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Antifungal and antibacterial activity of the extract from the fruit of *Aiouea trinervis* Meisn. (Lauraceae)

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Abstract

Aiouea trinervis is a Brazilian shrub species of the Lauraceae family. In this study, the antifungal and antibacterial activity of the hydroethanolic extract 70% of the fruit of *A. trinervis* on the genus *Candida*, *Staphylococcus* and *Salmonella* sp. was evaluated using the paper disk diffusion method. Antifungal activity was observed for *C. albicans* (7-4 mm) and *C. tropicalis* (11-3 mm), and in the antibacterial test for *S. aureus* (9-2 mm) and *S.* serovar *Enteritidis* (14-4 mm) in concentrations greater than 50 mg mL^{-1} of the hydroethanolic extract of the fruit. The results confirm the potential antifungal and antibacterial activity of the hydroethanolic extract of the fruit of *A. trinervis*.

Keywords: *Aiouea genus*. *Candida genus*. *Salmonella* genus. *Staphylococcus* genus.

Introduction

Lauraceae is an economically important family, with 52 genera and approximately 2750 species. It consists mostly of trees or tree-like shrubs that are rich in biologically active secondary metabolites, such as neolignans, g-lactones, alkaloids, phenols, flavonoids, and terpenes. These secondary metabolites have shown different biological properties: cytotoxic[1], Larvicidal[2], antitrypanosomal[3], and genotoxic[4].

Nineteen species inserted in the genus *Aiouea* are recognized, restricted to the neotropical region, occurring in South and Central America, in Brazil 14 species distributed in the Amazon, Caatinga, Cerrado and Pantanal are described[5,6].

The species *Aiouea trinervis* Meisn., 1864 (Laurales, Lauraceae) (**FIGURE 1**) is a shrub that grows in the Brazilian savanna of Goiás, Minas Gerais, Mato Grosso and Mato Grosso do Sul, Brazil, and is considered to be an endangered Brazilian species[7]. In the study phytochemical of Garcez *et al.*[4], the researchers demonstrated, in the fractionation of ethanol extracts from the roots, underground trunk, and the leaves of *A. trinervis* by liquid chromatography isolation, four butanolides: namely (-)-epilitsenolides C-1 and C-2, isoobtusilactone A, and obtusilactone A, and three known lignans: (+)-sesamin, (+)-methylpiperitol, and polyprenol-12.

The biological properties of members from this genus have been scarcely reported and refer to the evaluation of the genotoxic and/or cytotoxic potentials of only two species, namely *A. costaricensis* and *A. trinervis*[3].

It is stimated that about 25% of prescribed drugs in the world are of plant origin[8,9]. Approximately 80% people rely on traditional plant based medicines for their initial health care needs in developing countries due to the high cost[10].The observation of strains resistant to antimicrobial drugs has driven the search for new antimicrobial agents. As discussed, several plant organs of *A. trinervis* are used to verify innumerable biological activities, although they are still unaware of the phytochemical potential of the fruit.

The objective of this study was to evaluate the possible use of fruit hydroethanolic extract of *A. trinervis* was antifungal and antibacterial activities.

FIGURE 1: Fruits *Aiouea trinervis* of in domain Cerrado, phytophysiognomy restricted sense.

Source: Author, 2020.

Material and Methods

Plant material

Fruits of *A. trinervis* were collected in the county of Rio Verde (17°47'18.3'' South and 50°57'57.1'' West), Rio Verde University, Goiás, Brazil. The plant material was identified, and a voucher specimen was deposited with the number HRV at the Herbarium of Systematic laboratory, of Goiano Federal Institute, Goiás, Brazil. Voucher number (HRV 15097).

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Extract fruit production

Fresh *A. trinervis* fruits were dried at room temperature. After that, the dried pulps were separated from their seeds. Additionally, hydroethanolic 70% (*v/v*) extract of *A. trinervis* fruit was prepared by static maceration for 7 days. After extraction, the hydroethanolic solution were completely evaporated under vacuum at about 68°C. Then the reduced extract was lyophilized.

