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STRENGTH ANALYSIS OF CONCRETE USE SUGARCANE ASH PARTIAL REPLACEMENT OF CEMENT

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ABSTRACT
In this paper an attempt has been made to show the impact of Sugar Cane Ash as a partial replacement of cement on concrete structures by performing an experimental study in the laboratory to improve the compressive strength of concrete structures. Compressive strength of concrete cubes by mixing Sugar Cane Ash tested at 7, 14 and 28 days for M-15, and M-20 grade has been found to be Superior as compare to without Admixture. Sugar Cane Ash as a partial replacement of cement is added in the concrete mix design and a detailed parametric study for 5%, 10%, 15%, 20% and 30% . The results shows that compressive strength of concrete cubes has been improved by adding Sugar cane ash (as a partial replacement of cement) in the concrete Mix design.

Key words - Admixture, compressive strength, Sugar Cane Ash, Mix design.

1. INTRODUCTION

All through the world Ordinary Portland Cement is perceived significant development material. Standard Portland bond is the customary building material that really is in charge of around 5% - 8% of worldwide CO2 discharges. This ecological issue will no doubt be expanded because of exponential request of Ordinary Portland Cement (OPC). (Bangar Sayali S et al) example, silica smolder, rice husk fiery remains, fly slag, and electric-curve heater tidy. As of late, there has been an expanding pattern towards more proficient use of agro-mechanical buildups, including sugarcane sugar cane ash. A few procedures and items have been accounted for that use sugarcane sugar cane ash as a crude material. These incorporate power age, mash and paper generation, and items in view of aging.
Materials

Customary Portland concrete is utilized for the examination. The sugar cane ash fiery remains utilized as a part of the examination is gotten from a Corporate Sugar Factory (Kareli Sugar Mill) in the adjacent region. The sugarcane sugar cane ash comprises of around half of cellulose, 25% of hemicellulose and 25% of lignin. Every ton of sugarcane creates roughly 26% of sugar cane ash (at a dampness substance of half) and 0.62% of leftover cinder. The deposit after ignition exhibits a concoction piece overwhelms by silicon dioxide (SiO2).

2. LITERATURE REVIEW

Most of the researchers has been carried out there research work based on to find out the various alternative material to mix with the cement and find out there performance. The latest researches in this era are as follows:

1) A new treatment for coconut fibers to improve the properties of cement based composites – Combined effect of natural latex/pozzolanic materials" (2017), Everton Jose da Silva, Maria Lidiane Marques, Fermin Garcia Velasco, Celso Fornari Junior, Francisco Martínez Luzardo, Mauro Mitsuuchi Tashi In 1982, yomamoto and lakho, studied the effect of the presence of carbon in SCA. He concluded that content of carbon can be minimized by further burning and grinding it into more finer form. This process further improved the various properties of ash. They also told that rapid cooling also helps in improving the quality of SCA.

2) In feb 2014 , Dr. Subha khatri carried out a research on the impact of SCA on partial replacement with cement in making concrete produced in the surrounding regions and concluded that SCA has shown superior results on various paramenters of concrete. The variation of cubic strength ranges from 30% to 50% on above side depending upon various grades of concrete.

3) Mehta and pirtz made a considerable contribution regarding SCA. They developed a process of converting rice husk into energy and various valuable industrial products. It was shown by them that with 30% replacement of OPC by SCA the temperature of concrete can be considerably brought down upto 20%. This may make use of concrete economical in two ways. Firstly , cooling cost of concrete can be reduced or eliminated and secondly ,cement content can be reduced both of which could lead to considerably bringing down the cost of concrete.

4) We in 1981 concluded that the compressive strength was reduced when it was mixed in a large proportion of the partial replacement of cement in lean mixes. But in heavy grades such as m20 m25 m30 it is found to be increasing with some definite cement water ratio.

3. METHODOLOGY AND LABORATORY WORK

Out of many test applied to the concrete, Compressive strength of concrete is the utmost important which gives an idea about all the characteristics of concrete. By this single test one judge that whether Concreting has been done properly or not. According to I.S. 456-2000 compressive strength of different grades of concrete is tabulated below in Table 1. Similarly, according to I.S. 456-200, In this paper M-15 and M-20 grade of Concrete Mix design has been prepared by partial replacement of SCA of cement by weighing the ingredients cement, sand and aggregates with required water. Mixing was done by in a laboratory batch mixer. The specimens were cast in steel mould and compacted on a table vibrator. The specimens of 150 mm × 150 mm × 150 mm size of cube were cast for the determination of compressive strength. Curing of the specimens was started as soon as the top surface of the concrete in the mould was hard enough. Spreading wet gunny bags over the mould for 24 hours after the casting was carried out for the initial curing. The specimens were later placed immediately in water tank for further curing.

