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STUDY ON THE EFFECT OF PLASTIC FIBERS IN SUGARCANE BAGASSE ASH CONCRETE

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Abstract –*Cement holds a key part in the concrete. As the CO_2 emissions caused from the cement industry creates harms to the environment researchers are finding ways to eradicate the problem. The use of partial surrogate material for cement is found like sugarcane bagasse ash, rice husk, glass powder etc..It's benefit is that the agricultural waste is used up. The Sugarcane bagasse is the waste material after the juice is extracted from the sugarcane. This bagasse later on when burnt gives bagasse ash which can be used a partial surrogate of cement. The sugarcane bagasse ash is added at various percentage replacement of cement. The plastic waste has turned out to be a key concern in the world so its integration as a fiber is used to gain the strength in addition to the strength obtained by sugarcane bagasse ash concrete. It is supplemented to next optimum percentage obtained from sugarcane baggase ash by replacement of cement at various percentages. Various tests are conducted like compressive, split tensile and flexural strength test to comprehend the strength of these incorporated materials in the concrete.*

Key Words:**Sugarcane baggaseash(SBCA),Plastic fibre, Concrete, Cement.**

1. INTRODUCTION

Cement is the key material that binds and gives concrete its strength. Cement used is expensive and not eco-friendly due to its emission produced. The plastic waste too is a main causing problem in the world due to its lack of waste disposal.

The sugarcane bagasse is the waste material that is acquired after extraction of juice from the sugarcane. The agricultural waste material that would have been dumped is took and burnt to get bagasse ash. The bagasse has pozzolanic properties which hence can be used a partial surrogate for cement. Although the silica content varies from ash to ash depending on burning conditions its existence ensued in pozzolanic reactions, hydration products of cement and reduction of free lime in the concrete.

The plastic waste is recycled and cast-off in many ways nowadays. The use of plastic fiber in concrete yields higher strength and higher resistance to cracking and bending. The interaction of the cement mixture and the plastic fiber gives its strength and resistance to cracking at bending.

2. EXPERIMENTAL STUDY

The experimental study intents on probing the optimum percentage of partial replacement of cement by sugarcane bagasse ash and the enhancement of this sugarcane bagasse concrete by adding plastic fiber next to the optimum percentage that contributes towards the overall strength. The cement produces about 0.9 pounds of CO_2 for every pound of cement and it upsets the environment. The plastic waste also is major problem across the globe. In order to exploit the agricultural waste and plastic waste for partial surrogate of cement steered to the idea of experimental investigation. It was found that bagasse contained silica content which gave pozzolanic reaction and reduction in free lime in concrete. The plastic fiber has properties when mixed with cement matrix that imparts strength to the concrete. We casted sugarcane bagasse ash concrete alone and blends of both sugarcane bagasse ash and plastic fiber concrete.

3. SAMPLE COLLECTION AND TEST RESULTS

The various materials collected for our work are briefly mentioned below:

3.1 CEMENT

Ordinary Portland Cement of grade 53 were used for the entire work and elementary test were steered like Standard consistency, Initial setting time, Final setting time and fineness.

Table- 1: Test results of cement

TEST	RESULTS
Standard Consistency	32%
Initial Setting Time	45min
Final Setting Time	600min
Fineness	9.4%

3.2 COARSE AGGREGATE

Coarse aggregates were collected from crusher unit Paripally and steered the elementary tests like Specific gravity, Bulk density, Void ratio and Porosity.

Table- 2: Test results of coarse aggregate

TEST	RESULTS
Specific Gravity	2.76
Bulk density	1.69g/cc
Porosity	44.6%
Void ratio	0.8

3.3 FINE AGGREGATES

Fine aggregates were collected from PNP traders and steered the elementary tests like Specific gravity, Bulk density, Void ratio and Porosity.

Table-3: Test results of fine aggregates

TEST	RESULTS
Specific Gravity	2.48
Bulk Density	1.35g/cc
Porosity	45.5%
Void ratio	0.83

3.4 SUGARCANE BAGASSE ASH

Sugarcane bagasse ash was collected during the cleaning operation of a boiler in the sugar factory, located in the town of Anakapalli, AndhraPradesh.

4. DETAILS OF EXPERIMENT

The investigational program consists of preparing a sugarcane bagasse ash concrete by replacing various % of sugarcane bagasse ash in order to find the optimum percentage replacement. The % replacement variations are from 0% to 20%.The plastic fiber is added next to the optimum percentage of sugarcane bagasse ash by replacement of cement in various percentages. The percentage replacement variation is from 0.5% to 2%.

