

The Kakamega Forest Medicinal Plant Resources and their Utilization by the Adjacent Luhya Community

¹A.R.O. Nyunja, ¹J.C. Onyango and ²Beck Erwin

¹Department of Botany and Horticulture, Maseno University,
P.O. Box 333, Maseno, East Africa, Kenya

²Department of Plant Physiology, University of Bayreuth, 95440, Bayreuth, Germany

Abstract: Kakamega Forest is a rich natural setting endowed with abundant flora and fauna used by the local communities who once lived within the forest and those who now border it. There has been scarcity of information on plants used in basic traditional healthcare by the adjacent communities, Luhya, yet alternative medicine continues to fill in the gap left over by modern medicine. This study sought to survey and document plants used from the forest as medicine or in traditional healthcare and collect, identify and preserve specimens of such plants in the herbarium. Field observation and 240 open-ended interviews conducted during this research have indicated that the people highly value plant medicines for their primary healthcare needs and that the plants are used to cover a wide range of ailments and conditions affecting both man and his domestic animals. The diseases range from topical to internal and psychosomatic ailments, to simple as well as stubborn conditions. Such diseases include whitlow, measles, chickenpox and cancer amongst others. A total of one hundred and twenty herbal practitioners, over 18 years of age, were interviewed between March and September 2002 in this ethno-medicinal study. There have since been bi-annual follow up visits for more information. A total of 168 plant species spanning 74 plant families are reported herein. Moraceae topped the list with 10 species followed by the Euphorbiaceae with 9. The most frequently used were *Zanthoxylum gillettii*, *Trichilia emetica*, *Olea capensis*, *Entada abyssinica* and *Croton macrostachyus*. The biological diversity, as a phytomedical resource has been indexed thus, contributing to the database of the Kakamega Forest plants. It is hoped that the report will be of use to policy makers. There are several plants with uses hitherto not reported, for instance *Craterispermum schweinfurthii* an aphrodisiac, *Allophylus abyssinica* for the hunch back, *Ensete edule* for measles and *Sapium ellipticum* for burns. This research has the potential for production and industrialization of the medicinal plants. Medicinal value of plants is hereby fronted as a reason for conserving and preserving biodiversity in Kakamega Forest.

Key words: Ethno-medicine, medicinal plants, primary healthcare, conservation, indigenous knowledge, Luhya

INTRODUCTION

Kakamega Forest, Kenya, forms part of the world's equatorial forest belt. The equatorial forests in Africa are the extension of the Amazonian forest system in South America (Kokwaro, 1988). As such, Kakamega Forest is a living remnant from the long Pleistocene period when great climatic changes occurred throughout the world. As human population increased, the forests further shrunk getting replaced by savannas or bush leaving behind pockets of forests in Zaire, Uganda and Kenya (KIFCON, 1994). Today, Kakamega Forest covers an area of only 327 km², but remains an important habitat for various species of animals and plants most of which are

indigenous making the forest unique (Onyango *et al.*, 2004; RoK, 2002). Timber exploitation continued into 1980s when it was finally realized that the forest was more valuable as a scientific resource than as a source of timber alone (KIFCON, 1994; RoK, 2002). This has fuelled the need to conserve the forest.

In the early 20th century, various Luhya clans established themselves around Kakamega Forest (Were and Wilson, 1968). The Luhya people are the focus of study. This community is rural and practitioners of herbal medicine remain active. Many people still supplement herbal remedies with modern medicine partly due to dearth of services or inadequacy of services rendered at most of the local health institutions and partly

due to cultural practices, which still are deeply rooted (Were and Wilson, 1968). The population density of persons km^{-2} 861-Shinyalla, 1,485-Municipality, 645-Ikolomani and Kabras-352 and intensive land use around this forest is itself a danger to the very existence of the biological diversity of the area (RoK, 2002).

There still is a strong dependence of the Luhya on the use of plants especially for medicine to date. With forest destruction, the Luhya endanger their traditions and livelihood. This ethno medicinal study examines the traditional primary healthcare of the Luhya people around Kakamega forest since it has been little studied. Particular attention has been given to the custodians of Indigenous Knowledge (IK), specifically the healers, practitioners and other knowledgeable members of the society. The findings will expand the data and information available and will be of use to policy makers and health actors, while the custodians of knowledge are still alive and active.

The growth of herbal medicine is on the rise worldwide by the trend of back to nature creating a new niche for plant-based healthcare (Cox, 1994). The WHO and other major bodies have stressed the need to employ traditional healthcare where appropriate in healthcare programs to achieve the health for all goals. This is also, part of the Millennium Development Goals and Vision 2030 for Kenya. Between 35,000-50,000 plants species are used medically yet only about 100 are used to obtain clinically important drugs or drug molecules. There is thus, scope to add to the list of plants used and those that can clinically be used.

MATERIALS AND METHODS

Study focus: Kakamega forest: The Kakamega Forest stretches from $0^{\circ}10'-0^{\circ}21'N$ and longitude $34^{\circ}47'-34^{\circ}58'E$. It is located in Kakamega and Vihiga Districts in Western Province of Kenya and lies within the Lake Basin North of the Equator. The reserve comprises of 5 blocks namely Malava (719 ha), Bunyala (825 ha), Kaimosi (200 ha), Maragoli (720 ha) and the main forest block Kakamega comprising of Isecheno (14,500 ha), Kisere (471 ha) and Buyangu (3,997ha) (Fig. 1).

