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Short communication

Screening of some Nigerian medicinal plants for antibacterial activity

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Abstract

Crude extracts from eight Nigerian medicinal plants, used traditionally in the treatment of infectious and septic diseases in both humans and animals were screened in vitro for antibacterial activity, using the hole-plate diffusion method. Most of the extracts were active against Gram-positive bacteria. Two of the plant, *Angeiossus schimperi* and *Anacardium occidentale*, had good antibacterial activity against *Escherichia coli* and *Pseudomonas aeruginosa* which are Gram-negative bacteria. © 1999 Elsevier Science Ireland Ltd. All rights reserved.

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1. Introduction

Infectious diseases are usually characterised by clear symptoms, so it is likely that traditional healers have been able to recognize such diseases and have developed effective therapies. Moreover, as antibiotics mostly have clear effects, the chance of finding antimicrobially active traditional medicine is considered high (Sofowora, 1984; Elmi et al., 1986).

Traditional medicine is practised by a large proportion of the Nigerian population for their physical and psychological health needs. Medicinal plants have become the focus of intense study recently in terms of conservation and as to whether their traditional uses are supported by actual pharmacological effects or merely based on folklore (Cunningham, 1988; Locher et al., 1995; Williams, 1996).

This study was designed to investigate Nigerian medicinal plants for potential antibacterial activity by preliminary bioassay screening. The selec-

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tion of plants for evaluation was based on traditional uses (Sofowora, 1984) for treatment of symptoms such as wounds, boils, purulent sores and diarrhea among other things. A total of 20 plant extracts, some form different parts of the same plants, were tested for antibacterial activity using the hole-plate diffusion method (Ieven et al., 1979).

2. Materials and methods

2.1. Plant material

All plants were collected in the Bauchi district (Northern Nigeria) during the rainy season, when their leaves are fresh and well grown. The collection was done by the main author with the help of four traditional medicine men. Indications of these plants, collectors and voucher numbers are given in Table 1. Plant materials collected were gently pounded using a pestle and motar, oven-dried (50°C), grounded and stored in a cool dry place until use.

2.2. Preparation of extract

Dried, ground plant materials (5.0 g) was mixed with 50 ml of 80% ethanol at room temperature, left overnight and then filtered under vacuum using 0.45 acrodisc filter (Sartorius®). The filtrate was evaporated in vacuo and the sediments dissolved in water and freeze-dried. The freeze-dried extract were dissolved in 28 ml of distilled water to give a concentration of 36 mg/ml.

Table 1
Local indications of some Nigerian medicinal plants

Local name (Hausa)	Scientific name	Indications (local)
Marke	Combretaceae *Angeiossus schimperi* (Gull. & Per.) Collectors: Kudi & Ibrahim (651)	Fever Diarrhea Dressings
Sabara	Combretaceae *Guiera senegalensis* L. Collectors: Kudi & Demo (661)	Enteric problems Worms
Kalgo	Leguminosae *Bauhinia thonningii* (Schum.) Collectors: Kudi, Yayok & Ibrahim (691)	Diarrhea Fever
Rumfu	Leguminosae *Cassia goratensis* L. Collectors: Kudi & Demo (612)	Fever general Worms
Cashew	Anacardiaceae *Anacardium occidentale* L. Collectors: Kudi & Haruna (613)	Enteric condition Worms
Kadanya	Saptaceae *Butyrospernum parkii* L. Collector: Kudi (633)	Fever Dressing Boils
Madachi	Meliaceae *Khaya senegalensis* (A. Juss.) Collectors: Kudi & Demo (644)	Helminths
Hararrabi	Burseraceae *Boswellia dalzeili* L. Collectors: Kudi & Yau (624)	Diarrhea Fever Dressing

Table 2
Properties of some Nigerian medicinal plants used in traditional medicine[a]

