USAGE CONSENSUS STUDY OF BIOACTIVITY OF
THE LUO AND KURIA MEDICAL
ETHNObOTanIES

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DECLARATION

I hereby declare that this thesis is my own original work and has not been submitted before for any degree or examination at any other University and that all sources of materials used for the thesis have been correctly acknowledged.

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This thesis has been submitted for examination with our approval as the University supervisors.

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DEDICATION

This thesis is dedicated to my father Alfred Mika Owuor and to my late mother Merab Oduor Apondi.
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This work has been accomplished through the help and inspiration of many people I interacted with during the field, laboratory and write-up stages. I would like to thank everybody who contributed criticisms, ideas and insights, apologies to those whose names I have neglected or omitted here. I will mention some few noteworthy individuals who made immense contributions.

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For my part, I have attempted to give an accurate and faithful description of their knowledge and my own field observations. I shall feel myself abundantly rewarded if, by contributing my mite, I have enriched science with any new and interesting facts based on their practice.

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In conclusion I thank God for good health and zeal to undertake this study.
ACRONYMS AND ABBREVIATIONS

AICs – African Independent Churches
ATCC – American Type Culture Collection
ATM – African Traditional Medicine
CA – Consensus Analysis
CLSI – Clinical and Laboratory Standards Institute
CQ Resistant clone – chloroquine resistant clone (W-2)
CQ Sensitive clone – chloroquine resistant clone (D-6)
DCM – Dichloromethane
DMSO – Dimethyl Sulphoxide
FGD – Focus Group Discussions
GoK – Government of Kenya
HIV-AIDS – Human Immunodeficiency virus Acquired Immune Deficiency Syndrome
IC\textsubscript{50} – 50% inhibition concentration
ICF – Informant Consensus Factor
KEMRI – Kenya Medical Research Institute
LC\textsubscript{50} – Concentration that will kill 50% of the sample population of mosquito larvae in 24 hours
MEOH – Methanol
MIC – Minimal Inhibitory Concentration
MRSA – Multiple Resistant Staphylococcus Aureus
MDGs – Millennium Development Goals
NAI – University of Nairobi Herbarium
PRA – Participatory Rural Appraisal
RPMI 12640 – *Plasmodium* cell culture medium developed by the Roswell Park Memorial Institute (Sigma-Aldrich)

TM – Traditional medicine

TMP – Traditional Medical Practitioner

NGO – Non Governmental Organizations

SPSS* – Statistical Package for Social Sciences

SYBR* Green I – Dye that intercalates into the minor groove of double-stranded DNA

WHO – World Health Organization
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ABSTRACT

Traditional medicines are useful for managing human and animal health in Kenya. The purpose of this study was to document, compare and investigate the bioactivity of Luo and Kuria ethnopharmacopoeias.

The findings on ethnobotany and ethnomedicine are based upon fieldwork in Kuria, Migori, Siaya and Kisumu districts, in Nyanza province Kenya. Thirty four consenting traditional practitioners were interviewed over a one and a half year period on aspects of ethnosystematics, ethnomedicine, ethnobotany and ethnopharmacology. The cross-sectional survey used botanical collections, group discussions, interviews and questionnaires. Selection of species for biological activity testing was based on the consistency of use in the two ethnic communities. Biological activity studies used qualitative (disc diffusion) and quantitative (minimum inhibitory concentration tests, LC$_{50}$ and IC$_{50}$) tests.

The study gives a lexicon (plant and disease names) and taxonomy of illness and diseases in the Luo and Kuria medical systems. Out of the 306 documented species, 158 species (135 genera) and 148 species (129 genera) were used by Luo and Kuria respectively; 73 species and 38 families are common to both ethnopharmacopoeias. Of these 28 species are used to treat similar diseases.

Based on richness of species and usefulness, the most important families for illness/disease conditions are Fabaceae, Asteraceae and Euphorbiaceae. Both ethnopharmacopoeia have high species diversity indicated by high Shannon-Wiener indices ($H$), 5.33 and 6.52 for the Luo and Kuria respectively. Based on their close coefficient of similarity ($S$) value of 47.4% the difference between the Kuria and Luo ethnopharmacopoeia appears very narrow; they come into view as not hermetically sealed entities.
There are cross-cultural similarities in aetiologies, preparations, parts, medicinal plant families, species and usage possibly due to cultural diffusion. The individual informant consensus factor ($F_{ic}$) values for the groups, 0.504 and 0.567 for Luo and Kuria, indicate a medium level of informant agreement.

Traditional perceptions of health are prevalent and deeply rooted among the Kuria and Luo. Forty two and 52 illness and disease conditions are documented for the Luo and Kuria respectively. The top five ranked illness and disease conditions in terms of citation frequency among the two groups were: stomachache, culture bound syndrome, cattle diseases and infant diseases. Most plants have multiple disease uses. Leaf was the most frequently utilized plant part in both ethnopharmacopoeia and decoctions and infusions were the chief formulations. Out of the 308 medicinal plants species used by the Kuria and Luo 55 (17.8%) are formulated in multi-plant preparations; the other 253 (82.2%) are formulated as single plant preparations.

Fifteen plants with high and consistent usage reports among Luo and Kuria traditional healers were selected, collected and then screened for antibacterial, antifungal, and antiprotozoal activity with an overall aim of evaluating their use. *In vitro* bioactivity screening (drug susceptibility tests) for antimicrobial (bacterial, protozoal and mycotic) activities against Gram-positive and Gram-negative bacteria, yeasts and dermatophytes: *Staphylococcus aureus*, *Escherichia coli*, *Microsporum gypseum* and *Candida albicans* followed using methanolic extractions. Antimicrobial activity from the selected plant species was demonstrated. Most plant extracts exhibited antimicrobial activity against one or more of the tested microorganisms but no activity was shown for *Escherichia coli*. Of the 15 plants tested 40% showed antibacterial and 27% antifungal activity. Methanolic extracts were more active on gram-positive and filamentous fungi. *Tylosema fassoglense*, *Tithonia diversifolia* and *Albizia coriaria* elicited significant antibacterial activity whereas
Albizia coriaria, Plectranthus barbatus and Rhus natalensis elicited high preliminary antimycotic activity in dilutions ranging from 1:2 to 1:64. Albizia coriaria, Plectranthus barbatus and Tithonia diversifolia inhibited all test microbes in the MIC tests.

Dichloromethane extracts of eight medicinal plants were screened against two clones of Plasmodium falciparum, W2 (chloroquine resistant) and D6 (CQ sensitive) using the SYBR® Green I assay. The screenings yielded moderate to high antiplasmodial activity. Of the eight plants tested 37.5% showed activity (IC$_{50}$ < 5µg/ml) against Chloroquine resistant and 50% active (IC$_{50}$ <5µg/ml) against Chloroquine sensitive Plasmodium falciparum. Tylosema fassoglense, Ocimum kilimandscharicum and Ageratum conyzoides exhibited high activity against W-2 and Ocimum gratissimum, Ageratum conyzoides and Tylosema fassoglensis, Croton macrostachyus high activity against D-6.

Ethanolic extracts of five plants were tested for Aedes aegypti larvicidal toxicity at dilutions between 0.2% and 1.0%. Upon 24hours exposure Albizia coriaria and Plectranthus barbatus extracts were found to have the most larvicidal activity.

In conclusion both cultures have rich ethnopharmacopoeias and extensive plant knowledge. Even though accessibility to biomedicine has increased in the study areas traditional medicine plays an important role in providing healthcare. Ethnobotanical knowledge was sufficiently reliable for identifying plant extracts with antimicrobial activity. Some species with significant antibacterial; antimycotic and antiprotozoal effects were found in this study highlighting the significance of indigenous knowledge in seeking plants with bioactive compounds likely to yield new drugs.

Keywords: Ethnopharmacopoeia, medical pluralism, usage consensus, biological activity
1.0 CHAPTER ONE – INTRODUCTION AND BACKGROUND

1.1 Introduction

Biomedicine has been introduced successfully in many countries. Even though its distinction in healthcare delivery is recognized; it remains but one medical health system among several. The use of herbal medicines continues to expand rapidly across the world (WHO 2004) and a number of studies (Nangendo 2006; Nagata et al., 2011) highlight biomedicine’s peripheral location in relation to traditional medicine. However, this strong demand for herbal health products comes with concerns on efficacy and safety.

There is a need to search for new therapeutic agents due to the increasing instances of drug resistance by agents of human and animal diseases. The United States Centers for Disease Control and Prevention (CDC) has defined the antimicrobial resistance problem as a “major blooming public health crisis” (Taubes 2008). It is a recurring subject (Angulo et al., 2000, Cohen 2000, Walsh 2000, Little et al., 2002, Dean et al., 2005) threatening public health globally. Current approaches to overcome it include the search for new antimicrobials from plants guided by ethnobotany.

Medicinal plants represent a very potent source of discovery to address the uncertainties of microbial drug resistance. The underpinning thesis of this study is that comparative study of ethnopharmacopoeia provides a rich basis for new drug discovery by pinpointing species with high potential.

1.2 Background

The World Health Organization (WHO) has stressed the need to use traditional medicine where appropriate to achieve health care goals for all (WHO 2002). This call has
led to special attention on traditional medicine therapies based on their long usage in disease management and increased antimicrobial drug resistance. The study of traditional medicinal resources is important, because the inhabitants of rural Kenya and Africa in general, rely heavily on traditional remedies for their healthcare needs (Maundu et al., 2004, Kokwaro 2009), not only because of their cultural outlooks, but also because biomedical healthcare infrastructures in these areas are poorly developed (de Boer 2005), and hence, cannot adequately cater for local population needs. Health provision in the country is beyond the reach of most rural populations. Kenya has a doctor-patient ratio of 1: 6,536 (UNDP 2004) as a result, many communities depend heavily on traditional herbal medicines which are often more available, affordable and are sometimes perceived as more effective. However, several threats face traditional medicine; there is a rapid loss of traditional herbalists and decline in authentic knowledge in traditional treatment (Cox and Balick, 1994, Cox 2000, Cox 2004); commercialization of the art has also affected medicinal plant resources. Luo and Kuria oral health traditions are likely to die away if present patterns of social interactions intensify and older generations continue to pass on.

African countries are endowed with diverse plant resources. Kenya is estimated to have 6000 species of higher plants including 2000 tree and shrub species plant resources (Knox 1996). The PROTA (Plant Resources of Tropical Africa) program has recorded 6,377 plant species used in Tropical Africa, out of which more than 4,000 are used as medicinal plants, (Bosch et al., 2002). A recent synthesis (Maundu et al., 2004) estimates there are between 6,000–10,000 African medicinal species.

Despite the advent of biotechnology and modern methods of combinatorial chemistry and rational drug design, nature still plays a surprisingly important role as a source of new pharmaceutical compounds (Desmarchelier 2010). Over 6,000 plant have
been reported in ethnobotanical studies as medicines (Bosch et al., 2002, Maundu et al., 2004), it is important to prioritize them for further development.

A growing literature (Taniguchi and Kubo 1993, Cragg 1998, Korin et al., 2002, Khafagi et al., 2000, Wise 2003, Muregi et al., 2003) supports the link between drug discovery and ethnobotany. Ethnobotanical surveys typically produce several megabytes of data annually and the task of analyzing ethnobotanical data for new drug discovery largely depends on leads based on usage consensus by informants. The estimated success for this approach is conservatively placed at around 30%. Regardless of the fairly strong correlation between drug discovery and ethnobotany, some authors (Buenz et al., 2004, McClatchey 2005, Balunas and Kinghorn 2005, Bletter 2007) observe that ethnobotany has fulfilled little of its promise to deliver a bounty of new, laboratory-proven medicinal plants and compounds. Though these views on ethnobotany are posited the explanation lies largely with collection and analysis of ethnobotanical data. Meaningful interpretation of plant usage is hampered by the use of non-comparative approaches. For the ethnobotanical approach to be more effective there is need to improve its evaluation stringency; techniques are needed to narrow in on plants with the highest medical potential. While most ethnobotanical and ethnopharmacological studies tend to examine the role of medicinal plants, only a few compare plant use among different traditional cultures

Ethnobotany is going through a period of profound change; the way we look at ethnobotanical data is changing. Comparative ethnobotany is featuring more prominently in better understanding medicinal plant use pattern (Leporatti and Ghedira 2009, Nebel and Heinrich 2009). Moerman et al., (1999) recognized the importance of such studies in understanding medicinal plants noting that “almost nothing is known about possible
patterns of medicinal plant selection by human beings across cultures, regions and hemispheres”. In addition, the application of new informatics (databases and data-mining systems) to ethnobotanical data holds great promise for identifying novel pharmacotherapeutic leads for bioactive compounds (Buenz et al., 2004). Informatics presents a possibility of digesting more ethnobotanical information in less time. The systematic evaluation of indigenous pharmacopoeias in order to contribute to improved health care in marginalized regions has been placed on the agenda of international and national organizations and of NGOs (Heinrich 2000). It was thought useful to compare plant usage for two neighbouring ethnic communities linguistically classified as Nilotic (Luo) and Bantoid (Kuria), to get an indication if usage choice is due to ecological, epidemiological or cultural factors.

The general aim of this study was to assist local communities make the best possible use of their traditional medicine knowledge, practices and medicinal plants by documenting and scientifically validating the use of medicinal plants. While Luo plant use has been the subject of extensive studies (Johns et al., 1990, Kokwaro and Johns 1998, Aduma 1998, Orwa et al., 2007) little is known of the Kuria. Although some studies (Sillery 1936, Whiteley 1955, Ruel 1962, 1991 & 2000, Seba 1977, Abuso 1980, Odden 1987, Oda 1989, Cammenga 1994, Shetler 1995, Nyaigotti Chacha and Odden 1998, Prazak 2000, Heald 2000, Fleisher 2000, Mwita 2007 & 2008) have been carried out among the Kuria little has been done to record the Kuria pharmacopoeia and plant lexicon. No investigation, to the author’s knowledge, attempts to directly examine and comparatively study the Kuria pharmacopoeia. This study presents the first systematic study of Kuria medicinal plants. The thesis contributes to the inventory of Kenyan cultural heritage and drug discovery studies. It is an effort in rescuing African health heritages and establishing their therapeutic value and safety.
1.3 Objectives

The objectives for this study were:

1. To document and identify medicinal plants of the Luo and Kuria.

2. To compare the medicinal plants of the Luo and Kuria.

3. To determine bioactivity of selected medicinal plant extracts.
2.0 CHAPTER TWO – LITERATURE REVIEW

2.1 Introduction

This part reviews critical points of existing knowledge, concerns, findings, methodologies and theories, in ethnopharmacology and bioactivity of medicinal plants. It contrasts and evaluates them with the work done here.

2.2 The need for antimicrobials

Microbial drug resistance is a relevant and disturbing subject threatening public health globally. It has grown considerably, and with each passing decade, new resistance emerges (Taubes 2008). Even though pharmacological industries have produced a number of new antibiotics, microbial resistance to these drugs has increased. There are some species; *Escherichia*, *Klebsiella*, *Enterococcus*, *Cryptococcus*, *Salmonella*, *Candida*, *Plasmodium*, *Staphylococcus* and *Plasmodium*, *Trichophyton* that are commonly linked with epidemics (Linden and Miller 1999, Kühn et al., 2000, Wendo 2002, Dorsey et al., 2002, Sar et al., 2004, Threlfall 2002, Johnston and Jaykus 2004, WHO 2004). In Kenya diseases associated with highly resistant microorganisms, constitute a sizeable share, forty percent, of the pharmaceutical products market (EPZA 2005) and present a major challenge to drug discovery strategies. The small number of drugs in development for these cases compels a focused initiative requiring access to a diverse source of crude extracts.

One potential source of crude extracts is from testing local plant lore or ethnobotany. It is now a commonplace that such “traditional knowledge” is disappearing or changing under the pressures of a globalizing world (Heinrich 2010). The loss of language and traditional knowledge due to acculturation and plant habitat destruction is a major concern, particularly among smaller and more vulnerable tribes and indigenous groups (Cox 2000, Ghorbani et al. 2006, Heinrich 2010). The Luo and, more so, the Kuria are currently
undergoing a phase of rapid cultural and ecological change (Seba 1977, Rwezaura 1989, Prazak 1999, Heald 1999, Geissler and Prince 2010) and important aspects of their indigenous knowledge and folk Biology are vulnerable.

2.3 Traditional medicine

The World Health Organization (WHO) defines traditional medicine as: the diverse health practices, approaches, knowledge and beliefs incorporating plant, animal, and/or mineral based medicines, spiritual therapies, manual techniques and exercises applied singularly or in combination to maintain well-being, as well as to treat, diagnose or prevent illness (WHO 2002).

In Africa up to 80% of the population uses TM to help meet their health care needs {World Health Organization URL 1}. The reasons are its availability, affordability and the poorly developed biomedical healthcare infrastructures (de Boer 2005). African traditional medicine (ATM) considers health as a state of physical, mental and social well being. Van der Geest (1997) observes that (ATM) is characterized by its social character; description and explanation of illness in terms of personal interaction between members of one kinship group; a religious dimension of medical healing, an orientation to prevention; broad health and illness concepts; a deep personal involvement of healers in patient treatment; healer secrecy and reward system.

The interest and adoration of Traditional Medicine stems from the recognition that some conventional drugs trace their origin to it. Antimalarial molecules such as quinine, lapachol and artemisinin were originally isolated from herbal medicinal products (Wells 2011, Purcell 2004). To further illustrate this point Lam (2007) notes that at least 23 natural product and natural-product-derived drugs have been launched onto the market in Europe, Japan or the United States from 2001 to 2005.
Cynical views on TM have persisted especially with its growing use in society (Atwood 2003, Ernst 2003). The major reasons for this view are that they are not adequately regulated and reproducible (Ernst 2004). The WHO has led in the call for a change in this situation (WHO 2002). In the arguments quality-related problems (lack of consistency, safety, and efficacy) seem to be overshadowing the potential genuine health benefits of various herbal products (Huie 2002). On reproducibility traditional healers are solely responsible for formulation and invariably keep the knowledge secret (Kokwaro 2009). A point related to this is that volume wise traditional medicine doses exceed conventional drugs, often requiring them to be taken repeatedly (Valecha et al., 2000). Quality issues haunt traditional medicines (Calixto 2000, Barnes 2003, Van Andel et al., 2007) reducing their economic prospects. Yet TM health products are a potent resource that could expand Kenya’s national pharmaceutical market that valued at over ~KShs 8billion (1.3billionUS$) in 2005 (EPZA 2005).

The totality of TM materia-medica is referred to as the ethnopharmacopoeia (Heinrich 2003). For many herbal preparations extensive careful phytochemical, pharmacological and toxicological standardization is lacking. Ernst (2004) notes that the quality of herbal medicines is often suboptimal. Safety issues related to herbal medicine are complex with possibility of toxic herbal constituents and presence of contaminants or adulterants. Unfortunately, standardization principles of: authenticity, purity and assay described in (Yadav and Dixit 2008) are not suitable for many herbs (Goldman 2001) since their active principles are unknown in many cases. Goldman (2001) proposes that instead of standardizing a medicinal herb the results of a clinical trial might be used to identify an effective herbal formulation; a strategy requiring a consistent formulation and a large study sample.

However, even with lack of support from the major pharmaceutical companies, natural
products still show a substantial impact on the drug discovery process (Lam 2007). In Kenya TM was restrained because of the Witchcraft Act of 1925 (Okoth-Owiro 1994) but has experienced a remarkable rejuvenation characterized by commercialization of services and products of its practices and its beliefs (Jäger 2005, NCAPD 2008).

2.4 Ethnobotany

All human cultures depend on plants in different ways. This intricate and fundamental relationship between plants and people is a phenomenon that has intrigued scientists for a long time and is the focus of ethnobotany (URL 2).

The term ethnobotany is derived from the Greek word *ethnos*, which means 'people', and *botane* which means 'plants' (Choudhary *et al.*, 2008). Ethnobotany encompasses the full range of plant-people interactions.


Ethnobotany is an interdisciplinary science bridging the natural and social sciences, it draws from a wide array of qualitative and quantitative methods. In its early years ethnobotany was mostly descriptive; ethnobotanists merely compiled plant lists and descriptions of their uses. However, it has become more analytical with ethical (Posey 2004) historical (Heinrich *et al.*, 2006), linguistics (Martin 2004, Berlin 1976) aspects and methodologies included. In studying medicinal plants ethnobotany has the intention of discovering new drugs, conserving plants, understanding cultural beliefs and illness construction and preservation of cultural knowledge and healing concepts. Central to
understanding the basis and principles of traditional medicine and their larger use is ethnopharmacology, an interdisciplinary science (Edwards et al., 2005; Heinrich et al., 2009, Reyes-García 2010).

Ethnobotany has also become increasingly important in applied conservation projects that take in account both social and environmental aspects {URL 3}. When ethnobotanical studies take into account ethnomedicine, it becomes is useful in designing and delivering culturally appropriate health programmes. Fabrega (1975) defines ethnomedicine as the study of the relationship between disease, social behavior, and human adaptation, while Nations (1986) defines it as the body of beliefs about disease, its relation to other aspects of life.

2.5 Kenyan ethnobotany perspectives

Several ethnobotanical studies on medicinal plants focussing on single ethnic communities have been conducted in Kenya. Several ethnic groups have been subject of such studies Kamba (Wambugu et al., 2011), Kikuyu (Gachathi 2007), Luo Abasuba (Nagata et al., 2011), Samburu (Nanyingi et al., 2008), Ogiek (Ichikawa 1987, Ngari et al., 2010), Embu and Mbeere (Kareri et al., 2007), Maasai (Maundu et al., 2001, Bussmann et al., 2006), Marakwet (Lindsay and Hepper 1978), Nandi (Jeruto et al., 2008), Turukana (Morgan 1981), Luhya (Lado 2004, Nyunja et al., 2009), Sabaot (Okello et al., 2010), Digo and Duruma (Pakia and Cooke 2003, Nguta et al., 2010), Kamba (Wambugu et al., 2011), Digo (Pakia 2005) have been subject of studies on medicinal plants. Though Luo ethnobotany has received attention from the scientific community (Aduma 1998, Johns et al., 1990, Owuor 1999, Kokwaro and Johns 1998, Geissler et al., 2002, Orwa et al., 2007) the only published Kuria medicinal plant record is that of Albizia brachycalyx in epilepsy treatment (Moshi et al., 2005). Broadly these ethnobotanical studies record
medical knowledge and belief of these groups. It is immediately apparent that some ethnic communities have not been systematically studied. In addition most of the studies focus on single ethnic groups and only a few investigations address comparative plant use aspects. This study compared medicinal plant use of the Luo and Kuria ethnic groups. Moerman (2007) argues that plants with demonstrable biological effectiveness more are likely to be found by comparing usage between cultural groups. Secondly, there are few studies on specific genera or families. The only studies are on Apocynaceae by (Omino and Kokwaro 1993) and Labiatae by (Githinji and Kokwaro 1993). Some studies have focussed on specific disease conditions; ear, nose and throat (Njoroge and Bussmann 2006b), skin (Njoroge and Bussmann 2007), snakebites (Owuor et al., 2005). Bioactivity studies are increasing and can be categorized on basis of their focus into those on either one species, like (Kuria et al., 2001), few or many species (Okemo et al., 2004, Omwenga et al., 2009, Matasyoh et al., 2007, Munyendo et al., 2011). This appreciable increase in bioactivity studies concurs with views made by Sofowora (1993) in an earlier review of African medicinal plant research. A large part of the literature concerned with antimicrobial activity has tended to focus on antiplasmodial activity (Omulokoli et al., 1997, Oketch-Rabah et al., 1999, Muregi et al., 2003, Koch et al., 2005, Muthaura et al., 2007, Akeng'a et al., 2009, Kigondu et al., 2009). Broadly there is little attention to antiviral activity, (Tolo et al., 2006, 2007) are some recent publications in the area. The number of ‘ethnography related’ studies and publications covering plant use and ethnomedicine aspects are few. Another area of neglect is anthropological research. There are recent toxicological research publications using mosquito larvae (Yenesew et al., 2006, Ohaga et al., 2007, Matasyoh et al., 2008, Maniafu et al., 2009). Isolation and characterization of natural products still continues and is invariably accompanied with bioactivity studies (Wanyama et al., 2010).
2.6 Approaches in ethnobotany for new drug discovery

Several topical reviews (Newman et al., 2000, Fabricant and Farnsworth 2001, Newman et al., 2003, Butler 2004, Van der Heijden et al., 2004, Okigbo and Mmeka 2006, Karou et al., 2007) confirm that the drug discovery process continues to rely considerably on the ethnobotanical approach. Even with lack of support from the major pharmaceutical companies, natural products show a substantial impact on the drug discovery process (Lam 2007). Their role of ethnobotany in the selection of medicinal plants for the development of new drugs is twofold: (1) they may become the base for the development of a medicine, a natural blueprint for the development of new drugs, or; (2) a phytomedicine to be used for the treatment of disease. There are numerous illustrations of plant derived drugs (Iwu 2007); these include aspirin from Salix alba, codeine from Papaver somniferum, ipecac from Psychotria ipecacuanha, quinine from Cinchona pubescens and vinblastine from Catharanthus roseus (Cox and Balick 1994, Newman et al., 2000). The second approach which aims at optimization of mixed remedies as formulated dosage forms is perhaps more relevant to the needs of the poor rural populations but has remained largely ignored (Iwu 2007).

For this approach to remain effective there is need to improve its evaluation stringency. Techniques are needed to narrow in on plants with the highest medical potential. Models departing from the traditional approach have been sought and the attention has shifted from the use of medicinal plants within a culture to the need for comparing the use of plants inter-culturally (Moerman et al., 1999, Ghorbani et al. 2006). Cross cultural studies point out to medicinal plant species most likely to contain bioactive compounds. At best such studies are rare in Kenyan ethnobotany but can offer thought expanding and stimulating prospect in drug discovery alongside traditional bioactivity
testing guided by informant and cultural usage consensus. This technique draws on consensus analysis (CA) from the field of cognitive anthropology. CA is applied in ethnobotany in two important ways described by (Caulkins and Hyatt 1999): measuring the degree of agreement among informants about a domain of knowledge, belief, or practice; and determining the "culturally correct" information about that domain according to the pooled answers of the informants. Quantitative techniques are also being applied in analysis of ethnobotanical data. Several indices are used to measure the value of plant species. One particularly useful one is the Factor of informant consensus (Fic), an estimator of knowledge evenness ranging from 0 to 1 (Trotter and Logan 1986). A high value of this factor indicates that a large proportion of the informants rely strongly on these remedies.

3.0 CHAPTER THREE – STUDY DESIGN, MATERIALS AND METHODS

3.1 Introduction

In this section a description is made of the study area. Aspects of history, geography, demography, culture and economic life of the study population are presented. This description provides a useful background for understanding the groups being studied. The section also provides a description of field data collection methods and laboratory analysis procedures.

3.10 The Luo study Area

The study area traverses an ethnically heterogeneous, but phytoecologically regular area of approximately 10,400 square kilometers spatially, from Isebania in southern Kuria through Migori, Homa Bay, Kisumu and Siaya districts of Nyanza province. Kurialand and Luoland occupy 0.52% and 12.38% of Kenya respectively (Makoloo 2005).

The study area was chosen to capture likely variation in medicinal plant usage. The study area falls within the Lake Victoria regional mosaic plant belt of Africa, dominated by a graded vegetational landscape of relict tropical rainforest, bush grassland (Themeda-Hyparrhenia) and wooded grassland vegetation of the Combretum-Dodonaea-Balanites-Acacia matrix. The K5 floristic region, within which the study area falls, has a total flora of 1,969 species in the List of East African plants (Knox 1996).

The character of the vegetation varies with and depends on moisture, temperature and soil. The natural vegetation consists of grass and scattered trees and strips of riverine forest. The present vegetation cover, secondary in character, consists of agricultural crops and multipurpose (ornamental, medicinal, fruit, timber and shade) tree and shrub species have been planted in farm systems. The rainfall varies from 800 to 1300 mm and is fairly
well spread annually. The rainy season periods are from April-June and October-November. Several large rivers and small streams flow in this area; these include Migori, Sondu, Yala, Nyando, Awach, Nzoia and Kuja.

Geomorphologically Nyanza province consists of a low plateau and lowlands. Ojany (1996) distinguishes the lowlands into the lake lowlands and tectonic (Kano) plains. Geologically Nyanza province in Kenya lies in the Tanzania Craton that is geographically subdivided into the Nyanzian Shield (Saggerson 1952, Ogola 1987, Mathu and Davies 1996). The Nyanza Shield is formed by Kavirondian and Nyanzian rock systems. The older Nyanzian system (volcanics dominant) and Kavirondian (sediment dominant) are common below 1500 m in the west and the younger Bukoban (Kisii) system occurs in the east of the province in areas above 1500 m (Meert et al., 1994, Rombouts 1985). The lithology is widely variable and includes Archaean shales, mudstones, greywackes, phyllites, conglomerates in the Kavirondian group; Archaean basalts, andesites, dacites, agglomerates, andesitic tuffs and rhyolites for the Nyanzian Group; and rhyolites, basalts, quartzites, conglomerates for the Bukoban (Kisii) system (Rombouts 1985, Mathu and Davies 1996). The province is dominated by acrisol and cambisol soils types (Breimer 1976).
3.11 The Luo

The Luo people are an agropastoral-cum-labour-migrant group of the Western Nilotic cluster of societies; their language, "Dholuo", has a Nilo-Saharan eastern Sudanic affiliation. The ethnonym "Luo" alludes to fishing, the traditional economy of the people but also implies following/trailing. Numbering about 4,044,440 million in 2010 they are the fourth largest ethnic group in Kenya (2010 census). The twenty three Luo sub-tribes (ogendini) live within 60 kms around Lake Victoria in about 702,090 habitations interspersed over a 10,000 square kms area (Ogot 2009, Gunga 2009). The Luo emerged from affine groups in Southern Sudan (Ogot 1967) due to family disputes and power struggle. They migrated southward into Kenya in three waves between 1490 and 1790.
[much of this history follows Ogot (2009)]. The first Luo groups probably arrived in their present area of settlement early in the sixteenth century and their internal migration into south Nyanza completed around 1850. The Luo did assimilate with other ethnic groups, and integrated other ethnic group into Luo ethnic groups during the course of their migration. The Abasuba intermarried with the Luo and speak "Dholuo" as well.

3.12 Religious beliefs

The Luo believe in a supreme creator, whom they call Nyasaye. Several restrictive taboos (kweche) govern social order and breaking them invites the wrath of ancestors (Mboya 1938, Raringo 2001). Religion among the Luo blends traditional and Christian elements. Some Luo cultural practices have eroded away, due to adoption of Christianity and westernization. Harries (2009) observes a recent escalation of evangelical Christianity across Luoland. The Christianization process was characterized by suspicion and lack of dialogue between Luo and Christian belief and led to breakaway African Independent Churches (AICs) in the 1930s (Barrett 1982) which continue to splinter prolifically (Fedders and Salvadori 1979, Shipton 1997).

Though the Luo have adopted Christianity a majority of the rural folks also believe in afterlife and ancestral spirits.

3.13 Social organization

Lineage membership is the key rule in Luo social organization. The Luo are defined by an economic, political and ritual unit called the (oganda). Commonly the (oganda) comprised of agnatic lineages (tracing descent through men) related through blood and marriage linkages. Historically, these lineages were separated by forested or pasture areas referred to as (thim); a no man’s land (Onduru 2009). Settlement and kinship
affiliation in these territories are still based largely upon lineages of paternally related males. The lineages are further divided into clans, sub-clans and kinships. Luo marriage is exogamous, traditionally determined by seniority at birth (Wilson 1961). The incidence of polygyny is fairly high and post-marital residence is patrilocal and the inheritance patrilineal (Ocholla-Ayayo 1976).

The Luo do not have a system of formal age-sets or age-grades, but rather a conception of idealized life-cycle stages through which individuals pass over the course of their lives (Dietler and Herbich 1993). Luo societal relations are based on the respect (luor) for one another, older people as well as community teachings and beliefs. Within the Luo cosmological and symbolic system social interaction is governed by rules of gender, kinship and age. Kin align themselves for purposes of exchange of goods, marriage, and political alliance.

3.14 Political organization

According to Ogot (1967) the Luo had two systems of political life; one centralized around a jural-political leader (Ruoth) and another through a gerontocracy of clan elders or what is known as acephalous system. Luoland can be divided into tribal territories known as (pinje) and in modern times central and south Nyanza. The Luo system of governance was by consent and based on consultation between elders (Odinga 1967). The units of societal segmentation are the “birth group” (anyuola), “people with a common grandfather” (jokakwaro) and (dho ot) major segment or collectivity of related clan members (Southall 1952). The (dho ot) are found in lineage territorial areas called (gweng'). The settlement unit is the homestead (dala) pl. (mier). In the (gweng') the authority of elders (jodongo) exercised through a council (doho), composed of the county
elders (jodong gweng) and the local peacemaker (ogaye), was respected in affairs of the community. They made decisions regarding disputes and violations of cultural norms.

The (ruoth) did not inherit his position but had to prove his leadership qualities; he worked closely with a Council (buch piny) consisting of healers (ajuoke) and diviners (jobilo), the warrior leader (osumba mirwayi), the peace-maker (ogaye) and the council of elders (jodong dhoot) (Ogot 1967). The Luo Union and now the Luo Council of Elders continue to influence Luo moral identity and unity (Carotenuto and Luongo 2009). The Luo Council of elders led by the (ker) or king, is a powerful advisory organ, which is the custodian of Luo traditions and cultural virtue, its decisions influence the community's beliefs and practices. During colonial rule (loch wasungu) headmen were first appointed charged with the duty of keeping law and order, collecting tax and supplying labour for public works. Today, the government of Kenya has centralised authority and administrative units.

3.15 Economic organization

There is considerable socio-cultural and economic homogeneity among the rural Luo. The Luo people are an agropastoral-cum-labour-migrant group (Cohen and Atieno-Odhiambo 1989). Though subsistence and some cash farming are the backbone of their economy, many young people are engaged in migrant wage labour outside the community. Luo society has roles and responsibilities divided based on gender. Craft production, subsistence agriculture, childcare, cooking, and domestic maintenance are mainly female responsibilities. Fishing, an entirely a male activity, provides personal income opportunities both for adults and children. However, fish processing and marketing is primarily the responsibility of women, who also do much of the farm work.
3.20 The Kuria study Area

The Kenyan Kuria live in undulating hills ranging between 1,400 – 1,887 m above sea level bordering Tanzania to the south, Uriri and Migori divisions to the north and Transmara (Narok) district to the east. Kuria district, named for its people, was created in 1993 when it was carved from Migori District and covers an area of 581 square kms. Politically, the creation of the district enhanced ethnic identity of the Kuria. The district is located between latitudes 0°30' south and longitudes 34°15' and 34°30' east. Administratively it is split into two, Kuria East and Kuria West that share one local authority, Kehancha municipality and electoral constituency, Kuria constituency (see figure). Kuria West, administered from Kehancha, covers three divisions namely Kehancha, Mabera and Masaba Divisions while Kuria West, administered from Kegonga, spans Kegonga and Ntimaru divisions. There are several towns and a road network connecting them (see Figure 2).

