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Performance on Tamarind kernel Powder Concrete as an Addition and Bagasse Ash as Partial Replacement in Fine Aggregate for M_{20} Grade of Concrete

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ABSTRACT

One of the most often utilized building materials is concrete. The primary requirement for contemporary civil engineers is hence study on improving its qualities. Since years, engineers have been attempting to improve its qualities, either with the use of admixtures, or by partially substituting test material for cement compound. The study focuses on the split tensile strength tests and compressive strength testing of blended concrete containing various percentages of Bagasse Ash as Partial replacement in fine aggregate as 5-20% and Tamarind kernel powder added to concrete percentage of 0.3%, 0.6%, 0.9% and 1.2%. Tested for 7 and 28 days.

Keywords- ***Bagasse Ash, Tamarind kernel powder, compressive strength and split tensile strength.***

1. INTRODUCTION

Concrete is the most popular and most powerful building material. Concrete's primary components are cement, coarse aggregates, fine aggregates, and water. Concrete serves as the material that joins the coarse and fine particles collectively. A glue-like gel comprised of concrete and water encloses the sand and rock. Aggregates in their whole are a high-quality material. Under stress, concrete fails but functions well under pressure. In order to prevent these issues, we now use a variety of admixtures in the solid. The same sugar-cane business uses the industrial waste known as sugarcane bagasse as fuel all over the world. Bagasse Ash (SBA), a by-product of sugar factories, is discovered after burning sugarcane bagasse, which is discovered after all economically viable sugar from sugarcane has been tested for extraction. One of India's highly developed trees is the tamarind. Test powder for tamarind organic products, sometimes called tamarind shell powder.

2. OBJECTIVE

a) To use Bagasse Ash in fine aggregate as efficiently as possible.
c) To absorb water and improve the concrete's mechanical qualities by including Tamarind kernel powder.
c) To evaluate the outcomes of the split tensile strength and compressive strength tests.

3. MATERIALS

a. Cement: Ordinary Portland cement, which is the most widely used type of cement in construction globally, is a necessary component of concrete, mortar, plaster, and the majority of no specialty grout. Cement is the principal material used to make concrete. The characteristics of concrete will be greatly affected by changes in cement content. Ordinary Portland cement of grade 53 is used in this project in compliance with IS 12269-2013.
b. Fine Aggregate: The most important component of concrete created with natural sand or crushed stone is fine aggregate. The density and quality of the fine aggregate greatly affect the properties of the cured concrete.
c. Coarse Aggregate: The coarse material used was between 12.5 mm and 20 mm in size. Locally, it was simple to get there. The aggregates were cleaned to get rid of dirt and filth, and then dried such that only the top layer was damp. It was determined that the aggregates met the requirements of IS 383-1970.
d. Water: Water is one of the most essential components in construction and is required for several processes, including the production of mortar, the mixing of cement and concrete, and the curing of work. The caliber of the water used in the construction project has a direct impact on the durability of the motor and cement concrete.
e. Bagasse Ash: It contains a variety of unburned materials that were sieved through a 350-micron sieve to produce suitable ash, which was employed as fine aggregates in the creation of concrete.
f. Tamarind Kernel Powder: One of the highly developed plants in India is the tamarind. Tamarind cultivation in India is among the most remarkable on the world. Three components make up tamarind: pleasant tamarind organic product mash, hard green natural product mash, and tamarind seed. Tamarind shell powder, also known as tamarind organic product test powder.

4. RESULTS

a. Compressive Strength: Compressive strength testing is essential because it establishes a standard for the caliber of the concrete. The common unit of measurement for other strength is compressive strength. The strength is expressed in N/mm^2.Tested after 7 and 28 days.

Table 1: Compressive Strength Results on Tamarind kernel powder Concrete by Partial Replacement of Baggase Ash in Fine Aggregate.

