

An ethnobotanical survey of Bauchi State herbal plants and their antimicrobial activity

Harami M. Adamu^{a,*}, O.J. Abayeh^a, M.O. Agho^a, A.L. Abdullahi^b,
A. Uba^c, H.U. Dukku^c, B.M. Wufem^a

^a Chemistry Programme, Abubakar Tafawa Balewa University, P.M.B. 0248, Bauchi, Bauchi State, Nigeria

^b Science Education Programme, Abubakar Tafawa Balewa University, P.M.B. 0248, Bauchi, Bauchi State, Nigeria

^c Biological Sciences Programme, Abubakar Tafawa Balewa University, P.M.B. 0248, Bauchi, Bauchi State, Nigeria

Received 8 October 2004; received in revised form 12 December 2004; accepted 23 December 2004

Available online 16 March 2005

Abstract

A survey of medicinal plants used locally in the treatment of various diseases was carried out in Bauchi State—Nigeria. A total of 84 medicinal plants were listed. Preliminary antimicrobial activity of the aqueous extracts of the plants was investigated. The results indicated that out of 84 plants, 75 exhibited antimicrobial activity against one or more of the test organisms at a concentration of 200 mg/ml. The extracts were found to show potentially interesting activity against *Proteus mirabilis*, *Pseudomonas aeruginosa*, *Staphylococcus aureus* and *Escherichia coli*.

© 2005 Elsevier Ireland Ltd. All rights reserved.

Keywords: Medicinal plants; Antimicrobial activity; Concentration; Extracts

1. Introduction

The use of plants and plant preparations have been in existence since prehistory. There are several reports on the use of plants in traditional healing (Manandhar, 1985, 1987, 1994; Audu, 1993, 1995; Shretha and Joshi, 1993; Ahmad et al., 1998). However, few have been screened for biological activity. Audu (1993) reported the effective and palliative action of medicinal herbs used in Bauchi of which *Anogeissus leucarpus* was observed to be effective in treating 33 patients with abdominal pain.

The World Health Organization (WHO) reported that about 80% of the world's population depend mainly on traditional medicine and the traditional treatment involve mainly the use of plant extracts (WHO, 1993). This practice is commonly found in rural areas where synthetic drugs are not available or, where available, are too expensive to purchase. According to Audu (1995), 85% of the populations of Bauchi State—Nigeria are rural dwellers; and they use

herbal treatment for their medication. Maclean (1971) and Behrhost (1975) reported that in many African countries, the people consulted the traditional medical practitioners as the first choice.

The use of herbal drugs in treatment of diseases is found among all sections of people in Bauchi State. The herbs are found in open spaces, shops and in the market sold by traditional practitioners. There are others also that move about with the herbs in their vehicles and advertise through loud speakers. In spite of the wide acceptance of the use of plants by the people in Bauchi for treatment, and the wide availability of medicinal plants, there is no record of the survey of plants used in traditional medicine in Bauchi State.

This paper reports results of a survey that was done based on folk uses by traditional practitioners in Bauchi State and their antimicrobial activity.

2. Materials and methods

Plant materials were freshly collected in various parts of Bauchi State. The plants were obtained by using their ver-

* Corresponding author.

E-mail address: hmadamu@yahoo.com (H.M. Adamu).

Table 1
Antimicrobial activity of Bauchi medicinal plants and their traditional uses

