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RESEARCH ARTICLE

EXPERIMENTALSTUDY ON PARTIAL REPLACEMENT OF COARSE AGGREGATE BY DEMOLISHED CONCRETE WASTE AND ADDED BY PROPHIS JULIFERA ASH

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Abstract

DeteriorationofconcretestructuresmadewithordinaryPortlandcementThe experimental investigations are carried out to study the benefits of Prosopis juliflora in RCC structure by partial replacement of cement. Prosopis juliflora is one among the species that has performed much better than many native woody species. But wide spread Prosopis juliflora has become an invader species, so the removal of the plant is necessary now. At the moment, Prosopis juliflora provides approximately 75% of fuel wood needs of rural people in arid and semiarid regions of India. Prosopis juliflora is xerophytic and is adapted to many soil types under a wide range of moisture conditions. Most of the plant are removed by uprooting and is burnt.

Introduction:-

In present world, inflation is one of the main problems faced by every country. It has become essential to lower the construction cost without much compromise as far as strength and durability of the structure is concerned. The lowering of cost can be brought about in number of ways. Among all the methods available the most optimum at our disposal is the use of waste material as substitute. The strength of concrete depends upon the components such as aggregate, quality of cement, watercement ratio, work-ability, normal consistency of mix, proportion and age of concrete. New building materials are used to accelerate the construction work, in which the mixture plays an important role in characteristics of concrete. The growth in various types of industries together with population growth has resulted in the enormous increase in the production of various types of industrial waste materials such as rice husk ash, foundry sand, blast furnace slag, fly ash, steel slag, scrap tires, waste plastic, broken glass, etc

The history of the first introduction of Prosopis Juliflora into India is about 130 years old. Introduction of the species was first seriously attempted in 1970. Owing to its fast growth and drought hardiness, the species has since been introduced in many other parts of India from the north-west to extreme southern parts.

Experimental ProgramMaterialsUsed

This experimental investigation is aimed to introduce a concrete by adding the Prosopis juliflora. This project is carried out to use the waste ash in concrete and study its behaviour. The physical and chemical characteristics of Prosopis juliflora are studied. In our project, an experimental investigation was carried out to study the effect and flexural strength behaviour of Prosopis juliflora in concrete on mechanical properties.

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Fig 1:- MaterialsUsed.

Cement

Cement in concrete acts as a binding material that harden after the addition of water. It plays an important role in construction sector. In this study the Ordinary Portland Cement (OPC) of 53 grade (Sanghi Cement) is used according to IS: 1489-1991.

Fine Aggregate

The material which passes through BIS test sieve number 4 is termed as fine aggregate usually natural sand is used as a fine aggregate at places where natural sand is not available crushed stone is used as fine aggregates. In our region fine aggregate can be found from bed of Krishna River. It conforms to IS 383 1970 comes under zone II.

Coarse Aggregate

The material which is retained on BIS test sieve number 4 (4.75mm) is termed as coarse aggregate. The broken stone is generally used as a stone aggregate. Coarse aggregate used is locally available crushed angular aggregate of size 20mm and 10mm are used for this experimental work.

Water

Portable water is generally considered fit for making concrete. Water should be free from acids, oils, alkalies or other organic impurities. Water reacts chemically with the cement to form a cement paste in which inert aggregate are held in suspension until cement paste are hardened and it will also serve as a lubricant in the mixture of fine aggregates and cement.

Prosopis Juliflora

"Prosopis juliflora," (seemai karuvelai), once touted as a saviour of the drought-prone areas in the southern districts of Tamil Nadu, has now become a threat to the environmental system. The evergreen species, native to the South and Central America and the Caribbean, is a fast growing tree variety and tolerant to arid conditions and saline soil. Prosopis was introduced in India during the 1870s to meet the fuel wood demand and in Tamil Nadu the 1960s, particularly in the composite Ramanathapuram and Tirunelveli districts.

Table 1:- Mix proportion.

