

STUDY ON CONCRETE BY USING KENAF FIBRES WITH PARTIAL REPLACEMENT OF CEMENT WITH BAMBOO LEAF ASH

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Abstract

BLA was used in place of ordinary Portland cement at weight replacement rates of 0%, 2.5%, 5%, 7.5%, and 10%. The cubes were then crushed to determine the concrete's compressive strength at various curing days. The outcome showed that the water cement ratio, total number of curing days, and % of BLA replacement for OPC all had an impact on the workability and strength characteristics of the final concrete. However, it was noted that at 28 days, the results of 10% and 20% BLA were more comparable to the concrete with only OPC. Therefore, it is hoped that this research will serve as a rapid reference for working engineers who will discover BLA to be a good partial replacement for cement in concrete, cutting the cost of producing concrete. adding Kenaf fibre to improve the mechanical qualities of concrete. Compressive, flexural, and split tensile strength tests are performed on M40 grade concrete that has been mixed with various amounts of fibre, including 0%, 0.5%, 0.75%, 1%, and 1.25%, respectively.

Keywords: kenaf fibres , bamboo leaf ash, pozzalanic materials.

1. Introduction

The development of technology and an expanded field for using cement and mortars, the demand for concrete has

increased to rank second only to that of water. As a result, various properties of ordinary cement had to be changed to make it more suitable for various situations, wise, and environmentally friendly. The use of cementitious materials is a result of this. Decide that BLA can be used to substitute cement as a natural pozzolan in the making of concrete. In comparison to OPC (0%) concrete, blended concrete with a maximum load of 5% had greater compressive strength. However, only blended concrete of 5% and 10% achieved the desired Strength. The effect of partial replacement of BLA on the mechanical and physical characteristics of concrete, such as consistency, settling time workability, compressive strength micro structure, and durability, will be investigated experimentally. the BLA's chemical and physical characteristics, the fresh concrete's workability characteristics, and the hardened concrete's specific gravity, bulk densities, and compressive strength under uniaxial compressive stress.

2. Objectives

- a) To optimize the usage of cement with bamboo leaf ash in concrete.
- b) To evaluate the compressive and spilt tensile strength of concrete.

3. Materials

The properties of cement are presented in Table 1.

Table 1 Physical properties of cement

S. No.	Property	Cement (53 grade)
1	Specific gravity	3.18
2	Normal consistency	29%

3.1 Bamboo leaf ash

The bush behind the new Celestial church of Christ Odo-Arin Oyo was where the bamboo leaves utilised in the research were collected.

3.2 Kenaf fibres

Kenaf fibres, a traditional crop from the developing world that is set to be recognised as a new yearly renewable source of industrial purpose in the so-called developed nations, come in third after wood and bamboo. It is a warm-season annual fibre crop called kenaf that does well in hot and tropical environments. It is related to cotton, okra, and hibiscus due to systematics. A fibrous plant, it has an exterior bast fibre that makes up 25%–40% of the system and produces good quality pulp, and an inner core fibre that makes up 75%–60% of the system and produces low quality pulp. Kenaf fibre is now a prominent plant that is farmed for its fibre and is regarded as an industrial crop.

4. Experimental investigations

4.1 Compressive strength results

The compressive strength conducted in compression testing machine for the cast and cured specimens and the results are furnished in table 2 to 4.

Table 2: Compressive strength of concrete with bamboo leaf ash as partial replacement of cement in concrete

Sl.no	Bamboo leaf ash	Compressive strength results, N/mm ²		
		28 days	56 days	90 days
1	0%	49.55	53.69	57.96
2	2.5%	49.01	53.39	57.28
3	5%	48.32	52.64	56.26
4	7.5%	47.13	51.35	56.19
5	10%	46.48	54.02	53.92

Table 3: Compressive strength of concrete as partial replacement of concrete with kenaf fibres: -

Sl.no	Kenaf fibres	Compressive strength results, N/mm ²		
		28 days	56 days	90 days
1	0%	49.55	53.69	57.96
2	0.5%	50.62	55.15	58.95
3	0.75%	51.77	56.12	60.21
4	1%	52.64	57.04	61.53
5	1.25%	52.34	56.91	60.91

Table 4: Compressive strength of Concrete with bamboo leaf ash and kenaf fibres

Sl.no	Bamboo leaf ash + kenaf fibre	Compressive strength results, N/mm ²		
		28 days	56 days	90 days
1	0%	49.55	53.69	57.96

2	7.5%+1%	51.43	55.95	60.16
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4.2 Split tensile strength results

The split tensile strength conducted in compression testing machine for the cast and cured specimens and the results are furnished in table 5 to 7.

Table 5: Split tensile strength of concrete with bamboo leaf ash as partial replacement of cement in concrete

Sl.no	Bamboo leaf ash	Split tensile strength results, N/mm ²		
		28 days	56 days	90 days
1	0%	4.94	5.36	5.76
2	2.5%	4.83	5.24	5.62
3	5%	4.71	5.08	5.49
4	7.5%	4.53	4.93	5.27
5	10%	4.41	4.77	5.14

Table 6: Split Tensile strength of concrete as partial replacement of concrete with kenaf fibres: -

Sl.no	Kenaf fibres	Split tensile strength results, N/mm ²		
		28 days	56 days	90 days
1	0%	4.94	5.36	5.76
2	0.5%	5.01	5.44	5.85
3	0.75%	5.11	5.54	5.97
4	1%	5.31	5.77	6.20
5	1.25%	5.28	5.73	6.66

Table 7: Split tensile strength of Concrete with bamboo leaf ash and kenaf fibres

Sl.no	Bamboo leaf ash + kenaf fibre	Compressive strength results, N/mm ²		
		28 days	56 days	90 days
1	0%	4.94	5.36	5.76

2	7.5%+1%	5.10	5.54	5.96
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5. Conclusions

In this study, the concrete has a partial replacement of cement with bamboo leaf ash of 2.5%, 5%, 7.5%, 10% and kenaf fibers is added to concrete at a percentage of 0.5%, 0.75%, 1%, 1.25% and we got the optimum values of strength at the particular percentages given below:

- At 7.5% partial replacement of bamboo leaf ash with cement the compressive strength of concrete at 28, 56 and 90 days are 47.13, 51.35 and 56.19 N/mm².
- At 7.5% partial replacement of bamboo leaf ash with cement the split tensile strength of concrete at 28, 56 and 90 days are 4.53, 4.93 and 5.27 N/mm².
- At 1% addition of kenaf fiber the compressive strength of concrete at 28, 56 and 90 days are 52.64, 57.04 and 61.53 N/mm².
- At 1% addition of kenaf fiber the split tensile strength of concrete 28, 56 and 90 days are 5.31, 5.77 and 6.20 N/mm².
- By the combination of 7.5% bamboo leaf ash + 1% kenaf fibers with cement the compressive strength of concrete at 28, 56 and 90 days are 51.43, 55.95 and 60.16 N/mm².
- By the combination of 7.5% bamboo leaf ash + 1% kenaf fibers with cement the split tensile strength of concrete at 28, 56 and 90 days are 5.10, 5.54 and 5.96 N/mm².

6. References

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