

USE OF TRIANGULAR CACTUS FIBERS AND RICE STRAW FIBERS IN CLC BRICKS

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ABSTRACT

This project explores the innovative utilization of agricultural waste, specifically rice straw fibers and triangular cactus fibers, in the production of Cellular Lightweight Concrete (CLC) bricks. The increasing demand for sustainable construction materials has prompted the investigation into alternative reinforcing fibers that can enhance the mechanical properties and durability of CLC bricks. Rice straw, a byproduct of rice cultivation, is abundant and often discarded, while triangular cactus fibers, sourced from local cactus species, offer unique structural benefits.

The study involves the preparation of CLC bricks incorporating varying percentages of these fibers, followed by comprehensive testing to evaluate their compressive strength, and water absorption characteristics. Preliminary results indicate that the inclusion of rice straw and cactus fibers significantly improves the lightweight properties and eco-friendliness of CLC bricks, making them a viable option for sustainable building practices. This research not only contributes to waste management but also promotes the use of renewable resources in construction, aligning with global sustainability goals.

I. INTRODUCTION

CLC blocks, or Cellular Lightweight Concrete blocks, are an exciting development in the construction industry. They offer a lightweight and strong alternative to traditional concrete blocks. Now, when we incorporate Triangle Cactus Fibers and Rice Straw Fibers into CLC blocks, we take it to the next level! These biodegradable fibers have the potential to enhance the properties of CLC blocks, making them even more durable, sustainable, and environmentally friendly "Exploring the Potential of Triangle Cactus Fibers and Rice Straw Fibers in CLC Blocks." This project aims to investigate how these natural fibers can be incorporated into CLC (Cellular Lightweight Concrete) blocks to enhance their strength, durability, and sustainability. By utilizing these biodegradable fibers, we can create eco-friendly construction materials that reduce waste and promote a greener future.

When it comes to construction, triangle cactus fibers can offer some unique advantages. These fibers have been explored for their potential use as reinforcement in construction materials like concrete.

Due to their high tensile strength and durability, they can enhance the structural integrity of building components.

Rice straw fibers have several properties that make them suitable for construction applications. Firstly, they are lightweight, which helps in reducing the overall weight of the construction materials.

Additionally, rice straw fibers have good thermal insulation properties, which can contribute to energy efficiency in buildings. They also exhibit good fire resistance, making them a safer choice for construction. Furthermore, these fibers are renewable and biodegradable, aligning with sustainable construction practices. With proper processing and treatment, rice straw fibers can be incorporated into various construction materials, such as concrete or composite boards, to enhance their strength and durability.

Need of the study

There are several reasons why the use of natural plant fibers is important and worth studying:

1. Sustainability: Natural plant fibers are renewable resources, which mean that they can be replenished relatively quickly. This makes them a more sustainable choice compared to synthetic fibers, which are derived from non-renewable fossil fuels.
2. Environmental impact: The production of synthetic fibers can have negative environmental impacts, such as air and water pollution. In contrast, the production of natural plant fibers often has a lower environmental impact.
3. Comfort and breathability: Natural plant fibers are known for their ability to breathe, which makes them more comfortable to wear in hot or humid conditions.
4. Hypoallergenic properties: Some natural plant fibers, such as cotton and linen, have hypoallergenic properties that make them less likely to cause allergic reactions.
5. Durability: Some natural plant fibers, such as hemp and jute, are known for their strength and durability.
6. Cultural significance: In many parts of the world, natural plant fibers are a traditional and important part of the local culture and economy. The use of natural plant fibers can help to preserve and support these traditions.
7. Versatility: Natural plant fibers can be used in a wide range of products, including textiles, paper, and building materials. This versatility makes them an important resource for many industries.

Objective:

1. Use of triangular cactus fibers and rice straw fibers to increase the compressive strength.
2. Comparing the performance of CLC bricks with and without fiber.
3. To Enhancing Sustainability.
4. To promote innovation in sustainable construction practices and materials.

II. METHODOLOGY

Procedure of making of CLC bricks with rice straw and triangular cactus fibers
Phase 1 : Extraction of rice straw and triangular cactus fibers.