The district has an inland modified tropical type of climate. It receives annual precipitation of 1000-mm; higher altitude areas have higher rainfall and are more suited for agriculture. The major rivers are Hibwa and Tebesi. Kuria district falls within the Lake Victoria regional mosaic plant belt of Africa, dominated by a graded vegetal landscape of relict tropical rainforest, bush grassland (*Themeda-Hyparrhenia*) and wooded grassland vegetation of the *Combreto-Dodoneae-Balanites-Acacia* matrix. The natural vegetation cover has been reduced by human settlement while secondary vegetation is found in cultivated and disturbed areas. Natural vegetation is degraded and found in some riverine areas.

Topographically, Kuria district has undulating hills reaching an elevation of 1800m with several river valleys running from the south towards the north. The soil types range from clay formations in low-lying and flat regions, red volcanic soils to the south of the
district (Ntimaru) loams to the black sandy west and east of the district (Kehancha and Mabera divisions) (Min. Plan. and Nat. Dev. 2005).

The Kuria have been a marginalized community in both colonial and independent Kenya. Poor infrastructure, high illiteracy rates and insecurity in the past kept the Kuria impervious to many external influences. The Kenyan Kuria population stood at 563,033 persons in the 2010 census (URL 4). With a population density of 439 persons per square kilometer Kuria district supports a densely growing and poor rural population; in particular, Isebania town and Getong'anya area support high populations. The Human Development Indicators (HDI) of 0.4788 and Gender-related development index (GDI) of 0.4161 for Kuria district are among the lowest nationally. Correspondingly, the human poverty index (HPI), which includes lack of access to safe drinking, adult illiteracy, the percentage of underweight children, life expectancy (percent not surviving after 40) and of access is low at 42.5. The poverty incidence among rural households is 82% and the district is the second poorest nationally in terms of education. The main factors contributing to the escalation of poverty in the district are population growth, economic and environmental factors, HIV/AIDS menace and socio-cultural practices and attitudes (e.g. polygamy and wife inheritance) and unreliable rainfall patterns (Kenya Poverty Eradication Commission 2000 District Poverty Assessment Report).
Figure 2 - Kuria district urban centres and roads map

In Kuria the Government through the Ministry of Public Health and Sanitation and the Ministry of Medical Services maintains health centres dispersed over the district that provide biomedical services. There are 32 health facilities 15 Government of Kenya and 17 NGO and the doctor to patient ratio is 1: 56,913 (Min. Planning Nat. Dev. 2005, SID 2006).

3.21 The Kuria

The Kuria are an Eastern Bantu community living in Kenya and Tanzania. The prefix *aba* - pl. and *omu* - sl. designates the people, while *igi* - refers to their language. Their ethnonym "Kuria" links them with an ancestor called Mukuria and semantically (Muniko *et al.*, 1996) implies stabbing or pawing the ground, as in rutting bulls. They are resident in Kuria west and east districts of Nyanza Province in southwest Kenya and the
Tarime and Serengeti districts of the Mara region in Northern Tanzania; their homeland (kyaro) is called Bukuria. Abuso (1980) observes that culturally the Kuria are in many ways Nilotic, while linguistically they are Bantu. There is discourse in (Varnum 1970) on how the Maasai have exerted much influence upon the Kuria dress, diet and material culture. Anyumba (1983) observes that the neighbouring Luo have also influenced their culture, explaining in part the existence of the lyre among the Kuria, which is generally absent from Bantu cultures.

The Kenyan Kuria belong to four clans (ikiaro), pl. (ibiaro), namely: Nyabaasi, Kira, Irege and Gumbe; the ethnonym Kuria is applied to all these clans. The local language Igikuria, is phylogenetically related with the Gusii and Zanaki languages (Bickmore 1998), is vigorously spoken. Yet a recent study, (Mwita 2008) observes that Igikuria is in rapid transition due to preferred Swahili usage by Kuria speakers. Although they speak one mutually intelligible language Kuria clans are not fully homogeneous. Linguistically, slight differences (lexical and tonal variations) in their discourse have developed (Muniko et al., 1996, Mwita 2008).

On the ethnogenesis of the Kuria it is generally admitted (Ayot 1979, Abuso 1980) that they are hybrids, elements in their composition being Gusii and Kalenjin (Ruel 1962; Baker 1953). The people now known as Kuria are of diverse origins and emerged from the coalescing of several displaced groups affected by the movement of Maasai and Luo people's into southwestern Kenya. The Bakira clan were the first to settle in present-day Kuria territory ~1500AD, and were joined over the following century (i.e. from around 1630-50 to 1750) by waves of Bantu-speaking peoples including peoples of Nilotic stock who came from different directions and varied in size (Ruel 1962, Ruel 1973, Abuso 1980). Ayot (1979) and Ontita (2007) observe that large groups from the Gusii sub-clans,
Sweta, Nchari, Basi and Girango left behind in the Trans Mara-Migori areas significantly influenced the creation of the Kuria identity. The absorption of such diverse groups stimulated the evolution of a totemic system that surpassed kinship relations. This system was significant in cementing the hitherto heterogenous communities into one people, the Kuria. There was greater unity in a clan associating itself with a special creature namely Leopard (*ingwe*), Baboon (*irege*), Zebra (*enchage*) and Elephant (*inchugu*). Kuria mythology has several variations on the origin of the totems. Shetler (1995) notes the belief the clans possibly emerged from Mukuria (the ethnic ancestor) sons.

### 3.22 Religious beliefs

Aspects of Kuria religion have been studied and published in Ruel (1991). The Kuria believe in one supreme God known as *Nokwe*. The Kuria life-world consists of the community of the divine forces, living and dead and the supernaturals. Elders prayed to God directly or made intercession through ancestral spirits considered as agents. The Kuria have slowly adopted Christianity. There are several mainstream Christian denominations and African churches. The Catholic, the Seventh Day Adventist and the Maranatha church have many adherents. Christianity (*obokeresta*) with (*ubuituuria*) salvation is becoming common.

### 3.23 Political organisation

Each clan (*ikiaro*) was a politico-territorial group and a moral community with a dense network of kinship linkages (Ruel 2000). This political structure escalates rivalry among clans manifesting in vicious armed conflict between feuding clans. Blood feuds and revenge were common during the study period.
The Kuria traditional governance mechanism involves three different levels: the (iritongo) which investigates, judges and punishes; the (inchama), which takes the appeal from (iritongo); and the (sungusungu), which has in recent times replaced the traditional army (ichisaiga) as the enforcement wing of iritongo (Marwa 2002). The banchama are a socio-political transforming structure with an inhibiting influence emphasizing mediation, conciliation and consensus (Ruel 1965; 1991, Oda 1992). They provide social purification by undertaking the magical protection of their areas through a sequence of secret rituals for the community that helps against disease and illness (Oda 1992). The (banchama) are invested with secrecy and special power; they decide the timing of circumcision ceremonies and rule on other matters of general interest to the community, most particularly concerning peace and war. Today, the government of Kenya has centralised political authority through its administrative units. Administrative power is held by administrative officers namely the (omosaabo) sub-chief, chief (umuchifu), District Officer (umudiio), District Commissioner (umudisii) and Provincial Commissioner (umubiisi).

3.24 Social organization

The Kuria were traditionally organised around extended families and clans (ikiaro). There is a close correspondence between residence and kinship. Each ikiaro was a politico-territorial group and a moral community (Ruel 2000). The Kuria still remain a cluster of autonomous clans and the politics of identity is largely based on the clan system. Clan membership is of greater significance than tribal affiliation as witnessed in the 2007 general elections. Though clan consciousness remains strong and fires internal rivalries and disputes, Kuria marriages are exogamous and foster collaboration between feuding clans. Further distinction is recognized in the descent section (egesaku) pl. (igisaku), the
(irigiha) pl. (amagiha) clan segment, lineage (eeka) pl. (ichika) consisting of all male descendants with a common ancestor, usually grandfather, scattered in numerous homesteads (imigi, amachichi) sl. (umugi). The Kuria homestead typically consists of houses clustered around a central livestock pen (see Figure 3). Kuria families are patrilineal, patrilocal and often polygynous headed by the husband (mogaka) with more than one wife (umukari) pl. (abakaari). The children (abana) belong to the father.

Figure 3 - Traditional Kuria home at Nyankore village, Kuria district

Kuria society was also organized by an age-set system based on circumcision (esaaro). The age set (amakora, sing. irikora) system regulates relationships with the concept of 'respecting' or 'fearing' (ogosooka) between the age-sets (Ruel 1962). The age-set (esaaro) system was a strong social group system that governed social relationships strictly. An individual would socialize and marry only within his age-set. Though the age-
set system has declined and collapsed circumcision, for boys (*murisia*) sl. and girls (*musagane*) sl., is deeply entrenched with elaborate symbolism and remains an active practice every three years during the month of December. Circumcision is done in secluded places, thickets or wetlands called (*irikenge*).

3.25 Economic organization

Economically, the Kuria are heterogeneous, with characteristic household inequalities in wealth and livestock ownership (Prazak and Booth 1995). Traditionally livestock rearing and subsistence crop cultivation were important economic activities; hunting and food gathering were also practiced. They also traded with their neighboring communities. The modern Kuria people are agro-pastoralists. There has been an overall decline of the pastoral sector of the economy as crops have increasingly been produced for the market (Heald 2000). The Kuria have a long tradition of raiding neighboring ethnic groups' cattle (Fleisher 2000). Their attachment and prestige for cattle has diminished over the years. They have now taken to agriculture, small scale subsistence farming and petty entrepreneurship. They cultivate large quantities of maize, cassava, bananas, sorghum and millet, beans, pumpkins and sweet potatoes. Cash crop farming of tobacco has also been established with significant success.

3.30 MATERIALS AND METHODS

3.31 Introduction

This section provides a description of materials used, field data (Ethnobotanical) collection methods and laboratory (extraction and biological activity assay) procedures.
3.32 MATERIALS

3.33 Herbarium specimen collection

Plant specimens were collected as pointed out by the traditional healers during guided walks and detailed information on parts used, ailments treated, formulations and dosages taken. Herbarium specimens allowed correct identification of plants with their scientific binomial names.

3.34 Collection of plants for the screening regimen

Fifteen plants were selected for the chemical and biological activity screening procedure. From the Kuria ethnopharmacopoeia *Ageratum conyzoides* (BOO 1226), *Acmeila caulirhiza* (BOO 1232), *Plectranthus barbatus* (BOO 1291), *Solanum incanum* (BOO 1276), *Rhus natalensis* (BOO 1220), *Tagetes minuta* (BOO 1258), *Croton macrostachyus* (BOO 1266) and *Ocimum gratissimum, Bidens pilosa* (BOO 1210), (BOO 1290) were collected from the Kuria ethnopharmacopoeia. From the Luo ethnopharmacopoeia species collected were *Toddalia asiatica* (BOO 1163), *Tylosema fassoglense* (BOO 1156), *Ageratum conyzoides* (BOO 1021), *Albizia coriaria* (BOO 1027), *Carissa spinarum* (BOO 1051), *Ocimum kilimandscharicum* (BOO 1122), *Tithonia diversifolia* (BOO 1158), *Senna occidentalis* (BOO 1172) and *Zanthoxylum chalybeum* (BOO 1170).

Plant material for chemical and bioactivity analysis were collected from several locations in southwestern Nyanza province (Kadem, Kanyamkago and Awendo) in February 2011. However, due to spoilage of material at the time of analysis, plant material for *Ocimum kilimandscharicum* was collected in the Karen area of Nairobi. For each species, 500 g of material was macerated, uniformly air dried, then packaged in sugar bags.
3.35 Selection of plants for the screening regimen

The approach for plant selection for bioactivity studies was based on informant consensus, frequency of citation by respondents. After documentation of Luo and Kuria plant use the number of specific reports of usage as medicine was tallied and the top ten species, with the high usage reports, from the Luo and Kuria datasets were selected. In total fifteen plants were selected. The 15 medicinal plants screened for biology activity in this study are used creatively by the Luo and Kuria. Some of them, Carissa spinarum, Rhus natalensis and Tylosema fassoglense, are also utilized as food. They are used traditionally to manage 33 disease/illness conditions. The main disease groups they manage are gastrointestinal conditions, internal body pains and culture bound syndromes. Most of them, 10 out of 15, are used for managing gastrointestinal conditions and 8 of them are used in managing internal body pains. Two among these species, Albizia coriaria and Rhus natalensis, are particularly remarkable for their use versatility; both have 8 different medicinal uses.

3.40 METHODS

3.41 Ethnobotanical studies

The ethnobotanical survey, a descriptive research method, followed methods in Martin (2004) and Reyes-García (2010) to identify and document plants used by the Kuria and Luo ethnic groups. The use, management and classification of plants for medicine were systematically recorded using a variety of qualitative tools in the field. These tools included: semi-structured interviews and group interviews. The fieldwork covering ethnobotany of the Kuria was conducted in five periods between 2008 and 2009 and for the Luo between 2009 and 2010. The core study areas in Kuria district were (Kuria East
and West) Bugumbe, Bukira and Nyabasi areas. The Luo survey core study areas were Ugenya, Migori, Suba and Kano areas of the Nyanza province. Respondents were interviewed in thirty two different sites, 15 Kuria sites and 28 Luo sites (see figure 4 below). The study was explained to participants in detail before seeking their participation. Permission to record; write and photograph; was sought and only upon concurrence were these done. All real names of respondents have been concealed for confidentiality and upholding informants' right to anonymity and privacy.

![Figure 4 - Sites visited during field excursions](image)

### 3.42 Key respondents

The study recruited forty people of Luo and Kuria heritage, for one-time interviews, from the following categories (healers and herb-vendors, the elderly and
women lay persons). The key informants were selected on the basis of their age, knowledge and beliefs. Purposive sampling, individuals recommended by the local administration was used in selecting group interview respondents and translators. The eighteen, 5 female and 13 male, traditional medical practitioners from Kuria district had an average age of 54.1 ±13.8 years. The sixteen, 14 female and 2 male, Luo traditional medical practitioners had an average age of 59.1 ±16.3 years.

3.43 Interviews

Information on medicinal plant use was gathered employing qualitative methods; in-depth, key-informant interviews with traditional healers and others, as well as group interviews were done. The main survey was also preceded by an intensive period of pre-testing of the interview schedule and the training of a field assistant. The interview schedule (see appendix 7) was organised into two parts, the first part focussed on the background of the respondent. The second part focussed on their knowledge of medicinal plants and ethnomedical knowledge.

Interviews lasted about an hour, starting with self introduction and explaining objectives of the study. To facilitate data collection the interview guide was translated from English to Igikuria and Dholuo. To ensure good data collection during the survey as prescribed in (Betti 2004) a method of enquiring on diseases was preferred than enquiry on plant species. During the interview information was sought for each medicinal plant collected: its vernacular name, part used, preparation, administration and dosage. The therapeutic accounts were made for specific ailments, a symptom or a physiological effect and careful questioning done to determine suitable Western counterparts for some diseases. Responses were recorded in emic categories. There were unremitting efforts to
center discussion and observations to address ethnomedicine and medicinal plant use, the central issues in this study.

During interviews respondents were let to finish their train of thoughts on these issues. Active and passive observations continued throughout the study to ascertain some responses recorded during the interviews. Questions emerged unexpectedly as the discussions and observations progressed. Subsequent interviews were enriched by questions confirming and clarifying already collected data.

To complement the interviews, two group discussions and three focus group discussions (FGDs) were conducted using group interview and FGD guides (see appendix 8). These discussions were held in Kuria and Siaya districts. Group interviews, for healers, laypersons and patients, were held with aid of the assistants. As part of the interviews, "guided-tours" with interviewees were done to observe plants cited and collect samples for botanical identification.

Figure 5 - An interview session at Ekerege market, Kuria district (author on the right)
3.44 Plant identification

Voucher specimens of medicinal plants, in duplicates, were collected, prepared by drying and pressing. They were tentatively identified directly in the field using Agnew and Agnew (1994), Beentje (1994), Knox (1996) and Kew Herbarium Staff (1952 - 2011) then further verified before deposition at the Nairobi University herbarium (NAI). At this stage The Herbarium curator, Mr. Patrick Kyalo Mutiso assisted with identification and authentication of specimens.

3.45 Preparation of crude plant extracts

Plant samples were shade dried at room temperature for one week before thorough grinding using an electric mill. For each species, 30 grams dried and grounded material was extracted with 100ml of methanol and stored in a shaded cupboard. All the chemicals used in the experiment were of analytical grade. Methanol, Dichloromethane and Dimethyl Sulphoxide (DMSO), were purchased from Sharlab S. L., Spain. The extracts used for antimalarial screening were extracted with 100ml of 100% dichloromethane (DCM). The products were evaporated in vacuo to an extract using a rotary evaporator at 40°C. Extract sample bottles with residual solvent after evaporation were left with open caps to enable removal of excess solvent. Dried extracts were stored in labelled sterile rubber capped bottles in a refrigerator until required for use. The yields of the medicinal plants are shown in Table 5 below (chapter 4).
3.46 Antimicrobial tests

Susceptibility tests were performed using Gram-positive and Gram-negative bacteria, yeasts and dermatophytes. The screens were done against American Type Culture Collection (ATCC) *Staphylococcus aureus* (ATCC 25923) [gram-positive bacterium], Multiple Resistant Staphylococcus Aureus (MRSA), *Escherichia coli* (ATCC 25922), *Microsporum gypseum* and *Candida albicans* (clinical isolates from Kenyatta National Hospital, Nairobi). Microbe isolates (slants) were obtained from the Centre for Microbiology Research (CMR), Kenya Medical Research Institute (KEMRI).

3.47 Disc diffusion and MIC assay

Standardization (quality control) of the test systems was done by using reference ATCCs strains *S. aureus* 25923, *E. coli* 25922 as outlined by the Clinical and Laboratory Standards Institute (CLSI 2008) to take care of factors influencing extract test results. They were the size of inoculums, 0.5 MacFarland standards or $10^8$ colony forming units (cfu), medium supporting adequate growth of the test organisms, and amount of medium used.
The Kirby-Bauer method (Kirby et al., 1966) was used. Methanol extracts were filtered through cloth, cotton wool, and a paper filter. Sterile 6mm paper discs (Whatman No. 1) were impregnated with 25-30μl of neat extracts dissolved using DMSO and the discs left to air dry for one hour. The Mueller Hinton media were inoculated with \textit{E. coli} and \textit{S. aureus} strains and Saboraud dextrose media with \textit{Candida albicans} and \textit{Microsporum gypseum}. The test extracts were then introduced and incubated for 18-24 hours. For each extract three independent experiments were run; the values given are means of three replicates recorded to the nearest whole millimeter.

The extracts with activity from disc diffusion assays were subjected to MICs. By serial dilution 1:2, 1:4, 1:8, 1:16, 1:32 and 1:64 extracts were prepared and impregnated into discs and then placed on prepared media and incubated for 18-24 hours under aerobic conditions at 37°C and 24°C for bacteria and fungi respectively. Reading of the zones of inhibition was then done in millimeters.

3.48 The antiplasmodial assay

The plant extracts were screened against \textit{Plasmodium falciparum} strains using the SYBR® Green I assay (Desjardins et al., 1979, Smilkstein et al., 2004). Two \textit{Plasmodium falciparum} strains, CQ sensitive (D6) from Sierra Leone and CQ resistant (W-2) from Vietnam, were used. The strains were cultured and maintained at the Walter Reed Malaria Research Laboratories at the Kenya Medical Research Institute (KEMRI), Kisian-Kisumu. The culture medium was a variation of that described by Trager and Jensen (1976), which consisted of RPMI 12640 supplemented with 10% human serum, 25 mM $N$-2-hydroxyethylpiperazine-$N$-2-ethanesulfonic acid and 25 mM NaHCO$_3$. Human type O$^+$ erythrocytes served as host cells.
Samples from malaria-positive patients were adjusted to 2% hematocrit (packed cell volume) and 1% parasitaemia for setting up the malaria SYBR® green I fluorescence assay (MSF assay). 100μl of infected red blood cells were transferred to a 96-well plate containing pre-dosed serially diluted 12.5μl of plant extracts. The 96-well plates were then placed in an incubator with mixed gases (95% N₂, 5% CO₂, and 5% O₂) for 72 hours.

Lysis buffer was prepared using 2.423g Tris base in a 1 litre bottle of cell culture water ([20 mM]ₖᵣₐₜ) and dissolved completely using a magnetic stirrer. The lysis buffer’s pH was adjusted pH 7.5 using concentrated HCl. Additionally 10 ml 0.5 M EDTA ([5 mM]ₖᵣₐₜ), 80 mg saponin (0.008 % w/v final) and 0.8 ml Triton X-100 (0.08 % w/v final) were added. The solution was then mixed solution thoroughly, avoiding the production of bubbles. The solution volume was then topped up to 1 litre then vacuum filtered to remove particulate matter and stored at room temperature. Exactly 10 μl of SYBR® Green stock solution (10,000 x SYBR® Green I) were aliquoted into amber microtubes and stored at -70°C until required. Then exactly 2.0μl SYBR® Green I added to 10 ml MSF lysis buffer (0.2μl SYBR®/ml of lysis buffer). The mixing was done well to avoid bubble production. At the end of the incubation period, 100μl of lysis buffer containing SYBR® green I; a nucleic acid staining dye was added to the 96-well plates.

The plates were then incubated in the dark for 1 hour. Fluorescence reading was then done using a Tecan® micro-plate reader. IC₅₀ values of the plant extracts were then calculated using Graphpad Prism (Graphpad Prism for Windows, version 4.0; Graphpad Software Inc., San Diego, CA), an online software resource from the World Antimalarial Research Network (WARN) website.
3.49 Addition of culture and controls to microplates

Thawed daughter plates with the isolate identifications (IDs) were labelled and the dating performed. The 1% parasitaemia, 2% hematocrit culture were added to the microtiter plate immediately to prevent death of parasites. Exactly 100 µl of the prepared infected red blood cells were added to all wells on plate starting with the lowest concentration of drug and then to progressively higher ones (therefore starting from right; column 10 to the left; column 2). Exactly 100 µl of the 2% hematocrit uninfected red blood cells (negative control) were added to column 11, wells B, C, D and 100 µl of the iRBC (positive controls) to column 11, wells E, F, G. Column 11 remained without drugs.

The plates were then placed in a culture bubble and closed carefully then gas tubings of the gas tank opened on both ends and the bubble gassed for 5 minutes. The valves were carefully closed after gassing and the gas tank closed. The culture was incubated for 72 hours at 37°C in a humidified chamber. Note was made of the plate templates and times the plates were put in the incubator and time they were to removed, 72 hours after. The cultures were removed after 72 hours incubation for the SYBR® Green assay.

3.50 Larvicidal tests

Dried and ground material, 50 grams, of Albizia coriaria, Plectranthus barbatus, Tylosema fassoglense and Carissa spinarum were put in a Soxhlet apparatus and extracts prepared using 100% ethanol at 30–40°C. Dried residues were evaporated to dryness in rotary vacuum evaporator at 30–40°C. Stock solutions were prepared with the residues following (Arjunan et al., 2011). Residues were dissolved in ethanol and mixed with deionized water to form (2% stock solution), from which further dilutions were done to prepare 0.2%, 0.4%, 0.6%, 0.8%, and 1.0%.
Larvicidal toxicity tests were carried out against *Aedes aegypti* L. (Diptera: Culicidae). Third instar larvae of the species, obtained from a mosquito colony maintained at the School of Biological Sciences (SBS) insectary were used for the study. Experimental conditions were kept at a temperature of 28°C and an average humidity of 45% and a photo period of 12 hours of light and 12 hours of darkness.

Instars were placed into plastic containers containing 40ml of de-ionized water and 1 ml of 0.2%, 0.4%, 0.6%, 0.8%, and 1.0% concentrations of plant extract (see figure 7 below). At each tested concentration, three replicates were conducted. Control groups of larvae were exposed to de-ionized water. No food was provided during the treatment. Larval mortality was observed after 24 hours of exposure. The larvae were considered dead when they did not respond to prodding stimulus.

![Figure 7](image)

**Figure 7** – Plastic containers with extracts and mosquito larvae

### 3.5.1 Data analysis

Data analysis began in the field with transcribing recorded conversations, checking orthography, identification of main themes, coding and linking of associated concepts and

Data was entered manually onto a field notebook. All analyses were performed using SPSS* (v. 17.0), IBM SPSS* Statistics, USA. Data was then entered into SPSS® ver. 17 suite and counterchecked against notebook records for consistency before analysis by frequencies and percentages. Log probit regression analysis (Finney 1964) was employed on the results to determine LC$_{50}$ values - the concentration of extract that causes death in 50 percent of test animals (see appendix 4).

### 3.52 Limitations

A number of factors made the field study phase particularly interesting as well as challenging. Firstly the field study coincided with civil unrest in Kuria; this made an extensive study of the Buirege area difficult. The viciousness of raids and conflicts led to abandonment of homesteads and several trading centres. Secondly the recruitment of a research assistant delayed onset of the Kuria field survey. Engagement with healers and lay respondents was good; they were supportive to give information on their knowledge as a whole. Only three practitioners were unwilling to disclose their plants. Occasionally commitment with patients or search for *materia medica* caused rescheduling of interview appointment dates with some healers. There were no restrictions in active participation but patriarchy among the Kuria and Luo presented some hindrance with ethnobotanical data collection from women. The terrain was generally difficult during rainy seasons; accessibility was difficult or even impossible for some areas.
4.0 CHAPTER FOUR – RESULTS

4.1 Introduction

In this section local practices, attitudes, conceptions, definitions and interpretations of health and illness of the Luo and Kuria are reported. Social norms and beliefs that influence health resulting in culture-specific therapy choice and health behaviours are described. Ethnomedicine is discussed along the following topics: disease explanations and aetiology, traditional practitioners and management of health. In the middle and end part of the chapter local medicinal plant knowledge and biological activity aspects of shortlisted medicinal plant species are covered.

4.11 Luo Ethnomedicine

4.12 Luo illness aetiology

The Luo concept of life is captured by the word (ngima). The words (ngima maber) relate to health (vitality and agency) and wellbeing beyond the absence of disease – it is wholeness including balance and harmony and prosperity (Mulemi and Nangendo 2001). Health is seen as state of (physical, social and spiritual) wholeness. Good fortune (hawi) and blessing (gweth) are related with (ngima maber) and it is not uncommon to find plant therapies and other preparations like blessed water (pi hawi) given by traditional practitioners (jothieth) and faith healers (jolemo) to uphold or induce it. Yet the complexity of good fortune is the response to its overflow e.g. during twin delivery the mother is cleansed by oral administration of Crotalaria spinosa infusion; van Beek (2002) explains that such an “overflow of fertility” needs to be normalized. Among the Kuria a similar observation is made; a Centella asiatica leaf infusion is given to baby twins as a
first ritual. The sustenance of life is attributed to (chuny); every living thing has a chuny (Masolo 2004). Death is attributed to disconnection of chuny (chot chuny).

Several models are used to explain cause of illness. The Luo are strongly aware of natural, social and supernatural causation of disease. Sicknesses (twoche) and suffering (chandruok) are caused by inheritance at birth, breach of taboos, contagion, supernatural (ancestors, deities and evil spirits) and or human magical agents. This aetiological worldview implies the Luo seek different therapeutic possibilities when faced with illness. Foster (1976) broadly classifies these causes into two categories, naturalistic and personalistic. In Luo terms naturalistic causes are either due to biological agents (visible or invisible) or (kudni) pl. (kute) or natural forces of the environment. From the personalistic perspective disease is due to the active, purposeful interference by a human agent (sorcerer), nonhuman (an ancestral or evil spirit jachien) or supernatural. In supernatural and human aetiologies spiritual forces (juogi) active in Luo society and destructive medicine (navi) are implicated. The Luo concept (juok) does not only refer to metaphysical concepts but also has moral connotations. Juok can also be used to morally qualify behaviour; in this context it, (juok), is the daring and unrestrained moral capacity to commit evil (Masolo 2004). Some traditional medical practitioners (jatung'), (janawi) and (jandagla) conduct evil acts (timbe juok). Such acts include manipulating the victim’s physical, mental, social and sexual ability and activity through ritualistic practices with their personal effects, hair or bodily excretions. Common conditions associated with such acts are sihoho (severe stomachache from sorcery), dhoho (swelling of facial parts) and bewitchment (chuowo tung'). Sihoho, actuated visually (juok wang'), is distinct from dhoho, instigated verbally (juok mar dhok) and causes intense skin rashes and even bleeding. Bewitchment (chuowo tung') requires an evil eye specialist (jatako) who sucks out bad food. In addition there is awareness that maintenance of taboos (kweche) and
cultural injunctions (*chike*) are significant for good health. Pollution and contamination also explain disease; some contagious diseases stem from cultural notions of purity. Nangendo (2006) exemplifies this point with the practice preventing sexually active women from preparing food for mothers and their newborn. Similar natural and personalistic aetiologies are given for livestock diseases.

Forty two diseases have been recorded and are categorized based on physiological concepts but several others not fitting into biomedical concepts are found under psychosomatic diseases and culture bound syndromes. Frequently reported conditions are (*mbaha*) infant disease with symptoms akin to jaundice, (*ang’iew*) measles, fever (*homa*), (*yamo*) internal body pains characterized by boils and swellings, (*oranyancha*) loose stools, (*ich kach*) abdominal pains ‘gwonyo’ skin eruptions exuding infectious pus and (*adhola*) wounds, (*rariw*) foetal misalignment; other less reported conditions are (*ndulme*) epilepsy and (*nyach*) venereal diseases. Some diseases are considered normal and others such as (*sigete*) amenorrhoea and (*nyach*) venereal diseases stigmatized.

The study reports four common culturally specific illness conditions (*chira, muma, rariw* and *yamo*) that are underestimated in biomedical institutions but socio-culturally important and only treatable with traditional medicines. (*Chira*) or ritual impurity is a potentially fatal condition caused by violation of social and cultural values. *Rariw* is a culturally mediated female condition – with a description akin to the biomedical understanding of ectopic pregnancy, taking a different structure. The name (*rariw*), derived from (*riwo*) meaning block or delay, literally refers to the condition that blocks the uterine area or foetus. (*Yamo*) pl. (*yembe*) is a common illness affecting humans and livestock whose genesis is in the intestines from whence it spreads. A description of its progression was given by one key informant “*yamo* starts with nausea, your disposition changes; in this early stage it still seeks where it can erupt from in your body, when it gets
a place it erupts’. This account concurs with Nyamanga et al., (2006) on yamo’s pathogenesis. Yamo only responds to herbal treatments that disperse (keyo yamo) its characteristic boils and swellings.

4.13 Cognitive explanations of health

Ethnophysio logically and ethnoanatomically the body is understood to have organs and a system of channels and good body health means proper functioning of all body channels – nasal, oral, urinogenital and anal. Several expressions (wiye, iye, ite, wang’e and dende oyawre), meaning the head, stomach, eye and body are free or open, allude to this notion. Blood flows through vessels (leche) and (remo marach) ‘bad blood’ is believed to be the cause of illness. Blockage interferes with flow, thus leading to illness. Some diseases are caused by a humoral state in which blood coagulates or reduces (rumo remo). In such conditions the explanation of therapy is based on neutralizing undesired humoral qualities by the application of a substance(s) with the opposite quality. Ethnophysio logically the idea of good health of an individual is related with the presence of ‘worms’ (kudni or njokla) living on the body’s nutrition. An extensive account of these ‘worms’ is found in (Geissler 1998a, 1998b). The worms are classified on basis of their colour and size as red (small, parasitic and blood sucking) and white. In this study a distinction is made between malevolent/ parasitic (red) and (white) physiologically benevolent worms. The latter must be in the body; their absence is not good for health. Worms are also believed to influence the brain thereby causing epilepsy.

4.14 Luo medical practitioners

There are several Luo medical specialists locally referred to as (jathieth) sl. (jathieth) literally “those who treat”. These practitioners are involved in ritual cleansing, neutralizing
harmful power and making ‘appropriate’ interventions to improve broken interrelationships of the patient with his people (yawa), relations (jokakwaro), “birth group” (anywola), homestead (dala), village (gweng’) and workplace (kapango). Practitioners use supernatural power (through divination), and employ materia medica for treatments. These healers symbolize prosperity and offer time, sympathy and understanding inspiring patient trust and confidence. Healers are from all walks of life, ranging from 26 to 78 years, were interviewed. Slight differences (in knowledge and healing roles) were observed among the sex and age; gender distinction exists for the jabilo (most are men) and nyamrerwa (commonly women).

The knowledge of herbal medicine is generally shrouded in secrecy and is acquired voluntarily (by buying or training) or involuntarily (through spirit possession). Some healers acquire special skills, new medicines and divination, through dreams and spiritual guidance. An intergenerational transmission of healing skills continues in which sincere young (late childhood and young adult) individuals by observing, listening and participating in medicine collection learn from elder relatives. In buying medicine (nyiewo yath) the healer shows, for a fee, the medicines for a condition. Involuntary initiation to the healing art is influenced by ancestral spirits possession. Such possession is potentially harmful and must be directed/ consolidated by (loso), a spirit appeasing ritual. Different qualities and skills of the healers depend on their possession spirits. As regards the type of healing skill, there are two broad spirit categories: (juogi manuol) influence genealogical inherited (thieth mar kwaro) skills in roving (basic herbal skills) and domicile (magico-spiritual skills) types of practice. Some spirits (ojijo) impart very basic skills, general rudiments of herbalism manifested as drug vending or part-time herbalism supplemented by farming, fishing, or other vocations. On the other hand (juogi mag chieng madongo) are more demanding and persistent spirits with broader functional expression traits of
herbalism, even extending into spiritualism. Their extreme expression can be very possessive, resulting in dementia and even death.

In the medical practitioner's continuum there are several specializations. On its extreme are healers with modernized and Christianized conceptions of healing, they include: (jolemo) faith healers and (jomenyo) 'illuminators' and (jocheko) verifiers who specialize in prayers and can 'smell' (ng 'weyo) or detect evil material and intentions; and the (jablek) modernized healer who uses gloves and even injections.

The (jabilo) is a magico-religious healer who uses language skilfully, generalizes in all types of illnesses and diagnoses mainly by divination (goyo gagi); comparably faith healers engage in 'speaking in tongues' (dhum). Ogot (1963) observes that they wielded considerable socio-political influence in pre-European days. The seer (jalek); (jatak) evil eye specialist; (janak) is a dental surgeon; (jachomo) bonesetter; epiglottis surgeon (jalim); cleanser (jaluoko); (nyamrerwa) traditional birth attendance, (jakor) prophesy giver and (jadil) mediates rituals.

4.15 Managing health among the Luo

Luo traditional healing has both a logical and psychosocial component and attempts to confront diseases in both the material and immaterial worlds.