Material	Cement(Kg/ m3)	Fine aggregate(kg/m3)	Coarse aggregate(kg/m3)	Water litre
Mix proportion for 1m3	383	546	1214	191.6
Ratio by	1	1.43	3.1	0.50

weight				
Take ratio	1	1.5	3	0.50

For ratio 1:1.5:3
Cement = 383 kg/m3
Fine Aggregate = 574.5 kg/m3
Coarse Aggregate = 1149 kg/m3
Water = 191.6 lit/m3
Cube Size = 0.15 x 0.15 x 0.15 = 0.003375 m3
Cylinder Size = $(\pi \times d^2/4) \times 0.3 = 0.0053$ m3

TOTAL QUANTITY OF MATERIALS

Water	= 14.091 lit
Cement	= 23.898 Kg
Prosopis Juliflora Ash	= 4.221 Kg
Fine Aggregate	= 42.201 Kg
Coarse Aggregate	= 86.16 Kg

Batching
It is the process of measuring concrete mix ingredients either by volume or by mass and introducing them into the mixture. Traditionally batching is done by volume but most specifications require that batching be done by mass rather than volume.

Mixing
It is the process of measuring concrete mix ingredients either by volume or by mass and introducing them into the mixture. Traditionally batching is done by volume but most specifications require that batching be done by mass rather than volume. Percentage of accuracy for measurement of concrete materials is as follows: Concrete is basically a **mixture of two components:**

Cement Paste
Aggregates
The Cement paste, usually comprised of Portland cement and water, binds the aggregates (sand and gravel or crushed stone) into a rock like mass as the Paste hardness because of the chemical reaction of the cement and water.

Casting
Casting is a manufacturing process in which a liquid material is usually poured into a mould, which contains a hollow cavity of the desired shape, and then allowed to solidify. The solidified part is also known as a casting, which is ejected or broken out of the mould to complete the process. Casting materials are usually metals or various cold setting materials that cure after mixing two or more components together; examples are epoxy, concrete, plaster and clay. Casting is most often used for making complex shapes that would be otherwise difficult or uneconomical to make by other methods.

Curing
The curing period depends upon the type of cement used, mixture proportions, required strength, size and shape of member, ambient weather, future exposure condition, and method of curing. Since all desirable properties are improved with curing, the period should be as long as practical. For most concrete structures, the curing period at temperature above 5°C (40°F) should be minimum of 7days or until 70% of the specified compressive or flexural strength is attained. The period can be reduced to 3days if high early strength concrete is used and the temperature is above 10°C (50°F). Properly cured concrete leads to increased strength and lower permeability and avoids cracking where the surface dries out prematurely. Care must also be taken to avoid freezing or overheating due to the exothermic setting of cement. Improper curing can cause scaling, reduced strength, poor abrasion resistance and cracking

Table 2:- Mix proportional for Conventional Concrete.

	Water(lit)	Cement(kg)	Fine aggregate(kg)	Coarse aggregate (kg)
Per m3	191.6	383	574.5	1149
Cube	0.647	1.293	1.94	3.88
Cylinder	1.02	2.03	3.05	6.09

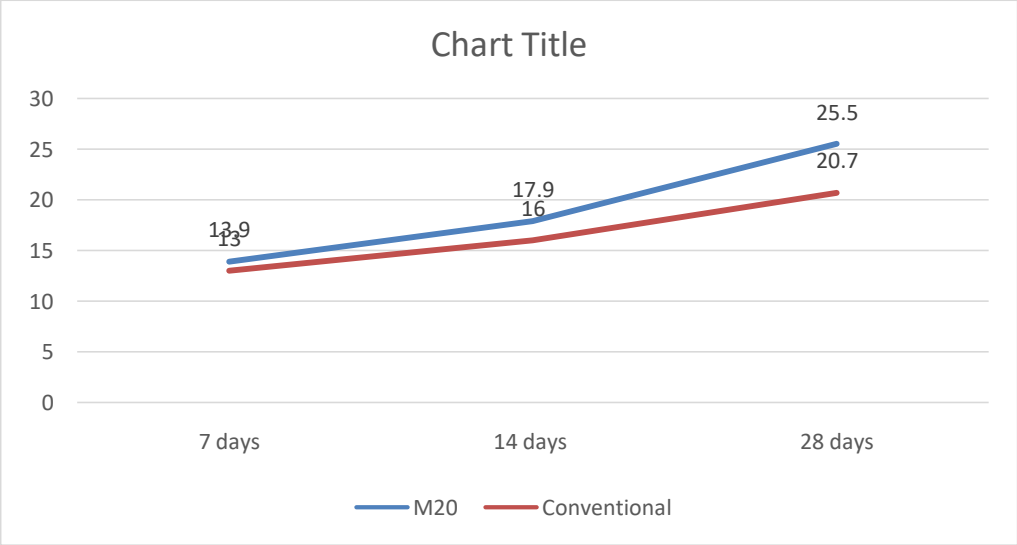
	Water(lit)	**Cement(kg)**	**Fine aggregate(kg)**	**Coarse aggregate (kg)**	**PROSOPIS JULIFLORA**
Per m3	191.6	383	574.5	1149	1.293
Cube 15%	0.647	1.293	1.94	3.88	0.194
Cylinder 15%	1.02	2.03	3.05	6.09	0.305
	4.697	7.966	14.067	28.72	1.407
Total (For 3)	14.091	23.898	42.201	86.16	4.221