- 1 Cutting of upper layer of rice straw and triangular cactus.
2. Remove the wet core of rice straw and triangular cactus.
3. Keep the extracted rice straw and triangular cactus fibers at some warm temperature to make it dry. 4. Put the dry fibres in some salted water for 24 hours and dry it again.



Phase 2: Making the foam by foam agent

1. Remove the lumps if the agent in powder form and Add the foam agent into water as per the proportion 1 : 30. And stir it well.
2. Fill the container with the agent
3. Start the compressor and then we will get the foam.



Phase 3: Making the bricks.

- 1 Weigh the cement, fly ash, fibers and foam as per the proportion.
2. Make the mesh of weighted fiber.
- 3 Mix the all ingredient in a pan in well manner. Remove the lumps.
4. Fill the mixture in 3 layers.
5. After filling first layer lay the mesh of a rice straw fiber and triangular cactus fiber in zig zag manner and repeat this process for 2nd and 3rd layer
6. After filling give it the finishing touch and cure the bricks for 7, 14 and 28 days



Observations:

1. compressive strength testing Without Fibres bricks

SR.NO	PROPORTION	WEIGHT(kg)	28 DAYS COMPRESSIVESTRENGTH (N/MM ²)
1.	Standard CLC Brick	4.4	3.54
2.	20%- FLY ASH 80%-CEMENT	4.5	3.1
3.	30%- FLY ASH 70%-CEMENT	4.33	2.96
4.	40%- FLY ASH	4.16	2.68

	60%-CEMENT		
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Bricks with fiber reinforcement

DescriptionOf CLC Bricks	Proportion	Triangular Cactus Fibers		Rice Straw Fibers	
		Weight(KG)	Compressive Strength (N/MM2)	Weight(KG)	Compressive Strength (N/MM2)
20% fibers by volume of bricks	20%- FLYASH 80%-CEMENT	4.5	3.84	3.1	2.80
	30%- FLYASH 70%-CEMENT	4.26	3.04	3	2.10
	40%- FLYASH 60%-CEMENT	4.085	2.87	2.8	1.80
30% fibers by volume ofbricks	20%- FLYASH 80%-CEMENT	4.524	3.024	2.9	1.33
	30%- FLYASH 70%-CEMENT	4.294	2.96	2.83	1.31
	40%- FLYASH 40%-CEMENT	4.152	2.68	2.72	1.26
40% fibers by volume of bricks	20%- FLYASH 80%-CEMENT	4.252	2.86	2.81	1.23
	30%- FLYASH 70%-CEMENT	4.191	2.72	2.73	1.16

40%- FLYASH 80%-CEMENT	4.251	2.66	2.67	1.01
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2. Water absorption test

20% FLYASH 80% CEMENT	30% FLYASH 70% CEMENT	40% FLYASH 60% CEMENT
Percentage of absorbedwater	Percentage of absorbedwater	Percentage of absorbedwater
5.02	5.48	5.58

3. Drop test on bricks

We drop the brick from app. 1m height. after the performing drop test there is no any effect or damage to the brick.



III. RESULTS AND DISCUSSION

As we know the red clay bricks are commonly used in the construction work of any structure. But the CLC bricks are not used as load carrying member. But after adding triangular cactus fibers and rice straw fibers we can get the result better than the red clay bricks in all aspects like weight, water absorption, compressive strength etc. Results:

1. Weight of CLC bricks with 40 % triangular cactus fibers and rice straw fibers is less than the weight of CLC brick without fibers.
2. Compressive strength of CLC bricks with 20 % triangular cactus fibers and rice straw fibers is more than the CLC brick without triangular cactus fibers and rice straw fibers.
3. CLC bricks with triangular cactus fibers and rice straw fibers absorb more water than the CLC brick without sisal fiber.
4. CLC bricks with 20 % triangular cactus fibers and rice straw fibers doesn't break when we drop it from 4 feet.

IV. CONCLUSION

After all the tests we can conclude that the CLC bricks with 20% fiber of triangular cactus fibers are more better than the CLC bricks without fiber and in economical aspect also.

CLC bricks with 20% fiber can be exchanged with standard CLC bricks.

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