

**PHYTOCHEMICAL ANALYSES AND THERMODYNAMIC STUDIES OF
ETHANOL EXTRACT OF *Dracaena trifasciata* (Laurentii) AS
CORROSION INHIBITOR FOR MILD STEEL
IN 1.0 M HCl SOLUTION**



ISSN: 2141 – 3290
www.wojast.com

UTAM, E. C.^{1*}, BoEKOM, E. J.¹, UMOREN, I. U.¹, OBOT, A. S.¹,
EKPEYONG, I. O.², AKPAN, U. E.³, AFANGIDE, I. S.¹, EYO, F. I.¹,
EDET, E. O.¹, AMBROSE, S. D.¹, UMOINYANG, A.¹,
OBOT, E.¹ AND NKANTA, C.¹.

¹ Department of Chemistry, University of Uyo, Akwa Ibom State, Nigeria.

² Department of Chemical Sciences, Akwa Ibom State Polytechnic, Ikot Osurua, Akwa Ibom State.

³ Department of Industrial Chemistry, University of Port Harcourt, Nigeria.

*CORRESPONDENCE: edidiongutam101@gmail.com

ABSTRACT

The increasing awareness of green chemistry and the research of green corrosion inhibitors have become a popular direction for many corrosion researchers thereby replacing harmful synthetic chemicals. Although numerous plants and their phytochemicals have been reported as anti-corrosive agents, vast majority of plants have not yet been studied for their anti-corrosive activity. Based on this, the investigation of the inhibitory effect of ethanol extract of *Dracaena trifasciata* (Laurentii) on mild steel in 1.0 M HCl was studied using weight loss analysis at concentrations 0.2, 0.5, 1.0, 1.5 and 2.0 g/L from 303 K-333 K. From the study, weight loss increased with increase in temperature and time, and decreased with increase in concentration of the inhibitor. At 2.0 g/L, the extract exhibited higher inhibition efficiency of 60% at 303 K. Thermodynamic parameters revealed adsorption process as spontaneous. Enthalpy ($\Delta H^{\circ}_{\text{ads}}$) values were positive indicating the adsorption process as endothermic and entropy ($\Delta S^{\circ}_{\text{ads}}$) values were negative showing a decrease in the disorderliness of the system. The adsorption of *Dracaena trifasciata* (Laurentii) obeyed Freundlich adsorption isotherm. GC-MS analysis showed a total of 24 bioactive compounds with Isopropyl linoleate and Propyleneglycol monooleate, being the most abundant compounds (14.475%). Functional groups obtained from FT-IR analysis of the extract were ester, acid anhydride, alcohol, alkane, alkene and carboxylic acids.

KEYWORDS: Mild steel, Corrosion Inhibition, Freundlich Isotherm, GC-MS and FT-IR

INTRODUCTION

Corrosion is a natural process in which materials react with the environment to form a more chemically stable compound such as its oxides and hydroxides, and the corroded state of metals is the most stable state (Santosh *et al.* 2021). Majority of materials used for construction and some aspect of the oil and gas sectors are made up of metals such as steel rods, sheets and pipes which are regularly exposed to industrial processes including acidic solutions such as pickling, chemical and industrial acid descaling (Obodom *et al.* 2023), thus making it susceptible to corrosion. For instance, the pickling process involving the use of hydrochloric acid to achieve a better surface quality, causes different degrees of corrosion to the metal substrate (Tan *et al.* 2020).

The prevention of corroded metals is of great concern as different methods such as electroplating, painting or oiling of surface metals have been widely used. One of the best methods of minimizing corrosion issues is the use of inhibitors to protect the metal against corrosion. Inhibitors often work by adsorbing themselves on the metallic surface to protect the metallic surface by forming a film (Obot *et al.* 2022). BoEKOM *et al.* (2020) noted that organic compounds inhibit the acid corrosion of mild steel to a remarkable degree. Over the years, green plants have found themselves effective in the control of corrosion as green plants being readily available and ecofriendly contain phytochemical constituents effective for use as corrosion inhibitors. Literature studies have reported ecofriendly plant extracts including stem, root, bark and even seeds to contain

constituents effective for use as a corrosion inhibitor (Obot *et al.* 2022). Studies done by Abakedi *et al.* (2024) using stem extracts of *Telfairia occidentalis* revealed the plant as a good corrosion inhibitor for mild steel in acidic medium.