Traditional medicine (yadh nyaluo) is not only considered to be plant material but includes elements from the animal and mineral kingdoms and even verbal resources like blessings. Medicine (yath) is used for curative, preventive and protective measures. Therefore certain medicines are given to prevent conditions e.g. miscarriage (ich mao), labour difficulty. Protective interventions involve scarification (saro) and snuffing (fito). Some conditions such as sihoho (severe stomachache), dhoho (swelling of facial parts) are only treated with traditional medicines.
Aspects of health seeking behaviour among the Luo are covered in (Odhalo 1963, Osero 1990, Okoth-Owiro 1994, Kawango 1995, Sindiga 1995, Mulemi and Nangendo 2001, Nangendo 2006). The medical system is essentially pluralistic and Nyamwaya’s (1996) notion that patients vacillate along the therapy continuum stands. Several actions: self-medication, hospital, healer visits are taken to maintain and restore health. Though many Luo use biomedicine reliance on traditional medicine is still common in rural areas. Odhalo (1963) observes that health in the community is the outcome of many things. The Luo have curative and preventive healing strategies that attempt to address both tangible and intangible causes, known and unknown causes of ill health. In treatments several therapies are combined to enhance synergistic healing action. Even spirits of the departed (jochien) causing sickness are sought and propitiated to prevent physical or observable misfortune, e.g. failure of relationships, crops, unemployment etc.

4.16 Ethnosystematics of the Luo

Luo folk classifications distinguish about 119 plants. In total 131 names are recorded for these species. The basic Luo ethnobotanical taxonomy classifies two main plant forms: lum (grasses) and yien (shrubby and arboreal plants). The study confirms similar names documented in some previous studies (Kokwaro 2009, Aduma 1998, Johns and Kokwaro 1998) with very high consistency. There are slight pronunciation variations in Central and South Nyanza names. Most Luo names have the primary prefixes nya-, ra-, and o- and are derived from morphological, ecological, visual or chemical attributes of the plant. Plant use is also considered in naming e.g. raywe alluding to usage as a broom. Even exotic species are named. Some Luo plant names apply to two completely distinct species. Similar observations on shared names are made among the Turukana (Morgan 1981).
4.17 Ethnopharmacology of the Luo

The entire group of interviewees (n = 18) gave a total of 231 disease citations for 159 medicinal plants for forty two illness/disease conditions. Most of these medicinal plants were reported once (27.7%), twice (14.4%) and four times (10.7%). The illness/disease conditions with the highest number of mentions were culture bound syndrome (9.5%), stomachache (6.9%) and psychosomatic (6.4%).

The medicinal plants are from 48 plant families. The most popular plant families are the Leguminosae (17%), Asteraceae (10.7%), Euphorbiaceae (8.2%), Lamiaceae (6.2%) and Acanthaceae (3.8%) (see figure 8 below giving species numbers). The top three medicinal Subclasses based on the Cronquist classification are Rosidae (39%), Asteridae (38.4%) and Dillenidae (9.4%). Medicines employ whole plant, flowers, fruit (olemo), leaves (oboke) bark (pote, pind) or roots (tiend). In the Luo ethnopharmacopoeia these six plant parts are combined in eleven different combinations. The leaves are the most utilized parts (45%) with diversified uses for decoctions, infusions and ointments. Medicines are prepared as infusions (yadh abuda), pounded form (yadh aswaga), decoction (yadh achwaka), ash (yadh misalo) and poultices (yadh amuona). Medicinal plant products are administered both externally and internally in several different forms for a wide range of health problems. Medicine preparation forms provided are (0.6%) (buru) ash, decoctions (22.6%), infusions (28.3%), or ointments (3.1%) other preparations involve inhalation (0.7%), enemas massage therapy, manipulating or applying pressure to the body. In formulating medicines plants are fairly (17.6%) used in combinations and commonly solely (82.4%). There are diverse combinations of multi-plant preparations in the ethnopharmacopoeia. Yet some plant species, especially their roots, are common in these multi-plant regimens. They include Carissa spinarum, Albizia coriaria,
Zanthoxylum chalybeum, Euclea divinorum, Lannea spp. and Harrisonia abyssinica. The top ten medicinal plants based on usage consensus are given in Table 1 p. 49.

Non-plant materials employed in healing include: minerals e.g. soda ash (kado osero) and animal material e.g. animal fat and use of Spider egg sac to hold medicines in place over boils, pustules. The choice of treatment depends on the severity and degree of urgency. In administering infusions strenuous preparation is sacrificed for fast action. A considerable portion, 46%, of the pharmacopoeia is used for managing conditions explained in psychosocial/ psychosomatic magic terms.

The medicinal plants categorized on basis of their habit are 59.1% herbs, 21.3% shrubs and 19.7% trees.

Figure 8 - Top ten plant families of the Luo ethnopharmacopoeia
Table 1 - Top ten widely used Luo medicinal plants selected for biological assays

<table>
<thead>
<tr>
<th>Species</th>
<th>Local name</th>
<th>Reports</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toddalia asiatica</td>
<td>Nyalwet kwach</td>
<td>28</td>
</tr>
<tr>
<td>Microglossa pyrifolia</td>
<td>Nyabung odidi</td>
<td>25</td>
</tr>
<tr>
<td>Tylosema fassogleense</td>
<td>Ombasa</td>
<td>24</td>
</tr>
<tr>
<td>Albizia coriaria</td>
<td>Ober</td>
<td>23</td>
</tr>
<tr>
<td>Ageratum conyzoides</td>
<td>Oluoro chieng'</td>
<td>22</td>
</tr>
<tr>
<td>Carissa spinarum</td>
<td>Ochuoga</td>
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</tr>
<tr>
<td>Ocimum kilimandscharicum</td>
<td>Omweny</td>
<td>20</td>
</tr>
<tr>
<td>Tithonia diversifolia</td>
<td>Akech</td>
<td>19</td>
</tr>
<tr>
<td>Senna occidentalis</td>
<td>Nyayado</td>
<td>17</td>
</tr>
<tr>
<td>Zanthoxylum chalybeum</td>
<td>Roko</td>
<td>16</td>
</tr>
</tbody>
</table>

4.21 Kuria Ethnomedicine

4.22 Kuria illness aetiology

Life is considered sacred in Kuria society and all stages of human life are respected; premature death is grieved. Willful injury to life through murder, abortion and voluntary impotence is seen as sacrilege in this sense. Physical, spiritual and social well-being obohoru, peace omorembe and unity obogotaini/ obumui are desired and sought fervently. Thus the Kuria perception of well being obohoru and disease amarooi/ oborooi embraces natural and supernatural aetiologies.

Duality in disease causation is accepted, with a clearness of spiritual and non-spiritual origins. Similar notions are held for livestock diseases. This aetiological worldview implies the Kuria seek different therapeutic possibilities when faced with illness. There is always the need to know the cause and invariably the question of why the illness and who possibly caused it. These perceptions resonate with observations in Gichinga (2007) that African spirituality is connected with self, community, and environment and if anything happens that may threaten the flow of life, people search for meaning and explanation to it. Liddell et al., (2005) classify this notion as proximate (infection and contagion) and ultimate (moral or social) cause of disease.
Moral explanations locate aetiological responsibility on the individual. There are codes and social scripts, norms that are to be strictly observed and forms of deviance from individuals bring uncleanliness and impurity leading to illness, serious disease and even death. Thus violation of taboo (*umugiro*) is avoided. Breachers of these taboos are struck by illness and also can spread it. An example is *ichinkera* that affects breastfeeding children *ogokoorra omoona ichinkera* resulting from spousal dishonesty. Acts of abusing/neglecting aged persons can invoke *iriraga* or cursing through the tongue and lead to societal stigma (*irigenko*). Inappropriate behaviour may lead to cursing (*ugukumuma*). Swearing (*okorea imuma*) can absolve one from suspicion of social ills. Medicine can be taken to give blessing (*imitabirio*) or bring good luck (*igisio*) and remove misfortune (*ibitimba*).

Another aspect is that contagion can cause disease. Consumption of contaminated food (*ibiakorea ibiboosu*) can lead to stomachache (*enda eraroma*) or diarrhoea (*egosaaha*), hernia (*iriHEMA/ iriguchi*) caused by eating *obohoro* and *obooru bwichinyinyi* the latter is distinguished by the green colour of faeces. There is recognition of physical, including weather, and biological agents in disease aetiology. Disease can also be caused by biological agents such as jiggers (*ichimbonde/ ichimbundi*), tick (*engoha*), fleas (*ichinkara*), tapeworms (*amakoorumo*), germ or (*egekonde*) and fly (*ingi*).

Ectoparasitic diseases are acknowledged including those caused by microbial life e.g. *amabehi* – fungal disease. Physical injury can cause disease, e.g. injured eye (*ensongo*), injury to the skin (*egekoba/ irisakwa*) causing wounds (*ibisese*), bruises (*ogokamahwa*) and spraining (*ukubichenoka*). Similarly nutrition is considered an aetiologic factor. Some conditions such as kwashiakor (*ubwiro bo moona*) common in poorly breastfed children results from early weaning but also in adults.
The Kuria believe in spirits (benevolent and malevolent). There is a complex perception of malevolent spiritual power that can cause illness, sickness, natural disasters and conflicts among people. In this understanding ancestral spirits invariably send sickness and death to express their demands for rituals, sacrifices and social order. Other malevolent spirits are of fallen persons killed by the Kuria in war; warriors, circumcision initiants, bachelors, spinsters or jilted lovers, someone whose life is unfulfilled/offended or cut short. Such spirits can be vengeful and rituals are performed to divert their malevolence. They are either 'fetched', brought into the home and promised perpetuation by naming children after them, or they are cast out (Ruel 1965, Oda 1989). In relation to this it is widely held that disregard of traditional naming conventions can cause illness in infants. Witchcraft (magic and sorcery) undermine social order and are given as explanation for misfortune and disease. Many people continue to fear witchcraft. Two agents, witch (omorogi, abarogi pl.) and sorcerer (omosohi), a heritable condition, bewitch victims. Their abilities (abarogi) are either inherited or acquired; an ability sometimes operating independently of their will or even knowledge (Foster 1976). The omorogi can incite illness by summoning evil spirits (ibihui), and influence the course and outcome of natural illness. He can also cause victims harm by keeping a small pack of their personal effects (egetoondo) – e.g. cloth, hair and tooth; in Igikuria described as (omorogi amobeeka) or literally as the witch has kept him/her. They can also place something on the wayside (omorogi amotoreeye egetana gonchera or akogekeye egatana gonchera) to harm victims. It 'attacks' when the intended victim jumps over or steps on it. The effectiveness/potency of such evil increases if the victim communicates what he feels or saw; the sorcerer's ability to harm is markedly reduced as the day progresses.

White (1948) refers to sorcery as acquired power to work evil. The sorcerer, among the Kuria, can apply medicines and send animals to harm victims because of jealousy or
vengeance. The direct gaze of the sorcerer (omosohi) can project malevolent power that causes bones, leaves, twigs, soil, feathers to burrow into the victim's skin, killing them if not removed. The action is described literally as throwing/ hurling ibiriri (akorekereye ibiriri) also referred to as (uguchiima) harm magically. The evil eye (ibiriri) is common and severe at the onset of harvest when maize fields are developing tassels (ibisawa) also described as (kahurukiri ibisawa). The Kuria consider it a recent condition and associate it with women of Kisii and Maragoli ethnic extraction.

In this study, fifty two health conditions/ illnesses are recorded. The Kuria have an understanding of different illnesses, these include: parasitic diseases, those affecting body organs and systems such as the gastrointestinal, urinogenital, pulmonary, nervous, musculoskeletal, pregnancy complications, nutritional diseases and psycho-social conditions. Similarly several diseases affecting livestock were noted; these include: poultry diseases (oboroi bwiichingoko); hair loss/ alopecia (irigoko); foot and mouth disease (isinaabi); rabies (igichuuro gie eseese); and cattle diseases (amaroi giching'ombe). In both animals and humans there is cognition of diseases being infectious, existing at/ before birth and developing during early stages of life. Hereditary diseases (amaroi gurutundura/ gagookiranja) broadly include physical deformities such as those observed in lame persons (ababeeru). Grave and infectious diseases include dementia (igichuro), cold (irikeeng'enti), measles (obuchorochoro), mumps (ichintayoyo), epilepsy (endori), small pox (obohendu/ surura) and foot and mouth disease (isinaabi).

Healers and respondents descriptions of disease signs and symptoms were in general detailed demonstrating a remarkable insight. Several descriptions of illness and its course were given; affliction by disease (aroorre), wasting (atoba/ atomonona abooncha), fever (irihendo/ ehoma/ irikeeng'enti), feverish body and cold body (mbaye naembeho komobere) and wasting person/ (omonto abooncha).
Aside from spiritual cleansing, luck bringing and protection therapies which cannot be evaluated empirically there is congruence of some Kuria medical terms and/ or explanations with biomedical understandings. Some disease constructs and anatomical concepts correspond, in part, to biomedical equivalents e.g. respiratory conditions, such as *itiiha* and tuberculosis, correspond closely. Malaria, just as in biomedicine, was associated with symptoms of coldness/ chill (*ikinyigita*). Descriptions and diagnosis of anaemia (*atabararuka* i.e. *ugusira amanyinga komobere*) and its explanation; due to prolonged disease and malaria (*amareria*) are realistic in biomedical terms. It was understood by respondents that some disease conditions like cold *ichikegeenti*, whooping cough (*egekong’onto*), tuberculosis (*itiiha*), and jaundice (*oborooi bonyancha*) including some ectoparasitic infections guarantee isolation. The severity of *itiiha* led to its likening with cancer. There is some reconceptualization, renaming, of aetiology and symptoms to match biomedical epistemology e.g. *amareria* for malaria; *ehoma* for fever.

Two distinct types of epilepsy *endori*, treatable and untreatable, were identified. Though some inherited cases are treatable, cases caused or sent by evil persons (*orogerwe*) are rarely treated. Another view is that consumption of *Sesamum calycinum* (*iritiambui*), a slimy vegetable akin to the nasal issue of epileptics during convulsions, contaminates one and can also lead to epilepsy. Touching a convulsing victim can transmit the condition. Children with worms (*ichiinchoka*) eat soil and have reddish hair and bloodshot eyes in the morning. In *ibimeni* the child frequently pricks their anus with fingers. In a related manner tapeworms (*amakoorumo*) are infectious. Sterility or barrenness in women can be caused by unattended venereal disease infection in youth or spirit attack. Menstrual cramps are believed to affect the possibilities of conception. In this amenorrhic condition, called *ichiinkegeti*, heavy menstrual flow is identified as ominous; causing infertility and affecting the reproductive system *ichiinkegeti*. Herbal preparations are administered to
make the flow light. Rare disease conditions, such as hunchback (*iriguku*), or those recalcitrant to conventional treatment, are invariably attributed to the *omorogi* or witch. Madness can also be caused by narcotics, especially excessive marijuana (*ichaga*) smoking, and bad acts like arson. The view of good health is influenced by local understanding of body's structure and functioning and gives underlying meaning in the ways that the Kuria respond to disease. Cultural perceptions prevail in matters of health; the meanings underlying these beliefs cannot be ignored. Twelve conditions (*irihema*, *oborooi bwichinyinyi*, *ichinkegeti*, *ichinkera*, *oborooi bonyancha/ manjano*, *egesonono*, *ekieegeso*, *irikeyi*, *endori*, *amagobe* and *ekeena*) were considered untreatable in hospitals.

4.23 Kuria medical practitioners

The Kuria have an elaborate traditional medical system with a range of practitioners, specializations, pharmacopoeia and medical paraphernalia. The practitioners are critical in the delivery of traditional medicine. Medical knowledge and ability is specialized among these practitioners who are in the real sense ritual experts. The medical vocation (*oboreri*) has several specializations. The most common type of healer in Kuria is (*omoreri*) who dispenses medicinal concoctions. He is principally responsible for administering herbal preparations and handles many other tasks including child care, removal of evil charms in homestead remove (*ibiriri*); the seer or diviner is the (*omoraguri*) pl. (*abaraguri*), the (*omooroti*) pl. (*abarooti*) predict future with dreams and communicate with the supernatural world. Ruel (1991) observes they were able to provide insights into the immediate future and played an important role in the political and especially military organisation of the Kuria even presiding over the clan council. The (*omorobi wa amaguha*) sets fractured bone for humans and livestock, (*omogeemba*) pl. (*abageemba*) make rain; (*umuiburia*) pl. (*abaiburi*) or traditional birth attendants offer
antenatal, perinatal and postnatal services; and the \textit{(omosari)} pl. \textit{(abasari)} is the traditional circumciser. These practitioner specializations have several embedded cleansing and healing powers and skills and complement each other in providing total health among the Kuria. Some practitioners, \textit{(omorogi)} pl. \textit{(abarogi)}, combine useful and harmful therapeutic interventions. This ambiguous relationship with sorcery results in harmful forms of traditional medicine. Several specialists e.g. \textit{umubuchuri/ omosabiri}, literally the 'cleanser', exist to retaliate such malevolent action. Of these practitioners there are those who use supernatural power, those who use materia medica and mix both. Some healers imbue their practice with Christian values. \textit{(Omosabiri)} pl. \textit{(abasabiri)} prays with the Holy Bible discovering hidden charms (\textit{ibitana}) or potent medicine. The \textit{(abasabiri)} are a product of Christianization of the Kuria. The seer or diviner is commonly a male but no gender distinction exists for \textit{umubuchuri} and \textit{omoreri}.

Healing skills can also be bought \textit{(okogora irioogo)}, acquired through dreams and gained through genealogy/ kinship as explained proverbially in \textit{mweito nyumba niimukiri iriogo} i.e. our own. Others get skills through an apprenticeship with their relatives. Respondents acknowledged spiritual experience upon becoming healers.

As part of the diagnosis practitioners interview and physically examine the patient. Other diagnostic procedures by the \textit{omoraguri} involve divination with rattles \textit{(chegechege)} or praying to determine the cause of a misfortune or 'see' what is hidden. The views and practices of these practitioners are not static but are under constant influence from religious and biomedical epistemologies. The expansion of biomedicine is rapid and has been accompanied by the spread of Christianity. Healing being one of the Christian ministries, churches have had a historical involvement with health care. The faith and prayer healers combining roles of church leader and healer are in many ways similar to the \textit{(baprofiti)} prophets of the Setswana described by (Ingstad 1990). In Kuria district healing
ministries are widespread and not undervalued. Bukuria is a fertile ground for Christian missions; most by Luhya churches. Sermons are done in (olulogooli) language then translated into Igikuria. Agents of such healing are the faith and prayer healers (abagaaka biekanisa or abatangati biekanisa) who blend pastoral and medical practices and are particularly popular with churchgoers in the Israel Nineveh and Mosaraba (literally the Cross). These churches syncretize vigorously, mixing Christian and traditional Kuria elements. There is an exchange and interchange going on with a possibility that the focal point of healing is moving into these Churches.

4.24 Managing health among the Kuria

Health solutions are sought for illness, sickness and misfortunes of the individual, the immediate family, extended family, lineage, descent and ethnic group. Several actions: self-medication, hospital, healer visits are taken to maintain and restore health. Solutions are sought first by the patient, then relatives (immediate and extended family), lineage, descent group and ethnic group. Medicine is for both treatment and prevention from natural and supernatural causes. A case of the latter is protective scarification (aitarra amariogo) by warriors to prevent injury/attack. Protection and cure for evil eye (ibiriri) requires protective amulets (aikonera/ orobenda oroberetu) literally a red belt, rituals and herbal treatments. Plant with red parts flowers or leaves are planted or left in fields to divert the evil eye. Healing rituals (protective and curative) are important and extremely varied in Kuria medicine. Ruel (1965) articulates ritual aspects of Kuria culture and this framework is used to analyze ritualistic healing aspects. Kuria rituals (inyangi) may be divided into two double categories, rites of circumstance and rites of passage each of these being further subdivided into individual and communal rites. The sacrifices are performed on occasions of illness, misfortune, or untoward happening and are intended to assuage,
appease, restore, or cleanse: their general purpose is to right what was wrong, to render propitious what was un-propitious (Ruel 1965). They include the actions of blessing (okoohoohera), sacrifice (ukumwensa) and cleansing (ukwitabiria). Oda (1989) describes, "excluding" and "including", ritual actions where "the dead" are pointed out as a causal factor of misfortune. The conclave of ritual elders (inchaama) undertakes protection of the community through secret rituals (Ruel 1991, Oda 1989, Marwa 2002).

Self-medication is an important initial management response for such illnesses and minor physical complaints. Roadside retail shops and market places play an important role in providing access to these prophylactics. Indications of this are the usage of penicillin (bensiriini) for tropical sore (irikuege) and rashes (irihonda). Nyamwaya (1987) observes this complementarity of traditional and Western medicine among the Kuria. He however points out that they utilize Western medicine for the biological phase of most illnesses.

4.25 Ethnosystematics of the Kuria

Kuria plant knowledge can be described as extensive. In this study a plant lexicon (vocabulary) of one hundred and ninety two (192) names is recorded. However, this lexicon may not be exhaustive because non-medicinal plants have been overlooked. Kuria ethnosystematics compares distantly with scientific systematics but the names fit assumed ethnosystematic categories in Martin (2004); with primary (unitary), secondary (binomial), and complex (polynomial) names recorded. Some names are assigned to more than one plant. Plant omote naming is influenced by plant morphological features, growth habitat, taste, smell, and colour. The taxa covered in scientific terms are mostly at the level of family and genus; no names are recorded for subspecies and variants. Three natural plant categories based on habit: grass, herb and tree are recorded. Included in this number are exotic plant species. Phytonyms (place names based on plants) are abundant and varied.
Vernacular names have been spelt largely as spoken in Bugumbe and Bukiria areas. There is richness within and between the Kuria dialects; some spelling and pronunciation variation exists in names. Though there is a degree of uniformity in plant names local plant names recorded in this study show slight variations; the lexical particularities, there are dialectic variations in the usage of u and o in plant lexemes. The naming conventions invariably assign prefixes to plant names; most Kuria names have the primary prefixes e-, o-, umu-, iri-, iki-, mu- and ind-. The prefix i is invariably for nouns. Some of the plant names can be parsed into constituent meanings e.g. roka ro mburi for Cynoglossum caerulum has animal references. Some names are descriptive irita kunguha for Tithonia diversifolia literally means not aging. Of interest is application of a general name, omuchongoma, to Melia azedarach and Senna siamea exotic tree species. Gender considerations are made in plant naming e.g. the male pawpaw is referred to as omobaibai mosaja. The difficulties faced with Kuria ethnosystematics were; translation and meaning interpretation of plant names. There will be need to include etymological (derivational) studies of plant names. There is consistency of some Kuria plant names e.g. Agave sisalana, Vitex fischeri, Amaranthus spp., Fuerstia africana, Carissa spinarum, Rhus natalensis, Senna didymobotrya and B. alba with those of affine Bantu languages (Muregi et al., 2003, Gachathi 2007, Nagata et al., 2011).
Table 2 - Top ten widely used Kuria medicinal plants selected for biological assays

<table>
<thead>
<tr>
<th>Species</th>
<th>Igikuria name</th>
<th>Reports</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ageratum conyzoides</td>
<td>Weisebo</td>
<td>14</td>
</tr>
<tr>
<td>Acmella caulirhiza</td>
<td>Igichanga raariamatei</td>
<td>12</td>
</tr>
<tr>
<td>Plectranthus barbatus</td>
<td>Iriri rebana</td>
<td>9</td>
</tr>
<tr>
<td>Solanum incanum</td>
<td>Iritorotoro</td>
<td>9</td>
</tr>
<tr>
<td>Rhus natalensis</td>
<td>Omosangora</td>
<td>8</td>
</tr>
<tr>
<td>Tagetes minuta</td>
<td>Irichaga</td>
<td>8</td>
</tr>
<tr>
<td>Fuerstia africana</td>
<td>Ekebunga baare</td>
<td>7</td>
</tr>
<tr>
<td>Croton macrostachyus</td>
<td>Omosocho</td>
<td>7</td>
</tr>
<tr>
<td>Microglossa pyrifolia</td>
<td>Ebegete begete</td>
<td>7</td>
</tr>
<tr>
<td>Ocimum gratissimum</td>
<td>Ikiiri/ Ikiiria</td>
<td>6</td>
</tr>
</tbody>
</table>

4.26 Ethnopharmacology of the Kuria

The entire group of interviewees (n = 16) used 149 medicinal plants and made 254 disease citations for fifty two illness/disease conditions. Most of the medicinal plants were reported once (43.6%), twice (25.5%) and thrice (9.4%). The disease categories with the highest number of mentions were stomachache (10.2%), cattle conditions (7.4%) infant diseases (5.9%) and culture bound syndrome (5.5%). The top ten medicinal plants based on usage consensus are given in Table 2 above.

Of the 148 plant documented for the Kuria ethnopharmacopoeia (122 plants) are used for between two to three, the exception Microglossa pyrifolia which recorded eight illness/disease conditions, the rest (27 plants) were used for only one illness/disease condition. In formulating medicines plants are frequently (17.4%) used in combinations and commonly solely (82.6%). There are diverse combinations of multi-plant preparations in the Kuria ethnopharmacopoeia. However, some plant species, especially their roots, are notable in these multi-plant regimens they include: Carissa spinarum, Euclea divinorum, Erythrina abyssinica, Carica papaya and Rhoicissus revoilii.
The medicinal plants are from 57 plant families. The most popular plant families are the Asteraceae (15.4%), Leguminosae (7.4%), Lamiaceae (6.7%), Euphorbiaceae (6.7%), and Acanthaceae (4.7%) (see figure 9 below showing number of species). The top three medicinal Subclasses based on the Cronquist classification are Asteridae (42.3%), Rosidae (30.9%) and Dillenidae (9.4%). In broader taxon classing the medicinal plants belong to the Asteridae (42.3%), Rosidae (30.9%), Dillenidae (9.4%), Magnoliidae (2.7%), Caryophyllidae (5.4%), Liliidae (3.4%), Commelinidae (2.0%) and Zingiberidae (2.0%) subclasses.

**Figure 9 - Top ten plant families of the Kuria ethnopharmacopeia**

Medicinal plant products are administered both externally and internally in several different forms for a wide range of health problems. Medicines employ fruit (*ichihagoe*), leaves (*amato*) bark (*makanda*) and roots (*egekobe*). Leaves (44.3%), bark (5.4%), roots (8.1%), whole plant (16.8 %), flowers (0.7%) and fruits (2%). The most common medicinal multi-part preparations combine the leaves with roots (10.1%). Medicine
preparation forms are: powders (1.3%), (irivu) ash, decoctions (22.1%), infusions (20.8%), or ointments (0.7%) other preparations involve inhalation (0.7%), enemas massage therapy, manipulating or applying pressure to the body. Non-plant materials (mineral and animal), soda ash (irigaate), supplement medicinal plant medicines employed in healing. The medicinal plants of the Kuria categorized on basis of their habit are 62.4% herbs, 21.5 shrubs and 16.1% trees.

4.30 Ethnobotany of the Luo and Kuria

This section describes in detail medicinal plants of the Luo and Kuria people. The plant families and species are arranged in alphabetical order. Each species has its local and scientific name provided, followed by its medical use. Number of independent reports, diseases cited and voucher specimen numbers are provided with the herbarium where it is prescribed.

4.31 Luo ethnobotany

ACANTHACEAE

Acanthus pubescens Otaglo magwar (DHOLUO)

Ethnobotany – Possession of plant leaves or stem believed to help somebody to win civil cases. The said parts also useful in cases of bewitchment, ‘kochuowi tung’.

No. of independent reports 1 Disease(s) cited 2 *BOO 1013 (NAI).

Asystasia schimperi Atipa (DHOLUO)

Ethnobotany – Slimy crushed leaves applied onto ringworms (bonde/ siling’) as a cure.

No. of independent reports 5 Disease(s) cited 1 *BOO 1017 (NAI).

Dyschoriste radicans Ratek-min-ang’asa (DHOLUO)
Ethnobotany – Plant infusion used as bath for ‘chira’ condition of moral and/or ritual impurity.
No. of independent reports 4 Disease(s) cited 1 *BOO 1059 (NAI).

Justicia flava (NO DHOLUO NAME GIVEN)
Ethnobotany – Whole plant pounded and infusion drunk for ‘chira’.
No. of independent reports 1 Disease(s) cited 1 *BOO 1091 (NAI).

Justicia betonica Akech, Seje (DHOLUO)
Ethnobotany – The leaves crushed and infusion made with slightly warm water filtered for treating diarrhoea and vomiting. Leaf infusion used as a bath for driving away evil spirits and treating ‘chira’.
No. of independent reports 2 Disease(s) cited 4 *BOO 1092 (NAI).

Thunbergia alata Nyawend agwata (DHOLUO)
Ethnobotany – Crushed leaves applied on fungal diseases. Whole plant burnt and ash applied onto the tongue for oral thrush treatment.
No. of independent reports 8 Disease(s) cited 2 *BOO 1135 (NAI).

AGAVACEAE
Agave sisalana Tuoro (DHOLUO)
Ethnobotany – Leaf with fruits of Capsicum annuum or C. frutescens (pind arombe) are used to make an infusion administered orally dose for bird respiratory conditions.
No. of independent reports 12 Disease(s) cited 1 *BOO 1014 (NAI).

ALOACEAE
Aloe dawei Ogaka lang’o (DHOLUO)
Ethnobotany – Succulent leaves placed on cattle pen gate. Stepped on by cattle and helps in healing hoof wounds and preventing foot and mouth disease/anthrax or ‘achany’.
No. of independent reports 1 Disease(s) cited 1 *BOO 1019 (NAI).

Aloe lateritia Ogaka (DHOLUO)
Ethnobotany – The leaves decocted and drunk to heal wounds. Leaf ash and sap rubbed on tongue to heal oral thrush and also applied to wounds to enhance healing. Leaf infusion administered orally for severe constipation and stomachache.
No. of independent reports 4 Disease(s) cited 4 *BOO 1020 (NAI).

AMARYLLIDACEAE
Ammocharis tinneana Rabwond otenga (DHOLUO)
Ethnobotany – Root boiled and the decoction reported to be a powerful emetic.
No. of independent reports 1 Disease(s) cited 1 *BOO 1015 (NAI).

Crinum macowanii Rabwond otenga (DHOLUO)
Ethnobotany – Root sap applied on snakebite and decoction drunk. Root decoction used as drench for livestock.

Crinum kirkii

Rabwond otenga (DHOLUO)

Ethnobotany – Root decoction a powerful emetic; evokes violent vomiting.

ANACARDIACEAE

Lannea humilis

Kuogo (LUO)

Ethnobotany – Leaf infusion drunk for ‘chira’. Bark plus that of Albizia coriaria decocted and given to treat ‘mbaha’, child disease with symptoms akin to jaundice. The leaf infusion, mixed with Albizia coriaria leaves, given orally as an emetic. Bark decoction given to sick children.

Lannea schimperi

Kuogo/ Amirni (DHOLUO)

Ethnobotany – Leaf decoction drunk for infertility and stomachache. Leaves decocted with those of Eucalyptus sp. for fumigation from cold conditions.

Mangifera indica

Mawembe (LUO)

Ethnobotany – Bark decoction administered orally to stop diarrhoea and ‘orianyancha’ loose stools. Bark mixed with that of Azadirachta indica, Lannea humilis and male Carica papaya plant for stomach conditions and venereal diseases.

Rhus natalensis

Sangla (DHOLUO)

Ethnobotany – Leaf infusion administered orally for stomachache.

APIACEAE (nom. alt. UMBELLIFERAE)

Centella asiatica

(NO DHOLUO NAME GIVEN)

Ethnobotany – Leaf infusion drunk orally for stomachache and measles.

APOCYNACEAE

Carissa spinarum

Ochuoga (DHOLUO)

Ethnobotany – Roots mixed with those of Euclea divinorum, Tylosema fassoglense, Acacia brevispica, Zanthoxylum chalybeum Warburgia ugandensis, Toddalia asiatica and Rhoicissus revollii and boiled. The decoction is drunk for 'yamo'/ boils and also used by fumigating patient. Fruit is edible.

*BOO 1049 (NAI).

*BOO 1052 (NAI).

*BOO 1096 (NAI).

*BOO 1099 (NAI).

*BOO 1105 (NAI).

*BOO 1129 (NAI).

*BOO 1050 (NAI).

*BOO 1051 (NAI).
Rauvolfia caffra

**Ethnobotany** – Bark decoction administered orally for chest conditions.

No. of independent reports 1  
Disease(s) cited 1  
*BOO 1131 (NAI).

Thevetia peruviana

**Ethnobotany** – Leaves dried and ground then blown into children's nasal passage to ease nasal breathing and prevent worms ‘njoka’ from causing fits in child.

No. of independent reports 2  
Disease(s) cited 2  
*BOO 1405 (NAI).

ASCLEPIADACEAE

*Mondia whytei*  
**Ethnobotany** – Roots chewed for enhancing appetite and sexual libido.

No. of independent reports 4  
Disease(s) cited 2  
*BOO 1107 (NAI).

ASPARAGACEAE

*Asparagus flagellaris*  
**Ethnobotany** – Root decoction used in treating jaundice and venereal diseases. Leaves placed on house eaves to chase bats. Leaf infusion used as bath and drunk for ‘chira’.

No. of independent reports 7  
Disease(s) cited 4  
*BOO 1018 (NAI).

ASTERACEAE (nom. alt. COMPOSITAE)

*Ageratum conyzoides*  
**Ethnobotany** – Leaves rubbed and applied on fresh wound as haemostatic. Leaves gently pounded with those of *B. pilosa* and used as a bath for skin rashes in infants.

No. of independent reports 22  
Disease(s) cited 2  
*BOO 1021 (NAI).

Aspilia mossambicensis  
**Ethnobotany** – Administered, as a bath, when taboos are broken; especially those relating with food. Root chewed and sap swallowed to aid expulsion of the placenta.

No. of independent reports 8  
Disease(s) cited 2  
*BOO 1022 (NAI).

*Bidens pilosa*  
**Ethnobotany** – Leaf infusion used to treat the evil eye or *juok*. Seed placed on market wares to prevent the evil eye or its influence; also on scalp hair for same effect. Root chewed and sap swallowed for difficult delivery.

No. of independent reports 3  
Disease(s) cited 3  
*BOO 1028 (NAI).

*Cotula anthemoides*  
**Ethnobotany** – Pounded leaf infusion given in cases of persistent cough.

No. of independent reports 1  
Disease(s) cited 1  
*BOO 1053 (NAI).

*Emilia discifolia*  
**Ethnobotany** – Pounded leaf ointment used for massaging aching bones. Treats ‘bit’, an infantile disease that causes physical disability.
Galinsoga parviflora
*BOO 1062 (NAI).

**Ethnobotany** - Plant infusion used as a bath against rashes. Used with other vegetable species to prepare a vegetable dish called ‘atwago’ that is fermented and mixed with milk before serving.

Gutenbergia cordifolia
*BOO 1081 (NAI).

