Utilization of Sugarcane Bagasse as Retarder in Concrete

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Abstract **- Concrete is the most commonly used material in building construction. The production process of concrete includes aggregates, cement and water other than these any ingredients used are known as concrete admixtures. Retarding admixture is mostly used in concrete because it can retard (or) slows the hydration process of concrete and delays the setting time during hot weather concreting. This offers extra time for transportation and concrete placement. However, the admixtures prices are high in market we are replacing with an waste material (sugarcane bagasse), sugarcane bagasse disposal has been major concern in world as it is produced in large amount due to its usage in food products, our project aims to solve the problem of proper disposal of sugarcane bagasse by blending it and using it as an admixture with concrete there by studying its improvement of setting time and compressive strength of concrete.**

Index Terms **- Compressive Strength, Retarder, Sugarcane Bagasse, Setting Time.**

I.INTRODUCTION

In concrete industry, retarders are widely used for long transportation and handling period to prevent concrete for set in within allowable time. Moreover, the increase setting time will give more time to the workers to complete the texturing process. Normally chemical retarder will be used. It is expensive and chemical based. This situation has led to the extensive study on concrete resulting in natural admixture to be used as concrete retarder inmost structural application without affecting its quality.

Retarding admixture or retarders are used to slow the rate of setting time of the concrete mix. Retarders mainly made of the basis of sugar (sugar-based). The retarders oppose the hot weather which decrease and accelerate the concrete setting time. The hot weather causes the increase in rate of hardening that causes difficulty in placing and finishing process. Retarders help keeping the concrete more workable during placing and delay the initial setting time of concrete. Normally chemical retarder will be used. It is expensive and chemical based. This situation has led to the extensive study on concrete resulting in natural admixture to be used as concrete retarder in most structural application without affecting its quality. In this study sugarcane bagasse is used as a retarding admixture.

II. MATERIALS

A. Cement

Cement is the mixture of calcareous, siliceous, argillaceous and other substances. Cement is used as a binding material in mortar, concrete, etc. In this study OPC 53 grade cement is used.

B. Sand

Standard sand conforming to IS: 650-1991 is used for preparing moulds for conducting compressive strength of cement.

C. Water

Tap water was used for the mixing and it was properly examined to ensure that it was clean, free from particles and good for drinking.

D. Sugarcane Bagasse

Sugar cane bagasse is a lignocellolusic fibre residue obtained from sugar cane culm, after the culm is milled and the juice is extracted. The sugars found in sugarcane bagasse can make it act as a natural retarder as the main content of the chemical retarder is sucrose. According to Lea (1988), sugar belongs to the type of retarders that can hold up setting and hardening indefinitely.

III. METHODOLOGY

The tests to determine efficiency of sugarcane bagasse as concrete retarder includes initial and final setting

time. These tests are done for both conventional concrete and concrete with sugarcane bagasse and the time taken between conventional concrete and concrete with sugarcane bagasse to set is compared.

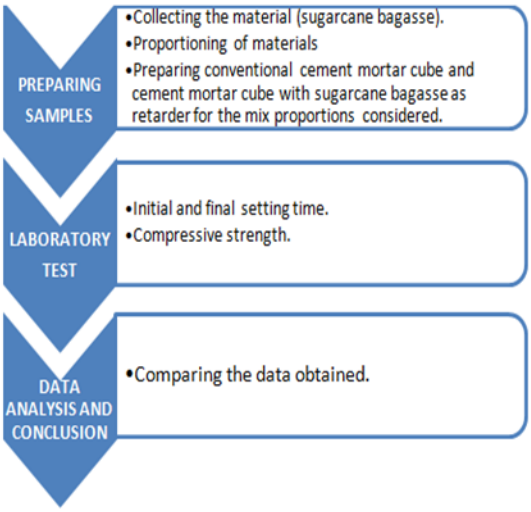


Fig 1: Flowchart representing sequence of work

A. Preparation of Samples

For Setting Time of Cement:

Initially take 300grams of cement and sugarcane bagasse is mixed at varying percentages of 1%, 2% and 3% of weight of cement, and then 0.85P of water is added and the samples are prepared where P-water percentage obtained from normal consistency of cement there after the samples are placed in Vicat Mould and then the time taken is noted for getting the penetration of 5-7mm from bottom of mould and 33-35mm from top of mould.

For Compresive Strength of Cement:

Initially take 300gms of cement and 600gms of sand and add ((P/4)+3)% of weight of cement and sand the samples are prepared with varying percentages of 1%, 2% and 3% of weight of cement and then the cubes are prepared in 70.6 mm x 70.6 mm x 70.6 mm and tested in compressive testing machine.

TABLE 1: PROPORTION OF MATERIALS

Sample No.	Identification of Sample	% of Sugarcane Bagasse Taken
1.	$C_{100}S_0$	0%
2.	$C_{100}S_{0.5}$	0.5%
3.	$C_{100}S_{1.0}$	1.0%
4.	$C_{100}S_{1.5}$	1.5%
5.	$C_{100}S_{2.0}$	2.0%
6.	$C_{100}S_{2.5}$	2.5%
7.	$C_{100}S_{3.0}$	3.0%

Where (C) represents Cement percentage and (S) represents Sugarcane Bagasse percentage.

