

Comparative Study on Behaviour of Concrete Pavement Block using Coconut Fibre and Coconut Shell

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Abstract

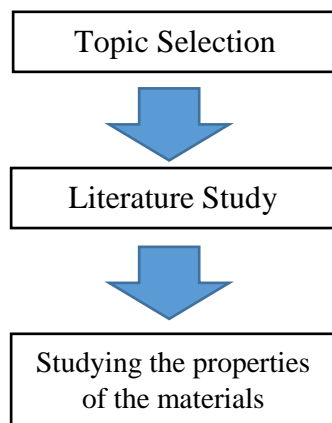
Concrete is widely used in all over the countries as a construction materials. Increase in cost of concrete made construction, looks extremely costly. The manufacturing of concrete includes Cement, Coarse Aggregate and Fine Aggregate. Due to wide usage of concrete cost of materials is increased. Therefore the coconut fibre is added as the partial replacement of cement, alternative material is used for partial replacement of fine aggregate and Coconut shell is used for partial replacement of coarse aggregate in concrete. The main aim of this project is to decrease the cost of concrete and make price effective. Research were supported out on 240 mm x 120mm x 80 mm zigzag paver blocks for M 30 grade. Coconut Fibre and Coconut Shell plays the main role in the project.

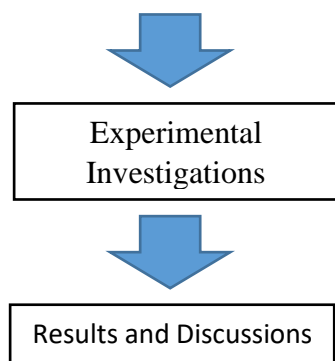
Key Words: Fine Aggregate, Coarse Aggregate, Coconut Fibre and Coconut Shell, etc

1. Introduction:

Civil engineering construction material is concrete. Its manufacturing interaction includes the amount of substances like cement, sand, aggregates, water and admixtures. Because of the infrastructural development across the world, the interest for the construction material is expanding step by step. Along these lines, to utilize concrete mix there is a need to track down some substitute or feasible materials. Everyday various kinds of waste materials creation is expanding and making numerous ecological issues. Utilizing these waste materials in manufacturing of concrete will reduce common defilement and the cost of concrete. The concrete mixture contains coarse and fine aggregate. Coarse aggregate is regularly open and preparing plant crushed. Fine aggregate is much of the time obtained from river beds.

2. Methodology





3. Materials Used

1. Cement
2. Fine Aggregate
3. Coarse Aggregate
4. Quarry Sand
5. Water
6. Coconut Fibre
7. Coconut Shell

4. Experimental Investigation:

- 4.1 Cement
- 4.2 Fine Aggregate
- 4.3 Coarse Aggregate
- 4.4 Quarry Sand
- 4.5 Coconut Fibre
- 4.6 Coconut Shell

4.1 Cement (OPC 53)

Cement is basically a binder, a substance utilized for development that sets, solidifies and sticks to different materials restricting them together.

At the point when it is utilized in the concrete it invigorates the good strength. The basic tests like Specific gravity, Fineness test (90%), Initial test (30 mins) and Final test (600 mins), and then Normal consistency test (24%) were used.

S. No.	Test	Result
1	Specific Gravity	3.14
2	Fineness Test	90%

3	Initial and Final	30mins and 600mins
4	Normal Consistency	24%

4.2 Fine Aggregate

Manufacturer Sand is used in the fields, which will give equal amount of texture rather than River sand. Specific Gravity=2.3, Fineness modulus=5.5, size=passing through 4.75mm, water absorption ratio=1%.

S. No.	Test	Result
1	Specific Gravity	2.3
2	Water absorption	1%
3	Size	Passing through 4.75mm
4	Fineness Modulus	5.5

4.3 Coarse Aggregate

The size of 20mm is used in the fields. Which will restrain the materials and gives more strength to the concrete. Specific gravity test is done for this aggregate. Since it attains 2.59. Water absorption of aggregate = 0.092% Average crushing value of aggregate= 23.66% Fineness Modulus = $293/100 = 2.9$.

S. No.	Test	Result
1	Specific Gravity	2.59
2	Water absorption	0.092%
3	Crushing value	23.66%
4	Fineness Modulus	2.9

4.4 Quarry Sand

Quarry dust particles passing from 4.75mm sieve is used. Fineness Modulus = $426.6/100 = 4.266$.

