

Ecuadorian *Musa acuminata* peel extract as potential corrosion inhibitor for admiralty brass

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Introduction

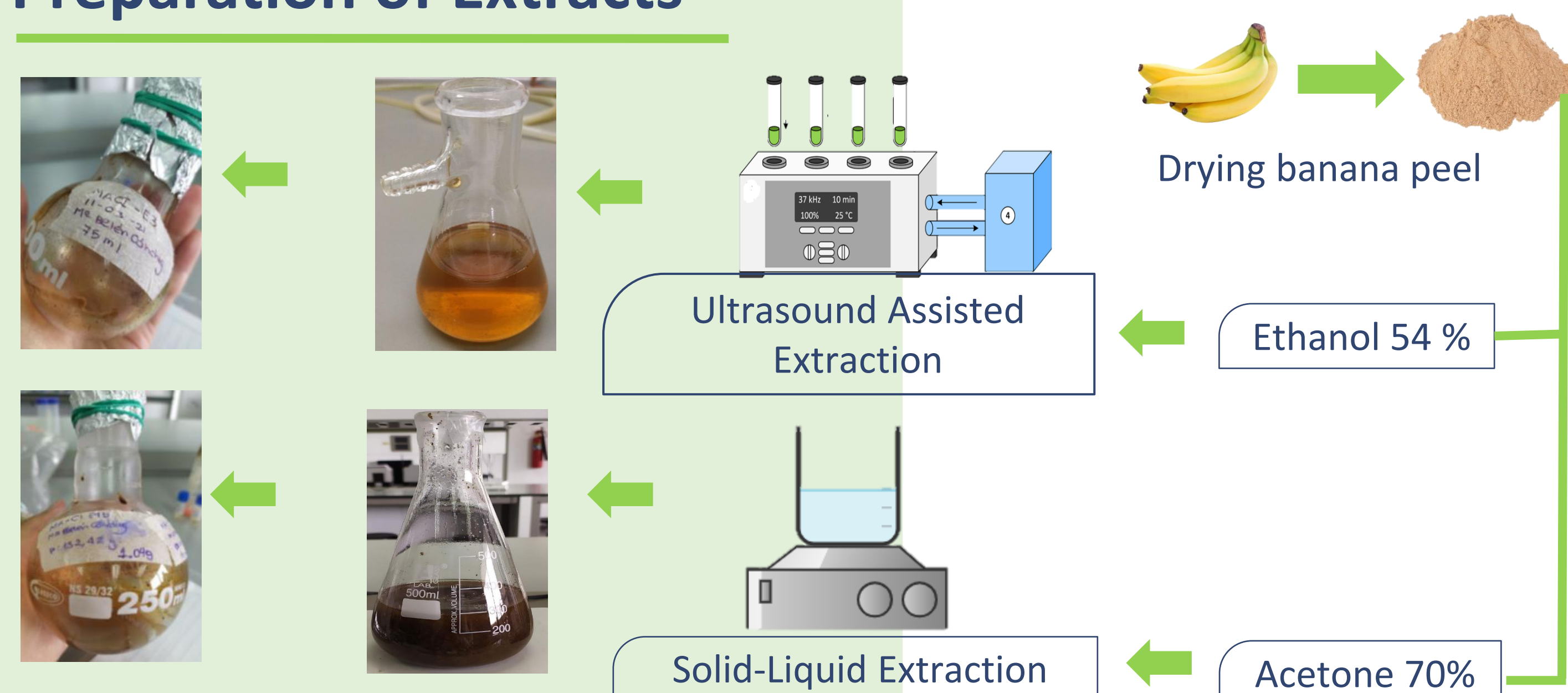
The admiralty copper alloy (CDA 443) is frequently used to manufacture heat exchangers in cooling water systems in most refineries¹. To clean these heat exchangers used diluted acid solutions, which have to be inhibited to avoid corrosion damage. An alternative source of corrosion inhibitors is natural products. Ecuadorian bananas not qualified for export, approximately 350 000 tons, are consumed locally. The waste of this product can be used within the context of the circular economy.

Objectives

The objective of this work was to carry out the phytochemical analysis of acetonic and ethanolic extracts from Ecuadorian *Musa acuminata* peel and preliminary to determine the corrosion inhibition efficiency. In this way, this product will be given added value.

Methodology

Preparation of Extracts



Conclusions

- Qualitative phytochemical analysis indicates that ethanolic and acetonic extracts exhibited carbohydrates, glycosides, phenols, flavonoids, phytosterols and tannins.
- The total content of higher phenolic compounds is contained in extract acetonic (38 ± 1 mg GAE/g of dry matter)
- Acetonic extract presented a percentage of inhibition efficiency for copper admiralty in HCl of 34.72% while that ethanolic extract showed of -0.19%.
- The maximum DPPH scavenging percentage was 80.57% in the ethanolic extract. However, only the acetonic extract showed corrosion inhibition. Therefore, it could be stated that the anticorrosion activity not be a determining factor for the inhibition activity.