**Ethnobotany** - The plant leaves decocted and administered orally for measles. Leaves crushed and steeped in water. The infusion is drunk for stomachache.

Microglossa pyrifolia
*BOO 1082 (NAI).

**Ethnobotany** - Leaves boiled and decoction drunk for ‘iyamo’. Root decocted and drunk for ‘sihoho’. Root pulverized for wounds, ‘neko’ or madness (through nasal passages) and ‘yamo’.

Psiadia punctulata
*BOO 1109 (NAI).

**Ethnobotany** - Leaf crushed and infusion drunk for stomach upsets. The plant leaves and those of Tragia brevipes burnt and ash licked to prevent spirit attack. Plant twigs (leaves and flowers) burnt and ash applied on infant’s tongue to treat oral thrush.

Schkuhria pinnata
*BOO 1126 (NAI).

**Ethnobotany** - Infusion or decoction of pounded plant leaves drunk for stomachache and cases of ‘chira’ ritual impurity. Plant leaf infusion administered for persistent abdominal aches during menses ‘ojijo’.

Solanecio mannii
*BOO 1139 (NAI).

**Ethnobotany** - Leaf infusion drunk for ‘sihoho’, stomachache and cattle disease.

Tagetes minuta
*BOO 1141 (NAI).

**Ethnobotany** - Whole plant uprooted, and laid on safari ant track as repellant. Crushed fresh seeds used to rid poultry roosting areas of mites. The sap of crushed leaves is haemostatic.

Tithonia diversifolia
*BOO 1157 (NAI).

**Ethnobotany** - Leaf infusion drunk for ‘sihoho’, stomachache and cattle disease.
**Ethnobotany** – Leaves crushed and steeped in water. The infusion is drunk for ‘sihoho’ or acute stomachache and also for malaria. Half table spoon of leaf decoction given to children for stomachache.

No. of independent reports 19  
Disease(s) cited 3  
*BOO 1158 (NAI).

*Sphaeranthus suaveolens*  
(NO DHOLOU NAME GIVEN)

**Ethnobotany** – Leaf infusion used in treating a condition referred to as ‘golo wino’ or expulsion of the umbilical cord.

No. of independent reports 1  
Disease(s) cited 1  
*BOO 1138 (NAI).

**Melanthera scandens**  
Nyamin ang’we (DHOLOU)

**Ethnobotany** – Leaf infusion given for a pregnancy condition called ‘rariw’ foetal misalignment.

No. of independent reports 1  
Disease(s) cited 1  
*BOO 1110 (NAI).

*Vernonia hymenolepis*  
Omuya (DHOLOU)

**Ethnobotany** – Leaf crushed and mixed with oil and rubbed onto skin to treat ‘mbaha’ infantile jaundice.

No. of independent reports 1  
Disease(s) cited 1  
*BOO 1167 (NAI).

*Vernonia amygdalina*  
Olulusia/ Olanga langwe (DHOLOU)

**Ethnobotany** – Leaf infusion drunk for ‘ich kuot’ constipation and flatulence. Leaf infusion mixed with sheep's chyme ‘wen’ and used to treat bewitchment.

No. of independent reports 8  
Disease(s) cited 3  
*BOO 1169 (NAI).

**BALANITACEAE**

*Balanites aegyptiaca*  
Othoo (DHOLOU)

**Ethnobotany** – Plant grown or its parts believed to secure home from evil. Leaf infusion used in treating ‘chira’ condition of moral and/ or ritual impurity. The plant leaves prepared together with volcanic ash used to treat cough.

No. of independent reports 6  
Disease(s) cited 2  
*BOO 1029 (NAI).

**BIGNONIACEAE**

*Kigelia africana*  
Yago (DHOLOU)

**Ethnobotany** – Bark decoction drunk for women's conditions and stomachache. Bark mixed with other species and decocted for jaundice, venereal diseases and ‘yamo’ internal body pains.

No. of independent reports 13  
Disease(s) cited 5  
*BOO 1093 (NAI).

*Markhamia lutea*  
Siala (DHOLOU)

**Ethnobotany** – Root decoction drunk orally for infertility caused by ‘sigete’, pains during menses. Root decoction causes drastic diarrhoea and should be used cautiously. Also used in treating an infantile disease identified as ‘winyo’ or ‘kulbat’ translating to pneumonia;
this mixture should have parts of the Egyptian vulture (*Koga*). For conjunctivitis the young shoots chewed and sap applied onto eye. No. of independent reports 10 Disease(s) cited 4 *BOO 1108 (NAI).

**CAPPARIDACEAE**

*Cleome hirta*  
**Ethnobotany** – The whole plant infusion bathed in for ‘chira’ condition of moral and/or ritual impurity. The leaves consumed as vegetable.

No. of independent reports 1 Disease(s) cited 1 *BOO 1060 (NAI).

*Cleome gynandra*  
**Ethnobotany** – Seed of the plant is believed to destroy rivalry/animosity.

No. of independent reports 2 Disease(s) cited 1 *BOO 1055 (NAI).

**CARICACEAE**

*Carica papaya*  
**Ethnobotany** – Root decoction, with other plants, *Ximenia americana*, *Carissa spinarum*, *Erythrina abyssinica* and *Euclea divinorum*, administered orally for venereal diseases. Root mixed with *Kigelia africana* bark decocted for gonnorrhoea. Only male papaya tree roots used.

No. of independent reports 15 Disease(s) cited 1 *BOO 1057 (NAI).

**CELESTRACEAE**

*Maytenus heterophylla*  
**Ethnobotany** – Bark mixed with *Gardenia ternifolia* root then boiled. The decoction is administered sparingly for chest complications.

No. of independent reports 1 Disease(s) cited 1 *BOO 1106 (NAI).

**COMBRETACEAE**

*Combretum collinum*  
**Ethnobotany** – Root decoction taken orally for ‘yamo’ internal body pains.

No. of independent reports 1 Disease(s) cited 1 *BOO 1058 (NAI).

*Terminalia brownii*  
**Ethnobotany** – Tree bark mixed with that of *Albizia coriaria* and *Lannea schweinfurthii* and decoction drunk for ‘mbaha’ and a disease condition reported to redden child’s anal pore; caused by fine worms.

No. of independent reports 2 Disease(s) cited 1 *BOO 1160 (NAI).

**CONVOLVULACEAE**

*Astripomoea hyoscyamoides*  
**Ethnobotany** – Plant leaves crushed, mixed with oil used for massaging painful body parts. The sap applied on skin disease.

No. of independent reports 3 Disease(s) cited 2 *BOO 1016 (NAI).
Evolvulus alsinoides  
**Ethnobotany** – The plant uprooted and its roots and soil from its roots used as a protectant of maize fields. Mixed with *Colutea anthemoides* the plant infusion used to treat ‘chira’ condition of moral and/or ritual impurity.

No. of independent reports 1  
Disease(s) cited 2  
*BOO 1063 (NAI).*

*Ipomoea aquatica*  
Mboha aora (DHOLUO)  
**Ethnobotany** – Leaf infusion used as a bath for ‘chira’ condition of moral and/or ritual impurity.

No. of independent reports 1  
Disease(s) cited 1  
*BOO 1085 (NAI).*

*Ipomoea hildebrandtii*  
Obinju (DHOLUO)  
**Ethnobotany** – The stem or leaf sap applied onto fungal skin diseases.

No. of independent reports 2  
Disease(s) cited 1  
*BOO 1101 (NAI).*

*Ipomoea obscura*  
(NO DHOLUO NAME GIVEN)  
**Ethnobotany** – Twiny herb’s leaves crushed and mixed with oil then used by bonesetters for correcting and healing fractures and sprains. Also used to set fractured livestock bones.

No. of independent reports 1  
Disease(s) cited 1  
*BOO 1094 (NAI).*

**CRASSULACEAE**

*Kalanchoe densiflora*  
Koko (DHOLUO)  
**Ethnobotany** – Leaf decoction alone or mixed with those of *Abras precatorius* decocted drunk for cough. Leaves chewed and pasted on boils and whitlow or ‘koko’. Leaf sap applied on tongue with oral thrush.

No. of independent reports 3  
Disease(s) cited 3  
*BOO 1102 (NAI).*

**CURCUBITACEAE**

*Cucumis dipsaceus*  
Otange (DHOLUO)  
**Ethnobotany** – Fruit infusion sat on to calm and heal anal prolapse (haemorrhoids).

No. of independent reports 1  
Disease(s) cited 1  
*BOO 1030 (NAI).*

*Kedrostis foetidissima*  
Ang’we (DHOLUO)  
**Ethnobotany** – Leaf infusion drunk and bathed with to treat measles. Also used to protect from an evil eye type called ‘dhoho’ or ‘koko’ that results in a swollen face. Leaves with those of *Crotalaria spinosa* crushed and wiped on face.

No. of independent reports 13  
Disease(s) cited 2  
*BOO 1095 (NAI).*

**DRACAENACEAE**

*Sansevieria robusta*  
Wire (DHOLUO)  
**Ethnobotany** – To initiate emesis root cleaned, pounded softly, infused in water, strained then egg yolk added. This is administered orally in the event of a snakebite.

No. of independent reports 1  
Disease(s) cited 1  
*BOO 1137 (NAI).*
EBENACEAE

_Euclea divinorum_ Ochol (DHOLUO)

**Ethnobotany** – Root decoction administered orally for menstrual pains *'sigete'*. Root decoction used in treating used for *'yamo'* internal body pains and inducing diarrhoea. Plant roots with those of *Zanthoxylum chalybeum, Lannea humilis, Ximenia americana* and *Mangifera indica* decocted for constipation. Bark decoction purgative in action.

No. of independent reports 15 Disease(s) cited 5 *BOO 1072 (NAI).

EUPHORBIACEAE

_Croton dichogamus_ Ofunyu, rachar (DHOLUO)

**Ethnobotany** – Leaves crushed and used to massage weak knees and also as bath for *'wuoyo' –* a condition common in malnourished infants. Leaf infusion used to prevent miscarriage – *'ich mao'*. 

No. of independent reports 1 Disease(s) cited 2 *BOO 1031 (NAI).

_Croton macrostachyus_ Amboro (DHOLUO)

**Ethnobotany** – Stem and bark decoction drunk for stomachache. Reported as a strong purgative.

No. of independent reports 6 Disease(s) cited 1 *BOO 1035 (NAI).

_Erythrococca bongensis_ Hariadho (DHOLUO)

**Ethnobotany** – Leaf infusion prepared and then spat on person suffering from *'chira'*. Leaf decoction administered orally for stomachache. Leaf infusion mixed with small amounts of volcanic ash, *kat nyaluo*, for worms. Leaves crushed mixed with oil/ ghee and used for massaging infants. Root decoction drunk for constipation in children. Leaf consumed as a potherb with *dindi, Amaranthus, Vigna unguiculata, Solanum nigrum* and milk.

No. of independent reports 4 Disease(s) cited 4 *BOO 1064 (NAI).

_Euphorbia inaequilatera_ (NO DHOLUO NAME GIVEN)

**Ethnobotany** – Used to treat a wasting disease in children called *mdhohi*.

No. of independent reports 1 Disease(s) cited 1 *BOO 1065 (NAI).

_Euphorbia tirucalli_ Ojuok (DHOLUO)

**Ethnobotany** – Leaves mixed with those of *Lannea* and boiled, the decoction used to treat measles. Sap added to milk or porridge to heal venereal diseases, within ten minutes the result is severe diarrhoea. The leaves or root baked and chewed for throat conditions.

No. of independent reports 4 Disease(s) cited 4 *BOO 1067 (NAI).

_Euphorbia candelabrum_ Bondo (DHOLUO)

**Ethnobotany** – Considered to be *nawi* – causes wasting in victims; in cases of disagreement if one of the parties crosses/ skips over the roots, the whole plant should be uprooted and the affected individual must cleansed, *'hoso'*. Small bits of the plant's twigs
are strung on a necklace and placed on the child's neck to treat the sunken fontanelle 'winyo'.

No. of independent reports: 2  
Disease(s) cited: 2  
*BOO 1070 (NAI).

**Flueggea virosa**  
Kagna/ Kang (DHOLUO)

**Ethnobotany** — Leaf infusion drunk for 'chira' condition of moral and/ or ritual impurity and placed on eaves of house for the same condition.

No. of independent reports: 8  
Disease(s) cited: 2  
*BOO 1074 (NAI).

**Jatropha curcas**  
Jok (DHOLUO)

**Ethnobotany** — Leaf infusion or sap orally ingested to stop 'diep' diarrhoea.

No. of independent reports: 1  
Disease(s) cited: 1  
*BOO 1089 (NAI).

**Phyllanthus fischeri**  
Kagna/ kagno (DHOLUO)

**Ethnobotany** — Leaf infusion drunk for 'chira' condition of moral and/ or ritual impurity and grave transgressions *muma madongo*. Leaf infusion administered orally to hasten placenta removal in livestock and humans.

No. of independent reports: 11  
Disease(s) cited: 3  
*BOO 1128 (NAI).

**Ricinus communis**  
Obala ndagwa (DHOLUO)

**Ethnobotany** — The roots are chewed in the second trimester of pregnancy to facilitate easy parturition. Root chewed to hasten placenta expulsion.

No. of independent reports: 7  
Disease(s) cited: 2  
*BOO 1133 (NAI).

**Synadenium grantii**  
Fangafa (DHOLUO)

**Ethnobotany** — Sap from stem and leaves applied onto skin to treat 'kalanga' fungal diseases.

No. of independent reports: 1  
Disease(s) cited: 1  
*BOO 1140 (NAI).

**FABACEAE (nom. alt. LEGUMINOSAE)**

**Abrus precatorius**  
Ombulu (DHOLUO)

**Ethnobotany** — Leaves chewed and sap swallowed to treat coughs. Root decoction drunk for general malaise.

No. of independent reports: 8  
Disease(s) cited: 2  
*BOO 1025 (NAI).

**Acacia brevispica**  
Rapedo/ pedo (DHOLUO)

**Ethnobotany** — Plant roots mixed with those of *Rhoicissus revoilii* and *Harrisonia abyssinica* and boiled for 'mbaha' jaundice in infants. Condition also called 'ayieny'.

No. of independent reports: 2  
Disease(s) cited: 1  
*BOO 1026 (NAI).

**Albizia coriaria**  
Ober (DHOLUO)

**Ethnobotany** — Child placed in the frothy bark infusion to relieve and stop anal itching. Oral intake of root decoction stops diarrhea. Bark infusion drunk for acute constipation or if condition is mild boiled and decoction administered orally. Roots mixed with those of
Lannea humilis to treat ‘yamo’ internal body pains and ‘nyach’ venereal diseases. Bark decoction drunk for constipation and stomachaches. Bark infusion and decoction used to treat livestock diseases.
No. of independent reports 23 Disease(s) cited 6 *BOO 1027 (NAI).

Caesalpinia volkensii

Ethnobotany - Seed is burnt and the ash mixed with ghee oil and volcanic ash ‘kado osoro’ throat, chest and cough conditions. Bark decoction or infusion drunk for stomachache. Plant seed has magical properties.
No. of independent reports 10 Disease(s) cited 5 BOO 1048 (NAI).

Crotalaria spinosa (NO DHOLUO NAME GIVEN)

Ethnobotany – After the delivery of twins, whole plant infusion administered orally to prevent death of either twin and cleanse the mother.
No. of independent reports 1 Disease(s) cited 1 *BOO 1047 (NAI).

Crotalaria brevidens

Mitoo (DHOLUO)

Ethnobotany - Leaf vegetable eaten for its laxative activity.
No. of independent reports 1 Disease(s) cited 1 *BOO 1033 (NAI).

Dichrostachys cinerea

Otamo-liech (DHOLUO)

Ethnobotany - A bark decoction is prepared for stomachache. Crushed leaves and bark infusion, administered orally to stimulate menstrual flow, emmenagogue, thus enhancing fertility.
No. of independent reports 1 Disease(s) cited 2 *BOO 1054 (NAI).

Dolichos oliveri

Jandarusi (DHOLUO)

Ethnobotany - root decoction instilled into nasal pores for ‘neko’ dementia and epilepsy. Instilled in nasal pores for ‘yamo’ in livestock.
No. of independent reports 1 Disease(s) cited 3 *BOO 1061 (NAI).

Entada abyssinica

Osembe (DHOLUO)

Ethnobotany - The leaves are pounded, mixed with oil and used in massaging, physiotherapy of sprained muscles and broken limbs.
No. of independent reports 1 Disease(s) cited 1 *BOO 1068 (NAI).

Erythrina abyssinica

Mrembe (DHOLUO)

Ethnobotany -Roots mixed with Vernonia sp. and Capparis sp. for venereal diseases and stomachache. Bark decoction (with other species) used in treating ‘yamo’ internal body pains.
No. of independent reports 9 Disease(s) cited 3 *BOO 1069 (NAI).

Erythrina excelsa

Roko, yuoma (DHOLUO)
Ethnobotany - The bark decoction is drunk for 'orianyancha' a gastrointestinal condition characterized by loose stools. Seeds used in magic.
No. of independent reports 2 Disease(s) cited 2 *BOO 1075 (NAI).

Glycine wightii
Ethnobotany - Plant infusion used to prevent witchcraft.
No. of independent reports 1 Disease(s) cited 1 *BOO 1080 (NAI).

Indigofera arrecta
Ethnobotany - Root chewed, sap swallowed as aphrodisiac and makes one likeable.
No. of independent reports 8 Disease(s) cited 1 *BOO 1086 (NAI).

Indigofera circinella
Ethnobotany - Seed strung on thread and used as an amulet protecting child from certain worm activity.
No. of independent reports 4 Disease(s) cited 1 *BOO 1087 (NAI).

Piliostigma thonningii
Ethnobotany - Root decoction administered orally for diarrhoea and stomachache. The leaf infusion used for flavouring porridge.
No. of independent reports 9 Disease(s) cited 2 *BOO 1127 (NAI).

Cassia hirsuta
Ethnobotany - Root boiled and decoction drunk for stomachache.
No. of independent reports 1 Disease(s) cited 1 *BOO 1045 (NAI).

Cassia hildebrandtii
Ethnobotany - Pounded leaf infusion administered orally for stomachache. Also administered for 'sihoho' - acute stomachache caused by sorcery.
No. of independent reports 15 Disease(s) cited 2 *BOO 1111 (NAI).

Ormocarpum trichocarpum
Ethnobotany - Leaves chewed and pasted on depressed fontanelle.
No. of independent reports 1 Disease(s) cited 1 *BOO 1046 (NAI).

Senna bicapsularis
Ethnobotany - The twig of the plant is protective against persons with wrong intentions. The twig may also be used as a toothbrush.
No. of independent reports 1 Disease(s) cited 2 *BOO 1142 (NAI).

Senna didymobotrya
Ethnobotany - Flower petals and stalks crushed, mixed with oil or paraffin, and applied topically on skin to treat fungal infections called 'kalanga' or 'jumbe'. Leaf decoction drunk for 'yamo' internal body pains. Twigs stuck on house eaves to prevent nightmares/
spirit possession. Leaf infusion sprinkled to prevent spirit possession. Root decoction drunk for ‘segrete’, a female condition. Leaf infusion drunk for ‘chira’ condition of moral and/or ritual impurity. Root infusion drunk to enhance childbirth during labour.

No. of independent reports 21 Disease(s) cited 5 *BOO 1148 (NAI).

*Senna siamea*

Ayieko (DHOLUO)

**Ethnobotany** — Bark and root decoction drunk for stomachache. Root decoction drunk for mild or immature sigete. Prevents infertility.

No. of independent reports 5 Disease(s) cited 2 *BOO 1150 (NAI).

*Senna occidentalis*

Nyayado/ ayado (DHOLUO)

**Ethnobotany** — Leaves crushed and steeped in water. The infusion is drunk for stomachache. Root mixed *Cymbopogon citratus* and decocted. Administered orally for abdominal pains and ‘segrete’, abdominal pains during menses. Leaves of the plant and those of *Vigna unguiculata, dindi* and *Amaranthus* sp. used in preparing a vegetable called ‘aboka’. Leaf infusion drunk and used as a bath for measles. The scraped roots used in making an infusion that is sprinkled in the house to prevent quarrels.

No. of independent reports 17 Disease(s) cited 4 *BOO 1172 (NAI).

*Sesbania sesban*

Oyieko, asao (DHOLUO)

**Ethnobotany** — Crushed leaves are applied on to skin fungal infections. Leaf with bark decoction drunk for jaundice.

No. of independent reports 1 Disease(s) cited 2 *BOO 1151 (NAI).

*Tamarindus indica*

Chwa/ ochwa (DHOLUO)

**Ethnobotany** — Leaves pounded, then drunk and bathed with for ‘ang’iew’ jaundice. Used for flavouring porridge. Roots decocted for general body pains including pain while urinating.

No. of independent reports 5 Disease(s) cited 2 *BOO 1153 (NAI).

*Tephrosia vogelii*

Jinga (DHOLUO)

**Ethnobotany** — Crushed leaf infusion or decoction used for livestock with ‘aluny’ alopecia and insect parasites.

No. of independent reports 1 Disease(s) cited 1 *BOO 1154 (NAI).

*Tylosema fassoglense*

Ombasa (DHOLUO)

**Ethnobotany** — Root decoction drunk for ‘nyach’ venereal diseases and jaundice or ‘nyanam’. Root infusion used to treat constipation in livestock. Root decoction used in treating ‘yamo’ internal body pains.

No. of independent reports 24 Disease(s) cited 4 *BOO 1156 (NAI).

*Vigna unguiculata*

Alot bo (DHOLUO)

**Ethnobotany** — Leaf sap dropped into the eye for conjunctivitis.

No. of independent reports 1 Disease(s) cited 1 *BOO 1165 (NAI).
LAMIACEAE (nom. alt. LABIATAE)

**Ajuga integrifolia**

*Ethnobotany* – Leaf crushed and infusion used to initiate vomiting.
No. of independent reports 1  Disease(s) cited 1  *BOO 1023 (NAI).

**Hyptis pectinata**

*Ethnobotany* – Crushed leaves used in preparing an infusion with warm water. Infusion administered orally for *Iwodo* oral thrush and *orioanyancha lose stools*.
No. of independent reports 2  Disease(s) cited 2  *BOO 1083 (NAI).

**Leonotis nepetifolia**

*Ethnobotany* – Leaf sap dropped into eye to treat *Odondwe* or conjunctivitis. Leaf infusion used in stopping bleeding during pregnancy and miscarriages.
No. of independent reports 21  Disease(s) cited 2  *BOO 1097 (NAI).

**Leucas martinicensis**

*Ethnobotany* – Leaf infusion used to treat hernia; *hima* or *arip*. Leaves mixed with those of *Hyptis pectinata* crushed, made into an infusion and drunk for stomach ache.
No. of independent reports 2  Disease(s) cited 2  *BOO 1098 (NAI).

**Ocimum gratissimum**

*Ethnobotany* – Leaf infusion used in treating ‘*chira*’ condition of moral and/or ritual impurity. Leaves rubbed and inhaled for common cold. Twigs burnt in house at dusk to repel mosquitoes. Leaves used in a fumigation treatment for ‘*yamo*’.
No. of independent reports 14  Disease(s) cited 3  *BOO 1112 (NAI).

**Ocimum kilimandscharicum**

*Ethnobotany* – Leaf infusion alone used in managing ‘*ich kuot*’ constipation. Leaves rubbed and inhaled for common cold. Leaf infusion plus of other species used to treat *sigete* abdominal pains during menses and nightmares.
No. of independent reports 20  Disease(s) cited 4  *BOO 1122 (NAI).

**Orthosiphon thymiflorus**

*Ethnobotany* – Young leaves, chewed, then heated and used as a compress for swollen feet.
No. of independent reports 1  Disease(s) cited 1  *BOO 1114 (NAI).

**Plectranthus barbatus**

*Ethnobotany* – Leaves decocted for stomachache and ‘*yamo*’ internal body pains. Crushed leaf sap applied in tongue to treat ‘*Iwodo*’ oral thrush.
No. of independent reports 12  Disease(s) cited 2  *BOO 1123 (NAI).

**Plectranthus caninus**

Api (DHOLUO)
Ethnobotany - Sap from plant squeezed into cup, filtered and administered orally for *oriantyancha* loose stools and *mbaha* infantile jaundice.
No. of independent reports 1 Disease(s) cited 2 *BOO 1124 (NAI).

*Plectranthus longipes* (NO DHOLUO NAME GIVEN)
Ethnobotany - Leaf infusion in slightly warm water administered orally to children for malaria.
No. of independent reports 1 Disease(s) cited 1 *BOO 1125 (NAI).

*Tinnea aethiopica* Olando/ Arech (DHOLUO)
Ethnobotany - Leaf infusion drunk and used as bath for measles, *ang'iew*.
No. of independent reports 1 Disease(s) cited 1 *BOO 1161 (NAI).

MALVACEAE

*Hibiscus diversifolius* Owich (DHOLUO)
Ethnobotany - Leaf infusion bathed in and drunk for 'chira' condition of moral and/ or ritual impurity. Leaves crushed and applied onto burns.
No. of independent reports 1 Disease(s) cited 2 *BOO 1084 (NAI).

*Hibiscus fuscus* Owich (DHOLUO)
Ethnobotany - Leaf infusion bathed in for 'chira'. Crushed leaves mixed with petroleum jelly and used for physiotherapy of sprained muscles and fractured limbs.
No. of independent reports 1 Disease(s) cited 2 *BOO 1088 (NAI).

*Malvastrum coriomialdianum* Nyayuora, raywe (DHOLUO)
Ethnobotany - The whole plant infusion or decoction prepared for *rariw* foetal misalignment and women risking miscarriage.
No. of independent reports 2 Disease(s) cited 1 *BOO 1103 (NAI).

*Sida cordifolia* Raywe (DHOLUO)
Ethnobotany - Leaves gathered, crushed and pasted on *buche* boils.
No. of independent reports 1 Disease(s) cited 1 *BOO 1146 (NAI).

*Sida tenuicarpa* Ogundu (DHOLUO)
Ethnobotany - Leaves of *Sida* mixed with those of *Phyllanthus* sp. to make an infusion for treating 'chira' condition of moral and/ or ritual impurity. Leaves crushed, mixed with oil and used for massaging.
No. of independent reports 2 Disease(s) cited 2 *BOO 1149 (NAI).

MELIACEAE

*Azaadirachta indica* Nyamin dwele (DHOLUO)
Ethnobotany - Bark and root decoction and leaf infusion preparations used for several human and veterinary conditions but mostly 'yamo' internal body pains, stomachache, rashes, constipation and malaria.
No. of independent reports 16  Disease(s) cited 5  *BOO 1024 (NAI).

* Ekebergia capensis  Kuogo (DHOLUO)  
**Ethnobotany** – Leaf infusion used for the treatment of venereal diseases, malaria and fatigue. Root decoction administered orally for infant conditions.  
No. of independent reports 7  Disease(s) cited 4  *BOO 1071 (NAI).

* Melia azedarach  Dwele (DHOLUO)  
**Ethnobotany** - Children with measles, ‘ang’we’, bathed with an infusion made from crushed leaves of *Kedrostris foetidissima* and *Melia azedarach*. Leaf infusion administered orally for malaria, stomachache and constipation.  
No. of independent reports 19  Disease(s) cited 4  *BOO 1104 (NAI).

* Turraea robusta  Ragwe pien (DHOLUO)  
**Ethnobotany** – Leaf infusion sprinkling helps maintaining calm in the homestead.  
No. of independent reports 1  Disease(s) cited 1  *BOO 1162 (NAI).

**MORACEAE**  
* Ficus spp.  Ng’owu (DHOLUO)  
**Ethnobotany** - The root and bark decoction of these species are used mainly for ‘yamo’ internal body pains treatment.  
No. of independent reports 1  Disease(s) cited 1  *BOO 1076 (NAI).

**MYRTACEAE**  
* Eucalyptus citriodora  Bao (DHOLUO)  
**Ethnobotany** – Leaves used in most preparations that treat ‘yamo’ internal body pains. Normally mixed with *Lannea schweinfurthii*, *Euclea divinorum* and *Carissa spinarum*. Bark burnt and ash mixed with salt to ease expectoration in difficult coughs.  
No. of independent reports 9  Disease(s) cited 2  *BOO 1073 (NAI).

* Psidium guajava  Mapera (DHOLUO)  
**Ethnobotany** – Root decoction administered orally for diarrhoea.  
No. of independent reports 3  Disease(s) cited 1  *BOO 1121 (NAI).

**OLEACEAE**  
* Jasminum fluminense  Oseke (DHOLUO)  
**Ethnobotany** - The leaf infusion is drunk for ‘sigete’ abdominal pains during menses and ‘chira’ condition of moral and/ or ritual impurity. The root decoction is drunk for delayed or missed menses. Leaf infusion instilled into nostrils for ‘ndulme’ or epilepsy.  
No. of independent reports 3  Disease(s) cited 3  *BOO 1090 (NAI).

**PEDALIACEAE**  
* Sesamum calycinum  Anyulo (DHOLUO)  
**Ethnobotany** - Leaves prepared into a vegetable that reportedly settles upset stomach.
POACEAE (nom. alt. GRAMINEAE)

*Sorghum bicolor*  
Bel (DHOLUO)  
**Ethnobotany** – The fruits are eaten, juice swallowed or crushed and the resulting infusion used as an anti-diarrhoeal remedy.  
No. of independent reports 2  
Disease(s) cited 1  
*BOO 1144 (NAI).*

*Cynodon dactylon*  
Modhno (DHOLUO)  
**Ethnobotany** – Leaf chewed and sap applied on baby’s mouth as protective medicine. Specific grass plant trailing across a path considered a source of good luck ‘hawi’. Plant used as a love charm; also for winning influence in court.  
No. of independent reports 4  
Disease(s) cited 2  
*BOO 1043 (NAI).*

*Cymbopogon citratus*  
Majand lum (DHOLUO)  
**Ethnobotany** – Leaf decoction drunk for ‘orianyancha’ loose stools and treating ‘diep’ diarrhoea.  
No. of independent reports 3  
Disease(s) cited 2  
*BOO 1044 (NAI).*

PHYTOLACCACEAE

*Phytolacca dodecandra*  
Owoho/ oboho (DHOLUO)  
**Ethnobotany** – Leaf infusion used to induce placenta expulsion.  
No. of independent reports 1  
Disease(s) cited 1  
*BOO 1118 (NAI).*

PLUMBAGINACEAE

*Plumbago zeylanica*  
Rachier (DHOLUO)  
**Ethnobotany** – Crushed leaves of the plant and those of *Phyllanthus fischeri* used for massaging sprained limbs. Plant infusion drunk for measles.  
No. of independent reports 5  
Disease(s) cited 2  
*BOO 1119 (NAI).*

POLYGONACEAE

*Oxygonum sinuatum*  
Okuro (DHOLUO)  
**Ethnobotany** – Crushed leaves applied on boil.  
No. of independent reports 4  
Disease(s) cited 1  
*BOO 1115 (NAI).*

PORTULACACEAE

*Portulaca oleracea*  
Taga taga (DHOLUO)  
**Ethnobotany** - The leaf sap applied on skin rashes as remedy.  
No. of independent reports 1  
Disease(s) cited 1  
*BOO 1117 (NAI).*

RANUNCULACEAE

*Clematis brachiata*  
Achogo (DHOLUO)  
**Ethnobotany** - Crushed inflorescence essence inhaled for nasal congestion during common cold.
RHAMNACEAE

*Ziziphus abyssinica*

**Ethnobotany** - The boiled root concoction with other species prepared for 'yamo' internal body pains and venereal diseases.

No. of independent reports: 5  
Disease(s): 2  
*BOO 1155 (NAI).*

RUBIACEAE

*Oldenlandia corymbosa*

(NO DHOLUO NAME GIVEN)

**Ethnobotany** - The leaf infusion used in treating ritual impurity 'chira'.

No. of independent reports: 1  
Disease(s): 1  
*BOO 1116 (NAI).*

*Rubia cordifolia*

Agwayo/ mdhoyi (DHOLUO)

**Ethnobotany** - Leaf ash used for scarifying child against 'sihoho' severe stomachache caused by sorcery, also applied on mother's breast. Whole plant is burnt and ash applied or licked for oral thrush.

No. of independent reports: 5  
Disease(s): 2  
*BOO 1130 (NAI).*

*Gardenia ternifolia*

Rayudhi (DHOLUO)

**Ethnobotany** - Twigs are placed on eaves of hut to prevent lightning strikes.

No. of independent reports: 8  
Disease(s): 1  
*BOO 1078 (NAI).*

RUTACEAE

*Citrus limon*

Ndim (DHOLUO)

**Ethnobotany** - Root boiled and the decoction drunk for stomachache. Roots or fruit decocted and the decoction drunk for stomachache.

No. of independent reports: 6  
Disease(s): 1  
*BOO 1039 (NAI).*

*Clausena anisata*

Ang’we (DHOLUO)

**Ethnobotany** - The leaf stem decoction used as a bath and drunk for measles and fumigated for colds and chest conditions. Plant infusion used in keeping spirits away.

No. of independent reports: 5  
Disease(s): 3  
*BOO 1041 (NAI).*

*Zanthoxyllum chalybeum*

Roko (DHOLUO)

**Ethnobotany** - Roots mixed with *Albizia coriaria* bark and boiled. Decoction drunk for 'mbaha' jaundice. Roots also mixed with *Euclea divinorum* and *Plectranthus barbatus* for treating 'yamo'. The root decoction given to expectant mothers with 'inactive' foetuses.

No. of independent reports: 16  
Disease(s): 3  
*BOO 1170 (NAI).*

*Toddalia asiatica*

Nyalwet kwach (DHOLUO)

**Ethnobotany** - Root decoction mixed with other plants (including *Warburgia ugandensis*) used to treat 'yamo'. Root decoction alone serves for 'yamo' internal pains of
the stomach. To initiate emesis on livestock root with that of *Tylosea fassoglene*
de decocted and administered orally to animals.
No. of independent reports 28 Disease(s) cited 2 *BOO 1163 (NAI).

*Teclea nobilis*  Ondati/ Ondagwa (DHOLUO)
Ethnobotany — Roots with those of *Zanthoxylum chalybeum* and *Euclea divinorum*
de decocted and administered orally for ‘yamo’ internal body pains.
No. of independent reports 1 Disease(s) cited 1 *BOO 1164 (NAI).

**SAPINDACEAE**

*Cardiospermum halicacabum*  Binya (DHOLUO)
Ethnobotany — Leaf embrocation used to massage sprained muscles and polio ‘abach’ patients. Crushed leaves pasted on boils to enhance bursting.
No. of independent reports 1 Disease(s) cited 2 *BOO 1038 (NAI).

**SIMAROUBACEAE**

*Harrisonia abyssinica*  Pedo (DHOLUO)
Ethnobotany — The root decoction with *Euclea divinorum* given as griping water to young and also as stomachache remedy.
No. of independent reports 9 Disease(s) cited 1 *BOO 1077 (NAI).