Dracaena trifasciata (Laurentii) is an ecofriendly plant belonging to the family: Asparagaceae, commonly known as snake plant or mother-in-law's tongue in English is a perennial, erect, herbaceous evergreen succulent plant, native to tropical West Africa and countries such as Nigeria, Congo, Ghana, Indonesia, India and also found in wild tropical and subtropical regions (Babu *et al.* 2023). It is used for the treatment of different ailments such as ear-ache, ulcer, jaundice, pharyngitis, skin itches, urinary diseases, analgesic and antipyretic (Babu *et al.* 2024). It is also used as a good source of fiber. (Rahman, 2022). However, there is limited study in the area of *Dracaena trifasciata* as a corrosion inhibitor. Hence, this study aims toward creating eco-friendly corrosion control and preventing solutions using *D. trifasciata* to identify the effectiveness of the plant as a corrosion inhibitor for mild steel in 1.0 M HCl solution, and to add to knowledge as there is a dearth of information on *D. trifasciata* as corrosion inhibitors.

MATERIALS AND METHOD

SAMPLE COLLECTION AND EXTRACTION METHOD

Fresh samples of *D. trifasciata* were collected from a flower garden along Nsikak Eduok Avenue (Two lanes, Uyo Local Government Area of Akwa Ibom State, Nigeria). The plant

was identified by a taxonomist in the Department of Botany and Ecological studies, University of Uyo, and given the herbarium No: UUH4324. So as not to affect the bioactivity, *D. trifasciata* (Laurentii) was cut into small pieces and dried under room temperature for three weeks. The dried samples were ground into powdery form using an agate mortar and pestle. 140 g of *D. trifasciata* was soaked in 1500ml of ethanol. The mixture was filtered and the filtrate was subjected to evaporation at room temperature to obtain the ethanol extract of the plant. Extract concentrations of 0.2, 0.5, 1.0, 1.5 and 2.0 g/L in 1.0 M HCl solution were prepared and used to observe weight loss at 303 K – 323 K.



Figure 1: *Dracaena trifasciata* (Laurentii)

PROCEDURE FOR GC-MS SCREENING (ASTM D5769)

Agilent 8860 gas chromatography connected to a 5977B MSD was used for the analysis. One microlitre of the sample was injected in the pulsed spitless mode onto a 30m x 0.25mm ID DB 5-MS coated fused silica column with a film thickness of 0.15 micrometre. Helium gas was used as a carrier gas. The column head pressure was maintained at 20psi to give a constant of 1ml/min. Other operating conditions were pre-set. The column temperature was initially held at 328 K for 0.4min, increased to 473 K at a rate of 298 K/mins, then to 553 K at a rate of 281 K/mins and to a final temperature of 573 K at a rate of 298 K/mins, held for 2mins for a total run time of 12.09 mins. The identification time was based on retention time, and components with lower retention time elute first before those with higher retention time.

SAMPLE PREPARATION FOR GC-MS

50mg of the sample was weighed into a beaker. 10ml of the solvent mix (1:1 - Hexane: Dichloromethane) was measured into the beaker to homogenize the sample. The homogenized sample was cleaned up with 100 -200 mm mesh silica gel and 3 g of anhydrous sodium sulphate in a well-packed column, conditioned with hexane to form a slurry. 1 microlitre of the sample was injected through the injection port into the GC-MSD.

FOURIER TRANSFORM INFRA RED SPECTROSCOPY

Fourier transform infra-red spectra IR spectrum was recorded in spectrophotometer. Approximately 1 - 2 mg of the powered sample was mixed with 100 - 200 mg of

potassium bromide (KBr), a pressure of approximately 5,000 – 10,000 psi was used to form a translucent pellet set in the FT-IR spectrometer. The resulted spectrum was compared with reference spectra.

WEIGHT LOSS ANALYSIS

Mild steel coupons were degreased in ethanol and dipped in acetone for drying. Each of the coupons was weighed and suspended by glass hook, hung on a glass rod into a test solution containing different concentrations of the extracts in separate 100 ml beakers. The process was maintained at 303 K using a thermostat water bath. For weight loss analysis to be carried out, the coupons were retrieved from the test solutions after an interval of two-hours and it was washed with ethanol, dipped in acetone for drying before weighing again to obtain the weight of the coupons. The same procedure was carried out for every two-hour interval progressively for ten-hours. Mild steel had a high corrosion rate and as such, a shorter time interval was sufficient to observe a significant weight loss.

