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MECHANICAL PROPERTIES OF NYLON FIBER CONCRETE WITH COW DUNG ASH

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ABSTRACT

In this work, we examined the mechanical characteristics of concrete that contains cow dung ash (CDA) and nylon fibers.As a percentage of the weight of the concrete, nylon fibers were added, and CDA partially substituted cement. The objective was to evaluate the cumulative impact of these additives on the workability, tensile, flexural, and compressive strengths of concrete. Different weight percentages of nylon fibers and CDA cement substitute were used to create concrete mixes. The findings showed that workability decreased with increasing nylon fiber percentage, although tensile and compressive strengths were generally enhanced.At larger percentages, CDA replacement may have decreased later strength, although it first improved early strength. The best mixtures showed increased resistance to cracking and ductility.This study sheds light on how to create improved and sustainable concrete for a range of uses, especially in low-cost and rural construction situations.To enhance the blend for particular applications and long-term durability, more study is required.Compressive and split tensile strengths should be tested after 28, 56, and 90 days.

KEYWORDS: ***Cow dung ash, Nylon Fiber, Workability, Sustainable,Compressive strength, Split tensile strength***

1. INTRODUCTION

In measured volume, concrete—an artificial rock-like substance—is the most often utilized building material worldwide.Cement, fine and coarse aggregates, and water make up the majority of its composition; admixtures are frequently added to change its characteristics.The hydration process, in which cement and water combine chemically to create a solid, binding paste that envelops the particles, is what gives concrete its charm.Over time, this paste becomes stronger and harder, creating a composite that is both long-lasting and adaptable.Its remarkable compressive strength, fresh moldability, and reasonable cost account for its extensive use.Concrete is the core of

contemporary infrastructure, influencing the built environment globally through anything from massive bridges and tall skyscrapers to common pavements and home foundations.

The mineral-rich byproduct of burning dried cow manure, cow dung ash (CDA), has a long history of use in a variety of ways.It has long been prized as a natural fertilizer and soil amendment due to its high potassium, phosphorus, and calcium content.In addition to agriculture, CDA has been utilized as a binding agent in building and for its antibacterial properties in traditional medicine.Its availability and sustainability make it an environmentally benign resource, and study into its possibilities in a variety of industrial and technological fields is still ongoing.

. Concrete is increasingly being reinforced with nylon fibers to enhance its functionality.As internal reinforcement, these short, scattered fibers mainly reduce drying shrinkage cracking and plastic shrinkage.In the end, this addition improves the concrete's durability, impact and abrasion resistance, and tensile strength.

2. OBJECTIVES

1. Find out how much cow dung ash is best for strengthening concrete.
2. Examine how different lengths of nylon fiber impact the strength of concrete.
3. Examine how cow dung ash and concrete reinforced with nylon fibers affect each other's durability.

3. MATERIALS

3.1 Cement: The main applications for cement, a finely powdered binding material, are in mortar and concrete. It solidifies when combined with water, binding aggregates like as sand and gravel to create strong, durable structures. Cement, which is made out of limestone, clay, and other minerals, is necessary for the stability and longevity of buildings and infrastructure.

3.2 Fineaggregate: Small particles that fit through a 4.75 mm filter make up fine aggregate, which is usually sand or crushed stone.It is essential for concrete and mortar because it fills in the spaces between the bigger coarse aggregate particles.

3.3 Coarse aggregate: Larger particles, such as crushed stone or gravel, make up coarse aggregate, a crucial building element that is retained at a 4.75 mm filter size.It gives concrete mixes their bulk, strength, and long-term durability by forming their structural structure.The total stability and load-bearing capability of a structure are greatly increased by this element.

3.4 Water: Water is a necessary component of several building procedures, such as curing, mortar preparation, and cement mixing.The total performance of the structure is influenced by the water quality, which has a direct impact on the durability and strength of mortar and cement concrete.

3.5Cow Dung Ash: The powdery residue that remains after burning cow manure is called cow dung ash.Currently under investigation for its potential as an additional cementitious material, it has been employed historically in a variety of applications.

3.6 Nylon Fibre: Strong and elastic, nylon fiber is a synthetic polymer that is well-known for its adaptability and

longevity.It is being investigated as a possible reinforcement in building materials and is utilized in textiles.

