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Ethnobotanical study of anthelmintic and other medicinal plants traditionally used in Loitoktok district of Kenya

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ABSTRACT

Aim of the study: The objective of the study was to investigate and document the utilization of medicinal (with emphasis on anthelmintic) plants by the people of Loitoktok district in Kenya for the management of both animal and human health.
Materials and methods: The study was conducted between May and October 2009. Information was gathered from 23 traditional health practitioners, from across the district, by use of semi-structured questionnaires; transect walks, oral interviews and focus group discussions. Voucher specimens of cited plants were collected and deposited at the botanical herbarium of the University of Nairobi.
Results: A total of 80 medicinal plants cited were collected and identified as belonging to 46 families and 70 genera. The plants identified were 48%, 38%, 7%, 6% and 1% trees, shrubs, herbs, lianas and lichens, respectively. Most of the plants belonged to the families Fabaceae (10%), Euphorbiaceae (6%), Rutaceae (5%) followed by Boraginaceae, Labiateae, Rubiaceae, and Solanaceae at 4% each. However, the six most important families by their medicinal use values in decreasing order were Rhamnaceae, Myrsinaceae, Oleaceae, Liliaceae, Usenaceae and Rutaceae. The ailments treated included respiratory conditions, helminthosis, stomach disorders, malaria, sexually transmitted diseases, infertilities and physical injuries. Helminthosis in both livestock and humans was recognized as a major disease managed by use of medicinal plants (with an informant consensus factor of 0.86) in the study area. The most frequently used plant anthelmintics were *Albizia anthelmintica* (Fabaceae), *Myrsine africana* (Myrsinaceae), *Rapanea melanophleos* (Myrsinaceae), *Clausena anisata* (Rutaceae) and *Olea Africana* (Oleaceae) used by 70%, 70%, 26%, 13% and 9% of the respondents, respectively. Other plant anthelmintics used, each by 4% of the respondents, were *Rumex usambarensis* (Polygonaceae) and *Salvadora persica* (Salvadoraceae).
Conclusion: It is concluded that traditional health practice in Loitoktok depend largely on naturally growing plants and that the study area has a potential for bio-prospecting of crude drugs from plants due to the large number of medicinal plants cited. There is also need for further studies to validate the plants used in medicinal remedies in this area.

1. Introduction

Ethnobotanical studies are often significant in revealing locally important plant species especially for the discovery of crude drugs. Right from its beginning, the documentation of traditional knowledge, especially on the medicinal uses of plants, has provided many important modern drugs (Cox, 2000; Flaster, 1996). The modern pharmacopoeia still contains in the order of 25% of the drugs derived from plants and many others are synthetic analogues built on prototype compounds isolated from plants. Traditional medicine still remains the main resource for a large majority (80%) of the people in developing countries for their primary health care needs (Danøe and Bøgh, 1999; WHO, 2002). There has been a resurgence of interest in traditional health practices throughout the world, which mainly encompasses ethnobotany and the use of herbal remedies. The forces responsible for this momentum include the perception that "natural is nice", concerns of synthetic drug residues in the environment and the food chain, and particularly the spectre of rapid emergence of multiple resistant pest organisms through misuse and overuse of these modern drugs. A case in point is the effectiveness of artemesinin from the Chinese herb, *Artemesia annua*, against multi-drug resistant malaria (WHO, 2002).

More than 50,000 flowering plants are used for medicinal purposes across the world (Govaerts, 2001; Schippmann et al., 2002). In Kenya, more than 1200 plants are described as medicinal from

