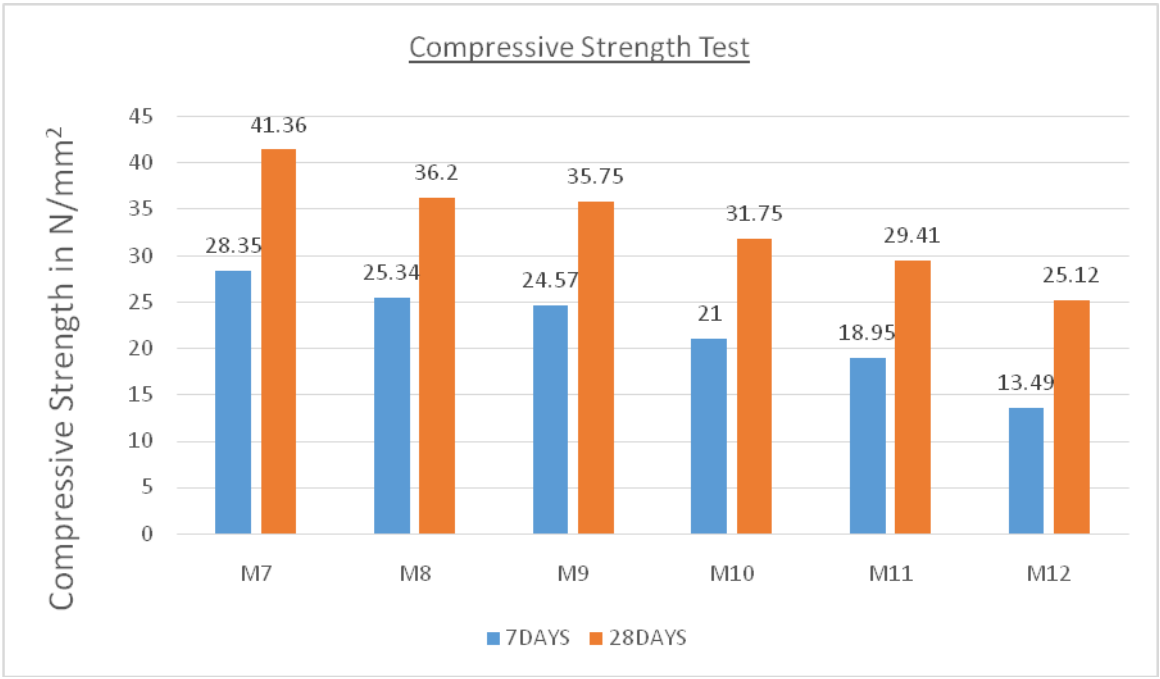

Fig.3 Compressive Strength values of concrete for replacement of fine aggregate with sea shells at curing ages of 7 days and 28 days with addition of 1.5 % fiber.

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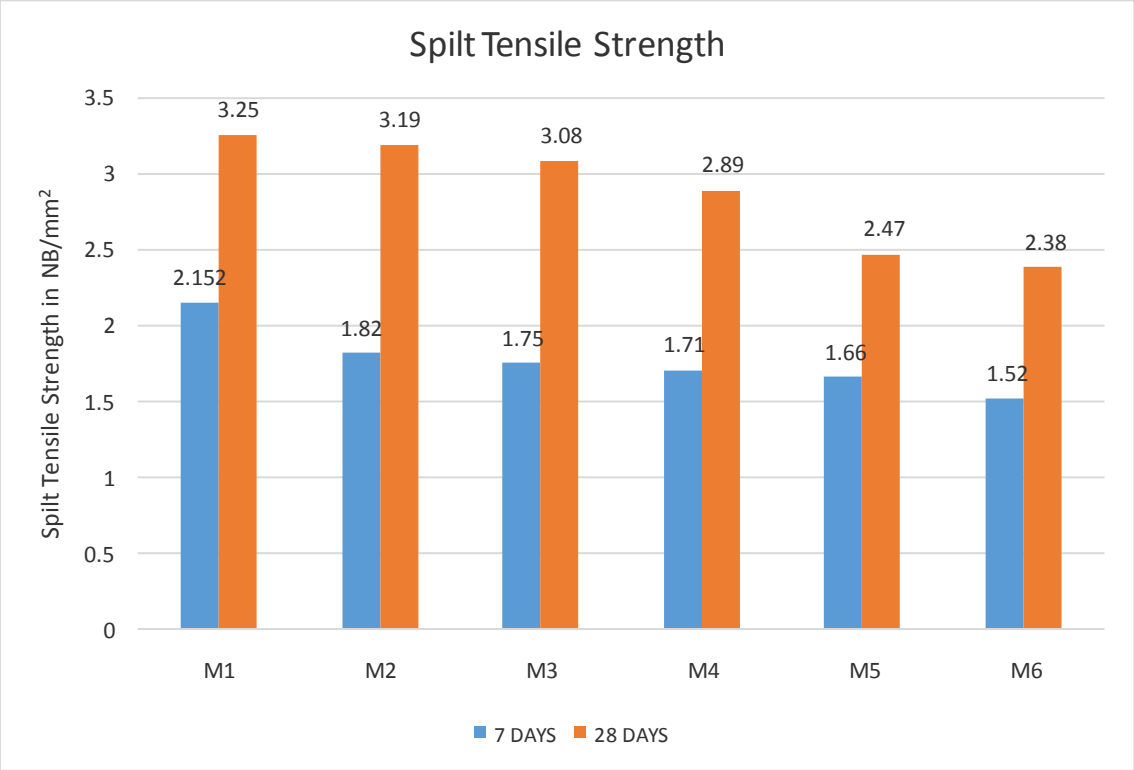

Fig.4 Spilt Tensile Strength values of concrete for replacement of fine aggregate with Sea shells at curing ages of 7 days and 28 days.