4. EXPERIMENTAL RESULTS

4.1 Compressive strength

The minimum compressive strength of a cubes is represented as the cube of compressive strength (15 cm x 15 cm x 15 cm). The concrete specimens are typically evaluated between the ages of seven and twenty-eight days. The cubes are usually assessed after 28,56 and 90days.

Table 1: Compressive strength results of concrete with Cow dung ash used as a partial replacement for cement.

Sl.no	% of Cow Dung Ash	Compressive Strength Results, N/mm^2		
		28 days	56 days	90 days
1	0%	39.58	42.74	45.91
2	2.5%	41.43	44.62	48.05
3	5%	42.61	46.01	49.44
4	7.5%	45.04	48.69	52.28
5	10%	42.12	45.48	48.86

Table 2: Compressive strength results of Nylon fiber added by weight of concrete.

Sl.no	% of Nylon Fiber	Compressive Strength Results, N/mm^2		
		28 days	56 days	90 days
1	0%	39.58	42.74	45.91
2	0.25%	41.42	44.69	48.34
3	0.50%	42.57	45.97	49.38
4	0.75%	45.62	49.26	52.93
5	1.0%	43.09	46.53	49.98
6	1.25%	41.74	45.07	48.42

Table3: Combined Compressive strength of Nylon fiber concrete with Cow dung ash.

Sl.no	Combined Replacement(s)	Compressive Strength Results, N/mm^2		
		28 days	56 days	90 days
1	0%	39.58	42.74	45.91
2	0.75 % of NF+7.5% CDA	48.35	52.21	56.08

4.2 Split tensile strength

A load is applied along a horizontal cylindrical specimen until failure occurs to estimate the material's split tensile strength, which is a measurement of its resistance to tension. Because it replicates the tensile stresses that exist in structural parts, this test is essential for assessing the tensile characteristics of concrete. Better durability and resistance to cracking in concrete constructions for 28,56 and 90 days.

Table 4: Split tensile strength results of concrete with Cow dung ash used as a partial replacement for cement.

Sl.no	% of Cow Dung Ash	Split tensile Strength Results, N/mm^2		
		28 days	56 days	90 days
1	0%	3.92	4.23	4.54
2	2.5%	4.13	4.46	4.79
3	5%	4.27	4.61	4.95
4	7.5%	4.56	5.01	5.36
5	10%	4.32	4.67	5.12

Table 5: Split tensile strength results of Nylon fiber added by weight of concrete.

Sl.no	% of Nylon Fiber	Split tensile Strength Results, N/mm^2		
		28 days	56 days	90 days
1	0%	3.92	4.23	4.54
2	0.25%	4.18	4.51	4.84
3	0.50%	4.25	4.69	4.98
4	0.75%	4.61	4.97	5.34
5	1.0%	4.38	4.73	5.08
6	1.25%	4.09	4.41	4.75

Table6: Ccombined Split tensile strength of Nylon fiber concrete with Cow dung ash.

Sl.no	Combined Replacement(s)	Split tensileStrength Results, N/mm^2		
		28 days	56 days	90 days
1	0%	3.92	4.23	4.54
2	0.75 % of NF+7.5% CDA	4.93	5.32	5.71

5. CONCLUSION

1. The normal concrete compressive strength results for 28, 56 and 90 days is39.58, 42.74 and 45.91 N/mm^2.
2. At 7.5% partial replacement of cement with cow dung ash which gives compressive strength result for28, 56 and 90 days is 45.04, 48.69 and 52.28 N/mm^2.
3. At 0.75% addition of nylon Fibre to concrete then the compressive strength result for 28, 56 and 90 days is45.62, 49.26 and 52.93N/mm^2.
4. Compressive strength result for combined replacement of 7.5% cow dung ash for cement and 0.75% nylon fiber is addition to concrete for 28, 56 and 90 days is 48.35, 52.21 and 56.08N/mm^2.
5. The normal concrete split tensile strength result for 28, 56 and 90 days is 3.92, 4.23 and 4.54N/mm^2.
6. At 7.5% partial replacement of cement with cow dung ash which gives split tensile strength result for 28, 56 and 90 days is4.56, 5.01 and 5.36N/mm^2.
7. At 0.75% addition of nylon fiber to concrete then the split tensile strength result for 28, 56 and 90 days is 4.61, 4.97 and 5.34 N/mm^2.

8. Split tensile strength result for combined replacement of 7.5% cow dung asfor cement and 0.75% nylon fiber is addition to concrete for28, 56 and 90 days is 4.93, 5.32 and 5.71 N/mm^2.

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