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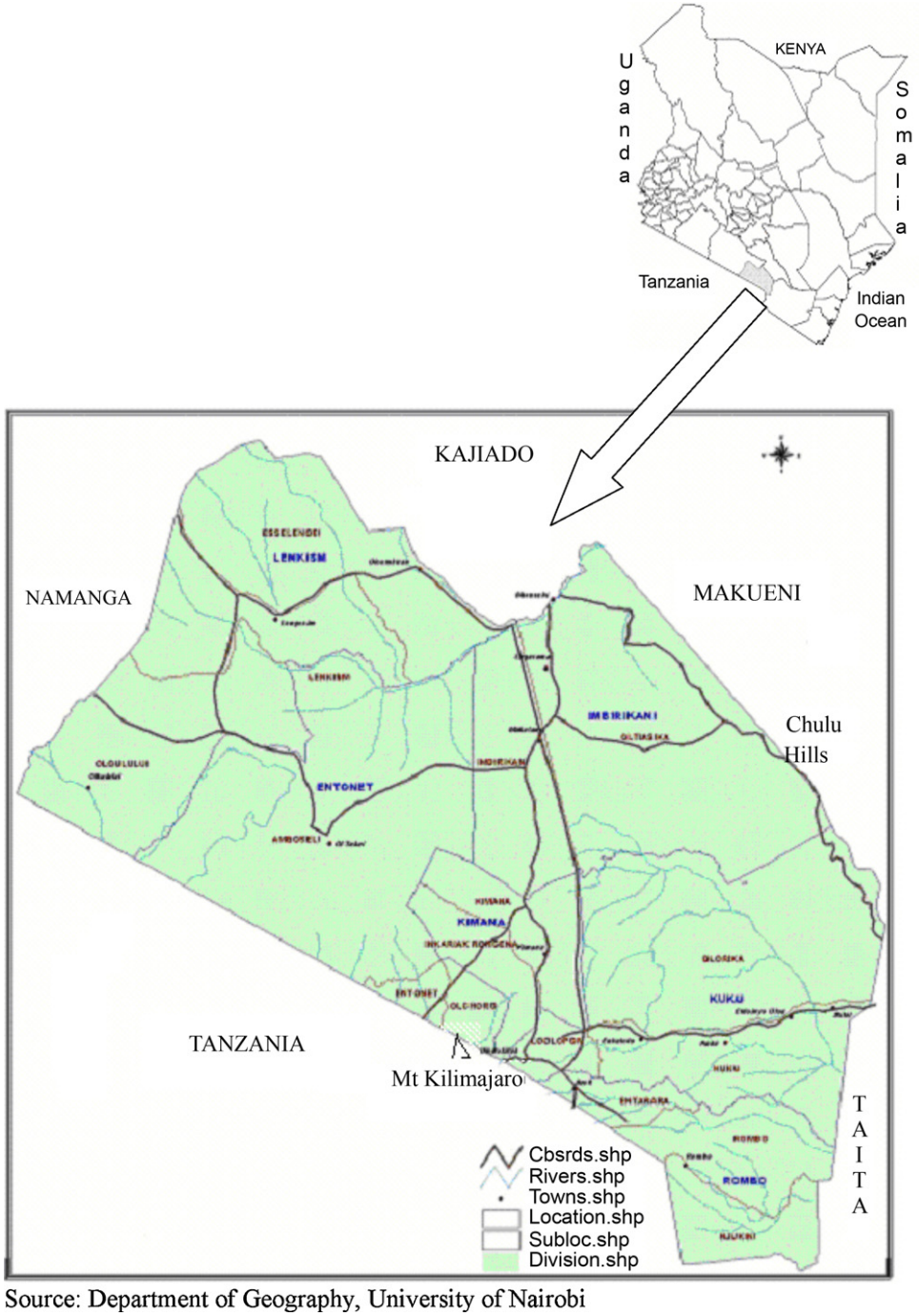

Fig. 1. Map of Kenya showing the location of Loitoktok district.

a flora of approximately 10,000 members (Kokwaro, 1993). The wide spread use of traditional medicine among both urban and rural population in Kenya could be attributed to cultural acceptability, efficacy against certain types of diseases, physical accessibility and affordability as compared to modern medicine. Kenyan traditional medical system is characterized by variation and is shaped by the ecological diversities of the country, socio-cultural background of the different ethnic groups as well as historical developments, which are related to migration, introduction of foreign culture and religion. In Kenya, the knowledge from herbalists is often passed secretively from one generation to the next through word of mouth.