S. No.	Test	Result
1	Fineness Modulus	4.266

4.5 Coconut Fibre

The coconut fibres of size 6 mm length and diameter of 0.01 mm is used

Test	Result
Specific Gravity	1.23

4.6 Coconut Shell

India is the fourth largest production of coconut harvesting in the world. So by using the waste of coconut shell, the test was carried out.

S. No.	Test	Result
1	Specific Gravity	1.33
2	Shell Thickness	Size (2-7mm)

5. Scope of the study

The experiment has carried out by adopting M30 grade of concrete, Coarse aggregate is replaced with coconut shell. We are adding the coconut shell as 10%, 20% and 30% as a partial replacement of coarse aggregate. Fine aggregate is replaced with the quarry sand. We are adding 30% of quarry dust as a partial replacement of the fine aggregate. The design Mix utilized for the undertaking is M30 grade (1:1.36:2.23) with W/C proportion 0.5. The overall experiment is carried out by casting conventional mix, coconut fibre with quarry sand, and coconut shell with quarry sand. Therefore the specimen is to be casted and compression test will be carried out for 7 days, 14 days and 28 days.

6. Mix Design

Mix design defines the process of picking the precise components of concrete and will control its comparative proportions with certain strength and durability as economically as possible. M30 Mix Proportion is taken, as per IS 10262:2009.

7. Specimen Preparation

7.1 Using Concrete Fibre

The Paver block concrete contains materials of cement, fine aggregate, coarse aggregate added to it in a right proportion and mixed properly. Then the coconut fibre was added as a partial replacement of cement as 0.5%, 1%, 1.5%. Now the mixture are transferred to the mould and allowed to dry for 24hrs so that they harden. After drying the paver block have removed from moulds and allowed for curing. The curing is going to be done for 7, 14 and 28 days.

7.2 Using Concrete Shell

The concrete pavement block contains the materials of cement, fine aggregate and coarse aggregate, when it is added to the mix proportion it gives the strength to the pavement block. Then

the coconut shell has been added as a replacement of coarse aggregate in the order of 10%, 20%, 30%. Now the mixture are been transferred to the mould and allowed to dry for 24hours so that they harden. After drying

the paver block have removed from the moulds and allowed for curing. The curing is going to be done for 7, 14, and 28 days.

8. Compression Test

Out of many test applied to the concrete, this is the most extreme significant which gives a thought regarding every one of the attributes of concrete. By this single test one adjudicator that whether Concreting has been done appropriately or not. After casting the specimen, the specimen will be left for 24 hours. Then it will be remoulded and leave for curing. After the completion of curing period the specimen will be tested by Compression testing machine. This is usually characterized as the protection from failure under the activity of compressive forces and it is a huge parametric property that engineers use to check the performance of the material all through assistance conditions. Load at the dissatisfaction inaccessible by area of specimen gives the compressive strength of concrete. The size of the pavement block is 240 mm x 120 mm x 80 mm. According the Strength parameters, the graph will be plotted by use of the calculation table.

Table 8.1 Compressive Strength for Nominal Mix

Days	Cube No.	Load applied(kN)	Compressive Strength (N/mm ²)
7 days	1	560	24.8
	2	555	24.6
	3	385	17.1
14 days	1	560	20.1
	2	600	27.4
	3	650	28
28 days	1	704	31.3
	2	780	32.6
	3	661	27.1

