

STUDIES ON THE RATIONALE OF AFRICAN TRADITIONAL MEDICINE Part II. Preliminary Screening of Medicinal Plants for Anti-Gonococcal Activity

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Crude extracts of medicinal plants traditionally used to treat gonorrhoea in Tanzania were tested for *in vitro* antigonococcal activity by filter-paper disc assay method. Of the 30 extracts tested, 9 (30%) inhibited the growth of *Neisseria gonorrhoeae*. The bark of *Acacia nilotica* Del. which is a popular remedy for gonorrhoea, had the highest antigonococcal activity. Among another batch of 58 medicinal plants used for ailments other than gonorrhoea, 14 (24%) had significant antigonococcal activity. Eighteen of the 22 (82%) extracts found active against gonococcus, also inhibited the growth of *Staphylococcus aureus* (Oxford strain).

INTRODUCTION

Venereal disease is extremely common among both rural and urban population all over Africa. Surveys in country practice in South Africa and elsewhere show that venereal diseases form the third commonest category of patients seen, being only exceeded by sick children and expectant mothers [1]. Despite the introduction of sulpho-*namides* and antibiotics, a large proportion of rural population still resorts to traditionally used herbs when confronted with gonorrhoea, which is not very seldom. In West Africa, a wide variety of medicinal plants including cottonwood tree (*Bombax Spp.*), *Alchronea cordifolia*, *Alchronea floribunda*, *Mussaend elegans*, *Craterspermum laurinum* and *Aframomum baumannii* are commonly used [2]. A mixture, believed to be a remedy for acute gonorrhoea is prepared as follows. The seeds of *Ricinodendron africanum* are fried with a little sesame oil and then beaten to a paste with a handful of *Aspidium* sp. The mixture is cooked together and the liquid part is drunk in daily doses until symptoms subside [2].

The present study forms a part of the general investigation on the rationale of African traditional medicine and places on record observations made on the *in vitro* sensitivity of *Neisseria gonorrhoeae* to the extracts of African medicinal plants used for treating gonorrhoea and other unrelated diseases.

MATERIALS AND METHODS

In all, extracts of 88 medicinal plants were tested. Relevant information about the taxonomy and traditional uses of the active plants is given in Table 1. The plants were collected from the coastal region of Tanzania. The crude extract was obtained by extracting fresh powdered leaves, bark, flowers or whole plant, depending upon use in traditional medicine (500 g) in a Soxhlet apparatus for 10 hr or until the extract was clear. The extract was then filtered by passing through cotton-wool and the solvent evaporated under reduced pressure on a rotary evaporator using a water bath. The solvent used for extraction was methylated spirit.

Test Culture. The test organisms employed for assaying antigonococcal activity were *Neisseria gonorrhoeae* isolates from clinical cases, isoalted and maintained at the Department of Microbiology and Immunology, Faculty of Medicine, Dar es Salaam.

The culture medium used was chocolate agar containing 7% human blood. Filter-paper disc assay method for testing antibacterial activity was employed. Pre-warmed chocolate agar plates were heavily seeded with *N. gonorrhoeae*. A dilute (ca. 1%) solution in chloroform of the plant extract was applied onto a 6-mm sterile absorbent filter-paper disc; after evaporation of the solvent, the disc was placed on the surface of the medium seeded with gonococci. The plates were incubated in an atmosphere containing 5-10% carbon dioxide at 37° and observed for zones of

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inhibition of bacterial growth after 24–48 hr. The antibacterial activity of the extract was recorded as +, ++, +++ and ++++ depending upon the size of the zone of inhibition (+ 10–15, ++ 15–20, +++ 20–25, ++++ 25 mm). The results are tabulated in Table 1.

RESULTS AND DISCUSSION

During the current investigation a total of 88 medicinal plants were tested for *in vitro* antigonococcal activity. Twenty-two (25%) of the plants tested, showed activity

Table 1. *In vitro* antigonococcal activity of African medicinal plants.

