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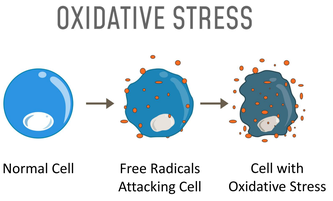
DNA Barcode, chemical analysis, and antioxidant activity of *Psidium guineense* from Ecuador

PROBLEM

Oxidative stress, caused by an imbalance between reactive oxygen species (ROS) and the body's antioxidant defenses, is a key factor in the development of chronic diseases, including diabetes, cancer, cardiovascular diseases, neurodegenerative disorders, respiratory diseases and others. Synthetic antioxidants (e.g., BHA, BHT) have limitations, including potential toxicity. Thus, natural antioxidants from plants, particularly polyphenols and flavonoids, are sought as safer alternatives.

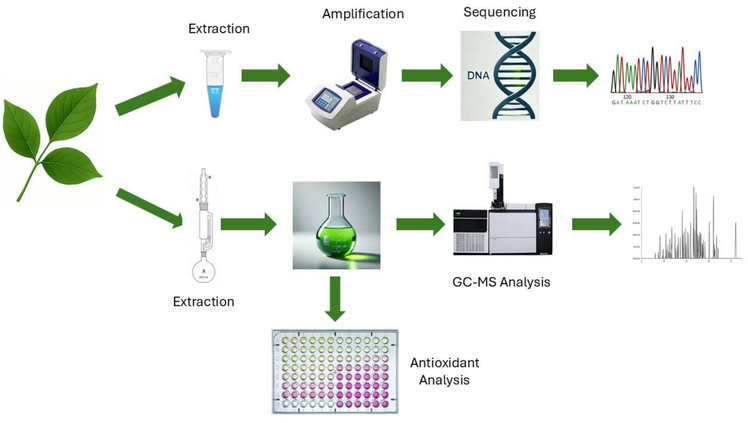


GENERAL OBJECTIVE

To characterize *P. guineense* through DNA barcoding and the chemical composition of leaf extract (methanol, ethyl acetate, dichloromethane and hexane) by phytochemical analysis, GC-MS and evaluation of its antioxidant activity, contributing to biodiversity conservation and highlighting its potential in nutrition and medicine.

PROPOSAL

This study characterizes Ecuadorian *Psidium guineense* through DNA barcoding (9 loci), phytochemical profiling, GC-MS, and antioxidant assays (DPPH/FRAP/ABTS). We assess its genetic diversity, bioactive compounds (e.g., polyphenols), and free radical scavenging capacity to validate its nutraceutical potential. The integrated approach provides foundational data for conservation and biomedical applications.



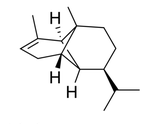
RESULTS

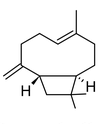
Phytochemical screening

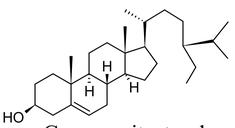
Phytochemical screening detected catechins, saponins, triterpenoids, steroids, flavonoids, alkaloids, reducing sugars, tannins, phenolic compounds, oils and fats. Ethereal, alcoholic and aqueous extracts showed high alkaloid content.

GC-MS Analysis

A total of 65 compounds were identified, including monoterpenes, diterpenes, carboxylic acids, sesquiterpenes and oxygenated sesquiterpenes. Alpha-copaene was the most prominent chemical constituent (10,26%), followed by caryophyllene (6,79%) and gamma-sitosterol (1.4%).


Alpha-copaene


Caryophyllene


Gamma-sitosterol

DNA barcode analysis

BLAST analysis indicated the presence of *Psidium spp.* using the sequences available in the nr database, including plastid genomes and single-locus sequences. The *matK* barcode could be used to differentiate species of *Psidium*, as different clades are formed, specially of *P. guajava* and *P. guineense*.

Total phenolics and flavonoids content and Antioxidant Activity

Leaf extracts showed high phenolic and flavonoid contents and strong antioxidant activity.

ABTS radical cation inhibition activity (mg TE/g)	DPPH radical scavenging activity (mg TE/g)	Ferric reducing antioxidant power (mg TE/g)	Total phenolic content (mg GAE/g)	Total flavonoid content (mg QE/g)
1.25 ± 0.01	0.57 ± 0.04	105.52 ± 4.84	54.34 ± 0.49	6.43 ± 0.27

CONCLUSIONS

- Phytochemical screening revealed the presence of secondary metabolites, such as polyphenols and alkaloids.
- This study provides insights into the bioactive potential of *Pdidium guineense* leaf extracts through a comprehensive analysis of its chemical profile, with high phenolic and flavonoid content, and high antioxidant activity.
- The study provides the first genetic characterization of this species, contributing to genetic diversity assessments and phylogenetic studies.
- The *marK* and ITS1 barcodes have demonstrate their utility in distinguishing *P. guineense* at species levels.