References

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- (4) Al-Nemari, R.; Al-Senaidy, A.; Semlali, A.; Ismael, M.; Badjah-Hadj-Ahmed, A. Y.; Ben Bacha, A. GC-MS Profiling and Assessment of Antioxidant, Antibacterial, and Anticancer Properties of Extracts of Annona Squamosa L. Leaves. *BMC Complement. Med. Ther.* 2020, 20 (1), 1–14. <https://doi.org/10.1186/s12906-020-03029-9>.

Results

Qualitative analysis

Table 1. Phytochemical screening of ethanolic and acetonic extraction of *Musa acuminata*.

Secondary Metabolites	Ethanolic	Acetonic
Alkaloids	-	-
Aminoacids	-	-
Carbohidrates	+	+
Glycosides	+	+
Phenols	+	+
Tannins	+	+
Quinones	-	-
Terpenoids	-	-
Saponines	-	-

Quantitative analysis

Table 2. Total phenolic content, flavonoid and antioxidant activity of ethanolic and acetonic extraction of *Musa acuminata*.

Extract	TPC	TFC	DPPH
Ethanolic	32 ± 1	15.53 ± 0.09	17.30 – 80.56
Acetonic	38 ± 1	14.90 ± 0.08	34.85 – 76.26

TPC (mg GAE/g of dry matter), TFC (mg QE/g of dry matter), DPPH (% scavenging activity)

Fourier Transform Infrared Spectroscopy (FTIR)

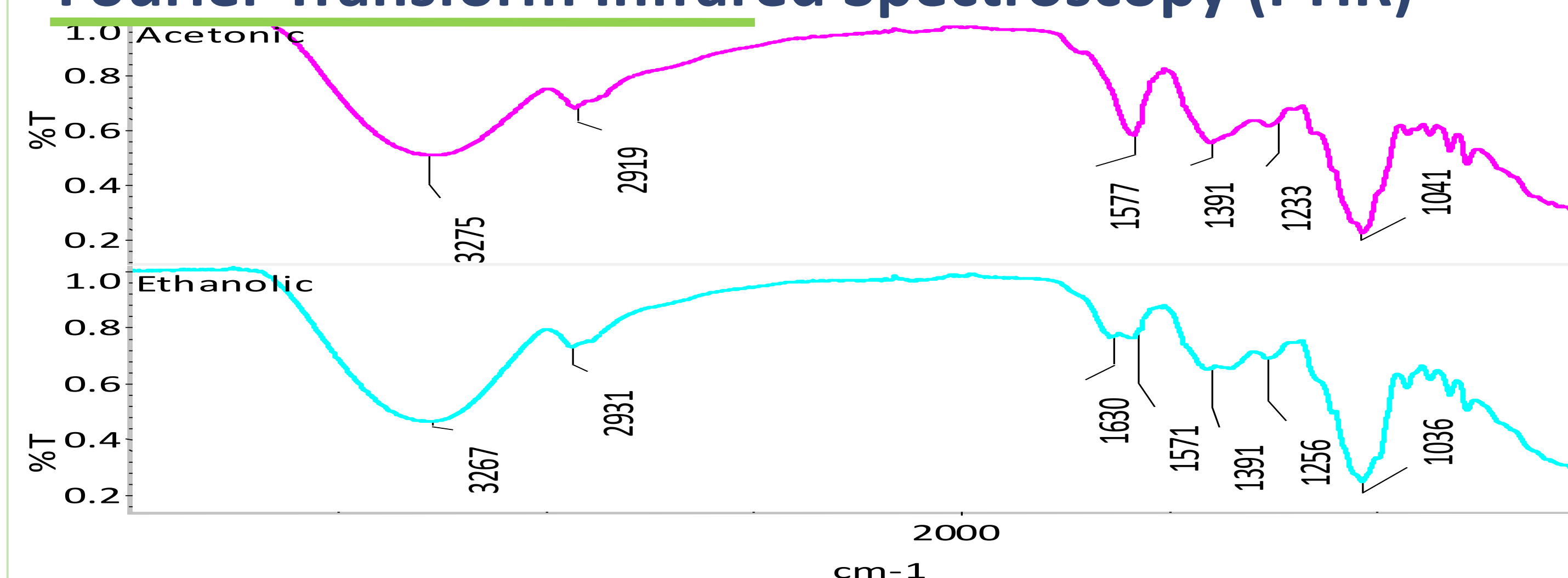


Figure 1. FT-IR spectra of ethanolic and acetonic extraction of *Musa acuminata*. FTIR was used to identify the functional groups present in the extracts. O-H, C=O and C-O stretching vibrations confirmed the presence of phenols compounds.

