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EXPERIMENTAL STUDY ON BACTERIAL CONCRETE

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Abstract – *Crack formation is very common phenomenon in concrete structure which allows the water and different type of chemical into the concrete through the cracks and decreases their durability ,strength and which also affect the reinforcement when it comes in contact with water, CO2 and other chemicals. For repairing the cracks developed in the concrete ,It requires regular maintenance and special type of treatment which will be very expansive. So,to overcome from this problem autonomous self-healing mechanism is introduced in the concrete which help store pair the cracks by producing calcium carbonate crystals which block the microcracks and pores in the concrete. The selection of the bacteria was according to their survival in the alkaline environment such as B.Pasteur ii, Bacillus subtitles and B.spherical which are mainly used for the experiments by different researchers for their study. The condition of growth is different for different types of bacteria. For the growth, bacteria were put in a medium containing different chemical at a particular temperature and for a particular time period*

Key Words: **Durability, Strength, CO2, Bacillus, Bacterial Concrete**

1. INTRODUCTION

Concrete is the most common material used for all types of constructions. Due to its strength and durability, concrete became inevitable. The only defect in the use of concrete is that it is weak in tension. Since the concrete is weak tension the possibility of formation of crack is more. Apart, from this, freeze- thaw action and shrinkage also leads cracking in concrete. Durability of concrete is highly affected due to cracks and it leads corrosion of reinforcing bars, so it is very essential to find the suitable repair mechanism for regain the strength of concrete

1.1 Bacterial Concrete

Self-repairing concrete biologically produces calcium carbonate crystals to seal the cracks that appear on the surface of the concrete structures. cracks often occur in concrete because of the low tensile strength of this material. Rapid crack-healing is necessary since it is easier for aggressive substance to ingress into concrete through cracks than through the concrete matrix.

1.2 Material Specification

Ingredients of the concrete are cement, fine aggregate and coarse aggregate .The Cement, sand, quarry chips and coarse aggregate are tested in the lab as per the standard code procedure and these materials were used for the concrete

2. Experimental procedure for cultural growth of bacteria

Bacillus subtilis is a common soil bacterium, which can produce calcite precipitates on suitable media supplemented with a calcium source. The bacteria were cultured in liquid medium according to the supplier's recommendations. The medium used to grow bacteria consisted of 5.0 g peptone, 3.0 g meat (beef) extract, 5.0 g yeast extract per litre of distilled water; to which 1.5% agar was added to obtain a solid medium for the stock culture. This medium was supplemented with 0.01g $MnSO_4$. H_2O to enhances porulation and pH was adjusted to7.0 using 1N NaCl. The mixture was first sterilized by autoclaving for 20 minutes at 120 - 140^{0}C, allowed to cool to room temperature(25^{0}C).

Table -1: Specific Gravity of Cement

S.NO	Weight of empty bottle(w1)	Weight of bottle +water(w2)	Weight of bottle+cement +kerosene(w3)	Weight of bottle+cement +kerosene (w4)	Weight of cement(w5)
1	0.072	0.170	0.149	0.194	0.060

Split Tensile Strength Test of Concrete

Compression testing machine, two packing strips of plywood 30cm long and 12mm wide.

Fig -1: Split Tensile Test of Concrete

3. RESULTS AND DISCUSSION

Compressive Strength

Table-1: Compressive strength for concrete by adding bacteria

Sl.No	Age of concrete	Conventional concrete(CC30) (N/mm²)	CC30 with1.0%bacteria (N/mm²)
1	7days	29.05	31.55
2	14days	33.99	38.51
3	28days	41.915	42.93

Comparison graph of compressive strength

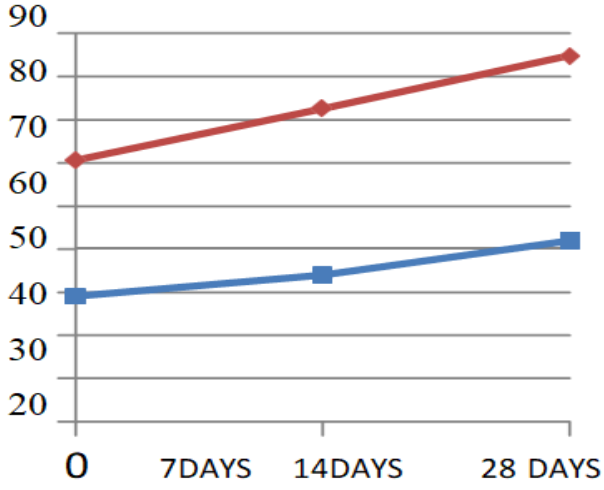

Chart -1: Comparison Graph of Compressive Strength

4. CONCLUSION

Bacterial concrete is advantageous than conventional concrete due to itsself-healing capacity and eco-friendly nature.Calcite precipitate of bacteria indirectly increases the strength of concrete by filling the voids. The cost of bacterial concrete is more. So, it is profitable when we go for higher RC structures. By using bacterial concrete the rehabilitation cost can be reduced. Design of mix concrete with bacteria is not there in IS code of any design standards. Growth of bacteria is not go odinany atmosphere.

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