

# STRENGTH STUDIES ON PINEAPPLE FIBRE CONCRETE BY USING ALCCOFINE AS PARTIAL REPLACEMENT OF CEMENT

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## ABSTRACT:

The most popular material used in construction is concrete. A cement paste that can flow holds together concrete, a composite material made of fine and coarse aggregate. cement with Alccofine-1203 which is finer than cement which provides higher strength and durability to the concrete structure. In this work, a short trial is conducted to change the mechanical properties of Pine apple leaf fibre reinforced concrete and alccofine. The cement is partially replaced with 0%,5%,7.5%and 12.5% as well as addition of pine apple leaf fibre in concrete with percentages 0.1%, 0.2%,0.3%, 0.4% and 0.5%. Compressive strength, split tensile test results for concrete must be determined after 7 and 28days.

**KEY WORDS:** Alccofine-1203, Pine apple leaf fibre, Compressive strength and Split tensile strength.

## 1. INTRODUCTION

In this work, aCivil engineering works that are incredibly challenging and intricate are being developed today. Concrete will support procedures like post & pre tensioning to get a higher strength at a time with the reduction of concrete. There are many approaches to achieve various required conditions, some of which may be of a higher strength than the conventional. Cement serves as the concrete's binding agent and is combined with water, coarse aggregate, and fine aggregate. An exothermic reaction occurs when cement gets into contact with water, hardening the concrete's components as a result short trial is conducted to change the mechanical properties of Pine apple leaf fibre reinforced concrete and alccofine.

Alccofine 1203 is a new generation micro fine material with a particle size significantly smaller than cement, fly ash, and other similar materials. The mineral additive Alccofine, produced by Ambuja Cements Ltd., was utilised in this experiment. It's made from materials used in the iron ore business. Alccofine has a higher percentage of alumina and silica content in its chemical composition. It has specific properties that help concrete operate better in both fresh and hardened stages. The use of Alccofine 1203 as a cement substitute improves the strength and durability of concrete of all ages..

An unwanted byproduct of pineapple plants is pineapple leaf fibre (PALF). PALF is widely available, inexpensive, has a high specific strength, and is rigid and abundant for industrial use. By using bio-composites as reinforcement material, PALF is promoting sustainable development. A natural fibre called pineapple leaf fibre (PALF) has the potential to take the place of synthetic fibres in concrete reinforcement. As a reinforcement fibre in concrete, PALF will fibrillate, absorb water, and alter the mechanical properties of freshly-poured concrete.

## 2. OBJECTIVES

- Optimize the usage of Alccofine in cement.
- To absorb water and mechanical properties of concrete by adding Pineapple leaf fibre in concrete.
- To assess the results of the compressive strength and split tensile strength tests.

## 3. MATERIALS:

**a. Cement:** The most widely used type of cement is ordinary Portland cement, which is used as a fundamental component in most non-specialty grout, concrete, mortar, and other construction materials. When making concrete, cement is the

primary component. By altering the cement content, concrete's properties will be significantly impacted. Ordinary Portland Cement of Grade 53, in accordance with IS 12269-2013, was the material used in this project.

**b. Fine aggregate:** The most important aspect of concrete created with natural sand or crushed stone is fine aggregate. The density and quality of the fine aggregate significantly affect the properties of the cured concrete.

**c. Coarse aggregate:** In this experiment, coarse material that was readily available locally and had a maximum size of 20 mm and a minimum size of 12.5 mm was used. The aggregates were cleaned to get rid of dirt and dust, and they were then dried until they were surface dry. According to IS: 383-1970, the aggregates passed testing.

**d. Water:** Water is one of the most important elements in construction and is required for the preparation of mortar, mixing of cement concrete and for curing work etc. The quality of water used has a direct impact on the strength of the motor and cement concrete in the construction work.

**e. Alccofine:** Alccofine 1203 is a new generation micro fine material with a particle size significantly smaller than cement, fly ash, and other similar materials.

**f. Pine apple leaf fiber:** The capacity of beams after cracking and the width and deflection of concrete fractures may both be reduced using bamboo fibre. In bio composites and material science, pineapple leaf fibre composite plays a significant role. PALF has been shown to be a good alternative to manufactured filaments because of its sensible and limitless character. The leaves' outermost layer is separated from the fibres in the leaves to produce the fibres, which are then dried.