The experiment was repeated at 313 K, 323 K and 333 K for the various concentrations of the inhibitors. The differences in weight between the initial weight and the final weight were taken as weight loss using the formula in Equation 1

$$\Delta W = (W_0 - W_1) \text{ g} \quad 1$$

Where, W_0 is the initial weight in the absence of the inhibitor and W_1 is the final weight of the coupon in the presence of the inhibitor.

The corrosion rate (CR), surface coverage (Θ) and inhibition efficiency (%IE) were computed using Equations 2 – 4 respectively

$$CR = \frac{\Delta W}{S t} (\text{g/cm}^2\text{hr}) \quad 2$$

Where (ΔW) is the weight loss, (S) is the total surface area of the coupons and (t) is the corrosion time.

$$\text{Surface coverage } (\Theta) = \frac{CR_0 - CR_1}{CR_0} \quad 3$$

The weight loss was used to calculate the inhibition efficiency with the formula:

$$\% IE = \frac{CR_0 - CR_1}{CR_0} \times 100 \quad 4$$

Where: CR_0 is corrosion rate in the absence of an inhibitor; CR_1 is corrosion rate and IE is inhibition efficiency

RESULTS AND DISCUSSION GAS CHROMATOGRAPHY MASS SPECTROSCOPY (GC-MS)

The GC-MS analysis result of *Dracaena trifasciata* is presented in Table 1. The result showed the presence of twenty-four (24) bioactive compounds of which Isopropyl linoleate and Propyleneglycol monooleate had the highest peak area (14.475%), 1,5,9-Undecatriene, 2,6,10-trimethyl-, (Z)- and 1,5,9-Decatriene, 2,3,5,8-tetramethyl- recorded (peak area of 10.455%), Hexadecanoic acid, 1,4-butanediol

ester and Hexadecanoic acid, 1,1-dimethyl-1,2-ethanediyl ester with (peak area of 8.807%), 7-Oxabicyclo[2.2.1]heptane and 7-Oxabicyclo[4.1.0]heptane (peak area 8.140%). The remaining 16 bioactive compounds had a peak area within the range of (7.6 - 1.5%) and 9-Octadecenoic acid (Z)-, 2-hydroxy-1-(hydroxymethyl) ethyl ester exhibited the lowest peak area of (0.0001%). Abakedi *et al.* (2016) noted that phytochemicals (containing organic N, S and O atoms in the combined form) are good potential corrosion inhibitors. From the above analysis, *D. trifasciata* (Laurentii) contains (N and O atoms) in the combined form. Thus, making the plant effective for use as a corrosion inhibitor.

FOURIER TRANSFORM INFRA-RED SPECTROSCOPY (FT-IR)

FT-IR analysis of ethanol extract of *Dracaena trifasciata* (Laurentii) was carried out and results were presented in Fig 2. The compounds indicated showed bands at 1058.6, 1420.1, 1640.0, 2124.6 and 3257.7 cm⁻¹. The broad band at 1058.6 cm⁻¹ is indicative of ester functional group and acid anhydride functional group, 1420.1 cm⁻¹ are assigned O-H bend (alcohol) and C-H bend (alkane) respectively. 1640.0 cm⁻¹ is attributed to C=C stretching indicating alkene functional group. 2124.6 cm⁻¹ is assigned to O-H stretching vibration which is a characteristic of carboxylic acid functional group. 3257.7 cm⁻¹ broad band is assigned to O-H stretch indicating potential presence of alcohol functional group in the compound analyzed

Table 1: GC-MS analysis of *Dracaena trifasciata* (Laurentii)