**SOLANACEAE**

*Solanum incanum*  Ochok (DHOLUO)
Ethnobotany — Root baked and chewed, sap swallowed to treat sore throat and hasten delivery. Seed used in ordeal trial or swearing, stepped on and guilty is fatal. Roots mixed with those of *Crinum macowanii* are infused or decocted for colds. Root decoction used to treat typhoid.
No. of independent reports 12 Disease(s) cited 4 *BOO 1143 (NAI).

*Solanum nigrum*  Osuga (DHOLUO)
Ethnobotany — Plant infusion sat on for prolapsed rectum. Eaten as a vegetable it eases constipation. Pregnant women are encouraged to eat the vegetable prepared from its leaves; the belief is that they will then give birth to dark-eyed and smooth-skinned babies. Leaves crushed and applied on the skin for fungal infections called ‘jumbe’.
No. of independent reports 2 Disease(s) cited 2 *BOO 1152 (NAI).

*Solanum sessilistellatum*  (NO DHOLUO NAME GIVEN)
Ethnobotany — Fruit sap instilled into goat, sheep or cow’s nose to kill worms.
No. of independent reports 1 Disease(s) cited 1 *BOO 1147 (NAI).

*Capsicum annum*  Apilo (DHOLUO)
Ethnobotany — Fruit consumed with food to stop constipation.
No. of independent reports 1 Disease(s) cited 1 *BOO 1404 (NAI).
Physalis peruviana
Ethnobotany – Aching heels, ‘gik’ or hiccups treated by oral administration of crushed leaf infusion.
No. of independent reports 1 Disease(s) cited 1 *BOO 1120 (NAI).

Withania somnifera
Ethnobotany – For infant conditions, especially ‘mbaha’ jaundice, the root boiled administered to child orally and by fumigation.
No. of independent reports 11 Disease(s) cited 1 *BOO 1168 (NAI).

SCROPHULARIACEAE
Cynchium adonense
Ethnobotany – Leaf infusion
No. of independent reports 1

TILIACEAE
Corchurus trilocularis
Ethnobotany - Crushed leaves are applied on infant’s gum to treat plastic teeth ‘jimo’.
No. of independent reports 1 Disease(s) cited 1 *BOO 1032 (NAI).

Grewia bicolcor
Ethnobotany – Leaves and bark used to prepare meat poisoned by venom. Branchlets used in granary and basket construction. Branchlets used to tame wild domestic stock. Root or bark mixed with other species and boiled, decoction used in treatment of ‘yamo’ internal body pains. Plant used magically to unite people.
No. of independent reports 4 Disease(s) cited 2 *BOO 1079 (NAI).

Triumfetta rhomboidea
Ethnobotany - Roots chewed and juice swallowed to hasten placenta expulsion.
No. of independent reports 1 Disease(s) cited 1 *BOO 1159 (NAI).

VERBENACEAE
Clerodendrum myricoides
Ethnobotany - Root decoction administered orally to women with ‘sigete’ abdominal pains during menses. Root decoction with Maesa lanceolata, Carissa spinarum, Maytenus senegalensis roots drunk for ‘yamo’
No. of independent reports 1 Disease(s) cited 2 *BOO 1132 (NAI).

Clerodendrum rotundifolium
Ethnobotany – Leaf infusion and root decoction prepared for stomachache. Leaf infusion drunk for fever.
No. of independent reports 1 Disease(s) cited 2 *BOO 1037 (NAI).

Lantana camara
Ethnobotany – Onyalo biro/ tek tagwari (DHOLUO)
Ethnobotany - Crushed leaves sap swallowed for sore throat and coughs.  
No. of independent reports 1  Disease(s) cited 2  *BOO 1100 (NAI).

*Lantana trifolia*  
Nyabend winyo (DHOLUO)  
Ethnobotany – Leaf infusion used as a wash for hurt eye or trachoma.  
No. of independent reports 1  Disease(s) cited 1  *BOO 1414 (NAI).

**VISCACEAE**  
*Viscum bagshawei*  
Achwogra (DHOLUO)  
Ethnobotany – Plant leaves and stem used to enhance sexual performance.  
No. of independent reports 1  Disease(s) cited 1  *BOO 1166 (NAI).

**VITACEAE**  
*Cissus rotundifolia*  
Minya (DHOLUO)  
Ethnobotany – Leaf infusion administered orally to coughing/sneezing poultry *gwen manur*.  
No. of independent reports 1  Disease(s) cited 1  *BOO 1036 (NAI).

*Cissus quadrangularis*  
Minya (DHOLUO)  
Ethnobotany – Leaf infusion given to livestock for unknown condition. Mixed with *Aloe* spp. the leaf infusion also given to poultry for swollen eyes.  
No. of independent reports 1  Disease(s) cited 2  *BOO 1040 (NAI).

*Rhioicissus revoilii*  
Rabong’o (DHOLUO)  
Ethnobotany – Decoction of root plus that of *Gardenia ternifolia* drunk for ‘dhoho/mbiko’ leprosy.  
No. of independent reports 13  Disease(s) cited 1  *BOO 1134 (NAI).

**ZINGIBERACEAE**  
*Zingiber officinale*  
Tangaus (DHOLUO)  
Ethnobotany – Roots decocted and chewed for ‘yamo’ internal body pains.  
No. of independent reports 1  Disease(s) cited 1  *BOO 1171 (NAI).

*Aframomum mala*  
Akuno/osaye (DHOLUO)  
Ethnobotany – Fruit eaten with seeds as antihelminthics crushed seeds alone induce vomiting.  
No. of independent reports 1  Disease(s) cited 2  *BOO 1012 (NAI).

**4.32 Kuria Ethnobotany**

**ACANTHACEAE**  
*Asystasia schimperi*  
Irichiria (IGIKURIA)  
Ethnobotany – Leaves eaten as vegetable for constipation and stomachache.  
No. of independent reports 1  Disease(s) cited 2  *BOO 1192 (NAI).
**Barleria eranthemoides**  
Omphonia (IGIKURIA)  
**Ethnobotany** – Leaf sap dropped into aching eye for relief.  
No. of independent reports 1  
Disease(s) cited 1  
*BOO 1198 (NAI).*

**Dyschoriste radicans**  
Enyakorogati/ Ekerarangere (IGIKURIA)  
**Ethnobotany** – The crushed leaves are used to massage sprained or sore muscles. Leaf infusion of the plant and those of *Erythrina abyssinica* administered orally for spirit possession. Pounded leaf, stem of plant or ash applied onto swollen breast areola after birth.  
No. of independent reports 3  
Disease(s) cited 3  
*BOO 1212 (NAI).*

**Justicia betonica**  
Mokera ogetango/ Mukeragitango (IGIKURIA)  
**Ethnobotany** – The leaf infusion administered orally for *ibimeni*, a condition where the infant invariably raises its rear prominences during sleep. Leaf infusion administered orally for stomachache in infants and adults.  
No. of independent reports 2  
Disease(s) cited 2  
*BOO 1216 (NAI).*

**Justicia flava**  
Esarara (IGIKURIA)  
**Ethnobotany** – Circumcision (*kusarwa*) initiates lay on these plants after the operation. The leaf infusion administered orally for *ibimeni* or worm infection.  
No. of independent reports 2  
Disease(s) cited 2  
*BOO 1218 (NAI).*

**Ruellia patula**  
Omphonia (IGIKURIA)  
**Ethnobotany** – The leaf sap dropped into eye to soothe from aching. Leaves chewed to relieve from coughing. Plant chewed by initiates on the eve of initiation.  
No. of independent reports 3  
Disease(s) cited 2  
*BOO 1219 (NAI).*

**Thunbergia alata**  
Ikinya kerangeta (IGIKURIA)  
**Ethnobotany** – Cattle with bloody urine given an infusion of *Sida tenuicarpa*, *Fuerstia africana* and *Dyschoriste radicans* leaves. The young buds wrapped in *S. incanum* leaves strapped with *Panicum* sp., then baked and hit on fireplace stone before pasting on boils to fasten their maturation. The paste is sealed with a spider egg case or *iritachandigi*. Leaves crushed and applied onto gums to prevent plastic teeth *amaino gomono*. A peculiar use for predetermining the sex of child to be conceived involves giving the mother plant leaf infusion for four days for a boy child and three days of fruit for girl child fruit. The dried plant leaves traditionally used as snuff.  
No. of independent reports 4  
Disease(s) cited 4  
*BOO 1197 (NAI).*

**ADIANTACEAE**

**Pellaea adiantoides**  
Umuri gwa igena, Umuri gwirigena (IGIKURIA)  
**Ethnobotany** – Circumcision initiants (*abasamba*) given the plant leaves and stem to chew on eve of the initiation day. Stem or leaf put in mouth to win case. To make initiates brave *kuhetia iriogo resaro*.  
No. of independent reports 1  
Disease(s) cited 1  
*BOO 1222 (NAI).*
AGAVACEAE
Agave sisalana Amakonge (IGIKURIA)
Ethnobotany – Leaf sap used for removing vermin from cattle. Applied onto ticks ‘chingoha’. Cattle drenched with leaf sap for bloat.
No. of independent reports 2 Disease(s) cited 2 *BOO 1195 (NAI).

ALOACEAE
Aloe dawei Ekegaka (IGIKURIA)
Ethnobotany – The leaf sap is used in initiating weaning of the young ones. Sap also applied on breasts to prevent babies from suckling. Leaf decoction drunk for oedematous feet.
No. of independent reports 3 Disease(s) cited 3 *BOO 1231 (NAI).

Aloe lateritia Ekegaka (IGIKURIA)
Ethnobotany – Sap applied on breasts to prevent babies from suckling. The plant leaves rubbed gently on sore muscles. Leaf infusion used for chicken diseases.
No. of independent reports 1 Disease(s) cited 3 *BOO 1235 (NAI).

AMARANTHACEAE
Amaranthus hybridus Ekeboga (IGIKURIA)
Ethnobotany – The leaves eaten as vegetable. Pregnant women encouraged to eat this vegetable for good foetal development. Makes the baby active (move) in the womb.
No. of independent reports 1 Disease(s) cited 1 *BOO 1224 (NAI).

Amaranthus cruentus Omuchicha (IGIKURIA)
Ethnobotany – Leaves pounded and infusion administered orally for bloody diarrhoea.
No. of independent reports 1 Disease(s) cited 1 *BOO 1196 (NAI).

Achryanthes aspera Oroka ro mbwiri (IGIKURIA)
Ethnobotany – The leaves pounded and steeped into water then used as a bath against jaundice. Plant name literally translated means goat’s beard.
No. of independent reports 1 Disease(s) cited 1 *BOO 1221 (NAI).

ANACARDIACEAE
Lannea schimperi Umunyingei (IGIKURIA)
Ethnobotany – The bark steeped in dirty water as a disinfectant.
No. of independent reports 1 Disease(s) cited 1 *BOO 1223 (NAI).

Mangifera indica Umuyembe (IGIKURIA)
Ethnobotany – Young leaves boiled and given to persons suffering from jaundice or manjano. Also mixed with Napier grass (Pennisetum purpureum) leaves, lemon grass (Cymbopogon citratus), Citrus limon leaves and decocted for jaundice.
No. of independent reports 2 Disease(s) cited 1 *BOO 1208 (NAI).
Ozoroa insignis  
Ethnobotany — The leaf sap instilled into nose to treat meningitis. Bark decoction with other species including omutaminyo for fever.
No. of independent reports 1  Disease(s) cited 1  *BOO 1225 (NAI).

Rhus natalensis  
Ethnobotany — The bark plus that of Psidium guajavum and whole Emilia discifolia plant decocted for treating jaundice. The bark and leaves pounded and infusion or decoction administered to stop constipation and diarrhoea. Mixed with Carissa spinarum and Euclea divinorum the root decoction is used as a purgative. Upon birth leaf infusion given to human babies and calves to ease suckling. During bee harvest leaf chewed and sap spat onto bees to prevent them from stinging. Charcoal prepared from the tree used in preparation of traditional sour milks. Twigs used as toothbrushes. Fruits edible, used to flavour porridge; have a thirst reducing effect.
No. of independent reports 8  Disease(s) cited 8  *BOO 1220 (NAI).

Rhus vulgaris  
Ethnobotany — The young stems used as toothbrushes. Root decoction together with Carissa spinarum drunk orally for sexually transmitted diseases. Fruits edible.
No. of independent reports 2  Disease(s) cited 2  *BOO 1213 (NAI).

APOCYNACEAE
Carissa spinarum  
Ethnobotany — Roots with those of Citrus limon and bark of Erythrina abyssinica and Senna siamea decocted for sexually transmitted diseases. Root decoction drunk orally for internal swelling in the body.
No. of independent reports 2  Disease(s) cited 2  *BOO 1215 (NAI).

ARECACEAE (nom. alt. PALMAE)
Phoenix reclinata  
Ethnobotany — Root decoction administered orally to initiate stupor. The leaves used for craft and the palm rachis used in stirring sour milk in gourds ekerandi.
No. of independent reports 2  Disease(s) cited 1  *BOO 1227 (NAI).

ASCLEPIADACEAE
Sarcostemma viminalle  
Ethnobotany — Root chewed, sap swallowed to enhance parturition during difficult delivery.
No. of independent reports 1  Disease(s) cited 1  *BOO 1229 (NAI).

ASPARAGACEAE
Asparagus flagellaris  
(No IGIKURIA name given)
**Ethnobotany** – The plant is used to prevent bad luck. It makes one charming and enhances success.

No. of independent reports 1  
Disease(s) cited 1  
*BOO 1230 (NAI).

**APIACEAE (nom. alt. UMBELLIFERAE)**

*Centella asiatica*  
(NO IGIKURIA NAME GIVEN)

**Ethnobotany** – Plant infusion drunk to treat dogbite ‘oromerwe ne sese’. Whole plant decocted with others and administered to children suffering from ‘oboro bwachinyinyi’ or green faeces. The leaf infusion given to baby twins as a first ritual. Leaf infusion given to sustain ‘endaerausi amanje’ a ‘leaking’ pregnancy.

No. of independent reports 4  
Disease(s) cited 4  
*BOO 1241 (NAI).

**ASTERACEAE (nom. alt. COMPOSITAE)**

*Acmella caulirhiza*  
Igichanga raariamatei (IGIKURIA)

**Ethnobotany** – The plant’s leaves are chewed to induce salivation. The whole plant chewed, sap swallowed to ease toothache pain. Pounded plants steeped in water then given to cattle to increase milk production and improve appetite.

No. of independent reports 12  
Disease(s) cited 3  
*BOO 1232 (NAI).

*Ageratum conyzoides*  
Weisebo (IGIKURIA)

**Ethnobotany** – The crushed leaves applied onto wound to stop blood flow and also antiseptic; similarly applied to hasten maturation of boils. The leaf infusion given to griping infants. Infusion bathed in and administered orally to prevent rashes/ *ubusisa* in children. Plant leaves, mixed with those of *Emilia discifolia* and *Bidens pilosa* then boiled and the decoction given to young infants for constipation.

No. of independent reports 14  
Disease(s) cited 5  
*BOO 1226 (NAI).

*Aspilia mossambicensis*  
Ikiogia (IGIKURIA)

**Ethnobotany** – Leaves dried, grounded and applied on egesese or tropical wounds. Leaf chewed and juice applied on circumcision wound. To stop nose bleeds (epistaxis) leaf infusion instilled into nasal pore. The leaf infusion given for loose greenish stools in children and stomachache in adults. The root decoction administered as griping water to the newborn. Mother given leaf infusion throughout pregnancy to prevent delivery of babies whose navels *insisa* don’t heal, a condition described as fatal. Aerial plant parts used to wash utensils.

No. of independent reports 4  
Disease(s) cited 5  
*BOO 1228 (NAI).

*Berkheya spekeana*  
Irikagangwe/ Irikara rangwe (IGIKURIA)

**Ethnobotany** – The whole plant and another one named ‘iriraari’ burnt and the ash licked for chinsegete or menstrual cramps.

No. of independent reports 1  
Disease(s) cited 1  
*BOO 1199 (NAI).

*Bidens pilosa*  
Irigikia/ iritotoni/ irotoni maiso (IGIKURIA)
Ethnobotany – Whole plant decoction drunk for stomachache. The leaf infusion bathed in and administered orally to prevent rashes. Leaves crushed and applied on watery boils iritotorwa common in children. Plant leaves rubbed and sap applied on fresh wounds to stop blood flow.

No. of independent reports 5  Disease(s) cited 4  *BOO 1210 (NAI).

Conyza bonariensis

Ethnobotany – Pounded leaves used to make an infusion that is given to children to clear 'ibimeni' or worm infection. Leaf infusion of plant with Gutenbergia cordifolia syringed into anal pore of child to prevent ibimeni.

No. of independent reports 2  Disease(s) cited 1  *BOO 1209 (NAI).

Crassocephalum vitellinum

Ethnobotany – Pounded leaf infusion used for severe stomachache. The root chewed and sap swallowed to reduce bleeding during and after circumcision kusarwa.

No. of independent reports 2  Disease(s) cited 2  *BOO 1200 (NAI).

Cotula anthemoides

Ethnobotany – The whole plant is used in cooking bad meat or livestock carcass.

No. of independent reports 2  Disease(s) cited 1  *BOO 1211 (NAI).

Elephantopus scaber

Ethnobotany – The scabrous leaves pounded, mixed with cold water and used to improve appetite in cattle. The plant is used to treat a hard swelling on children’s abdomen.

No. of independent reports 2  Disease(s) cited 2  *BOO 1238 (NAI).

Emilia discifolia

Ethnobotany – Whole plant alone or leaves mixed with bark of Piliostigma thonningii and Erythrina abyssinica decocted for yellow fever or jaundice. Mixed with other plants to treat general conditions in infants.

No. of independent reports 3  Disease(s) cited 2  *BOO 1233 (NAI).

Galinsoga parviflora

Ethnobotany – The young and tender leaves are eaten as vegetable and plant decoction taken to prevent earaches and profuse/ excessive sweating.

No. of independent reports 2  Disease(s) cited 2  *BOO 1193 (NAI).

Gutenbergia cordifolia


No. of independent reports 4  Disease(s) cited 5  *BOO 1207 (NAI).
**Kleinia abyssinica**  
Ehoria (IGIKURIA)

**Ethnobotany** – Used by the *banchama* council of elders who lead, as an appeal court, and ensure a good harvest by performing rituals. The council also calls for community gatherings *ritongo* where hearings and announcements are made. Where *banchama* meet trees are not to be cut their gathering is called the *inchama*. They are a secret council. Eligible persons should be above 50 years of age, honest and discreet. During the late 1990’s the *iritongo* instituted *sungusungu* to control cattle rustling. Though operating with the sanction of the district administration, the group recognizes local norms of crime, trial and punishment.

No. of independent reports 1  
Disease(s) cited 1  
*BOO 1204 (NAI).

**Microglossa pyriformia**  
Ebegete begete (IGIKURIA)

**Ethnobotany** – The leaves mixed with *Erythrina abyssinica* bark are decocted and administered for stomachache. The leaves chewed and sap swallowed for sore throat. Pounded/crushed leaves inhaled for colds and headache. Plant with raindrop insect used for magic – believed to bring good luck. Leaf infusion used for menstrual cramps *chinkegeti*, believed to make the flow light. For boils it is used with another plant.

No. of independent reports 7  
Disease(s) cited 7  
*BOO 1194 (NAI).

**Schkuria pinnata**  
Amato amarogara/ Amatomaroro (IGIKURIA)

**Ethnobotany** – The leaf decoction administered for malaria. Pounded leaf infusion drunk for stomachache and also for initiating vomiting. Leaf infusion cure for evil eye witchcraft.

No. of independent reports 3  
Disease(s) cited 4  
*BOO 1191 (NAI).

**Solanecio angulatus**  
(NO IGIKURIA NAME GIVEN)

**Ethnobotany** – The roots of the plant are dug and heated in embers. The sap of baked root is swallowed to ease toothache.

No. of independent reports 1  
Disease(s) cited 1  
*BOO 1234 (NAI).

**Sonchus oleracea**  
(NO IGIKURIA NAME GIVEN)

**Ethnobotany** – Whole plant infusion used with others to confuse people, make them forget home.

No. of independent reports 1  
Disease(s) cited 2  
*BOO 1236 (NAI).

**Tagetes minuta**  
Irichaga (IGIKURIA)

**Ethnobotany** – The leaf sap applied on wounds to hasten healing and stop bleeding. The plant is used in killing and keeping fleas and *obororo* mites away from the house; fireplace ash – *iribwi* also used. Cattle with bloat from consuming cassava or maize given an infusion of crushed plant. In goats a condition accompanied by delirium-like symptoms and a baked liver *iriim*, the crushed roots are mixed with some water and potassium permanganate. Leaf sap wiped on rashes on children’s feet. Children bathed in leaf infusion against measles and rashes.

No. of independent reports 8  
Disease(s) cited 6  
*BOO 1258 (NAI).
**Tithonia diversifolia**

*Irita kunguha (IGIKURIA)*

**Ethnobotany** – Leaf infusion or decoction drunk for stomachache. Mixed with *Senna siamea* roots the leaves are boiled and the decoction administered for typhoid and constipation. Leaves mixed with those of *Warburgia ugandensis*, infused and used for treating watery diarrhoea. Root decoction drunk to treat jaundice or *manjano* characterized by yellowish eyes and urine.

No. of independent reports 6  
Disease(s) cited 5  
*BOO 1217 (NAI).*

**Vernonia amygdalina**

*Umurururwa (IGIKURIA)*

**Ethnobotany** – Leaves crushed and mixed with water. This infusion is drunk as remedy for hiccups and stomachache. Rashes in children treated by applying crushed leaves. Twigs and leaf used for making traditional beds. Root decoction for purgation of intestinal vermin in infants, also recommended for *iriheme*; a condition characterized by swollen kidney. For the latter condition the decoction taken for four days. Leaves can be used as soap.

No. of independent reports 6  
Disease(s) cited 4  
*BOO 1214 (NAI).*

**Vernonia galamensis**

(NO IGIKURIA NAME GIVEN)

**Ethnobotany** – The leaves pounded with those of *Ageratum conyzoides* pasted onto boils to hasten ripening.

No. of independent reports 1  
Disease(s) cited 1  
*BOO 1256 (NAI).*

**Vernonia karaguensis**

*Irinya bukima (IGIKURIA)*

**Ethnobotany** – The leaf decoction given to young babies. The root decoction used to treat worms. Root infusion for stomachache. Leaf chewed and sap swallowed to ease coughing.

No. of independent reports 4  
Disease(s) cited 4  
*BOO 1237 (NAI).*

**Vernonia lasiopus**

(NO IGIKURIA NAME GIVEN)

**Ethnobotany** – The pounded leaf infusion used as bath for swollen legs.

No. of independent reports 1  
Disease(s) cited 1  
*BOO 1240 (NAI).*

**BIGNONIACEAE**

*Kigelia africana*  
*Omoriba/ Omuriba (IGIKURIA)*

**Ethnobotany** – Fruit flesh decocted and administered as an anti-anaemic. Fruits pounded and infusion drunk or fruit hidden and believed to take with them mumps away. Used in curing child urination on beddings. Also the same could be stopped by climbing the tree, urinating while on top alighting and not looking back. For livestock the pounded bark infusion sprinkled on cattle wounds. The wood from *Kigelia africana* preferred for making yoke for oxen ploughs.

No. of independent reports 4  
Disease(s) cited  
*BOO 1239 (NAI).*

**BORAGINACEAE**

*Cynoglossum caerulum*  
*Roka ro mburi (IGIKURIA)*
Ethnobotany - Mothers giving birth to children with navels *insisa* that don’t heal; leading to death, given leaf infusion through her pregnancy.

No. of independent reports 1  Disease(s) cited 1  *BOO 1242 (NAI).

**CANNABINACEAE**

*Cannabis sativa*  Ichaga (IGIKURIA)

*Ethnobotany* - Leaf infusion can be used to treat measles.

No. of independent reports 2  Disease(s) cited 1  *BOO 1244 (NAI).

**CANELLACEAE**

*Warburgia ugandensis*  Esoko (IGIKURIA)

*Ethnobotany* - Bark pounded mixed with water and infusion drunk for stomachache. Bark infusion also given to cattle with bloody diarrhoea.

No. of independent reports 1  Disease(s) cited 2  *BOO 1245 (NAI).

**CAPPARIDACEAE**

*Cleome hirta*  (NO IGIKURIA NAME GIVEN)

*Ethnobotany* - Leaves eaten as vegetable

No. of independent reports 1  Disease(s) cited 1  *BOO 1246 (NAI).

**CARICACEAE**

*Carica papaya*  Omobaibai (IGIKURIA)

*Ethnobotany* - The roots and those of *Erythrina abyssinica* boiled and drunk as treatment for venereal diseases. Male papaya (*omobaibai mosaja*) plant’s roots baked in fire and chewed for yellow faeces and decocted for venereal diseases or *egesonono*. Leaf decoction used as an infant bath for an unspecified condition.

No. of independent reports 6  Disease(s) cited 2  *BOO 1247 (NAI).

**CHENOPODIACEAE**

*Chenopodium album*  (NO IGIKURIA NAME GIVEN)

*Ethnobotany* - Leaf infusion administered orally for worms.

No. of independent reports 1  Disease(s) cited 1  *BOO 1248 (NAI).

**CHRYSOBALANACEAE**

*Parinari curatellifolia*  Omotaburo (IGIKURIA)

*Ethnobotany* - The young leaves and bark are decocted for chest pains.

No. of independent reports 1  Disease(s) cited 1  *BOO 1249 (NAI)

**COMBRETACEAE**

*Combretum collinum*  Omorama (IGIKURIA)

*Ethnobotany* - A ceremonial plant whose young twigs are used to drive cattle to bride’s house during *enyaangi* - marriage ceremony. Brings blessings and the twigs used are placed above the doorway after the marriage. These young twigs or those of *Sida* sp. can
be used for this. Leaves chewed and juice swallowed for stomachache. During hut construction the first hole dug is meant for an omorama pole.

No. of independent reports 5  Disease(s) cited 3  *BOO 1250 (NAI).

**Terminalia mollis**
Omoturumo/ Muturumu (IGIKURIA)

**Ethnobotany** – Ritually prepared tree’s fruits used for killing by witchcraft. Tree felled on blind cat to enable this effect. Used for furniture making.

No. of independent reports 1  Disease(s) cited 1  *BOO 1251 (NAI).

**COMMELINACEAE**
**Cyanotis arachnoidea**
Ege eta (IGIKURIA)

**Ethnobotany** – The succulent leaves are gently rubbed onto swollen areas. The whole plant burnt and ash licked for mouth wounds.

No. of independent reports 1  Disease(s) cited 1  *BOO 1252 (NAI).

**Commelina benghalensis**
Irikangire (IGIKURIA)

**Ethnobotany** – The leaves eaten as vegetable.

No. of independent reports 1  Disease(s) cited 1  *BOO 1253 (NAI).

**CONVOLVULACEAE**
**Evolvulus alsinoides**
Irinyeregania (IGIKURIA)

**Ethnobotany** – The pounded plant used in treating difficult boils, prevents them from appearing in bad areas. Helps translocate boils to manageable areas. Pounded leaves and those of *Cissampelos mucronata* pasted to ripen boils.

No. of independent reports 2  Disease(s) cited 2  *BOO 1254 (NAI).

**CELESTRACEAE**
**Elaeodendron buchananii**
Muthinithi (IGIKURIA)

**Ethnobotany** – Bark infusion and decoction administered for livestock diseases.

No. of independent reports 2  Disease(s) cited 1  *BOO 1255 (NAI).

**Maytenus senegalensis**
Ikibute (IGIKURIA)

**Ethnobotany** – Young leaves crushed and sap swallowed, then rubbed on the belly area of the body to treat ‘ichiinkegeti’ menstrual period pains. Pounded bark infusion and decoction given to ease birth. Pounded leaf infusion administered orally for oboroi bwinyinyi or green faeces.

No. of independent reports 3  Disease(s) cited 1  *BOO 1259 (NAI).

**CURCUBITACEAE**
**Cucumis melo**
Umunyabirondo (IGIKURIA)

**Ethnobotany** – The root decoction drunk for snake or dog bite.

No. of independent reports 2  Disease(s) cited 3  *BOO 1260 (NAI).

**Momordica foetida**
Omobora (IGIKURIA)
Ethnobotany – For swollen glands *ching’wena* in calves, the pounded leaves compressed on affected areas then calf drenched with leaf infusion. 
No. of independent reports 1 Disease(s) cited 1 *BOO 1261 (NAI).

**Zehneria scabra**  
Ewaawa (IGIKURIA) 

Ethnobotany – This plant is taken to prevent stomach swelling during beer drinking. Crushed leaf infusion used to bath children with rashes. 
No. of independent reports 2 Disease(s) cited 2 *BOO 1262 (NAI)

**DRACAENACEAE** 

*Dracaena fragrans*  
Irikubo (IGIKURIA) 

Ethnobotany – The shoots of this plant are placed in the house eaves to keep away ‘umwitii’ owls from perching in the homestead at night. The owl brings bad luck (ill health and death). The plant is sacred/ blessed. The twigs placed on kraal doorway to prevent foot and mouth disease in livestock. Also used for granary construction. 
No. of independent reports 2 Disease(s) cited 2 *BOO 1263 (NAI).

**EBENACEAE** 

*Euclea divinorum*  
Ikimusi (IGIKURIA) 

Ethnobotany – Root decoction for purgation. Leaf decoction used to treat jaundice. The plant twigs placed on house eaves to keep away owls from the homestead. Leaf infusion given to cattle for unspecified condition. Plant roots mixed with *Toddalia asiatica*, *Carica papaya*, *Carissa spinarum* and those of *Hibiscus fuscus* boiled for a long time and administered orally for stomachaches. Reported to cause urination of toxic stuff. 
No. of independent reports 5 Disease(s) cited 5 *BOO 1264 (NAI).

**EUPHORBIACEAE** 

*Bridelia micrantha*  
Umuturu nkanga/ Mokoronkanga (IGIKURIA) 

Ethnobotany – Mature tree branches used in constructing *ikiihita* or homestead gate. The plant's bark together with that of *Rhus vulgaris* decocted and given to cattle as a supplement. 
No. of independent reports 2 Disease(s) cited 1 *BOO 1265 (NAI).

**Croton macrostachyus**  
Omosocho (IGIKURIA) 

Ethnobotany – Freshly fallen leaves pounded, mixed with water and given to cattle with swollen neck glands. The leaf sap applied on fresh wounds as haemostatic. For mid foot sole pains leaves are placed on the *inyyengerahia* (additional stone) fire place stone to warm and then used as warm compresses by gently stepping on with the ailing foot (cellulitis). Injured calf eye splashed/ washed with leaf infusion. Leaves burnt and ash licked to manage oral thrush. 
No. of independent reports 7 Disease(s) cited 4 *BOO 1266 (NAI).

**Erythrococca bongensis**  
(NO IGIKURIA NAME GIVEN)
**Ethnobotany** — Tiny worms called *'ibimeni'* are treated by anal administration of the leaf infusion. Wasting child disease called *chinkera* caused by immorality/ adultery is prevented by sewing the branch spines in child’s cloth.

No. of independent reports 1  Disease(s) cited 2  *BOO 1270 (NAI).

**Euphorbia candelabrum**  
Engoto (IGIKURIA)

**Ethnobotany** — The plant sap used in preparing poison arrows. Used in some rituals.

No. of independent reports 2  Disease(s) cited 2  *BOO 1268 (NAI).

**Euphorbia hirta**  
Ikinya bobere (IGIKURIA)

**Ethnobotany** — The sap used in treating eye conditions, trachoma like condition called *ensongo*.

No. of independent reports 1  Disease(s) cited 1  *BOO 1273 (NAI).

**Euphorbia tirucalli**  
Ikinyara (IGIKURIA)

**Ethnobotany** — The milky sap dropped into hurt livestock eyes. Used as live fence.

No. of independent reports 1  Disease(s) cited 1  *BOO 1243 (NAI).

**Jatropha curcas**  
Omuintankoba (IGIKURIA)

**Ethnobotany** — The leaf sap applied on bleeding areas as haemostatic, enhancing clotting, and antiseptic. The unripe seeds eaten daily are reported to have female contraceptive activity.

No. of independent reports 3  Disease(s) cited 2  *BOO 1269 (NAI).

**Ricinus communis**  
Irisiribono/ Iribono/ Iririransani (IGIKURIA)

**Ethnobotany** — For speedy delivery the roots are chewed and the sap swallowed. The white part of the seed can be used for violent purgation (eaten). Finger millet porridge is given as antidote to the initiated diarrhoea. Unspecified parts of the plant used in preventing *ibiriri* or evil eye. This perilous witchcraft is usually possessed by women. When such a woman looks at somebody’s food, the food turns bad inside the stomach of the victim who develops strong stomach aches and can, if not treated by a specialist, die a painful death. Unspecified plant parts with those of another species used in preparing fish poison. Dried seed put in obohoro, overnight ugali, and swallowed for weak vision and also its prevention. Leaves of plant and those of *Rhus natalensis* pounded, mixed with salt and given to cattle as a galactagogue. Seeds used in magical way to predetermine the gender of child a couple desires.

No. of independent reports 7  Disease(s) cited 6  *BOO 1267 (NAI).

**Synadenium grantii**  
Ikirigiiria/ Ikirigiiri (IGIKURIA)

**Ethnobotany** — The milky sap instilled into leaking ear. Planted in the homestead the tree prevents *ibiriri* or evil eye. Tree twiglets tied to expectant cow’s tail to prevent its growing udders being affected by the evil eye.

No. of independent reports 2  Disease(s) cited 3  *BOO 1257 (NAI).
Tragia brevipes

Induri (IGIKURIA)

Ethnobotany – Used in magic. The plant used in a peculiar way to win a woman’s love (iriheebia) love charm. That particular plant to be used should be growing on an anthill and picked early in the morning to work.

No. of independent reports 2  Disease(s) cited 2  *BOO 1284 (NAI).

FABACEAE (nom. alt. LEGUMINOSAE)

Desmodium setigerum

(NO IGIKURIA NAME GIVEN)

Ethnobotany – Crushed leaves applied on umbilical cord and infusion given to an infant whose navel heals slowly or is not healing.

No. of independent reports 1  Disease(s) cited 1  *BOO 1271 (NAI).

Erythrina abyssinica

Omotembe/ Egetembe (IGIKURIA)

Ethnobotany – Miscarriages in pregnant women or enderarwa prevented by drinking heartwood decoction. Colostrum milk placed on the young leaf buds amato amarere and instilled in calves' nose to prevent swelling at the node of the mandibular/ lower jaw. Root decoction used in treating jaundice.

No. of independent reports 2  Disease(s) cited 3  *BOO 1272 (NAI).

Indigofera arrecta

Egesanguji/ Egesangucha (IGIKURIA)

Ethnobotany – The root baked in embers and offered to woman experiencing birth difficulties. Root chewed and saliva swallowed to ease pain during labour. Root baked in embers and chewed to ease kichomi. Roots boiled and the decoction drunk to ward off fatigue and general malaise; revitalizes the body.