S.No	% Of Bagasse Ash	Compressive Strength Results, N/mm^2	
		7 days	28 days
1	0%	18.57	27.12
2	5%	19.34	27.96
3	10%	19.79	28.32
4	15%	20.62	29.26
5	20%	19.82	28.78

Table 2: Compressive Strength Results on Tamarind kernel powder Concrete

Sl.no	Addition of Tamarind Kernel powder in Concrete	Compressive Strength Results, N/mm^2	
		7 days	28 days
1	0%	18.57	27.12
2	0.3%	21.46	31.24
3	0.6%	24.73	36.01
4	0.9%	20.58	29.53
5	1.2%	20.25	28.95

b. Split tensile Strength: The cylindrical specimens (150 mm in diameter x 300 mm in height) were examined to ascertain the split tensile strength at ages 7 and 28 days. Until the cylinder fails throughout its vertical diameter, a load is applied to a cylindrical sample that is positioned horizontally between the loading surfaces of a compression testing apparatus.

Table 3: Split tensile Strength Results on Tamarind kernel powder Concrete by Partial Replacement of Baggase Ash in Fine Aggregate.

S.No	% Of Bagasse Ash	Split tensile Strength Results, N/mm^2	
		7 days	28 days
1	0%	1.81	2.66
2	5%	1.84	2.75
3	10%	1.92	2.78
4	15%	1.97	2.87
5	20%	1.94	2.83

Table 4: Split tensile Strength Results on Tamarind kernel powder Concrete

Sl.no	Addition of Tamarind Kernel powder in Concrete	Compressive Strength Results, N/mm^2	
		7 days	28 days
1	0%	1.81	2.66
2	0.3%	2.11	3.07
3	0.6%	2.43	3.48
4	0.9%	2.07	2.92
5	1.2%	1.85	2.83

Table5 : Combined Compressive strength Result of Partial replacement 0.6% Tamarind kernel powder concrete + Partial replacement of 15% of baggase ash in Fine aggregate

S.No	Combined replacements (%)	Compressive Strength Results, N/mm^2	
		7 days	28 days
1	0	18.57	27.12
2	15%BASH+0.6%TKP	25.76	37.07

Table6 : Combined Split tensile strength Result of Partial replacement 0.6% Tamarind kernel powder concrete + Partial replacement of 15% of baggase ash in Fine aggregate

S.No	Combined replacements (%)	Split tensile Strength Results, N/mm^2	
		7 days	28 days
1	0	1.81	2.66
2	15%BASH+0.6%TKP	2.49	3.58

CONCLUSION

1. The Normal Concrete of Compressive Strength results for 7 and 28 days is18.57 N/mm^2 and 27.12 N/mm^2.
2. The Normal Concrete of Split tensile Strength results are for 7 and 28 days is1.81 N/mm^2 and 2.66 N/mm^2.
3. At 15% partial replacement of Bagasse Ash with Fine Aggregate the Compressive Strength results for 7 and 28 days is 20.62 N/mm^2 and 29.26 N/mm^2.

4. At 15% partial replacement of Bagasse Ash with Fine Aggregate the Split tensile Strength results for 7 and 28 days is 1.97 N/mm^2 and 2.87 N/mm^2.
5. By adding 0.6% Tamarind Kernel Powder in Concrete the Compressive Strength results for 7 and 28 days is 24.73 N/mm^2 and 36.01 N/mm^2.
6. By adding 0.6% Tamarind Kernel Powder in Concrete the Split tensile Strength results for 7 and 28 days is 2.43 N/mm^2 and 3.48 N/mm^2.
7. By the combination of 15% partial replacement of Bagasse Ash with Fine Aggregate +0.6% Tamarind Kernel Powder in Concrete the Compressive Strength results for 7 and 28 days is 25.76 N/mm^2 and 37.07 N/mm^2.
8. By the combination of 15% partial replacement of Bagasse Ash with Fine Aggregate +0.6% Tamarind Kernel Powder in Concrete the Split tensile Strength results for 7 and 28 days is 2.49 N/mm^2 and 3.58 N/mm^2.

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