Data collection: The study focused on the Luhya people. Emphasis was laid on ethno medicine, specifically, the phyto-medicines. The study involved interviews, photo taking and ocular observation. The observations were open, but non participatory so as to get more objective results. The interviews were oral and this required rapport. Individuals were preferred to groups because of the nature of information required. The unstructured or semi



Fig. 1: Annex, OGUTU, 1997, 32

structured questions allowed the interviewees to give as much information as they could in a conversational atmosphere in a more or less confidential manner. Care was taken to avoid lies by confirming surprising answers and by not asking leading questions or those with implied responses. Questionnaire forms were often only filled in later and not during interview sessions. In total, 120 persons were interviewed over the 6-months period between March and September 2002. The local and scientific names were sought.

Specimen collection and processing: The plant specimens were collected, processed and dried in the university drier at $40^{\circ}C$. The ones that could not be identified immediately in the field were taken to the Nairobi University Herbarium (NAI) and the East Africa Herbarium (EA) (also referred to as the National Museums of Kenya Herbarium), for proper identification. Standard taxonomic procedures were diligently followed (Agnew and Agnew, 1994; Beentje, 1994; Judd *et al.*, 2008; Lawrence, 1951; Maundu and Tengnas, 2005; Stace, 1989) to ensure accuracy of scientific names to the corresponding local names. Simon Mathenge of University of Nairobi Herbarium and Kirika of the East Africa Herbarium confirmed the names. Taxonomic recognition of name changes has been given through authorities and synonyms where appropriate. The pressed plant materials were mounted, poisoned and stored as

voucher specimens in the University Herbarium, Maseno with duplicates to be deposited at the NAI and EA.

Questionnaires were used but the study situation remained tricky due to the forest management policy (Kenya Wildlife Service side and Kenya Forest Department renamed Kenya Forest Service). Purported remedies were regarded as valid if >3 independent persons gave the same account. But, since knowledge in traditional medical practice is highly secretive, all accounts were recorded for they could represent restricted knowledge that's very effective in disease management. The rest of the data was subjected to descriptive statistical analysis using Excel.

RESULTS

Plants mentioned by various participants have been listed alphabetically for convenience. Unless otherwise stated, the disease or conditions and associated medicaments are those applicable to man. This summary is a species list that gives more information on tree species cited regarding range (number) of disease the plants can treat, parts used and other local names. The local names are in Luhya, a name that has been preferred to cater for all the dialects available since the adjacent communities are a mix across the various subgroups (Table 1).

Table 1: Plant list, local names are in Luhya language

Scientific name	Local name (s) in Luhya	Family	Part used	Disease category
