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ORIGINAL ARTICLE **OPEN ACCESS**

Phytochemical and Weight Loss Analysis in Corrosion Studies of *Mimusops elengi*

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ABSTRACT
Mimusopselengi, is considered as a blessed plant among Hindus, evergreen tree found in the Deccan Peninsula and Andaman Islands has been involved in more modern research due to its huge amount of medicinal properties. Phytochemical screening helps to explain the constituents of the plant extracts and also is helpful in searching for bioactive agents those can be used in the synthesis of useful drugs and in many engineering fields as a coating material such as corrosion inhibitors. Organic substances containing polar functions with oxygen, nitrogen, and sulfur atoms in a conjugate system have been reported to exhibit the good inhibiting properties. Thus, our main aim is to extract Mimusopselengi from methanol polar solvent and ensure the phytochemicals present in that plant is suitable for corrosion studies.
Keywords: *Mimusopselengi, evergreen tree, phyto chemical analysis, Weight loss method.*

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INTRODUCTION

Mimusops elengi is a small to large evergreen tree, grows up to 15 m high and it is regarded as by a short, dark and very rough trunk and wide spreading, [1,2].The leaves are glossy and are dark green when old with 6.3 - 10 cm in long and 3.2 - 5 cm in wide [3] as shown in Fig. 1.The extracts of this plant has anthelmintic [4], anti-anxiety [5], antihyperlipidemic[6], antiulcer [7], anticonvulsant [8], anti-oxidant, anti-inflammatory, analgesic and antipyretic activities [9]. One of the most practical methods for protection against metallic corrosion is the use of corrosion inhibitors. Lots of corrosion inhibitors can be used in the corrosion inhibition process. When small concentrations are added to corrosive media, they either decrease or prevent the reaction of the metal with the media. Inhibitors hide corrosion reactions either by reducing the probability of corrosion occurrence or by reducing the rate of attack or by both.Inorganic substances such as phosphates, chromates, dichromates and arsenates have been found effective as inhibitors. They however suffer a major disadvantages of higher toxicity and as such their use has come under severe criticism. These toxicity effects have led to the use of organic substances as anti-agents which are more eco-friendly and harmless.Organic substances containing polar functions with oxygen, nitrogen, and sulphur atoms in a conjugate system have been reported to exhibit the good inhibiting properties. The aim of this study is phytochemical screening of the main active component in the plant and to evaluate the corrosion inhibition activity of *Mimusops elengi* leaves.

MATERIALS AND METHOD

Collection and preparation of plant sample

Good fresh leaves of *Mimusops elengi L.* were collected, cleaned, shade dried, and grinded in a mechanical grinder, and then sieved to get fine powder. From that, 30g of this powdered dried sample is successively extracted with 300ml methanol by using soxhlet apparatus until the decolourisation of the solvent. The prepared stock inhibitor concentration is 10(v/v)%solution. From this various required other concentrations are got by diluting this stock solution.

Phytochemical analysis

The extracts were analyzed by the following procedure for the presence of the alkaloids, phenol, amino acids, flavonoids, terpenoids and carbohydrate.