No. of independent reports 3  Disease(s) cited 4  *BOO 1274 (NAI).

Piliostigma thonningii

Egekobure (IGIKURIA)

Ethnobotany – Bark decoction administered to cattle for an unspecified condition.

No. of independent reports 1  Disease(s) cited 1  *BOO 1275 (NAI).

Pseudarthria hookeri

Ekegengerio/ Ikiginguri (IGIKURIA)

Ethnobotany – Root chewed and sap swallowed for excessive bleeding. The twig of this plant is used to gently tap/ hit a child unable to start walking. Leaf infusion drunk for stomachache.

No. of independent reports 3  Disease(s) cited 3  *BOO 1277 (NAI).

Senna bicapsularis

Omuchegechege (IGIKURIA)

Ethnobotany – Dried and ground leaves licked as treatment for asthma.

No. of independent reports 1  Disease(s) cited 1  *BOO 1286 (NAI).

Senna didymobotrya

Iribino (IGIKURIA)

Ethnobotany – Flower parts infusion or decoction used to treat flatulence, indigestion and constipation in adults and children. Flower petals decocted for jaundice and drunk orally, for up to one month in severe cases.
**Seneca occidentalis**

**Ethnobotany** – The plant used to treat snakebite *endomerwe ni njoka*. The plant name translated means taboo for snake.

- No. of independent reports: 1
- Disease(s) cited: 1
- *BOO 1288 (NAI)*.

**Stylosanthes fruticosa**

**Ethnobotany** – Pounded leaves infusion drunk for bloody diarrhoea.

- No. of independent reports: 1
- Disease(s) cited: 1
- *BOO 1281 (NAI)*.

**Tylosoema fassoglense**

**Ethnobotany** – Plant seed used by sorcerer to ‘turn away’ misfortune or bad luck. The plant decoction used in treating kidney conditions.

- No. of independent reports: 2
- Disease(s) cited: 1
- *BOO 1282 (NAI)*.

**LAMIACEAE (nom. alt. LABIATAE)**

**Ajuga integrifolia**

**Ethnobotany** – Leaves crushed and applied onto the breast to stop swollen breast pain in man and cattle.

- No. of independent reports: 1
- Disease(s) cited: 1
- *BOO 1278 (NAI)*.

**Fuerstia africana**

**Ethnobotany** – The leaves of the plant used to treat stomachache. The root infusion administered to children for measles. The plant infusion bathed with and leaves rubbed around the upper groin. The leaf infusion drunk to expel worms. The leaves are rubbed on the hands and the reddish sap applied on the face or small twig tucked into scalp hair to prevent witchcraft/ provide protection. Used magically to encourage rainfall, by scattering the rainbow *omokubia nyungu*.

- No. of independent reports: 7
- Disease(s) cited: 6
- *BOO 1283 (NAI)*.

**Hoslundia opposita**

**Ethnobotany** – Fruits of this plant relished by children. Ritual plant, young twigs worn as an armband, to prevent wasting condition in child resulting from its mother missing/ skipping funeral *amatanga* of a close relative and also prevent being made ritually unclean by *ibikwi*. The plant used in magic, can cause harm to persons who share a common lover, used when one of them falls ill. Used with *Ocimum gratissimum* to treat 'ibimeni' in children. Leaf infusion used for *ibimeni*. With *Ocimum gratissimum* leaf infusion used to lower children's fever; used as a bath.

- No. of independent reports: 5
- Disease(s) cited: 5
- *BOO 1285 (NAI)*.

**Leonotis nepetifolia**

**Ethnobotany** – Leaves boiled and administered orally for *chinsegete* or menstrual cramps. Leaf infusion administered orally for stomachaches.
Leucas calostachys

Ethnobotany - Leaf infusion drunk for stomachache endero kuuma, also used to cure the ibiriri or evil eye. Leaves heated and placed to clear hematomas, bloody bump under skin, hit by blunt objects due to assault. Reportedly clears up internal blood clots.

Ocimum gratissimum

Ethnobotany - The leaves are chewed and saliva swallowed for stomachache in adults and infants. The leaf infusion also used for this condition and flatulence. Leaves pounded, boiled in sealed vessel and vapour used to fumigate ere igundira for measles or ekeena. The leaf decoction or infusion used to bath child – reduces fever.

Ocimum kilimandscharicum

Ethnobotany - Mixed with Cassia kirkii leaves plus Leucas calostachys the decoction is offered to barren women. Dried leaves and vegetable oil eaten as cure for chest conditions and mild tuberculosis. The plant twigs plus inflorescences are used as mosquito deterrents.

Plectranthus barbatus

Ethnobotany - Leaves heated and applied onto painful body parts as compresses. The leaves of the plant chewed and juice swallowed to induce vomiting (emesis). A mixture of the plant's leaves plus those of Ocimum gratissimum and Tithonia diversifolia are pounded, boiled and the decoction given to treat oruchoka described as a worm infecting the child through the anus and going up to the neck through the spine. This causes head stiffness and convulsions. The infusion can also serve for this condition and stomachache. Baby bathed with leaf infusion for rashes. Leaves used as toilet wipe for babies. Children place these leaves on footpaths to beg for niceties during enyaangi or wedding ceremonies.

Plectranthus caninus

Ethnobotany - Crushed leaf infusion used to treat stomachache. The heated leaves applied to boils and infusion administered orally.

LORANTHACEAE
Loranthus platyphyllus  
(NO IGIKURIA NAME GIVEN)
Ethnobotany - Whole plant infusion used in magic preparations.
No. of independent reports 1  Disease(s) cited 1  *BOO 1292 (NAI).

MALVACEAE
Hibiscus fuscus  
Orotengeti/ Orosabai (IGIKURIA)
Ethnobotany - The pounded leaves applied on dark eyed boil and covered with iritachandigi, the papery film of the spider’s egg, to hasten bursting. Leaves pounded, dried and then added as ingredient for porridge to increase fertility.
No. of independent reports 2  Disease(s) cited 2  *BOO 1295 (NAI).

Sida tenuicarpa  
Irikuri ieng’ombe (IGIKURIA)
Ethnobotany - Gathered leaves pounded and pasted on irihute or boils. Leaves and twig decocted and given to expectant women to prevent miscarriages.
No. of independent reports 1  Disease(s) cited 2  *BOO 1364 (NAI).

Sida cordifolia  
Ikirundu (IGIKURIA)
Ethnobotany - Plant leaves and stem decocted and given to stop diarrhoea.
No. of independent reports 1  Disease(s) cited 1  *BOO 1312 (NAI).

MELIACEAE
Melia azedarach  
Muchongoma (IGIKURIA)
Ethnobotany - Leaf decoction drunk for stomachache.
No. of independent reports 1  Disease(s) cited 1  *BOO 1299 (NAI).

Turraea robusta  
Ekerekari (IGIKURIA)
Ethnobotany - With an unspecified plant sap used in preparing an arrow poison antidote.
No. of independent reports 1  Disease(s) cited 1  *BOO 1298 (NAI).

MELIANTHACEAE
Bersama abyssinica  
Ekebamba rahi (IGIKURIA)
Ethnobotany - Pounded root infusion used for fits and convulsions (epilepsy).
No. of independent reports 1  Disease(s) cited 1  *BOO 1358 (NAI).

MENISPERMACEAE
Cissampelos mucronata  
Otongaini o bagaka/ Urururu/ Urururua (IGIKURIA)
Ethnobotany - Root decoction with other plants used in treating barrenness. Used with V. madagascariensis leaves to treat ibichoncho or swollen neck glands in cattle. Hot machete used to press the affected area. Root decoction instilled into baby’s nose to treat convulsions (epilepsy); leaf infusion instilled into nose to stop bleeding, has haemostatic ability. The twiny stems also used as fastening/ packing material. Root infusion served ritually for severe stomachache called irikobi, case requires slaughter of sheep or drinking blood venedected using blade or arrow. Girl initiants given the plant infusion in their long period of their ritual seclusion.
MYRSINACEAE

*Maesa lanceolata*
Ekegunchanguba, Omotorere (IGIKURIA)

**Ethnobotany** – The leaves placed on kraal gateway to prevent/treat foot and mouth disease.

No. of independent reports: 1  
Disease(s): cited 1  
*BOO 1300 (NAI)*.

MYRTACEAE

*Psidium guajava*
Omobera (IGIKURIA)

**Ethnobotany** – Pounded leaves and egg yolk given to babies to stop diarrhoea. The leaves and those of other plants prepared into an infusion for *ibimeni* or round worms. The bark boiled with other plants and decoction given to treat jaundice.

No. of independent reports: 3  
Disease(s): cited 3  
*BOO 1301 (NAI)*.

OLEACEAE

*Jasminum fluminense*
Irinya ikore (IGIKURIA)

**Ethnobotany** – The leaf infusion of the plant and *Erythrococca bongensis* used to manage spirit possession. Crushed leaves gently rubbed on infant’s gums to prevent *ibisara* or false teeth. Infusion of leaves and those of *Vernonia karaguensis* administered orally and pulped leaves applied topically on *ibioso* or ringworm infested areas.

No. of independent reports: 4  
Disease(s): cited 3  
*BOO 1303 (NAI)*.

OPLILACEAE

*Opilia celtidifolia*
Mukuru kanga (IGIKURIA)

**Ethnobotany** – Leaf decoction taken orally to prevent miscarriages and prepare for safe birth.

No. of independent reports: 1  
Disease(s): cited 1  
*BOO 1304 (NAI)*.

OXALIDACEAE

*Biophytum petersiana*
Ikibundi (IGIKURIA)

**Ethnobotany** – The whole plant pounded and placed together with *obohoro* ugali on the cattle kraal gate. Plant chewed and the paste applied on circumcision wounds.

No. of independent reports: 2  
Disease(s): cited 2  
*BOO 1355 (NAI)*.

*Oxalis latifolia*
Egetheregania matei (IGIKURIA)

**Ethnobotany** – Leaves chewed to enhance salivation.

No. of independent reports: 1  
Disease(s): cited 1  
*BOO 1305 (NAI)*.

PEDALIACEAE

*Sesamum calycinum*
Iritia mbui (IGIKURIA)

**Ethnobotany** – The leaves are cooked and eaten as vegetable. The plant used as a treatment for misfortunes. The whole plant’s infusion used for bathing children with
omotere or measles. The slimy leaves applied on hands to aid the removal of tightly fitting bangles and rings.

No. of independent reports 3  Disease(s) cited 3  *BOO 1306 (NAI).

PHYTOLACCACEAE
Phytolacca dodecandra  Irihoko (IGIKURIA)
Ethnobotany – Root decoction used sparingly, only three spoonfuls, for severe stomachache.

No. of independent reports 1  Disease(s) cited 1  *BOO 1307 (NAI).

POACEAE (nom. alt. GRAMINEAE)
Cynodon dactylon  Orumuru/ Oromurua (IGIKURIA)
Ethnobotany – Accidental swallowing of fishbone or midge fly igichune prompts chewing of the stem, juice swallowed. Placed on doorstep to prevent person with evil intentions. Cattle with bloat or ichinda ivimbire fed with salted plant to relieve the condition. Used in magic especially to give economical benefit. Plant infusion drunk for stomachache.

No. of independent reports 4  Disease(s) cited 5  *BOO 1205 (NAI).

Eleusine coracana  Uburi (IGIKURIA)
Ethnobotany – The porridge prepared from millet ikirunguri, drunk hot or warm, is given to small children, the sick or very old in egesenjo split gourds, as nourishment and to revitalize them.

No. of independent reports 1  Disease(s) cited 1  *BOO 1310 (NAI).

Pennisetum trachyphyllum  Ituutu (IGIKURIA)
Ethnobotany – Leaves used to prepare an infusion for treating jaundice.

No. of independent reports 1  Disease(s) cited 1  *BOO 1309 (NAI).

POLYGONACEAE
Oxygonum sinuatum  Egosokoro/ Ekesokoro (IGIKURIA)
Ethnobotany – Leaves pounded and applied on boils to hasten their maturation. Leaves edible; eaten as relish.

No. of independent reports 1  Disease(s) cited 1  *BOO 1311 (NAI).

Rumex bequaertii  ~  Iritandura ngebo (IGIKURIA)
Ethnobotany – Roots boiled and administered orally for miscarriages.

No. of independent reports 1  Disease(s) cited 1  *BOO 1313 (NAI).

RANUNCULACEAE
Clematis brachiata  (NO IGIKURIA NAME GIVEN)
Ethnobotany – Leaf infusion used in treating cattle.

No. of independent reports 1  Disease(s) cited 1  *BOO 1206 (NAI).
Rubiaceae

*Gardenia volkensii* Ekegagana (IGIKURIA)

**Ethnobotany** – Crushed leaf infusion used to treat stomachache

No. of independent reports 1 Disease(s) cited 1 *BOO 1314 (NAI).

*Tarenna graveolens* Omonaigwa (IGIKURIA)

**Ethnobotany** – Used magically, twig or leaf inserted in mouth during court hearing to bring favourable hearing in a civil court or *iritongo* hearing.

No. of independent reports 1 Disease(s) cited 1 *BOO 1315 (NAI).

*Vangueria madagascariensis* Egokomorio/ Egekomoorio (IGIKURIA)

**Ethnobotany** – During child bearing labour pounded leaf infusion given to delivering mother to hasten birth. Fruit edible.

No. of independent reports 2 Disease(s) cited 1 *BOO 1316 (NAI).

Rutaceae

*Clausena anisata* Irinyagasuri (IGIKURIA)

**Ethnobotany** – Leaf decoction or infusion used for stomach ache and flatulence. This was considered a very vital remedy. Twig or branch given to child to hold to hasten walking; anxiety to have the child independent. The local name alludes to its strong smell.

No. of independent reports 2 Disease(s) cited 2 *BOO 1317 (NAI).

*Toddalia asiatica* Urunisia (IGIKURIA)

**Ethnobotany** – The plant used to prevent witchcraft. Root decoction boiled and administered orally for stomachache.

No. of independent reports 2 Disease(s) cited 2 *BOO 1318 (NAI).

*Teclea nobilis* Ekerorwe, Ekerore, Ekerroe (IGIKURIA)

**Ethnobotany** – The roots boiled and decoction drunk for bilharzia. Leaf infusion offered orally for stomachache. Tree twigs and branches used in making walking sticks and staffs. These sticks are not brittle and are used commonly for self defense and in ordeal trials.

No. of independent reports 3 Disease(s) cited 2 *BOO 1320 (NAI).

Scrophulariaceae

*Cynicium adonense* (NO IGIKURIA NAME GIVEN)

**Ethnobotany** – Whole plant harvested, dried and burnt. Ash applied on child’s tongue to clear oral thrush also called *obogaga*.

No. of independent reports 1 Disease(s) cited 1 *BOO 1322 (NAI).

Solanaceae

*Datura stramonium* Egisara (IGIKURIA)

**Ethnobotany** – A light porridge made of finger millet laced with ritually prepared leaf infusion of the plant causes hallucination. This preparation is administered by the
*banchama* in oathing/ ordeal trials when there is social strife/ insecurity. This oath is used to test the veracity of testimony.

No. of independent reports 2 Disease(s) cited 2 *BOO 1325 (NAI).

**Solanum aculeastrum**  
Iri botoboto (IGIKURIA)

**Ethnobotany** – The fruit sap instilled in livestock noses as a remedy.

No. of independent reports 2 Disease(s) cited 1 *BOO 1324 (NAI).

**Solanum incanum**  
Iritorotoro (IGIKURIA)

**Ethnobotany** – The root baked in embers and offered to woman experiencing birth difficulties. Root chewed and saliva swallowed to ease serious stomachache and pain during labour. The fruit is baked in fire, pierced and the sap used for *ogosara* or body tattooing. Invariably the baked root is removed then struck *kung'uta* on the middle/ lone fireplace stone to remove the ash *irikia iritaka*. Fruit sap applied on children's feet to heal rashes.

No. of independent reports 9 Disease(s) cited 4 *BOO 1276 (NAI).

**Solanum nigrum**  
Uruswega (IGIKURIA)

**Ethnobotany** – Stem/ leaf sap dropped into burst boil to prevent it from further blocking i.e. allow all abscess to leave.

No. of independent reports 1 Disease(s) cited 1 *BOO 1345 (NAI).

**Withania somnifera**  
Omokubia nyongo/ umukubia nyongo (IGIKURIA)

**Ethnobotany** – Whole plant infusion or decoction taken for bloody diarrhoea, also acts as purgative.

No. of independent reports 1 Disease(s) cited 1 *BOO 1328 (NAI).

**STERCULIACEAE**

**Dombeya burgessiae**  
Omugoya/ omung'osa (IGIKURIA)

**Ethnobotany** – Leaf infusion given to cow after calf birth to hasten placenta removal.

No. of independent reports 1 Disease(s) cited 1 *BOO 1323 (NAI).

**TILIACEAE**

**Grewia bicolor**  
Omokooma (IGIKURIA)

**Ethnobotany** – Inner bark tied to open wounds to prevent bleeding. Bark stripped, pounded, mixed with water and cow drenched with the infusion for bloat.
banchama in oathing/ ordeal trials when there is social strife/ insecurity. This oath is used to test the veracity of testimony.

No. of independent reports 2 Disease(s) cited 2 *BOO 1325 (NAI).

Solanum aculeastrum
- **Iri botoboto (IGIKURIA)**

**Ethnobotany** – The fruit sap instilled in livestock noses as a remedy.

No. of independent reports 2 Disease(s) cited 1 *BOO 1324 (NAI).

Solanum incanum
- **Iritorotoro (IGIKURIA)**

**Ethnobotany** – The root baked in embers and offered to woman experiencing birth difficulties. Root chewed and saliva swallowed to ease serious stomachache and pain during labour. The fruit is baked in fire, pierced and the sap used for ogosara or body tattooing. Invariably the baked root is removed then struck kung'uta on the middle/ lone fireplace stone to remove the ash irikia iritaka. Fruit sap applied on children's feet to heal rashes.

No. of independent reports 9 Disease(s) cited 4 *BOO 1276 (NAI).

Solanum nigrum
- **Uruswega (IGIKURIA)**

**Ethnobotany** – Stem/ leaf sap dropped into burst boil to prevent it from further blocking i.e. allow all abscess to leave.

No. of independent reports 1 Disease(s) cited 1 *BOO 1345 (NAI).

Withania somnifera
- **Omokubia nyongo/ umukubia nyongo (IGIKURIA)**

**Ethnobotany** – Whole plant infusion or decoction taken for bloody diarrhoea, also acts as purgative.

No. of independent reports 1 Disease(s) cited 1 *BOO 1328 (NAI).

**STERCULIACEAE**

Dombeya burgessiae
- **Omugoya/ omung'osa (IGIKURIA)**

**Ethnobotany** – Leaf infusion given to cow after calf birth to hasten placenta removal.

No. of independent reports 1 Disease(s) cited 1 *BOO 1323 (NAI).

**TILIACEAE**

Grewia bicolor
- **Omokooma (IGIKURIA)**

**Ethnobotany** – Inner bark tied to open wounds to prevent bleeding. Bark stripped, pounded, mixed with water and cow drenched with the infusion for bloat.
Grewia villosa  
Omoti aiguha (IGIKURIA)  
Root decoction offered as a tonic during pregnancy, expectant mother to avoid milk during this treatment.  
No. of independent reports 2  
Disease(s) cited 1  
BOO 1326 (NAI).

Triumfetta rhomboidea  
Igichuuria ng’ondi (IGIKURIA)  
Ethnobotany – The sticky fruit is business charm tucked on garments or ware to allure clients. Bark chewed to mitigate adverse effects of dust inhalation.  
No. of independent reports 2  
Disease(s) cited 2  
BOO 1327 (NAI).

VERBENACEAE  
Clerodendrum myricoides  
Omosese (IGIKURIA)  
Ethnobotany – The leaves and roots decocted for pneumonia in humans and livestock. Parasitic dodder plants found on this plant are believed to bring great luck and riches. The crushed root infusion or decoction administered to infants for sabura or mumps. The plant is considered to be a blessing, good to be in the homestead.  
No. of independent reports 4  
Disease(s) cited 4  
BOO 1297 (NAI).

Clerodendrum rotundifolium  
Irihinti bagura/ Irisinyoro (IGIKURIA)  
Ethnobotany – Leaf infusion used in treating worms. Hollow stem used to blow enema into child's anus, for ibimeni or worm infection. Sap from plant used in healing hurt livestock eyes.  
No. of independent reports 3  
Disease(s) cited 3  
BOO 1329 (NAI).

Lantana camara  
Omochibu, umuchibi (IGIKURIA)  
Ethnobotany – The leaves and those of Ocimum kilimandscharicum, Cupressus lusitanica decocted in airtight utensils and used as a fumigatory treatment.  
No. of independent reports 1  
Disease(s) cited 1  
BOO 1356 (NAI).

Lantana trifolia  
Kehembwe/ kebarisia, ekehembea babarisi (IGIKURIA)
**Ethnobotany** – Leaves applied onto infant’s gums to prevent plastic teeth. Leaf infusion dropped into nostrils at the beginning and month end to prevent convulsions. The leaf infusion sprayed onto hurt eye of cow. Leaf decoction brings a drunken stupor. Crushed roots mixed with petroleum jelly applied onto umbilical cord of newborn that does not heal. Fruits eaten as snack by children.

No. of independent reports 4  Disease(s) cited 4  *BOO 1320 (NAI).

*Lippia javanica*  
**Irinyente/ Irihiriria (IGIKURIA)**  
**Ethnobotany** – Pounded leaf infusion drunk for stomachache. The leaves are rubbed on fingers and inhaled for colds and headaches. Leaf decoction drunk for menstrual cramps. Charcoal from twigs used in preparing traditional sour milks. Plant leaves mixed with those of *Ocimum gratissimum*, made into an infusion drunk for *ibimeni* or worm infection.

No. of independent reports 4  Disease(s) cited 5  *BOO 1330 (NAI).

*Vitex fischeri*  
**Omuhurahura (IGIKURIA)**  
**Ethnobotany** – The leaves pounded and mixed with cold water to treat malaria.

No. of independent reports 1  Disease(s) cited 1  *BOO 1331 (NAI).

**VISCACEAE**  
*Viscum bagshawei*  
**Ethnobotany** – Whole plant infusion used in witchcraft.

No. of independent reports 1  Disease(s) cited 1  *BOO 1332 (NAI).

**VITACEAE**  
*Cissus rotundifolium*  (NO IGIKURIA NAME GIVEN)  
**Ethnobotany** – Leaves boiled for stomachache.

No. of independent reports 1  Disease(s) cited 1  *BOO 1333 (NAI).

*Cyphostemma serpens*  
**Enkomititi/ Irinabu (IGIKURIA)**  
**Ethnobotany** – The crushed leaf infusion used in treating jaundice. For bloody diarrhoea vine’s roots dug, dried for a day then decocted. The decoction said to be good for stomach conditions.

No. of independent reports 2  Disease(s) cited 3  *BOO 1334 (NAI).

*Cyphostemma adenocaule*  
**Ekeneebwe (IGIKURIA)**  
**Ethnobotany** – Pounded root decocted for stomachache and diarrhoea.

No. of independent reports 2  Disease(s) cited 2  *BOO 1280 (NAI).

*Rhoicissus revoilii*  
**Irirementa (IGIKURIA)**  
**Ethnobotany** – The leaf sap dropped into auditory pore to stop earache. The sap applied on the glans of circumcised boys as an antiseptic and haemostatic. Used by rainmakers *abogema* in rainmaking rituals. The root tuber is put in pots and foams, like clouds, and then placed beside home. Used to treat abscess *inzimana* on foot. In this therapy, leaves pounded with goat fat and placed on red hot pot pieces. The warmed leaves are then
placed on *Plectranthus* leaves then gently stepped on. For boils that are not ripening the leaves chewed and sap swallowed and pounded leaves pasted on the boil's eye.

No. of independent reports 3 Disease(s) cited 4 *BOO 1335 (NAI).

**ZINGIBERACEAE**

*Aframomum mala*  
Egetong’ono (IGIKURIA)

**Ethnobotany** – The fruits eaten for deworming.

No. of independent reports 1 Disease(s) cited 1 *BOO 1365 (NAI).*
4.40 Experimental results

4.41 Bioactivity exploration

Fifteen plants were collected following leads (based on the number of independent usage reports) supplied by Luo and Kuria traditional healers. Bioactivity screening (in vitro drug susceptibility tests) for possible antimicrobial activities followed using their methanolic extractions. The crude extract yields from the selected species are given in Table 3 below. The yields were calculated using the formula:

\[
\text{Percentage yield} = \frac{\text{weight of crude extract obtained}}{\text{weight of dried plant material used}} \times 100
\]

Methanol due to its polarity provides total extraction of secondary metabolites. In general most species had yields in the range of 5%, however, higher extraction efficiencies were noted for Toddalia asiatica and Albizia coriaria.

Table 3 - Crude extract yields

<table>
<thead>
<tr>
<th>Species</th>
<th>Plant part</th>
<th>Percentage yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bidens pilosa</td>
<td>Whole plant</td>
<td>4.1%</td>
</tr>
<tr>
<td>Plectranthus barbatus</td>
<td>Leaves and stem</td>
<td>5.4%</td>
</tr>
<tr>
<td>Tylosema fassoglense</td>
<td>Tuber</td>
<td>6.7%</td>
</tr>
<tr>
<td>Acmella caulisrhiza</td>
<td>Whole plant</td>
<td>4.3%</td>
</tr>
<tr>
<td>Ocimum gratissimum</td>
<td>Leaves and twigs</td>
<td>3.6%</td>
</tr>
<tr>
<td>Tagetes minuta</td>
<td>Leaves and stem</td>
<td>5.4%</td>
</tr>
<tr>
<td>Carissa spinarum</td>
<td>Roots</td>
<td>4.5%</td>
</tr>
<tr>
<td>Solanum incanum</td>
<td>Roots</td>
<td>3.9%</td>
</tr>
<tr>
<td>Tithonia diversifolia</td>
<td>Leaves and twigs</td>
<td>6.0%</td>
</tr>
<tr>
<td>Senna occidentalis</td>
<td>Whole plant</td>
<td>4.9%</td>
</tr>
<tr>
<td>Rhus natalensis</td>
<td>Leaves and stem</td>
<td>5.0%</td>
</tr>
<tr>
<td>Toddalia asiatica</td>
<td>Leaves and stem</td>
<td>20.3%</td>
</tr>
<tr>
<td>Ageratum conyzoides</td>
<td>Whole plant</td>
<td>4.5%</td>
</tr>
<tr>
<td>Albizia coriaria</td>
<td>Stem bark</td>
<td>11.9%</td>
</tr>
<tr>
<td>Croton macrostachyus</td>
<td>Leaves and stem</td>
<td>6.8%</td>
</tr>
<tr>
<td>Zanthoxylum chalybeum</td>
<td>Stem bark</td>
<td>5.2%</td>
</tr>
<tr>
<td>Ocimum kilimandscharicum</td>
<td>Leaves and twigs</td>
<td>5.4%</td>
</tr>
</tbody>
</table>

The tests conducted were of the qualitative (disc diffusion), figure 7, and quantitative (minimum inhibitory concentration tests MIC) type. Susceptibility tests were
performed using Gram-positive and Gram-negative bacteria, yeasts and dermatophytes. The screens were done against *Staphylococcus aureus* (ATCC 25923) [gram-positive bacterium], Multiple Resistant *Staphylococcus aureus* (MRSA), *Escherichia coli* (ATCC 25922), *Microsporum gypseum* and *Candida albicans* (clinical isolates from Kenyatta National Hospital, Nairobi). Microbe isolates were obtained from the Centre for Microbiology Research (CMR), Kenya Medical Research Institute (KEMRI).

### 4.42 Screening of some Luo and Kuria medicinal plants for antimycotic activity

The methanolic plant extracts were screened against fungal species. The test species used for the MIC investigations were: *Microsporum gypseum* and *Candida albicans*. Activity of extracts was determined by measuring the sizes of the zones of inhibition. The results in Table 4 below were obtained. The results range from 6-21mm inhibition zones. The DMSO negative control showed no inhibitory effect.

**Table 4 - Antimycotic activity of selected Luo and Kuria medicinal plants**

<table>
<thead>
<tr>
<th>Plants</th>
<th>Part</th>
<th><em>C. albicans</em> (mm)</th>
<th><em>M. gypseum</em> (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Acmella caulirhiza</em></td>
<td>Whole plant</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td><em>Ageratum conyzoides</em></td>
<td>Whole plant</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td><em>Albizia coriaria</em></td>
<td>Stem bark</td>
<td>18</td>
<td>11</td>
</tr>
<tr>
<td><em>Bidens pilosa</em></td>
<td>Whole plant</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td><em>Carissa spinarum</em></td>
<td>Roots</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td><em>Croton macrostachyus</em></td>
<td>Leaves/stem</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td><em>Ocimum gratissimum</em></td>
<td>Whole plant</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td><em>Plectranthus barbatus</em></td>
<td>Leaves/stem</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td><em>Rhus natalensis</em></td>
<td>Leaves/stem</td>
<td>14</td>
<td>6</td>
</tr>
<tr>
<td><em>Senna occidentalis</em></td>
<td>Whole plant</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td><em>Solanum incanum</em></td>
<td></td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td><em>Tithonia diversifolia</em></td>
<td>Leaves/stem</td>
<td>21</td>
<td>11</td>
</tr>
<tr>
<td><em>Toddalia asiatica</em></td>
<td>Roots</td>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td><em>Tylosema fassoglene</em></td>
<td>Root tuber</td>
<td>11</td>
<td>6</td>
</tr>
<tr>
<td><em>Zanthoxylum chalybeum</em></td>
<td>Stem bark</td>
<td>6</td>
<td>16</td>
</tr>
</tbody>
</table>

(6) = No activity of methanolic extract
The most interesting activity on fungal isolates was obtained from *T. diversifolia* (21mm growth inhibition). The fifteen plants showed varied activity, only *Croton macrostachyus*, showed no activity with any of the fungal test microorganisms. Though *Albizia coriaria* has higher activity to *Candida albicans* than *Rhus natalensis* their activity is in the same range compared to that of *Tylosema fassoglense* and *Plectranthus barbatus*. For *Microsporum gypseum* the *Zanthoxylum chalybeum* gave the highest activity. *Albizia coriaria* and *Plectranthus barbatus* also showed activity in the same range (11mm growth inhibition), all other tested species showed no antifungal activity.

4.43 Screening of some Luo and Kuria medicinal plants for antibacterial activity

The methanolic plant extracts were screened against *S. aureus* (ATCC 25923), MRSA and *E. coli* (ATCC 25922). The results obtained are reported Table 5 below. Activity of extracts was determined by measuring the sizes of the zones of inhibition. A zone of inhibition of 6mm indicates no activity (see figure 10 below). The DMSO negative control showed no inhibitory effect.

![Figure 10 - Disc diffusion plate](image)

*Figure 10 - Disc diffusion plate*

*T1 - Rhus natalensis; T2 - Albizia coriaria; T3 - Plectranthus barbatus; T4 - Tylosema fassoglense; T5 - Toddalia asiatica; T6 - Toddalia asiatica*
The most interesting activity on bacterial isolates was obtained from *T. diversifolia* (21mm growth inhibition). The antibacterial activity shown with *Staphylococcus aureus* can be clustered in four groups; that of *Tithonia diversifolia* alone, that of *Albizia coriaria* and *Rhus natalensis* and that of *Plectranthus barbatus* and *Tylosema fassoglense* and the weak activity exhibited by *Toddalia asiatica*.

Table 5 - Antibacterial activity of selected Luo and Kuria medicinal plants

<table>
<thead>
<tr>
<th>Plants</th>
<th>Part</th>
<th><em>S. aureus</em> (mm)</th>
<th><em>E. coli</em> (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Acmella caulirhiza</em></td>
<td>Whole plant</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td><em>Ageratum conyzoides</em></td>
<td>Whole plant</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td><em>Albizia coriaria</em></td>
<td>Stem bark</td>
<td>18</td>
<td>6</td>
</tr>
<tr>
<td><em>Bidens pilosa</em></td>
<td>Whole plant</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td><em>Carissa spinarum</em></td>
<td>Roots</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td><em>Croton macrostachyus</em></td>
<td>Leaves/stem</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td><em>Ocimum gratissimum</em></td>
<td>Whole plant</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td><em>Plectranthus barbatus</em></td>
<td>Leaves/stem</td>
<td>11</td>
<td>6</td>
</tr>
<tr>
<td><em>Rhus natalensis</em></td>
<td>Leaves/stem</td>
<td>14</td>
<td>6</td>
</tr>
<tr>
<td><em>Senna occidentalis</em></td>
<td>Whole plant</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td><em>Tithonia diversifolia</em></td>
<td>Leaves/stem</td>
<td>21</td>
<td>6</td>
</tr>
<tr>
<td><em>Toddalia asiatica</em></td>
<td>Roots</td>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td><em>Tylosema fassoglense</em></td>
<td>Root tuber</td>
<td>11</td>
<td>6</td>
</tr>
<tr>
<td><em>Zanthoxylum chalybeum</em></td>
<td>Stem bark</td>
<td>6</td>
<td>6</td>
</tr>
</tbody>
</table>

(6) = No activity of methanolic extract

**4.44 Minimum Inhibitory Concentration (MIC) results**

Minimum Inhibitory Concentration (MIC) tests were performed on extracts to determine the minimum concentration of extract inhibiting microbial growth. Results are given in table 6 below. Dilutions which inhibited microbial growth were noted. Activity was observed for the 1:2, 1:8, 1:16 and 1:32 serial dilutions. No activity was observed for the 1:4 dilutions. Dimethyl Sulphoxide (DMSO) was used as a negative control and showed no inhibiting effect. Only *Albizia coriaria*, *Plectranthus barbatus* and *Tithonia diversifolia* showed inhibitory activity to all test microbes at three dilutions, 1: 64, 1: 16
and 1: 2 respectively. *Zanthoxylum chalybeum* and *Bidens pilosa* showed activity only to the dermatophyte *Microsporum gypseum*; this activity was at a high dilution of 1: 2. *Carissa spinarum* only showed activity against MRSA.

Though the mode of extract action, whether germicidal or germistatic, and active compounds are not clear, in general the plant extracts subjected to the MIC test showed inhibitory activity at different dilutions ranging from 1: 2 to 1: 64.

Based on the MIC results it would be interesting to further investigate *Albizia coriaria*, *Plectranthus barbatus* and *Tithonia diversifolia*, species that showed activity with all test microbes.

