

# Studies on Strength Properties of Concrete with the Addition of Tamarind kernel powder as an Additive

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**Abstract** – Concrete is one of the most widely used material in building construction. In modern days concrete is losing its properties when subjected to environmental condition. Hence there is need to enhance the properties of concrete and various additives are added in cement to improve the properties of concrete. In this paper studies were carried out using tamarind kernel powder as an additive. Tamarind kernel powder was varied from 0% to 0.75% at common interval of 0.25% and Compressive strength and split tensile test were conducted. It was observed that there was improvement in strength with addition of tamarind kernel powder.

**Key Words:** Concrete, Tamarind kernel powder, Compressive strength

## 1. INTRODUCTION

An admixture is material other than water, aggregate or cement which is used as an ingredient or mortar to control setting and early hardening, workability or to provide additional qualities to concrete. There are various admixtures used to enhance the properties of concrete. The admixture may be artificial admixture or natural admixture. The artificial admixtures are costlier; they increase the overall cost of the project. Hence our aim is to use natural admixtures which are cheap. In this project we are using tamarind kernel powder which is naturally obtained from tamarind seed.

## 2. MATERIALS

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

**2.1 Cement:** OPC 53 grade cement conforming to IS 12269 (1987) was used throughout the investigation.

**2.2 Coarse aggregate:** Coarse aggregate of nominal size 20mm conforming to IS 383-1970 are used.

**2.3 Fine aggregate:** Natural river sand conforming to IS:383-1970 was used in the investigation.

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

**2.5 Water:** Potable water conforming to IS 456-2000 was used for curing and casting.

## 3. METHODOLOGY

### 3.1 MIX DESIGN

In this experimental work, M30 grade concrete with w/c ratio of 0.45 was used. In this experimental study, totally 12 numbers of cube specimens were casted; cubes of size 150\*150\*150mm. Totally 12 numbers of cylinders were casted of size 300mm height and 150mm diameter. 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

### 3.2 COMPRESSIVE STRENGTH TEST

Cube specimen of size 150x150x150mm is used for compression test. Oil is applied uniformly to the inside of the moulds on all the surfaces. Concrete is filled in three layers with tamping of 25 blows for each layer. Immediately after this they are covered with wet gunny bags and after 24 hours they are taken out of the moulds and immersed in water tank for 28 days after which they are taken to the laboratory and tested with the application of gradual loading.

Compressive strength = load at failure / area of cross section in N/mm<sup>2</sup>.



FIG-1: Cube specimen under compressive testing machine

### 3.3 Split Tensile Strength:

Cylindrical concrete specimen is placed between the platens of testing machine, keeping the two plywood strips one at the bottom and the other at the top. The whole assembly is arranged at the center of plates of testing machine. The load is applied gradually at a rate of 1.4 to 2.1N/mm<sup>2</sup>/minute until the failure. The maximum load applied to the specimen is noted. Split tensile strength is calculated to nearest to 0.05N/mm<sup>2</sup>.

$$\text{Split tensile strength} = \sigma_p = 2P / \pi dl \text{ N/mm}^2$$

P=load in Newton d=diameter of cylinder in mm

l=length of cylinder in mm



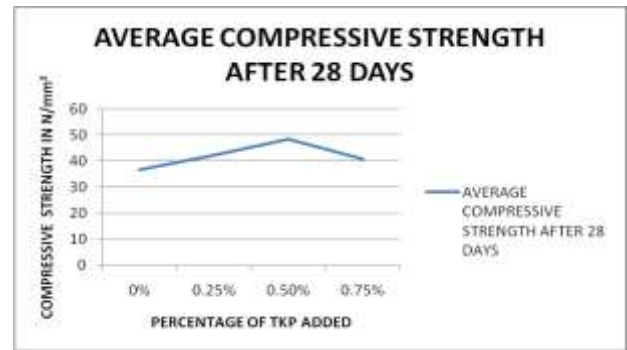
Fig 2: The Split Tensile Strength test setup

## 4. RESULTS AND DISCUSSION

### 4.1 Compressive test

The compressive strength of concrete was increased with addition of tamarind kernel powder(TKP).The maximum strength was observed at 0.5% addition of TKP and decreased at 0.75% addition of TKP

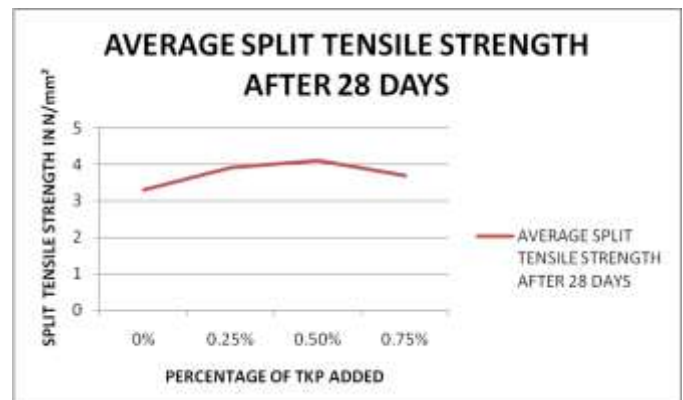
% Addition of TKP	Average 28-day compressive strength in N/mm <sup>2</sup>
0%	36.7
0.25%	42.15
0.5%	48.3
0.75%	40.8



### 4.2 Split tensile strength

The split tensile strength value is increased with addition of TKP. The maximum strength is observed at 0.5% addition of TKP. The strength decreased at 0.75% addition of TKP.

Addition of TKP in %	Average 28-day Split tensile strength in N/mm <sup>2</sup>
0%	3.3
0.25%	3.8
0.5%	4.1
0.75%	3.7



## 3. CONCLUSION

The addition of TKP was found effectively improved the properties of concrete. The compressive strength is increased by 24% at addition of 0.5% TKP. The split tensile strength is increased by 19.5% at 0.5% addition of TKP. From the results it is concluded that Tamarind kernel powder(TKP) can be used to improve the properties of concrete

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