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Retraction: Turkey Berries Leaves Extract as Corrosion Inhibitor Embedded Steel in Concrete (*IOP Conf. Ser.: Mater. Sci. Eng.* **1145 012073)**

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Turkey Berries Leaves Extract as Corrosion Inhibitor Embedded Steel in Concrete

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Abstract. Different approaches such as surface preparation and cathodic protective procedures traditionally used have been used for corrosion reduction. Corrosion inhibitors have proved to be the most cost-effective and simple method for protecting and corrosion protection of the concrete embedded steel. The inhibitors reduce the rate of corrosion, preventing monetary damages incurred by metallic corrosion on steels. The toxicity of conventional bio-toxic organic compounds is a significant concern. Eco-friendly, non-toxic green inhibitors are the focus of intensive research. This research focuses on acidic solutions to imitate manufacturing processes on methods of corrosion preventive use of turkey-leaves extract-based corrosion inhibitors for steel. The dosage percentage will be raised by 0.5%, 1.0%, 1.5%, 2.0% and 2.5%. The present work provides an overview of corrosion forms, the corrosion mechanism and, in particular, a current application research is turkey leaves extracts as corrosion inhibitors in steel production.

Keywords: Embedded steel, Corrosion, Turkey leaves, Corrosion Inhibitor, Mechanical Properties

1. Introduction

Concrete has relatively high compressive strength, but the tensile strength is much weaker. It is also normally strengthened by tension-resistant materials (often steel). Concrete elasticity at low stress is relatively stable, but begins to decline as matrix cracking occurs [1,2]. Concrete has a very low thermal expansion coefficient and decreases after maturing. Because of the shrinking and tension, all concrete systems break to some limit. Concrete that is subject to long-term forces is vulnerable to cracking.

Corrosion inhibitors are frequently used in a commercially feasible manner to protect metals and alloys from corrosion. It was a broadly used building material due to its fascinating properties such as flexibility, resilience, sustainability and economics [3]. Worldwide there are approximately four tonnes of concrete per year and approximately two tonnes per person in India. Concrete is a combination of sand and gravel or crushed stone that is normally bound together by a Cementous paste binder. The paste consists of cement and water from Portland and can also contain other concrete materials (CMs), such as fly ash or slag cement, and chemicals [4,5].



The transformation of a raffined metal in a more chemical-stable form such as oxide, hydroxide or sulphide is a natural process. It is a slow destruction by chemical and/or electrochemical reaction of their atmosphere of materials (usually metal). The area of corrosion is devoted to corrosion protection and prevention.

Plant products are affordable, widely available, and organic, along with being ecologically and environmentally friendly. Research that inhibits the properties of tannins, alkaloids, organic, amino acids and organic compounds in plants are concerned [6,7]. Sol-gel coatings with inhibitors have been very successful in recent years. Although extensive research on plant extract corrosion inhibition has been performed, there are still sparse studies on comprehensive adsorption processes and the naming the active substance.

The development of theoretical methods assisted by wet research observations will enable us to remedy this difference and allow us better understand the mechanisms and adsorption patterns of the inhibitor's mechanisms and its interface with the inhibitor surface [8,9]. The present study intentionally focuses on plant extract as green corrosion inhibitors.

2. Objectives

The aim of this research is to perform a property test on turkey leaves. Key aims of project work are as follows:

1. To identity the Organic corrosion Inhibitors.
2. To assess the optimal corrosion inhibitor dosage based on mechanical behaviour.
3. To compare and select the appropriate dose of an inhibitor of corrosion in its durability.

3. Materials Used

Cement:

In this analysis, ordinary Portland cement of a grade 53, commercially available, is of 3.14 specific gravity and has the standard quality of 32 percentage in line with IS: 12269-1987.

Fine Aggregate:

The 4.75mm sieve was a perfect mix of river sand [9]. Fine aggregate gravity is 1.93 percent of 2.62 water absorption.

Coarse Aggregate:

For the present study, the course aggregate 20 mm was used and its gravity is 2.65. The aggregates have been inspected according to specifications IS: 2386-1963 (I, II, III) [10].

