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DURABILITY OF CONCRETE WHEN TAMARIND KERNEL POWDER USED AS ADDITIVE

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Abstract: *The conventional concrete is loosing its value in modern days as it does not serve the present needs. In order to improve the properties of the concrete in the fresh and the hardened state admixtures are added. In this work, an attempt is made to study the possibilities of using tamarind kernel powder as an admixture in concrete. The addition of tamarind kernel powder is varied from 0% to 0.5% at 0.25% regular intervals. In this project our aim is to check the impact of TAMARIND KERNEL POWDER (TKP) over the durability properties of concrete when used as additives. Durability properties are studied using standard tests.*

Key Words*: *Concrete, admixture, water absorption, acid attack, chloride resistance test.

1. INTRODUCTION

Concrete is one of the oldest and most common construction materials in the world, mainly due to its low cost, availability, its long durability, and ability to sustain extreme weather environments. One of the main fields of research in civil engineering is improving the durability of concrete structures. In 2013, it was estimated by the American Society of Civil Engineers (ASCE) that $3.6 trillion should be invested in the United States infrastructure to bring it to a "good condition" With an average grade of D+, the study highlights the importance of improving durability of concrete in infrastructure. In this project the various durability properties studied are water absorption ,acid attack , chloride resistance test.

2. TERMINOLOGIES

CONCRETE - Concrete is a heterogeneous mixture composed of Cement, Fine Aggregate and Coarse Aggregate mixed in the required proportion.

ADMIXTURES – Additional material used for improving the properties of concrete.

DURABILITY- The durability of concrete is defined as its ability to resist weathering action, chemical attack, abrasion, or any other process of deterioration.

WATER ABSORPTION-This test method is used to determine the rate of absorption of water by hydraulic cement concrete by measuring the increase in the mass of a specimen.

ACID ATTACK TEST-When the cement paste comes in contact with the acid its components breakdown this phenomenon is known as acid attack.

CHLORIDE RESISTANCE- Chloride attack is one of the most important aspect while dealing with durability of concrete. It primarily causes corrosion of reinforcement.

3. MATERIALS:

The materials used in the investigation are: Cement, coarse aggregate, Fine aggregate, Tamarind kernel powder and water.

3.1 Cement: OPC 53 grade cement confirming to IS 12269 (1987) was used throughout the investigation.

3.2 Coarse aggregate: Coarse aggregate of nominal size 20mm confirming to IS 383-1970 are used.

3.3 Fine aggregate: Natural river sand confirming to IS:383-1970 was used in the investigation.

3.4 Tamarind kernel Powder: Commercially available TKP powder was used for producing cement with TKP.

3.5 Water: Potable water confirming to IS 456-2000 was used for curing and casting.

4 4.METHODOLOGY

4.1MIX DESIGN

In this experimental work, M30 grade concrete with w/c ratio of 0.45 was used.in this experimental study, totally 27 numbers of specimen were cast. The specimens were cubes of size 150*150*150mm.The TKP was added to the concrete by percentage weight of cement. table shows the arrived values of mix ratio of conventional concrete.

CEMENT	FINE AGGREGATE	COARSE AGGREGATE	WATER
1	1.64	2.51	0.45

4.2 WATER ABSORPTION TEST: Cube specimens of size 150x150x150mm are used for the test. After 28 days of curing period the test specimen is taken out from curing tank and surface moisture was wiped with the cloth. The

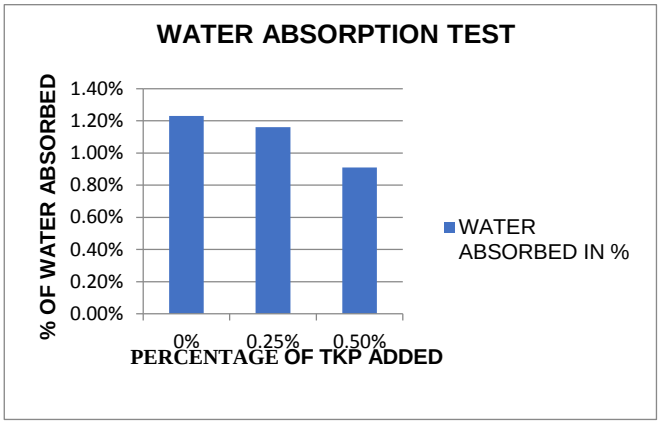
surface dried specimen was kept in an oven at 100+50C for 24 hours After 24 hours the oven dry weight (W1) of specimen was taken surface dry weight of specimen was taken until the weight of specimen (W2)) Percentage water absorption= (W2-W1/W1)*100