Result and Disscussion:-

Compressive Strength Of Cube

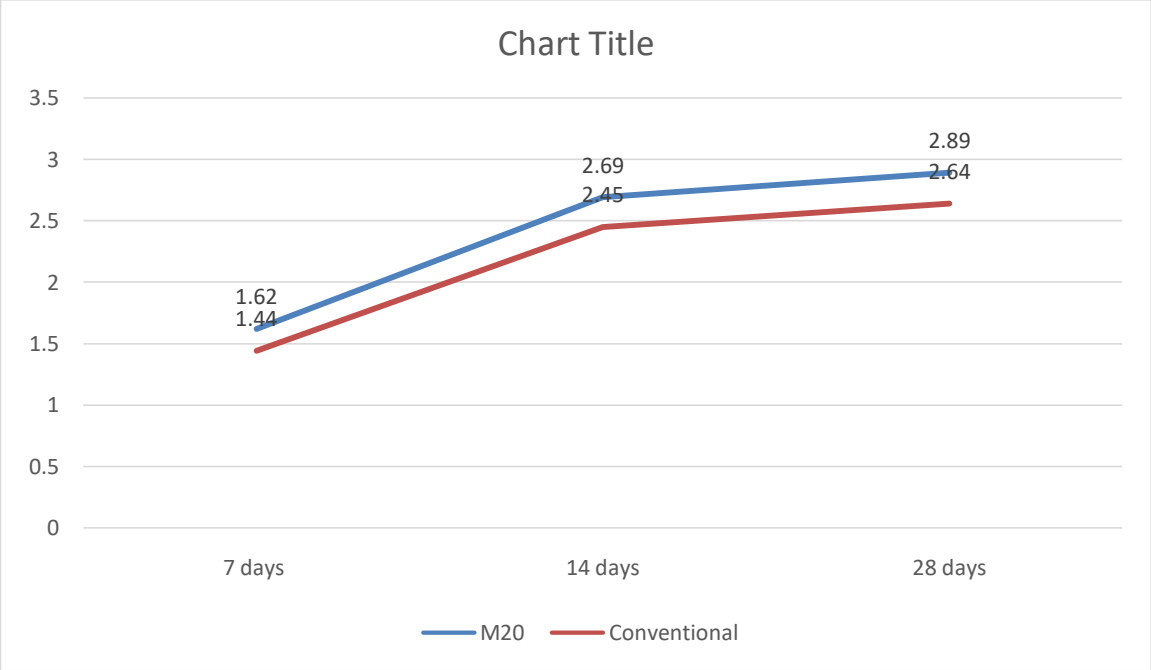
Table 3:- Compressive strength of cube.

CONCRETE MIX/DAYS OF CURING	**COMPRESSIVE STRENGTH(N/mm2)**		
	7 days	14 days	28 days
M20(Replacement prosopis julifora)	2.34	3.2	4.46
Conventional	2.03	2.94	4.12



Split Tensile Strength Of Cylinder

CONCRETE MIX/DAYS OFCURING	TENSILE STRENGTH(N/mm2)		
	7 days	14 days	28 days
M20(Replacement prosopis julifora)	1.62	2.69	2.89
Conventional	1.44	2.45	2.64



Conclusions:-

Based on the experimental investigation on concrete with cement is partially replaced by Prosopis juliflora as 15% on 7,14 & 28 days the following conclusions were made:

1. Compressive strength of concrete increases with the amount of Prosopis juliflora by 15 % on various days of curing respectively.
2. After that strength gradually slips while increasing the percentage of Prosopis juliflora.
3.The replacement of cement with Prosopis juliflora up to 15% is desirable, as it is cost effective.
4. As a result of these, this research work concludes that more than 15% of Prosopis juliflora is not a suitable material for cement replacement in concrete.

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