Alkaloids
2ml of extract was measured in a test tube to which solution of iodine potassium iodide was added. A reddish brown colouration indicated the presence of alkaloids.
Phenol
To a portion of the extract was taken in a beaker and add few drops of 1% $FeCl_3$ and also mix aspirin in water to use as a control. A purple colour was formed, indicates the presence of phenol.
Amino acid
1 ml of the extract taken in a dry test tube and in another test tube taken for 1ml distilled water as a control. Add 1ml of biuret reagent to all test tubes, mix well purple color was obtained indicates the Presence of an amino acid.
Flavonoids
The stock solution (1ml) was taken in a test tube and added few drop of dilute NaOH solution an intensive yellow colour was appeared in the test tube. It became colourless when on the addition of a few drops of dilute acid that indicated the absence of flavonoids.
Terpenoids
About 0.5g of extract in separate test tube was taken with 2ml of chloroform, 5ml of concentrated sulphuric acid was carefully added to form a layer observed for absence of reddish brown colour interface to show positive results for the absence of terpenoids.
Carbohydrates
The test solution is combined with the small amount of Molisch's reagent in a test tube. After mixing a small amount of concentrated sulphuric acid is slowly added the sides of the sloping test tube, without mixing, to form a layer. A positive reaction is indicated by appearance of a purple red ring at the interface between the acid and layers.
Preparation of Specimen
Mild steel specimens of size 1.0 cm ×4.0 cm ×0.2 cm and chemical composition 0.026 % sulphur,0.06 % phosphorous, 0.4 % manganese, 0.1% carbon and the rest iron were polished to a mirror finish and degreased with acetone.
Weight – loss method
Mild steel specimens were immersed in 5M of Concentrated HCl in various Concentration of the inhibitor for one day. The Inhibition efficiency (IE %) was calculated using the equation,

$$\text{Inhibition Efficiency (IE \%)} = (1\text{-}W_1/W_2) \times 100$$

$$\text{Surface coverage } (\theta) = (1\text{-}W_1/W_2)$$

Where W_1 and W_2 are the weight loss for mild steel in the presence and absence of inhibitor.
Determination of corrosion Rate
The corrosion rate (CR) is directly proportional to the weight loss cm^2 in a specified time and was calculated by the formula.

$$CR = (87.6 \times W) \ / \ DAT$$

Where, W = weight loss in mg.
D = density of mild steel (7.86 g / cm^2 for mild steel).
A = Area in cm^2,
T = Exposure time in hours
Trends of CR and IE are graphically evaluated.

RESULTS AND DISCUSSION
The Phytochemical analysis was studied for the methanolic extract of *Mimusopselengi*and that was reported in the table 1.The symbol (+) represents presence of compounds in their methanolic extract and the symbol (–) represents absence of the compounds in their methanolic extract. The process of methanolic extractions were showed in Fig. 2(a-c).
The Phytochemical Analysis of *Mimusops elengi leaves was carried out*, using methanolic environment. The presence of alkaloids, flavanoids, terpenoids, phenols, carbohydrates, amino acids and proteins were conformed in the methanolic extract of leaf whereas anthraquinone was absent in methanolic extract is conformed. These results ensure, a number of phyto constituents, which are the key factors in the medicinal values of these plant.
Analysis of results of weight loss method
The corrosion rate (CR) and inhibition efficiency (IE %) values calculated using weight loss data for various concentration of inhibitor *Mimusops elengi* leave extract in 5 M Hydrochloric acid medium are presented in Table 2. It is apparent that the IE increased with the increasing inhibitor concentration. This behavior is explained based on the strong interaction of inhibitor molecule with the metal surface resulting in adsorption. The extent of adsorption increases from 0.3 to 3.0 (v/v) % concentration of the

inhibitor leading to increased IE and decreased CR which is shown in Figure 3. This indicates that the chemical components of the inhibitor are adsorbed on the metal surface resulting in the blocking of the reaction sites and protection from the attack of corrosion active ions in the medium[10]. The extent of weight loss in the presence of the inhibitor has found to concentration dependent [11]. The maximum IE of 78% was observed at an inhibitor concentration of 30ml. Generally the inhibitor molecule suppresses the metal dissolution by forming a protective film adsorbed to the metal surface and separating it from the corrosion medium. Thus it is lowering the capability of citrate ion to adsorb on the metal surface. The corrosion suppressing ability of the inhibitor molecule originates from the tendency to form either strong (or) weak chemical bond of Fe atoms using the lone pair of electrons present on the five nitrogen atoms present on the *Mimusopselengi* inhibitor. *Mimusopselengi* leave extract contains five nitrogen atoms, which together provide this molecule greater adsorption and film-forming behaviors on the metallic substrate and appreciable anticorrosion behavior. In addition, being a drug molecule, *Mimusopselengi* leave extract is highly soluble in the aqueous environment[12].