<i>Acacia abyssinica</i> Benth.	Omuniyrya	Mimosaceae	St, bk, gum	Gut, wounds
<i>Calophylla</i> sp. Brenan				
<i>Albizia gummifera</i> (JF gmel.) C.A. Sm	Omukhunzulu	Mimosaceae	Bk, gum	Gut
<i>Albizia coriaria</i> Oliv.	Omuperi/Musenzeri, musenzeri	Mimosaceae	st, bk	Eye, boils, flu, colic pains, gut, abdominal discomfort, constipation, stomachache, fertility, deworming, joints and backbone, STD, cardiac conditions, kidney ailments
<i>Allophylus abyssinicus</i> (Hochst.) Radlk.	Shisasari	Sapindaceae	lv, rt	Boils, childbirth, STD, hunchback and crooked limbs
<i>Aningeria altissima</i> (A. Chev.) Aubrev and Pellegr.	Mukangu	Sapotaceae	bk	Bechic
<i>Antiaris toxicaria</i> (Pers.) Lesch.	Mulundu /Omulundu, lulundu	Moraceae	lv, bk	fontanel gap, abdominal pains, STD, kidney ailments
<i>Bequaertiodendron oblanceolatum</i> (S. Moore) Heine and J.H.Hemsl	Musamia	Sapotaceae	Fr	Scabies
<i>Bersama abyssinica</i> Fres.	Omuyundi, muyundi	Melianthaceae	Bk	Stomachache, joints and backbone, prostrate
<i>Blighia unijugata</i> Bak.	Shiarambatsa, shiarambatsia	Sapindaceae	Bk	Veterinary
<i>Bridelia micrantha</i> (Hoechst.) Baill.	Shikangania, Kuluhanga luhanga-Shihanga Mulondang'ombe, Mukonang'ombe, Malesi king'ombe	Euphorbiaceae	rt, bk	Boils, flu, gut, stomachache, joints and backbone, STD, dysentery, diarrhoea
<i>Carica papaya</i> L.	Pawpaw	Caricaceae	rt, fr, lv	Skin, ringworms, cough, miscarriage, STD
<i>Ceiba pentandra</i> (L.) Gaertn.	Shikhori	Bombacaceae	Bk	General body illness
<i>Celtis gomphophylla</i> Bak. (Syn. <i>C. durandii</i> Engl.)	Musua/ muswa	Ulmaceae	Rt	Fertility, deworming, general body illness, STD
<i>Chaetacme aristata</i> Planch.	Likhoma/Likunga, Likhoma, likunga)/mtondo kwerayi?	Ulmaceae	lv	Skin, boils, fertility
<i>Chorisia speciosa</i> A. St. Hil		Bombacaceae	Bk	Wounds
<i>Clerodendrum myricoides</i> (Hochst.) Vatke	Shisilangoho, Shikuma	Verbenaceae	rt, lv, tw, bk	Sore throat, ear, superstition, chest problems, flu, stomachache, joints and backbones, STD, dysentery, diarrhoea, malaria, headache
<i>Coffea eugenoides</i> S. Moore	Nandi/wild coffee, Shirokhomoli/shikhokoli, ikawa, Nandi coffee/wild coffee	Rubiaceae	Lv	Heavy menses, stop menses, veterinary
<i>Combretum molle</i> G. Don	Shilaha/eshilaha, sheraha	Combretaceae	St	Warts, boils
<i>Craterispermum schweinfurthii</i> Hiem.	Murenjeretsia	Rubiaceae	Bk	Aphrodisiac, diarrhoea, malaria, veterinary
<i>Croton macrostachyus</i> Del.	Musutsu/mutswitswi, Shisutsu, Muswishi/ Musueshi	Euphorbiaceae	rt, bk, lv	Sore throat, flu, TB, uvula, haemostatics, stomachache, measles, STD, dysentery, diarrhoea, malaria
<i>Croton megalocarpus</i> Hutch.	Musine/Mukinduri	Euphorbiaceae	bk, lv, rt	Paralysis/stroke, chest problems, stomachache, abortifacients, diarrhoea
<i>Cupressus lusitanica</i>	Mukhurabwa, mutarakwa, Cypress/cypress	Cupressaceae	lv, gum, fr, bk	Superstition, toothache, deworming, measles, dysentery
<i>Cussonia arborea</i> A. Rich.	Shitandavasia = kitandawabasia	Araliaceae	Rt	Stomachache, childbirth, veterinary
<i>Diospyros abyssinica</i> (Hiern) F. White	Lusui	Ebenaceae	bk, tw, wp, rt	Superstition, STD, diarrhoea
<i>Dracaena steudneri</i> Engl.	Mkhuvambu/ mukhuvambu	Dracaenaceae (?inc. Agavaceae)	bk, lv	Superstition, stomachache, measles, diarrhoea, veterinary

