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REVIEW ON CONVENTIONAL CONCRETE AND NYLON FIBER REINFORCED CONCRETE BEHAVIOR

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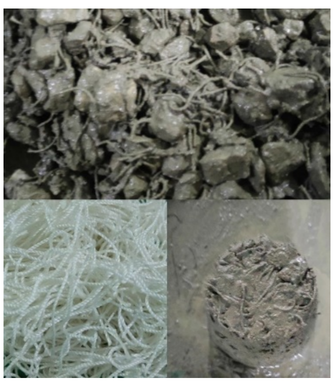
Graphical abstract



Abstract

The addition of fibers to reinforced cement concrete enhances the suitability of structures under impacts and earthquake loads by boosting firmness or energy-consuming proficiency of the hardened concrete material. During cracking of concrete, one of the most relevant behaviors of fiber like “bridge effect” starts functioning. As a result of this, fiber blocks crack formation and propagation, and hence strength and ductility of concrete structure improve. The goal of this study is to compare the mechanical properties of reinforced cement concrete by mixing nylon fibers and without mixing nylon fibers. In this study, data from existing article are assessed to compare the strengths of nylon fiber reinforced concrete and conventional concrete by using concrete strength measuring test results such as compressive strength test, flexural strength test, and split tensile strength test. Adding fiber with concrete mix reduces the moisture content, thereby lessening the workability of concrete which produces fiber ball. Due to the obvious lack of homogeneity caused by fiber balling, the efficiency of fiber reinforced concrete is reduced. During the mixing of small portions of fibers with dry concrete the difficulty of fiber separation can prevent by providing good distribution and scattering within the mixtures which enhance concrete strength and thus the balling incident can escape. The dynamic transmission of stress between concrete mix and the fiber achieves by considering significant factors like aspect ratio, volume, and orientation of the fiber. Nylon fiber provides mechanical improvement of reinforced concrete by enhancing impact resistance and increasing flexural toughness, as a result the load-bearing capacity of concrete develops effectively. Introducing nylon fibers with concrete mixture promotes strong tensile comportment of concrete outstandingly after the post peak stage.

Keywords: Bridge Effect, Compressive Strength, Ductility, Flexural Toughness, Split Tensile Strength.

1.0 INTRODUCTION

In this modern world concrete is one of the most resilient, durable, and extensively used manufacturing material. Concrete is a composite material which is made up with the mixture of aggregate, cement, and water. Because of its inherent brittleness and low tensile strength, the use of concrete is bounded. As reinforced cement concrete is normally used in developing projects, concrete's limitations like poor ductility and low tensile strength need to be reduced to ensure the sustainability of concrete structures. Concrete is particularly strong in compression yet relatively weak in tension, and it shows modest resistance to cracking. It has been seen that with the addition of small, closely spaced and uniformly fibers into the concrete act to just like a crack arrester means when concrete starts cracking, the fibers start functioning and arrest the crack propagation and those fibers improve the properties of concrete and make concrete as a homogeneous and isotropic material. The term "Fiber Reinforced Concrete," abbreviated as "FRC," is used to describe this type of concrete. FRC is used in mostly developing projects like highway and airport pavement, earthquake resistant structures etc.

Among all fibers, nylon fiber is widely used because of its easy availability, hydrophilic characteristics, and low cost and are acknowledged for its strength, durability, and resilience. When nylon fibers are added to concrete, the concrete's quality improves. Nylon Fiber Reinforced Concrete has greater flexural strength, tensile strength, impact resistance, excellent permeability and frost resistance as compared to conventional cement concrete. The use of nylon fiber in construction projects offer excellent opportunity to enhance concrete's strength characteristics. In reinforced cement concrete structure, corrosion of steel reinforcement is the major problem because it may affect the durability and sustainability of existing RC structures. Corrosion impact can be reduced by using nylon fiber reinforced concrete.

2.0 NYLON FIBER REINFORCED CONCRETE (NFRC)

The term "NFRC" refers to a composite made of nylon fiber and concrete to which variable percentages and lengths of nylon fiber are added. The main advantage of NFRC is that it can improve the mechanical property of concrete. Analyzing the literatures that are currently available, it is found that two types of nylon fibers are mostly used in construction projects-

1. Nylon 6
2. Nylon 6.6

Figures 1 and 2 represent some nylon fiber samples.