S/N	COMPONENTS	(%) PEAK AREA	COMPOUND GROUPS
1	Propane, 1,1,3-triethoxy-	3.466%	Ether
2	5-Hydroxymethylfurfural	2.661%	Glycoside
3	4-Hydroxy-3,5-dimethylbenzoic acid	7.238%	Fatty acid
4	Benzoic acid, 3-methoxy-4-methyl-	6.510%	Fatty acid
5	7-Oxabicyclo [2.2.1] heptane	8.140%	Ether
6	7-Oxabicyclo [4.1.0] heptane	8.140%	Ether
7	Octadecanoic acid	7.641%	Fatty Acid
8	Tetradecanoic acid	7.641%	Fatty Acid
9	Cyclobutylcarboxylic acid	6.697%	Fatty Acid
10	2-Pentenoic acid	7.057%	Fatty Acid
11	Cyclobutanecarboxylic acid, 2-ethylhexyl ester	4.229%	Alkaloid
12	Cyclobutanecarboxylic acid, 2-octyl ester	4.229%	Alkaloid
13	2-Butenoic acid, 2-methyl-, 3-methylbutyl ester, (E)-	2.116%	Alkaloid
14	iso-Amyl tiglate	1.953%	Alkaloid
15	1,5,9-Undecatriene, 2,6,10-trimethyl-, (Z)-	10.455%	Terpene
16	1,5,9-Decatriene, 2,3,5,8-tetramethyl-	10.455%	Terpene
17	Hexadecanoic acid, 1,4-butanediol ester	8.807%	Fatty Acid Ester
18	Hexadecanoic acid, 1,1-dimethyl-1,2-ethanediyl ester	8.807%	Fatty Acid Ester
19	Glycerol 1-palmitate	3.085%	Glyceride
20	n-Nonadecanol-1	3.383%	Alcohol
21	9,12-Octadecadienoic acid (Z, Z)-	2.088%	Fatty Acid
22	Isopropyl linoleate	14.475%	Fatty Acid Ester
23	Propyleneglycol monoleate	14.475%	Ester
24	9-Octadecenoic acid (Z)-, 2-hydroxy-1-(hydroxymethyl)ethyl ester	0.0001%	Fatty Acid Ester

Figure 2: FT-IR spectrum of ethanol extract of *Dracaena trifasciata*

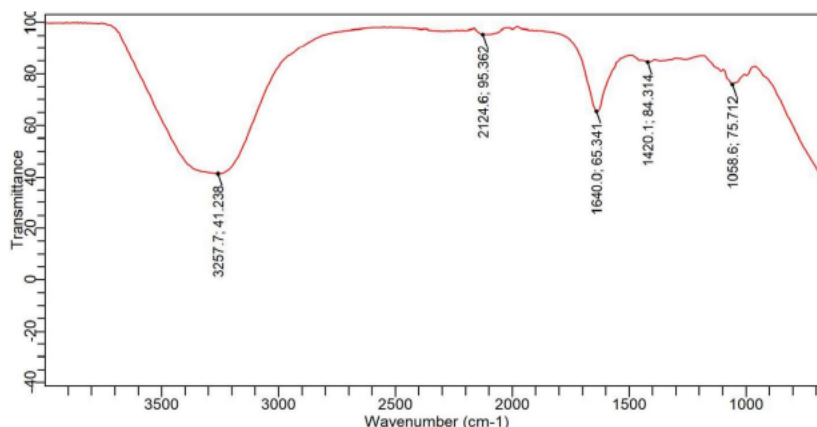


Table 2: Functional groups obtained from FTIR analysis of *Dracaena trifasciata*

Peak Number	Wavenumber (cm ⁻¹)		Intensity	Type of vibration	Molecule/Functional group responsible
1a	1058.56395	75.71233	Strong	COOC	Ester
1b	1058.56395	75.71233	Strong	CO-O-CO	Acid anhydride
2a	1420.11572	84.31419	Strong	O-H bend	Alcohol
2b	1420.11572	84.31419	Strong	C-H bend	Alkane
3	1640.02865	65.34069	Strong	C=C stretch	Alkene
4	2124.58257	95.36225	Strong	O-H stretch	Carboxylic acid
5	3257.69327	41.23846	Medium	O-H stretch	Alcohol

WEIGHT LOSS ANALYSIS

Weight loss analysis was carried out over a total immersion period of ten hours in 1.0 M HCl solution in the presence and absence of the inhibitor (*Dracaena trifasciata*) to reduce the corrosion of mild steel in acidic medium. The result showed that weight loss (g) increased with time, decreased with increase in the concentration of the inhibitor and increased with temperature. The decrease in weight loss with increase in concentration of the inhibitor can be attributed to the inhibitive effect of *Dracaena trifasciata*. With 2 g/L, the extract exhibited higher inhibition efficiency of 60% at 303 K. The inhibition efficiency was dependent on concentration of the extracts. The corrosion rate (CR) and inhibition efficiency (%IE) of mild steel are presented in Table 3. The corrosion rate was seen to decrease with increase in the concentration of the extracts. Similar observations had been reported by (Jackson and Essien, 2019; Obodom *et al.*, 2023; Abakedi *et al.*, 2024; Obot, *et al.*, 2022).

