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An Experimental Investigation On M25 Grade Of Concrete By Partial Replacement Of Tannery Sludge With Fine Aggregate

[1]G.Srikanth, [2]Mohammed Omer Alam
[1]Assistant Professor , [2]M.E Student
[1]Civil Engineering,
[1]Lords Institute of Engineering & Technology, Hyderabad, Telangana

Abstract: Concrete is a most common material which is commonly used in all types of civil engineering works. The demand for aggregates is more in current situation and on the other side the industries are producing a large number of tanning wastes from the leather industries cause of this dumping and contamination of these tannery wastes it affects the environment and causes some disposal problems. So, the experimental studies carried on the tannery solid wastes to introduce it with concrete and make it as a partial replacement in reinforced concrete. In this study, by partially replacing of fine aggregate with tannery sludge with some limited percentage 0%, 10% ,20%, 30% in volume. The concrete grade M25 selected and specimens are casted and tested for both grades. The size of concrete cube is 150mm by 150mm by 150mm, the size of concrete cylinder is 300mm height ,150mm diameter, the size of concrete prism is 150mm by 150mm by 500mm.. So, these specimens are been casted and cured for 28 days and these specimens are tested to found the mechanical properties by compressive strength test for cube is done on 7th day, 14th day and 28th day respectively, split tensile test for cylinder is done on 28th day, flexural strength test for prism is done on 28th day, flexural strength test for RC Beam is done on 28th day respectively. And to compare the results with the normal conventional concrete with tannery sludge replaced concrete where the specimens undergo heavy loading conditions. So as a result, the compressive strength and tensile strength of 30% replacement of tannery sludge is a bit higher than the normal conventional concrete.

I.INTRODUCTION

Concrete is weak in tension. Micro-cracks begin to generate in the matrix of astructural element at about 10 to 15% of the ultimate load, propagating into macro-cracks at 25 to 30% of the ultimate load. Consequently, plain concrete members cannot be expected to sustain large transverse loading without theaddition of continuous bar reinforcing elements in the tensile zone of supported members such as beams or slabs.They have proven that they can improve themechanical properties of the concrete, both as a structure and a material, not as

areplacement for continuous reinforcement when it is needed but in addition to it. Such a weakness is partially overcome by the addition of reinforcing bars, which can be either steel or fiberglass, as main continuous reinforcement in beams and one-way and two- way structural slabs or slabs on grade (NawyandNeuw-erth,1977; Nawyetal.,1971They are able to add to the stiffness and crack-control performance by preventing the micro crack.

II.SCOPE AND OBJECTIVE

2.1 OBJECTIVE

- To Find out the chemical properties of Tannery sludge.
- To find out the mechanical properties of Concrete (Compressive strength, Split tensile strength, Flexural strength).
- To Determine flexural behaviour of reinforced concrete beam.

2.2 SCOPE OF THE STUDY

In this study, by partially replacing of fine aggregate with tannery sludge with some limited percentage 0%, 10% ,20%, 30% in volume. The concrete grade M25 is selected and specimens are casted and tested. The size of concrete cube is 150mm by 150mm by 150mm, the size of concrete cylinder is 300mm height ,150mm diameter, the size of concrete prism is 100mm by 100mm by 500mm, the size of Reinforced concrete beam is 230mm by 230mm by 1000mm. So, these specimens are been casted and cured for 28 days and these specimens are tested to found the mechanical properties by compressive strength test for cube is done on 7th day, 14th day and 28th day respectively.

III.CONCRETE MIX DESIGN

Table 3.1 : Design Parameters

Grade Designation	**M25**
Type of Cement	OPC 53
Maximum nominal size if aggregate	20mm
Maximum Water Cement Ratio	0.50

Table 3.2: Mix Proportion of PCC for M25 Grade

Materials / Mix	Cement	Fine Aggregate		Coarse Aggregate
		Tannery waste	Fine Aggregate	
Nominal mix	17.86kg	0kg	33.7 kg	55kg
Mix 1	17.86kg	3.37kg	30.33kg	55kg
Mix 2	17.86kg	6.74kg	26.96kg	55kg
Mix 3	17.86kg	10.10kg	23.6kg	55kg
Total	**71.5kg**	**20.21kg**	**114.6kg**	**220kg**

IV.RESULT AND DISCUSSION

4.1 EXPERIMENTAL RESULTS FOR M25 GRADE OF CONCRETE

The experimental results of this compressive strength test (cube), Tensile strength test (cylinder), Flexural strength test (prism) and flexural strength test (Reinforced Concrete Beam) is the experimental result and calculation are for **M25 Grade of concrete.**

4.1.1 COMPRESSIVE STRENGTH FOR CUBE (M25 GRADE)

To find the capability of concrete to counterattack by crushing force, compression strength test was carried out for casted cube specimens. The cubes are made in M25 Grade of Concrete. The test specimen of cube of size (150mm×150mm×150mm) are casted and tested 7th, 14th, 28th day. To carry out the compressive strength test.