Antifungal and antibacterial assay

Antifungal and antibacterial activity was assessed as described by Vieira *et al.*[11] adapted, using the disk diffusion technique and the results expressed in (mm). Strains of *Candida albicans* (ATCC 10231), *Candida tropicalis* (ATCC 4563), *Candida guilliermondii* (ATCC 90877), *Candida krusei* (ATCC 34135), *Staphylococcus aureus* (ATCC 25923) *Salmonella* serovar *Enteritidis* (ATCC 13076) and *Salmonella* serovar *Typhimurium* (ATCC 14028) were used.

The activation of the microorganisms was carried out in sterile conc. 0.85% NaCl until reaching a degree of 0.5 on the MacFarland scale UV-*Vis* ($1x10^4$ CFU mL^{-1}). Petri dishes (10 cm) containing Sabouraud Dextrose Broth (SDB) (HiMedia) were used for antifungal assay, and Mueller Hinton Broth (MHB) (HiMedia) for bacteriological tests.

The petri dishes were sown with the aid of a sterile swab embedded in the microbial suspension, covering the entire surface of the plate. Then the paper disks (7 mm) impregnated with 50 µL of extract at 500, 200, 50, 25 and 5 mg mL^{-1} were deposited diluted in saline solution with 10% DMSO; a disc soaked in a 10% DMSO solution (negative control) and discs with antimicrobial agents (positive controls), which for the bacteria were Azithromycin (15 µg) and Cephalexin (30 µg), and ketoconazole (50 µg) for yeasts. The tests were performed in triplicate. The plates were incubated at 36°C in an oven for 24-36 hours and then the microbial growth inhibition halos when present were measured.

Statistical analysis

All measured values were expressed as mean ± standard deviation (SD), which were calculated using PAST 3 software. Differences between means ($P \leq 0.05$) were considered significant by the Tukey test.

Results and Discussion

The results showed the inhibition activity of the extract, and it was observed the fungal organisms were resistant to the extract at concentrations below 50 mg mL^{-1} for *C. albicans*, and 25 mg mL^{-1} for *C. tropicalis*. The strains of *C. guilliermondii* and *C. krusei* demonstrated resistance to all concentrations of the extract. The inhibition antibacterial, was observed for *S. aureus* and *S. serovar Enteritidis* only in the largest extract concentrations (500-50 mg mL^{-1}). *S.* serovar *Typhimurium* was shown to be resistant to all usual concentrations (**TABLE 1**). The concentrations of the fruit extract of *A. trinervis*, showed inhibition lower that compared by the two antibiotics and antifungal reference, when evaluated by the Tukey test ($p \leq 0.05$). There was no inhibition of fungal and bacterial growth by the action of the vehicle (DMSO).

Table 1: Antimicrobial activity of hydroethanolic extract of *Aiouea trinervis* fruit.

Microorganisms	Growth inhibition halo (mm)*							
	500	200	50	25	5	Disc 15 µg[a]	Disc 30 µg[b]	Disc 50 µg[c]
C. albicans	7	4	-	-	-			26
C. krusei	-	-	-	-	-			28
C. guilliermondii	-	-	-	-	-			24
C. tropicalis	11	8	3	-	-			29
S. aureus	9	7	2	-	-	24	27	
S. Enteritidis	14	10	4	-	-	28	25	
S. Typhimurium	-	-	-	-	-	29	28	

*Concentrations of the extract determined in mg mL^{-1}. (-) There was no inhibition halo formation. Azithromycin disc[a]. Cephalexin disc[b]. Ketoconazole disc[c].

Data on antibacterial and antifungal activity in *A. trinervis* are scarce. Other Lauraceae genera such as *Aniba* (*A. parviflora*) present studies with potential antimicrobial activity from the essential oil on *Pseudomonas aeruginosa*, *Escherichia coli*, *Staphylococcus epidermidis*, *S. aureus* and *Bacillus cereus*[12].

The experiment was conducted only with four fungus and three species of bacteria, which do not at all indicate the total inactivity against microorganisms. Therefore, further research are essential with other species of bacteria and fungus in concentrations higher than this study.

Conclusion

It is concluded that the extract of the fruit of *Aiouea trinervis* has antifungal activity on *Candida albicans* and *Candida tropicalis*, and antimicrobial on *Staphylococcus aureus* and *Salmonella* serovar *Enteritidis*, suggesting a slight microbiological potential on the strains evaluated.

Financing source

Nenhuma.

Conflict of interests

Não há conflito de interesses.

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Contributors

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