Graphical representation for Nominal Mix

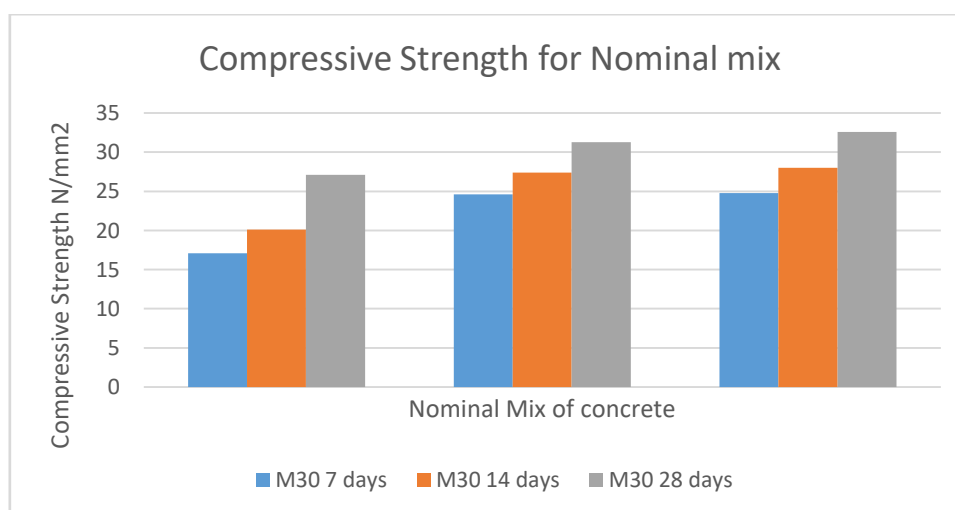


Table 8.2 Compressive Strength by adding Coconut Fibre

Grade	Days of curing	Compressive Strength			
Volume of coconut fibre		0%	0.5%	1%	1.5%
M30	7 days	22	24.50	26.14	27.36
	14 days	23.59	26.24	29.38	31.73
	28 days	27.01	30.56	34.72	36.21

Graphical Representation for Compressive Strength by adding Coconut Fibre

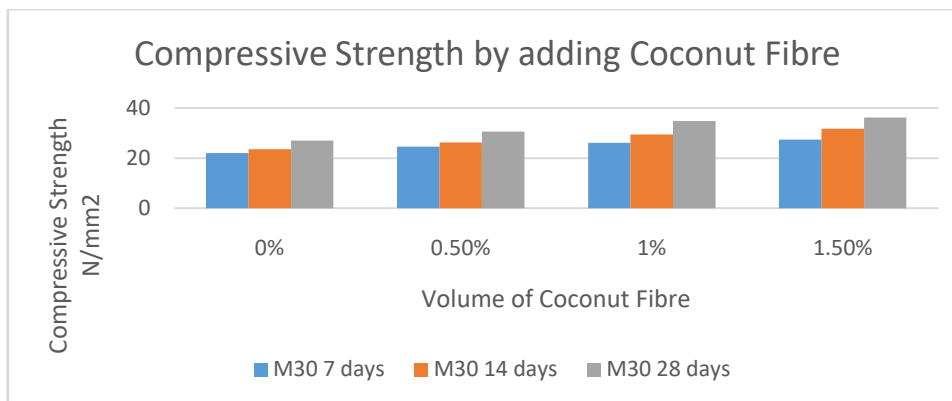
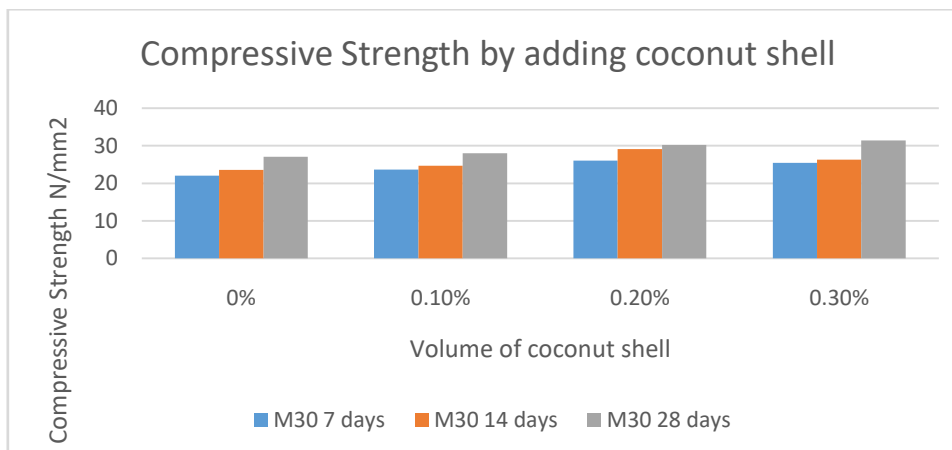


Table 8.2 Compressive Strength by adding Coconut Fibre

Grade	Days of curing	Compressive Strength			
Volume of coconut shell		0%	0.1%	0.2%	0.3%
M30	7 days	22	23.6	26.03	25.4
	14 days	23.59	24.7	29.1	26.24
	28 days	27.01	28	30.2	31.4

Graphical Representation for Compressive Strength by adding Coconut Shell



Results and Discussion:

Compression strength increases while adding the coconut shell by 10 to 30%.

By adding coconut fibre, the compressive strength varies from 1.3% to 6.81%, while compared to the nominal mix.

By increasing the fibre content the formation gradually increases and gives more strength though comparing to the conventional concrete.

Additionally it also reduces the environmental pollution due to coconut shell. And it reduces 16.6% cost construction by reducing the cost of fine aggregate and a coarse aggregate.

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