

The use of *Toddalia asiatica* (L) Lam. (Rutaceae) in traditional medicine practice in East Africa

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Abstract

Toddalia asiatica (L) Lam. (Rutaceae) has been used by traditional health practitioners in East Africa for management of diseases, however, the extent of its usefulness has not been established to date. Fieldwork for this study was carried out in the Lake Victoria Basin between March and September 2006. The purpose was to collect ethnomedical information that will serve as a basis for further studies to establish current and potential medicinal uses. The ethnomedical information was obtained through interviews using semi-structured questionnaires. Consultative meetings were also conducted with traditional health practitioners and other members of the communities in Kenya, Uganda and Tanzania.

Results of this study show that *Toddalia asiatica* is collected in the wild, prepared mostly as decoctions or concoctions and administered orally. It is used for the management of a number of disease conditions. The most frequently cited diseases were stomach problems (78%) followed by malaria (25%). Cough (22%), chest pain (13%), food poisoning (8%), sore throat (7%), were also mentioned among other disease conditions treated. Validation studies of therapeutic claims will be carried out at a later date.

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1. Introduction

World Health Organization (WHO) estimates that more than 80% of health care needs in developing countries are met through traditional health care practices (WHO, 2002). In East Africa, 90% of the population rely on traditional medicines (TM) and traditional health practitioners (THPs) as the primary source of health care (Miller, 1980). This is mainly because of accessibility (Odera, 1997; Tabuti et al., 2003) and the holistic nature of traditional health care services (Gessler et al., 1995). A traditional health practitioner is defined as a person who is recognized by the community in which he lives, as competent to provide health care by using plant, animal and mineral substances (Sofowora, 1982). Plants are most used among the three substances. Medicinal plants have been a source of some of the most effective anti-malarial agents such as quinolines and artemisinin derivatives.

In this study, ethnomedical information was collected for a commonly used medicinal plant, *Toddalia asiatica*. This medicinal plant was chosen because it is widely available and used in East Africa and in particular in management of malaria related symptoms (Orwa et al., 2007). Malaria and malaria-related morbidity and mortality are important public health problems, particularly in the lake region. *Toddalia asiatica* was therefore considered a good model for initiating developmental processes and conservation for sustainable exploitation.

Toddalia asiatica (L) Lam. (Rutaceae) (Syn: *Paullinia asiatica* L., *Scopolia aculeata* Sm., *Toddalia aculeata* Pers.) is a medicinal plant commonly known as Orange climber (Eng.). The species is traditionally used as a browse for goats and as a hedge among the Maasai and Kipsigis communities (Glover et al., 1966a). However, the most important use of *Toddalia asiatica* is medicinal. The fruit is traditionally used to treat malaria and coughs; roots to treat indigestion and influenza and the leaves for lung diseases and rheumatism (Glover et al., 1966b; Adjanohoun et al., 1993; Maundu et al., 2001; Meyer, 2005; Duraipandiyan et al., 2006). *Toddalia asiatica* is also used to

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treat nasal and bronchial pains, stomachache, snake bites, and in rituals (Kokwaro, 1993).

From the forgoing it is noted that many people are already using traditional medicine treatments that exploit *Toddalia asiatica*. However, although some ethnomedical information exists in literature, these studies are purely academic and local communities often do not benefit. This ethnomedical survey therefore opted for a different approach, which involved local traditional health practitioners (THPs) from the outset. It is the intention of this study that any results generated will be shared with the THPs and the communities in which they practice for their benefit as part of the research project implementation. The aim of this study was to investigate and document the traditional medical practices that exploit *Toddalia asiatica*. The ethnomedical and ethnobotanical information documented will serve as a basis for further studies to establish the medicinal claims. The information will also serve as a tool for planning the development and technology transfer of processing and domestication technologies to rural communities as a basis for sustainable exploitation of *Toddalia asiatica* for safe medicinal use, conservation and environmental restoration.

2. Methodology

2.1. Study site

Fieldwork was carried out in Kenya, Uganda and Tanzania around the Lake Victoria Basin. Interviews were conducted in Kisumu, Siaya and Rachuonyo Districts of Kenya; Iganga and Kampala Districts of Uganda and Bukoba District in Tanzania. Consultative meetings were held in Kisumu, Kampala and Bukoba.