Botanical name (sample voucher number)	Hausa name	Part used	Claimed medicinal uses	Antimicrobial activity			
				Pro.	Pse.	Staph.	E. coli
Amarantaceae <i>Celosia trigyna</i> (26)	Nanafa or nanaho	Leaves	Vermifuge	–	+	–	+
Anacardiaceae <i>Sclerocarya birraca</i> (63)	Danya	Bark	Stomach pain	–	–	–	–
Annonaceae <i>Annona senegalensis</i> (9)	Gwandar daji	Leaves	Placenta, diarrhoea and gonorrhoea	++	++	++	++
Apocynaceae <i>Adenium obesum</i> (4)	Kariya	Bark	Fish poisoning	++	++	+	+
Araceae <i>Pistia stratiotes</i> (59)	Kainuwa`a	Leaves	Kill lice	–	–	–	–
Aristolochiaceae <i>Aristolochia albidia</i> (11)	Madacin kasa	Root	Emesis and nausea	+	+	+	+
<i>Aristolochia bracteolata</i> (12)	Duman dutse	Stem	Anthelmintics	+	–	+	+
Asclepiadaceae <i>Calotropis procera</i> (21)	Tumfafiya	Whole plant	Amenorrhoea	+	+	+	+
Bignoniaceae <i>Stereospermum kunthianum</i> (67)	Sansami	Bark	Headache	+	–	+	+
Bombacaceae <i>Adansonia digitata</i> (3)	Kuku	Leaves	Diarrhoea	–	–	–	–
Bombaceae <i>Bombax brevicuspe</i> (17)	Kurya	Leaves	Bruises	–	+	–	–
Burseraceae <i>Boswellia dalzielii</i> (18)	Hano/ararabi	Bark/root	Fever, rheumatism and snake-bite	+	+	+	+
Caesalpiaceae <i>Piliostigma thonningii</i> (58)	Kaego	Bark/leaves	Relief toothache and chest pain	–	+	–	+
<i>Commiphora pendunculata</i> (31)	Namifi dashi	Bark	Incense	–	–	–	–
Cochlospermaceae <i>Cochlospermum tintorium</i> (29)	Rawaya or barge	Bark	Schistosmiasis	+	–	+	+
Combretaceae <i>Anogeissus leiocarpus</i> (10)	Marke	Bark	Cough, diarrhoea and dysentery	++	++	++	++
<i>Combretum hypopilinum</i> (30)	Jan taramniya	Bark/root	Headache	+	–	–	–
<i>Guiera senegalensis</i> (45)	Sabara	Leaves	Cough, syphilis, diarrhoea, leprosy, impotence and gastroenteritis.	–	+	+	–
<i>Terminalia avicennioides</i> (74)	Baushee	Bark	Dysentery, piles	–	+	+	–
Compositae <i>Ambrosia meritima</i> (6)	Babamore	Leaves/shoot	Nose bleeding	–	+	–	–
Cyperaceae <i>Cyperus tonkinensis</i> (32)	Kajiji dantunugu	Root	Headache	+	–	–	–
Ebenaceae <i>Diospyros mispiliformis</i> (35)	Kanya	Bark	Hypertension	+	–	–	–