Table 1: Continue

Scientific name	Local name (s) in Luhya	Family	Part used	Disease category
<i>Ehretia cymosa</i> Thonn.	Likati/shikati, shikuti	Boraginaceae	rt, tw	Boils, stomachache
<i>Ensete edule</i> (J.F. Gmel.) Horan, (Syn. <i>Ensete ventricosum</i> (Welw.) Cheeseman)	(Lisitsi/masitsi, Lisitsi) liruku	Musaceae	Tuber, fr	Measles
<i>Entada abyssinica</i> A. Rich.	Musembe	Mimosaceae	bk, tw, lv	Scabies, flu, TB, stomachache, childbirth, fertility, deworming, joints and backbones, STD, dysentery, diarrhoea, cardiac conditions, kidney ailments, cancer, veterinary
<i>Erythrina abyssinica</i> DC	Shirembe, mrembe,	Fabaceae	lv, bk, lv,	Superstition, skin, flu, haemostatics, stomachache,
<i>Abyssinica</i> sp.	Omurembe, omrembe, murembe	(Papilionaceae)	tw, wp	stomach ulcers, deworming, STD, mumps, veterinary
<i>Eucalyptus globulis</i>	Blue gum	Myrtaceae	Lv	Measles, flu
<i>Euclea divinorum</i> Hiem.	Mujendasi/muchendasi	Ebenaceae	Rt	Sore throat
<i>Euphorbia tirucalli</i> L.	Euphorbia (eshikhoni).	Euphorbiaceae	Sap	Warts
<i>Fagaropsis angolensis</i> (Engl.) Dale	Shingulutse, Shingululutse	Rutaceae	tw, bk	Chest problems, gut, induce menopause, stomachache, STD
<i>Ficus exasperata</i> Vahl.	Omuseno, museno	Moraceae	bk	
<i>Ficus lutea</i> Vahl.	Mukavakava, alukhava, alukhaba, alukhaaba, mkava, Alukhava/alukhaaba, Shikalava/shikalaba, shikholove, Likalava	Moraceae	rt, lv, bk	Sore throat, asthma, heavy menses, general illness, veterinary
<i>Ficus natalensis</i> Hochst.	Mutoto, Omutoto	Moraceae	bk	Toothache
<i>Ficus sur</i> Forssk.				
(Syn. <i>F. capensis</i> Thunb.)	Musingu	Moraceae	Bk	Toothache
<i>Ficus sycomorus</i> L.	Omukhuyu, mukhuyu	Moraceae	Sap, bk	Toothache, colic pains, gut, abdominal discomfort, constipation
<i>Ficus thonningii</i> Bl.	Mutoto, Muyundi	Moraceae	bk, lv	Chest problems, stomachache, malaria, veterinary
<i>Funtumia africana</i> (Benth) Stapf.	Mutondo/omutondo	Apocynaceae	lv, bk	Boils, dysentery, diarrhoea
<i>Grevillea robusta</i> A. Cunn. Ex. R. Br.	Bipilia, ilieyo	Proteaceae	Bk	Sore throat, ear, superstition, chest problems, flu, toothache
<i>Harungana madagascariensis</i> Lam. Ex. Poir	Musila/Munamusai/ Mwinyalira matsai, muranga, mnamsai, Shamasai/shisamatsayi	Clusiaceae (Guttiferae)	lv, fr, bk	Eye, superstition, scabies, flu, stomachache, heavy menses, general body illness, dysentery, malaria
<i>Kigelia africana</i> (Lam.) Benth. (Syn. <i>K. aethiopium</i> (Fenzl.) Dandy, <i>K. pinnata</i> (Jacq. DC.))	Eshiololwe...	Bignoniaceae	Fr	Childbirth
<i>Kigelia moosa</i> Sprague	Murabe/Omurabe/ muratina, Eshiololwe...	Bignoniaceae	Bk, rtfr	Gut, measles, topical
<i>Lansea fulva</i> (Engl.) Engl.	Muvumbi/Mubumbo/ bwinyanya, kumubumbu, lumuvumbu, luvungu, lubungu	Anacardiaceae	Bk	Gut, diarrhoea
<i>Lansea schimperii</i> (A. Rich) Engl.	Mwembu, kumugumbu	Anacardiaceae	bk	Gut, diarrhoea, dysentery
<i>Maesa lanceolata</i> Forrk.	Mushebeshebe, Mushevesheve	Myrsinaceae	rt, bk, lv	Superstition, boils, colic pains, snakebite, STD, headache
<i>Mangifera indica</i> J. Koning ex L.	Mango	Anacardiaceae	fr	Constipation
<i>Markhamia lutea</i> (Benth.) K. Schum.	Lusiola	Bignoniaceae	lv, bk, rt	Sore throat, flu, stomachache, measles, cardiac conditions, kidney ailments, veterinary
<i>Maytenus heterophylla</i> (Eckl. and Zeyh.) Robson	Litsoyi	Celastraceae	Rt, tw	Gut
<i>Melia azedarach</i> L.	Neem, mwarubaini	Meliaceae	lv, bk	Stomachache, gut, dysentery, diarrhoea, malaria, measles, kidney ailments
<i>Morus mesozygia</i> , Stapf. (Incl. <i>M. lactea</i> (Sim Mildbr.)	Omunuku, munugu	Moraceae	bk, st	Urinary tract infection, veterinary
<i>Musa paradisiaca</i> L.	Plantain/banana	Musaceae	Fl	Ear, asthma, cough
<i>Olea capensis</i> L. subsp. Welwitschii Friis and P.S. Green	Mutukuyo/mtukuyu/ Elgon teak	Oleaceae	bk, rt, tw	Scabies, chest problems, flu, gut, constipation, stomachache, childbirth, prenatal care, fertility, joints and backbones, STD, dysentery, diarrhoea, cancer, urinary tract infection
<i>Persea americana</i> Mill.	Avocado	Lauraceae	fr	Skin, gut
<i>Piliostigma thonningii</i> (Schumach.) Milne-Redh.	Shiboyeramboko shivoyelamboko)	Caesalpiniaceae	bk, lv, rt	Ear, superstition, stomachache, childbirth, fractures, veterinary, vegetables, colic pains
<i>Pinus patula</i>		Piniaceae	Lv,	Fflue, respiratory
<i>Pittosporum mannii</i> Hook. F.	Mmonyo monyio	Pittosporaceae	bk, rt	Boils, STD

