Institute of Pharmaceutical Research (INIFAR)
University of Costa Rica
Global Health, Biodiversity and New Medicines Seminar

Exploring Costa Rica's potencial for novel drug development

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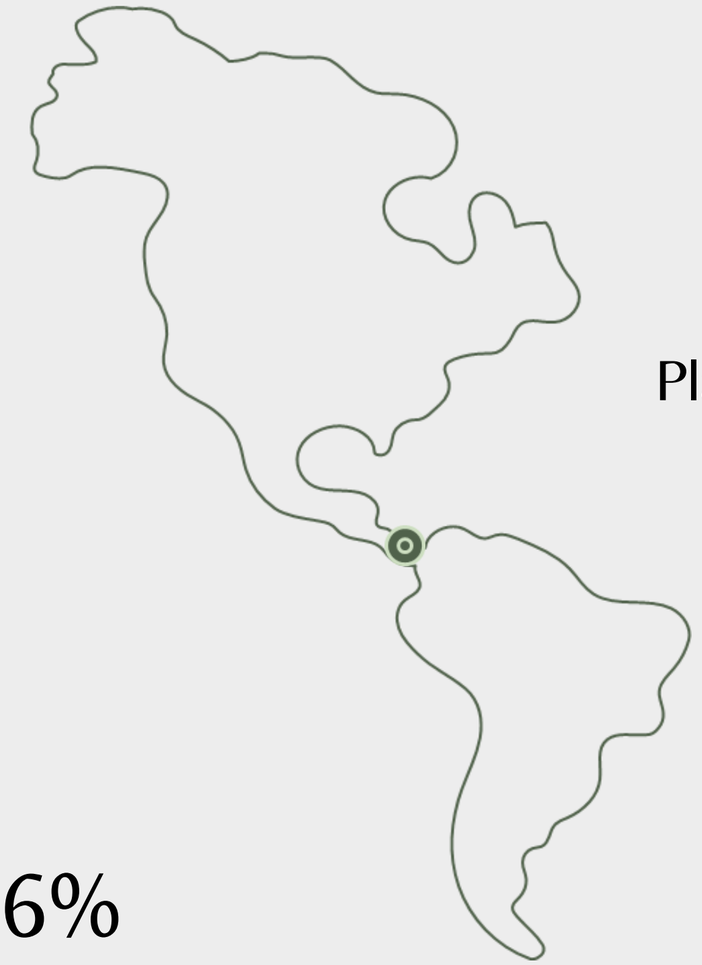
2023

INIFAR Instituto de Investigaciones Farmacéuticas

UNIVERSIDAD DE COSTA RICA

500000

Species in Costa Rica



11500

Plant species in the country

12%

Endemic species

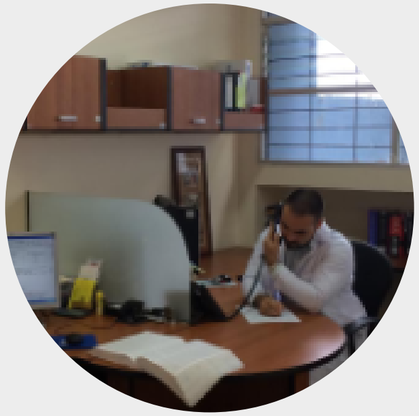
6%

Of the world's biodiversity

- Overestimation of the possible effects of certain plants.
- Interest in medicinal plants is increasing globally.
- Increase in global consumption and trade in medicinal plants and herbal products.

INIFAR

LAYAFA
Pharmaceutical Analysis
and Consulting Laboratory



CIMED
National Center for
Drug Information

LABIOFAR
Biopharmacy and
Pharmacokinetics Laboratory

LAFITEC
Phytopharmacology,
Pharmaceutical and Cosmetic
Technology Laboratory

LAPONABi
Polymers, Nanotechnology
and Pharmaceutical
Biotechnology Laboratory

INIFAR/LAFITEC

Tours with biologists around Costa Rica → Botany workshop for plant identification