Normal Water:

The water which should be used for concrete preparation if suitable for drinking [11]. The water should be pure and harmless, with impurities like tar, alkali and acids etc.

Green Corrosion Inhibitors

Plant material extracts contain heteroatomous materials including P, N, S, O. The molecules are combined through the corrosive particle of the form of protective films and metal surfaces, resisting corrosion. Selecting the locally available green inhibitors:

Solanum Torvum (Turkey berry leaf)

Solanum torvum / turkey berry are used as rootstock in the horticulture as well as devil's fig, pea eggplant, brush or susumber seeds. Grafted plants are highly robust and survive the diseases of the root system that enable the crop to continue for another year.

Typically, the houseplant is 2 to 3 m high and 2 cm basal width then can grasp 5 m high and 8 cm basal width. The plant primarily has one stem in the ground but it can branch out on the lower trunk. The bark of the stem is grey and almost smooth with lenticels [12]. The inner bark has an ivory

hue in green. The plants evaluated by the author were found to thrive on firm soil, thin taproots and sophisticated sides. It's white in the roots. The leaves are found in the rising branches. Figure 1 shows the process flow diagram for the preparation of Turkey Berry Leaf extract.

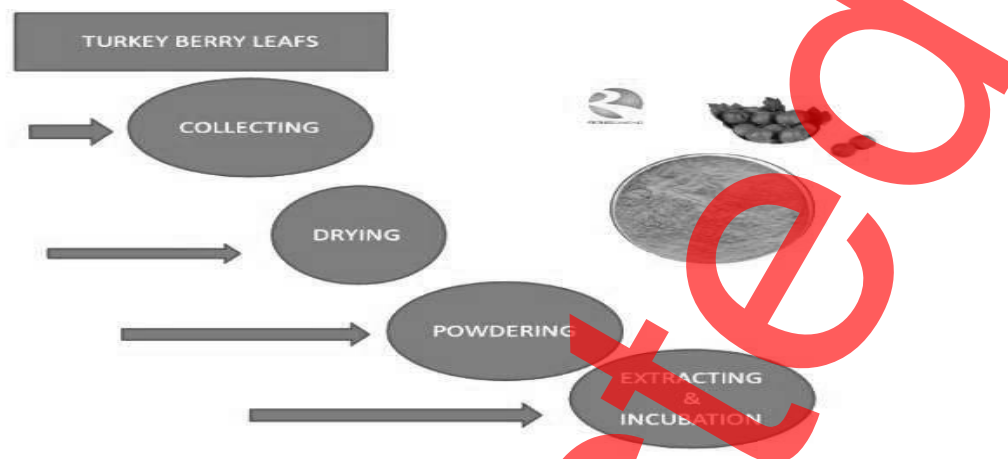


Figure 1. Process flow diagram for the preparation of Turkey Berry Leaf extract

The branches are grey-green and are surrounded by stellar hair. The spines are small and slightly curved and range between dense and totally absent all over the plant, including the midst of the leaf. The leaves are opposite or one per node; the blades are approximately 7 to 23 cm, 5 to 18 cm long. The flowers are white and 5 lobes are tubular, divided into cymes. Shortly after opening, they will be lost.

Preparation of Plant Extract:

1. The leaves were harvested from the nearby plant and washed vigorously with water for the removal of excess materials and for the powdering of it.
2. The calculated amount of sample was inserted in the bottle, the proportion of water applied (1:2). The blend was 48 hours remaining.
3. The residue is collected through oven heating

4. Concrete Mix Design for M25 grade:

Mix design is the method for determining the characteristics of concrete mixture that are desired and defined. Concrete grade M25 used in this study. The mixing estimates for each concrete unit volume shall be as shown in Table 1.

