International Journal of Advances in Engineering and Management (IJAEM)
Volume 5, Issue 4 April 2023, pp: 1589-1591 www.ijaem.net ISSN: 2395-5252

Experimental Study on Fiber Reinforced Concrete by Using Kenaf Fiber

1) Prof. K. Sharmiladevi[1], 2) A.Nivedha Sree[2],
Assistant Professor,Paavai Engineering College,Namakkal
PG Student,Paavai Engineering College

Date of Submission: 20-04-2023 Date of Acceptance: 30-04-2023

ABSTRACT - This paper deals with experimental investigation the natural kenaf fiber can be effective material to reinforce concrete strength which will not explore the use of kenaf and restrict the utilization of polymer which is environmentally detrimental. The demand for natural coarse aggregate has been increasing day by day. So, there is important to find material that could replace the coarse aggregate which plays a major role in concrete. This project deals with partial replacement of natural coarse aggregate in concrete with Kenaf fiber. The testing is going to be M25 grade concrete mix ratio and those concrete cubes will be tested for compression test. The results were analysed and contrasted with a specimen (with 0% fibre) using fibres with volume fractions of 0.2%, 0.3%, 0.4, and 0.5% with a 20 mm fibre length. The conclusion is that adding fibres decreases the workability of fresh concrete but significantly increases its compressive strength.

KEYWORDS: Kenaf Fibre, Compressive strength.

I. INTRODUCTION

Due to its versatility and ability to be cast into any form or shape, concrete is the most commonly used construction material worldwide. It also takes the place of outdated building materials like masonry made of stone and brick. Concrete mechanical strength can be altered by making the proper adjustments to its constituent parts, such as cementitious material, aggregate, water, and special ingredients. As a result, concrete is excellently suited for a variety of applications.

Concrete typically has good strength in compression and a weakness in tension. In reinforced concrete, the use of natural fibre has grown significantly in recent years. Biodegradable materials are required due to the environmental issue. For instance, adding natural fibres to reinforced concrete encourages the use of green and sustainable concrete. Moreover, as environmental concerns have grown.

Further research and verification in the use of green and renewable materials rather than using s ynthetic fibrewith a negative environmental impact l ed to awareness and the need to reduce environment al waste, whichresearchers to choose the use of ecof riendly materials and their positive environmental impact.

Due to certain characteristics, including its low cost, density, and biodegradablity,

Kenaf fiber, an important as drawn a lot of attention.

II. FIBER IN CONCRETE

The inherent weakness of plain concrete is caused by the presence of microcracks at the mortar-aggregate interface. Fibers can be added to the mixture to eliminate the weakness. To make concrete more durable or capable of resisting the development of cracks, various fibre types, such as those found in conventional composite materials, can be added to the mix. At the internal micro cracks, the fibres aid in load transfer. Fiber-reinforced concrete is the name given to such a concrete (FRC).

The exceptional resilience of kenaf fibre reinforced concrete (KFRC) to cracking and crack propagation is one of the material's key characteristics. Fiber composites have enhanced extensibility and tensile strength due to their ability to stop fractures, both at first crack and at ultimate. In particular, under split tensile loading, the fibres are able to keep the matrix together even after significant cracking. Overall, all of them have the effect of giving the fibre composite a strong post-cracking ductility that is unheard of in regular concrete. The fibre composite's capacity to absorb energy and resist repeated shock or impact loading would significantly improve as it changed from a brittle to a ductile type of material.Fiber reinforced concrete has been successfully used in many applications such as, hydraulic structures, precast products, architectural panels and others applications. The development of high-performance

International Journal of Advances in Engineering and Management (IJAEM)
Volume 5, Issue 4 April 2023, pp: 1589-1591 www.ijaem.net ISSN: 2395-5252

engineering products made from natural resources is increasing worldwide, due to renewable and environmental issues.

Kenaf Fibre :

Kenaf fiber has high potential to be used for composite reinforcement in construction material. Kenaf fibers are coming into interest to use in reinforced concrete elements in recent years due to its attractive properties such as lightweight and renewable these properties are dependent on several numbers of factors including the type, length and volume fraction of fibers.

Many applications, including hydraulic structures, precast products, architectural panels, and others, have successfully utilised fibre reinforced concrete. Due to concerns about renewable resources and the environment, the creation of high-performance engineered goods created from natural resources is expanding globally. The usage of kenaf fibre as composite reinforcement in building materials has a lot of potential. Due to their appealing qualities, such as being lightweight and renewable, kenaf fibres have recently gained interest for usage in reinforced concrete components. These attributes rely on a variety of variables, including the kind, length, and volume percentage of the fibres.

