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**Journal of Chemical and Pharmaceutical Research, 2017, 9(6):218-222**

**Review Article**

**ISSN : 0975-7384**
**CODEN(USA) : JCPRC5**

# Antimicrobial and Antiseptic Activity of Genus *Mimosa* spp.: A Literature Review

**JFS Oliveira[1*], JDS Rocha[1], LO Lessa[1], JM Albuquerque[1], MLA Bastos[1], RCSS Verissimo[1], CV Barbosa[2], V Alvino[1] and THL Bernardo[1]**

[1]*Research Laboratory in Treatment of Wounds, Federal University of Alagoas, Maceio, Alagoas, Brazil*
[2]*Laboratory of Technology, Federal University of Alagoas, Maceio, Alagoas, Brazil*

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**ABSTRACT**

*The use of plants for the medical treatment of illness has a long history in worldwide folk medicine. In this context, the scientific community is interested in discovering vegetable extracts that have distinct biological activities- such as antimicrobials, antioxidants and antiseptics. Among the plants currently utilized in traditional medicine, there is a species of the Mimosaceae family that can be used against several pathogens. This study aims to review the current literature on Mimosa spp. as it relates to antimicrobial and antiseptic activities. Data collection was made on the following data basis: Scielo, Medline (via Pubmed), Lilacs and Scinfider, on May and July/2016. Descriptors were selecte on both bases: "Descritores em Ciencias da Saude" (DECs) and Medical Subject Headings (MeSH). For searching strategies, "Mimosa AND Anti-Infective Agents" and "Mimosa AND Anti-Infective Agents, Local", in English, Portuguese and Spanish, were used. 97 articles were found total; of those, 84 discuss antimicrobial activity and 13 discuss antiseptic activity. Then, only 16 articles followed inclusion criteria. However, 6 of those articles were found in more than one data base, which lead to a 7 articles sample. The outcome shows a proven antibacterial activity of the genus Mimosa, but antiseptic activity is not evident. Thus, further research needed to focus on that.*

**Keywords:** *Mimosa* spp; Anti-infective agents

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## INTRODUCTION

The use of plants for the medical treatment of illness has a long history in worldwide folk medicine [1]. Many cultures have relied on using the properties of plants to treat disease. This practice has been with man since the beginning- and generation after generation, has evolved with him [2]. Given the history of medicinal plants treating disease, the pharmaceutical industry has used its phitochemicalproperties to synthetize drugs and heal disease. These drugs are based on the knowledge and information, provided by communities, which have been using the healing properties of these plants for generations. The presence of bioactive compounds is an important factor, which give plants a rich basis characteristic when creating different types of drugs [3]. Among the plants used in traditional medicine, the Mimosaceae family has around 60 genus spread in more than 4000 species found in tropical, subtropical, and, especially, dry areas. According to studies, different species of plants from this family are used in anthelmintic, anti-inflammatory, astringent, cholesteryl, antihemorrhagic, diuretic and painkiller type drugs. According to Silva et al. [2], few studies are described in the scientific world relating the use of plants from this family to antimicrobial activity. This study aims to review the literature on genus *Mimosa* spp. as it relates to antimicrobial and antiseptic activities.

## EXPERIMENTAL SECTION

This study aims a literature review with analysis of secondary data, having as guiding question: Does genus Mimosa have antimicrobial and antiseptic activity? The material was research on May and July of 2016. The selected eletronic databases were: Literatura Latino-Americana e do Caribe em Ciências da Saúde (LILACS), Scientific Electronic Library Online (Scielo), Medical Literature Analysis and Retrieval System Online (MEDLINE via Pubmed) and Scifinder. Descriptors were selected on Descritores em Ciências da Saúde (DECs) and Medical Subject Headings (MeSH) databases, and combined through Boolean operators "AND", "OR" and "NOT". The research strategies used were to combine the following: "Mimosa AND Anti-Infective Agents" and "Mimosa AND Anti-Infective Agents, Local", in English, Portuguese and Spanish. For inclusion it was required that the articles were published papers, fully available in English, Portuguese and Spanish. Thesis, dissertations, book chapters, experience reports and review studies were exclude as well as articles that were not fully available on free platform.

For data selection, an initial screening was made by reading the title and abstracts, in order to confirm that the articles answer the guiding question of this study, and if they followed inclusion and exclusion criteria. Thus, after a pre-selection of eligible articles, every author independently read the articles in full before confirming inclusion in this study.

