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Research Article

Antibacterial and Antifungal Potential of the Ethanolic Extract of *Praxelis clematidea* R.M. King & Robinson

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ABSTRACT
Praxelis clematidea R.M. King & Robinson belongs to the family Asteraceae. Plants from this family have been extensively studied for the development of new drugs and insecticides. Based on this information, the ethanolic extract of *Praxelis clematidea* was evaluated for antibacterial and antifungal activity. Six bacterial strains and six fungal strains were used in the study for activities. Microdilution method was used for antibacterial and antifungal assay of the ethanolic extract. The results were also compared with the standard drug, Chloramphenicol (100 µg/mL) and Nistatin (100 UI/mL). The obtained results showed activity of the extract ethanolic against *Candida* species, in particular against *Candida albicans*, which highlights the immense antifungal potential of this plant species.

Key words: *Praxelis clematidea*, antibacterial activity, antifungal activity, microdilution method, *Candida* species

INTRODUCTION

Although approximately 20% of the world plants have been submitted to pharmacological or biological test, it could be concluded that natural products from plant origin are an important source to discover new leads with economical and pharmaceutical importance and great possibilities to be developed as drugs, dyes, fragrances and pesticides, among others[1].

Praxelis clematidea R.M. King & Robinson belongs to the Eupatorieae tribe of the family Asteraceae, and consists of 2,400 species distributed in 170 genera[2]. Plants from this family have been extensively studied for their chemical composition and biological activity and some have led to the development of new drugs and insecticides[3,4,5].

In phytochemical studies with ethanolic extract of *Praxelis clematidea* was isolated six flavonoids[6]. This class is increasingly becoming an object of investigation, and many studies have isolated and identified flavonoids that possess antifungal, antiviral and antibacterial activities. In addition, various studies have demonstrated synergy between active flavonoids, and between flavonoids and conventional chemotherapeutic agents[7,8].

Based on promising source of antimicrobial effects provided by species of the family Asteraceae, in particular those containing species flavonoid as secondary metabolites. The aimed of the present study were to investigate the antibacterial and antifungal activities of ethanolic extract of the aerial parts of *Praxelis clematidea* R.M. King & Robinson.

MATERIALS AND METHODS

Preparation of plant extract: The aerial parts of *Praxelis clematidea* R.M. King & Robinson were collected in Lagoa do Paturi, a municipality of Santa Rita, in the state of Paraiba (Brazil), in May 2008. The identification of the botanical material was performed by Prof. Dr. Maria de Fatima Agra, Botany Sector, Laboratory of Pharmaceutical Technology/UFPB "Professor Delby Fernandes de Medeiros". Exsiccates of the plant are deposited in the Prof. Lauro Pires Xavier (JPB) Herbarium, Paraiba Federal University, under the code M. F. Agra et al. 6894 (JPB).

The dried and pulverized plant material (aerial parts, 10 kg) was submitted to exhaustive maceration utilizing ethanol as the extraction solvent (3 × 10 L, every 72 h). The ethanolic solution obtained was concentrated in a rotary evaporator under reduced pressure, resulting in a crude ethanolic extract (600 g).

Bacterial and fungal strains: For antibacterial activity assays, were selected 6 strains of bacteria (*Staphylococcus aureus* - ATCC 13150, *Staphylococcus aureus* - ATCC 25923, *Pseudomonas aeroginosa* - P03, *Pseudomonas aeroginosa* - *ATCC 25853, Escherichia coli* - *ATCC 25922* and *Escherichia coli* - *5*) and for antifungal activity assays, were selected 6 strains of fungi (*Candida albicans* – ATCC 90028, *Candida albicans* – LM 109, *Candida tropicalis* - ATCC 13803, *Candida tropicalis* – LMP 20, *Candida krusei* – LM 13 *and Candida krusei* – LM 08). All the microorganism strains were obtained from the Laboratory of Mycology collection. Bacteria and fungi were kept on Nutrient Agar (NA) slants at 4 °C. Inocula were obtained from overnight cultures grown on NA slants at 37 °C and