**4. RESULTS AND DISCUSSIONS:**

**Compressive strength test:** The measurement of concrete's compressive strength is crucial since it serves as a benchmark for the material's quality. Compressive strength is the standard unit of measurement for other strength. In N/mm<sup>2</sup>, the strength is measured.

**Table 1: Compressive strength result on concrete by Alccofine as partial replacement of cement**

Sl.no	Alccofine	Compressive strength results, N/mm <sup>2</sup>	
		7 days	28 days
1	0%	32.86	48.25
2	5%	36.50	52.76
3	7.5%	38.81	55.85
4	12.5%	36.40	52.63

**Table 2: Compressive strength result on concrete by addition of pine apple fibers**

Sl.no	Pine apple fiber	Compressive strength results, N/mm <sup>2</sup>	
		7 days	28 days
1	0%	32.86	48.25
2	0.1%	35.51	50.77
3	0.2%	36.29	52.26
4	0.3%	38.27	54.79
5	0.4%	35.47	51.57
6	0.5%	34.46	50.17

**Table 3: Combined replacement of Cement by Alccofine and Pine apple fiber**

Sl.no	% of Alccofine and % of pine apple	Compressive strength results, N/mm <sup>2</sup>	
		7 days	28 days
1	0%	32.86	48.25
2	7.5%Aloc+0.3%PALF	40.61	59.02

**SPLIT TENSILE STENGTH:**The split tensile test is a common method for measuring the tensile strength of concrete. It is an indirect test, meaning that it does not directly measure the tensile strength of the concrete, but rather measures the tensile strength by applying a compressive force to the concrete and observing the resulting crack.

**Table 4: Split tensile strength result on concrete by Alccofine as partial replacement of cement**

Sl.no	Alccofine	Split tensile strength result , N/mm <sup>2</sup>	
		7days	28 days
1	0%	2.93	4.34
2	5%	3.56	5.18
3	7.5%	3.84	5.56
4	12.5%	3.65	5.23

**Table 5: Split tensile strength result on concrete by addition of Pine apple fibers**

Sl.no	Pine apple fiber	Split tensile strengthResults, N/mm <sup>2</sup>	
		7 days	28 days
1	0%	2.93	4.34
2	0.1%	3.54	5.06
3	0.2%	3.62	5.22
4	0.3%	3.77	5.46
5	0.4%	3.53	5.14
6	0.5%	3.43	5.00

**Table 6:Combined Split tensile strength of Alccofine and pine apple fiber**

Sl.no	% of Alccofine and % of pine apple	Split tensile strengthResults, N/mm <sup>2</sup>	
		7 days	28 days
1	0%	2.93	4.34
2	7.5%Aloc+0.3%PALF	3.52	5.16

### 5. CONCLUSION:

The concrete's compressive and split tensile strength were assessed at different stages. In the case of normal concrete, the compressive strength recorded 32.86 N/mm<sup>2</sup> at 7 days and increased to 48.25 N/mm<sup>2</sup> at 28 days. With the addition of 0.3% pineapple fiber, the compressive strength improved to 38.27 N/mm<sup>2</sup> at 7 days and 54.79 N/mm<sup>2</sup> at 28 days. When 7.5% of Alccofine was incorporated, the compressive strength further increased to 38.84 N/mm<sup>2</sup> at 7 days and 55.85

N/mm<sup>2</sup> at 28 days. The combined effect of these enhancements resulted in a compressive strength of 40.61 N/mm<sup>2</sup> at 7 days and 59.02 N/mm<sup>2</sup> at 28 days. Similarly, the initial split tensile strength for normal concrete was 2.93 N/mm<sup>2</sup> at 7 days and 4.34 N/mm<sup>2</sup> at 28 days, which was augmented to 3.84 N/mm<sup>2</sup> at 7 days and 5.56 N/mm<sup>2</sup> at 28 days when 7.5% Alccofine was utilized. Additionally, the incorporation of 0.3% pineapple leaf fiber led to split tensile strength values of 3.77 N/mm<sup>2</sup> at 7 days and 5.46 N/mm<sup>2</sup> at 28 days. The combined effect yielded a split tensile strength of 3.52 N/mm<sup>2</sup> at 7 days and 5.16 N/mm<sup>2</sup> at 28 days.

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