5. METHODOLOGY

5.1 OPTIMUM PERCENTAGE OF REPLACEMENT BY SUGARCANE BAGASSE ASH (SCBA)

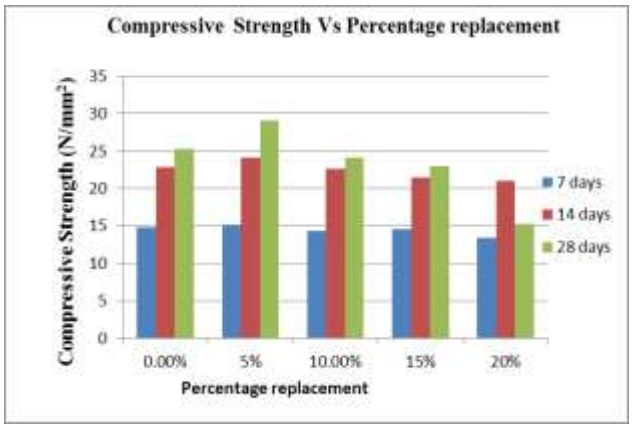
The sugarcane bagasse ash was incorporated into the concrete at different percentages 0%(control specimen),5%,10%,15%, and 20% to achieve optimal percentage. Various test like compressive strength test, split tensile strength and flexural strength test. The test results were shown in the table below.

Table- 3: Test results of sugarcane bagasse ash

% Replacement	Compressive Strength (N/mm^2)		Split Tensile Strength (N/mm^2)		Flexural Strength (N/mm^2)	
	7 days	28days	7days	28days	7days	28days
0%	14.7	25.29	1.3	1.09	3.4	5.76
5%	15.2	29.07	1.51	2.12	3.9	6.56
10%	14.3	24.12	1.45	1.18	3.1	5.55
15%	14.5	22.96	1.40	0.992	2.94	4.95
20%	13.4	15.26	1.01	0.718	2.31	4.20

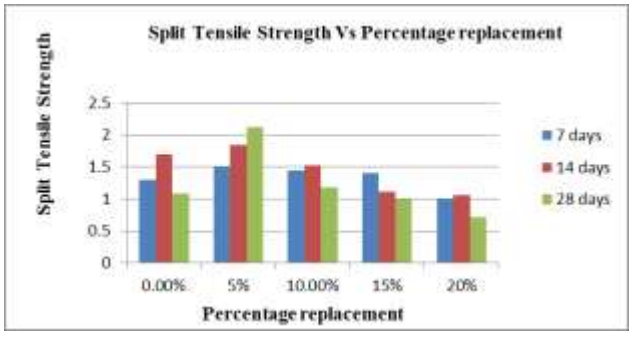
The graphs drawn based on the results are shown below

Chart- 1: Graph between percentage replacement and compressive strength



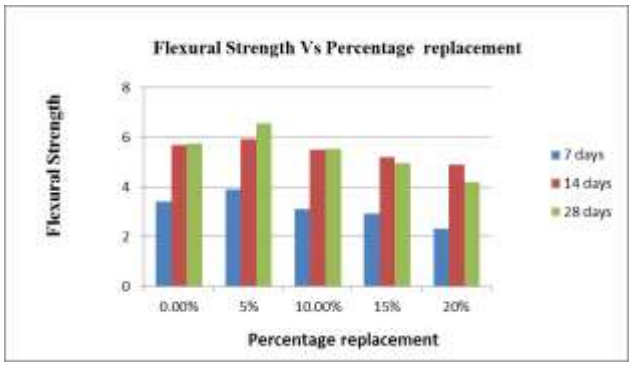
From the graph drawn we can sum up that at 5% it depicted the highest strength.

Chart- 2: Graph between percentage replacement and split tensile strength



From the graph drawn we can sum up that at 5% there is an increase in strength but it doesn't yield much strength to the concrete.

Chart- 3: Graph between Flexural Strength and percentage replacement



From graph drawn we can sum up that the percentage replacement showing the highest strength is depicted at 5% .

