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

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ABSTRACT

We are all too aware that building construction is essential to the world's rapid development. A thorough investigation shows that the natural resources are being depleted as the use of concrete rises. We thought about changing some of the proportions to protect our natural resources. The study focuses on testing the split tensile strength and compressive strength of blended concrete that contains different 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%. Both at28, 56 and 90 days test.

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

1. INTRODUCTION

Concrete is the most widespread and robust building material. The principal components of concrete are cement, large aggregates, small aggregates, and water. Concrete serves as the connecting material between the coarse and fine particles. A concrete and water-based gel surrounds the sand and rock. Total coarse aggregates are a premium material used in construction. Under pressure, concrete performs well, but under strain, it fails. To prevent these issues, we now use a variety of sources of admixtures in the solid. The same sugar-cane business uses sugarcane bagasse, a type of industrial waste, as fuel everywhere over the world. Bagasse Ash (SBA), a byproduct of sugar mills, is discovered following the burning of sugarcane bagasse, which is discovered following the evaluation of the extraction of all economically viable sugar from sugarcane. Tamarind shell powder, also known as tamarind organic product test powder.

2. OBJECTIVE

a) To make the most use of bagasse ash in fine aggregate.
c) To absorb water and enhance the mechanical properties of the concrete by adding Tamarind kernel powder.
c) To assess the results of the compressive and split tensile strength tests.

3. MATERIALS

a. Cement: Ordinary Portland cement is the kind of cement that is used in building the most commonly all over the world. It is a necessary component of concrete, mortar, plaster, and the majority of nonspecialty grout. Cement is the main substance used to make concrete. On the characteristics of concrete, changing the cement content will have a big effect. Ordinary Portland cement of grade 53, in line with IS 12269-2013, was used in this project.
b. Fine Aggregate: Fine aggregate, which can be either natural sand or crushed stone, is the most important ingredient in concrete. The density and quality of the fine aggregate have a big impact on how the concrete behaves once it has hardened.
c. Coarse Aggregate: The coarse material's maximum and lowest sizes were 12.5 mm and 20 mm, respectively. Locally, it was very accessible. The aggregates were cleaned to get rid of dirt and filth, and then they were dried so that they were just damp on the surface. It was determined that the aggregates complied with IS 383-1970.
d. Water: Water is one of the most important building elements because it is required for many different processes, including creating mortar, mixing cement, and curing work. The quality of the water used has a direct impact on the durability of the motor and cement concrete in the construction project.
e. Bagasse Ash: It contains a variety of unburned materials that were sieved through a 350-micron sieve to produce suitable ash that was used as fine aggregates in the creation of concrete.
f. Tamarind Kernel Powder: In India, tamarind trees are among the most advanced.Tamarind cultivation in India is one of the most amazing practices worldwide. The three parts of tamarind are the pleasant hard green natural product mash, the tamarind seed, and the tamarind organic product mash. Powdered tamarind, often called tamarind shell powder, is an organic product test.

4. RESULTS

a. Compressive Strength: Compressive strength testing of concrete is essential since it establishes a standard for the substance's caliber. The most common way to quantify other strength is in terms of compression strength. Strength is expressed in units of N/mm^2.

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		
		28 days	56 days	90 days
1	0%	27.12	29.38	31.53
2	5%	27.96	30.40	32.57
3	10%	28.32	30.73	32.99
4	15%	29.26	31.88	34.08
5	20%	28.78	31.36	33.54

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		
		28 days	56 days	90 days
1	0%	27.12	29.38	31.53
2	0.3%	31.24	33.81	36.41
3	0.6%	36.01	39.07	41.98
4	0.9%	29.53	32.01	34.45
5	1.2%	28.95	31.48	33.77

b. Split tensile Strength: The cylindrical specimens, which measure 150 mm in diameter and 300 mm in height, were examined at ages 28, 56, and 90 days to ascertain their split tensile strength. A cylindrical sample that is horizontally positioned between the loading surface of a compression testing apparatus is loaded until it breaks along its vertical diameter.

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		
		28 days	56 days	90 days
1	0%	2.66	2.87	3.11
2	5%	2.75	2.98	3.23
3	10%	2.78	3.01	3.27
4	15%	2.87	3.12	3.35
5	20%	2.82	3.07	3.29

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

Sl.no	Addition of Tamarind Kernel powder in Concrete	Split tensile Strength Results, N/mm^2		
		28 days	56 days	90 days
1	0%	2.66	2.87	3.11
2	0.3%	3.07	3.32	3.57
3	0.6%	3.48	3.78	4.05
4	0.9%	2.92	3.17	3.42
5	1.2%	2.83	3.08	3.36

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		
		28 days	56 days	90 days
1	0	27.12	29.38	31.53
2	15%BASH+0.6%TKP	37.07	40.22	43.16

Table6: Combined Split tensiletrength 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		
		28 days	56 days	90 days
1	0	2.66	2.87	3.11
2	15%BASH+0.6%TKP	3.58	3.86	4.17

5. CONCLUSIONS

1. The Normal Concrete of Compressive Strength results for 28 ,56 and 90 days is 27.12 N/mm^2, 29.38 N/mm^2 and 31.53 N/mm^2.
2. The Normal Concrete of Split tensile Strength results is for 28 ,56 and 90 days is 2.66 N/mm^2, 2.87 N/mm^2 and 3.11 N/mm^2.