EFFECT OF INHIBITOR CONCENTRATION ON INHIBITION EFFICIENCY

As shown in (Figure 3), an increase in the concentration of the inhibitor led to a corresponding increase in inhibition efficiency. The highest inhibition efficiency of 60 % was obtained at extract concentration of 2.0 g/L at 303 K. This indicated that *D. trifasciata* (Laurentii) inhibited the corrosion of mild steel in 1.0 M HCl solution. Also, the increase in inhibition efficiency with increase in

concentration of the extract showed that the adsorption of the extract on the surface of the mild steel was concentration-dependent.

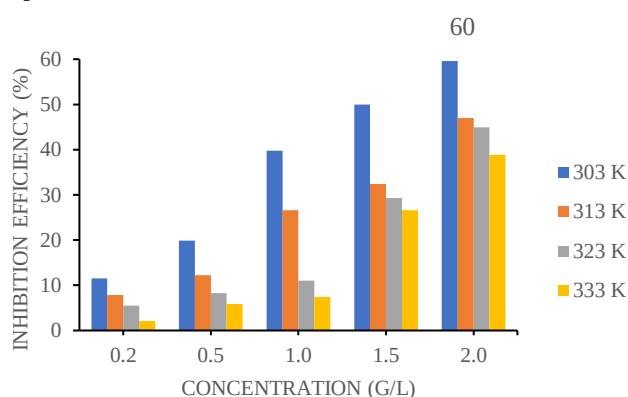


Figure 3: Effect of *D. trifasciata* extract concentrations on inhibition efficiency of mild steel in 1.0 M HCl solution

EFFECT OF TEMPERATURE ON INHIBITION EFFICIENCY

Changes in temperature affected inhibition efficiency of *D. trifasciata* extract. From Table 3, increase in temperature resulted in a decrease in the inhibition efficiency of *D. trifasciata* extract on mild steel. Thus, showing the efficiency of the extract as a corrosion inhibitor at lower temperatures.

The activation energy (E_a) of the corrosion process in the absence and presence of *D. trifasciata* (Laurentii) was calculated using Arrhenius equation given in Equation 5 (Abakedi *et al.*, 2024).

$$\ln CR = \left[\frac{-E_a}{RT} \right] + \ln A \quad 5$$

Where CR is the corrosion rate of mild steel determined from the weight loss experiment, A is the Arrhenius or pre-exponential constant, E_a is the apparent activation energy, R is the molar gas constant ($8.314 \text{ JK}^{-1}\text{mol}^{-1}$) and T is the absolute temperature in Kelvin.

The values of the activation energy (E_a) were obtained from the gradients of $(-E_a/R)$ of the linear plot of $\ln CR$ versus $1/T$ as presented in Figure 4(a) and the results are presented in Table 4. From Table 4, the values of the activation energy (E_a) in the presence of the extracts are higher than values of the activation energy (E_a) for the blank. These indicated that the presence of *D. trifasciata* (Laurentii) increased the energy of activation of the metal dissolution reaction. The higher the values of activation energy in the presence of *D. trifasciata* (Laurentii) in contrast to the blank, and the decrease in the percentage inhibition efficiency with increase in temperature showed that the mechanism of adsorption of *D. trifasciata* (Laurentii) on mild steel surface was by physical adsorption. Similar trend was reported by (Obodom *et al.*, 2023).

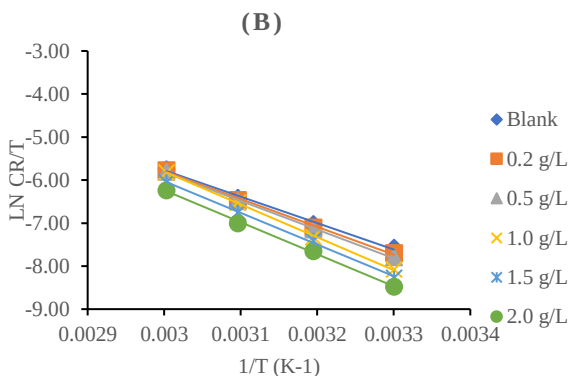
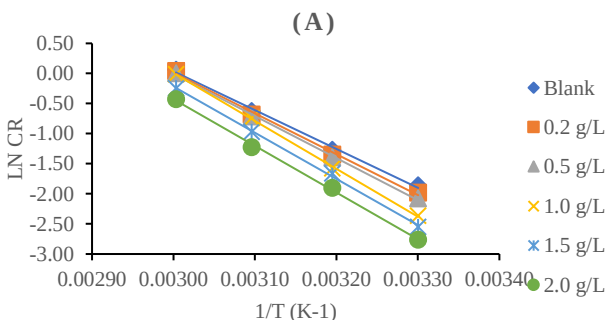