2.2. Study population

Traditional Health Practitioners were recruited from among those practising within the Lake Victoria Basin with assistance from the head of traditional health practitioners' associations within every region. A total of 60 THPs were interviewed using questionnaires while another 41 THPs participated in consultative discussions.

2.3. Ethnomedical survey

Indigenous knowledge is held by THPs who are specialists in this field hence the selection of this group for the study. The fieldwork was carried out between March and September 2006. A total of Sixty (60) THPs, aged between 18 and 85 years were interviewed using questionnaires. This involved an evaluation

of the THP's knowledge and use of *Toddalia asiatica*. The questionnaires captured information relating to the collection of the medicinal plant, its medicinal uses and the preparation of remedies. Details of the preparation and use of *Toddalia asiatica* for management of diseases was recorded. Consultative discussions on the medicinal use, processing and cultivation and conservation practices of *Toddalia asiatica* were also carried out. Plant voucher specimens were collected for botanical verification and deposited in herbaria at the three study areas. See Table 1.

3. Results and discussion

3.1. Traditional health practitioners' characteristics

Of the 60 traditional health practitioners interviewed, more than half (31) were from Iganga and Kampala Districts of Uganda, one third (20) from Kisumu, Siaya and Rachuonyo Districts of Kenya and 9 were from Bukoba District, Tanzania. The majority (50, 83%) were males and 10 (17%) were female. Most (56%) were between 41 and 60 years old and 22% were above 60 years old at the time of the interview. Only 2% were below 20 years old, 5% were between 21 and 30 years, and 15% between 31 and 40 years old. This data indicates that THPs are elderly men and women with extensive experience of traditional healing and therefore are a useful source of authentic ethnomedical information.

Of those interviewed, 10% did not have any formal schooling while 2% had middle level college education. Majority (60%) had primary education and 27% had secondary education. One did not respond to the question on level of education. Most healers interviewed were married (97%). The THPs received their training through inheritance (92%), apprenticeship (5%) or divine call/dreams (2%). These results show that healers possess modest education and knowledge of traditional healing is passed on principally by oral tradition. Consequently there is little documentation, which is an important starting point in the identification and exploitation of traditional medicine potential.

Concerning regulation of traditional health practitioners, a number of regulatory initiatives have been introduced by Governments from time to time. For example in Kenya the Ministry of Gender, Sports, Culture and Social Services had introduced a notification system requiring the THPs to register themselves with the cultural officers at various levels. There is now a Council of Traditional Healers in Tanzania. The council is about a year old and it has an office at the Ministry of health. The council regulates the activities of the THPs in Tanzania. In recognition of this, a number of THPs (52%) had some form of practice licence obtained from relevant government departments or their

Table 1
Toddalia asiatica voucher specimens

Country	Collection site	Herbarium where voucher specimens are deposited	Voucher specimen number
Uganda	Nsuki wild life centre, Wasiso District	Makerere University	NAB 1
Tanzania	Iberera ward, Bukoba District	University of Dar es Salaam	Minja s.n. May 2006
Kenya	Kajulu hills, Kisumu District	University of Nairobi	Mwitari 007

associations. Others however, had only a licence that allowed them to harvest from the restricted forest areas.

Government initiatives to develop traditional medicine in the three countries is exemplified in existing draft national policies on traditional medicine, which are at various stages of development for each country. Initiatives for promoting collaboration have largely focused on HIV prevention and care. In Uganda, THETA (Traditional and modern health practitioners together against AIDS and other diseases), a non-governmental organisation, is promoting collaboration between traditional and modern healers through collaboration in clinical trials to study the effectiveness of herbal treatments for opportunistic infections. In Tanzania, Tanga AIDS Working Group (TAWG) is an alliance of traditional healers, biomedical health workers, botanists, social scientists and people living with HIV/AIDS. Its goal is to bridge the gap between traditional medicine and biomedicine in order to improve HIV prevention and care (<http://www.unaids.org>, accessed on 14th September 2007). PROMETRA-Kenya (Promotion for Traditional Medicine) is a Kenya branch of an international Non-Governmental Organisation (PROMETRA INTERNATIONAL). The NGO aims at rehabilitation and promotion of traditional medicine in general (<http://www.prometra.org/Kenya/Kenya.html>, accessed on 21st September 2007). PROMETRA-Kenya focuses on Empowerment of Traditional Medicine Practitioners in Management, Prevention of HIV/AIDS and Promotion of Right to Health. Other activities include training THPs on improved practice, nutrition and conservation of medicinal plants (Martha Njama, Personal Communication).