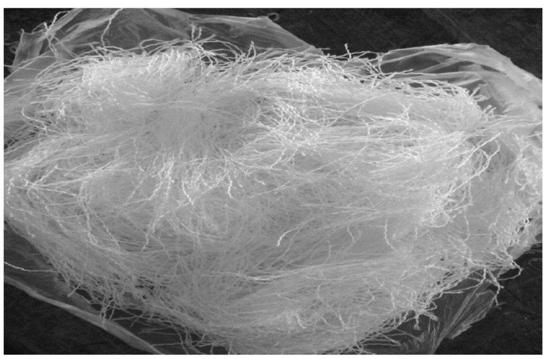


Figure 1 Nylon fiber (Vaisakhi et al. 2019)

Figure 2 Nylon fiber (Saxena, J., & Saxena, A. 2015)

Nylon is a heat stable inert polymer which shows hydrophilic characteristics and large scope of material resistance. Nylon fiber's properties are imparted by the manufacturing conditions and fiber dimensions. Nylon fiber is effective in improving concrete mix cohesion, increasing resistance to plastic shrinkage during curing, intercepting the fissures, resisting to spalling, & impact and abrasion resistance. However, the main purpose of using nylon fiber reinforced concrete is to increase the mechanical and ductility properties of concrete.

Strength improvement of concrete by using nylon fiber depends on factors like fiber length and fiber mix percentage. These two factors, fiber length and fiber mix percentage both are related to the term fiber balling which becomes the most prominent issue to gain expected outcome (Dewangan et al. 2019). In nylon fiber reinforced concrete, balling develops frequently with long fibers but seldom with short fibers. Higher amounts of nylon fiber in the concrete mix are so much more likely to generate fiber balling; this results in a significant reduction in strength.

Some nylon fiber reinforced cube and cylinder specimens are shown in Figure 3 and Figure 4 represents nylon fiber blended with concrete mix.

Figure 3 Nylon fiber reinforced specimen (Vaisakhi et al. 2019)

Figure 4 Nylon fiber mix with concrete (Ishtiaq 2019)

3.0 REVIEW OF LITERATURE OVER EXPERIMENTAL ANALYSIS

The behavior of Nylon Fiber Reinforced Concrete (NFRC) specimens like cubes cylinders and beam had been carried out over the normal reinforced concrete cubes, cylinders, and beam by Vaisakhi et al. (2019). In this research 3 cubes, each measuring 150x150x150 mm and 3 cylinders, each measuring 300 mm in height and 150 mm in diameter and also 3 beams of size 500x100x100 mm were cast with M20 concrete mix, 0.5% coarse aggregate was replaced by nylon fibers of 50 mm length. Here, the mix design for M20 grade concrete was 1:2:3, as per IS 10262:2009 code.

Results of the compression test, split tensile test, and flexural test were taken from Vaisakhi et al. (2019) and are presented in Tables 1, 2, and 3 –

Table 1 Compressive Strength Test Result on Cubic Specimens (Vaisakhi et al. 2019)

Serial No.	Concrete Type	Compressive strength (N/mm²) [after 7 days]	Compressive strength (N/mm²) [after 28 days]
1	Conventional concrete	23.556	24.4
2	Nylon fiber reinforced concrete	24.4	25.33

Table 2 Split Tensile Strength Result Test on Cylindrical Specimens (Vaisakhi et al. 2019)

Serial No.	Concrete Type	Split Tensile Strength (N/mm²) [after 7 days]	Split Tensile Strength (N/mm²) [after 28 days]
1	Conventional concrete	2.13	2.97
2	Nylon fiber reinforced concrete	3.4	3.82

Table 3 Flexural Strength Test Result on Beam Specimens (Vaisakhi et al. 2019)

Serial No.	Concrete Type	Flexural Strength (N/mm²) [after 7 days]	Flexural Strength (N/mm²) [after 28 days]
1	Conventional concrete	4	4.8
2	Nylon fiber reinforced concrete	5.6	6

By analyzing experimental results of Vaisakhi et al. (2019), it was noted that the compression, split tension, and flexural strengths of nylon-reinforced concrete were quite greater when compared to regular concrete.

