

Study on Strength of Concrete by Adding Jaggery

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Abstract: This examination manages the impacts of the jaggery on the cement concrete. Studies were done on a cement paste, four sorts of various concrete blends, with and without the utilization of jaggery. The impacts of various dose levels 0, 0.1, 0.2, 0.3 and 0.4 percent of the jaggery by weight of concrete with M-30 review, blend outline of concrete. At last it was reasoned that workability and compressive quality of concrete upgraded when admixtures like Jaggery included into the concrete structure.

Keywords: Compressive Strength, Flexure strength, Jaggery, Setting Time, Split Tensile Strength, Workability.

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I. Introduction

Cement concrete is the utilized material now-a-days and in effect broadly utilized as a part of more prominent amounts than some other man made material of development in the field of Civil Engineering. The times of incredible Engineering advancement and the expected request of future social orders have required the need to use the mechanical waste and results so as to accomplish high economy. Next to each other some methods for safe transfer of such a material which can cause natural contamination is found. Understanding that the waste and side-effect of sugar industry may found a reasonable admixture with cement and other restricting materials. It can substantiate itself in the field of development material examination especially for the main sugar delivering countries of third world like India, Ghana and so forth. In such nations sugar ventures are broadly conveyed all through the length and expansiveness making the crude material effectively accessible. Perceiving the need, a progression of investigations were led to think about the impact of Molasses on concrete, which is one of the four sorts of misuse of sugar industry. Retarders are utilized as a part of the concrete piece to enhance the setting time and furthermore to expand the temperature of the creation with various sort of admixtures.[7] Utilization of these admixtures will diminish the isolation and drying. Sugar is a starch, a substance made out of carbon, oxygen and hydrogen. Jaggery is produced using the result of sugar stick. In this way, both are valuable to include as an admixtures in the concrete creation.

II. Literature Review

V.Ganesan (2015) [9] has learned about exploratory investigations on strength of concrete by somewhat supplant cement with sugarcane stick bagasse fiery debris.. The examination program incorporated the incomplete replacement of cement by bagasse powder by 10%, 15% and 20% and found that expansion in compressive strength and flexural strength of RC concrete for 15 % replacement of cement with bagasse slag. Yogesh. R. Suryawanshi (2015)[8] has inspected about on impact of sugar powder on Strength of cement.. Sugar powder content is 0, 0.05, 0.075, 0.1, 0.15, and 0.2 % by weight of cement. Every one of the examples was water cured and testing is improved the situation 3 days, 7 days and 28 days. The measure of sugar powder 0.1% of the aggregate weight of cement gives expanded introductory and last setting time. The measure of sugar powder 0.1% of the aggregate weight of cement gives enhanced outcomes in compressive strength. The compressive strength of cement and concrete is expanded up to 15 - 20%. A. V. Pavan Kumar (2015)^[1] has performed about effect of Sugar, Jaggery and Sugar Cane Ash on Properties of Concrete..

The admixtures (sugar and jaggery) are incorporated into concrete at the estimation levels of 0, 0.025, 0.05, 0.1% with 5, 10, 15, 20, 25% Ash is and cement up to 15% to improve the distinctive properties of concrete. Collapse To slump was seen in both the admixtures at a measurements of 0.1%. Workability increments when the measurement of admixture was increased. Compressive strength of concrete improves when dose of admixture is expanded.

III. Objectives Of Study

The focuses of this investigation work is to find the properties of fresh and hardened concrete for M-30 grade with the expansion of jaggery (0%, 0.1%, 0.2%, 0.3% and 0.4%). In this test compressive strength, split tensile strength, flexural strength and workability of concrete has been the objective may be summarize as follows:-

- To find out the execution of glue of cement with jaggery as an admixture by directing consistency tests on the crisp blend.
- To find out the compressive strength, split tensile strength, and flexural strength of solidified concrete for M30 with the age of 7, 14, 28 and 50 days.