Table 1. Volume of concrete per unit Weight

Target mean strength	31.56N/mm ²
Water/cement ratio	0.48
Weight of cement	395kg/m ³
Weight of water	191.5kg/m ³
Weight of fine aggregate	511.2kg/m ³
Weight of coarse aggregate	1021kg/m ³

Casting:

The concrete is used in M 25 grade. Ordinary 53-grade port land cement and 4.75 mm screens with an M-sand are used. 20 mm size coarse aggregates have been used. Portable water has been used for mixing and curing. The mix ratio is 1:1.53:3.15:0.50. In various percentages 0%, 0.5%, 1.5%, 2% and 2.5% by weight of cement is added to the green inhibitor. Each mixture is cast with three specimens.

5. Test on Hardened Concrete:

The hard concrete test is an essential aspect of the quality and execution of concrete work. The hardened concrete test is intended to confirm the concrete quality in the sector.

Cube Compression Test:

Concrete cube strength is measured in experiments on specimens 150mm x 150mm x 150 mm cube after 7,14 and 28 days of cure according to IS: 516 – 1959. The compression testing machine with 2000 KN capacity should be used to test the test specimen. The cubes are placed such that the load is applied to the other side of the compression testing machine. The capacity is imposed to the limit of 140 kg/cm²/min upon failure of the sample. The concrete compressive strength gives an idea about concrete results represented by Equation (1)

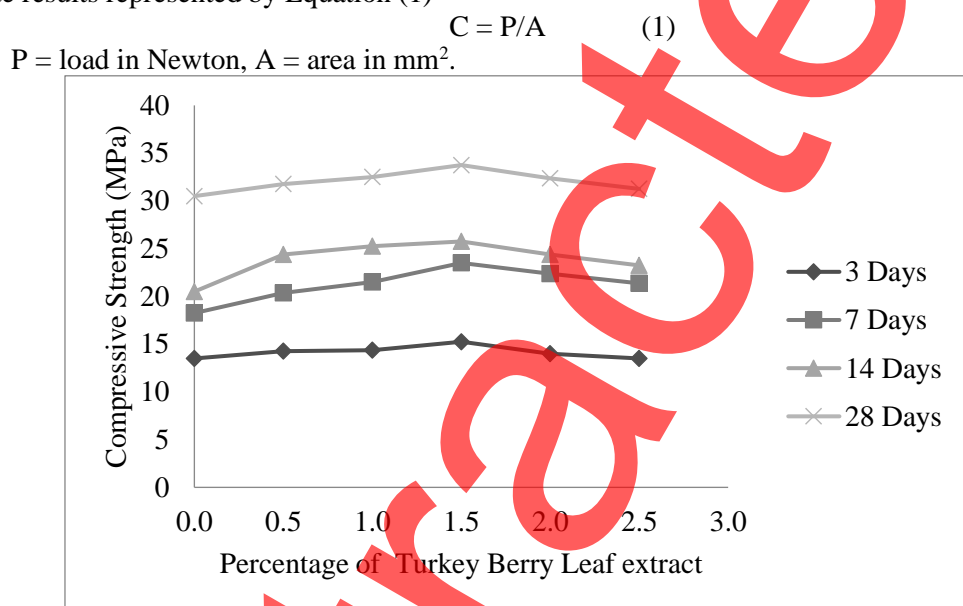


Figure 2. Compressive Strength with Percentage of Turkey Berry Leaf extract

Figure 2, with the addition of 1.5% of berry leaf extract, the cube strength of the concrete is improved by 10.65% compared with conventionally used concrete.

Split Tensile Strength:

One of the essential characteristics is the tensile strength of cement. Likewise, to identify the load at which the specimen can split, a tensile strength determination of concrete is required. Cracking in the traverse direction is a kind of tension failure. In the preparation of test specimens and application of direct axial tensile load, direct tensile strength of concrete is determined. Split tensile strength is an indirect way to detect concrete tensile strength. Sample in the form of a cylindrical 150 mm diameter, long 300 mm. The test is done by horizontally positioning the cylinder among the loading surface of the compression testing machine and applying the load up to a vertical diameter of the cylinder fails. The test shall be completed for 28 days. The intensity of this stress represented by Equation (2)