21 trial mixes were investigated by DAS & GHOSH (2020). Here seven combinations for the trial mix as per the percentage of nylon fiber were used. Three trial mixes with no nylon fiber were produced for this study. Two test mixtures with 0.25% nylon fiber were created. Additionally, four trial mixes with 0.75% of nylon fiber and three trial mixes with 0.5% of nylon fiber were considered. Furthermore, two trial mixes with 1% of nylon fiber, four trial mixes with 1.25% of nylon fiber, three trial mixes with 1.5% of nylon fiber were also experimented. And, in this test M30 grade concrete mix was used.

In this experimental test, along with concrete beams strength of cubes, each dimension of 150mm x150mm x 150mm & cylinders, each dimension of 150mm x 300mm and were prepared and assessed. Here, three concrete cubes, cylinders, beams for each nylon fiber percentage combination were studied the 28 days compressive strength of cylinder and cube along with tensile strength of cylinder and flexural strength of beam.

The results obtained from DAS & GHOSH (2020) are shown in Figures 5, 6, 7 & 8-

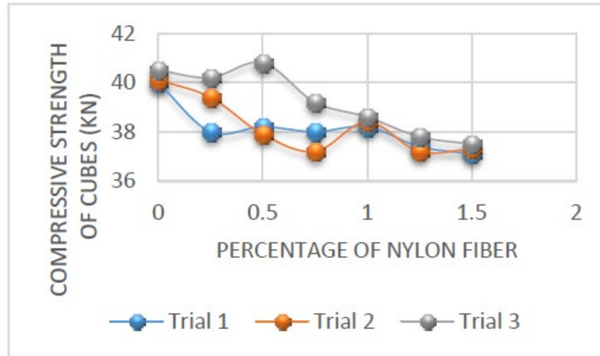


Figure 5 Compressive strength of cubes graph (DAS & GHOSH 2020)

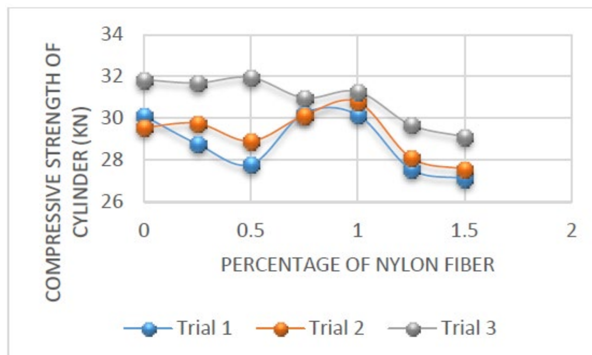


Figure 6 Compressive strength of cylinder graph (DAS & GHOSH 2020)

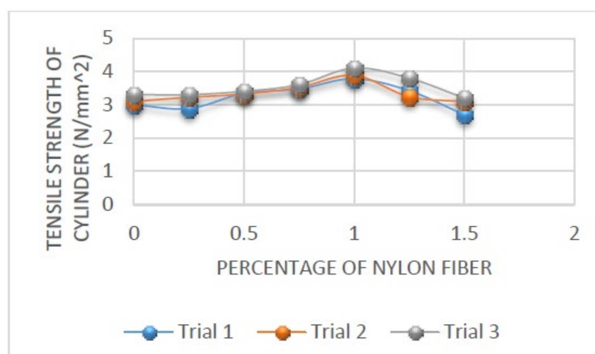


Figure 7 Tensile strength of cylinder graph (DAS & GHOSH 2020)

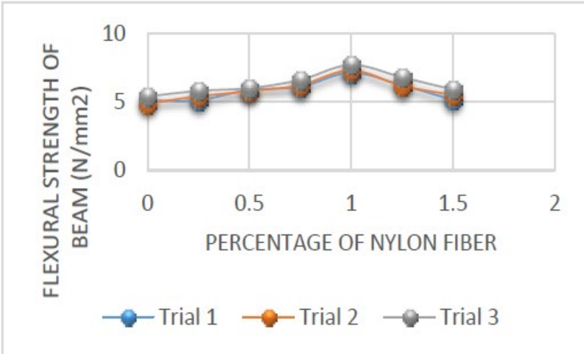


Figure 8 Flexural strength of beam graph (DAS & GHOSH 2020)

According to DAS and GHOSH's (2020) investigation of the tensile and flexural behaviors of conventional concrete and nylon fiber reinforced concrete, employing 1% nylon fiber in concrete increased the tensile strength and flexural strength of concrete marginally. The compressive strength of nylon fiber reinforced concrete was found to be greater than that of conventional concrete when the nylon fiber mixture was 0.5%. When additional fiber was introduced, the strength did not increase. For compressive strength of trial 3, trial 3 showed higher value than other two trials. The reason might be the improper tamping during casting, improper curing etc.

