

Traditional herbal drugs of Southern Uganda, II: literature analysis and antimicrobial assays

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Abstract

Continuing field interviews brought the total species used for disease treatment by herbalists of the majority Baganda Tribe of southern Uganda to 168. Literature searches provided support for the ethnomedical claims for a number of these species, and provided criteria for the species classification into four categories of use validation. They also helped guide the selection of species for recollection, for chemical extraction and further testing in laboratories of the Uganda Ministry of Health and the University of Illinois at Chicago. Many species proved active against microorganisms in several susceptibility assays conducted in Uganda and the US.

Author Keywords: Traditional herbal drugs; Uganda; Use validation; Antimicrobial activity

Part I of this paper appeared in Volume 70 (pp. 281–300) of the Journal of Ethnopharmacology. This continuation is a report on results of further fieldwork and laboratory investigation of claimed ethnomedical uses of plants collected in Uganda, East Africa ([Fig. 1](#)). The Uganda Ministry of Health Natural Chemotherapeutics Research Laboratory (NCRL) has continued to host this collaborative survey and investigation of medicinal plants that started in 1996 ([Hamill](#) and [Hamill](#)).

This effort has been directed, in part, toward the compilation of a materia medica for the region through continuous informal question-and-answer 'semi-structured interviews' ([Alexiades and Sheldon, 1996](#)) with health care workers and locally recognized herbalists. Further fieldwork was carried out in February through May, 1999. Funding to carry out antimicrobial susceptibility testing in Uganda, using extracts made at NCRL, was secured and these tests were carried out in 1999.

2. Background and study sites

This project was initiated as a cooperative effort between the University of Illinois at Chicago College of Pharmacy (UIC COP) and the NCRL, with participation from faculty and staff of the Makerere University Department of Botany and the Institute for Tropical Forest Conservation (ITFC, Ruhija, Uganda, funded by the World Wildlife Fund). The goals of this project have included the collection and identification of southern Uganda's plants that are commonly used as medicine. Following identification and cataloguing, re-collection of selected plants was undertaken by members of the participating institutions for the purpose of extraction and antimicrobial susceptibility assays. Re-collection was largely guided through instructions and recommendations from Ugandan traditional healers.

For the second collections expedition in 1999, the medicinal plants of Baganda herbalists were targeted. The Baganda People (Muganda—sing., Baganda—pl., Kiganda—adj., refers to Baganda culture) are the cultural group that defines the Kiganda culture and Buganda Kingdom, one of the remaining traditional kingdoms of the region. More than 3 million people in Uganda are Baganda (20% of the population), making them the majority tribe for the nation. The districts most dominated by Kiganda culture include Kampala (pop. 774 241), Mpigi (pop. 913 867), Masaka (pop. 838 736), Mubende (pop. 500 976), Mukono (pop. 824 604), Luwero (pop. 449 691), Kiboga (pop. 141 607), Kalangala (pop. 16 371) and Rakai (pop. 393 501) ([Rwabwoko](#) and [Kalyegira](#)).

Two climatic and vegetation zones define the Buganda Kingdom, including a semi-tropical, humid region near the shores of Lake Victoria with rich soil. The second is the eastern portion of the East African Central Plateau, which stretches across central Uganda. This area is drier and is used as grazing land. Sharing nearby borders with Rwanda, Tanzania, and Democratic Republic of Congo, the region remains a center of one of the most intractable, misunderstood, and violent ethnic conflicts in the world ([Ssekamwa](#) and [Gourevitch](#)). Poor land management strategies have seriously disrupted this otherwise floristically and climatically varied area.

Fieldwork was carried out in urban and rural areas that are dominated by the Baganda ([Fig. 2](#)). The vegetation and geography of this area are extremely varied, with swamp lowlands and dense deciduous tropical rain forest patches, and highlands at altitude ranges from ~1000 to ~1525 m. The area is the most heavily populated in the nation.

3. Methods

3.1. Fieldwork

The details of interviewee selection, interview methodology, plant collection and identification, and data analysis have been described in the previous paper ([Hamill et al., 2000](#)). Prior informed consent was obtained from participants following the guidelines and requirements described in the previous paper, including videotaped

discussions of project goals and potential for publication of data. All voucher herbarium specimens of plants studied ([Table 1](#)) have been deposited at participating herbaria in the USA (Field Museum of Natural History, Chicago; Missouri Botanical Garden, St. Louis) and Uganda (NCRL, Kampala; Makerere University, Kampala; ITFC. Samples for extraction were dried using standard methods described previously ([Soejarto, 1993](#)). Dried plants were finely milled and stored in labeled, undyed cotton bags.