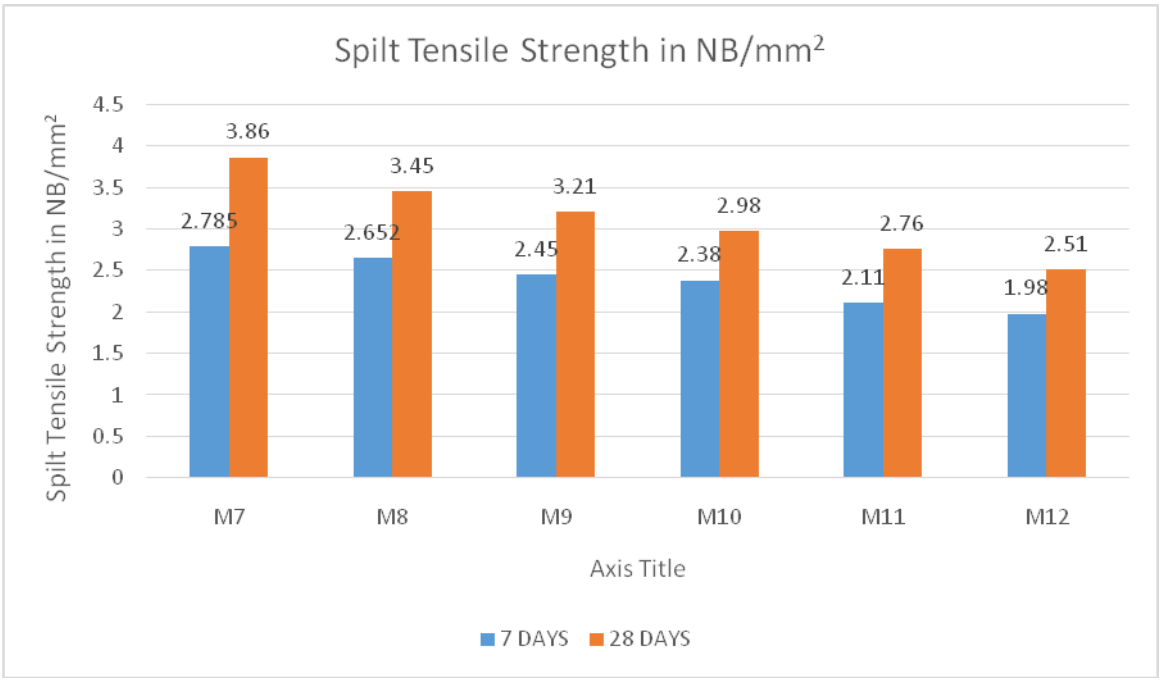

Fig.5 Compressive Strength values of concrete for replacement of fine aggregate with sea shells.

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IV. RESULTS AND CONCLUSIONS

From figure.2,3,4 and 5 as the percentage of sea shells are increasing, the compressive strength decreases for seven days and even for 28days.

From above figure.2, it was observed that the compressive strength of concrete is decreased by7.9%, 12.7 %, 12.94%, 52.21% and 61.46 % for 7days curing period and 9.2%, 17.7%, 26.9%, 32.10% and 46.07% for 28 days curing period when compared with conventional concrete (M1).

From above figure.3, it was observed that the compressive strength of concrete is decreased by10.6%, 13.3 %, 25.9%, 33.15% and 52.4 % for 7days curing period and 12.4%, 13.56%, 23.23%, 28.89% and 39.26% for 28 days curing period when compared with conventional concrete(M7) with addition of 1.5% fiber.

From above figure.4, it was observed that the spilt tensile strength of concrete is decreased by 15.34%, 18.6 %, 20.46%, 22.27% and 29.3 % for 7days curing period and 1.86%, 5.2%, 11.07%, 24% and 26.76% for 28 days curing period when compared with conventional concrete (M1).

From above figure.5, it was observed that the spilt tensile strength of concrete is decreased by 4.8%, 12.02 %, 14.54%, 24.23% and 28.9 % for 7days curing period and 10.6%, 16.8%, 22.79%, 28.49% and 34.97% for 28 days curing period when compared with conventional concrete (M7) with addition 1.5 % of fiber.

V. CONCLUSIONS

The basic experimental study has been conducted on concrete which is partially replaced fine aggregate with sea shells from 0% to 50% in steps of 10% and with and without addition of polyester fiber as reinforcement. The following conclusions are drawn:

From the above study it is concluded that the concrete with 10% of fine aggregate replacement is suitable for all strength aspect. With the addition of 1.5% of fiber reinforcement gives the results which tells even 20% of sea shells are also can suitable to use.

The target strength 33.25N/mm^2 of M25 grade concrete was satisfied by 20% of fine aggregate replaced with sea shells, from this we concluded that 20% of fine aggregate can be replaced with sea shells with addition of 1.5% of polyester fiber.

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