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EXPERIMENTAL STUDY ON STRENGTH CHARACTERISTICS OF CONCRETE BY ADDING SUGAR POWDER AND JAGGERY POWDER A REVIEW

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ABSTRACT

The impact of sugar and jaggery on the structural characteristics of concrete is highlighted in the article. Using sugar and jaggery as admixtures in the concrete formulation, the experiment was conducted to assess the strength characteristics of concrete. Recent times have seen a significant rise in the expense of construction materials due to rising material costs. Sugar is inexpensive and easily accessible, and it can be used at the building site to postpone the setting of cement. With a w/c ratio of 0.45, the blend used for the trial was 1:1.22:2.78. All of the samples underwent a 28-day water treatment. The examples for compressive strength had dimensions of 15*15*15 cm.Jaggery, which is a locally accessible material, can enhance concrete buildings, according to the evaluation report. In order to enhance the concrete's structural integrity, jaggery is added to it at rates of 0.1%, 0.2%, 0.3%, and 1%. The characteristics of concrete are significantly influenced by atmospheric circumstances. Ultimately, it was determined that the addition of admixtures like sugar and jaggery to the concrete formulation improved the workability and compressive strength of the concrete.Testing has been done to assess and determine the characteristics of concrete employing sugar and jaggery as admixtures in its composition.

I. INTRODUCTION

Due to its fundamental properties, including high compressive strength, high flexural strength, tensile strength, and longevity, concrete is successfully used for large-scale building projects. Concrete can harden quite quickly because the water-to-cement mixture needs to be just right. If the quality of the building is taken into consideration, the emphasized qualities of the concrete are its longevity, workability, and compressive strength. The interaction between the water and the concrete mix's components, known as an exothermic process, causes the concrete to harden. Strength also develops as the concrete era progresses.In order to be effective, finishable, strapping, robust, water-resistant, and clothed in resistance, the concrete must be. The right admixtures can frequently be chosen in order to quickly and affordably achieve this uniqueness. Unrefined admixtures, however, play a crucial part when the use of pharmaceutical admixtures becomes unprofitable. Therefore, the thesis's purpose is to look into how biological admixtures like sugar and jaggery alter the characteristics of concrete. Both of the aforementioned admixtures have already been used by researchers, but the issue of uniform mixing and the effect on improving workability is not as excellent as anticipated. Jaggery is a natural, traditional sweetener made by the concentration of sugarcane juice and is known all over the world [1] by different local names [2]. It is a traditional unrefined non-centrifugal sugar consumed in Asia, Africa, Latin America, and the Caribbean. Containing all the minerals and vitamins present in sugarcane juice, it is known as the healthiest sugar in the world. India is the largest producer and consumer of jaggery. Jaggery is well known for generating heat and providing the body with quick vitality. A glass of water and a jaggery is traditionally served to visitors as a form of greeting in many regions of India. In addition to being used as livestock fodder, jaggery is also used to make ayurvedic medications, ayurvedic sura, and health tonics. Jaggery has recently started to appear in confectionery goods. Jaggery is also used in the tobacco and textile sectors. Jaggery is also given to employees in coal mines and cement factories to prevent them from developing sensitivities to dust.In addition, the district office buys jaggery during natural disasters and gives it to the victims for a variety of health advantages. Maximum flexural and tensile strength is attained at a dosage

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of 0% jaggery. The concrete was improved in terms of its sturdiness and workability. The separation is also reduced while the environment also grows. Mani Raj and colleagues, 2019 [7] According to the study's findings, concrete can reach compressive strengths of 90% at 40% and 50% replacement and more than 100% at 30% replacement. Experimental research using eggshell, sugar, and aloe vera revealed that concrete's qualities could be improved. Shamsad Ahmad et al., (2020) [8] The drying time of cement rises considerably when introduced sugar (0.05% by weight), but the setting time is decreased. While adding sugar reduced the setting time for concrete, the sugar concentration of 0.05% boosted it. This review article provides information about the facts and results from the conducted literature search. In this essay, the use of sugar to increase concrete's resilience is also emphasized. Since the epidemic scenario, cement prices are rising dramatically on a daily basis. Additionally, the amount of carbon released into the environment during cement production is too excessive. Therefore, it is crucial to use cost-effective, environmentally responsible building components with outstanding binding and workability qualities. This research was done to find out how sugar affects concrete buildings. Jaggery is added to concrete to improve the properties of concrete-like workability and tensile strength. As the amount of jaggery in the concrete blend rises, so do the economy, stiffness, and compression strength. The hydration process is slowed down and the concrete takes longer to cure as a result of the addition of sugar. Heat is removed from combined concrete during the exothermic hydration process, which causes concrete to solidify. Plays are made between water and the other components of concrete during this soaking process. Concrete is extremely dependent on cement. Every day, there is a substantial increase in the use of cement in every industry. The primary goal of this article is to add jaggery as an admixture in concrete in a specific amount in order to enhance the current qualities of the concrete. Because jaggery is a readily accessible natural substance, the buildings are both cost-effective and ecologically friendly. Jaggery keeps the ecosystem clean and healthy and does not have any negative impacts on it. Concrete's efficiency is aided by the addition of water, but its power is reduced. This is why it's important to use concrete mixes that improve efficiency while maintaining concrete's strength. When water is introduced to cement under typical weather circumstances, the cement sets and hardensConcrete must be correctly cured by allowing adequate time for hydration in order to achieve the desired hardness. Sometimes, because of climatic factors, the concrete mix takes longer than expected to form and reach the appropriate strength, which leads to cracks and other issues with buildings. Retarders must therefore be used in concrete to ensure adequate strength and proper settling of the concrete.After 28 days, the variance in compressive strength between normal concrete and concrete with 0.1% sugar as anadmixture was 12.0%; by contrast, the variation in compressive strength for raw jaggery was 15.11%. As a consequence, jaggery is an appropriate admixture for concrete formulation [1]. The substitution ratio of jaggery was raised, and the workability and setting time were both improved. At an ideal substitution rate of 15% for sugar cane ash as an admixture, the compressive strength of this new concrete was improved by 8.93%.