The results of this study revealed that majority of the traditional healers (88%) work full-time as healers. Out of a total of 60 healers interviewed, 30 reported seeing less than 5 patients per day. Ten (10) of the healers reported seeing 6–10 patients daily, while another 10 saw a range of 11–15 patients daily. The latter two groups comprising 4 and 6 healers, respectively, reported seeing 15–20 and more than 20 patients daily. It is interesting to note that although the majority of THPs work full time, they are visited by less than five patients per day. This low patient load provides very little income to the practitioners. The study also revealed that three quarters (75%) claimed they keep records of their patients, though this was verified from only one THP in Bukoba.

3.2. Knowledge of *Toddalia asiatica* and anti-malarial use

The local/vernacular names of *Toddalia asiatica* in the Lake Victoria region include Nyalwet-kwach (Luo, Kenya), Kaule (Luganda, Uganda) and Mdaka komba (Swahili, Tanzania). The Luo in Kenya only know it as 'nyalwet-kwach' while in Uganda other names include katasubwa, kabahula or kirobo. Traditional healers in this study had adequate knowledge of the plant and its uses. Most THPs (93%) know the plant through family inheritance and only 5% through apprenticeship. *Toddalia asiatica* is recognized mostly through leaves (72%), thorns (58%) and roots (25%). The criteria used are that leaves are in three parts (trifoliate) and have a menthol-like taste while twigs are covered in small, recurved thorns. Roots are yellowish in colour and have

bitter taste. Some healers (7%) however said they just know and can recognize the plant. *Toddalia asiatica* is a monotypic genus (only one species) (Gunaseeli and Sampathkumar, 1985) and is therefore readily distinguished from its habitat.

During consultative meetings in Kisumu, the THPs unanimously identified *Toddalia asiatica* leaves and roots that were presented to them. The healers could also identify *Toddalia asiatica* by the leaves, thorns and fruits and by smell and taste when it is ground. Roots are yellow and the root bark has bitter taste. There was general agreement among the THPs in Kisumu that *Toddalia asiatica* is widely used for the management of malaria and other tropical diseases either alone or in combination with other herbs. Malaria diagnosis is often obtained from patient information. Some THPs at the consultative meeting in Kampala also revealed that they use root bark of *Toddalia asiatica* in combination with other medicinal plants to treat malaria. Medicinal plants mentioned by THPs as being used in combination with *Toddalia asiatica* and have been reported in literature to have antiplasmodial activity include *Maytenus senegalensis* (Lam.) Exzell. (Celastraceae) (El Tahir et al., 1999), *Clerodendrum myricoides* (Hochst) Vathek (Verbenaceae) (Benoit et al., 1996) and *Ximenia americana* L. (Olacaceae) (Benoit et al., 1996).

3.3. Medicines preparation and administration

Traditional health practitioners obtain *Toddalia asiatica* from the wild in forest edges (65%), river banks (35%) and anthills (10%) while 3% of the THPs have the plant in their home gardens. Others (12%) buy from hawkers. Postharvest processing is traditionally carried out by drying plant parts in the shade, storing these mostly on floors and grinding with traditional mortar and pestle before use. When dried, 68% THPs may store the dry powder for 1–2 years, 3% store for 2–3 years and 23% may store for more than 3 years.

