SCREENING FOR ANTIMICROBIAL ACTIVITY OF PLANTS USED IN TRADITIONAL MEDICINE

C. Ramalhete[a], A. Duarte[a], S. Mulhovo[b], M. J. U. Ferreira[a]

[a] CECF, Faculty of Pharmacy, University of Lisbon, Av. das Forcas Armadas, 1600-083 Lisbon, Portugal
[b] Department of Medicinal Plants and Traditional Medicine, Ministry of Health, Maputo, Mozambique

INTRODUCTION

Infectious diseases, the leading cause of premature deaths in the world, are killing almost 50.000 people every day.[1] Despite the existence of a wide variety of antibacterial agents, the treatment of infectious diseases is a frequent problem in modern-day-medicine due to a significant increase of bacterial resistance to several antibiotics.[2] One way to prevent antibiotic resistance is using new compounds that are not based on existing synthetic antimicrobial agents.[3] Plants contain numerous biologically active compounds, many of which have shown to have antimicrobial properties.[4] In fact, they are among the most important common sources of potentially valuable new drugs. People still use plants to treat a variety of diseases including bacterial infections. This is particularly important in places where modern medicines are too expensive for local population, which is the case in Africa.[2] However, it is necessary to evaluate the scientific base for the therapeutic actions of traditional plant medicines.

In this communication, we are reporting on the *in vitro* antimicrobial activity of some plants used in traditional medicine in Africa.

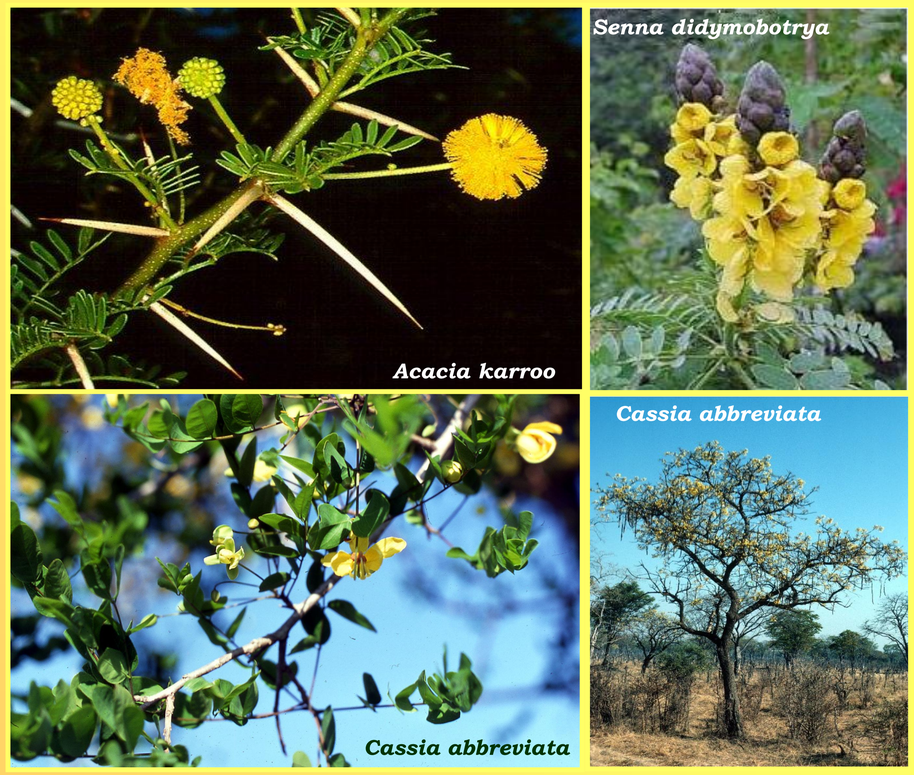


Figure 1- Some of the most active plants. [Adapted from 7]

RESULTS AND DISCUSSION

Different air-dried powdered plant parts (roots, leaves, seeds, bark or whole plant) used in traditional medicine, mainly in South and Southeast African regions, were extracted, sequentially, with apolar (hexane, dichloromethane) and polar solvents (ethyl acetate, methanol). The experimental procedure is summarized in the scheme 1.