Table 4.1: Compressive Strength Test (Cube) For M25 Grade of Concrete

S. No	Samples	Percentage (%) Tannery Sludge	7 Days (N/mm²)	14 Days (N/mm²)	28 Days (N/mm²)
1	Conventional mix	0%	4.3	2.4	2
2	Mix 1	10%	2.5	4.4	2
3	Mix 2	20%	3.5	1.8	3
4	Mix 3	30%	4.5	2.8	5

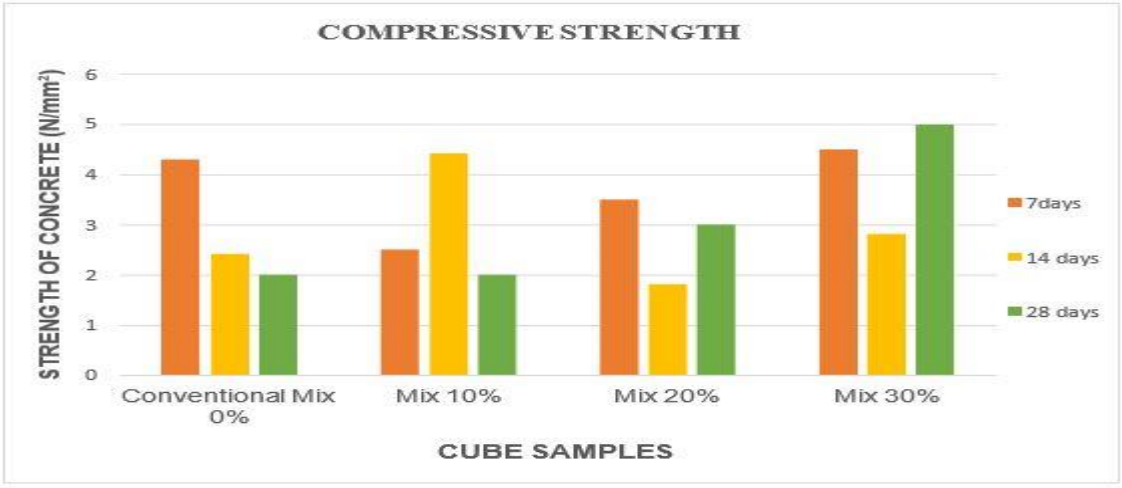

Fig: 4.1: Comparison of compressive strength cube for M25 grade of concrete

4.1.2 SPLIT TENSILE STRENGTH FOR CYLINDER (M25 GRADE)

Split tensile strength of concrete is the basic property of concrete to find its tensile force. The test was carried out on specimen cylinder of 150mm diameter and 300mm height are casted, cured and tested after 28 days. The cylinders are made in M25 Grade of Concrete. The tensile strength of concrete (cylinder) is founded.

Table 4.2: Split Tensile Strength Test (Cylinder) For M25 Grade

Samples	28^{th} day in (N/mm²)
Conventional mix (0%)	2.67
Mix (10%)	2.69
Mix (20%)	3.03
Mix (30%)	3.57