3. At 15% partial replacement of Bagasse Ash withFine Aggregate the Compressive Strength results for 28 ,56 and 90 days is 29.26 N/mm^2, 31.88 N/mm^2 and 34.08 N/mm^2.
4. At 15% partial replacement of Bagasse Ash with Fine Aggregate the Split tensile Strength results for 28 ,56 and 90 days is 2.87 N/mm^2, 3.12 N/mm^2 and 3.35 N/mm^2.
5. By adding 0.6% Tamarind Kernel Powder in Concrete the Compressive Strength results for28 ,56 and 90 days is 36.01 N/mm^2, 39.07 N/mm^2 and 41.98N/mm^2.
6. By adding 0.6% Tamarind Kernel Powder in Concrete the Split tensile Strength results for28 ,56 and 90 days is 3.48 N/mm^2, 3.78 N/mm^2 and 4.05 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 for28 ,56 and 90 days is 37.07 N/mm^2, 40.22 N/mm^2 and 43.16 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 for28 ,56 and 90 days is 3.58 N/mm^2, 3.86 N/mm^2 and 4.17 N/mm^2.

REFERENCES

[1] Prashant O Modania*, M R Vyawahareb. Utilization of Bagasse Ash as a Partial Replacement of Fine Aggregate in Concrete, Elsevier,25-29.

[2] G Dinesh, G. Swathi. Experimental Study of Bagasse Ash as Partial Replacement of Cement in Concrete, International Journal of Civil Engineering and Technology, 8 (10), (2017), 1739-1748.

[3] J. Sree Naga Chaitanya , Dr. K. Chandramouli , G. Hymavathi , A. Medhasri Mrunalini4 Rehman, Performance On Concrete By Using Bagasse Ash As An Admixture, International Journal Of Research Publication And Reviews,3(7),(2022), 504-1508.

[4] CharchitChandak, TusharSaxena, Compressive Strength Of Concrete When Tamarind Kernel Powder Is Used As An Additive, International Research Journal Of Engineering And Technology, 5(10), (2010),41-45.

[5] Tanveer Singh Bains, Khushpreet Singh. Experimental Study on Geopolymer Concrete using Fly Ash, Bagasse Ash and Metakaolin with Pet Fiber, International Journal of Innovative Technology and Exploring Engineering,8(7),(2019),2903-2907.

[6] M. Nagarani1, Dr. K. Chandramouli2, J. Sree Naga Chaitanya3.Strength Studies On Concrete With Dolamite And Ggbs,The International Journal Of Analytical And Experimental Modal Analysis, Xii(Vii), (2020), 2940-2946.

[7] J. Sree Naga Chaitanya, Dr.K. Chandramouli, K. DivyaDr.D. Vijayakumar, K. Akarshitha. Mechanical Properties Of Bamboo Fiber Reinforced Concrete By Using Ggbs As Partial Replacement Cement And Zeolite Powder As Fine Aggregate Powder, North Asian International Research Journal Consortiums ,9(6),(2023),17-23.

[8] A. Felix Sahayaraj, M. Muthukrishnan and M. Ramesh. Properties and Characterization of Tamarind Nut Shell Powder Filled Jute and Hemp Fibers Reinforced Hybrid Polymer Composites, Research Square,1-16.

[9] Sk. Sahera, Dr.K. Chandramouli, J. Sree Naga Chaitanya, Dr.D. Vijayakumar, T. Saiakhil. Strength Studies On Crimped Steelfiber Concrete As Partial Replacement Of Cement With Zeolite Powder, North Asian International Research Journal Consortiums, 9(6),(2023),10-16.

[10] Dr. K. Chandramouli,J. Sree Naga Chaitanya, G. Hymavathi, M. Chaitanya Nava Kumar, BudagalaTeja. Investigation On Concrete By Using Titaniumdioxide And Ggbs, Investigation On Concrete By Using Titaniumdioxide And Ggbs, 3(7),(2022), 1521-1524.

[11] Dr. G. Purushotham , Yathin K. L . Study of Mechanical Behavior for Tamarind Shell Powder and Coconut Coir Fiber Epoxy Composite for Aerospace Application, International Journal of Trend in Scientific Research and Development, 3(1),(2018),941-949.
[12] Dr.K. Chandramouli, J. Sree Naga Chaitanya, K. DivyaDr.D. Vijayakumar, L. Chandana. Mechanical Properties On Graphene Oxide And Metakaolin As Partial Replacement Of Cement And Quarry Dust As Partial Repalcement Of Fineaggregate In Concrete, North Asian International Research Journal Consortiums, 9(6),(2023),32-39.
[13] R. K. Misra and N. V. Rachchh, Mechanical performance of coir fiber reinforced polyester composite, J. Adv. Mater. Sci. 1, pp. 19–28, 2011.
[14] Dr. Kota Srinivasu, Dr.K. Chandramouli, J. Sree Naga Chaitanya, Sk.Sahera, P Abdul Rahman. Experimental Investigation On Crimped Steelfiber Concrete As Partial Replacement Of Zeolite Powder With Cement, North Asian International Research Journal Consortiums, 9(6),(2023),24-31.
[15] Dr.K. Chandramouli, J.Sree Naga Chaitanya, Dr.N.Pannirselvam, S.Naveen, Mechanical Properties of concrete with Silica Fume and Partial Replacement of Coarse Aggregate by Steel Slag , International Advanced Research Journal in Science, Engineering and Technology,8(7),2021.
[16] Dr.K. Chandramouli, J. Sree Naga Chaitanya, Dr.N.Pannirselvam, A. Murali Krishna. Ultra-High Strength Concrete by Using Alccofine (1203), International Journal of Creative Research Thoughts, 9(8), b41-b44.
[17] R. Srinivasan, K Sathiya, 2010. Experimental Study on Bagasse Ash in Concrete, International Journal of Service Learning in Engineering 5(2), p. 60.
[18] Tobón, J. I "Comparative Analysis of Performance of Portland Cement Blended with Nano Silica and Silica Fume, Universidad Nacional de Colombia September, 2010, pp. 3746.