Figure 4: (a) Arrhenius plot and (b) Transition state plot for mild steel in 1.0 M HCl in the absence and presence of different concentrations of *D. trifasciata* (Laurentii).

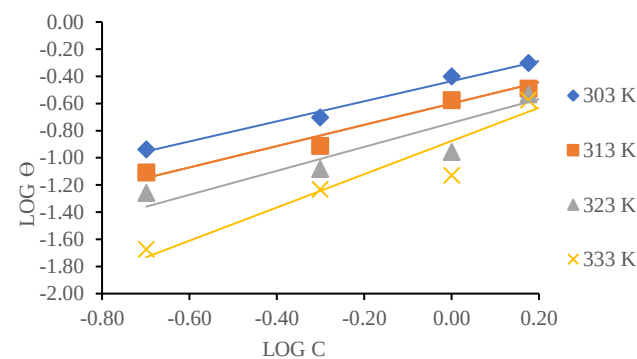


Figure 5: Plots of $\log \Theta$ vs. $\log C$ (Freundlich isotherm) for mild steel in different concentrations of *D. trifasciata* (Laurentii).

Table 3: Calculated values of corrosion rate (CR) and inhibition efficiency (% IE) for mild steel in 1.0 M HCl in the absence and presence of different concentrations of *D. trifasciata* (Laurentii) extract at 303 K to 333 K.

Plant	Extract Conc.(g/L)	Corrosion rate ($\text{mg cm}^{-2} \text{ hr}^{-1}$)				Inhibition Efficiency (%)			
		303 K	313 K	323 K	333 K	303 K	313 K	323 K	333 K
Laurentii	Blank	0.156	0.281	0.534	1.065	-	-	-	-
	0.2	0.138	0.259	0.505	1.042	11.54	7.82	5.52	2.12
	0.5	0.125	0.247	0.490	1.003	19.87	12.23	8.28	5.85
	1.0	0.094	0.206	0.475	0.986	39.74	26.60	11.04	7.44
	1.5	0.078	0.190	0.378	0.782	50.00	32.44	29.28	26.59
	2.0	0.063	0.149	0.294	0.652	59.62	46.96	44.91	38.82

Table 4: Calculated values of thermodynamic parameters for mild steel corrosion in 1.0 M HCl in the absence and presence of *D. trifasciata* (Laurentii) extract.

	Extract Conc. (g/L)	E _a (kJ mol ⁻¹)	ΔH (kJ mol ⁻¹)	ΔS (JK ⁻¹ mol ⁻¹)
Laurentii	Blank	53.64	51.00	-92.53
	0.2	56.40	53.76	-84.45
	0.5	58.10	55.46	-79.52
	1.0	66.15	63.51	-55.26
	1.5	63.83	61.19	-64.06
	2.0	64.51	61.87	-63.78

The enthalpy change (ΔH^o_{ads}) and the entropy change (ΔS^o_{ads}) were determined using transition state equation given in Equation 6 (Abakedi *et al.*, 2024).

$$\ln \left(\frac{CR}{T} \right) = \left[\ln \left(\frac{R}{Nh} \right) + \left(\frac{\Delta S}{R} \right) \right] - \left(\frac{\Delta H}{RT} \right) \quad 6$$

Where CR is the corrosion rate of mild steel determined from the weight loss experiment, R is the universal gas constant (8.314 JK⁻¹mol⁻¹), N is the Avogadro's number (6.02214 × 10²³ mol⁻¹), h is Planck's constant (6.62607 × 10⁻³⁴ Js), T is the absolute temperature in kelvin, ΔH^o_{ads} is enthalpy change, and ΔS^o_{ads} is entropy change.