No. of cubes made for laboratory experiment are as follows:

Grade	Partial replacement of cement	Sample size (no. of cube)
M15	0%	9
M15	5%	9
M15	10%	9
M15	15%	9
M15	20%	9
M15	25%	9
M20	0%	9
M20	5%	9
M20	10%	9
M20	15%	9
M20	20%	9
M20	25%	9

Compression strength analysis:

Compression strength testing was performed on the cubes by using compression testing machine at 7, 14 and 28 days. Following results were obtained:

Compressive strength of different grades of concrete at 7 and 28 days Grade of Concrete	Minimum compressive strength N/mm2 at 7 days	Specified characteristic compressive strength (N/mm2) at 28 days
M15	10	15
M20	13.5	20
M25	17	25
M30	20	30
M35	23.5	35
M40	27	40
M45	30	45

4. RESULTS AND COMPARATIVE STUDY

An experimental study has been carried out in laboratory to find the compressive strength of M-15, M-20 mix concrete cubes at 7 ,14 and 28 days by using Sugar Cane Ash at 10, 20 and 30% as partial replacement of cement.

As the analysis was done by mixing the SCA in the Based on the limited study carried out on the strength behavior ofSugar Cane Ash, the following conclusions are drawn:At all the cement replacement levels of Sugar Cane Ash; there is gradual increase in compressive strength from 3 days to 7 days.However there is significant increase in compressive strengthfrom 7 days to 28 days followed by gradual increase from 28days to 56 days.

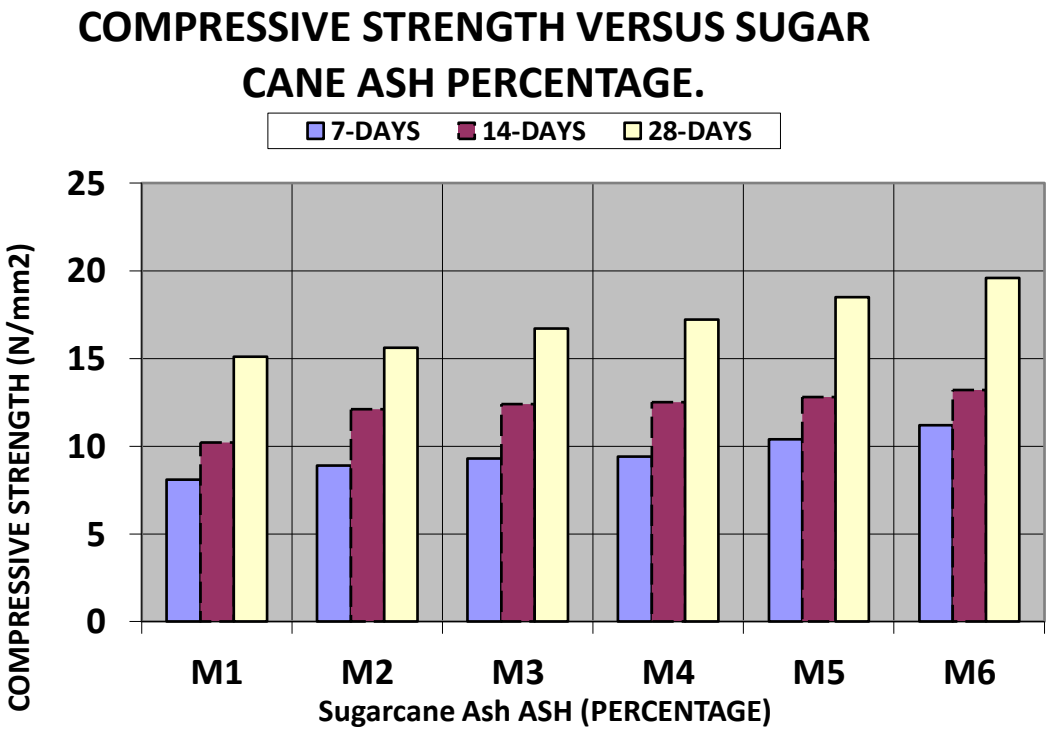
Compressive Strength of Grade M15 as M1, M2, M3, M4, M5, M6