The study of African medicinal plants has not been realized as fully as that of India, China or other traditional communities elsewhere (Iwu, 1993). In Kenya, though there has been some organized ethnomedicinal studies, there has been limited development of therapeutic products and the indigenous knowledge on usage of medicinal plants as folk remedies are getting lost owing to migration from rural to urban areas, industrialization, rapid loss of natural habitats and changes in life style (Njoroge and Bussman, 2006). In addition, there is a lack of ethnobotanical survey carried out in most parts of the country. In view of these, documentation of the traditional uses of medicinal plants is an urgent and important matter in order to preserve the knowledge (Fratkin, 1996). Thus, the purpose of this study was to investigate and document the traditional uses of medicinal plants by the people of Loitoktok district and to provide baseline data in an ongoing study whose aim is to formulate a plant

based anthelmintic using both indigenous technical knowledge and scientific pharmacognosy technique.

2. Materials and methods

2.1. Choice of study area

A reconnaissance survey was undertaken to Kajiado district headquarters, in May 2009, to identify key informants in the study. The district cultural officer, under whose jurisdiction the registration of herbalists fall and the local administrators were chosen as the key sources of information about the herbal practitioners. It is from discussions with these key informants that Loitoktok district, formerly part of Kajiado district, was chosen as the most suitable area of the study due to its widespread use of traditional medicine and relatively less modernity.

2.2. Study area description

Loitoktok district comprises an area of 6300 km^2 and is home to the Ilkisonko subgroup of the Maasai people. However, several non-Maasai groups, of which the Kikuyu and Kamba are the most numerous, now live in Loitoktok. Fig. 1 shows Loitoktok district in relation to the map of Kenya. It is located in the southwestern part of the Rift valley province of Kenya and borders Kajiado central district to the north, Namanga district to the northwest, Tanzania to the southwest, Taita-Taveta and Makueni districts to the southeast and northeast, respectively. Its highest point is the slopes of the snow-capped Mount Kilimanjaro (the highest mountain in Africa) and the Chyulu hills while its lowest point is the Amboseli basin.

Loitoktok has a bimodal rainfall pattern with the long rains falling between March and May and the short rains between October and December. High rainfall occurs around the slopes of Mt. Kilimanjaro and the Chyulu hills. Other areas, especially the rangelands are characterized by lower rainfall. The October–December rainfall accounts for 45% and the March–May for 30% of the total rainfall. The temperatures in Loitoktok, like rainfall, also vary with altitude and season. The hottest temperatures of 30 °C have been recorded around Lake Amboseli and the lowest mean minimums of 10 °C are experienced on the eastern slopes of Mt. Kilimanjaro. The coolest period is June–August and the hottest is September–February. The vegetation of the Amboseli plains is dominated by bushland and open grasslands (*Acacia* – commiphora mosaic). Swamps are found at the base of Mt. Kilimanjaro. The vegetation composition has changed significantly over the last decade (Ntiati, 2002). Most of the woodland has been converted into marginal crop farming areas, swamps into irrigated land and grassland to bush land due to overgrazing and overstocking.

2.3. Data collection

Data on medicinal plants traditionally used to treat worm infestation and other ailments was collected through interviews, stakeholder meetings; transect walks, focus group discussion and administration of semi-structured questionnaires to herbalists. The approach was for the herbalists to mention the plants used in anthelmintic herbal remedies and then those used in remedies for other diseases and conditions. The information sought included the herbalists' biodata, diseases treated with herbal remedies, harvesting of medicinal plants and parts used in herbal remedies, methods of their preparation and administration. Thirty herbalists from across the locations in Loitoktok district were recruited and 80% of them cooperated and fully participated in the study.

2.4. Collection of plant samples and identification

Plants reportedly used in herbal remedies were collected by a team comprising of herbalists, a botanist and researchers from the University of Nairobi. The plants were identified by a taxonomist and voucher specimens deposited at the University of Nairobi Herbarium. The information gathered included the vernacular name of the plant, species, habitat, parts used, ailments they cure and methods of preparation; dosage and routes of administration.