Figure 4(b) shows the transition state plot of ln (CR/T) versus 1/T (K⁻¹) for mild steel in 1.0 M HCl in the absence and presence of different concentrations of *D. trifasciata* (Laurentii). The enthalpy change (ΔH^o_{ads}) of adsorption was obtained from the gradient of (-ΔH^o_{ads}/R) and the entropy change (ΔS^o_{ads}) of adsorption was obtained from the intercepts of [ln(R/Nh) + ΔS^o_{ads}/R]. The values of (ΔH^o_{ads}) and (ΔS^o_{ads}) were calculated and presented in Table 4. From Table 4, the positive value of (ΔH^o_{ads}) indicated that the adsorption process was endothermic (heat was absorbed from the surroundings by the system) which also showed that the adsorption process was physisorption. The negative values of (ΔS^o_{ads}) in the absence and presence of *D. trifasciata* (Laurentii) showed a decrease in the degree of disorderliness of the system.

ADSORPTION ISOTHERM

To understand the nature of adsorption, the surface coverage (Θ) values obtained were fitted in the Langmuir, Temkin,

Freundlich and El-Awady adsorption isotherms; and Freundlich adsorption isotherm expressed in Equation 7 gave the best fit. (Obot *et al.* 2022).

$$\log \Theta = \log K + n \log C \quad 7$$

where C is the concentration, K_{ads} is the adsorption equilibrium constant, Θ is the surface coverage and 'n' is the interaction parameter. Linear Plot of log θ versus log C gave straight lines (Fig. 5), with gradients of 'n' and intercepts of log K_{ads}, demonstrating that the adsorption of *D. trifasciata* (Laurentii) on mild steel surface conformed to the Freundlich adsorption isotherm. The values of K_{ads}, also presented in Table 5 were evaluated from the intercepts of the graph.

ΔG^o_{ads} value was obtained following Fatima *et al.* (2019) as seen in Equation 8

$$K_{ads} = \frac{1}{55.5} \exp \frac{-\Delta G_{ads}}{RT} \quad 8$$

Negative values of ΔG^o_{ads} showed a spontaneous adsorption of the inhibitor molecules on the surface of the metal Obot *et al.* (2022). From (Table 5), values of equilibrium constant are relatively small and decreased as temperature increased, indicating a physisorption mode of reaction which related with the work done by Obot *et al.* (2022). According to (Ituen *et al.*, 2017; Suleiman and Salihu, 2017) ΔG^o_{ads} values at or less negative than - 20 kJ/mol indicate a physisorption reaction and ΔG^o_{ads} values less negative than - 40 kJ/mol are considered as a chemisorption mode of reaction. Thus, the adsorption process of *Dracaena trifasciata* on mild steel in 1.0 M HCl was by physisorption mechanism.

Table 5: Adsorption parameters from Freundlich isotherm for mild steel in 1.0 M HCl containing different concentrations of *D. trifasciata* (Laurentii) at 303 K to 333 K.

Inhibitor	Temp (K)	Activation Parameters				
		Intercept	Slope (n)	K _{ads}	ΔG (kJ/mol)	R ²
Laurentii	303 K	-0.4359	0.7395	0.3665	-7.5896	0.9902
	313 K	-0.6003	0.7841	0.2510	-6.8546	0.9750
	323 K	-0.7435	0.8815	0.1805	-6.1886	0.8606
	333 K	-0.8762	1.2240	0.1330	-5.5338	0.9203

CONCLUSION

In this study, the following conclusions were drawn: *D. trifasciata* (Laurentii) extract has been shown to be a good inhibitor of mild steel in 1.0 M HCl solution. The inhibition efficiency increased with increase in concentration of the extract, though the inhibition efficiency decreased with increase in temperature signifying the inhibition efficiency as temperature-dependent. The maximum inhibition efficiency (% IE) of *D. trifasciata* (Laurentii) was 60% at 303 K with an optimal concentration of 2.0 g/L. From the thermodynamic parameters derived, corrosion inhibition process of *D. trifasciata* (Laurentii) extract was endothermic in nature, and the adsorption process of the extract on the surface of mild steel obeyed Freundlich adsorption isotherm. Negative values of ΔG_{ads}^0 demonstrated spontaneous adsorption of the extract on the surface of mild steel. GC-MS analysis showed Isopropyl linoleate, Propyleneglycol monooleate, 1,5,9-Undecatriene, 2,6,10-trimethyl-, (Z)- and 1,5,9-Decatriene, 2,3,5,8-tetramethyl- as the outstanding compounds present in the plant. Functional groups obtained from FT-IR analysis of *Dracaena trifasciata* extract revealed the presence of Ester, Acid anhydride, Alcohol, Alkane, Alkene and Carboxylic acid. Other methods like Potentiodynamic Polarization, Electrochemical Impedance Spectroscopy, Scanning Electron Microscopy and Computational studies could be investigated for industrial applications.