## RESULTS AND DISCUSSION

Total 97 articles found; 84 relate to antimicrobial activity and 13 relate to antiseptic activity. Of those, 16 articles followed the inclusion criteria. However, 6 articles were found in more than one databases, which leads us to a sample of 7 articles. Figure 1 shows the outcome found in the searched databases.

| Databases | Search Strategies | Articles Found | Selected by title | Selected by summary |
|---|---|---|---|---|
| **PUBMED** | Mimosa AND Anti-Infective Agents | 40 | 12 | 11 |
| | Mimosa AND Anti-Infective Agents, Local | 7 | 2 | 2 |
| **SCIELO** | Mimosa AND Anti-Infective Agents | 0 | 0 | 0 |
| | Mimosa AND Anti-Infective Agents, Local | 0 | 0 | 0 |
| **LILACS** | Mimosa AND Anti-Infective Agents | 1 | 1 | 1 |
| | Mimosa AND Anti-Infective Agents, Local | 0 | 0 | 0 |
| **SCIFINDER** | Mimosa AND Anti-Infective Agents | 43 | 2 | 2 |
| | Mimosa AND Anti-Infective Agents, Local | 6 | 0 | 0 |

Source: Researchers authorship, 2016

**Figure 1: Outcome of articles search in databases. Brazil, 2016**

**Table 1: Articles found on databases, Brazil, 2016**

| Autor | Country | Species | Activity | Conclusion |
|---|---|---|---|---|
| MJD Silva et al. [2] | Brazil | *Mimosa caesalpiniifolia* Benth | The antimicrobial activity evaluated by the microdilution method in broth, on yeasts, Gram-positive and Gram-negative bacteria. In the antimicrobial activity, all the extracts and fractions exhibited growth inhibitory activity against the evaluated microorganisms and in concentrations ranging from 5 to 1000 µg/mL. | It was possible to establish correlations between the antioxidant and microbiological capacity of extracts and fractions of *M. caesalpiniifolia*, and of plant species containing tannins and flavonoids, demonstrating the efficiency of these compounds in the capture of these radicals and in the antimicrobial action. |
| IQM Padilha [6] | Brazil | *Mimosa tenuiflora (Wild.) Poir.* | The study aimed to study the anti-bacterial activity of (*Staphylococcus aureus*) from the ethanolic extract of *M. tenuiflora*, where it was evaluated by determination of the minimum inhibitory concentration (MIC), by agar dilution method, in 30 clinical isolates and by Kinetics of inactivation with reference lineage. The results were: in 16 of the isolates MIC values of 0.18 mg/ml, and in the others the value was 0.36 mg/ml, as well as in the reference lineage. Thus, the kinetics of inactivation showed only bacteriostatic effect in the extract | The study concludes that the data found are promising and could encourage. Other research on phytochemistry, toxicology and Pharmacological aspects of the M. tenuiflora by-products in order to support their possible rational use in antimicrobial therapy, mainly against S. Aureus. |

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| | | | concentrations up to 4x MIC and a rapid bactericidal effect in the concentration corresponding to 8x MIC. | |
| A Mahmood et al. [3] | Pakistain | *Acacia nilotica L., Albizia lebbeck L.* e *Mimosa himalayana Gamble* | The antibacterial activity studied by the agar diffusion method against a *Bacillus subtilis* gram-positive and gram-negative, three *Pseudomonas aeruginosa, Escherichia coli and Klebsiella pneumonia*. The crude extract from all plants showed better activity against gram-negative bacterial strains, while lower inhibition zones were found against strains of gram-positive bacteria. | This work is a basis for a more in-depth photochemical analysis and its isolation and identification. The results revealed that the three plants of the family Mimosaceae are effective against pathogens. These plants are effective even in low concentration. The study requires further pharmacological screening for the isolation and identification of active compounds |
| MV Rosado et al. [5] | Mexico | *Mimosa pigra* | The extracts of methanol and water were air-dried. In the phytochemical screening of *M. pigra*, flavonoids, quinones and saponins (in the methanol extract), sterols and tannins (in the extract of water) were found. The test solution of each extract was prepared in 5% dimethyl sulfoxide. Amicacin (0.03 mg/UI), nystatin (50 IU / ml) and itraconazole (0.025 mg/ml) were used as positive controls for bacteria, yeasts and fungi respectively, and dimethylsulfoxide was used as a negative control. The antibacterial activity was found, mainly against Gram-positive bacteria; none of the extracts showed any activity against *E. coli*, and only one, *Mimosa pigra*, was active against *P. aeruginosa*. | The study concludes that the results obtained do not justify the traditional use of the studied species against diarrhea. However, moderate activity against bacteria and yeasts, Gram-positive bacteria, known as opportunistic micro-organisms in infectious processes, can be a support for the use of these plants in the treatment of infected wounds, skin and eye infections. The observed antifungal activity of some extracts is also remarkable, although there are no reports related to this activity in traditional medicine. |
| N Hussain [7] | Pakistain | *Mimosa Hamata* | The study describes the isolation and characterization of the main active principles - gallic etilic and gallic acid, used in antimicrobial treatment in several plants, in Mimosa hamata plant. The method used to test the antimicrobial activity was a cup-plate method with agar, against *Salmonella typhosa, S. for A., S. for B, Shigella dysenteriae, S. flexnerine, Escherichia coli, Klebsiella pneumoniae, streptococcus faecalis, vibrio cholera Eltor, V. C, inaba, Staphylococcus aureus, S. albus, Diplococcus pneumoniae, Corynebacterium diptheriae.* A crude alcoholic extract of its aerial parts has been found antibacterial properties of a wide nature; However, no chemical product investigated on the plant has been reported in the literature. | It is as isolated as the antimicrobial principle from the aquatic plant *Symphaea fziberosa* being strongly active against *Mycobacterium smegniafis: Moderately active against S. aiirezis and E. coli and less active against C. Albicans. Gallic acid was reported to inhibit S. aureus slighty. It was isolated as one of the antimicrobial principles from leaves of Lawtsonia inernzis L.* |
| VK Gupta et al. [8] | Índia | *Mimosa pudica* | Disk diffusion test method was used for *Mimosa Pudica*. The ethanolic extracts of *M. pudica* were active against *Mycobacterium smegmatis* in primary screening. Inhibition on *M. tuberculosis* growth index values was observed in the presence of the ethyl acetate fraction at a minimum concentration of 0.05 mg/ml). | The radiometric BACTEC assay is a valuable method for detecting anti-tuberculosis activity of plant extracts. The results indicate that the extract and acetate fraction of ethanolic *M. philippensis* showed significant antimycobacterial activity, except against *M. tuberculosis*. |
| AL Gonçalves et al. [4] | Brazil | *Mimosa tenuiflora* | The hydroalcohol extracts were prepared following the guidance process A from the Brazilian pharmacopeia, adapted by Younes et al. (2000). The antimicrobial activity | The results obtained with the extracts corroborate its use as antimicrobials in popular therapeutics. However, it is possible to note the resistance |