To explore the impact of nylon fiber in concrete mixture, Ummahat (2019) constructed a total of 80 concrete cylinders and 60 concrete beams (prism specimens) in accordance with the ASTM C 31. The cylinder specimens, each had 100 mm diameter and 200 mm height. Among of total 80-cylinder specimens, 40 concrete cylinders were produced for compressive strength testing and other 40 cylinders were for tensile strength tests. The beam specimens, each measurement of 75mm x 75mm x 228mm were used to conduct the flexural strength test.

Tables 4, 5, and 6 show the results of the Compressive Strength, Split Tensile Strength, and Flexural Strength for various fiber lengths and fiber percentages that were acquired from Ummahat (2019).

Table 4 Compressive Strength at Various Fiber Lengths and Fiber Contents (Ummahat 2019)

(Every result represented the mean of 4 test samples.)

Length of Fiber (mm)	Amount of fiber (%)	Split Tensile Strength (MPa)	Comparing the percentage as opposed to fiber-free mix
Null fiber	Null fiber	1.59	-
19	0.5	1.68	5.66
25	0.5	1.58	0.63
50	0.5	1.57	1.26
19	0.37	1.36	14.47
25	0.37	1.46	8.18
50	0.37	1.55	2.52
19	0.25	2.25	41.51
25	0.25	2.28	43.40
50	0.25	1.79	12.58

Considering compressive strength up to 0.25% addition of Nylon fiber in concrete mix was effective. Beyond that percentage change in compressive strength was too little to consider. In the study by Ummahat (2019), 19 mm, 25 mm and 50 mm nylon fibers were used where 19 mm length fiber provided the best result. Considering 19 mm fiber with 0.25% fiber addition resulted in increased compressive strength by almost 100% over plain concrete.

Table 5 Split Tensile Strength at Various Fiber Lengths and Fiber Contents (Ummahat 2019)

(Every result represented the mean of 4 test samples.)

Length of Fiber (mm)	Amount of fiber (%)	Compressive Strength (MPa)	Comparing the percentage as opposed to fiber-free mix
Null fiber	Null fiber	11.08	-
19	0.5	11.02	0.54
25	0.5	11.34	2.35
50	0.5	10.79	2.62
19	0.37	11.96	7.94
25	0.37	13.91	25.54
50	0.37	10.67	3.70
19	0.25	21.03	89.80
25	0.25	19.73	78.07
50	0.25	18.81	69.77

Considering tensile strength up to 0.25% addition of Nylon fiber in concrete mix was effective. Beyond that percentage change in tensile strength was too little to consider. 19 mm, 25 mm, and 50 mm nylon fibers were investigated in this research by Ummahat (2019), where 19 mm length fiber offering the best outcome. When compared to ordinary concrete, the tensile strength improved by over 42% when 19 mm fiber with a 0.25% fiber addition was used. The trend is like the result of compressive strength.

Table 6 Flexural Strength at Various Fiber Lengths and Fiber Contents (Ummahat 2019)

Length of Fiber (mm)	Amount of fiber (%)	Flexure Strength (MPa)	Comparing the percentage as opposed to fiber-free mix
Null fiber	Null fiber	2.98	-
19	0.5	2.61	12.42
25	0.5	2.86	4.03
50	0.5	3.49	17.11
19	0.37	2.76	7.38
25	0.37	2.8	6.04
50	0.37	2.76	7.38
19	0.25	2.98	0
25	0.25	3.56	19.46
50	0.25	2.78	6.71

Considering flexural strength for 0.25% of fiber volume, flexural strength increased while using 25mm long fiber. The strength decreased after increasing fiber percentages. But the strength increased with increasing aspect ratio for 0.5% volume of fiber content.