IV. Materials Used In Work

The materials used as a piece of this examination are fine aggregates (stream sand), regular Portland concrete (Ultratech), 10 and 20 mm beat coarse aggregates which is available locally, Jaggery as admixture. Ordinary Portland cement: Ordinary Portland cement 53 review was utilized all through the test examinations. The cement fulfilled the prerequisites of Indian Standard Specification IS: 4031-1968. [6]

V. Test Conducted

An attempt has been made to consider the effect of jaggery on properties of concrete. The strategy took after, tests coordinated for assurance of design mix is inspected in this part .The properties considered in this examination are zone of sand, absorption points of confinement of aggregates, surface clamminess of aggregates ,mass thickness of aggregates, fineness of concrete .The different conducted were as follows :-

- For Aggregate:-Sieve Analysis, Water Absorption, Specific Gravity, Crushing Value, Impact Strength.
- For Cement: - Cement Consistency, Fineness.
- For Concrete: - Workability, Slump Test, Compressive Strength, Flexural Test, Split Tensile Strength.

VI. Concrete Mix Design

The concrete mix was design as per procedure mentioned in IS-10262, 2009 [3] and for designed purpose. We used ACI method and determine the physical properties of the entire gradient such as fine aggregate, coarse aggregate, cement. In the design the use specific gravity for all gradients such as for coarse aggregate-2.73, fine aggregate-2.65, and for cement -3.15.

For M-30 Mix Proportion used:-

Cement	Water	FA	CA	
456	:238.5	: 603	: 1068	[kg/m ³]
1	:0.523	: 1.322	:	2.342

VII. Result Analysis

7.1 Conventional Concrete and Material Properties

Table 1. Properties of Cement

Characteristics	Values	Unit
Specific gravity	3.15	--
Standard consistency	33	%
Initial setting time	35	Minutes
Final setting time	450	Minutes

7.2 Fine Aggregates: Locally accessible stream sand going through 4.75mm IS Sieve was utilized. The particular gravity of the sand was found as 2.65 and affirming to zone III of table 3.15 of IS 383-1970.[4]

7.3 Coarse Aggregate: Crushed shake aggregate accessible from nearby sources has been utilized. The measure of coarse aggregate was 20mm and 10mm.[5] its particular gravity is 2.65.[4]

Table 2.Physical Properties of Fine Aggregate

Properties	Values	Unit
Fineness modulus	2.78	--
Specific gravity	2.65	--
Water absorption	0.68	%
Void ratio	0.33	--
Bulk density	1795-1890	Kg/m ³

Table 3. Physical Properties of Coarse Aggregate

Properties	Values	Unit
Specific gravity	2.73	--
Crushing Value	26.37	%
Water absorption	2.60	%
Impact Value	30.75	%

7.4 Admixtures (Jaggery): Jaggery is made of the after effects of sugarcane and the date palm tree. Jaggery are the admixtures used to change the properties of concrete.[6] The principle objective in this task is the manner by which to build the properties of concrete with understood and effortlessly accessible materials, so that can make a sparing development. For expanding the workability of concrete there is important to build the water content in the concrete. It brings about diminishing the strength of concrete.

7.5 Consistency of Cement

Table.4 Consistency of Cement Containing Jaggery

S.No.	Percentage of Jaggery	Consistency %
1	0	33.5
2	0.1	33.0
3	0.2	33.5
4	0.3	32.5
5	0.4	33.0

The usual range of water to cement ratio for normal consistency is between 26% and 34%. The pastes with utilize as admixture composition of 0.1%, 0.2%, 0.3% and 0.4% showed a consistency mostly similar of normal consistency.