↓

Sample collection → Extraction

↓

Phytochemical tests/ in vitro, ex vivo and in vivo models → Results analysis


22 nov. 2022 5:00:34 p. m
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133° SE
Calle 506
San Carlos
Provincia de Alajuela
Altitud:360.2m
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Av. 323
ZETA TRECE
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Extracto etanólico 50:50
Pitahaya Variedad 2: Purpus
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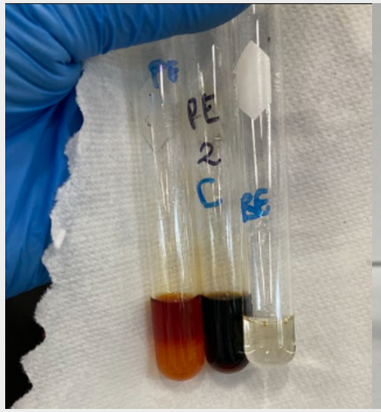
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Myrtaceae		
Specie	Location	Family usefulness
Calyptranthes guanacastensis	Northwest region of Guanacaste mountain range	• Treat influenza and cough • Treat abdominal pains • Antiemetic • Treat toothache • Treat rheumatism • Treat nerve crises • Treat diarrhea • Treat abuse of alcoholic beverages
Myrcia pauliijonesii	Surroundings of Chal bay in Osa peninsula	
Myrcia riverae	Dulce gulf and Osa peninsula	

Passifloraceae		
Specie	Location	Family usefulness
Passiflora soliana	Specie endemic to Costa Rica	• Airways congestion • Insomnia • Skin conditions • Treat helminths • Treat cold • Treat scurvy • Treat tuberculosis • Protects the stomach from gastric acids • Aphrodisiac • Calming and sedative • Diuretic
Passiflora chimuensis	Humid forests of the Caribbean, in the foothills of the Central Volcanic range and Talamanca	
Passiflora costarricensis	Specie endemic to Costa Rica	

Polypodiaceae		
Specie	Location	Family usefulness
Lellingeria vargasiana	Coco Island National Park	• Treat skin tumors • Anti-inflammatory • Treat vitiligo, psoriasis, and atopic dermatitis
Stenogrammitis grammitoides		

TEST IN PROGRESS

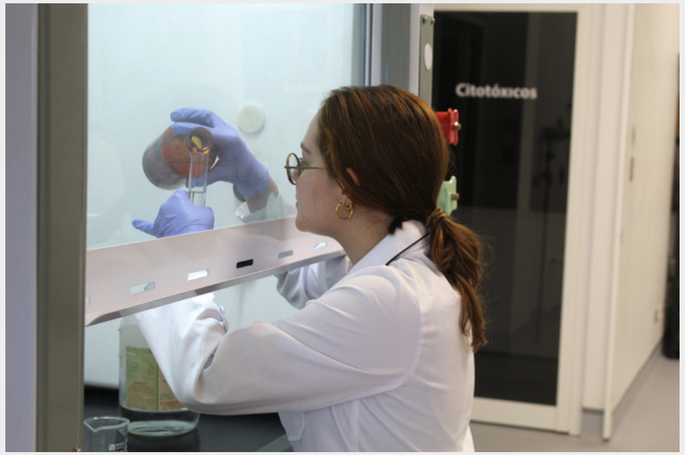
2023: 8 species are being studied

- *Mucuna pruriens and Mucuna uriens*
- *Tynanthus croatianus and Tynanthus macranthus*
- *Plinia costarricensis*
- *Licania platypus*
- *Witheringea solanacea*
- *Hylocereus undatus*
- *Ilex aquifolium*
- *Gonolobus edulis and Gonolobus taylorianus*

Witheringea solanacea

Licania platypus

PHYTOCHEMICAL PROFILE



Dragendorff (alkaloids), Mayer (alkaloids), Wagner (alkaloids), Tollens (carbohydrates), Molish (carbohydrates), Fehling (reducing carbohydrates), Benedict (reducing carbohydrates), Shinoda (flavonoids), Pews (flavonoids), Carr-Price (carotenes), Perchloric Acid (terpenes), Ammonium Molybdate IV (terpenes), Tortelli-Jaffe (terpenes), Sudan (fats), Kedde (cardiotonic glycosides), Guignard (cyanogenic glycosides), Cooling (mucilages), Rosenthaler (saponins), Foam (saponins), Bornträger-Kraus (quinones), Nihydrin (amino acids), Formaldehyde-HCl (condensed tannins), Salkowski (terpenes), Gelatin-Salt (tannins), FeCl3 (gallic and catechinic tannins), Lieberman- Buchard (steroids), Rosenheim (anthocyanins), Ferric hydroxamate (sesquiterpene lactones).