In the research conducted by Ozsar et al. (2017), the effects of shrinkage and fracture properties on NFRC were investigated by using Nylon 6.6 polyamide fibers. The research was concentrated on the results of varying the fibers' quantity and diameter. Nylon 6.6 fibers of two different types (long type, short type) were mixed to compounds of various diameters. The short kind had a diameter of 0.05 mm and a length of 12 mm, whilst the long type had a 0.55 mm diameter and was 54 mm long. In the study 4 beams with a size of 70×70×280 mm^3 and 4 cylinders with diameter 100 mm, height 200 mm were tested. The results were evaluated using the mix code DS 2-6, where DS stands for "Dosage." DS 2 denotes 2% nylon fiber of total concrete mix, DS 3 denotes 3% nylon fiber of total concrete mix, and so on.

The outcomes from Ozsar et al. (2017) are shown in Table 7 and Figure 9 –

Table 7 Composites' strength & fracture characteristics (Ozsar et al. 2017)

Mix Code →	DS 6	DS 5	DS 4	DS 3	DS 2
Water-Cement Ratio (W/C)	0.42	0.42	0.35	0.42	0.35
Micro-fiber Composition (%)	1	---	0.5	1	1
Macro-fiber Composition (%)	0.5	0.5	---	---	---
Fracture Energy (N/m)	2654	1099	998	2139	2356
Net Flexural Strength (MPa)	3.58	5.35	4.34	5.58	3.75
Compressive Strength (MPa)	36.75	63.31	43.27	53.79	38.79
Splitting Tensile Strength (MPa)	4.77	5.5	5.7	5.45	5.26

In this experiment, the lowest compressive strength had been revealed at mix code DS-6. In the composites the microfiber samples had more splitting tensile strength and net flexural strength than macro fiber samples. During crack propagation a few fibers were broken, and several fibers departed from the matrix.

In the research by Ozsar et al. (2017), a closed loop testing instrument was calibrated to a maximal ability of 100 kN to measure the fracture energy. The beams that were constructed for the fracture energy testing had dimensions of 500 mm in length and 100 mm in cross-section. The beams were pushed at a consistent velocity of 0.004 mm/min up to 0.5 mm of deflection, and after 4 mm of deformation, the speed was 0.05 mm/min.

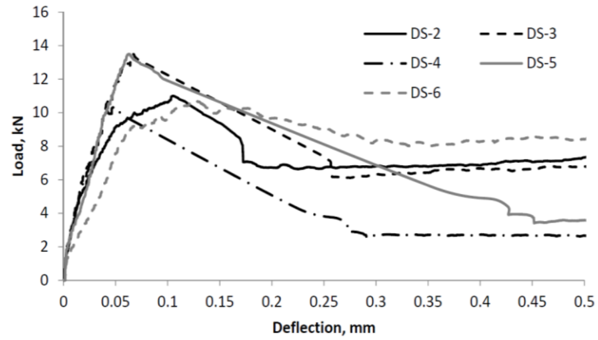


Figure 9 Load-deflection graphs for the constructed composites with four-point bending up to 0.5 mm of deflection (Ozsar et al. 2017)

The results of the test demonstrated that adding fiber had the most significant impact on the composites' fracture energy. In fact, Figure 9 illustrates how doses of nylon fiber affect the mechanical behavior of composites. The emergence of strain hardening in the ascending branch of the curve following the initial crack in Figure 9 is a typical indicator of strong overall performance of cementitious composites. Due to its hydrophilic character, nylon fiber has a significant influence on the post peak performance of composites. The composites with macro fibers provided the highest fracture energies. The microfibers had a limited impact on the mid-span of the beam's post-peak load vs. deformation behavior, whereas at the post top part of curve, a compressive impact of macro fibers had been observed. This leaded to the increase in the price of fracture strength. Due to the use of hybrid fibers (DS-6) on the inner side, the maximum fracture strength values were obtained although there was a 0.42 w/c ratio in that composite.

In the research by Manikandan et al. (2017), test specimens such as cubes, each had dimension of 150 mm mm x 150 mm x 150 mm & cylinders, each had dimension of 150 mm in diameter, 300 mm in height, as well as beams, each had dimension of 100 mm x 100 mm x 500 mm were cast by replacing fine aggregate with Nylon fiber with three specific percentages like 2%, 4% & 6%. M25 grade was applied to this study. Ordinary Portland cement (OPC) in grade 53, stone chips as the coarse aggregate, and sands from Zone III were used as the fine aggregate in a concrete mixture with a ratio of 1:1:2.2.