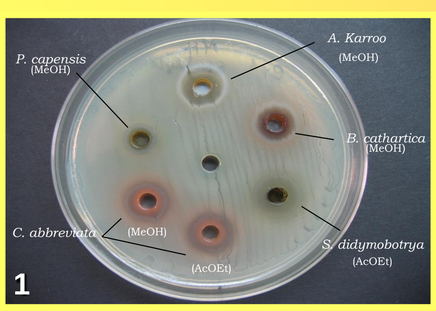
From the sixty three extracts tested, sixteen exhibited activity against *S. aureus P. aeruginosa* and *M. smegmatis*. As illustrated in the Table 1, and Figures 1 and 2, the most significant results were obtained to the polar extracts (ethyl acetate, and methanol) of *Acacia karroo* Hayne (Fabaceae), *Bridelia cathartica* Bertol. f. (Euphorbiaceae), *Senna didymobotrya* Fresen. Irwin & Barneby (*Fabaceae*), *Cassia abbreviata* (Fabaceae), and *Plumbago capensis* Thunb. (Plumbaginaceae). None of the extracts was active against *Escherichia coli.*

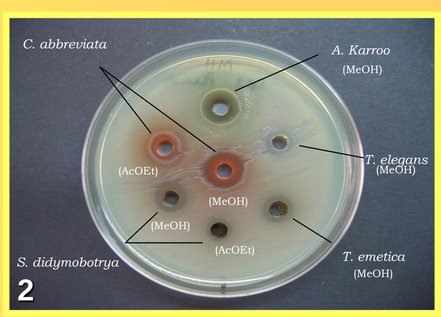
For the active extracts a further elucidation of the compounds responsible for these activity is warranted.

Table 1- Antibacterial activity of the most active species.

Species	Bacteria* tested zone of inhibition (mm)		
	Sa	*Pa*	*Ms*
***Acacia Karroo* Hayne**			
AcOEt extract	-	7.5	-
MeOH extract	13.0	13.0	13.0
Tabernaemontana elegans Stapt.			
AcOEt extract	-	6.5	-
MeOH extract	-	9.0	-
***Bridelia cathartica* Bertol. f.**			
AcOEt extract	-	-	-
MeOH extract	12.0	11.0	12.5
***Trichilia emetica* Vahl**			
AcOEt extract	-	-	-
MeOH extract	-	10.5	-
***Senna didymobotrya* Fresen.**			
AcOEt extract	12.5	9.5	9.5
MeOH extract	-	13.0	
Cassia abbreviata			
AcOEt extract	12.0	9.5	12.5
MeOH extract	11.0	13.0	13.5
***Plumbago capensis* Thunb.**			
AcOEt extract	-	-	-
MeOH extract	10.0	-	10.0
***Chenopodium ambrosioides* L.**			
AcOEt extract	-	-	-
MeOH extract	12.0	-	-
Cassia occidentalis			
AcOEt extract	-	-	-
MeOH extract	-	-	10.0

* Bacteria: Sa, *Staphylococcus aureus*; Ps, *Pseudomonas aeruginosa*; Ms, *Mycobacterium smegmatis.*





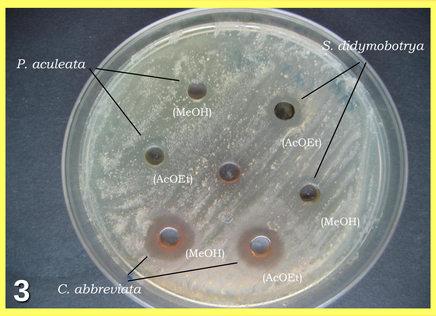


Figure 2 - Inhibition zone, observed after 48 h, for the most active extracts against:
1. *Staphylococcus aureus*;
2. *Pseudomonas aeruginosa*;
3. *Mycobacterium smegmatis.*

MATERIALS AND METHODS

Preparation of plant extracts: The air-dried powdered plant parts (roots, leaves, seeds, and bark) were sequentially extracted, with hexane, dichloromethane, ethyl acetate, and methanol, according to the scheme 1 .

Antimicrobial tests: The extracts were screened for *in vitro* activity against standardized bacteria: *Escherichia coli, Pseudomonas aeruginosa*, *Staphyloccocus aureus* and *Mycobacterium smegmatis* and fungal strain *Candida albicans.* The agar-well diffusion and agar-disc assays were employed.[5,6] The solvent used for extract solubilization was dimethyl sulphoxide (DMSO) to a final concentration of 20 mg/ml. The results were expressed as the average diameter of the zone of inhibition of microorganism growth around the well or disc.

Scheme 1- Extraction methodology.

1. Aqil, F. et al. J. Basic Microbiol. 2005; 45: 106-11. **2.** Koné, W. M. et al. J. Ethnopharmacol. 2004; 93: 43-9. **3.** Rojas, J. J. et al. BMC Complement Altern Med 2006; 1-6. **4.** Palombo, E. A. et al. J. Ethnopharmacol. 2001; 77: 151-7, **5.** Perez, C. et al. Acta. Bio. Med. Exp. 1990; 15: 113-115. **6.** Bauer, A. W. Am. J. Clin. Pathol. 1966; 45: 493-496. **7.** http://images.google.pt/