On the basis of the information collected, the root bark is the most frequently used (92%) plant part for preparation of traditional medicine. Leaves (37%), stem bark (8%) and fruits (5%) are also used but to a lesser extent. Root bark is normally dried, powdered and extracted in hot water for oral administration. Leaves may be pounded while wet, dried under shade, ground, sieved and then dissolved in hot water or boiled for oral administration. Other dry leaves in the shed, these are stored as such and samples are ground only when required. *Toddalia asiatica* is used both as a decoction (50%) and a concoction (47%) in the preparation of herbal remedies. A concoction is prepared by boiling more than one plant species in water, while a decoction is prepared from plant parts of single species. An infusion is a liquid in which required medicinal plants have been steeped.

The preferred route of administration for traditional medicine preparations is the oral route similar to the practice in orthodox medicine. Of the interviewed THPs, 98% reported that they administer the traditional remedies using the oral route, 13% by topical administration and 2% use it as a bath. None indicated that they use the parenteral route of administration. Dosages are measured intuitively, however these are not standardized. There is therefore an urgent need for documentation of proper quantity

and standardization of dosages so as to minimize possible incidences of overdose. Healers interviewed claim that the medicinal plant is safe and no toxicity arises from overdose. This would need to be validated through properly designed studies. There is also need for good manufacturing practices to be applied to product preparation as a means of promoting acceptability.

3.4. Common conditions treated by THPs using *Toddalia asiatica*

Common disease conditions treated using *Toddalia asiatica* are presented in Table 2. The most frequently cited indication was stomach problems (78%). From the data obtained, more than half of respondents from Uganda (25 out of 31), Kenya (16 out of 20) and Tanzania (6 out of 9) use *Toddalia asiatica* for stomach problems. The next most quoted disease condition was malaria as cited by 25% THPs, mostly from Kenya (11) and Tanzania (4). Although none of the respondents from Uganda indicated using the plant as an antimalarial, other healers at the consultative meeting in Uganda said that they use *Toddalia asiatica* to treat malaria. Other disease conditions cited were cough (22%), chest pain (13%), food poisoning, (8%), sore throat (7%), among others as listed in Table 2. An important observation is that *Toddalia asiatica* has many medicinal uses in East Africa.

This is significant in the context of plant conservation. When a medicinal plant is perceived to be of value within a community, people will be motivated to take care to protect the plant (Etkin, 1998).

The plant's potential for treatment of malaria has been demonstrated through laboratory studies involving the isolation of compounds with antiplasmodial activity such as nitidine (Gakunju et al., 1995) and coumarine derivatives (Oketch-Rabah et al., 2000; Pant et al., 2003). Antimicrobial activity of essential oils isolated from the leaves of *Toddalia asiatica* was demonstrated by Saxena and Sharma (1999). In vitro anti-platelet aggregation activity of compounds found in methanol extracts of the wood of *Toddalia asiatica* may be associated with pain relief (Ivan-Lih et al., 1998). Spasmolytic activity of hexane and chloroform fractions of ethanol extracts of aerial parts of *Toddalia asiatica* has also been demonstrated (Lakshmi et al., 2003).

3.5. Conservation measures applied on the plant species

Twelve out of twenty (60%) of the Kenyan THPs reported that they have domesticated some medicinal plants other than *Toddalia asiatica* for purposes of easy access and conservation. In consultative meeting with Ugandan THPs it also became apparent that some carry out conservation practices and some had

Table 2
A summary of ethnomedical information on *Toddalia asiatica* medicinal use