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Table 1- Antibacterial activity of the ethanolic extract of *Praxelis clematidea*

Bacterial strains/ Substance	*Staphylococcus aureus* ATCC 25923	*Staphylococcus aureus* ATCC 13150	*Pseudomonas aeruginosa* P 03	*Pseudomonas aeruinosa* ATCC 25853	*Escherichia coli* ATCC 25922	*Escherichia coli* 5
EEPC (1024 µg/mL)	-	-	-	-	-	-
Negative control	-	-	-	-	-	-
Positive control	+	+	+	+	+	+

(-) No inhibition (+) inhibition

Table 2- Antifungal activity of the ethanolic extract of *Praxelis clematidea.*

Fungal strains/ Substance	*Candida albicans* ATCC 90028	*Candida albicans* LM 109	*Candida tropicalis* ATCC 13803	*Candida tropicalis* LM 20	*Candida krusei* LM 13	*Candida krusei* LM 08
EEPC (1024 µg/mL)	+	-	-	-	-	+
EEPC (512 µg/mL)	+	-	-	-	-	-
EEPC (256 µg/mL)	+	-	-	-	-	-
EEPC (128 µg/mL)	-	-	-	-	-	-
Negative control	-	-	-	-	-	-
Positive control	+	+	+	+	+	+

(-) No inhibition (+) inhibition

diluted in sterile saline solution (NaCl 0.85% w/v) to provide a final concentration of approximately 106 count forming unit per mL (cfu.mL^{-1}) adjusted according to the turbidity of 0.5 McFarland scale tube.

Antimicrobial and antifungal assay: The microplate bioassay was used to determine the minimum inhibitory concentration (MIC) of ethanolic extract [9,10].

The antibacterial and antifungal activity was detected using the colorimetric method by adding 200 µL of resauzurin staining (0.1 g.100 mL-1) aqueous solution in each well at the end of the incubation period. MIC was defined as the lowest extract concentration able to inhibit the bacterial or fungi growth as indicated by resauzurin staining (dead cells were not able to change the staining color by visual observation – blue to red)[11] (Burt and Reinders, 2003). All experiments were carried out at least twice with consistent results.

RESULTS AND DISCUSSION

The use of plant extracts and phytochemicals, both with known antimicrobial properties, can be of great significance in therapeutic treatments. In the last few years, a number of studies have been conducted in different countries to prove such efficiency[12,13]. Many plants have been used because of their antimicrobial traits, which are due to compounds synthesized in the secondary metabolism of the plant. These products are known by their active substances, for example, the phenolic compounds which are part of the essential oils[14], as well as in flavonoid[15].

The results for antibacterial activity of the ethanolic extract of *Praxelis clematidea (EEPC)* are show in Table 1. And the results for antifungal activity of the EEPC are show in Table 2. The activity, in both cases, was measured in terms of presence of microorganism growth.

Results obtained from the *in vitro* antibacterial assay showed that the EEPC show no antibacterial activity against either gram (+) or gram (-) bacteria. However, results obtained from the *in vitro* antifungal assay showed that the EEPC show promising antifungal activity against *Candida albicans* (ATCC 90028) with MIC of 256 µg/mL, and low antifungal activity against *Candida krusei* (LM 08) with MIC of 1024 µg/mL. The different behavior observed between strains of the same species could be justified by the existence of genetic variability among different strains[16].

This antifungal activity against *Candida albicans* of EEPC has been observed in other studies with extracts of plant species of the family Asteraceae [16,17,18].

CONCLUSION

Based on these results it can be stated that the EEPC has an important antifungal activity against Candida species, which highlights the need for further studies with other fungal species to investigate the immense therapeutic potential of this plant species and with his isolated secondary metabolites.

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