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ANTIMICROBIAL ACTIVITY OF LATIN AMERICAN MEDICINAL PLANT EXTRACTS

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ABSTRACT

Resistance of pathogenic microorganisms to several drugs has increased due to the widespread use of antibiotics to treat infectious diseases. Hence, development of new antimicrobial drugs from plants is an area of active research in the search for medicinal, veterinary or agricultural industry use. For this work 19 plants species was collected, dried in the shade and oven. 20 g powder plant were macerated in cold either with dichloromethane (DCM) or methanol (MeOH) filtered, evaporated to yield determination expressed in grams per 100g of dry plant. Methods: Antibacterial activity assays of the DCM and MeOH extracts were performed by agar diffusion. Paper disks were then impregnated with 10 ul of extract (range: 340-614mg/disc for MeOH; 300-500mg/disc for DCM). Solvents of DCM or MeOH extracts were used as negative controls (NC) and Gentamicin and Cephazoline were used as positive control (PC). The microorganisms used for testing were *Escherichia coli* ATCC 25922, *Staphylococcus aureus* ATCC 25923, and *Pseudomonas aeruginosa* ATCC 27853. The inoculum was incorporated to Petri plates and paper disks with extracts were added, and incubated for 24 hours at 37°C. Results: All DCM extracts tested except *Gentianella parviflora, Baccharis crispa, Bauhinia candicans, Terminalia langiflora* and *Picrosia australis* showed activity against *Staphylococcus aureus*. The DCM extracts of the three species of Gaillardia showed to be as well active against *Escherichia coli*. Only the MeOH extracts of *Baccharis crispa*, Gentianella *achalensis, Lippia turbinata, Lippia germinata*, *Terminalia australis* and *bicolor adesmia* were active against Staphylococcus aureus. Conclusion: dichloromethane extracts of Gaillardia and Protousnea poepiggii species might be important sources for the isolation of compounds with antimicrobial activity with a potential use in the pharmaceutical industry.

Keywords: Plants, Herbal, Antimicrobial Activity, Extracts.

INTRODUCTION

Despite major advances in the chemotherapy of infectious diseases, these affections are far from being controlled or eradicated and they remain as one of the leading causes of death worldwide. In recent years, the resistance of pathogenic microorganisms to several drugs has increased due to the widespread use of antibiotics to treat infectious diseases. The research and development of new antimicrobial drugs from plants is an area of active research in the search for new molecules with different spectrum of activity or novel chemical structures that serve as seed for the development of drugs or extracts from medicinal veterinary or agricultural industry use [1].

In this study, 19 plant species of plants with traditional uses associated with several health properties were selected for analysis of their antimicrobial activity (table 1).

Achyrocline satureioides, Bicolor adesmia, Baccharis crispa, Bauhinia candicans, Equisetum giganteum, Gaillardia megapotamica var. radiata, cabrerae Gaillardia, Gaillardia megapotamica var. scabiosioides, Gentianella achalensis, Gentianella parviflora, germinata Lippia Lippia turbianata, Macfadyna ungui - cati, *Pellaea flavens, Picrosia longiflora, Protousnea poepiggii. Pterocaulon polystachyum, Terminalia australis, Terminalia triflora*

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were evaluated for antimicrobial activity against two Gram-negative bacteria (Escherichia coli and Pseudomonas aeruginosa) and a Gram positive germ (Staphylococcus aureus) with the aim of providing foundations for the development of new products for the treatment of infectious diseases.

MATERIALS AND METHODS

Plant material

The plant material was classified by Dr. Etile Spegazzini and a herbarium specimen of each is deposited in the Museum of Botany and Pharmacognosy "Carlos Spegazzini". The used portion of each of the 19 species was collected in the wild. The plant material was dried in the shade, then in an oven at 30°C and ground in mechanical grinder.

Preparation of extracts

20 g powder plants were macerated in cold with dichloromethane (DCM) for 48 hours with frequent and regular stirring. The extract was filtered and again macerated for 48 hours. After another filtered, extracts obtained were evaporated in a rotary evaporator to yield determination expressed in grams per 100g of dry plant drug.

The extracted plant was finally dried and again extracted with methanol (MeOH) using the same methodology for obtaining DCM extract.

Antimicrobial activity

Antibacterial activity assays of the DCM and MeOH extracts was performed by the method of agar diffusion Kirby- Bauer [12]. Paper disks were then impregnated with 10 ul of extract, dried on plate heated at 40°C and then kept at room temperature. MeOH impregnated extracts were in the range of 340-614 mg / disc and the DCM extracts in the range of 300-500 mg / disc. In addition, paper discs were impregnated with 10ul of the appropriate solvents according to DCM or MeOH extracts in order to use them as negative controls (NC). Gentamicin was used as positive control (PC) for gram negative activity and cephazoline for gram positive testing activity (both at 10 mg / disc). Assays were always performed in duplicate.

The microorganisms used for testing were *Escherichia coli* ATCC 25922, *Staphylococcus aureus* ATCC 25923, and *Pseudomonas aeruginosa* ATCC 27853. The inoculum was conducted from an overnight culture; it was incorporated into Mueller Hinton Agar (Merck) at a concentration of 10^8 by swabbing the surface using Petri plates of 9 mm in diameter. Once absorbed into the inoculum medium, the paper disks impregnated with the respective extracts to be tested were added, and the plates were incubated for 24 hours at 37°C. It was registered as positive antibacterial activity of the extracts the presence of inhibition zone.