Study of the effect on intestinal motility of fractions of the ethanolic extract of *Licania platypus* leaves in an isolated organ model in HSD rats: Sprague Dawley for the identification of the extract with the highest activity.

Phytochemical profile results: Carbohydrates, reducing sugars, proteins, soluble phenols, saponins, coumarins, flavonoids, steroids, and triterpenes. The presence of tannins were found only in the extracts from Guanacaste and San Ramón.

Pharmacological activities:

- Inhibition of the cholinergic pathway, specifically due to a non-competitive muscarinic antagonist effect and the release of NO by the NO/cGMP system, are possible mechanisms of pharmacological action involved in the antispasmodic effect of the metabolites present in the ethanolic extract leaves.
- The metabolites present in the ethanolic extract of leaves do not seem to interfere with the serotonergic pathway that participates in the contraction of intestinal smooth muscle.
- Antibacterial activity was also found with a MIC of 5mg/mL.

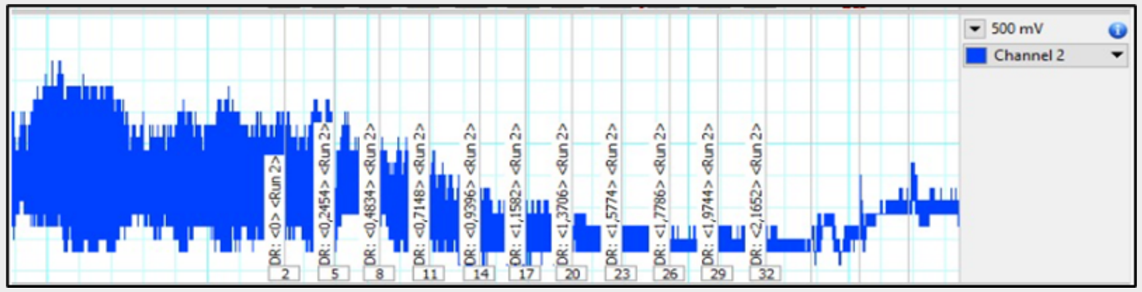
Pharmacological activities of hydroalcoholic extracts of the aerial part and fruit of the *Witheringia solanacea* plant

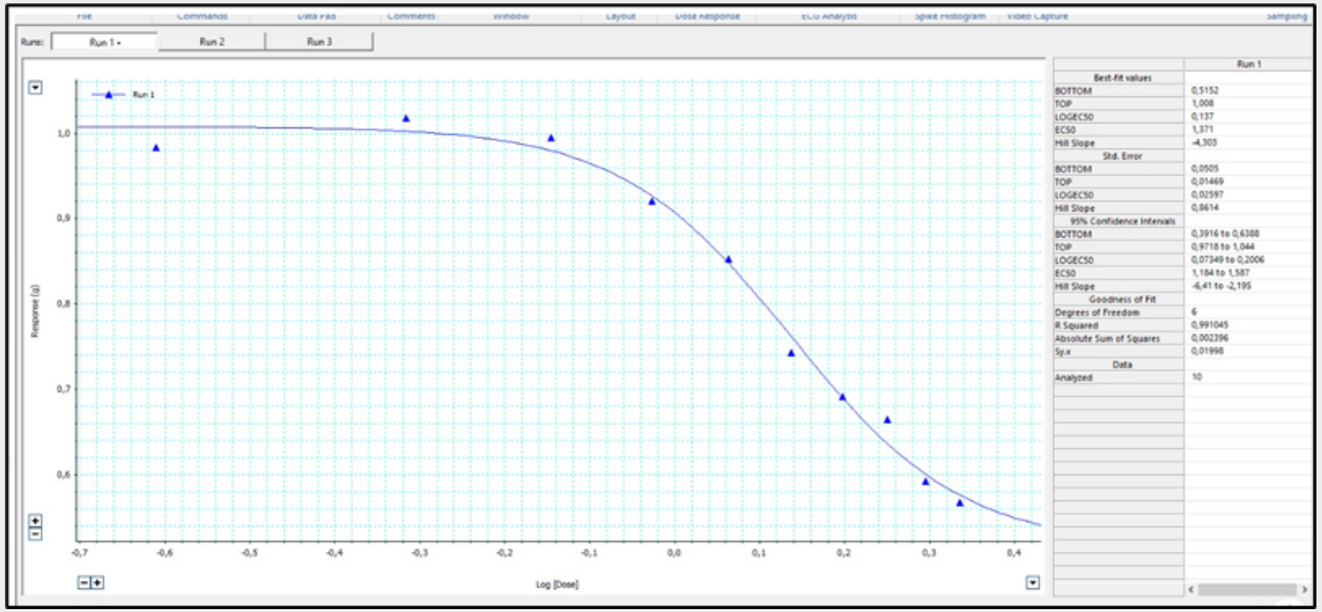
- Phytochemical screening: Phenolic compounds, flavonoids, coumarins, anthroquinones, cardiotonic glycosides, triterpenes and phytosterols. Only the fruit extract presented alkaloids.