4.3 Acid Resistance Test: Concrete cubes of size 150x150x150mm are cast and cured for 28 days. After 28 days curing cubes are taken out and allowed for drying for 24 hours and weight is taken. For acid attack 3% dilute Sulphuric acid is used. The cubes are immersed in acid solution for a period of 14 days. The concentration is maintained throughout this period with PH being 3. After 14 days the specimens are taken out from the acid solution. The surface of specimen is cleaned and weights are taken. The loss in weight of specimen is used as indicator for resistance to acid attack

4.4 Chloride Resistance Test: Cubes of size 150x150x150mm are cast and cured for 28 days. After 28 days curing cubes are taken out and allowed for drying for 24 hours and weights were taken. For chloride attack test, 5% dilute Sodium Chloride solution is used. The cubes are immersed in solution for a period of 14 days. The concentration is maintained constant throughout this period. After 14 days the specimens are taken out from the solution. The surface of specimen is cleaned and weights are taken. The loss in weight of specimen due to chloride attack is determined.

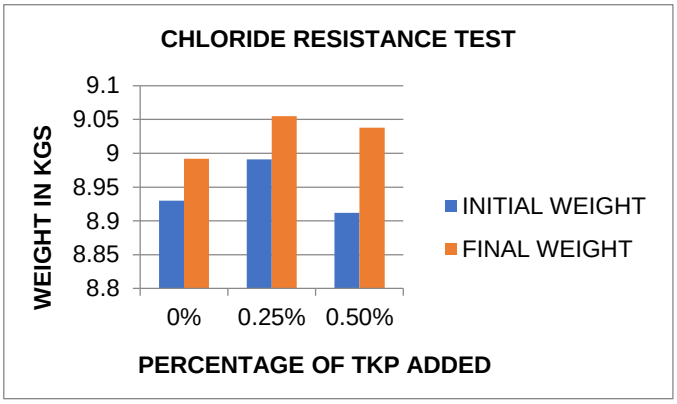
5. RESULT:

5.1 WATER ABSORPTION TEST



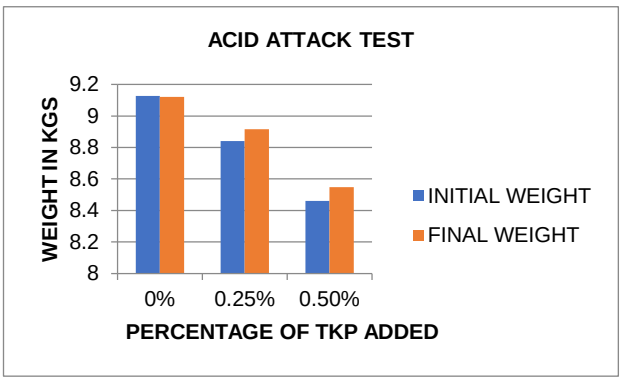
PERCENTAGE OF TKP ADDED	WATER ABSORBED IN %
0%	1.23
0.25%	1.16
0.5%	0.91

5.2CHLORIDE RESISTANCE TEST



PERCENTAGE OF TKP ADDED	%DIFFERENCE IN WEIGHT
0%	0.626GAIN
0.25%	0.71 GAIN
0.5%	1.39GAIN

5.3 ACID ATTACK TEST



PERCENTAGE OF TKP ADDED	%DIFFERENCE IN WEIGHT
0%	0.054 LOSS
0.25%	0.90 GAIN
0.5%	1.05 GAIN

6. CONCLUSIONS

The addition of TKP was found effectively improved the properties of concrete.

1. Water absorption was minimum for 0.5% TKP addition.
2. In the chloride test the weight of concrete was observed to be increased this may be due to the absorption of chloride by the specimen.
3. With the addition of TKP the concrete specimens showed improved resistance to acid then that of conventional concrete with 0.5% showing maximum resistance
4. Thus overall durability properties of concrete were enhanced with the addition of TKP.

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