Table 1. List of collected species from the survey in 1999, with some selected uses given during interviews

Southern_Uganda_1

Table includes new species collected during field work in 1999 as well as species re-collected in 1999 for further study; therefore the table is *not* comprehensive for the entire project. For a complete list of species collected during field work in 1996–1997, please see the first paper in J. Ethnopharmacol. 70, 281–300.

3.2. Literature analyses

Based on the extent of regional use and on the availability of published phytochemical and biological data, the ethnomedical use of each species was substantiated by assigning the species to one of five categories using a modified system of traditional plant use classification defined by [Ortiz de Montellano and Browner \(1985\)](#). Category 0 was assigned to species with limited regional use and with no readily available relevant phytochemical or biological publication data. Category 1 was assigned to species with an established and documented regional use for similar indications. Category 2 was assigned to species for which a minimal level of phytochemical or biological activity studies have been reported with seemingly corroborative results. Category 3 was assigned to species from which a chemical compound or compounds have been isolated and shown to be active in animal (in vivo) studies. Category 4 was assigned to species from which the active chemical constituent has been approved for use in humans (in the US or elsewhere). These data are summarized in [Table 2](#) for the species most commonly used by Baganda traditional herbalists.

4. Results

4.1. Medicinal uses and potential toxicity

One hundred twenty-four plant species ([Table 1](#)) were added to the original collection reported in 2000 by Hamill et al., bringing the total to 228 plant species from 73 families. These plants were collected from the southern region of Uganda ([Fig. 2](#)). Among these plants, 168 species (74%) are used by the Baganda Tribe for a variety of ailments. The Asteraceae were most richly represented in the collection, with 38 species.

During interviews, advice was often given by the traditional healer with regard to contraindications for use. Fourteen species detailed in [Table 6](#) are administered under such prohibitions. During collation and analyses, a number of plant species were found to be commonly used by women for conception, maintenance of pregnancy, or other perinatal uses. These species are detailed in [Table 7](#), which provides an interesting cross section of cultural use of medicinal plants. Notably, the folate-rich fruits of the Solanaceous plant *Solanum gilo* ([Keshinro, 1983](#)) were mentioned by Ugandan herbalists as one of the most widely recognized medicinal plants used to ensure a healthy, male child. Folic acid deficiency during pregnancy is a cause of birth defects ([Lucock, 2000](#)), therefore, consumption of these fruits during pregnancy may indeed contribute to the health of the unborn child.

Table 6. Contraindications in the use of Baganda herbal drugs, as indicated during interviews

Southern_Uganda_2

Table 7. Medicinal plants used by women before, during or after pregnancy (perinatal use)

Southern_Uganda_3

Listed in approximate order of reproductive cycle.

Literature searches showed that 11 species commonly used by the Baganda have been reported as notably toxic, and are listed in [Table 8](#).

Table 8. A selection of notably toxic plants used by the Baganda

Southern_Uganda_4

5. Discussion and conclusions

East Africans depend heavily on herbal remedies and on the specialists who possess the knowledge to administer the drugs ([Anokbonggo](#); [Anokbonggo](#) and [Fabry](#)). The Baganda herbalists are often highly respected individuals within their communities, and are trusted to identify and treat disease with the variety of crude drug preparations they have learned from their elders. In Uganda, as in other parts of the world, health care is often the particular job of the women of the household ([Wallman and Baker, 1996](#)). It is the women in the household who are responsible for cleaning and maintenance of the living areas, bathing of children, and preparation of food. It is also a maternal care figure, often the mother or *Ssenga* (paternal aunt, a traditional confidante and guide within the Baganda family system), who first notices a change in a family members' health; she may then prescribe medicines and courses of action to counter ill health. For these reasons, the investigation performed during this study has focused less on professional herbalists than on women responsible for the running of households, including Mrs Margaret Kigozi, Ms Molly Kajumba, Ms Olivia Maganyi, and Mrs Leya Nakalanzi. Numerous male herbalists of various tribal affiliations, both amateur and professional, contributed to the investigation as well, including Dr Yahaya Ssekagya (Director, Seya Nursing Home and Clinic, PO Box 16465, Kampala), Calebo Naambeneza (a noted herbalist of the Abayanda Tribe residing near Ruhija in southwest Uganda). Regardless of the apparent level of esteem held for them by their communities, none of the health care practitioners interviewed during this project were satisfied that their knowledge would be effectively transferred to the next generation. Neither have they, until fairly recently, perceived an interest at government levels to encourage cooperation between conventional and traditional health care workers practicing in Uganda.

