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Retrofitting and Repair of RCC Structure by Using Honey and Sugar Admixture

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Abstract: This paper emphasizes the effects of sugar and honey on the strength properties of concrete. The experimentation has been carried out for evaluating the strength properties of concrete using sugar and honey as admixtures into the concrete composition. Based on the literature, the main function for usage of sugar and honey is to extend the initial setting time of concrete. Usually, this type of admixture used in the special cases like large piers and long piles for Repair, Restrain and strengthening of building. Five different percentages of admixtures sugar and honey are chosen in the experimentation as 0%, 10%, 15%, 20%, and 25% by weight of cement the mixed grade of concrete was taken as M20 grade and the grade of cement was taken as 53. The blocks of size 15x15x15mm was been prepared and the compressing test is been carried out. Finally, it was concluded that the setting time where deled and the workability and compressive strength of concrete enhanced when admixture like sugar and honey added into the concrete composition. The result for the admixture blocks where compare to the normal blocks the conclusion was taken. Thus, by adding admixture in the concrete it is observed that the setting time of the concrete was been deled and the workability of the concrete was increased. Thus, such type of admixture honey and sugar can be used in retrofitting of the structure which is located in hot weather.

Keywords: Honey and Sugar Admixture, Retrofitting, Strengthening of members.

I. INTRODUCTION

Almost all civil engineer work is site work has derived in a controlled lab i.e., parameters temperature, humidity are controlled; hence in actual practice desired quality way not be achieved and also many a times, it may not be possible to fallows exact set of procedure concreting. Concrete is an inevitable material in the human being's life, because of its superior characteristics like strength and durability, but in certain situations it can't be used in all places because setting time of concrete. Retarders are used in the concrete composition to improve the setting time and also to increase the temperature of the composition with different type of admixture. It is observed that in olden time bending between the stones was achieved that in olden time bonding between the stones was achieved by mortar with combination of honey like sugar. Concrete made with admixture like sugar and honey can be utilized in particular situations like in hot weather concreting i.e., above 1000c acceleration the early hydration of cement and produce concrete having high strength is reduced considerably further, the rapid evaporation of water causes plastic shrinkage (cracks developed before the concrete has hardened) In concrete and subsequent cooling would cause tensile stresses and cracking. If water of plastic concrete sets, then overall volume of concrete increases and also delay's the setting and hardening of the cement as no water is available for chemical reaction; ultimately resulting large volume of pores and hence low strength is gained. Hence in order to maintain the standard conditions admixture is used. Lea 1988-Sugar falls under the category of Coating admixture; in the presence of water a cement particle sends out a swarm of calcium ions onto the surrounding water and any substance capable of immobilizing or delaying this sugar will also slow sown the interchanges between the water and the particles, thus retarding the hydration process.

A. Admixtures

S**ugar**: Sugar is carbohydrate, a substance composed of only carbon, oxygen, oxygen and hydrogen. Sucrose, fructose, dextrose, lactose and other 'oses' are members of this chemical class. It occurs in sugar cane and sugar beet.
Sugar (sucrose)- Most effective retarders with 1% delaying retardation almost indefinitely. Theory based on adsorption on the surface of cement particles or early hydration products.

Table 1 – Admixture (Sugar) Composition

Chemical composition	Percentage
Calcium	1 mg (0%)
Iron	0.01 (0%)
Sodium	None
Carbohydrate	99.98g (per 100g)

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Water	17.1g (per 100g)
Total carbohydrates	99.98 (per 100g)
Potassium	2 mg (0%)
Magnesium	None

Honey: Honey is strongly hygroscopic. Normal honey with a water content of 18.3% or less will absorb moisture from the air at a relative humidity of above 60%. Equilibrium moisture content (EMC), is obtained when the partial vapor pressure of surface water is in equivalence with partial vapor pressure of the environment. In this condition the substance doesn't either absorb or release moisture.

Table 2 – Admixture (Honey) Composition

Sugar	82.12g
Calcium	6 mg
Iron	0.42 mg
Sodium	4 mg
Carbohydrates	82.4g
Water	17.1g
Riboflavin (vit.B2)	0.038 mg
Potassium	52 mg
Niacin (Vit.B3)	0.121 mg
Pantothenic acid (B5)	0.068 mg
Folate (Vit.B9)	2 µg
Magnesium	2 mg
Phosphorus	4 mg
Zinc	0.22 mg

B. Scope

- It helps in understanding the different method of retrofitting
- To increases the life of concrete structure
- To use the damage structure again
- To reduce the cost of new construction

C. Objectives

- To study the different method of retrofitting.
- To analyses the different method of strengthening the column.
- To study and find to use different types of admixtures.
- To make the retrofitting process economical.
- To use the such type of admixture which are easily available

II. METHODOLOGY

In this project we are try to use honey as an admixture in the concrete to increase its durability. By comparing to the Epoxy resisting and other similar admixture, putting honey as a admixture helps to reduce the cost during the retrofitting and types of R.C.C Structures.