$$\sigma_{sp} = 2P/\pi DL \quad (2)$$

P is the load, D and L are the diameter and the specimen length

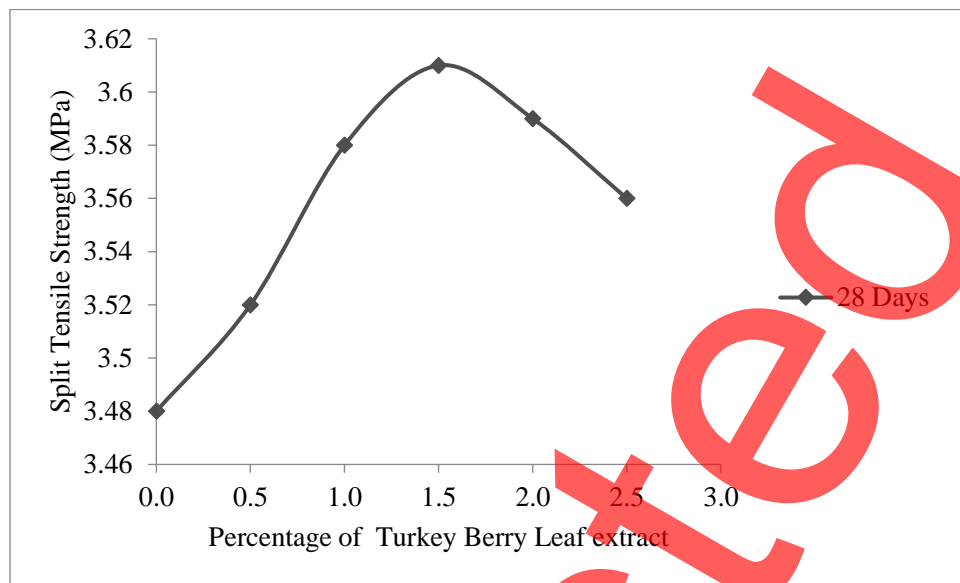


Figure 3. Split tensile strength with Percentage of Turkey Berry Leaf extract

This is represented in Figure 3. The split tensile strength of concrete is enhanced by 3.73% with 1.5% of berry leaf extract compared to conventional concrete.

Flexural Strength of Concrete:

100 x 100 x 500 mm beams are cast available of reference mixes for the determination of flexural strength. The specimens are tested by different techniques after about 28 days of curing. For testing the samples according to IS: 516-1959, the universal testing machine is used [7]. There has been a two-point loading process as shown in Equation (3)