Fig 1 KENAF FIBRE MATERIAL

Table 1 : Typical properties of fibre

Properties of fibre	**Fibre type**
Diameter (mm)	83.24 µm
Aspect ratio	15
Specific gravity	1.07
Water absorption	10%

Concrete for M25 grade were prepared as per I.S.10262:2009 with w/c 0.5.Mix proportion for M25 grade concrete for tested material as follows:

Table 2: Concrete mix proportions

Materials	Quantity (kg/m^3)
Cement	320
Fine aggregate	610
Coarse aggregate	1340
Water	175

Table 3: Workability of Concrete mix

S.No.	**Fiber Content**	**Length of Fibre**	**Slump**	**Slump**
	%	**mm**	**mm**	**Mm**
1	0	0	155	150 – 175
2	0.2	20	140	130 – 150
3	0.3	20	125	110 – 130
4	0.4	20	110	90 – 110
5	0.5	20	85	< 90
6	0.6	20	80	< 70

III. EXPERIMENTAL METHODOLOGY

a) **Compressive Strength Test:**

The 150 x 150 x 150 mm cube specimens were cast using concrete of the M25 grade for the compressive strength test. The moulds were filled with 0, 0.2, 0.3, 0.4, and 0.5 & 0.6% fibres, respectively. The moulds were vibrated using a table vibrator. The specimen's top surface was completed and levelled. The specimens were demoulded and moved to a curing tank after 24 hours, where they were left to cure for 7 and 28 days. These cubes were evaluated on a digital compression testing machine in accordance with I.S. 516–1959 after 7 and 28 days of curing. One noticed the failed load. Three cubes and three cylinders were evaluated in each category, and the average value is given. Here is how the compressive strength was determined:

Compressive strength (MPa) = Failure load / cross sectional area.

International Journal of Advances in Engineering and Management (IJAEM)
Volume 5, Issue 4 April 2023, pp: 1589-1591 www.ijaem.net ISSN: 2395-5252

IV. EXPERIMENTAL RESULTS

1) **Compressive Strength Test:**

A) **Using cube Specimen:**

Because steel fibre reinforced concrete is frequently subjected to compression, such as in tunnels, the compressive strength test is thought to be the most appropriate way to assess the behaviour of kenaf fibre reinforced concrete for underground construction at an early stage.

The table and graph below show the results of compression strength for M-25 grade concrete on cube specimens with 0%, 0.1%, 0.2%, 0.3%, 0.4%, and 0.5 & 0.6%

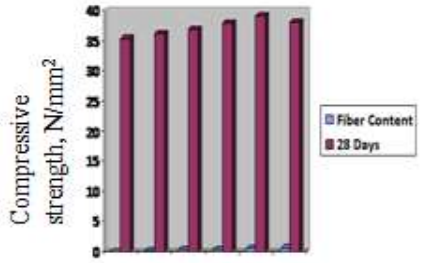
CONCRETE TEST SPECIMENS					
S No.	Fiber Content	Length of Fiber	Compressive strength (150 x 150 x 150 mm cube)		
			7 Days	14 Days	28 Days
	%	mm	RESULT		
1	0	0 mm	22.09	29.85	35.38
2	0.2	20 mm	23.76	30.82	36.1
3	0.3		25.08	33.38	36.89
4	0.4		25.41	32.67	37.94
5	0.5		26.62	33.1	39.12
6	0.6		24.8	32	38.09

Table 4: Results of Compressive strength using cubesspecimen

Compressive strength test in N/mm^2

Figure 1: Compressive strength of 7th,14th & 28th day results

Compressive strength of concrete



Length of fiber (20 mm) and Fiber percentage

Figure 1 Variation of Compressive strength of concrete with varying fiber percentage Of 0%, 0.2%,0.3%,0.4%,0.5% & 0.6%.

Effects of fiber percentage in Compressive Strength of Concrete

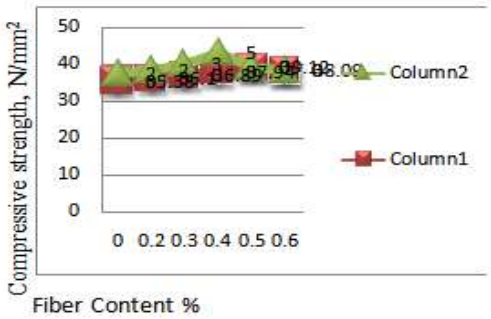


Figure 3 Effect Of Fiber % In Compressive Strength Of Concrete

V. V CONCLUSION

The following are the primary conclusions that can be derived from this project:

- The slump of fresh concrete was significantly reduced by the addition of kenaf fibre to concrete. This might be because the kenaf fibres in freshly laid concrete make the concrete stiffer and less workable.

- The findings of this study indicate that adding 0.5% volume and 20 mm of fibre to concrete will be the optimum percentage of fibre and increase its mechanical qualities by 15% when compared to a typical concrete mix.

REFERENCES

[1]. Rasheed Abed Hammood, Sharifah Maszura Syed Mohsin (2018) "Study on the Performance of KenafFiber to Strengthening of Reinforced Concrete Beams" AASCIT Journal of Environment, vol.3, pp. 29-32.

[2]. Omoniyi Tope Moses*, Duna Samson, Othman Musa Waila (2015) "Compressive strength characteristics of kenaf fibre reinforced cement mortar" Advances in Materials ; vol ,4(1):pp. 6-10

[3]. TianFook Lam and Jamaludin Mohamad Yatim (2015) "Mechanical properties of kenaf fiber reinforced concrete with different fiber content and fiber length" Journal of Asian Concrete Federation Vol. 1, No. 1, pp. 11-21, Sep.

[4]. Fibres add much needed protection to prestigious tunneling projects 2007-09-27.Archived from the original on 2007-09-27. Retrieved 2017-02-05.

[5]. P.Jagadeesan's "Study on performance of Infilled Wall in an RC-Framed Structure Using a Reinforcing Band" pp 6 Sep 2022.