Tables 8, 9 & 10, and Figures 10, 11 & 12 are obtained from Manikandan et al. (2017) –

Table 8 Compressive Strength (Manikandan et al. 2017)

Serial No.	Amount of fiber (%)	Compressive strength on average (N/mm^2)		
		7 days	14 days	28 days
1	0%	19.40	23.59	32.22
2	2%	21.74	25.88	33.88
3	4%	22.22	28.55	34.86
4	6%	24.45	30.24	36.56

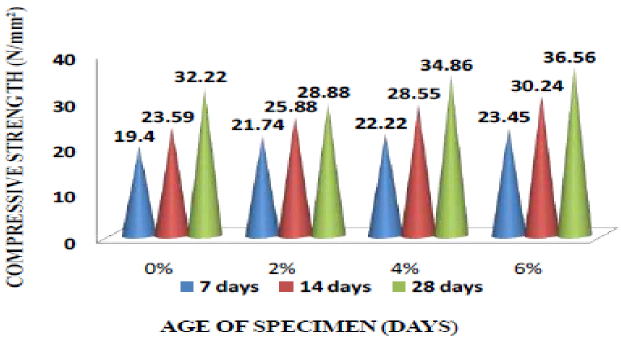


Figure 10 Compressive Strength (Manikandan et al. 2017)

Table 9 Split Tensile Strength (Manikandan et al. 2017)

Serial No.	Amount of fiber (%)	Split Tensile Strength on average (N/mm²)		
		7 days	14 days	28 days
1	0%	1.90	2.45	3.3
2	2%	2.26	2.63	3.5
3	4%	2.25	2.88	3.67
4	6%	2.36	3.02	3.9

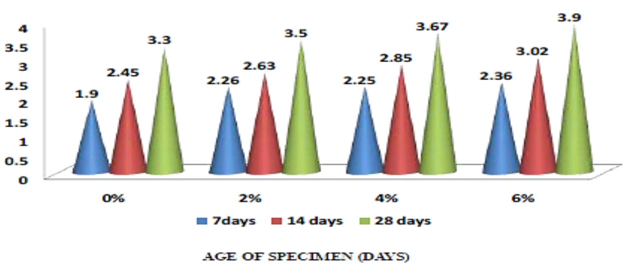


Figure 11 Split Tensile Strength (Manikandan et al. 2017)

Table 10 Flexural Strength (Manikandan et al. 2017)

Serial No.	Amount of fiber (%)	Flexural Strength on average (N/mm²)		
		7 days	14 days	28 days
1	0%	3.82	4.78	6.97
2	2%	4.49	7.28	8.49
3	4%	4.297	6.82	0.75
4	6%	4.08	6.44	7.07

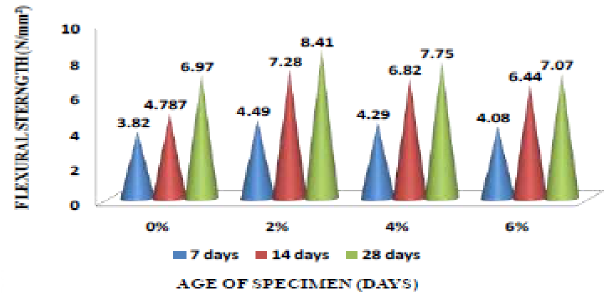


Figure 12 Flexural Strength (Manikandan et al. 2017)

From the experimental data analysis of Manikandan et al. (2017) the mechanical properties of concrete specimen vary with respect to the percentage of nylon fiber. Maximum compressive strength of 1.18% increase was found with 4% nylon fiber NRFC specimen by comparing with conventional concrete. When the mechanical properties of conventional concrete and nylon fiber reinforced concrete was compared, maximum split tensile strength of concrete was increased by 1.18% with 6% nylon fiber and maximum flexural strength was increased by 1.29% with 2% nylon fiber.

So, from the study it can be said that by using different percentages of nylon fiber with concrete specimens, the overall mechanical properties were improved by gaining more strength when compared to conventional concrete.