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| | | | was tested by the agar diffusion method, using Framex 389 filter paper sterile black strips with 6 mm diameter. *M. tenuiflora* showed high antimicrobial activity against *Streptococcus spp., Staphylococcus spp., Proteus mirabilis* and *Shigella sonnei*. | that some micro-organisms present that prevents their use in resistant infections. |

Source: Researchers authorship, 2016

The selected articles were published between 1979 and 2012, making it possible to include a greater number of studies that describe the subject at hand. Among these articles, only 2 were published in 2012, while the rest was published before 2010, which illustrates the need for more contemporary research about the subject in study of the 7 selected articles, none report antiseptic activity associated with the plant extract of the genus *Mimosa*. Therefore, there is no record of this type of activity in the literature researched. According to Mahamood et al. [3], many compounds extracted from plants of the Mimosaceae family presented antimicrobial activity, similar to that of synthetic medicines commonly produced by the pharmaceutical industry. Therefore, due to this similarity found with synthetic antibiotics, researchers call these metabolics of secondaries that have inhibitory capability and vegetal origin, in Phytocides or "Antibiotic Like-Substances" [4]. According to findings, the methods to evaluate antimicrobial activity were different among the studies: 3 articles performed the diffusion method on agar [3-5], and the others, respectively, one of each, used microdilution in broth [2], Minimal Inhibitory Concentration – MIC [6], cup-plate on agar [7] and disc diffusion [8]. Every study analyzed the extract using both gram-positive and gram-negative bacteria. Selected studies have shown at least one result against gram-negative bacteria. However, only 2 studies – from Rosado-Valado et al. [5] and Silva et al. [2] – have shown satisfactory result to gram-positive bacteria. Silva et al. [2] evaluated, in their study, the antimicrobial activity of *Mimosa caesalpiniifolia* Benth (Mimosaceae). They used microdilution in broth method, on yeasts, Gram-positive and Gram-negative bacteria, where every extract and fraction showed inhibitory activity against the microorganisms evaluated, in concentrations varying from 5 to 1000 μg/ml. The extracts showed greater inhibitory potential against Gram-positive bacteria, such as *Staphylococcus aureus* e *Bacillus cereus*. These authors still affirm that the *Mimosa caesalpiniifolia* specie has, on its shells, high levels of Tannins and flavonoids, which give them anti-hepatotoxic, and anti-inflammatory, anti-atherogenic, anti-allergic and antimicrobial actions. The phytochemical and biological study of the *Mimosa caesalpiniifolia* stem bark revealed it as a new alternative source of antitumor compounds. Possibly, it became effective because of the presence of betulinic acid and chemical cossinergism with other compounds [9]. Mahmood et al. [3] studied the antimicrobial activity of the crude methanolic extract from leaves of *Acacia nilotica L.*, *Albizia lebbeck L.* and *Mimosa himalayana* gamble belonging to the Mimosaceae family. Diffusion method on agar was used to study the activity. These plants showed better outcome against Gram-negative bacterial strains, such as *Pseudomonas aeruginosa*, *Escherichia coli* and *Klebsiella pneumoniae*. Nevertheless, the Gram-positive strain-*Bacillus subtilis*- showed resistance against the plants' crude extract. The antibacterial activity of *Mimosa tenuiflora* against *Staphylococcus aureus* was studied using ethanolic extract of *M. Tenuiflora*. Minimal Inhibitory Concentration (MIC) evaluated it -through diffusion method on agar- in 30 clinical isolates, and by kinetics of inactivation with reference lineage. In 16 isolates the MIC value was 0.18 mg/ml; in the others it was 0.36 mg/ml, as well as in the reference lineage. Thus, inactivation kinetic only showed bacteriostatic effect in extract's concentration 4 times MIC and a quick bactericidal effect in concentration correspondent to 8 times MIC [6]. Gonçalves [4] did another study using the same specie that showed high antimicrobial activity against *Streptococcus* spp., *Staphylococcus* spp., *Proteus mirabilis and Shigella sonnei*. However, in an attempt to produce less toxic pesticides and reduce the chemical products used in agriculture, Torre et al. [10], observed the action of *Mimosa tenuiflora* on pathogenic fungus. The commercial formula based on *Mimosa tenuiflora* did not show satisfatory activity against the phytopathogenics tested. According to the selected articles, it is possible to correlate the antimicrobial activity of extracts of genus *Mimosa* against gram-negative bacteria; against Gram-positive bacteria, it has reported few or no activity at all. However, the same cannot be affirmed about the antiseptic capacity, since it has not been reported in any literature. Therefore, there is a need for further studies to screen the bioactivity of these plants. Gupta et al. [8] carried out a study on the antimicrobial action of *Mimosa pudica*. The study was done by the disc diffusion assay. The ethanolic extracts of *Mimosa pudica* were active against *Mycobacterium smegmatis* in the primary screening. Inhibition at *Mycobacterium tuberculosis* growth index values was observed in the presence of fraction of ethyl acetate at a minimum concentration of 0.05 mg/mL. *Mimosa pudica* reported for having antidepressant, anticonvulsant, hyperglycemic and anti-implantation activity, as well as having effect on the menstrual cycle and ovulation [11]. The roots and leaves of *Mimosa pudica* are commonly used as vulnerable astringent and refreshing on fighting acne, as well as antispasmodic, hemostatic, constipating and antipyretic. In recent studies, it was proven that ethanolic extract has analgesic and anti-inflammatory properties [12] and aphrodisiac activity [13]. In this context, the scientific

community is interested in discovering plant extracts with different biological activities -such as antimicrobials, antioxidants, antifungal and anti-inflammatory properties. Plants that have antioxidant activity are important, since the presence of free radicals is related to predisposing factors in DNA mutations, protein oxidation and lipid peroxidation, which leads to atherosclerosis and atheroma formation. Therefore, the antimicrobial activity would be useful since many microorganisms acquire resistance to pre-existing drugs, which generates a growing worldwide health issue [2]. Even though there are no studies proving antiseptic activity with the genus *Mimosa*, it is still too early to state that such an extract is incapable of this. Despite that, some medicinal plants, such as the ones used from this genus, offer a range of secondary metabolites that fight microorganisms, making it a viable alternative for communities that are less able to afford conventional medicines. According to the World Health Organization, about 80% of the world's population uses these medicines from vegetal origin, mainly in the less developed regions [8]. Because of the constant use of medicinal plants for the treatment of disease, the pharmaceutical industry has used phytochemical properties in plants to synthesize drugs and cure disease. These drugs are based on the knowledge and information provided by communities who have been using these plant properties throughout history. The presence of bioactive compounds is an important factor that characterizes plants as enriching basis for different types of drugs [3]. Therefore, this study confirms the findings in the literature regarding genus *Mimosa*. Although no evidence on antiseptic activity was found, antimicrobial activity was found in 100% of the articles - and so were many other important activities for medical use, emphasizing the importance of carrying out more research to complement what is already presented in this study, in order to develop activities and discover new properties for genus *Mimosa*.

## ACKNOWLEDGEMENTS

To the Laboratory of Research in Wound Care; to the School of Nursing and Pharmacology at the Federal University of Alagoas; and to the National Counsel of Scientific and Technological Development, for the financial support, linked to the Institutional Scholarship Initiation Program Technological Development and Innovation, to which the authors are a part of the process.

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