7.6 Initial and Final setting time of cement:

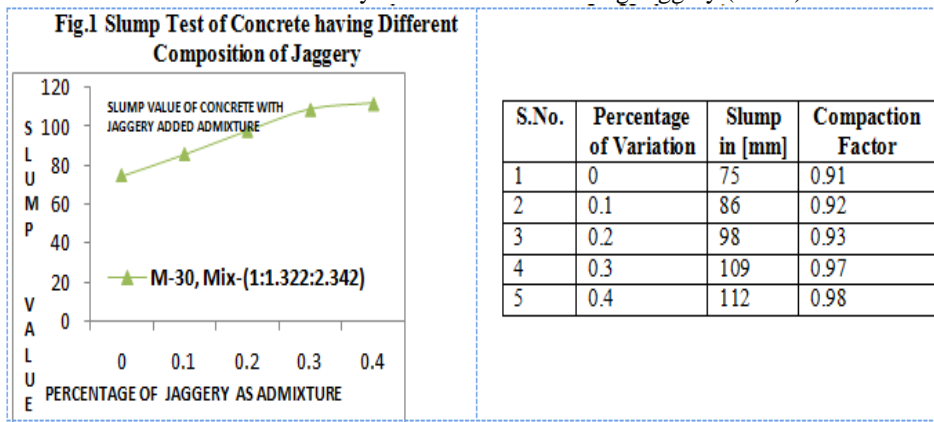
Table .5 Initial and Final Setting time of Cement Containing Jaggery

S.No.	Percentage of Jaggery	Initial Setting Time	Final Setting Time
1	0	35	450
2	0.1	40	480
3	0.2	45	530
4	0.3	55	580
5	0.4	65	630

The Indian standard confines the initial setting time of concrete not to be under 30 minutes and the last setting time not to surpass 10hrs. The outcomes for the setting time in expansion of jaggery impeded the setting; however this hindrance was inside breaking points as indicated by the Indian standard.

7.7 Workability of concrete

Table 6. Workability of Concrete Containing Jaggery (M-30)



A high quality concrete is one which have acceptable workability such as from the above results for slump shows that the workability increases with the increase in the percentages of Jaggery. All investigated Jaggery mixtures had height slump values and acceptable workability.

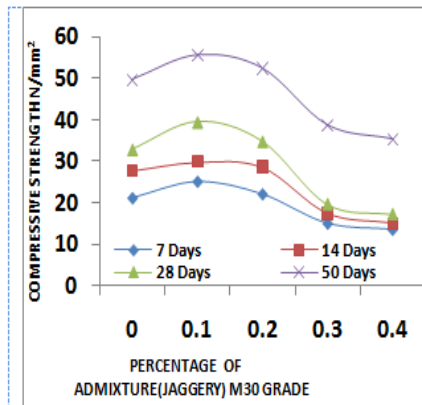


Fig.2 Compressive Strength (N/mm²) for M-30 Grade with Jaggery

Table 7: Compressive Strength [N/mm²]for M-30 Grade with Jaggery

Day's/%	0	0.1	0.2	0.3	0.4
7	21.2	25.2	22.16	15.02	13.51
14	27.71	29.77	28.61	17.52	15.17
28	32.8	39.48	34.78	19.56	17.11
50	49.6	55.53	52.40	38.7	35.3

1.8 Compressive strength of concrete

Compressive Strength Reading [2] (for the typical estimation of three cube test) at 7, 14, 28 and 50 days are higher than with the utilization as admixture 0.1% and 0.2% of piece jaggery and lower than 0.3% and 0.4% of jaggery appear differently in relation to different synthesis cube cases for 25 and M30 of concrete.

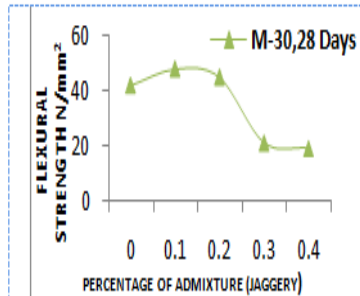


Fig.3 Flexure Strength results of M-30 Grade of Jaggery

Table 8: Flexural Strength M-30 Grade with Jaggery

Flexural Strength M-30 Grade Contain Jaggery [N/mm ²]					
Day's/%	0	0.1	0.2	0.3	0.4
28	2.205	2.52	2.3625	1.1025	0.9975

7.9 Flexural Strength

Flexure strength [2] has expanded contain jaggery with 0.1 and 0.2 % and abatement with 0.3 and 0.4% of contain jaggery. Contrast with typical cement with the M-30 review other jaggery structure with the age of 28 days.