- Fruit extract: Greater amount of phenolic compounds and total flavonoids, and a greater antioxidant capacity compared to the hydroalcoholic extracts from the aerial parts.

- The antioxidant activity of the plant is considered low.

AERIAL PART EXTRACT





- Antimicrobial activity with a MIC of 5 mg/mL, without reaching a bactericidal effect = weak antibacterial effect of the extracts.
- Relaxing effect on the muscular contraction of the intestine isolated in an organ bath system.
- Anti-inflammatory activity in the paw edema model, but not in the ear edema model.
- Appears to have low toxicity according to OECD protocols.

BIODIVERSITY LAW 7788

- Purpose: To conserve biodiversity and the sustainable use of resources in Costa Rica, as well as to fairly distribute the benefits and costs derived from it. In addition, it seeks to promote scientific research, environmental education and citizen participation in the conservation of biodiversity.

- Biodiversity protection: Establishes measures for the protection and conservation of ecosystems and endangered species. It also focuses on the conservation of wilderness areas and critical habitats for biodiversity, such as national parks, biological reserves, and biological corridors.

- Research and education: Promotes scientific research and environmental education as fundamental tools for the conservation of biodiversity. It establishes mechanisms to promote the generation of scientific knowledge about biodiversity and its sustainable use, as well as to disseminate this knowledge through educational programs.

- Access to genetic resources: The law regulates access to the genetic resources of Costa Rican biodiversity. It establishes a framework to ensure that access to these resources is legal, equitable and in a sustainable manner.

BIODIVERSITY LAW 7788

Are excepted from patent protection:

1.- The sequences of deoxyribonucleic acid, nucleotides and amino acids as they are found in nature or sequences of deoxyribonucleic acid, nucleotides and amino acids that do not meet the patentability requirements, as established in Law No. 6867, of April 25, 1983, and its reforms.

2.- Plants and animals.

3.- Microorganisms as they are found in nature.

4.- Essentially biological procedures for the production of plants or animals, other than non-biological or microbiological procedures.

5.- The natural processes or cycles themselves.

6.- Inventions essentially derived from knowledge associated with traditional or cultural biological practices in the public domain.

7.- Inventions whose commercial exploitation must necessarily be prevented to protect public order or morality, or to protect the health or life of people or animals or to preserve plants, or to avoid serious damage to the environment.

BIODIVERSITY LAW 7788

ARTICLE 66.-

Right to cultural objection The right for local communities and indigenous peoples to oppose access to their resources and associated knowledge, for cultural, spiritual, social, economic or other reasons, is recognized

ARTICLE 80.-

Mandatory prior consultation Both the National Seed Office and the Intellectual Property and Industrial Property Registries must consult the Technical Office of the Commission before granting intellectual or industrial property protection to innovations that involve elements of biodiversity. They will always provide the certificate of origin issued by the Technical Office of the Commission and the prior consent

BIODIVERSITY LAW 7788

The basic requirements for access will be:

1.-The previously informed consent of the representatives of the place where the access materializes, ... the regional councils of Conservation Areas, the owners of farms or the indigenous authorities, when it is in their territories.

2.-The endorsement of said previously informed consent, from the Technical Office of the Commission.

3.- The terms of technology transfer and equitable distribution of benefits, when any, agreed in the permits, agreements and concessions, as well as the type of protection of the associated knowledge required by the representatives of the place where the access materializes.

4.-The definition of the ways in which said activities will contribute to the conservation of species and ecosystems

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¡THANKS!

¿Questions and comments?

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