# EVALUATION OF THE IN VITRO ANTIBIOTIC ACTIVITY OF THE ETHANOLIC EXTRACT OF PURPLE IPÊ (HANDROANTUS IMPETIGINOSUS)

**Anna Victória Gonçalves Martins** [1]

**Rafaella Yokota Guedes**[2]

**Karine Harumi de Castro Shimazaki**[3]

**Bianca Rafaela de Souza Sá**[4]

**Rodrigo Scaliante de moura**[5]

**Universidade Evangélica de Goiás – UniEVANGÉLICA**[12345]

## ABSTRACT

Purple Ipê (*Handroantus impetiginosus*) is popularly known for its various medicinal actions. Some biological activities, including antimicrobial ones, have already been tested and found in the plant's components, notably lapachol and other secondary metabolites such as coumarins, flavonoids, and tannins. This study aimed to evaluate the antibiotic activity of the ethanolic extract of *Handroantus impetiginosus* bark against strains of *Staphylococcus Aureus, Staphylococcus agalactiae, Streptococcus pyogenes, Enterococcus faecalis, Escherichia Coli, Pseudomonas aeruginosa, Salmonela typhimurium* and *Klebsiella pneumoniae carbapenemase* using the Minimum Inhibitory Concentration (MIC) technique. The results suggest that the plant's ethanolic extract has better antimicrobial potential against Gram-positive bacterial strains.

**Keywords**: purple ipê; antibiotic; herbal medicine.

## INTRODUCTION

Purple Ipê (*Handroanthus impetiginosus*) is a plant native to the Brazilian Cerrado, traditionally known for its medicinal applications, being used in antimicrobial, antifungal, antioxidant, and antineoplastic treatments. Its various bioactive compounds support its traditional therapeutic efficacy, with the inner bark

[1] Acadêmica de medicina, Universidade Evangélica de Goiás, annavictoriamartins1@gmail.com

and the decoction method being the most suitable for producing medicinal extracts and the most commonly used in folk medicine (FELIPE, 2023).

The species contains substances in its core such as lapachol, a naphthoquinone with significant antimicrobial activity reported in the literature. The ethanolic extract of purple ipê flowers also presents secondary metabolites such as coumarins, tannins, flavonoids, steroids/triterpenoids, which may be correlated with the plant's antimicrobial effects (MORAES, 2020).

Given the ineffective control of bacteria resistant to antimicrobials due to the abusive use of antibiotics, research for new drugs as well as new therapeutic approaches such as potential associations of antimicrobials is necessary (CAMELO, 2024). Thus, this work aimed to verify the antimicrobial activity of the ethanolic extract of purple ipê inner bark against different bacterial strains through the analysis of the Minimum Inhibitory Concentration (MIC).

## METHODOLOGY

The study was qualitative-quantitative and experimental in nature, with a comparative approach, conducted in the microbiology laboratories of the Evangelical University of Goiás (UniEvangélica). The research involved the preparation and analysis of the purple ipê inner bark extract, which was dried, macerated, and stored in 99% ethanol under refrigeration. After filtration and drying of the extract using a rotary evaporator, the material was stored in an amber bottle at 4 °C.

The extraction procedure involved grinding the material until a fine powder was obtained, followed by the addition of 99.5% ethanol and protecting the solution from light with aluminum foil, keeping it in a refrigerator for 24 hours. Filtration and repetition of the process were carried out until a clear solvent was obtained. The final extract was evaporated in a rotary evaporator at 45ºC, then stored in a light-protected bottle and refrigerated.

The following bacterial strains were selected: *Staphylococcus aureus* (ATCC 25923), *Streptococcus agalactiae* (clinical isolate), *Escherichia coli* (ATCC 25922), *Pseudomonas aeruginosa* (ATCC 27853), *Salmonella typhimurium* (ATCC 51812), *Klebsiella pneumoniae* (ATCC 700603), *Enterococcus faecalis*,

and *Streptococcus pyogenes* (clinical sample). These strains were cultured in Mueller-Hinton Agar, incubated at 36ºC for 24 hours, and prepared for sensitivity tests.

The antimicrobial activity of the purple ipê extract was evaluated using the microdilution technique in 96-well plates to determine the Minimum Inhibitory Concentration (MIC). The samples were diluted to 2 mg/ml and added to plates containing Mueller-Hinton broth. The extract was tested in serial concentrations up to 3120 ppm. The microdilution technique was performed according to the CLSI M7-A6 NCCLS, 2003 protocol, with adjustments. The bacterial inocula were compared to the 0.5 McFarland scale standard and tested in duplicate. A negative control was included on the test plate. After incubation at 37ºC for 12 to 18 hours, the antimicrobial activity was visualized using the colorimetric method with 0.01% sodium resazurin, where bacterial inactivity was indicated by blue color and activity by pink color.

## RESULTS

Table 1 summarizes the results found with the ethanolic extract on different bacterial species. The results are expressed in mg/ml, where the indicated concentration was the lowest at which inhibition of bacterial growth occurred. As indicated in Table 1, for the concentration of the ethanolic extract, it was noted that Gram-positive bacteria had different MICs in experiments 1 and 2. These bacteria were inhibited even at very low concentrations of the extract, demonstrating a potential application and justifying its evaluation in *in vivo* models. However, Gram-negative bacteria were not inhibited at any concentration in the first experiment and showed little inhibition in the second experiment.

**Tabela 1.** Determinação da CIM do extrato etanólico de ipê roxo frente a diferentes bactérias

| Extrato etanol | Exp 1 | Exp 2 |
|---|---|---|
| Streptococcus agalactiae | 0,015625 | 0,03125 |
| Streptococcus pyogenes | 0,00390625 | 0,03125 |
| Staphylococcus aureus | 0,015625 | 0,125 |
| Enterococcus faecalis | 0,0625 | Sem inibição |
| Escherichia coli | Sem inibição | Sem inibição |
| Klebsiella pneumoniae | Sem inibição | 0,001953125 |
| Pseudomonas aeruginosa | Sem inibição | 1 |
| Salmonella typhimurium | Sem inibição | 0,5 |

**Concentração inibitória mínima expressa em mg/ml.**
**Fonte:** autoria própria

## CONCLUSION

The results obtained so far demonstrate the need for further investigation into the antimicrobial effect of the species to elucidate its best applicability as a therapeutic agent, justifying the performance of *in-vivo* tests that complement the study by also evaluating its safety and toxicity for clinical trials. Furthermore, these additional and more comprehensive experiments are necessary for its use as a new potential antibiotic, especially against Gram-positive bacteria.

## REFERENCES


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