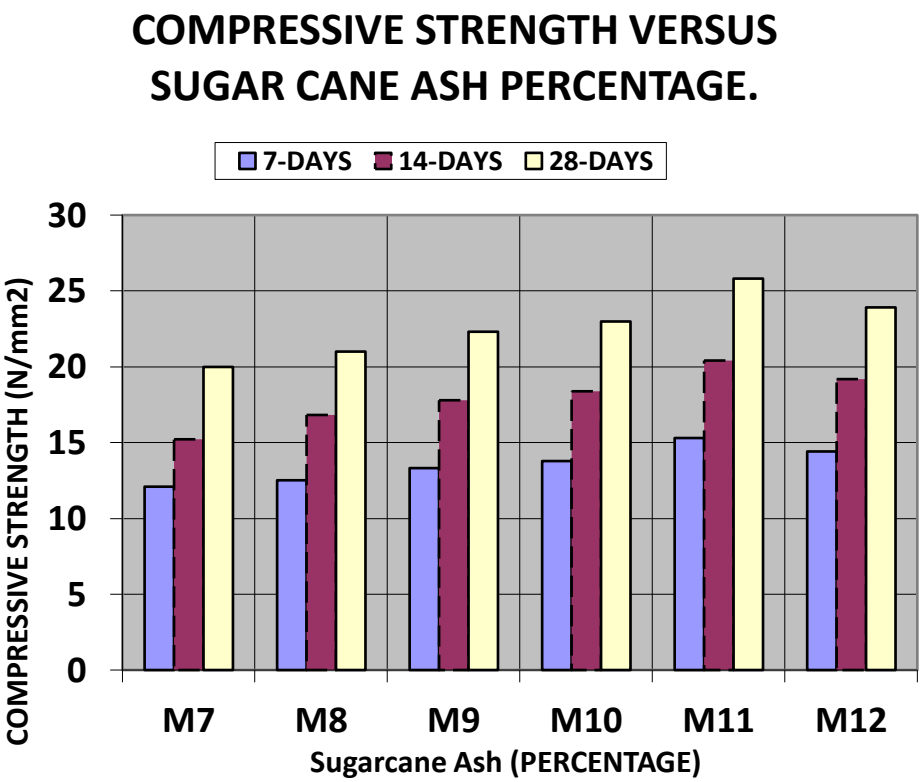
Mix	**M-1**	**M-2**	**M-3**	**M-4**	**M-5**	**M-6**
Sugar Cane Ash (%)	0	5	10	15	20	25
Test age (days)	**3-3 SAMPLES COMPRESSIVE STRENGTH (N/mm²)**					
7	8.0 8.5 8 **Av=8.1**	9.6 8.5 8.6 **Av=8.9**	9.5 9.2 9.4 **Av=9.3**	9.5 9.0 9.8 **Av=9.4**	10.5 10.5 10.4 **Av=10.4**	11.2 11.0 11.4 **Av=11.2**
14	10.0 10.0 10.6 **Av=10.2**	12.5 12.0 12.0 **Av=12.1**	12.8 12.0 12.4 **Av=12.4**	12.4 12.8 12.8 **Av=12.5**	12.8 13.5 12.2 **Av=12.8**	13.0 13.2 13.5 **Av=13.2**
28	16 14.5 15 **Av=15.1**	15.8 15.2 15.8 **Av=15.6**	16.8 16.8 15.5 **Av=16.7**	17.8 17.0 16.8 **Av=17.2**	18.2 19.0 18.5 **Av=18.5**	19.5 19.5 19.8 **Av=19.6**

Compressive Strength of Grade M20 as M7, M8, M9, M10, M11, M12

Mix	**M-7**	**M-8**	**M-9**	**M-10**	**M-11**	**M-12**
Sugar Cane Ash (%)	0	5	10	15	20	25
Test age (days)	**3-3 SAMPLES COMPRESSIVE STRENGTH (N/mm²)**					
	12.0 12.5	12.6 12.5	13.3 13.2	13.7 13.8	15.3 15.5	14.8 14.0

7	12.0 **Av=12.1**	12.6 **Av=12.56**	13.4 **Av=13.3**	13.9 **Av=13.8**	15.1 **Av=15.3**	14.4 **Av=14.4**
14	15.0 15.0 15.6 **Av=15.2**	16.7 16.8 16.9 **Av=16.8**	17.7 17.8 17.9 **Av=17.8**	18.4 18.3 18.5 **Av=18.4**	19.0 21.8 20.4 **Av=20.4**	19.2 20.5 18.5 **Av=19.2**
28	19.5 20.0 20.5 **Av=20**	20.0 21.0 22.0 **Av=21**	22.2 22.3 22.4 **Av=22.3**	22 23 21 **Av=23**	26.5 25.0 26.6 **Av=25.8**	25.0 23.1 23.8 **Av=23.9**





5. Results and Discussion of Compressive Strength:

Compressive strength in N/mm^2 of M15 and M20 grade

In the present study, a simplified experimental study has been proposed and carried out for showing the impact of Sugar Cane Ash in concrete structure. The response of study has been presented in the form of compressive strength of cubes at 7 ,14 and 28 days. A comparison study has been carried out at M-15, and M-20 grades of concrete with and without SCA

.Based on this, the following generalized conclusions can be drawn:

1. Any variation in cubic strength of concrete cubes with and without admixture has been found to be significantly influenced with respect to number of days. It increases about 40% at 7days 30% at 14 days and 50% at 28 days by inclusion of 10% SCA as an Admixture (partial replacement with cement)as compared to without Admixture for M-20 grade of concrete.

2. An increment of about 65% , 55% and 50% at 7 ,14 and 28 days has been observed respectively with 20% SCA as compared to without SCA for M-20 grade of concrete.

3. The compressive strength of concrete cubes has been found to be decreasing with 30% SCA as compared to without SCA for M-20 grade of concrete.

4. Similarly A comparison study has also been carried out to show the change in the compressive strength for M-15 and M-20 grade of concrete and the result thus obtained are shown in the above tables.

Hence, we conclude that the pozzolonaic property of SCA is very productive for economical and efficient concrete since it reuce the cost of concrete along with producing superior strength as compared to theconventional concrete.

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