7.10 Split Tensile Strength

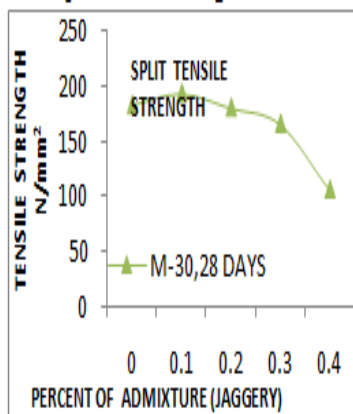


Table 9: Split Tensile Strength M-30 Grade with Jaggery

Split Tensile Strength M-30 Grade Contain Jaggery [N/mm²]

Day's/%	0	0.1	0.2	0.3	0.4
28	183.8	194.36	181.2	166.5	106.16

Fig.4. Split Tensile Strength Results of M-30 Grade with Jaggery

Split Tensile strength [2] has increment 0.1% contain jaggery as admixture and reduction with 0.3 and 0.4% of contain jaggery with M-30 review of solid contrast with ordinary concrete and other jaggery structure with the age of 28 days.

VIII. Conclusion

- The slump demonstrates that the workability increments with the expansion in the rates of Jaggery. Workability increments when the measurements of admixture was expanded.
- Jaggery as admixture, gives preferable strength esteems over the Sugar Segregation and bleeding was less, Setting time of the increments as the measurements of admixture was expanded.
- Compressive Strength at 7, 14, 28 and 50 days are higher than with the utilization as admixture 0.1% and 0.2% of piece jaggery and lower than 0.3% and 0.4% of jaggery appear differently in relation to different synthesis cube cases for M30 of concrete.
- Flexure strength has expanded contain jaggery with 0.1 and 0.2 % and abatement with 0.3 and 0.4% of contain jaggery. Contrast with typical cement with the M-30 review other jaggery structure with the age of 28 days.
- Tensile strength has increment 0.1% contain jaggery as admixture and reduction with 0.3 and 0.4% of contain jaggery with M-30 review of solid contrast with ordinary concrete and other jaggery structure with the age of 28 days.

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References

- [1]. A. V. Pavan Kumar. (2015) Effect of Sugar, Jaggery & Sugar Cane Ash on Properties of Concrete'. International Journal of Scientific Engineering and Technology Research 4(51), 11000-11006.
- [2]. BIS (Bureau of Indian Standards). (1991-07). Methods of Tests for Strength of Concrete. BIS 516-1959, Edition 1.2, New Delhi 110002.
- [3]. BIS (Bureau of Indian Standards). (1998). Recommended Guidelines For Concrete Mix Design. BIS 10262-1982, Edition 5, New Delhi 110002.
- [4]. IS 383-1970, Indian Standard Specification for Coarse and Fine Aggregates from Natural Sources for Concrete (2nd revision), Reaffirmed 1997.
- [5]. IS: 2386-1963: Method of Tests for Aggregate for Concrete, Bureau of Indian Standards, New Delhi, 1982.
- [6]. IS: 4031-1968, "Method of Physical Tests for Hydraulic Cement".
- [7]. V.Ganesan.(2015) Experimental Studies on Strength of RC Concrete by Partially Replacing Cement with Sugar Cane Bagasse Ash. International Journal of Innovations in Engineering and Technology (IJJET), 6(2), ISSN: 2319 – 1058.
- [8]. Yogesh. R. Suryawanshi. (2014) Experimental Study on Effect of Sugar Powder on Strength of Cement. International Journal of Research in Engineering & Technology,2(4), 249-252, ISSN (e): 2321-8843; ISSN (p): 2347-4599.

Books:

- [9]. M.S. Shetty. (2014) Concrete Technology Theory and Practice: Seventh Revised Edition 2013, S. Chand & Company Pvt. Ltd., New Delhi India.

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