Table 1: Continue

Scientific name	Local name (s) in Luhya	Family	Part used	Disease category
<i>Plectranthus babbartus</i> Andr.	Eshirookho, shilauha... shilokho	Lamiaceae	bk, lv	Stomachache, gut, fractures, dysentery, diarrhoea
<i>Prunus africana</i>	Mwililitsa	Rosaceae	bk, lv	Joints/ backbone, STD, prostrate conditions, cancer, urinary tract infection
<i>Psidium guajava</i> L.	Lipera	Myrtaceae	bk, rt	Cancer
<i>Sapium ellipticum</i> (Krauss) Pax	Muteso/omuteso, Museso) /Mutheso/musetso	Euphorbiaceae	Bk	Burns, veterinary
<i>Senna spectabilis</i> Irwin et Bameby.		Caesalpiniaceae	bk, rt	Joints and backbone, STD
<i>Sesbania sesban</i> (L.) Merr.	Omukhule, lukhule/ lukhula, mukhule	Fabaceae (Papilionaceae)	Lv	Childbirth, poultry
<i>Spathodea campanulata</i> P. Beauv. (Syn <i>S. nilotica</i> Seem.)	Mutsilio/Nandi flame, Muthulio	Bignoniaceae	Bk	Superstition, burns, stomach problems, abortifacients, fertility, STD, veterinary
<i>Syzygium cumini</i> (L.) Skeels	Zambarau	Myrtaceae	Bk, fr	Dysentery, gut
<i>Syzygium guineense</i> (Willd.) DC.	Musioma/Musirinya, Shitotole, kumusitole kumusemwa	Myrtaceae	bk, tw	Fertility, kidney ailments, veterinary
<i>Terminalia mollis</i> Laws	Olokhongwe	Combretaceae	bk	Gut, diarrhoea, stomachache
<i>Trichilia emetica</i> Vahl.	Munyama/Omunyama, irojo, musinzi, muyama	Meliaceae	bk, lv, rt, tw	Scabies, boils, chest problems, flu, whooping cough, TB, gut, constipation, stomachache, prenatal care, abortifacients, fertility, deworming, joints and backbones, measles, STD, dysentery, diarrhoea, cardiac conditions, veterinary
<i>Trilepisium madagascariensis</i> DC. (Syn. <i>Bosqueia phoberos</i>)	Mbalakaya	Moraceae	Bk	Joint and backbone
<i>Vangueria apiculata</i> K. Schum	Shikhomoli/shikhomoli /Okukhomoli	Rubiaceae	lv, tw	Stop menses, veterinary
<i>Vangueria infausta</i> Burch.	Mukhomoli	Rubiaceae	Lv	Stop menses
<i>Vernonia amygdalina</i> Delile	Mululusia, Musululitsa, Munyerasulisi, Shisululitsa, Shikulusi/shikuku shikulusu)	Asteraceae	Rt	Stitches
<i>Warburgia ugandensis</i> Sprague	Apachi/abachi	Canellaceae	Rt, bk, tw	Chest, asthma, respiratory, flu, sore throat cough, Sore throat, scabies, chest problems, stomachache,
<i>Zanthoxylum gillettii</i> (DE Wild.)	Shikhuma,			Gut, general, conditions, oral/bucal rheumatism, malaria, headache, cardiac conditions, gout, veterinary
Waterm. (Not <i>Z. macroph.</i>)	/shihuma	Rutaceae	Bk	

bk: bark; fl: flower; fr: fruit; lv: leaves; rt: root; st: stem; tb: tuber; tw: twigs; wp: whole plant; sa: sap; se: seed; rh: rhizome; gu: gum;

DISCUSSION

The survey revealed that information about plants is fairly widespread considering that of the 120 persons interviewed; 110 (91%) gave positive response. Only 10 (9%) totally refused. The 40 confirmed that they knew a lot about plants used in medicine but were reluctant to divulge their knowledge. Of the 110 who gave information, 14 (12.7%) gave uses of plants, but not plant names meaning that knowledge was there; 10 others (9%) gave only two remedies each though they were very knowledgeable; 4 others (3.6%) only listed names of plants used, but not how or for what; the rest (74.67%), majority, gave information freely. If the widespread knowledge was an indicator of potential use, then one could state that plant resources were heavily used in medicine. Out of the 110, who were positive, only 17 (16.36%) were not sure of names of some plants used. Thus, the people had a good folk knowledge of plants.

The local Luhya names provided the key to local biodiversity communication about. The problem is that local names may be general and imprecise. For instance,

shikuma refers to two unrelated plants, *Clerodendrum* and *Hoslundia* (Verbenaceae and Lamiaceae, respectively). Scientific names provide a precise tool to understand and retrieve information on plants. Documented in this report are 168 plant species of medicinal value. Of these 21 were herbs, 4 were twiners or lianas, 14 were climbers, 45 were shrubs, 82 were trees and 1 creeper. About 75% of these were shrub/tree species. They were spread across major plant families Moraceae and Euphorbiaceae afforded 10 species each followed by Lamiaceae with 9 records. The species range included poisonous plants such as *Funtumia africana* and *Tabernaemontana ventricosa*. Most records were indigenous taxa though some introduced species such as *Cupressus lusitanica*, *Grevillea robusta*, *Eucalyptus globulis*, *Sesbania sesban*, *Acrocarpus fraxinifolius*, *Pinus patula* *Punica granata* (Pomegranate) and *Melia azedarach* ended up in the local pharmacopoeia indicating that culture is dynamic. This study reports on tree species of medicinal value. Other categories will appear in subsequent publications.

Many plant harvesters were only interested in short term gains going by the many dried up and or over

debarked trees. Many *Trichilia emetica* trees had dried up due to poor harvesting. Different plant parts (roots, bark, gum, sap, seeds, fruit, flowers, twigs) were valued for treating varied or similar diseases. This explains why certain specific taxa were targeted for their bark, roots or rhizomes. Root destruction impacts negatively on plants such as *Markhamia lutea* hence, the forest. *Eucalyptus globulis* and *Melia azedarach* amongst others had useful leaves. Under controlled harvest species survival may be guaranteed, but if this fails, sustainability becomes questionable and the future of the forest as well.

Diseases managed, ranged from the common upper respiratory tract infections to reproductive health. That there was such specialized and discrete categories such as barrenness, schizophrenia and stroke inter alia, indicated that the traditional herbal practice was fairly specific and could supplement and complement modern medicine where, appropriate. The herbal remedy for measles, referred to as neem or mwarubaine turned out to be *Melia azedarach* and not the expected *Azadirachta indica*. Neither plant is mentioned in Kokwaro (1988). The *Azadirachta indica* in Maundu and Tengnas (2005) is in fact *Melia azedarach*, a case of confusion resulting from plants looking alike in vegetative phase. With proper screening, plants and plant products can be isolated and be used for drug development or homeopathic medicine or even industrialization (Gurib-Fakim, 2006; Ludeki *et al.*, 2006).