2.5. Data analysis and reporting

The data collected was analyzed and reported using proportions and percentages. The relative importance of individual plant species, for medicinal use by the community, was assessed by calculating their use values (UV_s) by a slight modification of the method described by Phillips and Gentry (1993); where use value of a species (UV_s) = $\Sigma_i UV_{is}/n_s$, where UV_{is} is the use value of one plant species to one informant and n_s is the number of informants interviewed for the species (in our case the number of informants citing use of the species). Our assumption was that every informant had equal chances of mentioning any of the species used in medicinal purposes in the area because of the way we framed our questions. $UV_{is} = \Sigma U_{is}/n_{is}$, where U_{is} is the number of uses mentioned by an informant for a particular plant species and n_{is} is the number of interviews by the informant (in our case only one interview for each informant). The value of a botanical family (FUV) = UV_s/n_f, where n_f is the number of species reported in the family.

Calculation of the consensus factor (F_{IC}) for the use of herbal remedies in the treatment of helminthiasis was done by the method provided by Trotter and Logan (1986), where $F_{IC} = N_{ur} - N_t/(N_{ur} - 1)$ and N_{ur} is the number of use-reports of informants for a particular illness usage, where a use-report is a single record for use of a plant mentioned by an individual, and N_t refers to the number of species used for a particular illness category for all informants.

3. Results and discussion

The traditional healers have registered an association with the Ministry of State on National Heritage and Culture for regulatory and advocacy purposes. Out of the 24 participating herbalists, 21 were men (87.5%) and three (12.5%) were women including one traditional midwife. Majority of the herbalists (62.5%) treated only human ailments while 37.5% attended both to human and livestock. The ages of the herbalists ranged between 29 and 81 years with an average of 53 years. This is probably an indication of how long it takes for the knowledge to be acquired or that the practice is not readily being passed on to the younger generations and therefore the urgency to document it before it disappears. This finding is quite similar to that reported by Minja and Allport (2001) among the Maasai of Simanjiro district in Tanzania. Fifty four percent (54%) of the herbalists had no formal education whereas 29% and 12.5% had primary and secondary education, respectively. This is low compared with the average national adult literacy rate of 71% in Kenya (Ndemo, 2005). However, the most educated herbal practitioner in the group had a university degree in Botany. Ninety two percent (92%) of the herbalists were of the Christian faith while 8% were traditionalists. Fifty eight percent (58%) of the herbalists inherited the practice from relatives while 42% acquired the knowledge by observation and apprenticeship with older herbalists. This pattern of knowledge transfer and the tendency of secrecy are also reported in similar studies elsewhere (Mesfin et al., 2009; Nanyingi et al., 2008).

Table 1
Plants used in various herbal remedies in Loitoktok district.