Strength of conventional concrete was compared with NFRC by Subramanian et al. (2016) by using cylinder and cube specimens. For that purpose, nylon fiber (0.75 inch) mix ratio was taken from 0% to 3%. The study was conducted by casting M20 of concrete. Here, total 24 cubic specimens and 48 cylindrical specimens were casted.
The results obtained from Subramanian et al. (2016) are shown below in Tables 11, 12 & 13-

Table 11 Cube specimens' compressive strength after 28th days (Subramanian et al. 2016)

Items	Amount of Nylon fiber (%)	Ultimate Loads (kN)	Ultimate Loads on average (kN)	Compressive Strength (N/mm²)
Normal mix	0%	590	613.33	27.25
		610		
		640		
NFM -1	1%	725	745	33.11
		745		
		765		
NFM -2	2%	590	621.66	27.69
		625		
		650		
NFM -3	3%	475	495	22.00
		485		
		525		

Table 12 Cylinder specimens' compressive strength after 28th days (Subramanian et al. 2016)

Items	Amount of Nylon fiber (%)	Ultimate Loads (kN)	Ultimate Loads on average (kN)	Compressive Strength (N/mm²)
Normal mix	0%	620	631.33	28.07
		650		
		625		
NFM -1	1%	615	628.33	35.56
		630		
		640		
NFM -2	2%	575	531.66	30.0
		495		
		525		
NFM -3	3%	475	443.66	25.08
		380		
		475		

Table 13 Cylinder specimens' Split Tensile Strength after 28th days (Subramanian et al. 2016)

Items	Amount of Nylon fiber (%)	Ultimate Loads (kN)	Ultimate Loads on average (kN)	Split Tensile Strength (N/mm²)
Normal mix	0%	120	133.33	1.88
		150		
		130		
NFM -1	1%	290	280	3.96
		270		
		280		
NFM -2	2%	210	225	3.18
		240		
		225		
NFM -3	3%	180	190	2.68
		200		
		190		

The results from the experimental work done by Subramanian et al. (2016) showed that using nylon fiber with conventional concrete increases load absorbing capacity. From the cube results it was found that the compressive strength of cube increased with the share of nylon fiber getting added up. No significant changes were observed in compressive strength test of cylindrical specimens. The split tensile strength test was improved by using nylon fiber with conventional concrete. Considering all three experimental results it is observed that when 1% nylon fiber was mixed with concrete it gave the best strength outcome.

In the study of BABY SINGH et al. (2019) mechanical behavior of NFRC were analyzed by using nylon 6 fiber which had a length 10 mm and diameter 10 micron. In this research, the compressive strength and the flexural strength of the concrete were tested less than 28 days curing period.

The compressive strength and flexure strength of concrete tests results obtained from BABY SINGH et al. (2019) are shown in Tables 14 & 15 and Figures 13 & 14-

Table 14 Compressive Strength of Concrete (BABY SINGH et al. 2019)

Amount of Nylon fiber (%)	Compressive Strength (N/mm²) 28th day
0%	35.50
1%	35.65
2%	38.20
3%	40.54

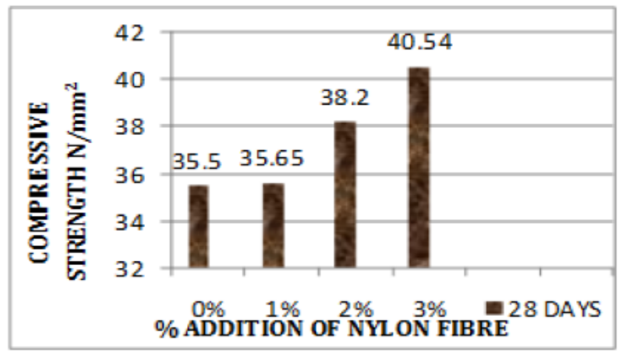


Figure 13 Compressive Strength of Concrete (BABY SINGH et al. 2019)

Table 15 Flexural Strength of Concrete (BABY SINGH et al. 2019)

Amount of Nylon fiber (%)	Flexural Strength (N/mm²) 28th day
0%	4.73
1%	5.02
2%	5.57
3%	5.86