Plant	Family	Part used and extracted	Traditional uses	Antigonococcal activity
<i>Sclerocarya caffra</i> Sond	Anacardiaceae	Bark	Dysentery, diarrhoea, gangrenous, rectitis, insecticide	+
<i>Uvaria acuminata</i> Oliv.	Annonaceae	Leaves	Epilepsy	++
<i>Kigelia africana</i> (Lam.) Benth.	Bignoniaceae	Bark	Wounds, sores, for gynaecological conditions, ulcers, abscesses, dysentery	++
<i>Tecomaria capensis</i> Spach.	Bignoniaceae	Leaves	Pneumonia, bleeding gums, diarrhoea, enteritis	++
<i>Tetracera boiviniana</i> Baill.	Dilleniaceae	Root		+
<i>Euclea natalensis</i> A.DC.	Ebenaceae	Rootbark	Gonorrhoea, diarrhoea, dysentery, bleeding gums	+
<i>Phyllanthus reticulatus</i> P.	Euphorbiaceae	Leaves	Gonorrhoea, venereal sores, hookworms, anaemia	++
<i>Ricinus communis</i> L.	Euphorbiaceae	Plant	Venereal diseases, ulcers, diarrhoea, fungicidal, eardrop	+++
<i>Acacia nilotica</i> Del.	Leguminosae	Bark	Tuberculosis, pneumonia, gonorrhoea, diarrhoea, smallpox	++++
<i>Albizia harveyi</i> Feurn.	Leguminosae	Roots	Any intestinal troubles	+
<i>Bauhinia reticulata</i> DC.	Leguminosae	Plant	Dysentery, leprosy, roundworm, anthrax, malaria, cough	+
<i>Caesalpinia pulcherrima</i> Swartz.	Leguminosae	Flowers	Lung diseases, fever, skin diseases	+
<i>Cassia abbreviata</i> Oliv.	Leguminosae	Dry roots	Gonorrhoea, syphilis, diarrhoea, dysentery, pneumonia, malaria	+
<i>Cassia obtusifolia</i> L.	Leguminosae	Whole plant	Stomach troubles	+++
<i>Lonchocarpus bussei</i> Harms.	Leguminosae	Leaves, roots and bark	Gonorrhoea, cough	+
<i>Malvastrum coromandelianum</i> (L.) Garcke.	Malvaceae	Plant	Wounds, diaphoretic, sores	+
<i>Sida serratifolia</i> L.	Malvaceae	Leaves	Pulmonary tuberculosis, diarrhoea	+++
<i>Sida serratifolia</i> L.	Malvaceae	Roots	Gonorrhoea	++
<i>Psidium guajava</i> L.	Myrtaceae	Leaves	Diarrhoea, skin diseases	+
<i>Ziziphus pubescens</i> Oliv.	Rhamnaceae	Stem	Measles, gonorrhoea	+
<i>Fagara chalybaea</i> Engl.	Rutaceae	Rootbark	Diarrhoea, coughs, malaria, toothache	+++
<i>Harrisonia abyssinica</i> O.	Simarumaceae	Twig and rootbark	Skin diseases, haemorrhoids	+++
<i>Premna chrysoclada</i> G.	Verbenaceae	Leaves	Ulcers, venereal diseases	+

The following plants did not show any antigonococcal activity:

Acanthaceae: *Barleria prionitis* L. (roots, leaves and bark); Amaranthaceae: *Achyranthes aspera* L. (plant); Anacardiaceae: *Rhus natalensis* Bernh. (leaves), *Lannea stuhlmannii* Engl. (leaves); Annonaceae: *Anona senegalensis* Pers. (bark), *Uvaria acuminata* Oliv. (roots); Apocynaceae: *Calotropis gigantea* Ait. f. (leaves), *Dictyophleba lucida* Pierre. (leaves), (trunk), *Nerium oleander* L. (leaves), *Plumeria rubra* L. (bark); Araceae: *Stylochiton hennigii* Engl. (roots and leaves); Boraginaceae: *Ehretia amoena* Klotzch. (rootbark); Cappariaceae: *Boscia salicifolia* Oliv. (bark), (leaves), *Maerua angolensis* DC. (bark); Caricaceae: *Carica papaya* L. (leaves), (roots), (bark); Celastraceae: *Elaeodendron schlechteranum* Loes. (roots); Combretaceae: *Combretum zeyheri* Sond. (fruits), (plant), *Terminalia catappa* L. (leaves); Compositae: *Aspilia natalensis* Willd. (roots), *Emilia sagittata* DC. (plant); Convolvulaceae: *Bonamia mossambicensis* Hall. f. (roots); Cyperaceae:

Cyperus rotundus L. (tuber); Ebenaceae: *Diospyros mespiliformis* Hochst. ex DC. (leaves); Euphorbiaceae: *Acalypha fruticosa* Forsk. (roots), *Flugea virosa* Baill. (bark), *Phyllanthus niruri* L. (Plant), *Pseudolachmaestylis maprouneaeifolia* Pax. (bark), *Securinega virosa* Baill. (bark), (pulp); Icacinaceae: *Pyrenacantha kaurabassana* Baill. (tuber), (green fruits); Labiatae: *Hoslundia opposita* Vahl. (leaves), *Leonotis nepetaefolia* R. Br. (plant); Lauraceae: *Cassytha filiformis* L. (plant); Leguminosae: *Acacia robusta* Burch. (rootbark), *A. senegal* Willd. (roots), *Adenantha pavonina* L. (seeds), *Caesalpinia pulcherrima* Swartz. (bark), *Cassia fistula* L. (bark), *C. amiculata* L. (seeds and bark), *Desmodium* sp. (plant), *Dichrostachys cinerea* Wight. Arn. (roots), *Peltophorum petocarpum* K. (roots), (bark), *Pongamia pinnata* L. (leaves and rootbark), (seeds), *Pterocarpus angolensis* DC. (bark), *Stylosanthes fruticosa* Alston. (plant), *Xeroderris stuhlmannii* Taub. (plant), Liliaceae: *Asparagus falcatus* L. (Plant); Malvaceae: *Sida spinosa* L. (leaves); Rhamnaceae: *Ziziphus pubescens* Oliv. (leaves); Rubiaceae: *Lamprothamnus zanguebaricus* Hiern. (leaves); Rutaceae: *Citrus aurantifolia* Swingle. (roots); Sapindaceae: *Allophylus rubifolius* Engl. (stem); Solanaceae: *Withania somnifera* Dun. (plant); Sterculiaceae: *Dombeya shupangae* K. Schum. (leaves), *Melhania velutina* Forsk. (leaves), *Waltheria indica* L. (flowers), (leaves); Tiliaceae: *Corchorus olitorius* L. (fruits and seeds), *Grewia forbesii* Harv. ex Mast. (bark and roots), *G. Stuhlmannii* K. Schum. (roots); *Triumfetta rhomboidea* Jacq. (bark and roots); Verbenaceae: *Lantana camara* L. (leaves); *Vitex fischeri* Guerke. (leaves), *Vite* sp. (roots); Vitaceae: *Cissus integrifolia* Planch. (stem), *Rhoicissus rovoilii* Planch. (roots).