Figure 1. Leaves and seeds of *Mimusopselengi*

Figure 2. a. Soxhlet apparatus b. Methanol Extract of plant c. Phytochemical Analysis

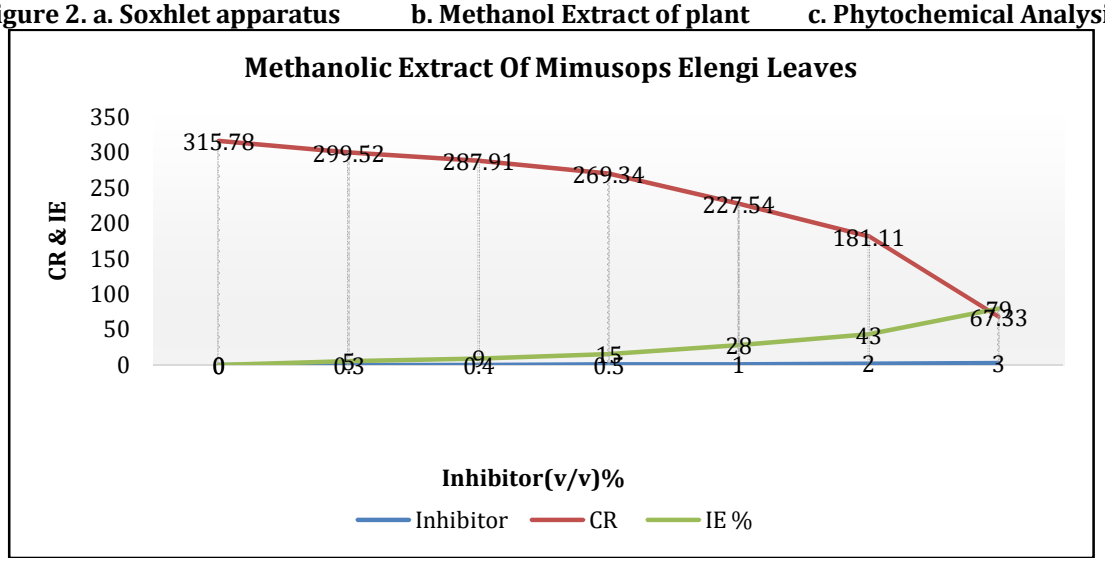

Figure 3. IE and CR of inhibitor *Mimusopselengi* leave extract in 5 M Hydrochloric acid medium

Table 1. The phytochemical Report

Methanolic Extract	Alkaloids	Flavanoids	Terpinoids	Anthro quinone	Phenol	Carbohydrate	Amino acids
Leaves	+++	+++	+++	-	+++	+++	+++

Table 2. weight loss data for various concentration of inhibitor *Mimusops elengi* leave extract in 5 M Hydrochloric acid medium

Inhibitor (v/v)%	Weight Loss (g)	CR X 10^3 (mmpy)	IE %	Surface Coverage(Ø)
0	0.680	315.78	-	-
0.3	0.645	299.52	05	0.0515
0.4	0.620	287.91	09	0.0882
0.5	0.580	269.34	15	0.1471
1.0	0.490	227.54	28	0.2794
2.0	0.390	181.11	43	0.4265
3.0	0.145	67.33	79	0.7868

CONCLUSION

The Phytochemical Analysis of *Mimusops elengi* leave, explains, the presence of alkaloids, flavanoids, terpenoids, phenols, carbohydrates, amino acids and proteins in the methanolic extract of leaf whereas anthroquinone was absent is conformed.

The presence of hetero atoms in this methanolic extract of the *Mimusops elengi* L plant, can also support as a corrosion inhibitor.

The adsorption of 3.0 (v/v)% concentration of the inhibitor leading to increased IE and decreased CR, clear that the IE increased with the increasing inhibitor concentration.

Thus, the most medicinal valued plant *Mimusops elengi* L can also be used as a good corrosion inhibitor in future studies.

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