Plant family	Species	Vn[a]	Local name	Habit	Medicinal uses	pu[b]	Nh[c]	UVs[d]
Amaranthaceae	*Sericocomposis hildebrandtii* Schinz.	JK25	Olaisai	Shrub	Malarial complications	R	1	0.04
Anacardiaceae	*Rhus natalensis* Bernh	JK57	Olmusigiyoi	Shrub	Endometritis, foot and mouth disease	Sb,R,L	3	0.13
	Ozoroa insignis Del.	JK63	Olokunonoi	Tree	Tooth ache, snake bite	R	1	0.09
Apocynaceae	*Carissa edulis* (Forsk.) Vahl	JK26	Olamuriaki	Shrub	Gonorrhea, syphilis	R	1	0.04
	Acokanthera schimperi Schewnf.	JK53	Olmorijoi	Tree	Blood pressure, ectoparasites, AIDS	R,Sb	1	0.13
Araliaceae	*Cussonia holstii* Harms ex Engl.	JK72	Oltimaroi	Tree	Abdominal pains	B	1	0.04
Asclepiadaceae	*Mondia whytei* (H.f.) Skeels	JK52	Olmokongora	Liana	Aphrodisiac, respiratory	R	1	0.09
Balanitaceae	*Balanites glabra* Meldbr & Schlectr	JK59	Olngosua	Tree	Cowpox, stomach upsets	R,B,T	3	0.17
Boraginaceae	*Cordia africana* Lam.	JK21	Muringa	Tree	Vitamins	L	1	0.04
	Kigelia africana (Lam.) Benth.	JK70	Oltarpoi	Tree	Measles	F	1	0.04
	Cordia monoica Roxb.	JK76	Oseki	Tree	Backaches	R	1	0.04
Burseraceae	*Commiphora swynnertonii* A. B. Burtt	JK71	Oltemuai	Shrub	gonorrhea	Sb	1	0.04
	Commiphora africana (A. Rich) Engl.	JK77	Osilalei	Tree	skin disorders	Sb	1	0.04
Cannelaceae	*Waburgia ugandensis* Sprague	JK79	Osokonoi	Tree	Respiratory	Sb	4	0.17
Capparidaceae	*Caparis tomentosa* Lam.	JK27	Olarunduudiai	Shrub	Respiratory	L, R	1	0.04
Celastraceae	*Maytenus senegalensis* (Lam.) Exell	JK24	Olaimurunyai	Shrub	Gynecological conditions	R	1	0.04
	Elaedendron buchananii Loes.	JK66	Olparsento	Tree	Cuts and wounds	R	1	0.04
Combretaceae	*Terminalia brownii* Fres.	JK30	Olbukoi	Tree	Skin disorders	Sb	1	0.04
	Combretum molle R.Br. exG.Don	JK49	Olmaroroi	Tree	Respiratory, kidney, backache	R,Sb	3	0.13
Commeliaceae	*Comelina africana* L.	JK06	Enkaiteteyia	Herb	Stillbirths, fever	T	1	0.04
Compositae	*Psiadia punculata* (DC.)Vatke	JK23	Olabaai	Shrub	Abdominal pains	L	1	0.04
	Artemesia afra Willd.	JK33	Olchanipus	Herb	East coast fever		1	0.04
Cucurbitaceae	*Zehneria scabra* L.f. Sond.	JK18	Lesitani	Liana	Malaria	F	1	0.04
Ebenaceae	*Euclea divinorum* Hiern.	JK40	Olkinyei	Tree	Constipation	R	1	0.04
Euphorbiaceae	*Ricinus communis* L.	JK34	Oldule	Shrub	Ruminal impaction/Constipation	F	1	0.04
	Euphorbia cuneata Vahl.	JK47	Olmame	Shrub	Gonorrhea	R	1	0.04
	Croton megalocarpus (Hutch.)	JK51	Olmerguet	Tree	Respiratory conditions	L	1	0.04
	Crorton dichogamus pax.	JK60	Oloibor benek	Shrub	Gonorrhea, arthritis	R	2	0.09
	Euphorbia candelabrum Kotschy	JK67	Olpopongi	Tree	Joints, venereal, infertility	R	1	0.13
Fabaceae	*Indigofera arrecta* A. Rich.	JK01	Eiyemiyem	Shrub	Stomach disorders	R	1	0.04
	Acacia drepanolobium Harms.	JK02	Eluaai	Shrub	Uterine cleaning	Sb	3	0.13
	Cajanus cajan (L.) Mill sp.	JK03	Enchuko	Shrub	Allergies	L	1	0.04
	Ormocarpum kirkii S. moore	JK08	Enkike empari	Shrub	Cuts and wounds	L, R	1	0.04
	Acacia xanthophloea Benth.	JK35	Olerai	Tree	skin disorders, fatigue	Sb,R	2	0.09
	Acacia nilotica (L.) Del.	JK39	Olkilorit	Tree	Stimulant/excitant	Sb	1	0.04
	Albizia anthelmintica Brongn	JK56	Olmugutan	Shrub	Helminthiasis, malaria, stomachache, emetic	Sb, R	16	1.09
	Erythrina abyssinica DC	JK64	Oloponi	Tree	Infertility, urinary tract infections	Sb,R	2	0.09
Flacourtiaceae	*Dovyalis abyssinica* (A. Rich.) Warb.	JK54	Olmorogi	Shrub	Indigestion	L	1	0.04
Labiatae	*Leucas pododiskos* Bullock	JK14	Entialongo	Shrub	Dysentery, stomachache	L	3	0.13
	Leucas calustachys Oliv.	JK29	Olbibiai-oibor	Shrub	Respiratory	L	1	0.04
	Iboza multiflora (Benth) E.A, Brunce	JK46	Olmalaka	Tree	Malaria, appetizer	L	1	0.09
Liliaceae	*Aloe secundiflora* Engl.	JK80	Osukuroi	Herb	Malaria, wounds	R, L	3	0.35
Loganiaceae	*Strychnos henningsii* Gilg.	JK74	Oltipilikwa	Tree	Arthritis, stomachache	R	2	0.09
Meliaceae	*Azadirachta indica* A. Juss	JK20	Muarubaini	Tree	Malaria, stomach problems	L,Sb,F	2	0.13
	Turraea mombassana Hiern ex Dc	JK31	Olchani narok	Shrub	Emetic, malaria	R	2	0.09
Moraceae	*Ficus sycomorus* L.	JK36	Olgaboli	Tree	uterine bleeding	B	1	0.04
	Ficus thonningi Blume.	JK69	Olreteti	Tree	Respiratory	Sb, R	1	0.04
Musaceae	*Musa acuminata* Colla	JK48	Olmarikoi	Herb	Blood pressure	Sb	1	0.04
Myrsinaceae	*Myrsine africana* L.	JK19	Loodwa/Seketet	Shrub	Worms, gonorrhea, constipation	F	17	1.22
	Rapanea melanophloes (L.) Mez.	JK32	Olchani onyokie	Tree	Worms, gonorrhea, heartburn	F	7	0.43