Plants	Part of plant	EC	OSA	ES	SP	CP	EF	MSA	AS	PA	MPA
Khaya senegalensis	Leaf	6	8*	8*	6	6	6	6	6	6	6
	Bark	6	12*	6	6	6	6	6	6	6	6
Cassia goratensis	Leaf	6	8*	6	6	6	6	6	6	6	6
	Bark	6	6	12*	8*	6	6	6	6	6	6
Boswellia dalzielli	Leaf	6	8*	6	8*	6	6	6	6	6	6
	Bark	6	10*	6	6	12*	6	6	8*	6	6
Bauhinia thonningi	Leaf	10*	8*	6	6	12*	6	8*	10*	6	6
	Bark	10*	8*	6	6	6	6	8*	8*	6	6
Butyrospernum parkii	Leaf	8*	16*	8*	6	6	8*	6	6	6	6
	Bark	8*	12*	8*	6	6	8*	6	8*	6	6
Guiera senegalensis	Leaf	6	12*	6	6	18*	12*	6	6	6	6
	Bark	6	10*	6	6	16*	10*	6	6	6	6
Anogeissus schimperi	Leaf	18*	18*	18*	18*	14*	18*	20*	18*	16*	22*
	Bark	16*	18*	16*	18*	16*	16*	18*	16*	18*	20*
Anacardium occidentale	Leaf	10*	12*	12*	14*	6	6	10*	6	6	12*
	Bark	8*	12*	10*	12*	10*	8*	12*	8*	8*	10*

[a] EC, *Escherichia coli*; OSA, oxoid *Staphylococcus aureus*; ES, *Enterobacter* species; SP, *Streptococcus pneumoniae*; CP, *Corynebacterium pyogenes*; EF, *Enterococcus faecalis*; MRSA, multiresistant *Staphylococcus aureus*; AS, *Acinetobacter* species; PA, *Pseudomonas aeruginosa*; MPA, multiresistant *Pseudomonas aeruginosa*.

* Values greater than 6 mm shows some activity.

2.3. Antibacterial activity

The plate-hole diffusion assay as described by Ieven et al. (1979) was used to determine the growth inhibition of bacteria by the plant extracts. The following bacteria, obtained from human clinical cases at the Leicester Royal Infirmary (except for *Staphyloccocus aureus*, Oxford) were used: *Staphylococcus aureus*, multiresistant *Staphylococcus aureus*, *Escherichia coli*, *Pseudomonas aeruginosa*, *Streptococcus pneumoniae*, *Enterococcus faecalis*, *Enterobacter* species, *Acinetobacter* species and *Corynebacterium pyogenes*. Bacteria were maintained at 4°C on nutrient agar plates before use.

Nutrient agar was prepared and 25 ml of each was poured into sterile universals. The universals with the broth were inoculated with the different species of bacteria and incubated at 37°C overnight. A total of 25 ml of molten Mueller–Hinton (MH) agar (Oxoid) held at 40°C was poured into sterile universals maintained at 40°C in a water bath. Each universal was inoculated with 200 μl of the different bacteria species, mixed well with the HM agar and poured into sterile petri dishes and allowed to set. Using a sterile cork-borer of 6 mm diameter, four holes per plate were made into the set agar containing the bacteria culture. A total of 200 μl of plant extracts were poured into three wells and one contained distilled water; the plates were placed in the incubator at 37°C overnight. Antibacterial activity was recorded if the zone of inhibition was greater than 6 mm (Vlietinck et al., 1995).

3. Results and discussion

The results of the screening are listed in Table 2. Out of the 16 samples, representing eight plant species, ten showed activity against one or more Gram-positive organisms. Four of the plants; *Bauhania thonnongii*, *Butryspernum parkii*, *Angeiossus schimperi* and *Anacardium occidentale*

showed activity against the Gram-negative bacteria *Escherichia coli* and the last two against *Pseudomonas aeruginosa*. All the bacteria were clinical isolates from human cases from Leicester Royal Infirmary. The negative results obtained against the Gram-negative bacteria by the rest of the plants were not surprising as, in general, these bacteria are more resistant than Gram-positive bacteria (Martin, 1995; Paz et al., 1995; Vlietinck et al., 1995).

The results of this study support, to a certain degree, the traditional medicinal uses of the plants evaluated both for human and animal disease therapy (Sofowora, 1984) and reinforce the concept that the ethnobotanical approach (Cox and Balick, 1994) to screening plants as potential sources of bioactive substances is successful. Several of the plants tested are now under investigation in order to isolate the active principles.

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