Euphorbiaceae <i>Chrozophora senegalensis</i> (27)	Bauren kiyashi	Bark	Amenorrhoea	–	–	–	–
<i>Euphorbia balsamefera</i> (39)	Yaro	Shoot	Expectorant	+	+	–	+
<i>Euphorbia hirta</i> (40)	Nonon kurciya	Stem	Asthma	+	+	+	+
<i>Euphorbia lateriflora</i> (41)	Fiddasarte	Shoot	Seed dressing	+	–	–	+
<i>Euphorbia poissonii</i> (42)	Tinya	Latex from bark	Pesticide	+	+	+	+
<i>Jatropha curcas</i> (48)	Binida zugu	Root	Constipation	–	–	+	+
Graminaceae <i>Andropogon schireusis</i> (8)	Yaman gar-gari	Root	Malaria and dysentery extrude	+	+	+	+
<i>Brachiaria distichophylla</i> (20)	Gariji	Leaves	Wound	–	+	–	+
<i>Urelytrum muricatum</i> (75)	Yaman gargarin tudu	Bark	Miscarriage and haemorrhage	+	+	+	+
<i>Vetiveria nigriflora</i> (76)	Jema	Root	Stomachache	+	+	–	–
Labiaceae <i>Hyptis suaveolens</i> (46)	Dodoyar fadama	Bark	Diarrhoea and dysentery	+	+	+	+
<i>Ocimum basilicum</i> (54)	Dodoya	Root	Pesticide	–	–	–	–
Leguminosaceae <i>Abrus precatorius</i> (1)	Tandara	Seeds	Nervous disorder	+	+	–	+
<i>Acacia pycnautha</i> (2)	Farinchinharamate	Bark/root	Cure of throat	–	+	+	+
<i>Andira inermis</i> (7)	Gwaska	Seeds/bark	Vermifuge	+	–	–	+
<i>Bauhinia refescens</i> (16)	Disga	Leaves	Eye treatment	–	+	–	+
<i>Cassia occidentalis</i> (16)	Bauzanfari	Seeds	Ringworm	+	–	–	+
<i>Cassia singueana</i> (24)	Rumfu	Wholeplant	Vaginal discharge	–	+	–	–
<i>Cassia tora</i> (25)	Tafasa	Leaves	Fever, cough and ulcer	+	+	+	+
<i>Daniella oliveri</i> (33)	Maje	Leaves	Toothache	+	+	+	+
<i>Detarium microcarpum</i> (34)	Taura	Root/bark	Dysentery and piles	++	++	++	++
<i>Entada africana</i> (36)	Tawatsa	Leaves	Wound	+	+	–	+
<i>Entada sudanica</i> (37)	Tawassa	Bark	Diarrhoea	+	+	+	+
<i>Erythrina senegalensis</i> (38)	Minjirya	Bark	Jaundice	+	+	+	+
<i>Indigofera pulchra</i> (47)	Bakin bunu	Whole plant	Malaria and dysentery	+	–	+	–
<i>Parkia higliobosa</i> (57)	Dorowa	Bark	Antiseptic	+	+	–	+
<i>Tamarindus indicak</i> (70)	Tsamiya	Fruit	Antiseptic and digestive	+	–	+	–
<i>Tephrosia purpea</i> (72)	Bubababa	Bark	Pesticide	+	+	–	+
<i>Tephrosia vogellia</i> (73)	Majinfa	Bark	Manajitis	+	+	–	+