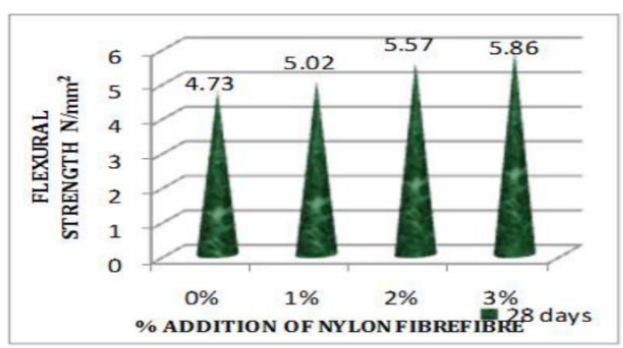


Figure 14 Flexural Strength of Concrete (BABY SINGH et al. 2019)

According to the analysis done by BABY SINGH et al. (2019), the strength gradually increased as Nylon Fiber was added. When nylon fiber was added at a rate of 1%, the compressive strength value after curing 28 days was 35.65 N/mm^2, compared to the conventional concrete mix the compressive strength value was found 35.50 N/mm^2. When 3% Nylon Fiber was added with concrete, about 28.57% increase in Compressive Strength was attained.

Similarly, the Flexural Strength value for the conventional mix was 4.17 N/mm^2 and for 1% addition of Nylon Fiber was 5.02 N/mm^2 at 28th day of curing. When 3% Nylon Fiber was added with concrete, about 23.8% increase in Compressive Strength was attained.

The structural behavior of conventional concrete was compared with NFRC by LOGESH (2021). In this test M30 grade concrete and 3 different percentages of nylon fiber with a length of 10 mm and diameter of 0.19 mm were used. Total test specimens were 24 cubes and 12 cylinders.

Tables 16 & 17 are obtained from LOGESH (2021)-

Table 16 Compressive Strength of Concrete (LOGESH 2021
)

Grade	Amount of Nylon fiber (%)	Compressive strength (N/mm^2) [after 7 days]	Compressive strength (N/mm^2) [after 28 days]	% Increase in Strength
M30	0	29.43	43.89	-
	1	32.73	50.49	15%
	2	35.93	55.69	27%
	3	34.20	53.80	23%

Table 17 Split Tensile Strength of Concrete (LOGESH 2021)

Grade	Amount of Nylon fiber (%)	Maximum Load at 28 Days (×10^{3}kg)	Split Tensile Strength at 28 Days(N/mm^2)	% Increase in Strength
M30	0	27.5	3.82	-
	1	32.1	4.45	16
	2	33.5	4.65	22
	3	33	4.58	20

With the addition of 2% nylon fiber, concrete achieved 27% greater compressive strength. Additionally, the split tensile strength of concrete improved by 22% with the inclusion of 2% nylon fiber. By further expanding the fiber content, the compressive and split tensile strengths were both reduced.

4.0 CONCLUSIONS

A comprehensive literature overview and analysis of published test results was done on compressive, tensile, and flexural properties of NRFC. The addition of 2% and 3% nylon fiber in concrete mix was found effective for concrete. At 2%, Nylon fiber reinforced concrete showed a better crack resistance than non-fiber reinforced concrete. Following conclusions can be drawn from the discussion and analysis.

Analyzing experimental results from literature review, it may be feasible to summaries that:

- Nylon Fiber Reinforced Concrete (NFRC) had considerably better strength than normal concrete with respect to percentage of Nylon fiber. When nylon fibers are added to concrete, they make the movement of aggregate more difficult by lowering the lubricating action of the cement paste, resulting in decreased workability, and increased mechanical strength.
- Use of fiber produced extra intently spaced cracks and decreased crack width.
- The measurements showed that Nylon fibers notably reduce the plastic shrinkage of concrete.
- Nylon Fiber Reinforced Concrete controls deformation & cracking under impact load better than conventional concrete.
- Compared to the conventional concrete compressive strength, nylon fiber reinforced concrete was more favorable to splitting tensile strength.
- Most studies concluded that including approximately 2% nylon fiber in the concrete mix had produced the best compressive, tensile, and flexural strength; however, few of other studies suggested adding 3% nylon fiber to the concrete mixture to boost strength. So, to increase the strength of concrete, incorporating up to 2% nylon fiber with concrete mix may be the appropriate approach.
- Finally, it can be said that Nylon Fiber is used in reinforced concrete to increase the mechanical properties of concrete.

Future research will be beneficial for improving nylon fiber reinforced concrete and creating stronger concrete.

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