II. LITERACTURE REVIEW

Fouziya Qureshi et al., (2017) [1] inspections of various concrete slump grades reveal that the workability rises as the quantity of jaggery is increased. Jaggery has greater strength values as an admixture than sugar segregation, and the use of these admixtures reduced bleeding significantly. As the additive dosage was raised, the concrete's setting time rose. Compressive Strength (for the typical estimation of three cube test) at 7, 14, and 50 days is higher than when piece jaggery is used as an admixture at 0.1% and 0.2%, and lower than when jaggery at 0.3% and 0.4% appears differently in relation to various synthesis cube cases for M20 and M25 of concrete.Flexure strength has increased for contain jaggery at 0.1 and 0.2% and for abatement at 0.3 and 0.4%. When compared to standard cement, the M-20 and M-25 review other jaggery structures with a 28-day age limit. Split tensile strength increased when 0.1% and 0.2% of jaggery was added, but it decreased when 0.3% and 0.4% of it was present and was evaluated at 28 days using M-20 and M-25.

V. Pavan Kumar et al., (2015) [2]studied how sugar, jaggery, and sugar cane ash affected the properties of concrete. Concrete is mixed with the admixtures (sugar and jaggery) at estimated levels of 0, 0.025, 0.05, and 0.1% with 5.10, 15.20, and 25%. Ash is included with cement up to 15% to enhance the unique qualities of concrete. In both admixtures, collapse to slump was observed at a value of 0.1%. Workability rises when the

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measurement of admixture was raised. By increasing the additive dose, concrete's compressive strength increases..

Bazid khan et al., (2004) [3] investigated the effects of adding sugar as an additive to three different types of cements. The test results demonstrate that the effects of sugar on cement paste curing time depend on doses and cement types. His research revealed that one form of cement, when applied in dosages greater than 0.25%, sped up initial setting time while delaying final setting time.

SudarsanaRao.Hunchate et al ACI method of mix design and the existing HPC literature are used to formulate an investigation employing silica fume and super plasticizer in 2014. The compressive strength improves up to 15% as the silica fume content rises before declining. Hence, 15% replacement is ideal. The ratio of HPC's 7-day and 28-day compressive strengths is 0.84 to 0.9. As more silica fume is used to substitute cement, the workability declines.

Akogu Elijah Abalaka (2011)- [4] According to his studies at a concentration of 0.05% of sugar content by weight of cement. The compressive strength of concrete increased by 11.84% at 3days testing. And for 0.06% obtained maximum compressive strength after 28days of testing.

V. Pavan Kumar (2015) [5] Talk about how sugar, jaggery, and sugar cane ash affect the properties of concrete in your performance. The addition of the admixtures (sugar and jaggery) to concrete at the measurement levels of 0, 0.025, 0.05, and 0.1% is done to assess how the properties of the concrete are improved. At varying degrees, such as 5%, 10%, 15%, 20%, and 25%, cement is used to replace sugar cane ash. The 15% partial replacement of sugar cane ash results in an 8.93% increase in the compressive strength of concrete. The concrete's compressive strength has increased by 15.57% at the dose level of 0.075% sugar, so much so that the concrete's compressive strength will decline for 7 days.