Table 1 (Continued)

Botanical name (sample voucher number)	Hausa name	Part used	Claimed medicinal uses	Antimicrobial activity			
				<i>Pro.</i>	<i>Pse.</i>	<i>Staph.</i>	<i>E. coli</i>
Liliaceae <i>Asparagus flagellaris</i> (13)	Tsatsari bera	Root	Schistosomiasis	–	+	+	–
<i>Allium sativum</i> (56)	Albasa	Scale	Pesticide	–	–	–	–
Loranthaceae <i>Loranthus pentagona</i> (50)	Kauchin	Bark	Dyspepsia and dysentery	–	+	–	–
Mediarachta <i>Azadirachta indica</i> (14)	Dogon yaro	Leaves	Malaria	+	+	+	+
Menispermaceae <i>Cissanpelos mucronata</i> (28)	Jibdakasa	Root	Diarrhoea	+	+	+	+
Mimosaceae <i>Amblygonocarpus andongensis</i> (5)	Sandar mayu	Bark	Vermifuge	+	–	–	+
Moraceae <i>Ficus abutilifolia</i> (43)	Yandii	Bark	Fever	+	–	–	–
Moringaceae <i>Moringa oleifera</i> (51)	Zogallangandi	Bark/leaves	Diarrhoea	–	+	–	–
<i>Moringa pterigosperma</i> (52)	Zogalla	Leaves	Gonorrhoea and syphilis	+	+	+	+
Myrtaceae <i>Psidium guajava</i> (60)	Goba	Leaves	Jaundice and dysentery	+	–	–	–
<i>Syzygium guineense</i> (68)	Malmoo	Flower	Stimulant	–	–	–	–
Narcisseae <i>Tapenathus dodoneitolius</i> (71)	Kauchi	Fruit	Leprosy	+	–	–	–
Nyctaginaceae <i>Boerhaavia adscendens</i> (19)	Babban juji	Bark	Dysentery and amenorrhoea	+	+	+	+
Olacaceae <i>Ximenia Americana</i> (19)	Tsa'ada	Whole plant	Toothache and headache	+	–	–	+
Oleaceae <i>Olea hochsetteri</i> (55)	Zaitum	Bark	Typhoid and diarrhoea	+	+	+	+
Punicaceae <i>Punica granatum</i> (61)	Rumani	Fruit	Dysentery and diarrhoea	+	+	+	–
Rhamnaceae <i>Ziziphus abyssinica</i> (81)	Magarya'a	Root	Diarrhoea	+	+	–	+
<i>Ziziphus mauritiana</i> (83)	Magarya	Root/leaves	Purgative	+	–	+	+
<i>Ziziphus mucronata</i> (82)	Magaryan kura	Root/bark	Gonorrhoea	++	++	++	++
<i>Ziziphus spina-christi</i> (84)	Kurna	Root	Cough	+	+	+	+
Rubiaceae <i>Nauclea latifolia</i> (53)	Tafashiya	Bark	Abdominal pain	–	–	–	–
Rubiaceae <i>Kohautia grandiflora</i> (49)	Rimin santari	Bark	Dysentery and sore throat	+	+	+	+
Solananeae <i>Capsicum annum</i> (22)	Barkono	Fruit	Pesticide	+	+	+	+
<i>Schwenkia americana</i> (62)	Daudanaaor	Leaves	Abdominal pain	+	–	+	–
<i>Solanum nodiflorum</i> (64)	Gautar kaji	Fruit	Emesis and diarrhoea	+	+	+	+
<i>Solanum rigrum</i> (65)	Gautar kaddi	Fruit	Skin eruptions	+	+	+	+
Sterculiaceae <i>Sterculia setigera</i> (66)	Kukuki	Bark	Dysentery and diarrhoea	+	+	+	+
Taccaceae <i>Tacca leontopetaloides</i> (69)	Yava	Leaves	Headache	–	–	–	–
Tiliaceae <i>Grewia mollis</i> (44)	Dargaza'a	Root	Gonorrhoea	+	+	+	+
Verbenaceae <i>Vitex chrysocarpa</i> (77)	Dinyar birii	Leaf/fruit	Diarrhoea	–	–	+	–
<i>Vitex doniana</i> (78)	Dinya	Bark	Antiseptic asthma	+	+	–	–
Zingiberaceae <i>Zingiber officinale</i> (80)	Sarkin zabur	Rhizome	Cough, diarrhoea	+	+	–	+
Zygophyllaceae <i>Balanites aegyptiaca</i> (15)	Aduwa	Bark	Abortifacient	+	+	+	+

Key: (–): no inhibition; (+): weak inhibition (<15 mm); (++) : strong inhibition (>15 mm); *Pro.*: *Proteus mirabilis*; *Pse.*: *Pseudomonas aeruginosa*; *Staph.*: *Staphylococcus aureus*; *E. coli*: *Escherichia coli*.

naacular names and their botanical names were verified using a guide by Gbile (1980, 1984) and Burkhil (1985).

3. Preparation of plant extracts

The plant materials were dried under shade and ground into fine powder. Fifty grams of powdered plant material were soaked in 250 ml of water for four days. At the end of the extraction, each extract was filtered on filter paper. The filtrates obtained were evaporated to dryness.

4. Microorganisms used

The test organisms were *Proteus mirabilis*, *Pseudomonas aeruginosa*, *Staphylococcus aureus* and *Escherichia coli*, which were obtained from the specialist Hospital Bauchi.

5. Determination of antimicrobial activity

The agar well diffusion method was used. The agar was inoculated with the organisms and allowed to solidify. A total of 8 mm diameter wells were punched into the agar and filled with the extracts (200 mg/ml), distilled water and a standard antibiotic (gentimicin at concentration of 100 mg/ml) was used as a positive control. The plates were incubated at 37 °C for 24 h. The antibacterial activity was calculated by measuring the inhibition—zone diameter observed.