REFERENCES

- Abakedi, O. U., Ekpo, V. F. and John, E. E. (2016). Corrosion Inhibition of Mild Steel by *Stachytarpheta Indica* Leaf Extract in Acid Medium. *The Pharmaceutical and Chemical Journal*, 3(1):165-171.
- Abakedi, O. U., James, M. A. and Udongwo, A. M. (2024). Adsorption Characteristics and Inhibition Effect of *Telfairia occidentalis* Stem Extract on Mild Steel Corrosion in Acidic Medium. *Journal of Materials and Environmental Science*, 15(9): 1282-1293.
- Babu, K. and Prabhu, D. S. (2023). Studies on anatomy, physico-chemical and thin layer chromatography of rhizome, root and leaf of *Dracaena trifasciata* (Prain) Mabb. *Journal of Pharmacognosy and Phytochemistry*, 12(1): 668-671.
- Babu, K. and Prabhu, D. S. (2024). *Dracaena trifasciata* (Prain) Mabb. – Traditional use, pharmacognosy, phytochemistry and pharmacology: A comprehensive review. *Journal of Phytopharmacology*, 13(3): 235-241.
- Utam, Phytochemical Analyses and Thermodynamic Studies of Ethanol Extract of *Dracaena Trifasciata* (Laurentii) as Corrosion Inhibitor for Mild Steel in 1.0 M HCl Solution <https://dx.doi.org/10.4314/wojast.v16i1.36>
- BoEKOM, E., Essien, K. E., Ekpo, V. F. and Obot, A. (2020). Kinetics, molecular dynamics and adsorption behaviour of pyridine on mild steel in 0.1M HCl solution. *Elixir International Journal*, 142: 54382-54387.
- Fatima, S., Sharma, R., Asghar, F., Kamal, A., Badshah, A. and Kraatz, H. B. (2019). Study of new amphiphiles based on ferrocene containing thioureas as efficient corrosion inhibitors: gravimetric, electrochemical, SEM and DFT studies. *Journal of Industrial and Engineering Chemistry*, 76: 374-387.
- Ituen E, Akaranta O, James A. (2017). Electrochemical and anticorrosion properties of 5-hydroxytryptophan on mild steel in a simulated well-acidizing fluid. *Journal of Taibah University for Science*, 11:788–800.
- Jackson, E. and Essien, K. E. (2019). Experimental and theoretical approach of L-Methionine sulfone (LMS) as corrosion inhibitor for mild steel in HCl solution. *Elixir International Journal*. 129: 52983-52988.
- Obodom, M. I., Akpan, I. A. and Abakedi, O. U. (2023). Gravimetric and Electrochemical Assessments of the Corrosion Inhibition Potential of *Cola nitida* seeds Extracts on Mild Steel Surface in Hydrochloric Acid (HCl) Solution. *Asian Journal of Chemical Sciences*, 13(6): 118-131.
- Obot, A. S., Boekom, E. J., Ita, B. N. and Utam, E. C. (2022). Kinetics consideration of ethanol leaves extract of *Costus lucanusianus* as green corrosion inhibitor for mild steel and aluminium in HCl solution. *International Journal of Research*, 10(1): 106-118.
- Rahman, H. (2022). Literature Review. *Sansevieria trifasciata* fibre. Bgmea University of Fation and Technology. 1-9.
- Santosh, K., Harsimran, S. and Rakesh, K. (2021). Overview of corrosion and its control: A critical review. *Proceedings on Engineering Sciences*, 3(1): 13-24.
- Suleiman, I. Y. and Salihu, S. A. (2017). Characterizations of plant extract by AAS and GC-MS as green inhibitor for mild steel in 1.0 M HCl. *Iran Journal of science and Technology*, 42(4): 1977-1987.
- Tan, B., He, J., Zhang, S., Xu, C., Chen, S., Liu, H. and Li, W. (2020). Insight into anti-corrosion nature of *Betel* leaves water extracts as the novel and eco-friendly inhibitors. *Journal of Colloid and Interface Science*, 582: 287-301.