Lavanya M. Rete was higher than at the (2012) [6] by 15.57%. The purpose of the testing was to determine if sugar stick baggese fiery remnants were appropriate for partial substitutions up to 30% of the bond with shifting water concrete (w/c) proportion. The results showed that sugarcane bagasse slag expansion always improves the quality. The biggest improvement in quality happens at 15% with 0.35 w/c percentage.

D. S. Deepika et. al. (2017) [7]. Examples of cured geo-polymers made from sugarcane bagasse ash and slag showed improved compressive quality and workability after being tested with slag-based geo-polymer. No blossoming was observed in SCBA-based unburned blocks, however water intake was more pronounced compared to fly fiery debris blocks in these blocks. Examples of mixed sugarcane bagasse and cinder pavers showed notable resistance to water sorption and infiltration as compared to control samples.

Akogu Elijah Abalaka (2011) [8] Sugar's effects on the physical characteristics of typical Portland cement and concrete. Research was conducted in the lab using regular Portland bond to examine the effects of sugar at centralizations of 0, 0.05, 0.06, 0.08, 0.10, 0.20, 0.40, 0.60, and 1% by weight of bond on bond glue and grade M 35 concrete cured at 3, 7, 14, and 28 days. Bond glue's underlying setting time was the longest when the sugar content was 0.06% and the soundness was estimated at 0.35 mm. With sugar content of 0.2–1%, streak setting was observed without any improvement in quality. The results of the compressive quality test show a minimal quality improvement across all age groups, with a peak at 11.84% at 3 days at 0.05% sugar level.

III. EXPERIMENTAL INVESTIGATION AND METHODOLOGY

Materials: employed in this investigation include fine aggregates, conventional Portland cement (Shree Jung Rodhak), and locally available crushed coarse aggregates with diameters of 10 and 20 millimetres.

Cement: IS: 12269-compliant 53 Grade conventional Portland cement from BHARATI cement PVT limited was used. The cement's initial and final setting times were 90 and 280 minutes, respectively, and it had a specific gravity of 3.12.

Sand:Sand from the easily accessible Pennar basin in the Kadapa region was used as a fine aggregate. The specific gravity of the sand was found to be 2.62, and it was confirmed that it matched zone II of table 4 of IS 383-1970.

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Coarse aggregate:Crushed stone is the type of coarse aggregate that is available locally. The size of the coarse gravel was 20 mm, and its specific gravity was 2.68.

Mixtures: Sugar was used as a concrete ingredient when creating concrete. A white, crystalline substance that is readily soluble in water and is available commercially was employed in the studies. A readily soluble in water solid kind of commercially available jaggery was employed as an addition. The concrete mix had three different additions of sugar and jaggery: 0, 0.05, and 0.1% by weight of cement. Figure 1 depicts the sample of sugar and jaggery.

IV. CONCLUSION

On the basic on this study we conclude that the following conclusions were drawn based on the experimental investigation carried out under the present work aimed to study the influence of sugar dosage on the setting time, strength. At 10% jaggery content, the concrete made with silica fume and jaggery exhibited an increase in compressive strength. Real slump was noticed at 0.25% of the additive, and slump collapse was noticed at 0.75% of the jaggery that was added to the concrete mix. In respect to typical concrete, the flexural strength of concrete dropped by 50%. By including jaggery into the concrete, properties like compressive strength, flexure strength, and split tensile strength were enhanced. A mix design with a w/c ratio of 0.45 is created for concrete of the M25 grade. casting of M25 mix with varying amounts of jaggery and 12% silica fume added. Jaggery improves the strength of concrete when used as an additive. The largest unorganised sector in India is the jaggery industry, one of the oldest and most significant rural cottage industries in the nation. Jiggery admixture increases compressive strength more than other two admixtures, while sugar admixture increases workability more than other two admixtures. With a rise in jaggery content, the slump and compaction factor values are enhanced. Jaggery is added to concrete to slow the hydration process by acting as a thin coating over the cement. Concrete took longer to set as a result.

V. FUTURE SCOPE

1.The present investigation has been made to suggest the environment-friendly and eco-friendly solution for the quality structure development which is locally available material jaggery which has been used as an admixture in the present project.

2. This project is targeting the improvement of consistency, initial and final setting time, workability, and increase in compressive strength of concrete by adding the jaggery as an admixture in 0.5%, 1%, 2%, 2.5%, 3%, 3.5%, 4%, 4.5%, and 5%.

3.The factors responsible for the enhancement of the properties of the concrete by adding jaggery as an admixture are studied by the various tests like consistency test of cement, initial and final setting time of cement, slump cone test, compaction factor test, compressive strength test, and scanning electron microscopy test.

4.For the further investigation of the behaviour of the concrete after adding the jaggery as an admixture in various proportions the tests like flexural strength test, split tensile strength test and shear strength test can be performed and the values and changes in the behaviour of the concrete can be reported.

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