TABLE 2: PHYSICAL PROPERTIES OF CEMENT

S.NO.	PROPERTY OF CEMENT	VALUES OBTAI NED
1.	Standard Consistency (%)	29%
2.	Initial Setting Time (mins)	42 mins
3.	Final Setting Time (mins)	330 mins
4.	Fineness (%)	8%
5.	Specific Gravity	3.15

IV. EXPERIMENTAL INVESTIGATION

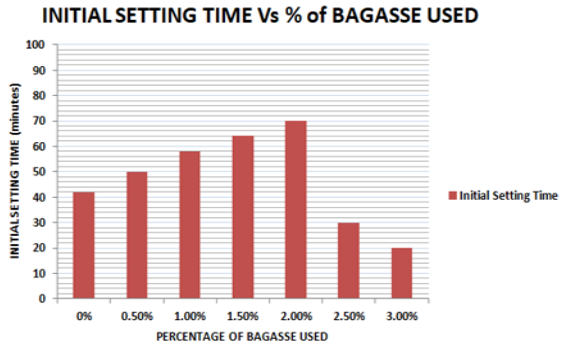
A. Initial Setting Time Test

The time to which cement can be moulded in any desired shape without losing it strength is called Initial setting time of cement.

TABLE 3: TEST RESULTS OF INITIAL SETTING TIME

Sample	Percentage of Bagasse Used	Initial Setting Time (min)
1	0%	42
2	0.5%	50
3	1.0%	58
4	1.5%	64
5	2.0%	70
6	2.5%	30
7	3.0%	20

CHART 1: INITIAL SETTING TIME WITH VARYING PERCENTAGES OF BAGASSE



B. Compressive Strength of Cement Test

To conduct this test, 4 types of cement mortar mixes were prepared regarding the difference amount of sugarcane bagasse is produced which is one for the control sample and another three for the cement mortar mixed with sugarcane bagasse. For each type of cement mortar mix, 6 samples were prepared to obtain the average result for 3 days and 7 days compressive strength. The test was done and samples were tested until failed.

TABLE 4: TEST RESULTS OF COMPRESSIVE STRENGTH OF CEMENT (3 Days)

Sample	Average 3 Days Compressive Strength N/mm^2			
% of Bagasse used as Admixture	0%	1%	2%	3%
3 days	8.30	7.70	6.50	2.65
3 days	8.25	7.75	6.75	2.72
3 days	8.31	7.70	6.70	2.70
Avg.	8.29	7.72	6.65	2.69

CHART 2: AVERAGE 3 DAYS COMPRESSIVE STRENGTH OF CEMENT WITH VARYING PERCENTAGES OF BAGASSE

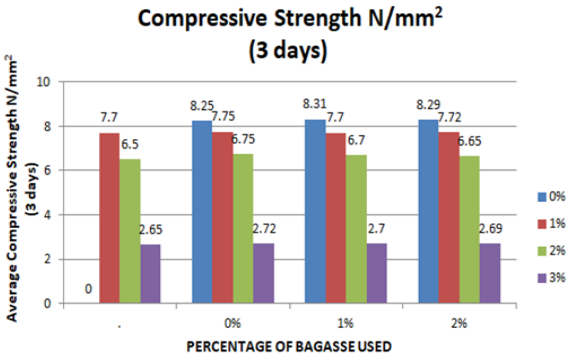
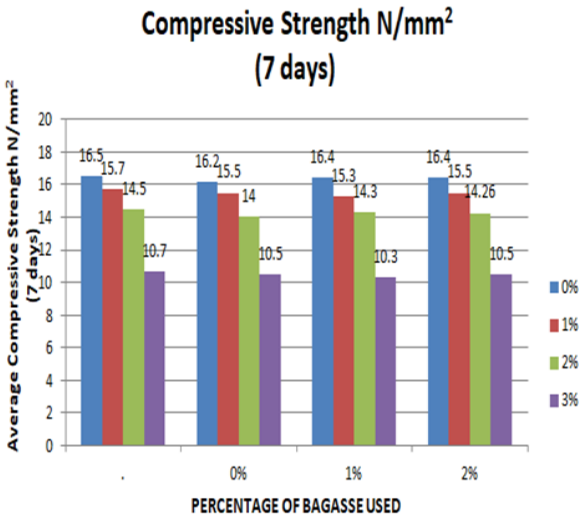


TABLE 5: TEST RESULTS OF COMPRESSIVE STRENGTH OF CEMENT (7 Days)

Sample	Average 7 Days Compressive Strength N/mm^2			
% of Bagasse used as Admixture	0%	1%	2%	3%
7 days	16.5	15.7	14.5	10.7
7 days	16.2	15.5	14.0	10.5
7 days	16.4	15.3	14.3	10.3
Avg.	16.4	15.5	14.26	10.5

CHART 3: AVERAGE 7 DAYS COMPRESSIVE STRENGTH OF CEMENT WITH VARYING PERCENTAGES OF BAGASSE



V. CONCLUSIONS

The following conclusions are drawn out from the study carried out:

1. By increasing the percentage of sugarcane bagasse in cement mortar has increased the initial setting of cement.
2. The Initial Setting Time of cement was increased upto 2% usage of sugarcane bagasse as retarder thereafter the sugarcane bagasse acts as an accelerator.
3. The Compressive Strength of cement was decreasing with usage of sugarcane bagasse as retarder.
4. With the use of sugarcane bagasse as an retarder in cement mortar the initial setting of cement has been increased where as there is an reduction in compressive strength.
5. So, finally we can conclude that sugarcane bagasse can act as a good retarder but in order to

satisfy the strength requirements any other material can be used along with sugarcane bagasse.

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