Laboratory investigations of biological activities of crude extracts of many of the reputedly anti-infective species collected during the study have indicated the presence of antimicrobial compounds. These activities may persist in the crude preparations used in traditional practices, and, if so, would account for the traditional use and provide a validation of such use. Antimicrobial susceptibility testing was thus used to determine the effectiveness of crude and later refined plant extracts as inhibitors of the proliferation of microorganisms.

The NCRL has been maintained, in part, for the purpose of documentation and standardization of traditional remedies. Efforts to gauge efficacy have been generally limited to reports of treatment success with use of certain preparations, though some biological evaluation and chemical characterization of traditional plant remedies have been conducted. A variety of methods that have been used at the NCRL, including disk diffusion, well diffusion and broth micro-dilution have been well described and shown to generate highly reproducible results ([Jorgensen and Woods](#)). For the microbiology component of this project that took place in Uganda, the agar well diffusion assay was used because it is a low-cost, customizable test that has been most heavily relied on at the NCRL. Test result data from this assay are easily reported by the categories of S, M, P and R. These categories are qualitative in nature, and are termed 'category results'. Currently, the NCRL makes available crude drug preparations for sale through the laboratory in Wandegaya to individuals who come there seeking treatment.

The traditional crude plant drugs of the Baganda have been catalogued, identified, characterized (through searches of the world literature on their chemistry, biology, pharmacology, and ethnology), extracted and tested for antimicrobial activity, and subjected to limited bioassay-guided fractionation. Literature reports and laboratory evidence support (*validate*) the ethnomedical use of a number of species, and indicate that it would be appropriate to acknowledge the use of medicinal plants in Uganda as a rational practice and a benefit to the public health. These data have contributed to ongoing efforts by the Ministry of Health and development and conservation-oriented organizations by helping to characterize and evaluate the continued reliance on crude drugs as a major component of first-line health care for more than 80% of Ugandans ([Anokbonggo](#) and [Anokbonggo](#)).

SIGNIFICATION DES SIGLES

LF, leaf;
RT, root;
ST, stem;
FL, flower;
BK, bark;
SB, stem bark;
WP, whole plant;

D1 signifies a 'strong decoction', corresponding to a handful of indicated material per 200 ml water;
D2 signifies a 'mild decoction', corresponding to about half the amount in D1 per 200 ml water;
D3 signifies a 'weak decoction', corresponding to about a heaped tablespoon per 200 ml water;

I1 signifies a 'strong infusion', corresponding to a handful of indicated material per 200 ml water;
I2 signifies a 'mild infusion', corresponding to about half the amount in I1 per 200 ml water;
I3 signifies a 'weak infusion', corresponding to about a heaped tablespoon per 200 ml water;

*I1 signifies a 'warm or cold and strong infusion', corresponding to a handful of indicated material per 200 ml water;
*I2 signifies a 'warm or cold and mild infusion', corresponding to about half the amount in D1 per 200 ml water;
*I3 signifies a 'warm or cold and weak infusion', corresponding to about a heaped tablespoon per 200 ml water;

PD, plant part is pounded fresh, as with a mortar and pestle;
EXP, plant part is expressed to yield juice, usually mixed with an equal portion of water;
MAS, plant part is chewed;
EMB, plant part is crushed and packed into or onto the surface of the skin, over a wound, for example;
P1 signifies powdering of dried plant material;
P2 signifies powdering of material and mixing with a small portion of salt, to effect a mixture which is licked occasionally to effect relief;
po, by mouth;
Top, topical;
IO, directly onto eye;
qd, once per day;
bid, twice per day;
tid, thrice per day;
qid, four times per day;
@: 'as needed to effect result'.

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