The high incidence of diseases related to poor hygiene such as dysentery and diarrhea has been attributed to the poor economy hence, poverty, while changing lifestyles and habits have accelerated problems related to the circulatory, respiratory systems and STDs as well as in reproductive health like barrenness and impotence. Though, use by women is now on the increase, mostly men use *Craterispermum schweinfurthii* as an aphrodisiac. Although, there were antidotes for such stimulants, the knowledge remained a guarded secret hence, lacks in this report. Traditional knowledge pertaining to such stimulants was widespread, a pointer to their efficacy.

The fact that there were medications for problematic diseases like mental illness, stroke, syphilis, cancer and urinary tract infections, medications for congenital anomalies like the hunch back, resistant fungal skin infections and medications for pre-and post-natal care for mother and child showed that primary healthcare was strong. Considering that many dermatological conditions are resistant and difficult to treat yet are purportedly managed traditionally suggests that a lot of scientific

gains can be made from this report. There was a precautionary note whenever toxic plants appeared in the local pharmacopoeia; *Funtumia africana*, *Antiaris toxicaria* and *Ficus sycomorus* are examples. Considering that many Western drugs originated from toxic plants through phytochemical studies, for instance Digoxin and Digoxin from Digitalis, it is probable that such plants could in future prove to be sources of new drugs (Arwa *et al.*, 2008; McGaw and Eloff, 2005; Onyango *et al.*, 2004).

Zanthoxylum gillettii seeds are also used in spicing tea, favored for its medicinal value against flu and common chest ailments. *Toddalia asiatica* and *Zanthoxylum gillettii* twigs are also used as toothbrushes. Other than stimulating, the gums and removing food particles, they have antimicrobial properties (Sofowora, 1982). The *Zanthoxylum* has been shown to contain antimicrobial derivatives and alkaloids against common oral infections (El-Said *et al.*, 1971). Though herbal, remedies appeared specialized, the same preparation could be used against other specified diseases making them appear general and broad range in action.

In this report, the most heavily utilized remedies were arboreal species (75%). The most targeted taxa were *Trichilia emetica*, *Harungana madagascariensis*, *Entada abyssinica*, *Zanthoxylum gillettii*, *Fagaropsis angolensis*, *Olea capensis*, *Croton macrostachyus* and *C. megalocarpus* and *Prunus africana*. There is a strong scientific basis for plant use in medicine. *Combretum* and *Zanthoxylum* have been shown to contain potent antimicrobial activity (Masoko *et al.*, 2007; Sofowora, 1982). This possibly explains why *Combretum* is used to clear skin warts, while *Zanthoxylum* features across divergent medications ranging from chest conditions, sore throat, skin rashes and scabies, gut problems, general illnesses and gonorrhea amongst others. This is in line with findings that *Combretum* contains combrestatins that inhibited the growth of several human leukaemia and solid tumour derived cell lines *in vitro* and *in vivo* (Hartwell, 1982; Powis, 1994) and have the capacity to inhibit tubulin polymerization as well as the ability to suppress angiogenesis (Dark *et al.*, 1997; Dorr *et al.*, 1996; El-Zayat *et al.*, 1993; Pettit *et al.*, 1998). *Combretum* also contains antioxidants (Masoko and Eloff, 2007). Cold infusions of *O. gratissimum* have been shown to contain thymol, which is both anthelmintic and antimicrobial hence, its antidiarrheal effects. Its aqueous decoctions have no antibacterial effect but have been shown to calm down gut muscles *in vitro* hence, their use in controlling gut related problems hence, its traditional use.

Tannins are known to occur in the bark of trees and shrubs (Kokwaro, 1993) hence, their use in herbal medicine. The low solubility of tannins and their ability to coagulate proteins has been exploited medically in cases of diarrhoea and dysentery and even the urinogenital system (Eldin and Dunford, 1999). The *Acacia* sp. are rich in gallotannins and catechins, which explains why they are used in against diarrhoea (Sofowora, 1982). The bark of *Albizia* and *Acacia* are rich in not only tannins but also gum. The tannins are capable of precipitating proteins thereby aiding in wound healing while, the gums act as emulsifying agents in the gut (Kokwaro, 1993; Sofowora, 1982). *Zanthoxylum* has been known to contain analgesic, antibiotic and counter-irritant properties hence, its use in treating flu, toothache, rheumatism, cancer, sickle cell and snakebites amongst others (El-Said *et al.*, 1971; Hesse, 2002). Though, the bark and root are used most often, research has proved that antisickling compounds are richest in the leaves.

There were hardly any cases of schistosomiasis encountered, attributed to the widespread *Croton macrostachyus* whose seeds have molluscicidal properties (El-Kheir and Salih, 1979). The informants felt there were more cancer cases. This could be due to changing habits and lifestyles, for instance sweet potatoes, *Ipomoea batatas* was a common food as well as wild fruits like *Physalis peruviana*. This is not the case any more yet *Ipomoea* has been found to contain lung-cancer-specific pneumotoxic furan derivative, an antineoplastic agent, while *Physalis* contains physalin an antileukemia lactone (Chiang *et al.*, 1992a, b; 1992; Cragg and Suffness, 1988; Rowinsky *et al.*, 1993).