**Table 6 - Minimum Inhibitory Concentration (MIC) test results**

<table>
<thead>
<tr>
<th>Plants</th>
<th>S. aureus (dil)</th>
<th>MRSA (dil)</th>
<th>M. gypseum (dil)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Albizia coriaria</em></td>
<td>1:64</td>
<td>1:64</td>
<td>1:2</td>
</tr>
<tr>
<td><em>Bidens pilosa</em></td>
<td>-</td>
<td>-</td>
<td>1:2</td>
</tr>
<tr>
<td><em>Carissa spinarum</em></td>
<td>-</td>
<td>1:2</td>
<td>-</td>
</tr>
<tr>
<td><em>Plectranthus barbatus</em></td>
<td>1:16</td>
<td>1:64</td>
<td>1:2</td>
</tr>
<tr>
<td><em>Rhus natalensis</em></td>
<td>1:64</td>
<td>1:32</td>
<td>-</td>
</tr>
<tr>
<td><em>Tithonia diversifolia</em></td>
<td>1:64</td>
<td>1:64</td>
<td>1:2</td>
</tr>
<tr>
<td><em>Toddalia asiatica</em></td>
<td>1:16</td>
<td>1:16</td>
<td>-</td>
</tr>
<tr>
<td><em>Tylosema fassoglese</em></td>
<td>1:16</td>
<td>1:8</td>
<td>-</td>
</tr>
<tr>
<td><em>Zanthoxylum chalybeum</em></td>
<td>-</td>
<td>-</td>
<td>1:2</td>
</tr>
</tbody>
</table>

(-) = No activity of methanolic extract

**4.45 Screening of some Luo and Kuria medicinal plants for antiprotozoal activity**

Dichloromethane extracts of eight plants used by the Kuria and Luo were screened for antiprotozoal activity. Sixteen tests, done in triplicates, were done with two clones of *Plasmodium falciparum*, W-2 (chloroquine resistant clone) from Vietnam and D6 (CQ sensitive clone) from Sierra Leone. Two reference drugs Mefloquine and Chloroquine were used as positive controls. Results are given in Table 7 below. Low IC<sub>50</sub> values indicate high antiplasmodial activity while high IC<sub>50</sub>'s low antiplasmodial activity. The
IC₅₀'s for drugs and total plant extracts against CQ-sensitive (D6) and resistant clones (W-2) ranged from 0.01217 to 10.679μg/ml. The best extracts against D6 (CQ sensitive clone) were those of *Tylosoema fassoglense, Ocimum kilimandscharicum, A. conyzoides*, and *Croton macrostachyus* which gave IC₅₀ values 0.770, 0.843, 2.150, and 2.720 respectively. The extract of *Albizia coriaria* showed little activity 10.679. The best extracts against W-2 (CQ resistant clone) were those of *Tylosoema fassoglense, A. conyzoides* and *Ocimum kilimandscharicum* which gave IC₅₀ values 0.8969, 3.444 and 1.547 respectively.

*Tylosoema fassoglense, Ageratum conyzoides, Ocimum kilimandscharicum*, and *Albizia coriaria* displayed high activity with W-2 (chloroquine resistant clone). *T. fassoglense, Ageratum conyzoides, Croton macrostachyus* and *Ocimum kilimandscharicum* displayed high activity on D6 (chloroquine sensitive clone). However, *Plectranthus barbatus* and *Croton macrostachyus* did not show activity within the tested range of concentration depicting need for higher concentration and hence inactive on the strains W-2 and D6.

**Table 7 - In vitro anti-plasmodial activity of total extracts on chloroquine resistant and sensitive clones.**

<table>
<thead>
<tr>
<th>Plant total extracts</th>
<th>IC₅₀μg/ml W-2 (CQ resistant clone)</th>
<th>IC₅₀μg/ml D6 (CQ sensitive clone)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Acmella caulirhiza</em></td>
<td>5.201± 0.297</td>
<td>9.939± 0.205</td>
</tr>
<tr>
<td><em>Albizia coriaria</em></td>
<td>6.798± 3.04</td>
<td>10.679± 1.939</td>
</tr>
<tr>
<td><em>Ageratum conyzoides</em></td>
<td>3.444± 3.13</td>
<td>2.150± 0.842</td>
</tr>
<tr>
<td><em>Croton macrostachyus</em></td>
<td>-</td>
<td>2.720± 0.627</td>
</tr>
<tr>
<td><em>Ocimum gratissimum</em></td>
<td>8.616± 2.49</td>
<td>-</td>
</tr>
<tr>
<td><em>Ocimum kilimandscharicum</em></td>
<td>1.547± 0.226</td>
<td>0.843± 0.123</td>
</tr>
<tr>
<td><em>Plectranthus barbatus</em></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><em>Tylosoema fassoglense</em></td>
<td>0.896± 0.37</td>
<td>0.770± 0.017</td>
</tr>
<tr>
<td><strong>Control</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chloroquine</td>
<td>0.07626</td>
<td>0.00443</td>
</tr>
<tr>
<td>Mefloquine</td>
<td>0.0374</td>
<td>0.01217</td>
</tr>
</tbody>
</table>

(-) = No activity of Dichloromethane extract

Values are mean ± SD of at least three replicates
Screening of some Luo and Kuria medicinal plants for larvicidal toxicity

The susceptibility of *Aedes aegypti* to 0.2%, 0.4%, 0.6%, 0.8% and 1.0% ethanolic plant extracts was determined. Results are given in table 8 below. The activity of tested extracts ranged from 0% to 73.3%. The distilled water negative control showed no larvicidal effect.

**Table 8 - Larvicidal activity of ethanolic extracts**

<table>
<thead>
<tr>
<th></th>
<th>Extract concentrations</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>0.2</td>
</tr>
<tr>
<td><em>Albizia coriaria</em></td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td><em>Carissa spinarum</em></td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td><em>Croton macrostachyus</em></td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td><em>Plectranthus barbatus</em></td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td><em>Tyloosema fassoglene</em></td>
<td>0%</td>
<td>0%</td>
</tr>
</tbody>
</table>

Only two ethanolic extracts, out of the five tested, possessed larvicidal activities. *Plectranthus barbatus* and *Albizia coriaria* showed activity within 1000 mg/l. Distilled water used as a negative control had 0% extract, and no larval mortality, at 24 hours. *Albizia coriaria* gave an LC<sub>50</sub> of 871mg/l and *Plectranthus barbatus* 8.92 mg/l. *Plectranthus barbatus* extract was found to be the most active. *Carissa spinarum* and *Croton macrostachyus* showed no activity. *Tyloosema fassoglene* showed slight activity only at 1.0%. This is the first report on the mosquito larvicidal activity for *Tyloosema fassoglene*. It appears the LC<sub>50</sub> for *Croton macrostachyus*, *Tyloosema fassoglene* and *Carissa spinarum* are above 1000 mg/l concentrations.

The present findings are comparable with those of *Albizia amara* against third instar *Aedes aegypti* LC<sub>50</sub> (Murugan *et al.*, 2007); Zarroug *et al.* (1988) where inactivity of aqueous *Croton macrostachyus* extracts to *Aedes aegypti* was reported. Yet in Karunamoorthi and Ilango (2010) *Croton macrostachyus* methanolic extracts show
activity against another *Anopheles* mosquito, *Anopheles arabiensis*, giving an LC$_{50}$ of 89.25ppm. A possible explanation would be the differing physiological characteristics of the two mosquito species. Compared to *Acmella caulirhiza* (Pandey and Agrawal 2009) these extracts show low larvicidal activity.

*Plectranthus barbatus* and *Albizia coriaria* toxic qualities (abortive activity and cytotoxicity) are reported in some studies (Almeida and Lemonica 2000, Lacaille Dubois *et al.*, 2011).
5.0 CHAPTER FIVE - DISCUSSION

5.1 Introduction

In this section a cross-cultural comparative analysis and discussion on ethnomedicine, medicinal plants and their bioactivities are presented. Medicinal plant bioactivity and usage data is discussed and supplemented with published bioactivity reports of these plants. In particular, the perspective of their use in other cultures, toxicity and bioactivity is highlighted.

5.2 Comparative ethnomedicine

Traditional perceptions of health are prevalent among the Kuria and Luo; both groups emphasize naturalistic and impersonal illness causes with recognition of some as contagious. Ritual practices are embedded in health practices of the both ethnic groups and disease aetiologies maintained because they effectively explain illness/disease in the particular culture. Other practices employed during therapy are social isolation and dietary restriction. Symbolic use of plants is generally based on identical principles; a point in case is the use of Viscum spp. for magical and psychosomatic uses. In terms of therapy attributes medicines initiating emesis or purgation were deemed important for recovery. Taste and smell distinctions can be made for some ailments; stomachache and sorcery remedies were commonly bitter in flavour. Strong odoured species provide protection against evil and witchcraft and ritual cleansing/purifying baths. Diseases of the head were managed administering instillations and snuffing. For treatments the majority of dermatological conditions involved direct application of sap or latex or a poultice on affected areas. In terms of efficacy medicinal plants from semi-arid regions were considered more potent therapeutically. In both groups there is belief that certain traits in
animals can be secured by their use in medicinal preparations. Similar cultural conceptions of healing are identified in (Njoroge and Bussmann 2006a, Nanyingi et al., 2008).

Among both, the Kuria and Luo, the medical system is essentially pluralistic but with slightly more balance towards traditional medicine. Even though accessibility to biomedicine in Kuria district has increased considerably, with rural households living on average at 5 kilometers to the nearest health facility (Min. Planning Nat. Dev. 2005), there is still reliance on traditional medicine. Three healing approaches, traditional, Christian and biomedical are used. Healing practices also change as people assess the efficacy of treatments. When patients experience some remission from their illness, they adhere to the therapies. The choice depends on; how they conceptualize the etiology of the health problem and how symptoms are perceived help in deciding the first step of treatment seeking.

Therapy seeking behavior is multiple with traditional medicine competing and compensating for certain weaknesses with biomedicine. Nyamwaya (1987) observes this complementarity of traditional and Western medicine among the Kuria but points out that biomedicine is utilized for the biological phase of most illnesses. Golooba-Mutebi and Tollman (2007) observe that choice of therapy is not always straightforward. Patients seek help across traditional medicine and biomedicine for particular conditions.

There are multiple explanations for therapy seeking behavior but the main determinants for traditional medicine choice are its cultural appropriateness and affordability. Other influencing socio-economic variables are: sex, age, social status, access to services and perceived quality of the service. Past experiences, negative or positive, with the health services, influence perceptions regarding efficiency and quality of the services. Some apprehensions to biomedicine are based on the lack of effective therapies for folk illnesses and the communication problems of the clinical encounter, which some respondents
described as dismissive. In both communities women are traditionally responsible for family health and benign plant use is invariably public knowledge, especially by mothers, but malevolent, ritual and magical plant usage are commonly the field of male specialists.

5.3 Disease relationships

Forty two illness and disease conditions are reported for the Luo and 52 for the Kuria. The top three ranked illness and disease conditions in terms of citation frequency among the Luo were: culture bound syndrome, stomachache and infant diseases; for the Kuria they were stomachache, cattle illnesses/conditions and infant diseases. Comparatively the Kuria had more citations of veterinary use. Human and veterinary medicine beliefs and practices in both groups are mutual in many aspects. Similar observations on animal remedies are made in (Nyamanga et al., 2006, Njoroge and Bussmann 2006a, Jemigan 2009). Of the 40 plant species reported in (Njoroge and Bussmann 2006a) seven also found in the studied ethnopharmacopoeias; these are Solanecio mannii, Thunbergia alata, Tagetes minuta, Warburgia ugandensis, Euclea divinorum, Ricinus communis and Ajuga integrifolia. Similarly Cissus rotundifolium, Croton macrostachyus, Aloe spp., Agave sisalana, Ajuga integrifolia, Capsicum annum, Elaeodendron buchananii, Albizia coriaria, Tephrosia vogelii, Euphorbia tirucalli and Clerodendrum rotundifolium are confirmed in the field manual Ethnoveterinary medicine in Kenya (ITDG and IRRR 1996). Validation of Tephrosia vogelii as an anti-tick agent is reported in (Gadzirayi et al., 2009); tick number was reduced by leaf infusions in a similar manner with conventional acaricides. In Kokwaro (2009) similar confirmations are made.

The overall impression is some illnesses are inseparable from cultural identity; however ibiriri (evil eye), a Luhya and Gusii construction, has presentations outside its cultural group – among the Kuria. Sigete (abdominal pains during menses) and chinsegete
(menstrual cramps); *dhoho* (sorcery) and *ibiriri* (sorcery); and *chira* (ritual impurity) and *ichinkera* (wasting infantile illness) have a one to one equivalence. The latter pair is socially constructed to regulate societal morals through restriction and punishment; Prince (2007) properly observes the prominence of ethical discourse on *chira*’s aetiology. Similar conditions are also reported among the Baka of Cameroon (Betti 2004). Sosnowska and Balslev (2009) observe that from the biomedical point of view they are not diseases but clusters of loosely bound syndromes whose aetiology and treatment contrast biomedical notions. Trotter (1986) observes that these illnesses do not exist within the boundaries of Western medicine and often have spectacular cures. For instance, (Luke 2003, Luke *et al.*, 2001) observe that for *rariw* Luo women resist Western medicine’s labels and treatment. On these differences Häußermann (2006) observes that the concept of illness is a culture-specific definition of suffering. Several culture specific disease conditions (*chira, sihoho, ibiriri, dhoho, ichinsegete* and *ichinkera*) are pervasive among the two groups and locals note it is needless to go to biomedical institutions for their management. Local practitioners are culturally skilled to handle them. This observation is consistent with that of (Green 1992). Similar aetiology aspects are observed in the Maasai (Bussmann *et al.*, 2006). Some diseases are considered exotic and some, such as whooping cough, diabetes and high blood pressure considered not common as before and treatable only by biomedicine. These ethnomedical belief findings among the Luo and Kuria affirm observations in other African contexts (Ingstad 1990, Nanyingi *et al.*, 2008, Betti 2004).

Malaria, sexually transmitted diseases and diarrhoea are cited as prevalent diseases among the two groups (KDHS 2003, Ministry of Planning and National Development 2005). Of these three health conditions gastrointestinal conditions (stomachache, constipation and diarrhoea) were most cited; 16.1% and 15.1% for the Kuria and Luo respectively. This observation concurs with those in other studies (Njoroge and Kibunja
2006, Nyunja et al., 2009, Arwa et al., 2010) where gastrointestinal diseases, especially diarrhoea, feature prominently in disease citations. Contrasting Jiofack et al., (2009) where 8% of documented remedies are used in managing malaria the studied groups appear to rely less on medicinal plants for this disease, with 0.78% and 0.86% for Kuria and Luo respectively; alluding to greater use of biomedical prophylactics for this condition. In Quave et al., (2008) dermatological remedies make up at least one-third of the traditional pharmacopoeia in southern Italy. Vernonia sp and Ageratum conyzoides are functionally identical for skin rashes in both systems. Only Tagetes minuta corresponds to reports in (Njoroge and Bussmann 2007), however several confirmations are made in the Medicinal plants of East Africa (Kokwaro 2009).

Based on ethnobotanical disease citations the incidences of women’s condition (pregnancy and birth, barrenness and ammenorhoea) were relatively high, 10% and 8.2% for the Luo and Kuria respectively. These percentages are higher than 1.05%, for cramps, reported by Bussmann and Sharon (2006) in South Ecuador. A possible explanation for the multiple remedies and citations for pregnancy and childbirth conditions is the high mortality and morbidity rates among the Kuria and Luo (KDHS 2003, Min. Planning Nat. Dev. 2005). Frequently cited illness/disease conditions included ichinkegeti, chinsegete and rariw (foetal misalignment resulting from a ‘displaced uterus’). Rariw affects the abdominal area downwards the pelvic of pregnant women; most treatments focus on massaging abdominal areas with herbal preparations to re-locate the foetus into place and allow normal development. The Luo folk medical construct possibly modifies the clinical manifestations of what could possibly be ectopic pregnancies. Geertz (1973) notes that the stricken patient is given a vocabulary to grasp the nature of his or her distress and relate it to the wider world.

Geschiere (2002) proposes that witchcraft (magic and sorcery) can be employed
both to undermine inequalities of wealth and power and to achieve economic prosperity. The discourse of witchcraft remains strong among both ethnic groups; it is part of a traditional system of social control that oversees individual behavior and dispenses justice. There is active use of medicinal plants for love, disputes, protection from imagined enemies, business and wealth.

The number of species used to treat psychosomatic conditions (culture bound syndrome, psychosomatic, witchcraft and spirit possession) is considerable for both ethnic groups. Among the Kuria 41 out of the 149 medicinal plants (27.5%) and Luo 37 out of the 159 medicinal plants (24.8%) of the medicinal plants are used to manage "magical" psychosomatic ailments. Kiteme (1973) estimated that 60-70% of human illnesses are psychosomatic. One could predict then, that if disease remedies were distributed in a similar way in ethnopharmacopoeia there would be 60-70% species for managing psychosomatic disorders. In fact the actual percentage values for the Luo and Kuria ethnopharmacopoeias, 20% and 27.5% respectively, are much lower than predicted. Similar trends are observed in another ethnopharmacopoeia; in Andean societies (Bussmann and Sharon 2006); 18% used to treat "magical" (psychosomatic) ailments. These statistics fuel a great deal of interest on psychosomatic disorders. The possible explanation for these high percentages is the holistic approach of traditional medicine; healers handle both organic and psychosomatic disorders. The implications are that though health facilities exist they are underutilized. Kale (2002) defines this unmet need as the treatment gap; the number of people with an illness, disease, or disorder who need treatment but do not get it. The treatment gap for psychosomatic diseases is particularly high in both communities. If the differences in Kuria psychosomatic therapies are due to cultural influences, one would expect to see them reflecting similarly in the Luo, a possible suggestion that they need to be fully explored.
5.4 Medicinal plant diversity

The use of medicinal plants is common and widely spread. Most of these plants are found in homesteads and collected from wild areas. However, intensification of agriculture (Heald 1999) and other anthropogenic activities have resulted in loss of large areas with natural vegetation; some species are also threatened by over-harvesting. There are limited concerted conservation and propagation efforts hence serious threats of extinction for some species. Table 9 below summarizes attributes of the documented ethnopharmacopoeias.

<table>
<thead>
<tr>
<th>Species</th>
<th>Plant families</th>
<th>Subclasses</th>
<th>Genera</th>
<th>Independent reports</th>
</tr>
</thead>
<tbody>
<tr>
<td>Luo</td>
<td>158</td>
<td>48</td>
<td>11</td>
<td>41</td>
</tr>
<tr>
<td>Kuria</td>
<td>148</td>
<td>57</td>
<td>10</td>
<td>17</td>
</tr>
<tr>
<td>Shared</td>
<td>73</td>
<td>22</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

Three hundred and six plant species were cited as having medicinal uses; most are native to the Lake Victoria plant belt with some introduced species. Out of the 306 species, 158 species (135 genera) and 148 species (129 genera) were used by Luo and Kuria respectively; 73 species (see appendix 3) and 38 families were used in common. The Luo and Kuria utilize 48 and 56 plant families respectively, the subclasses Rosidae and Asteridae are a rich source of these medicines. The distribution and abundance of medicinal plant species is associated with large identifiable taxa in the *Flora of Tropical East Africa*; Asteraceae 15.4% in Kuria and Fabaceae 15.7% in Luo. Similarly other studies (Jeruto *et al.*, 2008, Arwa *et al.*, 2010, Nanyingi *et al.*, 2008, Betti 2004), report prominence of the family Asteraceae. The families with higher percentage of species reported were Fabaceae, Asteraceae and Euphorbiaceae; an observation consistent with those made in a global review (Aguilar-Støen and Moe 2007). The possible explanations
are its high diversity in the flora; the pattern of its use or choice as medicine appears to concur with its abundance. Voeks (1996) suggests the notion of accessibility and efficacy of "disturbance pharmacopoeia": where secondary forest species, weeds, and even garden cultivars. Evaluating the two medicinal plant data-sets for weedy species 40 species (27%) are found in the Kuria and 27 species (17%) in the Luo ethnopharmacopoeias respectively. A comparison with the Kikuyu ethnopharmacopoeia (Ngugi et al., 2004) reports 75 species of which 18.6% are from the family Asteraceae and 34 weedy species in South Africa (Lewu and Afolayan 2009). From this analysis the Luo and Kuria datasets possibly do not represent "disturbance pharmacopoeias". Both ethnopharmacopoeias are evolving with the inclusion of exotic plant species, a similar observation is made in Palmer (2004). The Luo ethnopharmacopoeia has high species richness, a difference of 6 genera and 10 species, compared to the Kuria ethnopharmacopoeia. A possible explanation for high richness and closeness is that both communities lie in an ecologically similar environment and the use of medicinal plants is still vibrant. Forty nine plant families were used by the Luo and 55 by the Kuria. Among the plant families that were specific for the Luo ethnopharmacopoeia were: Amaryllidaceae, Crassulaceae Sapindaceae and Simaroubaceae and for the Kuria ethnopharmacopoeia Areaceae, Adiantaceae, Cannabinaceae, Chrysobalanaceae and Melianthaceae.

In answering the question how similar are the ethnopharmacopoeia, the Shannon-Wiener diversity index was calculated using the following formula applied by (Begossi 1996):

\[ H = -\sum (p_i \ln p_i) \]

(where "pi" is the proportion between the number of citations for each species and the total number of citations). High values of \(H\) would be representative of more diverse communities. The number of disease citations (see appendix 1 and 2) for medicinal plants species in the respective ethnopharmacopoeia were used in calculating the index. The
Shannon-Wiener index for the Luo is 5.33 and 6.52 for the Kuria respectively. Both high values indicate a diverse ethnopharmacopoeia, particularly for the Kuria. Comparatively similar calculations of the index in other studies are 4.59 (Camejo-Rodrigues et al., 2003).

To establish how similar the ethnopharmacopoeia are the coefficient of similarity ($S$) of medicinal plants between the two ethnic groups was calculated using the following formula applied by Xu (2008) as cited in Zheng and Xing 2009:

$$S=\frac{2c}{a+b}$$

(where $a$ and $b$ are species used by the Luo and Kuria respectively, $c$ are species in common use). The computed coefficient of similarity in this study is 47.4%; indicating similarity of the medicinal flora of the Luo and Kuria and is higher that of (Zheng and Xing 2009) 36.6%, and 15% for a study comparing Cambodian and Chinese ethnic groups (Xu 2008). The 73 shared taxa are unifying elements of the two ethnopharmacopoeia.

The coefficient of similarity ($S$) and informant consensus factor $F_{ic}$ supports the idea that the ethnopharmacopoeia are not exactly the same but close; the ethnopharmacopoeias amalgamate essential elements of both groups. The supposition that there are no flora differences in the pharmacopoeia of the Kuria and Luo is supported by an analysis of the shared medicinal taxa. Out of the 73 shared species twenty eight, 38.3% find use for common or related diseases, they are: *Aloe* spp. for ethnoveterinary conditions, *Ageratum conyzoides* as haemostatic; *Solanum nigrum, Cleome hirta* and *Galinsoga parviflora* as a nutraceutical; *Plectranthus barbatus, Toddalia asiatica* and *Melia azedarach* as stomachache remedies; *Ageratum conyzoides* for infant skin conditions and haemostatic; *Emilia discifolia* for infant conditions; *Tagetes minuta* as insect repellant and haemostatic; *Aloe* spp. for wounds; *Oxygonum sinuaturn* for boils; *Viscum bagshawei* for magical uses; *Lantana camara* for respiratory conditions; *Solanum incanum* for birth difficulties; *Aspilia mossambicensis* for child delivery; *Justicia flava* and *Justicia betonica* for culture bound
for culture bound syndromes; *Erythrococca bongensis* for culture bound syndromes; *Psidium guajava* for diarrhoea; *Carissa spinarum* for internal body swellings; *Carica papaya* for venereal diseases; *Cynodon dactylon* and *Jasminum fluminense* for psychosomatic diseases; *Ocimum kilimandscharicum* for respiratory conditions; *Ocimum gratissimum* for respiratory conditions; and *Aframomum mala* as antihelminth.

Though variation of some remedies seems to relate with the respective cultures e.g. for circumcision wounds different set of plant species, *Rhoicissus revoilii*, *Crassocephalum vitellinum* and *Aspilia mossambicensis*, are utilized by the Kuria. There is difficulty in determining that usage of these 38 plants could have been learned by contact with either or another neighbouring group.

There are recurrent patterns in the Luo and Kuria ethnopharmacopoeia. It appears there is no healing boundary between the two ethnic groups because of the shared species. This observation makes hazy the issue of where one ethnopharmacopoeia ends and the other begins. There appears to be a lot of knowledge exchange with the Luo who dominate the region. Abuso (1980) observes that culturally the Kuria are in many ways Nilotic, while linguistically they are Bantu. Outnumbered by the Luo in terms of engagement the Kenyan Kuria ethnopharmacopoeia could be less distinct than that of the Tanzanian counter population. It would be interesting to see what a survey of the Tanzanian Kuria ethnopharmacopoeia would be like. The difference and similarities of the Kuria and Luo ethnopharmacopoeia indicate more convergence and less divergence. Historical cultural exchange possibly explains the closeness in terms of species.

The other perspective for analyzing medicinal plant use and choice is based on habit i.e. tree, shrub and herb. In this study the role played by herbaceous species as medicine in the ethnopharmacopoeias is important, 59% in Luo and 62.4% for Kuria. Similar findings are reported in (Ngugi et al., 2004, Langenberger et al., 2011).
5.5 Folk knowledge relationships

In answering the question how significant the medicinal plants are, the study analyzed the pharmaceutical ethnobotanicity index (P.E.I).

\[ \text{P.E.I} = \frac{\text{medicinally useful plants}}{\text{total flora}} \]

The K5 floristic region, where the study area falls, has 1,969 species in the *List of East African Plants* (Knox 1996). The computed pharmaceutical ethnobotanicity index was 8% for the Luo and 7.5% for the Kuria ethnopharmacopoeia. The Luo P.E.I. is slightly greater than that of the Kuria.

These values are slightly higher than those for (Guarrera et al., 2008) but low compared with 23.2% for Montseny (Bonet and Vallès 2003), Catalonia/Iberian Peninsula (Bonet et al., 1999) and 23.1% for Serra de Sāo Mamede Portugal (Camejo-Rodrigues et al., 2003). They are also low compared to findings among the Sekenani Maasai 25% (Bussmann et al., 2006) and Loita Maasai 33% (Maundu et al., 2001). A possible explanation for the low figure is the large figure of species in the floristic which could not be representative of the flora in the two regions; the K5 is an extensive and diverse area. Some of the plants in the total flora are actually not in the study area.

To determine how informants rely strongly on the plants they used or mention, the informant consensus factor (\( F_{ic} \)) was calculated as in (Trotter and Logan 1986).

\[ F_{ic} = (n_{ur} - n_{r}/n_{ur} - 1) \]

(where \( n_{ur} \) is the "number of usage-reports" and \( n_{r} \) "number of taxa used"). A high value of this factor, ranging from 0 to 1, indicates that a large proportion of the informants rely strongly on these remedies. The informant consensus factor (\( F_{ic} \)) is used as an estimator of knowledge evenness.
Table 10 - Consensus of remedies

<table>
<thead>
<tr>
<th></th>
<th>Kuria</th>
<th>Luo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of taxa (n_t)</td>
<td>148</td>
<td>158</td>
</tr>
<tr>
<td>Number of plant families</td>
<td>56</td>
<td>48</td>
</tr>
<tr>
<td>Total number of usage reports</td>
<td>341</td>
<td>318</td>
</tr>
<tr>
<td>Nur</td>
<td>0.567</td>
<td>0.504</td>
</tr>
</tbody>
</table>

The individual informant consensus factor (Fic) values (see table 10 above) for the two groups are low compared to 0.85 observed in (Camejo-Rodrigues et al., 2003). This indicates a medium level of informant agreement. Luo ethnopharmacopoeia is one of Kenya's best described; nevertheless this fact is not reflecting in the moderate informant consensus factor (Fic). The Luo survey in this study had fewer respondents compared to an earlier study (Owuor 1999).

Johns et al., (1990) aver that a use is reliable when reported by at least three independent informants. Using this criterion for the Luo, 57.8% of the medicinal plants were reported three times and above; 27.7% were reported only once. In contrast, for the Kuria ethnopharmacopoeia, 30.2% are reported three times and above; 43.6% are reported once. The fact that biomedicine has expanded in Kuria, with rural households living on average at 5 kilometers to the nearest health facility (Min. Planning Nat. Dev. 2005), can possibly explain the low plant knowledge. In comparison to the Luo the pace of modernization and acculturation has been exceptionally rapid among the Kuria as documented (Seba 1977, Rwezaura 1989, Prazak 1999).

5.6 Comparative ethnopharmacology

Medicinal plant products were administered both externally and internally in several different forms for a wide range of health problems. Leaf was the most frequently plant part utilized in both ethnopharmacopoeia. The chief formulations were decoctions and infusions, the latter being more popular among the Luo.
The usage of concoctions (multi-plant preparations) in the two ethnic groups is moderate. Out of the 308 medicinal plants species used by the Kuria and Luo 55 (17.8%) are formulated in multi-plant preparations; the other 253 (82.2%) are formulated as single plant preparations. Most diseases and pains were treated with a single plant, a finding generally similar to that found by (Boulogne et al., 2011). The plants commonly used in multiple preparations include *Carissa spinarum* and *Euclea divinorum*. Some species: *Euclea divinorum*, *Carissa spinarum* and *Harrisonia abyssinica* used in multi-plant preparations of the Luo compare well with those in Johns et al., (1990), Aduma (1998), and Otieno et al., (2008). The common multi-plant regimens for both communities include two plants; *Carissa spinarum* and *Euclea divinorum*. The prevalence of *Carissa spinarum* in these preparations could be signaling, especially considering its recent implication almost as a panacea in the Loliondo area of Tanzania (Malebo and Mbwambo 2011). There is some scientific evidence (Otieno et al., 2008) on the superiority of efficacy of multi-plant over single plant extracts. The reagents in the concoctions produce desirable medical effects most likely due to synergistic interactions. The use of elephant dung, considered a panacea, and animal chyme is based on the interpretation that they are multi-plant extracts due to diverse herbivore diet (Otieno et al., 2008).

Among both groups plant material was formulated with mineral and wild animal parts and products. An interesting case of mineral use was the application of motor vehicle oil grease to kill cattle ticks and the use of potassium permanganate and soap in other treatments. There is evidence (Otieno et al., 2006) that therapy supplements like volcanic ash (*kadosero* Dholuo; *irigaate* Igikuria) have an effect on efficacy.

These observations on preparations and plant part utilization concur with those made for other Kenyan ethnic groups: Nandi (Jeruto et al., 2008), Samburu (Nanyingi et al., 2008), Luhya (Nyunja et al., 2009), Sabaot (Okello et al., 2010), Digo and Duruma
(Nguta et al., 2010), Kamba (Wambugu et al., 2011) and Kikuyu (Njoroge and Kibunga 2006) where most remedies were prepared from leaves and administered as infusions or decoctions.

5.7 Bioactivity exploration

Fifteen plants were evaluated for their antimicrobial activity (see tables 4, 5, 6 and 7). They were investigated on the basis of the number of usage reports and it is interesting that the exhibited antimicrobial activities correlate well. The fifteen plants evaluated in this study have been in long use as medicines appearing as popular remedies in ethnopharmacopoeias; Albizia coriaria, Ocimum spp. and Zanthoxylum chalybeum (Johns et al., 1990), Ageratum conyzoides and Tithonia diversifolia (Arwa et al., 2010), Carissa spinarum (Nanyingi et al., 2008), Croton macrostachyus (Wondimu et al., 2007, Giday et al., 2009, Mesfin et al., 2009, Kokwaro 2009, Teklehaymanot 2009 and Nyunja et al., 2009). The genus Plectranthus is traditionally used to treat a range of ailments including digestion, skin, infection, and respiratory problems (Lukhoba et al., 2006).

Though Toddalia asiatica had the highest extraction efficiency, this attribute does not relate with its bioactivity. Only the biological activity of Albizia coriaria comes close to its moderately high extraction yield. In the preliminary assays the results in tables 4, 5, 6 and 7 indicate that most plant extracts exhibited activity against one or more of the tested fungi and bacteria (Escherichia coli [gram-negative bacterium], Staphylococcus aureus [gram-positive bacterium], Microsporum gypseum [filamentous fungus] and Candida albicans [yeast]). In general the extracts worked well on the gram-positive and filamentous fungi; but were ineffective against Escherichia coli and Candida albicans, a Gram negative bacteria and yeast. No activity was shown by the extracts against the Gram negative E. coli. Similar results are made by Nostro et al., (2000), and Zampini et al.,
As pointed out by Nikaido and Vaara (1985) and Da Costa (2010) ordinarily, gram-negative strains are often more resistant than gram-positive. The lack of activity against Gram-negative bacteria is due to permeability issues related to phytochemical size and the outer membrane structure of Gram-negative bacteria, two cell membrane layers, posing challenges in reaching cell targets. Another possible explanation for observed lack of activity possible explained by the fact that the microbes were exposed only to hydrophilic compounds in the methanolic extracts; there is possibility that hydrophobic fractions might be active. The activity noted with methanolic extracts indicates the possibility that tannins or polysaccharides may be responsible for activity.

One species, Croton macrostachyus, showed no activity with any of the bacterial and fungal test microorganisms. Similar results for activity of its methanolic extract against S. aureus are reported by (Wagate et al., 2008). It was observed that only two species presented activity against only one strain; Tagetes minuta showed activity only against MRSA and Bidens pilosa which was the only extract that showed activity against Microsporum gypseum in preliminary screening and the MIC test. From the 15 plant extracts studied Albizia coriaria and Tithonia diversifolia showed an interesting profile of antibacterial activity on S. aureus (see table 5). Solanum incanum, Croton macrostachyus, Senna occidentalis, Bidens pilosa and Ageratum conyzoides exhibited no antibacterial activity (see table 5). Anti-diarrhoeal activity of Ocimum gratissimum is well established, a study on rats gave evidence that its leaf extracts prevented diarrhoea (Offiah and Chikwendu 1999). Stomachic effects are demonstrated by (Madeira et al., 2002) and mosquito repellant activity of Ocimum gratissimum volatiles in Oparaocha et al., (2010).

Of the 8 plant species investigated for antiplasmodial activity (see table 7) Ageratum conyzoides, Tylosema fassoglense, Croton macrostachyus and Ocimum spp. exhibited the best antiplasmodial activity i.e. low IC$_{50}$ <5μg /ml values. These activities
biological activities do not correspond to all uses mentioned by the traditional healers; most are unrelated to traditional ones recorded earlier during the ethnopharmacological survey.

5.7.1 Anti-bacterial activity

Some of these species screened are more or less involved in the cure of illnesses of possible bacterial origin. In Rajakaruna et al., (2002) no inhibition is reported for Toddalia asiatica methanolic extracts on S. aureus and E. coli. This study reports, possibly for the first time, activity of Carissa spinarum root extracts against MRSA; similar anti-MRSA activity is only reported for leaf material (Ramalivhana et al., 2010). In this study Acmella caulirhiza methanolic extract exhibit no antibacterial effect however, hexane extracts (Matu and Standen 2003) exhibited high activity against S. aureus; a possible indication that the active constituents are hydrophobic. It is also likely that varietal and plant ecotype differences explain the differences in antibacterial sensitivity. This point is exemplified for Ageratum conyzoides and Bidens pilosa in (Chah et al., 2006) where Ageratum conyzoides and Ocimum gratissimum exhibit no inhibition to S. aureus strains tested. Although the methanolic extracts in this study did not inhibit any test microorganism activity has been shown in other studies with Ageratum conyzoides (Almagboul et al., 1985).

