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Utilization of Prosopis Juliflora Root Powder as a Self Curing Agent

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ABSTRACT

Curing plays a chief function in the improving the strength of concrete. The function of a self-curing agent is to save the water and to reduce the water evaporation from the concrete, and hence they increase the water retention capacity of concrete compared to the conventionally cured concrete. Prosopisjuliflora root powder is used as admixtures for self-curing concrete in this study. Prosopisjuliflora (SeemaiKaruvelam in Tamil) grows tremendously and spreads due to its mechanism to overcome adverse conditions of like drought and salt. With deep penetrating roots, it can draw water from deeper layers. Their root has high water holding capacity, so powder made from it can be used as admixture for self-curing concrete. This project involves the experimental investigation of self-curing of concrete by using Prosopisjuliflora root powder. Tests on fresh concrete and hardened concrete were conducted. From the results, we have concluded that adding prosopisjuliflora root powder as a self-curing agent in the concrete mix at various percentages, the addition of 0.75% of prosopisjuliflora root powder by the weight of cement attains the 28 days compressive strength of a conventional M25 grade concrete in 7 days.

Keywords: Prosopisjuliflora, self curing agent, curing.

1. INTRODUCTION

Curing plays a chief function in the growth of concrete properties throughout construction. The function of self-curing agent is to save the water and to reduce the water evaporation from the concrete, and hence they increase the water retention capacity of concrete compared to the conventionally cured concrete.

Prosopisjuliflora root powder is used as admixtures for self-curing concrete in this study. Prosopisjuliflora (SeemaiKaruvelam in Tamil) grows tremendously and spreads due to its mechanism to overcome adverse conditions of like drought and salt. With deep penetrating roots, it can draw water from deeper layers. Their root has high water holding capacity, so powder made from it can be used as admixture for self-curing concrete. This project involves the experimental investigation of self-curing of concrete by using Prosopisjuliflora root powder.

MECHANISM AND SIGNIFICANCE OF SELF-CURING CONCRETE

Continuous evaporation of moisture takes place from an exposed surface due to the difference in chemical potentials (Free energy) between the vapour and liquid phases. The polymers added in the mix mainly form hydrogen bonds with water molecules and reduce the

chemical potential of the molecules that in turn reduces the vapour pressure, thus reducing the rate of evaporation from the surface. When the mineral admixtures react completely in a blended cement system, their demand for curing water (external or internal) can be much greater than that in a conventional ordinary Portland cement concrete. When this water is not readily available, it may result in significant autogenously deformation and (early-age) cracking. Due to the chemical shrinkage occurring during cement hydration, empty pores are created within the cement paste, leading to a reduction in its internal relative humidity and to shrinkage that may cause early-age cracking.

Materials

In developing the concrete mix for self-curing concrete, it is important to select proper ingredients, evaluate their properties and understand the interaction among different material for optimum usage. The different materials used in this investigation are discussed as follows

Cement

Ordinary Portland Cement of 53 grade was used in the investigation. The cement used has been tested for various Proportions as per IS- 4031-1988 and found to be confirming to various Specifications of are IS-12269 - 1987.

Aggregates

Fine aggregate used for in the study was properly graded to give the maximum voids ratio and shall be free from deleterious materials like clay, silt content and chloride contamination. Locally available manufactured sand was used as fine aggregate. The sand is sieved using 4.75 mm sieve and the material passed through it is used in the mortar.

The coarse aggregate is the strongest and the least porous component of concrete. The aggregates were free from adherent coating, injurious amount of disintegrated pieces, alkali, vegetable matter and other deleterious substances. 20 mm aggregates of specific gravity 2.5 were used.

PROSOPIS JULIFLORA ROOT POWDER

Prosopisjuliflora root powder was obtained after grinding the prosopisjuliflora root which was collected from an open field and it was well dried. The specific gravity of prosopisjuliflora root powder was 2.71. The different proportions of root powder (0.5%, 0.75%, 1%) were added to the concrete as self-curing agent by the volume of the concrete occupied.

Mix Design

The mix design was calculated for M25 grade and the ratio was obtained as 1:1.14:1.97 with a water cement ratio of 0.4.

Experimental Investigation

An attempt was made to study the strength development at addition of different levels with prosopisjuliflora root powder and the results were compared. Compressive strength of the specimens was studied. Three specimens were tested for each mix. The entire tests were conducted as per IS specifications. Three cubes were casted for all the mixes with 0%, 0.5%, 0.75% and 1% of prosopisjuliflora root powder.

Compressive Strength

The values of the compressive strength of mixes with varying prosopisjuliflora root powder content (0%, 0.5%, 0.75%, and 1.0%) were shown in Table 1 and Fig 2 shows the Compressive strength of Self-Curing Concrete.

It can be inferred from the above table that the compressive strength of the concrete increases upto the addition of 0.75% of self-curing agent and gets decreased after that. The mix with 0.75% of Prosopisjuliflora root powder is found to have maximum compressive strength. It was also observed that concrete with prosopisjuliflora with 7 days of curing produces strength approximately equal to that of conventional concrete with 28 days curing.

Table 1 Compressive Strength of Specimens

MIX NO	SELF-CURING AGENT CONTENT (%)	COMPRESSIVE STREGTH N/mm²	
		7 DAYS	28 DAYS
MIX 1	0	18.63	28.3
MIX 2	0.5	18.17	-
MIX 3	0.75	26.87	-
MIX 4	1	20.82	-

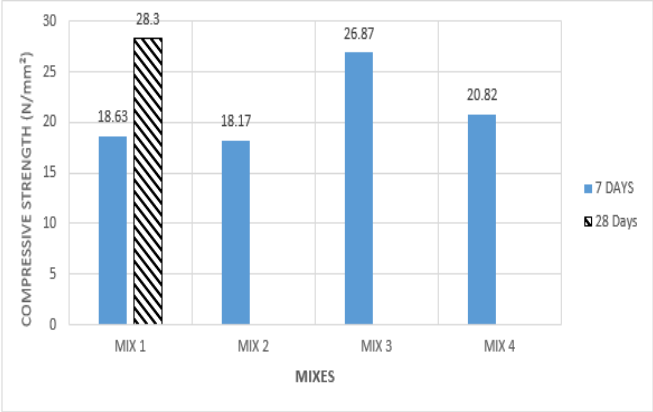

Fig1. Compressive Strength of Self-curing Concrete

CONCLUSION

An experimental investigation has been made to use a naturally available material as a self-curing agent. Tests on fresh concrete and hardened concrete were conducted. From the results, we have concluded that adding prosopisjuliflora root powder as a self-curing agent in the concrete mix at various percentages, the addition of 0.75% of prosopisjuliflora root powder by the weight of cement attains the 28 days compressive strength of a conventional M25 grade concrete in 7 days. The further addition of prosopisjuliflora root powder decreases the compressive strength of concrete. Hence, 0.75% addition is considered as the optimum dosage and hence prosopisjuliflora root powder is can be used as self-curing agent.

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Conflict of Interest

None of the authors have any conflicts of interest to declare.