5.2 OPTIMUM PERCENATGE OF COMBINATIONS OF BOTH SUGARCANE BAGASSE ASH AND PLASTIC FIBER

The plastic fiber is added to the next optimum percentage obtained from sugarcane bagasse ash concrete at various percentages like 0.5%, 1%, 1.5%, 2% and test were conducted to find the optimum percentage. The test results were shown in the table below:

Table- 4: Test results of SBCA with Plastic fiber

% Replacement	Compressive Strength (N/mm²)		Split Tensile Strength (N/mm²)		Flexural Strength (N/mm²)	
	7 days	28 days	7 days	28 days	7 days	28days
0.5%	17.16	26.4	1.4	2.15	4.4	6.71
1%	19.26	29.64	1.6	2.37	5.43	7.83
1.5%	16.12	24.8	1.31	2.01	4.06	6.24
2%	15.7	24.1	1.1	1.9	3.8	5.9

The graphs drawn based on the results are given below:

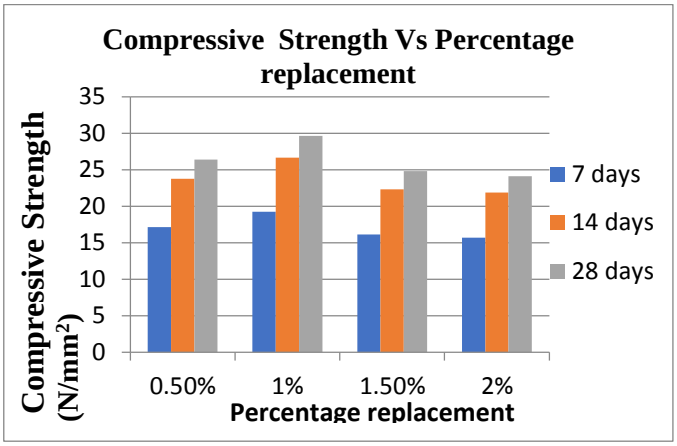


Chart- 5: Graph between Compressive Strength and percentage replacement

From the graph drawn we can sum up that a highest strength is depicted at 1% after the integration of plastic fibere into the sugarcane baggase ash concrete.

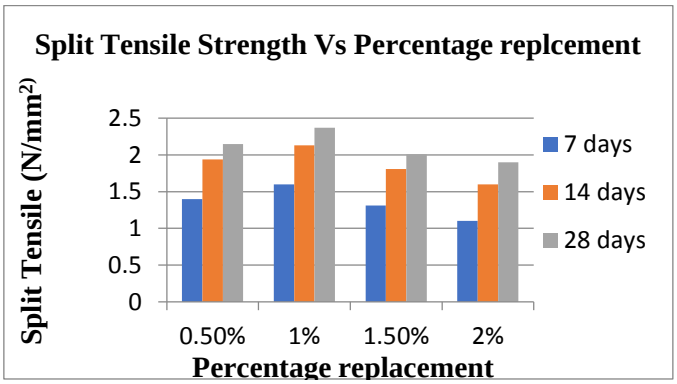


Chart- 6: Graph between Split Tensile Strength and percentage replacement

From the graph we can sump up that an increase in strength is depicted at 1% with significant strength increased after the plastic fiber is integrated into the sugarcane baggase ash concrete.

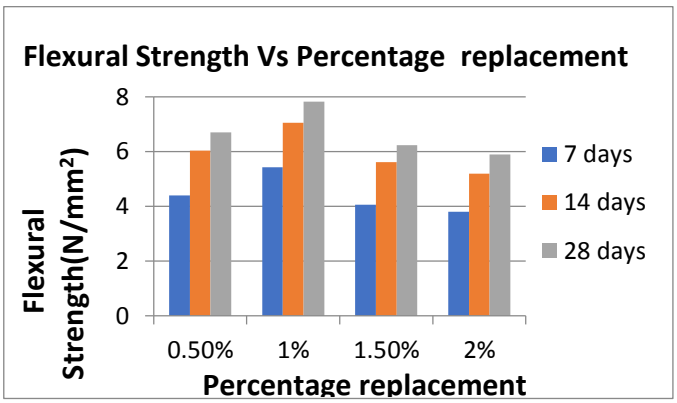


Chart- 7: Graph between Flexural Strength and percentage replacement

From the graph drawn we can sum up that an increase in strength is depicted at 1%.

6. RESULTS AND DISCUSSIONS

- The optimum percentage of sugarcane bagasse ash is 5%.
- There is significant reduction in the strength when split tensile result was obtained.
- The optimum percentage of combination of plastic finer and sugarcane baggase ash was found to be 1%.
- There is a momentous increase in the split tensile strength.

7. CONCLUSION

From the study on the replacement of cement by sugarcane bagasse ash an optimal percentage of 5% obtained. This optimum percentage showcased a significant reduction in strength due to the value obtained from the split tensile strength. The blend of plastic fiber and sugarcane baggase ash gave 1% which resolved the reduction in split tensile strength and showcased an addition of strength to the overall compared to the other.

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