In general, plant drugs were mainly administered in liquid form as decoctions, infusions and gargles among others. Solids like charcoal (carbon) or semi carbon dust, powders or ash were occasionally applied on wounds, burns and the tongue among others. Only in two cases was latex, a semisolid material administered. Topical applications included steam inhalation as in steam bath or regular bath, poultices or ointments or skin incisions. This would enable the drug to reach body tissues fast through body orifices and the lungs. With 75% of plants used belonging to category of trees and shrubs meant that too much extraction would be deleterious to the forest since there is a 75% chance that a remedy collected from the forest is likely to be from a tree. Climbers and monocots were seldom used. The parts used range between roots, leaves and twigs from trees, shrubs and climbers. The use of inflorescence (as in *Ensete edule*) or fruits (as in *Kigelia africana*) was rare. Tree species are too big to be used as whole plants, hence, the parts.

Certain aspects of herbal knowledge were localized and restricted within the community. As such remedies for snakebites, feminine conditions, bone fractures and anemia were hardly cited and guarded yet those for diarrhea, malaria, STD and stomachache were readily available (Owuor *et al.*, 2005). There are new findings. Burn treatment with *Sapium ellipticum* and *Spathodea campanulata* with positive results is new. *Allophylus abyssinica* is used to straighten up the extra curvature of the spinal column in those with the hunchback, best used during the early stages of onset and *C. schweinfurthii* an aphrodisiac are new findings. Such plants could be used in poverty alleviation through sales of parts or seedlings. The medicinal value of plants is therefore, fronted as a reason for conserving Kakamega forest.

CONCLUSION

This research has provided a detailed and comprehensive documentation of some of the commonly used medicinal plants in Kakamega forest, hence the need to conserve the forest. Report covers new uses and new records. It confirms how plants can be used to improve the value of the environment and reduce human suffering.

ACKNOWLEDGEMENTS

BIOTA E12 of the Ministry of Education and Research, Germany, for financial support. My assistants Patrick Omulubi (Maseno University) and Henry Makhola (KABICOTOA), Kakamega.KEEP and the members of the community living adjacent to Kakamega forest, on whom the information is based.

REFERENCES

- Agnew, A.D.Q. and S.A. Agnew, 1994. Upland Kenya Wild Flowers. A Flora of the Ferns and Herbaceous Plants of Upland Kenya. 2nd Edn. East Africa Natural History Society, Nairobi. ISBN: 9966-9921-03.
- Arwa, P.S., A.R.O. Nyunja and J.C. Onyango, 2008. Phytochemical and Microbial Activities of *Rhoicissus revoilii* Planch. Plant Sci. Res., 1 (3): 68-78.
- Beentje, H.J., 1994. Kenya Trees Shrubs and Lianas. National Museums of Kenya. 1st Edn. Nairobi. ISBN: 9966-9861-03.
- Chiang, H.C., S.M. Jaw and P.M. Chen, 1992. Inhibitory effects of physalin B and physalin F on various human leukemia cell lines *in vitro*. Anti-Cancer Res., 12: 1155-1162.

