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AN EXPERIMENTAL STUDY ON SELF HEALING CONCRETE BY USING RICE HUSK

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Abstract - *Concrete is most widely used construction material used all over the world and usually considered as indestructible because of their longer service life as compared with the most constructional product. However the continuous exposure of hard weathering leads to an increase of the porosity of concrete and as a result, mechanical features decreases.*

The permeability of concrete on the porosity and the connectivity of the pores. For increasing the durability and life time of the concrete, microbial concrete has depends on introduced which involve the utilization of bacteria.

These micro organisms are used for calcium carbonate precipitation in concrete; it is highly desirable because the calcite precipitation induced as a result of microbical activities is pollution free and natural. In concrete mix 0,5,10 and 15 of fine aggregate is replaced with rice husk.

Key Words: concrete, cement, bacteria, fine aggregate, Replacement.

1. INTRODUCTION

Concrete in most structures is destined to crack and embedded steel reinforcement take over tensile stresses. Crack formation is also a typical phenomenon related to durability. Percolated cracks may lead to leakage problems or ingress of harmful materials, which can cause deterioration of the concrete matrix or reinforcement corrosion? Durability can be enhanced by preventing further ingress of water and other substances.

Self- healing is characterized by regaining performance after a defect occurs. Damage targeted in bacteria based self-healing concrete particularly relates to increased durability and leakage prevention and extending service life of concrete structures.

Concrete is a vital building material that is an absolutely essential component of public infrastructure and most buildings. It is most effective when reinforced by steel bar, mainly because its tensile strength without reinforcement is considerably low relative to its compressive strength. It is also a very brittle material with low tolerance for strain, so it is commonly expected to crack with time. These cracks, while not compromising structural integrity immediately, do expose the steel reinforcement to the elements, leading to corrosion which heightens maintenance costs and compromises structural integrity over long periods of time. And the concrete is a high maintenance material.

Self - healing concrete in general seeks to rectify these flaws in order to extend the service life of any given concrete structure. This material is bacterial self -healing concrete. Self - healing concrete consists of a mix with bacteria incorporated into the concrete and calcium lactate food to support those bacteria when they become active. The bacteria, feeding on the provided food source, heal the damage done and can also reduce the amount of damage sustained by the concrete structure in place.

1.1 PROBLEMS IN CONCRETE

Concrete is an excellent material, but it is not perfect. You don't have to look very far to identify the real life concrete problems listed below

a) spalling/scaling

b) dusting

c) cracking

d) discoloration

e) crazing

1.2 FORMATION OF CRACKS

Cracks can be more specifically classified based on three factors:

1) Direction
2) Width
3) Depth of crack

They may be longitudinal, transverse, vertical, diagonal or random. They may range in size from less than 1mm (fine) to between 1 and 2 mm (medium) to over 2mm (wide).

2. EXPERIMENTAL INVESTIGATION

A.CEMENT: Ordinary Portland cement of 53 grades available in local market is used in the investigation.

B.WATER: Locally available potable water is used.

C.RICE HUSK

D.BACTERIA: Bacillus subtilis is used.

C.COARSEAGGREGATE: Coarse aggregate which passed through 25mm sieve and retained on 20mm is used.

D. FINE AGGREGATE: Fine aggregate which passed through 2.36mm and retained on 1.18mm is used.

3. METHODS FOR PREPARING BACTERIAL CONCRETE

In this research project, the preparation of bacterial bio concrete are be done by three process

- By direct adding of bacteria (bacillus subtilis).
- By developing bacteria with the help of adding the chemicals.
- Extraction of bacteria and directly sprayed or injected in structure.

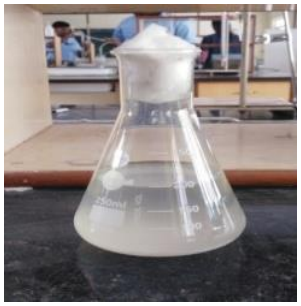

Fig.1Preparedchemicalbacteria Fig.2 Image of microcapsules

Cementkg/ m^3	Fine aggregate kg/m^3	Coarse aggregate kg/m^3	W/ c ratio
413	617.86	1257.17	
1	**1.49**	**3.04**	**0.45**