Electrochemical studies

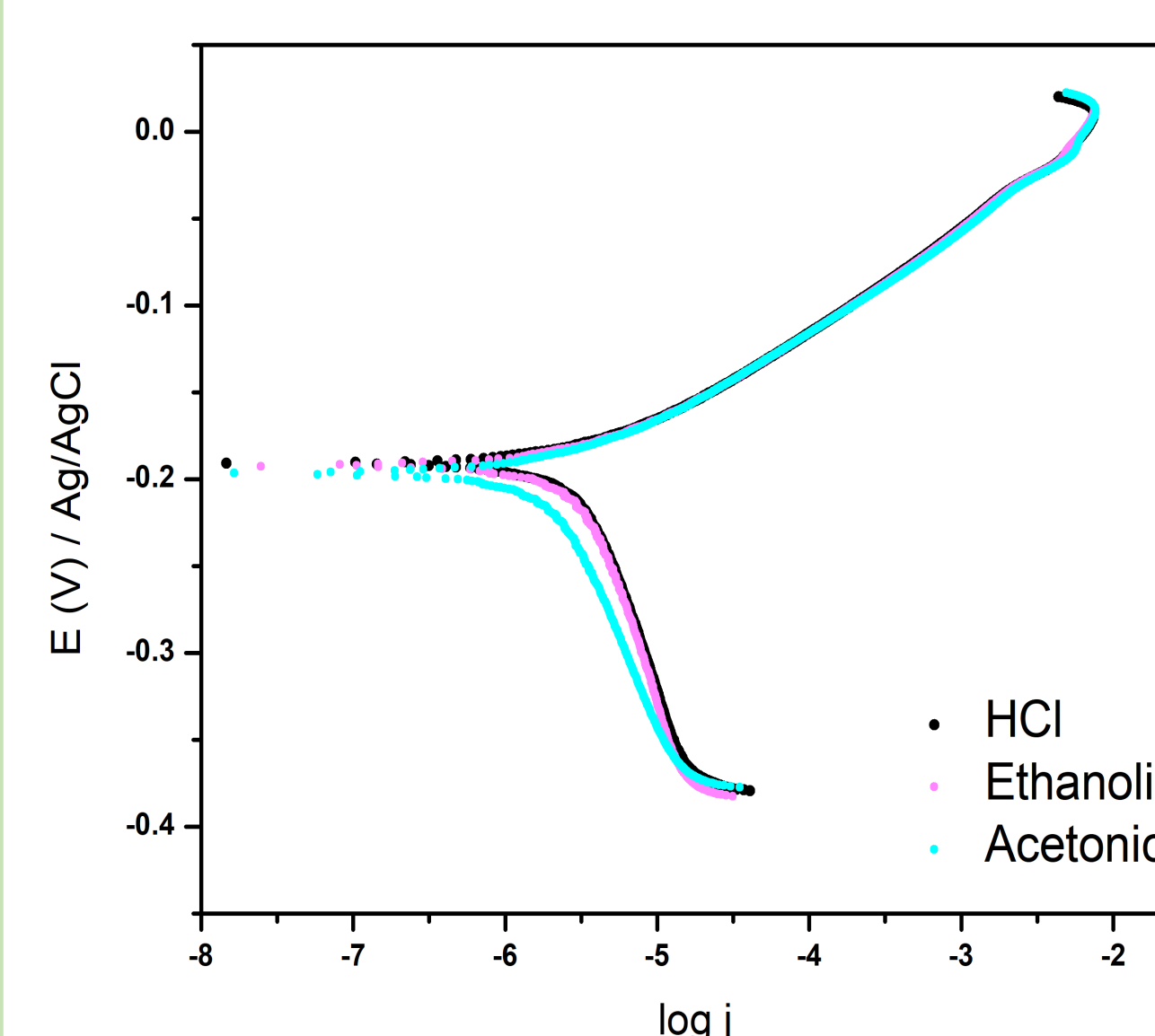


Figure 2. Potentiodynamic polarization curves for admiralty brass in HCl 0.5M (black) + 70 ppm of ethanolic extract (pink) + 70 ppm of acetonic extract (blue) of *Musa acuminata* at 25 °C.

Table 2. Tafel polarization parameters obtained for admiralty brass in 0.5 M HCl in the absence and presence of *Musa acuminata* extracts.

Parameter	HCl	Ethanolic	Acetonic
E _{corr} (V)	-0.19083	-0.19263	-0.19876
β_c (mV/dec)	247.6	252.8	202.9
β_a (mV/dec)	45.938	48.528	43.575
j _{corr} (μ A/cm ²)	10.5760	10.5960	6.9042
IE%	-	-0.19	34.72
R _p (Ω)	5627.6	5901.9	7980.2
IE%	-	4.65	29.48