

EXPERIMENTAL INVESTIGATION ON STRENGTH CHARACTERISTICS OF CONCRETE WITH THE PARTIAL REPLACEMENT OF WATER BY THE TANNERY WASTAGE

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Abstract – This report comprises of the optimum value of water content to be replaced by the tannery wastage and the corresponding variations in the strength characteristics of concrete. The attempt has been made with the addition of tannery wastage and their influence on the performance of concrete with the dose of 5%, 10% & 15%. The test considered for study is compressive strength test and its results are compared with those of normal concrete. The result shows that the concrete gained good strength with the addition of tannery wastage up to a dose of 10% and there was a slight fall in the compressive strength when the dosage was increased for 15%. The maximum compressive strength attained is 35.11 N/mm².

Key Words: Tannery wastage, compressive strength, waste management.

1. INTRODUCTION

Tanning is the process of treating skins and raw hide of animals to produce leather. Number of chemicals are used in the tanning process which are being dumped into the land as land fills. It gradually affects the land and causes pollution which adversely affects the human lives. The common chemicals used in the tanning are chromium salts, chlorinated phenols, sodium formate, cadmium and aldehydes. Among them chromium is the most widely used tanning chemical and it causes significant number of health issues in humans and animals.

Those chemicals disposed from the leather processing are very complex and leads to water pollution as well, if remains untreated, especially due to its high organic loading. On the other hand the properties of some of these chemicals can make them suitable for their addition in concrete to gain strength. Reduction of water content may increases the strength but on the other side it reduces workability. With the addition of tannery wastage, this drawback could be eliminated and strength as well as workability could be increased remarkably.

Amongst the various methods used to improve the compressive strength of concrete, the use of tannery wastage is relatively a new approach. The partial

replacement of water by the tannery liquid could be advantageous that it can increase the compressive strength of concrete if the proper curing regime is adopted.

1.1 Methodology

1. Studying literatures related to industrial wastes used in concrete.
2. Selection of materials based on their quality (cement, fine aggregates, coarse aggregates, water and other essential materials).
3. Calculating the ratio of mix proportions by the mix design for M25 grade of concrete.
4. Casting concrete cubes.
5. Water curing of concrete cube is done for 7 days, 14 days and 28 days.
6. Compressive strength test is carried out with the concrete specimens after 7, 14 and 28 days of curing.

1.2 Materials Used

1. Ordinary Portland Cement of 43 grade confirming to IS 456 2000
2. Graded fine aggregates
3. Graded coarse aggregates
4. Tannery wastage
5. Water.

1.2.1 Ordinary Portland Cement

Ordinary Portland Cement (OPC) is the basic Portland cement and best suited for use in general concrete construction for its binding property. OPC is divided into three grades of 33, 43 and 53. In our experimental study we are using 43 grade of cement. The specific gravity of cement was found to be 3.10.

Table-1: Specific gravity of cement

Observation	Trial 1	Trial 2
Wt. of flask	100	100
Wt. of flask+cement	280	280
Wt. of flask+cement+kerosene	495	490
Wt. of kerosene	340	336
Specific Gravity of cement	3.12	3.08

1.2.2 Graded fine aggregates

The aggregates having size less than 4.75 mm are termed as fine aggregates. Locally available sand conforming to zone IV was used in the experiment. Fineness modulus of sand was found to be 3.42 gm. Specific gravity determined by pycnometer was found to be 2.52.

1.2.3 Graded coarse aggregates

The aggregates having size more than 4.75 mm are termed as coarse aggregates. Locally available crushed coarse aggregates of size 20 mm was used in the experimental project. Specific gravity of coarse aggregate was found to be 2.91.

1.2.4 Tannery wastage

Tannery wastage consists of many hazardous toxic chemicals such as chromium salts, chlorinated phenols, sodium formate, cadmium and aldehydes. These chemicals are very complex and hazardous.

1.2.5 Water

Portable water free from impurities and salt used for casting and curing the concrete blocks as per IS- 456 2000.

2. RESULTS AND DISCUSSION

The average compressive strength test readings after 7 days, 14 days, and 28 days are listed below.

Table-2: Effect of tannery wastage on compressive strength of concrete.

Tannery wastage	Compressive strength(N/mm ²)		
	7 Days	14 Days	28 Days
0%	24.88	29.33	32.00
5%	25.55	30.22	32.22
10%	26.44	30.88	35.11
15%	25.99	29.99	32.99

The concrete specimen attained a maximum compressive strength of 35.11 N/mm² on the addition of 10% of tannery which is more than that of the required target strength (31.66 N/mm²).

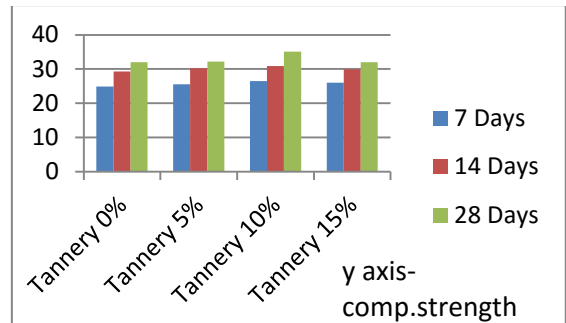


Chart-1: Compressive strength test results comparison chart



Fig -1: Compressive strength test on cube

3. CONCLUSIONS

Based on the analysis of experimental results and discussion, the following conclusions can be drawn:

1. Upon the addition of tannery wastage, the strength of concrete has increased considerably.
2. The optimum value of tannery waste addition is found to be 10%.
3. Compressive strength of the concrete specimen increased up to 10% dosage.
4. The compressive strength has fallen upon the addition of 15% of tannery wastage.
5. In our experiment the tannery wastage has been used effectively as a partial replacement of water and this paved the way for better mode of their disposal.

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