Table 1 (*Continued*)

Plant family	Species	Vn[a]	Local name	Habit	Medicinal uses	pu[b]	Nh[c]	UVs[d]
Olacaceae	*Ximenia americana* L.	JK07	Enkamai	Tree	Uterine bleeding, stomachache	R,F	2	0.13
Oleaceae	*Olea africana* L.	JK61	Oloirien	Tree	Worms, retained afterbirth, respiratory, anaplasmosis	Sb,L	6	0.48
Oliniceae	*Olinia usambarensis* Gilg.	JK41	Olkirenyi	Tree	Respiratory	F,Sb	1	0.04
Polygonaceae	*Rumex usambarensis* Dammmer	JK05	Enkaisijoi	Herb	Worms, constipation	T	1	0.13
Proteaceae	*Faurea saligna* Harv.	JK58	Olngeriantus	Tree	Stomach problems	R	2	0.09
Rhamnaceae	*Rhamnus staddo* A.Rich.	JK42	Olkokola	Shrub	Gonorrhea, diabetes, endometritis	R,Sb,F,L	15	0.74
	Rhamnus perinoides L' Herit	JK43	Olkonyil	Shrub	Gonorrhea, prostate, Malaria, brucellosis	R,Sb,F,L	15	1.22
Rosaceae	*Prunus africana* (Hk.f.) Kalkman	JK44	Olkujuk	Tree	Prostate, urinary tract infections	Sb, R, F	4	0.22
Rubiaceae	*Galium aprimnpoides* Forsk.	JK04	Engeriantus	Liana	Stomach ulcers, urinary infections	R	2	0.13
	Vangueria tomentosa Hochst.	JK38	Olgumi	Tree	Snake bites	R	1	0.04
	Hymenodictyon parvifolium Oliv.	JK65	Olosholo	Tree	Constipation	R	1	0.04
Rutaceae	*Calodendrum capense* (L.f.) Thunb.	JK10	Enkirashai	Tree	Stomach upsets, emetic	Sb	2	0.09
	Teclea simplicifolia (Engl) Verdoon.	JK37	Olgilai	Tree	Pneumonia, allergy, gonorrhea	R, L	4	0.22
	Clausena anisata (Wild) Hook.f.	JK50	Olmatasia	Shrub	Worms, stomach problems, prostate	Sb	3	0.26
	Zanthoxylum usambarense(Engl.)Kokwaro	JK62	Oloisuki	Tree	Malaria, respiratory, diarrhea	R,F	11	0.57
Salvadoraceae	*Salvadora persica* L.	JK68	Olremit	Tree	Worms, malaria, stomachache	R	4	0.17
Samydaceae	*Trimelia bakeri* Gilg.	JK16	Lasipeta	Shrub	Brucellosis, malaria	R,L,F,Sb	3	0.22
Santalaceae	*Osyris lanceolata* Hochst. & Steud	JK28	Olasesiai	Tree	Ringworm, impotence, fatigue	R,F,Sb,L	3	0.17
Sapindaceae	*Pappea capensis* Eckl. & Zeyh.	JK73	Oltimigomi	Tree	Aphrodisiac	B	1	0.04
Simaroubaceae	*Harisonia abyssinica* Oliv.	JK11	Enkisar ngatuny	Shrub	Venereal diseases	R	1	0.04
Solanaceae	*Solanum taitanse* Vatke	JK13	Entemelua	Shrub	Respiratory	R, F, L	1	0.04
	Withania somnifera (L) Dunal	JK17	Lesayiet	Shrub	Gonorrhea	R	3	0.13
	Solanum incanum L.	JK75	Ondulele	Shrub	Throat infections	R	1	0.04
Sterculiaceae	*Dombeya rotundifolia* (Hochst.) Planch	JK55	Olmotoo	Tree	Dysentery	R	1	0.04
Urticaceae	*Urtica dioica* L.	JK12	Entamejoi	Herb	Low butterfat in milk, diabetes, ulcers	L, R	2	0.13
Useneaceae	*Usnea* spp.	JK22	Ntana oosoito	Lichen	Malaria, heart burn, fever	W	4	0.3
Verbenaceae	*Clerodendrum myricoides* (Hochst.) Vatke	JK45	Olmakutkut	Shrub	Gonorrhea, syphilis	R	3	0.17
	Lippia kituiensis Vatke	JK78	Osinoni	Shrub	Induce vomiting	L	1	0.04
Vitaceae	*Rhoicissus tridentata* (L.f.) Wild & Drum.	JK09	Enkilenyai	Liana	Cuts and wounds	S, R	2	0.09
	Cissus quandringularis L.	JK15	Esukurtuti	Liana	Cuts and wounds	S	2	0.09