4. RESULTS FOR MATERIAL TEST

EXPERIMENTS	VALUES
Specific gravity for fine aggregate (M-Sand)	2.64
Specific gravity for coarse aggregate	2.79
Fineness modulus for fine aggregate (M-Sand)	4.03
Fineness modulus for coarse aggregate	7.17
I. Standard consistency of the cement sample II. Initial setting time of the cement sample	40% 35min
Specific gravity for rice husk	2.53

Fig.1 Vicat Apparatus Fig.2 Initial Setting time

TEST RESULTS

Flexural strength Split tensile strength

Compressive strength

5. BAR CHARTS FOR TESTS

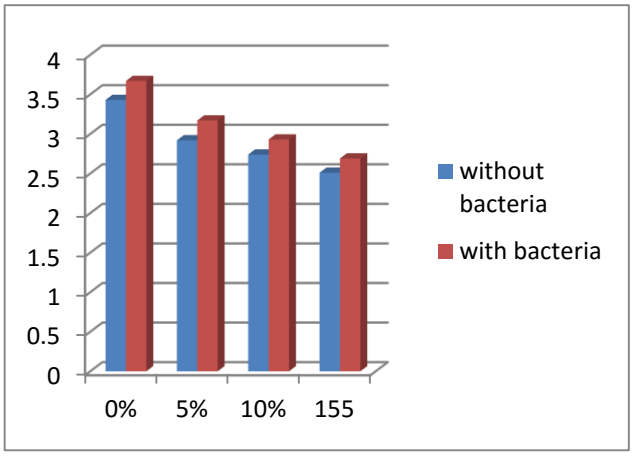

Chart -1: Split tensile strength

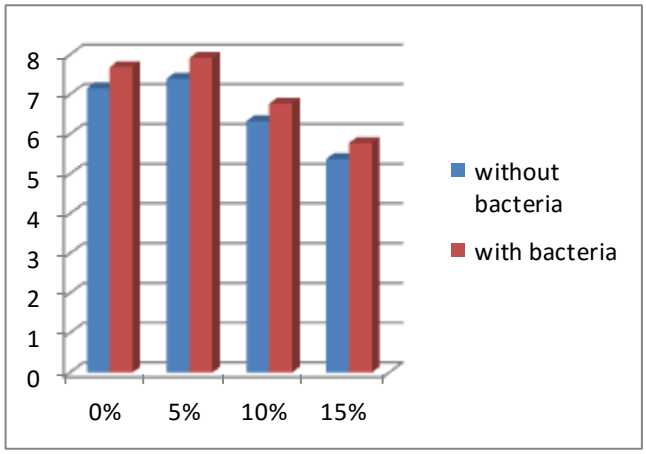

Chart -2: Flexural strength

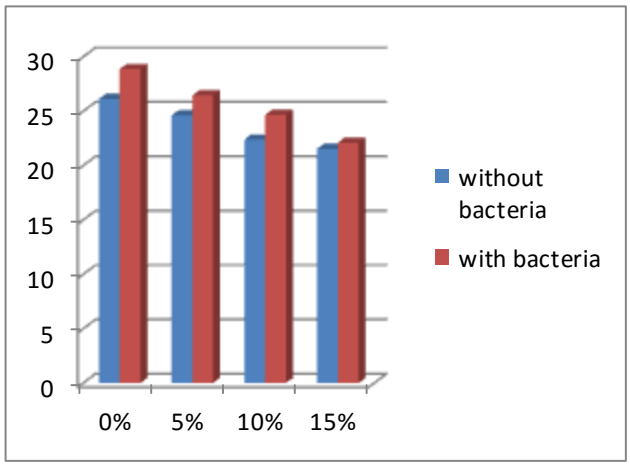

Chart -3: Compressive strength

6. CONCLUSIONS

Bacterial concrete technology has proved to be better than many conventional technologies because of its eco-friendly nature, self- healing abilities and increase in durability of various building materials.

When comparing conventional concrete with bacterial concrete (by direct adding of bacteria(bacillus subtilis) bacterial concrete has more compression strength, the compressive strength value of the bacterial concrete has increased 10% compared to the conventional concrete and these concrete has self – healing capacity.

But from summary of literature, we have identified that the bacterial concrete, in the form of chemically produced bacteria, the strength was increased only 7% compared to the conventional concrete.

From all aspects, it is investigated and proved that (method1) i.e., "the direct adding of bacteria" (bacillus subtilis), gives good results for this research project.

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