Diseases/symptoms	Plant part(s) used	Form of use	No. of healers who gave information				
			Uganda	Tanzania	Kenya	Total	
			N=31	N=9	N=20	N=60	%
Stomach problems	Root bark	Concoction	25	6	16	47	78
Malaria	Root bark/stem bark/leaves/fruits	Concoction	0	4	11	15	25
Cough	Root bark	Concoction	8	0	5	13	22
Chest pain	Root bark/leaves	Concoction/inhalant	0	1	7	8	13
Ulcers	Root bark	Decoction	7	1	0	8	13
Skin rash	Root bark	Pound fresh	7	0	0	7	12
Food poisoning	Root bark	Decoction	0	3	2	5	8
Menstrual cramps	Leaves/root bark	Concoction	3	1	1	5	8
Sore throat	Root bark	Chew	0	0	4	4	7
Diarrhoea	Root bark	Concoction	3	0	1	4	7
Snake bite	Root bark	Infusion	4	0	0	4	7
STI ^a	Root bark	Concoction	0	1	2	3	5
Tuberculosis	Root bark	Concoction	2	0	1	3	5
Tooth ache	Root bark	Chew	0	0	3	3	5
Pneumonia/bronchitis	Root bark	Concoction	1	0	1	2	3
Wound healing	Leaves/root bark powder	Concoction/topical	0	0	2	2	3
Amoeba	Root/stem/leaves	Concoction	0	1	1	2	3
Burns	Leaves	Concoction	0	0	1	1	2
Bacterial infection ^b	Root bark/leaves	Concoction	0	0	1	1	2
Prostate diseases	Root bark	Concoction	0	0	1	1	2
Tongue thrash	Leaves	Ash	0	0	1	1	2
Typhoid fever	Root/stem/leaves	Concoction	0	0	1	1	2
Back pain	Root/stem/leaves	Decoction	0	0	1	1	2
Haemorrhage following child birth	Root bark	Decoction	0	0	1	1	2
Asthma	Root bark	Concoction	1	0	0	1	2
Liver diseases	Roots/leaves	Decoction	1	0	0	1	2
Sweating feet	Root bark	Infusion	1	0	0	1	2
Vomiting	Root bark	Decoction	1	0	0	1	2

^a STI: sexually transmitted infection.

^b Bacterial infection as described by healers is common skin lesions as impetigo, boils, carbuncles, abscesses and infected lacerations.

even attempted to domesticate *Toddalia asiatica* but encountered some challenges. They advised that wildlings would achieve better growth than stem or root cuttings. Although *Toddalia asiatica* is used in Tanzania, it is not readily found in Bukoba district where the study was carried out. Plants provide the predominant ingredients of medicines in most medical traditions. However, concerns exist because most species of medicinal plants are collected from the wild. Examples of cultivated species of medicinal plants on any scale are few (Hamilton, 2004). Conservation and domestication is important for continued availability of medicinal plants and THPs should be encouraged and empowered to conserve biodiversity.

3.6. Challenges in traditional medicine practices

Traditional health practitioners face a number of challenges with regards to growth and economic value of their practice. They have inadequate or poor storage facilities for medicinal plants resulting in their storing these raw materials on floors under unhygienic conditions. They also reported having to travel long distances and transport is not always available. This increases the cost of plant collection as areas where healers reside they sometimes find that over-harvesting has resulted in limited supply. These challenges are also aggravated by inadequate conservation skills and extension services to promote and propagate medicinal plants. Other constraints impacting on sustainability of medicinal plants supply include limited land for cultivation and restrictions regarding harvesting from protected areas belonging to the government. Traditional healers also have inadequate tools and skills for postharvest processing. Obtaining funds to successfully market traditional medicine products is also a challenge. THPs are therefore unable to get maximum economic benefit from their practice.

One major challenge to their practice is the fact that some patients do not comply with instructions for use of the traditional medicine treatment for various reasons which the THPs did not elaborate. Many healers lack designated areas for traditional medicine practice. Practice settings range from the sophisticated premises to market places and homes. THPs appreciate the need for training in appropriate use of traditional medicines. They also admit that research is useful in informing policy to guide and regulate traditional medicine practice. Healers however reiterated that researchers should give research feedback to the healers and also observe their Intellectual Property Rights.

4. Conclusions

Traditional healers in this study had adequate knowledge of *Toddalia asiatica* and its uses. Many use it in management of malaria and stomach problems. The medicinal plant is mainly collected from the wild and unsustainable levels of use of the root bark and patterns of harvesting calls for conservation and domestication measures. This plant tends to grow as a large shrub, not a liana if planted in full sun. It could be domesticated very successfully in larger gardens. Because it is extremely thorny, it could also be used as a security fence, as is already used by the Maasai and Kipsigis (Glover et al., 1966a).

The therapeutic claims over *Toddalia asiatica* must be evaluated for efficacy and safety in order to raise confidence among clients of traditional medicine. The information obtained from this study confirmed the need for further investment by government and other stakeholders in research on traditional medicine practice and medicinal plants for sustainable utilization and economic development.

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