ranging from + to ++++ (Table 1). These 88 plants comprised of two distinct groups (a) those used for treating gonorrhoea by practitioners of African traditional medicine (b) those used for miscellaneous ailments other than gonorrhoea. Of the 30 group (A) plants, 9 (30%) inhibited the growth of *N. gonorrhoeae* to varying degrees. While among the remaining 58 group (B) extracts, 14 (24%) had almost similar antigonococcal activity. The same 88 extracts when tested against *Staphylococcus aureus* (Oxford strain) and *E. coli* exhibited varying levels of antibacterial activity [3]. However, there was a positive correlation between the anti-staphylococcal and antigonococcal activity. Eighteen of the 22 extracts (82%) having activity against gonococci were also active against *Staphylococcus aureus*. While only 2 out of 22 (9%) had antibacterial activity against *E. coli*. * Only 4 extracts (18%) active against gonococci failed to inhibit the growth of *Staphylococcus aureus*. Perusal of relevant literature [2-5] and discourses with local medicine men and tribal doctors [6] revealed that leaves, roots, root bark and whole plant extracts of a very wide variety of medicinal herbs are given to patients suffering from venereal diseases in general and gonorrhoea in particular. The herbs are administered in the form of infusions, decoctions, fried and made into a paste, invariably by the oral route, however, in West Africa, some time the infusions are directly introduced into urethra with a lean reed. The most common plants used for this purpose include (1) *Rhus natalensis*, (2) *Holarrhena febrifuga*, (3) *Phyllanthus reticulatus*, (4) *Euclea natalensis*, (5) *Carica papaya*, (6) *Acalypha fruticosa*, (7) *Euphorbia hirta* L., (8) *Phyllanthus niruri* L., (9) *Ricinus communis* L. (10) *Securinega virosa*, (11) *Hoslundia opposita* Vahl., (12) *Cassytha filiformis*, (13) *Acacia nilotica* Del., (14) *Acacia senegal* Willd., (15) *Acacia sieberiana*, (16) *Cassia abbreviata*, (17) *Cassia fistula* L., (18) *Lonchocarpus bussei* (19) *Pongamia pinnata*, (20) *Pterocarpus angolensis* DC., (21) *Sida serratifolia*, (22)

Sida spinosa, (23) *Ziziphus pubescens*, (24) *Solanum incanum*, (25) *Withania somnifera*, (26) *Triumfetta rhombioides*, (27) *Premna chrysoclada*, (28) *Vitex* Spp., (29) *Plumeria rubra* L., (30) *Dichrostachys cinerea* Wight. Arn. However, in the present studies, *in vitro* antigonococcal activity was only demonstrable in 3, 4, 9, 13, 16, 18, 21, 23 and 27.

A significant observation made was the highest antigonococcal activity of *Acacia nilotica* Del (++++). Among the group (A) plants, *Ricinus communis* L. (Euphorbiaceae) had (++++) antigonococcal activity which was followed by *Phyllanthus reticulatus* P. (+++), *Sida serratifolia* (+++), *Ziziphus pubescens* and *Premna chrysoclada* (+).

It was interesting to note that extract of *Acacia nilotica* which is used by the traditional doctors as a curative for tuberculosis, pneumonia, diarrhoea and small pox, was also active against *Staphylococcus aureus* (+++) and *E. coli* (++) . Further, in group (B) the extract of *Sida serratifolia* which is a traditional remedy for diarrhoea and pulmonary tuberculosis had (++) antigonococcal activity. Similarly the extract of *Cassia obtusifolia* had significant antigonococcal activity (++) and was also active against *Staphylococcus aureus* (++) and *E. coli* (+). The extract of this plant is traditionally used in diseases of the gastrointestinal tract. Another interesting observation was (++) antigonococcal activity of *Fagara chalybaea* and *Harrisonia abyssinica* which are popular remedies for diarrhoea and skin diseases respectively.

The present study is a preliminary one, it does not claim to confirm the usefulness of any plant extract in the treatment of gonorrhoea. This can only be done by *in vivo* clinical trials for which the work presented here can be used as a guide.

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*More than 40% of the plant extracts without antigonococcal activity showed various levels of inhibition of *Staphylococcus aureus*. This in a way rules out the effect of nonspecific factors like acidity.

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