To accomplish this project the first step was to find out the water cement ratio for the cement of 53 Grade. For this the instrument known as Vicat apparatus is been use. At start 100g of cement was taken by measurement then it was sieved by the 90µ sieve. Then to carry over the experiment the water was poured in the cement in small quantity. Thus, then the mixture was mixed proper till a uniform color was formed.

The mound of the apparatus was been oiled to remove the cake of cement from the mold easily. By fixing the initial setting time needle the imprecation on the cement cake was observed by keeping the time interval of 2 minutes. Initial set is said to have taken place when the needle (1.13mm dia.) of Vicat apparatus ceases to pass 3-5 mm above the bottom of cement paste taken in a Vicat mound (top internal dia.= 80mm, bottom int. dia.= 90mm, height = 40mm). Final setting is said to have occurred when the needle penetrates the cement paste to a maximum depth of 1mm. In both the cases, the setting-time is reckoned from the moment when the mixing-water is added to the cement. The results of this experiment, the water cement ratio was 0.47%.

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For conformation of this research, we first prepared the small concrete blocks of size (7x7x7 cm). In this block our main admixture honey and sugar both was added in 20% by the weight of cement. Total 3 blocks were prepared and it was been removed after 2 days because due to honey the setting time was been delayed. Then the blocks were been cured by submersing method for about 7 days were conducted on it.

After the curing the blocks were kept to dry for an about 24 hours in sunlight. Of taking the result the weight of block was measure by weighing machine its weight was about 1.5 to 2 kg, after it the compression testing were done in the compression testing machine (CTM).

III. TEST REPORT FOR COMPRESSIVE TESTING

A. Compressive Strength Testing

Table 3 – CTM Test (7 Days).

BLOCK NO.	WEIGHT	RESULT
Block no 1	1.7kg	42KN
Block no 2	1.5Kg	59.60KN
Block no 3	2Kg	42KN

For comparing the above results, we make 3 blocks of (P.C.C) Plain Cement Concrete of (7x7x7cm). The blocks were oiled for proper preparation of cement blocks. The blocks were prepared by doing compaction in 3 layers by using compaction rod. After one day setting the blocks were removed from the moulds. And it was cured by the submersible method for about 7 days. After the curing the blocks were kept under sunlight of 24 hours. The blocks were weighted in the weighing machine and then the compression testing was carried out.

Table 4 – CTM Test (28 Days)

BLOCK NO.	WEIGHT	RESULT
Block no 1	1.4kg	40KN
Block no 2	1.5Kg	38.40KN
Block no 3	1.6Kg	45KN

B. Assumptions

A retarding admixture causes cement set retardation by the following mechanisms-

- Adsorption of the retarding compound on the surface of cement particles, forming a protective skin, which slows down hydrolysis;
- Adsorption of the retarding compound on to nuclei of calcium hydroxide, poisoning their growth which is essential for continued hydration of cement after the end of induction period.
- Formation of complexes with calcium ions in solution increasing their solubility and discouraging the formation of the nuclei of calcium hydroxide, referred to in
- Precipitation around cement particles of insoluble derivatives of the retarding c compounds formed by reaction with the highly alkaline aqueous solution, forming a protective skin.

Retarding admixtures are mainly based on materials having liqnosulfouic acids and their salts, hydroxycarboxylic acids and their salts, sugar and their derivatives and inorganic salts, such as borates; phosphates, zinc and lead salts.

IV. RESULTS

By observing the results, it was seen that the honey was giving the more strength than the plain cement blocks. Thus, to continue the project our next step was to make the honey+sugar blocks of size (150mm x 150mm x 150mm). The blocks were made by putting the admixture in the percentage of 10, 15, 20, 25 and for each percentage total 6 blocks were made. With this blocks the 6 blocks of normal plain cement concrete were also been made. The admixture was added according to the weight of cement to the blocks. The grade of concrete was taken M20 and the grade of cement was 53. And at last, the compression strength test was to be conduct on the blocks using CTM.

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TABLE NO 5. Compression results of all blocks

Sr.No.	Percentage of admixture	7 days compressive strength in (N/mm2)	28days compressive strength in (N/mm2)
1.	0	38.04	52.53
		35.64	37.16
		31.15	33.6
2.	10	11.75	13.07
		11.11	12.45
		10.06	11.56
3.	15	15.26	17.38
		14.23	17.33
		12.13	14.89
4.	20	15.26	18.45
		15.21	17.82
		14.23	17.33
5.	25	19.00	19.29
		17.35	18.44
		14.27	17.82

V. CONCLUSION

- Compressive strength of concrete enhanced when the dosage of admixture was increased.
- Strength of the concrete improved with the extra cost and utility in specified situation.
- The amount of sugar 0.1% of the total weight of cement gives increased initial and final setting time.
- The amount of sugar powder 0.1% of the total weight of cement gives improved results in compressive strength.
- Due to the addition of honey the setting time of the concrete get delayed.
- The compressive strength of cement and concrete is increased up to 15-20% by increasing the percentage of admixture.
- The admixture honey + sugar can be used as a retarding agent which helps in delaying the setting time.
- Due to delay in the setting time such time of admixture can be used in hot weather concrete.
- This admixture is used for to retrofit the structure which are located in hot weather.
- This honey+sugar admixture is not suitable for the normal concreting work.

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