RESULTS

All the DCM extracts tested except *Gentianella parviflora, Baccharis crispa, Bauhinia candicans, Terminalia langiflora* and *Picrosia australis* showed activity against *Staphylococcus aureus*. The DCM extracts of the three species of Gaillardia (Gaillardia cabrerae, *G. megapotamica* var. Radiata and *G. megapotamica* var. Scabiosioides) showed to be as well active against Escherichia coli. Only the MeOH extracts of *Baccharis crispa*, *Gentianella achalensis, Lippia turbinata, Lippia germinata*, *Terminalia australis* and bicolor Adesmia were active against Staphylococcus aureus.

Table 1. Scientific Name and traditional uses

Scientific Name / Common Name		Family	Known Popular Use
Achyrocline satureioides	"Marcela female" "Vira vira"	Asteraceae	Choleretic, hepatoprotective, digestive, antimicrobial [2].
Baccharis crispa	"Carqueja"		Liver, kidney, digestive diseases, male impotence, antiulcer, antiseptic skin [3,4]
Gailliardia megapotámica var.radiat a	"Topasaire"		Analgesic, antiseptic, antineuralgic in treating ulcers, influenza, decongestant and acne [5,6]
Gailliardia megapotámica var. Scabiosioides	"Buttercup "		
Gailliardia cabrerae	"Pampa's Margarita"		
Picrosia longifolia	"Achicoria"		Tonic, laxative, diuretic, sudorific [7]
Pterocauulon polystachyum	"Bull's Shadow "		Digestive disorders [8] Insect repellent [9]
Macfadyena unguis-cati	"Nail Cat"	Bignoniaceae	Syphilis, malarial fever, poisonous snake bite
Terminalia australis	"Yellow launch"	Combretaceae	Digestive, liver disease, hemorrhoids astringent [7]

	"Yellow Stick"		
Equisetum giganteum	*"Horse Tail"*	Equisetaceae	Diuretic, astringent, antirheumatic, scabies [7]
Adesmia bicolor	"Babosita"	Fabaceae	Antidiuretic
Bauhinia candicans	*Cow hoof*		Antidiuretic, antidiabetic.
Gentianella achalensis	*sour Grass "nencia"*	Gentianaceae	Bitter, digestive, antioxidant, antipyretic tonic [10]
Gentianella parviflora			Bitter, digestive, tonic hepatoprotective [2,11]
Pellaea flavens	"Doradilla"	Pteridaceae	Menstrual regulator, colds, constipation
Lippia turbinata	"Poleo"	Verbenaceae	Digestive tonic, tachycardia, hemenagogo diuretic, abortifacient, nerves
Lippia germinata	*"Purple Salvia"*		Menstrual regulator, Cold
Protousnea poeppigii	Payun Monguén "Lichen Old Beard"	Polytrichaceae	Antibiotic and healing

Table 2. Antimicrobial activity of different plants extracts

Plants	*Staphylococcus aureus*		*Escherichia coli*		*Pseudomonas aeruginosa*	
	DCM	MeOH	DCM	MeOH	DCM	MeOH
Achyrocline satureoides	+	-	-	-	-	-
Adesmia bicolor	+	+	-	-	-	-
Baccharis crispa	-	+	-	-	-	-
Bauhinia candicans	-	-	-	-	-	-
Equisetum giganteum	+	-	-	-	-	-
Gaillardia megapotamica var. Radiata	+	-	+	-	-	-
Gaillardia megapotamica var. Sacbiosoides	+	-	+	-	-	-
Gaillardia cabrerae	+	-	+	-	-	-
Gentianella achalensis	+	+	-	-	-	-
Gentianella parviflora	-	-	-	-	-	-
Lippia turbinata	+	+	-	-		-
Lippia germinata	+	+	-	-	-	-
Macfadyena unguis-cati	+	-	-	-	-	-
Pellaea flavens	+	-	+	-	-	-
Picrosia langiflora	-	-	-	-	-	-
Protousnea poeppigii	+	-	-	-	-	-
Pterocauulon polystachyum	+	-	-	-	-	-
Terminalia australis	-	+	-	-	-	-
Terminalia triflora	+	-	-	-	-	-
CN	-	-	-	-	-	-
CP (gentamicine 10 µl)	+	+	+	+	+	+
CP (cephazoline 10 µl)	+	+	+	+	+	+

CONCLUSION

The discovery of new antibiotic agents, whether from natural or synthetic sources has become a pressing need for medical and scientific community, given the increasingly frequent occurrence of bacterial resistance [13-15]. In recent years, the interest shown in the knowledge in folk medicine was markedly enhanced. Noteworthy, that interest in herbal medicine is certainly less onerous for public health, especially in developing countries [16]. The World Health Organization recognizes the important dimension that medicinal plants have as therapeutic resource, especially in Primary Health Care [17].

Among the results obtained in our work, it is suggest that the dichloromethane extracts of the three species of Gaillardia and *Protousnea poepiggii* are important sources for the isolation of compounds with antimicrobial activity with a potential use in the pharmaceutical and / or agrochemical industry.

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