6. Results

Table 1 indicates a total of 84 medicinal plants that were collected from Bauchi State. The botanical, and vernacular names of the plant and the plant parts used together with their traditional therapeutic uses are presented. Aqueous extract

from each of the plants were obtained and tested against *Proteus mirabilis*, *Staphylococcus aureus*, *Pseudomonas aeruginosa* and *Escherichia coli*.

Table 1 also indicates the results of the antimicrobial activities of the aqueous extract of each plant with respect to the test organism at concentration of 200 mg/ml. A total of nine plants did not show any significant activity. Antibacterial activity was found in 75 plant extracts where each extract inhibit one or more organisms.

7. Discussion

There are several reasons that people use plants for medication. This includes improvement of health after herbal treatment, low cost of the drugs, non availability of synthetic drugs particularly in the rural areas of Bauchi State, or where available were either fake or expired drugs and in some cases the people are more accustomed to and comfortable with traditional healing (Audu, 1995). From Table 1, there are plants that are used to treat more than one ailment, for example, *Annona senegalensis* is used to treat diarrhoea and gonorrhoea. *Boerhaavia adscendens* for dysentery and amenorrhoea, *Guiera senegalensis* for diarrhoea, leprosy, impotency and gastroenteritis.

Table 1 also shows that various parts of a plant are used; the root, bark and the leaves. The antibacterial activity correlated with some of the claims of the traditional uses of the plants. Some of the plants appear to have broad spectrum of action. For example, *Adenium obesum*, *Andropogon schirensis*, *Annogeissus leiocarpus*, *Aristolochia abida*, *Detarium microcarpum*.

The result of the antimicrobial activity of the plant extracts is particularly important considering these opportunistic

organisms, which they inhibited. The extracts of these plants contain substances that are true antibacterials. Isolation of the active constituents of those plants that indicate broad spectrum of activity is in progress.

References

- Ahmad, I., Mahmood, Z., Mohammad, F., 1998. Screening of some Indian medicinal plants for their antimicrobial properties. *Journal of Ethnopharmacology* 62, 183–193.
- Audu, J.A., 1995. Studies on the effectiveness of medicinal herbs used as anthelmintics by traditional medical practitioners in South of Bauchi State II. *Journal of Economic and Taxonomic Botany* 19, 653–661.
- Audu, J.A., 1993. Observation on the efficacy and palliative action of medicinal herbs used by traditional herbal practitioners in Bauchi State I. *Journal of Economic and Taxonomic Botany* 17, 501–507.
- Behrhost, C., 1975. The Chimaltenango development project in Guatemala. In: *Health by People*. WHO, Geneva, pp. 30–52.
- Burkhill, H.M., 1985. *The Useful Plants of West Tropical Africa*, second ed., vol. I. Royal Botanic Gardens, Kew, pp. 1–6.
- Gbile, Z.O., 1980. Vernacular names of Nigerian plants (Hausa). *Forestry Research Institute of Nigeria*, Ibadan, 63 pp.
- Gbile, Z.O., 1984. Vernacular names of Nigerian Plants. *Forestry Research Institute of Nigeria*, Ibadan, 85 pp.
- Maclean, C.M.U., 1971. Hospital or healers? An attitude survey in Ibadan. *Human Organisation* 25, 131.
- Manandhar, N.K., 1985. Ethnobotanical notes on certain medicinal plants used by Tharus of Dang-Deokhuri District, Nepal. *International Journal of Crude Drug Research* 23, 153–159.
- Manandhar, N.P., 1994. An ethnobotanical survey of herbal drugs of Kaski district, Nepal. *Fitoterapia* 65, 7–13.
- Manandhar, N.P., 1987. Traditional medicinal plants used by tribals of Lamjung District, Nepal. *International Journal of Crude Drug Research* 25, 236–240.
- Shretha, I., Joshi, N., 1993. Medicinal plants of the Lele Village of Latipur District, Nepal. *International Journal of Pharmacognosy* 31, 130–134.
- WHO, 1993. Summar 9 WHO guidelines for the assessment of herbal medicines. *Herbal Grom* 28, 13–14.