F: fruits; L: leaves; R: roots; Sb: stem bark; W: whole plant.
[a] Voucher specimen number.
[b] Part of the plant used in the preparation of remedies.
[c] Number of herbalists citing the use of the plant in remedies.
[d] Species use values.

The conditions treated included stomach disorders and helminthosis, malaria, sexually transmitted diseases, infertilities, injuries, aches, coughs and colds. Some of the remedies were used for recreational purposes under various categories with regard to the effect they exert. Some of these are excitants, digestives, aphrodisiacs, emetics, bio-stimulators and fat emulsifiers. The most common methods of preparation included boiling or soaking in water, drying and grinding while the preferred route of administration was oral. These methods of remedy preparation and dosing are quite similar to those reported by others (Nanyingi et al., 2008; Teklehaymanot and Giday, 2007). The informants' responses indicated that there were variations in the dosages of remedies, units of measurement, duration and time that were prescribed for the same kind of health problems. The major factors that determine the amount to be given are age, physical fitness, stage of illness, pregnancy and presence or absence of any disease other than the disease to be treated. The lack of precision and standardization as a major drawback on the traditional health care system has been widely discussed (Abebe, 1986; Getahun, 1976; Sofowara, 1982). The majority of the herbalists (67%) interviewed were aware that overdosing could result in undesirable effects and some of the antidotes they frequently used were milk, finely ground charcoal, sorghum/millet porridge, beef soup and water.

In the current study, the medicinal plants were found in a wide range of habitats including woodlands, rocky surfaces, forests, grazing and farmlands, home gardens, road and riversides, farm borders and "live fences i.e. fences made from hedges or woody plants". However the majority of these plants were found growing in the wild and this is in conformity with findings from a similar study done in Ethiopia (Mesfin et al., 2009). A total of 80 plants were

Table 2
Plants used in anthelmintic remedies by herbalists in Loitokitok district.