$$f_{rup} = (WL)/(bd^2) \quad (3)$$

W = load, L = Span of prism (400 mm), b = width and d = depth of prism

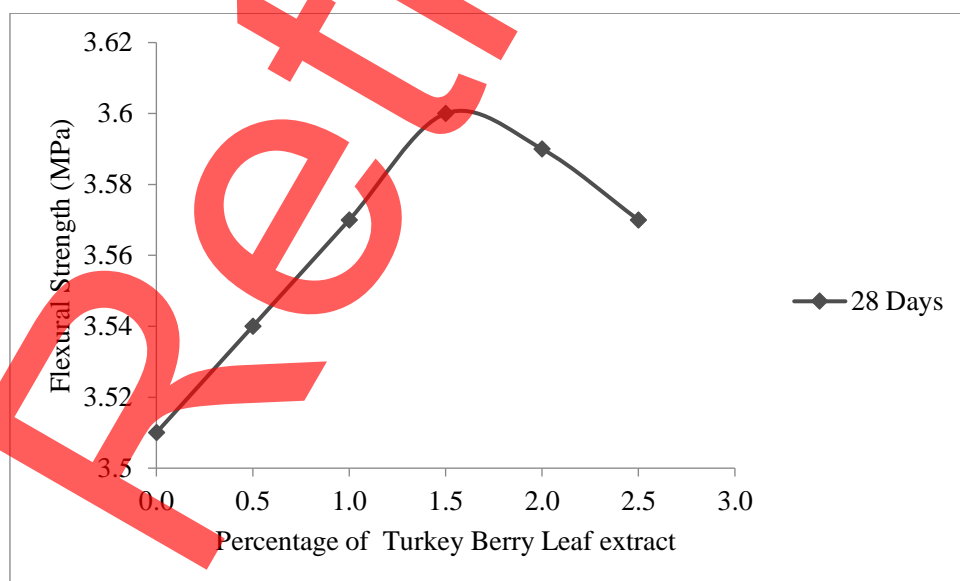


Figure 4. Flexural strength with Percentage of Turkey Berry Leaf extract

This is shown in figure 4. Concrete flexural strength is improved by 2.56 % with 1.5% of berry leaf extract compared to conventional concrete.

Water Absorption Test

The water absorption method was based on an ASTM C-642-81 for the hardened concrete specimen. For concrete cubes are used specimens measuring 100 x 100 x 100 mm. After 28 curing days, concrete cubes for each proportion mixture were cast and tested [9]. A water weight ratio (wet to dry weight difference) is used in calculating absorption of the water by dry specimen weight calculation.

$$\text{Water Absorption (\%)} = \{(\text{Wet mass} - \text{Dry mass}) / (\text{Dry mass})\} \times 100$$

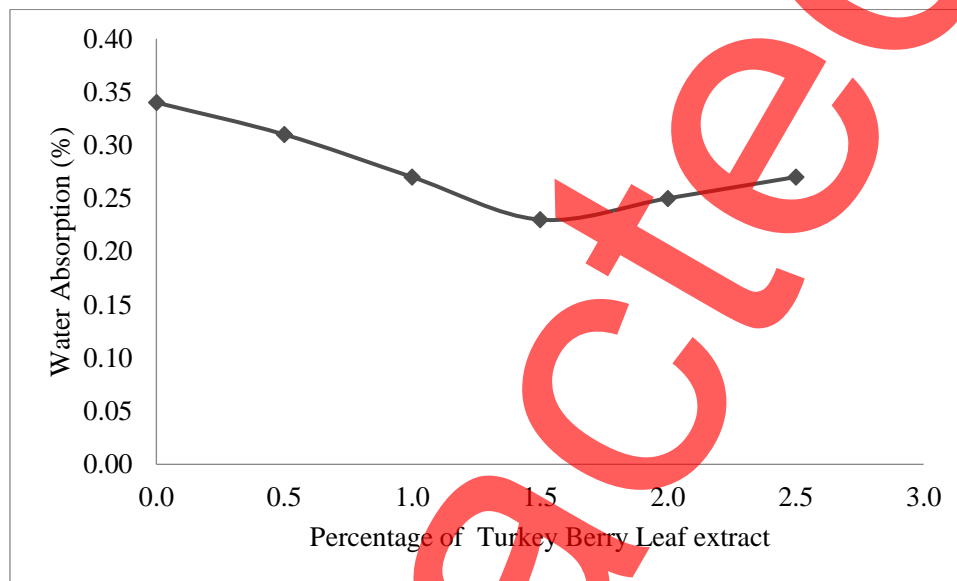


Figure 5. Water Absorption of concrete with Percentage of Turkey Berry Leaf extract

The values of water absorption for all mixtures are compared with the percentage of turkey berry leaf extract from the observed results is shown in Figure 5. Berry Leaf extract 1.5% is higher than conventional concrete than all mix ratios. The water absorption values for all mixtures are decreased up to 1.5 percent.

6. Conclusion

The basis of the experimental tests, the following conclusions can be made:

1. The green corrosion inhibitors turkey berry leaf extract is eco-friendly and locally available.
2. Amongst the various percentages of turkey berry leaf extract added such as 0%, 0.5%, 1%, 1.5%, 2%, and 2.5%, the concrete with 2.5% addition of an inhibitor has higher values than conventional concrete specimen of compressive, tensile and flexural strength.
3. The adding of a corrosion inhibitor greatly decreases water absorption properties.
4. The ideal percentage of turkey berry leaf is 2.5%; it improves the concrete strength and durability.

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