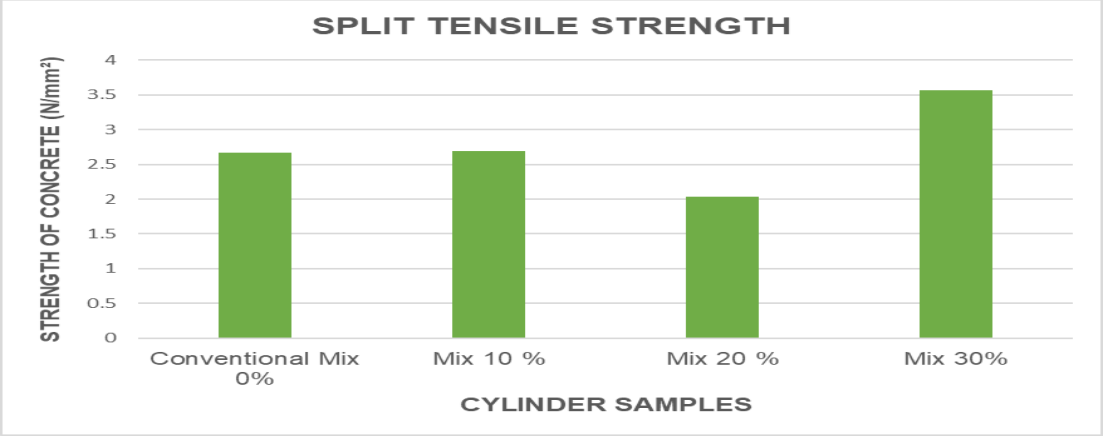

Fig: 4.2: Optimum Strength of Tensile Strength (Cylinder) For M25 Grade

4.1.3 FLEXURAL STRENGTH FOR PRISM (M25 GRADE)

Flexural strength test of concrete is tested to find the capability of concrete to counterattack flexural force. The test was carried out on specimen prism of size (100mm×100mm×500mm) are casted, cured and tested after 28 days. The prisms are made in M25 Grade of Concrete. Flexural strength test by three-point loading method is applied to find flexural strength**.**

Table 4.3: Flexural Strength test (Prism) for M25 Grade

Samples	28^{th} day in (N/mm^2)
Conventional mix (0%)	2.68
Mix (10%)	2.70
Mix (20%)	2.02
Mix (30%)	3.57

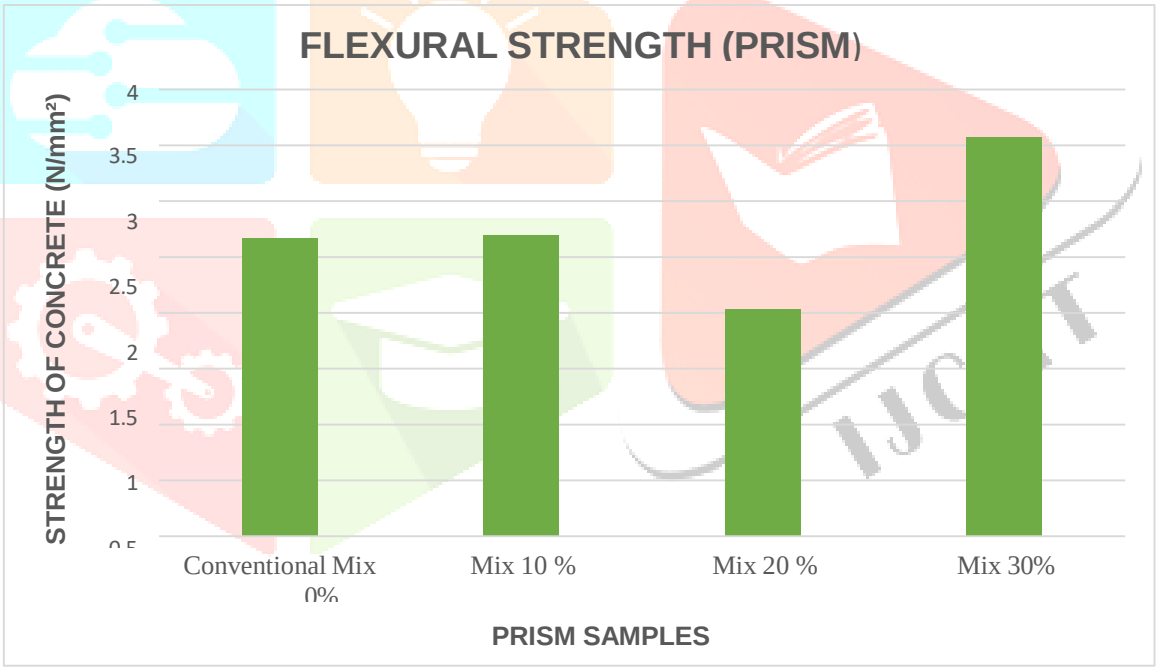

Fig: 4.3: Optimum Strength of Flexural Strength (Prism) For M25 Grade

V.CONCLUSION

5.1 GENERAL

The following conclusions are given below:

- As a partially replacing of tannery sludge as a fine aggregate it gives some results which gives some good strength and workability.
- Mechanical properties of nominal and tannery sludge concrete cube, cylinder, prism and RC Beam was studied for compressive, split tensile strength and flexural strength with curing time of 7 ,14 and 28 days.
- Compressive strength and split tensile strength of tannery sludge mix is increases and become good strength at 30% of replacement. That is the maximum strength of tannery sludge mix in both grades of concrete M25.
- The flexural strength of RC Beam with tannery sludge replacement mix is results as a weak in flexural strength comparing to conventional concrete beam.

It can be concluded from the above result that 30% replacement of tannery sludge waste with fine aggregate is the best and correct proportion for the compressive strength and split tensile strength. But the flexural strength of Reinforced Concrete Beam of tannery sludge mix is less compared to conventional beam. Thus, our project states the tannery sludge replacement in concrete can give good compressive strength and tensile strength.

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