Plant species/family	Parts used	Active principles	References
Albizia anthelmintica (Fabaceae)	Stem and root barks	Sesquiterpenes, kasotoxin	Beentje (1994), Gakuya (2001), Gathuma et al. (2004), Grade and Longok (2000), Koko et al. (2000), McCorkle et al. (1996), Minja and Allport (2001), Minja (2002), Nanyingi et al. (2008), Ole-Miaron (2003)
Myrsine africana (Myrsinaceae)	Fruits	Benzoquinones	Anonymous (1996), Beentje (1994), Desta (1995), Gachathi (1993), Gathuma et al. (2004), Kokwaro (1993), McCorkle et al. (1996), Nanyingi et al. (2008)
Rapanea melanophloeos (Myrsinaceae)	Fruits, stem and root barks	Benzoquinones	Anonymous (1996), Beentje (1994), Gachathi (1993), Kokwaro (1993), Midiwo et al. (2002)
Olea africana (Oleaceae)	Stem bark		Fratkin (1996), Kokwaro (1993)
Clausena anisata (Rutaceae)	Leaves	Essential oils, Clausenol (carbazole alkaloid)	Ole-Miaron and Mapenay (2004), Senthilkumar and Venkatesalu (2009)
Rumex usambarensis (Polygonaceae)	Tuber	Anthraquinones	Midiwo et al. (2002)
Salvadora persica (Salvadoraceae)	Root		Paliwal et al. (2007)

cited as being useful in various ethno-medical/veterinary remedies. These plants belonged to 46 different families and 70 genera as shown in Table 1. The Plant families Fabaceae, Euphorbiaceae and Rutaceae were cited at 10%, 6% and 5%, respectively, while others varied between 1 and 4%. However, the six most important families by their medicinal use values in decreasing order were Rhamnaceae, Myrsinaceae, Oleaceae, Liliaceae, Usenaceae and Rutaceae. The habits of the medicinal plants in the area were 48%, 38%, 7%, 6% and 1% trees, shrubs, herbs, lianas and lichens, respectively. Some of the medicinal plants recorded in Lotoktok are also used in remedies in other parts of Kenya and elsewhere in Africa (Anonymous, 1996; Beentje, 1994; Gathuma et al., 2004; Kokwaro, 1993; Mesfin et al., 2009).

Twenty-one herbalists (91%) used one or more plants for the treatment of helminthosis, which is probably an indication of the importance of the disease in the area. Seven plants belonging to 7 genera and 6 families were cited for their anthelmintic use (Table 2) in addition to other uses (Table 1). The most frequently used anthelmintic plants (with an informant consensus factor of 0.86) were *Albizia anthelmintica* (Fabaceae), *Myrsine africana* (Myrsinaceae), *Rapanea melanophleos* (Myrsinaceae), *Clausena anisata* (Rutaceae) *Olea Africana* (Oleaceae), *Rumex usambarensis* (Polygonaceae) and *Salvadora persica* (Salvadoraceae) by 70%, 70%, 26%, 13%, 9%, 4% and 4% of the respondents, respectively. These plants have been reviewed in Table 2, and all of them have been cited in one or more other studies for their anthelmintic and other uses.

The most widely sought plant parts in the preparation of remedies were the root, bark, leaves, stems and seeds in that order. The popularity of these parts has serious consequences from both ecological point of view and the survival of the medicinal plant species (Mesfin et al., 2009). The main threat for medicinal plants in the natural vegetation was increasing population pressure and agricultural expansion due to the continuing subdivision of the group ranches in the area (Ntiati, 2002). These factors combined with the natural vulnerability of such arid and semi-arid lands may lead to further reduction in natural habitats of the medicinal plants. Pressure from agricultural expansion, wide spread cutting for fuel wood combined with seasonal drought is also reported in other studies (Balemie et al., 2004; Lulekal et al., 2008; Nanyingi et al., 2008; Yineger et al., 2008) as main factors in environmental degradation.

4. Conclusion

It was established that herbal remedy is crucial for primary health care in Loitoktok district. Traditional medicinal plants were harvested mostly from natural vegetation area but also home gardens; roadsides, farmlands and live fences. The medicinal plants in the area are becoming scarce and traditional healers had resulted to planting some in their home gardens and sourcing the plants from distant places including across the border in Tanzania. However, traditional healers still depend largely on naturally growing species in their locality because of their belief that those species in the natural vegetation are more effective in the prevention and treatment of diseases and health problems. Furthermore, the documented medicinal plants can be used as a basis for further studies on the regions medicinal plants knowledge and for future phytochemical and pharmacological studies.

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