- Chiang, H.C., S.M. Jaw, P.M. Chen and W.S. Kan, 1992. Anti tumor agent physalin F from *Physalis angulata* L. Anti-Cancer Res., 12: 837-843.
- Cox, P.A., 1994. The ethnobotanical approach to drug discovery. Strengths and limitations in ethnobotany and the search for new drugs. Symposium on ethnobotany and the search for new drugs held at the Hotel Prain Centra, Fortaleza Brazil, 30th Nov to 2nd Dec 1993. John Wiley and Sons Ltd. Chichester, England. Ciba Foundation, 185: 25-41. ISBN: 0471-95024-6.
- Cragg, G. and M. Suffness, 1988. Metabolism Of plant derived anti-cancer agents. Pharmacol. Therapy, 37: 5425-432.
- Dark, G.G., S.A. Hill, V.E. Prise, G.M. Tozer, G.R. Pettit and D.J. Chaplin, 1997. Combrestatin A-4, an agent that displays potent and selective toxicity toward tumor vasculature. Canc. Res., 57: 1829-1834.
- Dorr, R.T., D. Dvorakova, K. Snead, D.S. Alberts, S.E. Salmon and G.R. Pettit, 1996. Anti tumor activity of combrestatin A-4 phosphate, a natural product tubulin inhibitor. Invest New Drugs, 14: 131-137.
- Eldin, S. and A. Dunford, 1999. Herbal medicine in primary healthcare. Butterworth-Heinemann, Oxford, pp: 1-180. ISBN: 07506-40537.
- El-Kheir, Y.M. and A. Salih, 1979. Investigation of the Nature of the Molluscicidal Factor of *Croton macrostachyus*. 2nd OAU/STRC Inter African Symposium on Traditional Pharmacopoea and African Medicinal Plant. Published by OAU/STRC Lagos. Pub No. 115.
- El Said, F., S. Fadulu, J.O. Kuya and E.A. Sofowora, 1971. Native Cures in Nigeria Part 11. In: Lyodia, W. (Ed.). The Antimicrobial Properties of the Buffer Extracts of Chewing Sticks, 34 (1): 172.
- El-Zayat, A.A., D. Degen, S. Drabek, G.M. Clark, G.R. Pettit and D.D. Von Hoff, 1993. *In vitro* evaluation of the antineoplastic activity of combrestatins A-4, a natural compound from *Combretum caffra*. Anti Cancer Drugs, 4: 19-25.
- Gurib-Fakim, A., 2006. Medicinal plants of traditions of yesterday and drugs of today. Molec. Aspects Med., 27: 1-93.
- Hartwell, J.L., 1982. Plants used against cancer. A Survey. Lawrence, CA: Quaterman Publications.
- Hesse, M., 2002. Alkaloids; Natures Curse or Blessings. 1st Edn. Wiley, V.C.H. Weinheim, pp: 414. ISBN: 3:9 063-9024-1.
- Judd *et al.*, 2008. Plant Systematics: A Phylogenetic Approach. 3rd Edn. Sunderland M.A. Sinauer Associates Inc. ISBN: 9780-3091-0333-6.
- KIFCON, 1994. Kakamega Forest, the Official Guide, KIFCON, Nairobi. 1st Edn. Published by Kifcon for Kenya Wildlife Services and Forest Department, pp: 1-67.
- Kokwaro, J.O., 1988. Conservation Status of the Kakamega Forest in Kenya: The Easternmost Relic of the Equatorial Rainforests of Africa. Monog. Syst. Bot., Missouri Botanic Garden, 25: 471-489.
- Kokwaro, J.O., 1993. Medicinal Plants of East Africa. 2nd Edn. Kenya Literature Bureau, Nairobi. ISBN: 9966-4419-05.
- Lawrence, G.H.M., 1951. Taxonomy of Vascular Plants. Oxford and IBH Publishing Co. PVT Ltd. New Delhi, pp: 1-823.
- Ludeki, J.V., G.M. Wamukoya and D. Walubengo, 2006. Environmental Management in Kenya. 1st Edn. A framework for Sustainable Forest Management in Kenya-Understanding the Forest Policy and Forest Act, Nairobi, 2005, pp: 1-163. ISBN: 9966-7018-26.
- Maundu, P. and B. Tengnas, 2005. Useful Trees and Shrubs for Kenya. Technical Handbook No. 35. World Agroforestry Center. Nairobi, Kenya: World Agroforestry Centre-Eastern and Central Africa Regional Programme (ICRAF-ECA), pp: 484. ISBN: 99 66-896-70-8.
- Masoko, P. and J.N. Eloff, 2007. Screening of 24 South African Combretum and 6 Terminalia (Combretaceae) species for antioxidant activities. Afr. J. Trad. Comp. Alt. Med., 4: 231-239.
- Masoko, P., J. Picard and J.N. Eloff, 2007. The antifungal activity of 24 South African Combretum species (Combretaceae). S. Afr. J. Bot., 73: 173-183.
- McGaw, J. and J.N. Eloff, 2005. Screening of 6 poisonous plants for antibacterial, anthelmintic and cytotoxic activity *in vitro*. S. Afr. J. Bot., 71: 302-306.
- Onyango, J.C., A.R. Nyunja Ochieng and R.W. Bussmann, 2004. Conservation of biodiversity in the East African tropical forest. Lyonia, 7 (2): 151-157. <http://www.lyonia.org/downloadPDF.php?pdfID=2350.1>.
- Owuor, B., B. Mulemi and J. Kokwaro, 2005. Indigenous snakebite remedies of the Luo of Western Kenya. J. Ethnopharmacol., 25 (1): 129-141.
- Pettit, G.R., S.B. Sing, E. Hamel, C.M. Lin and D.S. Alberts, 1989. Isolation and structure of the strong cell growth and tubulin inhibitor, Combrestatin A-4. Experientia, 45: 209-211.
- Powis, G., 1994. Anti cancer drugs. Antimetabolite metabolism and natural tumour agents. Int. Encyclopedia of Pharmacology. Ther., 140: 1-506.

- Republic of Kenya (RoK), 2002. Kakamega District Development Plan, Ministry of Planning and National Development.
- Rowinsky, E.K., D.A. Noe, D.S. Ettinger, M.C. Christian, B.G. Lubejko, E.K. Fishman, S.E. Sartorius, M.R. Boyd and R.C. Donehower, 1993. Phase 1 and pharmacological study of the pulmonary cytotoxin 4-ipomeanol on a single dose schedule in lung cancer patients; hepatotoxicity is dose limiting in humans. *Cancer Res.*, 53: 1794-1801.
- Sofowora, A., 1982. *Medicinal Plants and Traditional Medicine in Africa*. 1st Edn. Published by John Wiley and Sons, pp: 1-256. ISBN: 0471-90244-6.
- Stace, C.A., 1989. *Plant Taxonomy and Biosystematics*. 1st Edn. Cambridge University Press, pp: 1-260. ISBN: 0521-42783-1.
- Were, G.S. and D.A. Wilson, 1968. *East Africa Through a 1000 years*. 1st Edn. 1000AD to the Present day. East African Publishing House, Nairobi, pp: 1-206.