Tylosema fassoglense appears the most important species because of its broad (moderate and high) activity on test organisms. Recent work (Chingwaru et al., 2011) on a closely related species, Tylosema esculentum, reports antibacterial effect of methanolic extracts against S. aureus and Candida albicans. These results validate that methanolic extracts may be of value for diseases with gram-positive bacteria aetiology. Low activity for Rhus natalensis and Ocimum gratissimum against E. coli is also reported in (Karera et al., 2008). Ocimum gratissimum chloroform/ methanol extracts showed no activity on
Candida albicans (Runyoro et al., 2006). Yet, Ocimum gratissimum aqueous extracts show high activity in some studies (Junaid et al., 2006) and the essential oil from Eastern Kenya provenance was very active against E. coli (Matasyoh et al., 2007).

Differences are observed for Rhus natalensis against S. aureus, inhibition is slightly higher for leaves than roots (Kar eru et al., 2008) possibly alluding to higher bioactive molecule concentrations in aerial parts. Croton macrostachyus showed no activity with any of the test microorganisms. Similar observation on insensitivity of leaf and root methanolic extracts of Croton macrostachyus from Eastern Kenya was reported for S. aureus but minimal activity reported for E. coli (Wagate et al., 2008) and aqueous extracts showed slight Anopheles arabiensis larvicidal activity (Zarroug et al., 1988). Aqueous extracts of South American ecotypes Bidens pilosa show higher activity than alcohol extracts against E. coli (Rojas et al., 2006). Methanolic extracts of Tithonia diversifolia in this study had higher activity, 21mm against 14mm, observed for ethanolic extracts in (Ogunfolakan et al., 2010). The inactivity of aqueous Tithonia diversifolia extracts in Kareru et al., (2008), alludes to activity by non-polar constituents.

Most of these species are more or less involved in the cure of illnesses of possible bacterial origin. Despite the broad traditional use of Solanum incanum among the Kuria and Luo in closely related conditions, such as pain, rashes, colds and typhoid the bioassays demonstrated no antibacterial activities. However, some of these plants are not used for treating bacterial, protozoal and fungal infections but exhibited activity to the test organisms.

5.72 Anti-fungal activity

Albizia coriaria, Plectranthus barbatus and Rhus natalensis elicited high preliminary antimycotic activity (see table 4) but do not show significant activity in the
MIC tests. The most interesting activity on fungal isolates was obtained from *Tithonia diversifolia* (21mm growth inhibition). Despite lacking antibacterial activity only the *Bidens pilosa* extract, indicated activity against *Microsporum gypseum* in initial susceptibility screening and during the MIC tests (see table 4 and 6). Flindersine a compound isolated from *Toddalia asiatica* showed weak activity to *Candida albicans* (Duraipandiyam and Ignacimuthu 2009). Extracts from *Acmella caulirhiza* (both roots and flowers) exhibited no activity against *Candida* spp. (Fabry *et al.*, 1996). Though no activity with fungal isolates is observed for *Croton macrostachyus* in this study (see table 4), (Abera *et al.*, 2011) observe *in vitro* and *in vivo* activity of ethanolic extracts against *Colletotrichum kahawae*, a plant pathogen.

Using the activity classification by Nostro *et al.*, (2000), where an inhibition diameter exceeding 12 mm is considered active, the only active extracts are *Rhus natalensis*, *Tithonia diversifolia* and *Albizia coriaria* against *Candida albicans* and *Zanthoxylum chalybeum* alone against *Microsporum gypseum*. These species merit further investigation as potentially useful agents for the treatment of mycoses. Additionally their antimycotic activity should be determined further by microscopically examining their cytopathic effects.

### 5.73 Anti-protozoal activity

Over 1,200 plant species are reportedly used for the treatment of malaria and fevers worldwide, and are potentially important sources of new anti-malarial treatments (Wilcox and Bodeker 2004). However, plant extracts with low IC$_{50}$ values are more likely potential sources for novel antiplasmodial compounds. The IC$_{50}$’s for drugs and total plant extracts against CQ-sensitive (D6) and resistant clones (W-2) ranged from 0.01217 to 10.679µg/ml (see table 7). Many non-polar compounds might be responsible for the
antiplasmodial activity of these studied plants. The values obtained (see table 7) generally are promising and comparable to those of known plant remedies of various origins (Omulokoli et al., 1997, Oketch-Rabah et al., 1999, Muregi et al., 2003, Karou et al., 2003, Koch et al., 2005, Akeng’a et al., 2009, Kigondu et al., 2009, Abiodun et al., 2010).

The best extracts against W-2 (CQ resistant clone) were those of Tylosema fassoglense, Ageratum conyzoides and Ocimum kilimandscharicum which gave IC₅₀ values 1.195±0.37, 3.444±3.04 and 1.547±0.22 μg/ml respectively (see table 7). The best extracts against D6 (CQ sensitive clone) were those of Ageratum conyzoides and Albizia coriaria, Croton macrostachyus and Ocimum gratissimum which gave IC₅₀ values 0.7705±0.17, 2.1505±0.84, 2.7205±0.62 and 0.8438±0.123 μg/ml respectively (table 7).

Two classification schemes for antiplasmodial activity IC₅₀’s are proposed in literature. The classification of (Muregi et al., 2003) categorizes extract activity into: strong, IC₅₀ <1μg/ml; good IC₅₀ 1–10μg/ml; moderate, IC₅₀ 11–50; mild IC₅₀ 51–100μg/ml; and inactive IC₅₀ ≥100μg/ml. Deharo et al., (2001) classifies extracts that showed antiplasmodial activity IC₅₀’s of less than 5μg/ml as considered active, extracts that had IC₅₀’s from 5-10 μg/ml as considered moderately active and those with IC₅₀’s of over 10μg/ml as considered inactive.

Based on the cut off by (Muregi et al., 2003) eleven out of sixteen extracts 68.75% were active (strong and good) against W-2 and D6, however, based on those of Deharo et al., (2001) seven out of sixteen extracts 43.75% were active (active) against W-2 and D6. The plant extracts with low IC₅₀ values could be potential sources for novel antiplasmodial compounds upon further development. Using these two classifications, only Tylosema fassoglense, Ocimum kilimandscharicum and Albizia coriaria could be considered for both W-2 (chloroquine resistant) and D6 (chloroquine sensitive) drug development. Other
species, with exception of those which had no results, could be recommended for potentiating CQ.

The findings for *Ageratum conyzoides* (table 7) are consistent with previous results in (Clarkson *et al.*, 2004, Ukwe *et al.*, 2010, Nour, *et al.*, 2010). In Nour, *et al.*, (2010) *Ageratum conyzoides* shows activity (IC$_{50}$ = 7.9µg/ml) against *Plasmodium falciparum* K1 strain resistant to chloroquine and pyrimethamine; in (Clarkson *et al.*, 2004) strong activity is seen in DCM/ MeOH extracts compared to aqueous extracts. The efficacy of *Ageratum conyzoides* against protozoal diseases seems therefore to be fully confirmed.

The ethnobotanical use of *Albizia coriaria* to treat malaria (Orwa *et al.*, 2007) correlates with IC$_{50}$ values obtained with *Plasmodium falciparum* isolates (see table 7). Dichloromethane DCM stem bark extracts of *Albizia coriaria* in this study exhibit higher activity than methanolic extracts (Kigondu *et al.*, 2009) for both W-2 (chloroquine resistant) and D6 (chloroquine sensitive) clones. Aqueous extracts of *Albizia coriaria* displayed low antiplasmodial activity to both W-2 (chloroquine resistant) and D6 (chloroquine sensitive) clones compared to methanolic extracts (Kigondu *et al.*, 2009).

The IC$_{50}$ value for W-2 is tenfold that of methanolic extracts. The possible explanation for high DCM total extract activity is that the active principles are non-polar; medicinal plants are traditionally taken as aqueous extracts and these possibly take up little amounts of the active principles. A recent review of antimalarial compounds isolated from plants used in traditional medicine (Bero *et al.*, 2009) indicates that sub-family Caesalpinoideae provides the highest number of highly active compounds. *Croton macrostachyus* leaves and twigs DCM extracts had no activity on W-2 (CQ-resistant clone) but exhibited moderate activity on D6 (CQ-sensitive clone) table 7. The IC$_{50}$ of stem bark methanolic extracts of related species, *Croton zambesicus* growing in Cameroon was 5.69µg/ml against W-2 chloroquine-resistant strains (Boyom *et al.*, 2009) and 0.38µg/ml for methanolic aerial part...
extracts of *Croton lobatus* (Weniger et al., 2004). *Ocimum gratissimum* exhibits a lower IC$_{50}$ compared with *Ocimum kilimandscharicum* (see table 7). Similarly lower *in vitro* activity is reported for the closely related *Ocimum americanum* (Clarkson et al., 2004); IC$_{50}$ value of 4.2µg/ml.

Alkaloids, terpenoids, coumarins, flavonoids, chalcones, quinones and xanthones have been associated with antiplasmodial activity (Dharani et al., 2010); strong IC$_{50}$ values (≤2 µM) are invariably linked with alkaloids and diterpenes, while moderate activity (2 < IC$_{50}$ ≤ 11 µM) associated with coumarins, steroids, stilbenes and tannins (Bero et al., 2009). *Albizia coriaria* is reported to have triterpene saponins coriarosides A and B. (Noté 2010, Hill and Connolly 2011). These saponins are considered by Lacaille-Dubois et al., (2011) of significant anti-proliferative potential.

### 5.8 Assessment of ethnomedical data and biological activity results

Not all biomedical diseases are translated or recognized easily in ethnopharmacological data consequently in new drug discovery ethnomedicinal data can provide either specific or non-specific leads (Cox 1994). Indeed, some drug discoveries have been completely unrelated to folk usage e.g. *Catharanthus roseus* and the discovery of its antitumour principle vincristine was unrelated to its antidiabetic folk uses (Spjut & Perdue 1976), likewise *Tripterigium wilfordii* from China with anti-HIV principle triptolide was reported as insecticidal elsewhere in Ethiopia (Kumara et al., 2005). To strengthen new drug discovery efforts, unifying ethnomedicinal knowledge and biological activity is important. This relationship was determined. In general most ethnomedicinal uses and symptoms resemble those for conditions suggested by laboratory biological activity studies e.g. all the symptoms or conditions mentioned for the *Ocimum spp.* characterize malaria. However, the scarcely cited use of *Rhus natalensis* as a thirst reducing agent stands distinctly compared
with the proposed use of the species for chronic bacterial infections based on biological activity studies. Such claimed use possibly qualifies *Rhus natalensis* as a candidate for further confirmation studies.

Scientific validation of some these uses are confirmed by literature reports on their chemical nature, clinical effects and mechanism of action. The plants evaluated in this study have been reported to possess a number of phytochemicals: diterpenoid volatile oils *C. macrostachyus* Tane et al., 2004, Tariku et al., 2010), monoterpenes and sesquiterpenes *Carissa spinarum*, *Tithonia diversifolia* and *Plectranthus* (Achenbach et al., 1983, 1985, Heinrich et al., 1998, Chagas-Paula et al., 2011); abietane and labdane diterpenoids (Koch et al., 2006, Lukhoba et al., 2006); essential oils *Carissa spinarum* and *Ocimum gratissimum* (Matasyoh et al., 2007); alkaloids *Zanthoxylum chalybeum* and *Ageratum conyzoides* (Kato et al., 1996, Okunade 2002) and protoberberines *Zanthoxylum chalybeum* (Olila et al., 2001); flavonoids *Tylosema esculentum* (Chingwaru et al., 2011), tannins *Ageratum conyzoides* (Chiang et al., 2004) coumarins, chromenes *Ageratum conyzoides* (Okunade 2002, Chiang et al., 2004), benzoferans and terpenoids contains many bioactive compounds (Okunade 2002, Chiang et al., 2004); chlorogenic acids *Tithonia diversifolia* (Heinrich et al., 1998); steroidal saponins *Solanum incanum* (Segal et al., 1977); glycosides *Senna occidentalis* (Hatano et al., 1999); anthraquinones *Senna occidentalis* (Chukwujekwu et al., 2006). *Tagetes minuta* essential oil contains three major monoterpane ketones, ocimenones (Singh et al., 2003).

The activity of crude plant extracts is often attributed to the complex mixture of active compounds (Kamaraj et al., 2011.) Some clinical effects have been reported for the screened species; a strong antibacterial activity is attributed to *Ocimum kilimandscharicum* (Nakamura et al., 1999); anti-inflammatory activity *Tithonia diversifolia*, *Carissa*
spinarum and Ageratum conyzoides (Abena et al., 1996, Woode et al., 2007); easing chronic joint pains *Carissa spinarum* (Wambengu et al., 2011).

Other studies pinpoint mechanism of action of the plants, these include: chlorogenic acids implicated in *Tithonia diversifolia* anti-inflammatory activity (Chagas-Paula et al., 2011); diosgenin in *Solanum incanum* anti-proliferative activity (Chen et al., 2011), *Tagetes minuta* essential oil possibly exerts a negative modulation on GABAergic function (Marin et al., 1998); *Rhus natalensis* increased in vitro Measles Virus neutralization (Parker et al., 2007) and inhibited peptidase and glycosidase enzyme activities of oral bacteria (Homer et al., 1992).

This activity of crude extract biomolecules can be synergistic, antagonistic or independent. The presence of diterpenoid volatile oils has been reported in *C. macrostachyus* (Tane et al., 2004, Tariku et al., 2010).

*Ocimum gratissimum* oil is dominated by monoterpenes and sesquiterpenes (Matasyoh et al., 2007) and its essential oil containing eugenol has evidence of antibacterial activity (Nakamura et al., 1999). Lignans (Achenbach et al., 1983) sesquiterpenes (Achenbach et al., 1985) benzenoids, essential oils (Bentley et al., 1984, Moudachirou et al., 1998) have been reported in *Carissa spinarum* bark. Anti-inflammatory activity reported in (Woode et al., 2007) corroborates the ethnopharmacological use of *Carissa spinarum* roots in the treatment of (yamo) characterized by inflammation (swelling and pain) and in (Wambengu et al., 2011) the treatment of chronic joint pains. *Zanthoxylum chalybeum* contains the alkaloid skimmianine and protoberberines (Kato et al., 1996, Olila et al., 2001). *Ageratum conyzoides* contains many bioactive compounds including flavonoids, alkaloids, coumarins, essential oils, tannins, chromenes, benzofurans and terpenoids (Okunade 2002, Chiang et al., 2004). Chlorogenic acids are implicated in *Tithonia diversifolia* anti-
inflammatory activity (Chagas-Paula et al., 2011). Diosgenin, a steroidal saponin, reported in unripe *Solanum incanum* fruit (Segal et al., 1977) has anti-proliferative activity (Chen et al., 2011). The biological activities presented by *Tithonia diversifolia* have been attributed to its sesquiterpene lactones (Heinrich et al., 1998). Anthraquinones, glycosides have been reported in *Senna occidentalis* (Hatano et al., 1999, Chukwujekwu et al., 2006) *Senna* anthranoides derivatives are frequently used as cathartics (Nadal et al., 2003). Abietane (Koch et al., 2006) and labdane (forskolin) diterpenoids have been found in *Plectranthus* and *Fuerstia* (Lukhoba et al., 2006). The tubers of *Tylosema esculentum*, related to *Tylosema fassoglense*, were found to contain high concentrations of gallic acid and phenolics (Chingwaru et al., 2011). *Ageratum conyzoides* essential oil has been tested for anti-inflammatory, analgesic and antipyretic activities in mice and rats (Abena et al., 1996).

Based on correlating ethnomedicinal use and bioactivity results the study recommends some additional community level uses following (tables 4, 5, 6 and 7) for medicinal plant material harvested from wild sources to boost community health (see Table 11 below). Six new use categories (antimalarial, antimalarial drug potentiation, chronic bacterial infections, skin antifungal, broad activity antibacterial and mild antifungal for internal conditions) based on scientific evidence are given. The alternate dosage forms are applicable to community level, as water-based formulations. The plant parts used in making preparations are based on yields would be; >4% root/ whole plant, >5% stem bark, >3% leaves and aerial parts. Their processing and preparation should include elimination of contaminants, unwanted materials by cutting, washing and sorting.

The alternate or new uses are based on *in vitro* biological activity and are for providing sources of new effective drugs. Most of these uses are unrelated to traditional ones recorded earlier during the ethnopharmacological survey.
Long cultural usage and the preliminary larvicidal toxicity findings indicating relatively safe therapeutic properties do not assert total safety of the proposed uses and dosage forms. The overall goal in drug development is quality, safety and efficacy.
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</tr>
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</table>

AP - aerial parts; L - leaf; WP - whole plant; R - root; SB - stem bark; RB - root bark, R and L - root and leaves; F and L - flower and leaves
5.91 Toxicity

Toxicity study of medicinal plants is of major interest to human health. Toxic traits limit the use possibility for extracts or their preparations. Increased information on toxicity is extremely useful in developing formulations usable at community level. Traditional toxicity investigation employs brine shrimp, mosquito larvae and rat and mice as test animals. While toxicity tests done with mosquito larvae do not always extend to humans, the LC_{50} values can be indicative of safe doses. The extract with the lowest LC_{50} value is the most toxic while that with highest LC_{50} value is the least toxic. At 24 hours only Albizia coriaria and Plectranthus barbatus had LC_{50} values below 1000 mg/l (see table 8). Carissa spinarum, Tylosea fassoglense and Croton macrostachyus exhibited no larvicidal activity. Good botanical larvicides have activity under 100μg/ml (Promsiri et al., 2006); therefore none of these ethanolic extracts can be used in vector control programs. Non polar extracts could possibly have exhibited activity against Aedes aegypti larvae.

Though positive antimicrobial activity was shown by some species their popular usage should be guarded since some have reported toxicities. There are toxicity indications for Albizia coriaria and Tithonia diversifolia in mice (Johns et al., 1990, Fakunle and Abatan 2007, Adebayo et al., 2009, Elufioye et al., 2009). Croton macrostachyus may have a possible role as an oncogenic co-factor as discussed in (Mizuno et al., 1983). Though special attention has been given to Ageratum conyzoides lately (Ukwe et al., 2010, Kamboj and Saluja 2008, Nour et al., 2010) adverse reports, toxicity to sheep have been reported (Purohit 1962). Some studies (Ukwe et al., 2010) clear such reports; noting that aqueous extracts exhibited an LD_{50} above 5000 mg/kg having shown no mortality at all the doses tested. Cell cytotoxic studies with Carissa spinarum gave safe indications (Tolo et al., 2007). Plectranthus barbatus treatments of 440mg/kg per day increased the incidence of rat fetuses with skeletal variations (Almeida and Lemonica 2000). No studies
have been found reporting on the toxicity of *Carissa spinarum* (Malebo and Mbambo 2011) and *T. fassoglense*. The median lethal dose (LD$_{50}$) of *Carissa spinarum* in experimental mice was: 282.8 mg/kg following intraperitoneal administration of over 5000 mg/kg following oral administration (Ya’u et al., 2008). *Senna occidentalis*, one of the species evaluated in this study, had a considerably high LD$_{50}$ value of 99.5μg/ml (Orech et al., 2005). *Tagetes minuta* essential oil elicited anxiogenic-like effects (Marin et al., 1998)
6.0 CHAPTER SIX – CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

This study aimed at identifying, documenting, comparing and evaluating the medicinal plants of the Luo and Kuria. The two main research questions were:

(a) How similar is medicinal plant use among the Luo and Kuria?
(b) Do popularly used plants among the two groups exhibit biological activity?

This section concludes with a summary of findings and recommendations are included to guide future work on ethnobotany, ethnomedicine and bioactivity of materia medica.

6.2 Traditional medical knowledge and flora of the Luo and Kuria

These findings among the Kuria and Luo support the WHO estimation that traditional medicine provides over 70% of human and animal healthcare needs of rural populations. There is a rich cultural heritage and wealth of information on plants, plant products and health ethnopractices possessed by the ethnic groups. Luo and Kuria traditional healing have both logical and psychosocial components that deal with biological, social, mental health aspects and spiritual well being. Some psychosocial ethnomedical beliefs and health practices are pervasive and forcefully influence local illness/disease construction, plant use patterns. Diseases of psycho-social aetiology account for sizeable fractions of the ethnopharmacopoeias. Though the present analysis of psycho-social conditions is incomplete these beliefs and practices merit attention for sustainable health delivery because both studied groups approach biomedicine based on these traditional understandings of healing. The survival and success prospects of traditional medicine appear to be excellent given its pragmatic and dynamic nature.
The Luo and Kuria have integrated plant species from Asia, the Americas and Europe into their plant ethnopharmacopoeias. The use and preparation of plants is related to local concepts of disease, chemical and physical properties and the world view of the ethnic group. Leaves are frequently utilized in preparing drugs and decoctions and infusions are chief formulations. The Kuria medicinal plants are being reported for the very first time.

The main hypothesis that both medicinal floras are similar was investigated; the key finding based on analysis of shared medicinal plant taxa, diversity (F_{ir}) and similarity (S) indices is that ethnopharmacopoeia of ethnically distinct groups living in geographical proximity converge strongly (see table 10). The Shannon-Wiener index (6.52) for the Kuria ethnopharmacopoeia is higher than that for the Luo (5.33) and species richness for the two groups is almost the same. In addition the coefficient of similarity (S) and informant consensus factor F_{ir} supports the idea that they are not exactly the same but close. The indices demonstrate that the ethnopharmacopoeias amalgamate essential elements of both groups, a reflection of assimilation of new uses. The supposition that there are no flora differences in the pharmacopoeia of the Kuria and Luo is supported. Analogies in aetiologies, preparations, parts, medicinal plant families, and plant species are possibly explained in mutual cultural exchanges. Large and common plant families in the geographical flora are selected and commonly utilized as medicines.

6.3 Bioactivity of the Luo and Kuria ethnopharmacopoeia

Ethnobotanical knowledge was sufficiently reliable for identifying plant extracts with biological activity. This study validates traditional medical knowledge and practice of the Kuria and Luo through scientific research. It demonstrates that the use of ethno-directed methods is useful for documenting cultural health practices and that usage
consensus is reliable for pointing species with potential activity. Local knowledge had a significant influence on the observed in vitro antimicrobial activity for the fifteen plants evaluated; this outcome strengthens the usage of these plants. Six out of 15 plants (40%) extracts show antibacterial activity; four out of 15 plants (27%) show high antifungal activity; and three out of eight (37.5%) active (IC$_{50} <$ 5µg/ml) against W-2 (CQ resistant clone) and four out of eight (50%) were active (IC$_{50} <$ 5µg/ml) against (CQ sensitive clone) see Table 4, 5,6 and 7. Some despite frequent reports by respondents elicited low bioactivity; this does not necessarily imply they are not without curative value because they may display in vivo activity. For crude products these results are promising and demonstrate the value of the ethnobotanical approach in seeking new sources of bioactive molecules. Although the nature of all the compounds responsible for bioactivity is not fully known these results validate that methanolic extracts may be of value for diseases with gram-positive bacteria aetiology and dichloromethane extracts for those with protozoal aetiology. Scientific evidence for efficacy of herbal medicines against a host of pathogenic microbes is provided in the thesis, this is important to deliver evidence-based herbal medicine so the treatment methods can become more effective and safe. On the basis of these results it is arguable that medicinal plants used in traditional medicine should not be dismissed on face value. Research opportunities abound for validating popular medicinal plant species and should possibly include some species cited few times that may have been missed bioactivity studies. Among the fifteen plants studied, only *Tylosea fassoglense, Ageratum conyzoides, Tithonia diversifolia* and *Albizia coriaria* elicited significant antimicrobial (antibacterial, antifungal and antiplasmodial) activity, the other species are not necessarily without curative value.

Among the fifteen plants studied, *Tylosea fassoglense, Tithonia diversifolia* and *Albizia coriaria* elicited significant antibacterial activity; *Albizia coriaria, Plectranthus*
barbatus and Rhus natalensis elicited high preliminary antimycotic activity; and Albizia coriaria, Ageratum conyzoides and Ocimum kilimandscharicum antiplasmodial activity. Albizia coriaria could be an important candidate for resistant antiplasmodial drug development. Tylosema fassoglense is an important candidate for antimicrobial tests against micro-organisms, especially those with antibiotic resistance. Carissa spinarum, Plectranthus barbatus and Tylosema fassoglense are promising candidates and the possibility of combining them in preparations would possibly improve efficacy of the drug mixture. For antimalarial potentiation drug species, with exception of those which had no results, could be recommended.

Based on the MIC results it would be interesting to further investigate Albizia coriaria, Plectranthus barbatus and Tithonia diversifolia, species that showed activity with all test microbes. Their bioactive principles remain to be identified. Rhus natalensis, Tithonia diversifolia and Albizia coriaria merit further investigation as potentially useful agents for the treatment of mycoses. Any further evaluations should consider determination of action mechanisms and identification of their active biomolecules.

Results of toxicity assessment (larvicidal activity) observed in Albizia coriaria and Plectranthus barbatus (see Table 8) are an indication of safety. They are mild and neither, i.e. Albizia coriaria nor Plectranthus barbatus, can be used in vector control programs. Though, toxicity reports in scientific literature on Ageratum conyzoides, Tithonia diversifolia and Croton macrostachyus cautions further development of their products special attention should be directed to Tylosema fassoglense for use as either as a monoherbal or polyherbal. Evidence for the efficacy and safety of traditional crude herbal preparations of Tylosema fassoglense is fairly strong.
6.4 Recommendations

The case in this study was that the ethnobotanical approach provides a rich foundation for new drug discovery. Aspects of ethnomedicine, ethnobotany and ethnopharmacology were covered and based on the findings gaps in knowledge still exist; the following recommendations are made for researchers, local community, institutions and government. Based on this study it is proposed that future research and development endeavours include.

- Further research on both ethnopharmacopoeias to establish the chemical and pharmacological basis of the activity which has been clearly shown in antimicrobial susceptibility studies. Such studies should include isolation and identification of pure compounds.

- Studies to determine toxicity of developed/formulated plant extracts and their modes of activity. Such studies should include *in vivo* investigation of extracts for their immediate and long-term effects on test organisms, including the rate of recovery from toxic effects and adverse drug–drug and drug–food interaction effects.

- Determining where local communities can support medicinal plant conservation. Special attention being paid to conservation and management of plant families popularly used as medicine and maintenance of natural vegetation cover. Explore the cultivation of promising chemotypes for rapidly declining species.

- Intensive ethnographic fieldwork to record cultural (social and psychological) aspects and new therapies. Culture-specific lexicographic and terminological (disease and plant names) studies of Kuria and Luo should be done to advance understanding in ethnosystematics.
Fostering collaboration between THPs and Biomedical researchers and practitioners. With emphasis on training traditional healers to provide health education and appropriate health care.
7.0 REFERENCES


Lindsay, R. S. and Hepper, F. N. 1978. 'Medicinal plants of Marakwet, Kenya.' 49pp. Kew: Royal Botanic Gardens.


Saggerson, E. P. 1952. 'Geology of the Kisu


(URL 1) [http://www.who.int/mediacentre/factsheets/fs134/en/](http://www.who.int/mediacentre/factsheets/fs134/en/)

(URL 2) [http://www.plantinteractions.co.uk/ethnobiology/ethnobotany/](http://www.plantinteractions.co.uk/ethnobiology/ethnobotany/)

(URL 3) [http://www.terralingua.org/](http://www.terralingua.org/)

(URL 4) [http://opendata.go.ke/](http://opendata.go.ke/)
# APPENDIX 1

## NUMBER OF CITATIONS FOR DISEASES – LUO

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</tr>
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<tr>
<td>Ammenorhoea</td>
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<td>Burns</td>
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APPENDIX 2

NUMBER OF CITATIONS FOR DISEASES - KURIA

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### APPENDIX 3

**SHARED MEDICINAL PLANTS OF THE LUO AND KURIA**

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## APPENDIX 4

### PROBIT CALCULATION TABLES

*Albizia coriaria*

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<td>7</td>
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<td>33.30%</td>
<td>4.56</td>
</tr>
<tr>
<td>1000mg</td>
<td>3.0000000</td>
<td>20</td>
<td>15</td>
<td>73.30%</td>
<td>73.30%</td>
<td>5.61</td>
</tr>
</tbody>
</table>

*Plectranthus barbatus*

<table>
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<tr>
<th>Conc. (mg/L)</th>
<th>Log₁₀ Conc.</th>
<th>Total No.</th>
<th>No. Dead</th>
<th>% Mortality</th>
<th>Corrected % Mortal.</th>
<th>Probit</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>-</td>
<td>20</td>
<td>0</td>
<td>0%</td>
<td>0%</td>
<td>-</td>
</tr>
<tr>
<td>200mg</td>
<td>2.3010300</td>
<td>20</td>
<td>0</td>
<td>0%</td>
<td>0%</td>
<td>-</td>
</tr>
<tr>
<td>400mg</td>
<td>2.6020600</td>
<td>20</td>
<td>1</td>
<td>12.5%</td>
<td>12.5%</td>
<td>3.87</td>
</tr>
<tr>
<td>600mg</td>
<td>2.7781513</td>
<td>20</td>
<td>4</td>
<td>20%</td>
<td>20%</td>
<td>4.16</td>
</tr>
<tr>
<td>800mg</td>
<td>2.9030900</td>
<td>20</td>
<td>10</td>
<td>50%</td>
<td>50%</td>
<td>5.00</td>
</tr>
<tr>
<td>1000mg</td>
<td>3.0000000</td>
<td>20</td>
<td>12</td>
<td>56.25%</td>
<td>56.25%</td>
<td>5.18</td>
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</table>
### APPENDIX 5

**TRANSLATION OF LUO DISEASES**

<table>
<thead>
<tr>
<th>Local name</th>
<th>Translation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. abuba/ nyach</td>
<td>venereal disease/ gonnorrhoea</td>
</tr>
<tr>
<td>2. abach</td>
<td>polio</td>
</tr>
<tr>
<td>3. achany</td>
<td>foot and mouth disease</td>
</tr>
<tr>
<td>4. adhola</td>
<td>wound</td>
</tr>
<tr>
<td>5. ahonda/fuolo</td>
<td>cough</td>
</tr>
<tr>
<td>6. ahonda guogi</td>
<td>whooping cough</td>
</tr>
<tr>
<td>7. angiew</td>
<td>measles</td>
</tr>
<tr>
<td>8. athung ‘a</td>
<td>cold</td>
</tr>
<tr>
<td>9. bonde/ siting</td>
<td>ringworms</td>
</tr>
<tr>
<td>10. bur</td>
<td>boil</td>
</tr>
<tr>
<td>11. chira</td>
<td>condition of moral and/ or ritual impurity</td>
</tr>
<tr>
<td>12. chuowo tung</td>
<td>bewitchment</td>
</tr>
<tr>
<td>13. diep</td>
<td>diarrhoea</td>
</tr>
<tr>
<td>14. dhoho/ mbiko</td>
<td>leprosy</td>
</tr>
<tr>
<td>15. gik</td>
<td>hiccups</td>
</tr>
<tr>
<td>16. golo wino</td>
<td>removal of the umbilical cord</td>
</tr>
<tr>
<td>17. gwonyo</td>
<td>scabies</td>
</tr>
<tr>
<td>18. hima/ arip</td>
<td>hernia</td>
</tr>
<tr>
<td>19. ich kach/ muorruok</td>
<td>stomachach...</td>
</tr>
<tr>
<td>20. “ich kuot”</td>
<td>constipation and flatulence</td>
</tr>
<tr>
<td>21. ich mao</td>
<td>miscarriage</td>
</tr>
<tr>
<td>22. lwodo</td>
<td>oral thrush</td>
</tr>
<tr>
<td>23. jimo</td>
<td>plastic teeth</td>
</tr>
<tr>
<td>24. juok</td>
<td>evil eye</td>
</tr>
<tr>
<td>25. kalanga/ jumbe</td>
<td>skin fungal infections</td>
</tr>
<tr>
<td>26. koko/ tong ‘juok’</td>
<td>whitlow</td>
</tr>
<tr>
<td>27. koko/ dhoho</td>
<td>swelling of facial parts from evil eye</td>
</tr>
<tr>
<td>28. mbaha/ ayieny</td>
<td>jaundice in infants</td>
</tr>
<tr>
<td>29. mdhohi</td>
<td>wasting infantile disease</td>
</tr>
<tr>
<td>30. neko</td>
<td>madness/ dementia</td>
</tr>
<tr>
<td>31. ndulme</td>
<td>epilepsy</td>
</tr>
<tr>
<td>32. njokni</td>
<td>worm infection</td>
</tr>
<tr>
<td>33. odondwe</td>
<td>conjunctivitis</td>
</tr>
<tr>
<td>34. ojivo</td>
<td>persistent abdominal aches during menses</td>
</tr>
<tr>
<td>35. muma madongo</td>
<td>grave transgressions</td>
</tr>
<tr>
<td>36. orianyancha</td>
<td>loose stools</td>
</tr>
<tr>
<td>37. rarirw</td>
<td>foetal misalignment</td>
</tr>
<tr>
<td>38. remo matin</td>
<td>anaemia</td>
</tr>
<tr>
<td>39. sepe</td>
<td>spirit possession</td>
</tr>
<tr>
<td>40. sihoho</td>
<td>severe stomachache caused by the &quot;evil eye&quot;</td>
</tr>
<tr>
<td>41. sigete/ segrete</td>
<td>abdominal pains during menses</td>
</tr>
<tr>
<td>42. wich bar</td>
<td>headache</td>
</tr>
<tr>
<td>43. wil</td>
<td>sprain on foot or arm</td>
</tr>
<tr>
<td>44. winyo/ kulbat</td>
<td>pneumonia/ sunken fontanelle</td>
</tr>
<tr>
<td>45. yamo</td>
<td>internal body pains</td>
</tr>
</tbody>
</table>
## APPENDIX 6

### TRANSLATIONS OF KURIA DISEASES

<table>
<thead>
<tr>
<th>Local name</th>
<th>Translation</th>
</tr>
</thead>
<tbody>
<tr>
<td>ekirungara/ ekirongora</td>
<td>heart burn</td>
</tr>
<tr>
<td>endero kuuma /endaera gosomera</td>
<td>stomachache</td>
</tr>
<tr>
<td>oruchoka</td>
<td>fine stringy worm infection</td>
</tr>
<tr>
<td>chinsegete/ ichinkegeti</td>
<td>menstrual cramps</td>
</tr>
<tr>
<td>ibimeni</td>
<td>worm infection</td>
</tr>
<tr>
<td>ibisara</td>
<td>false teeth</td>
</tr>
<tr>
<td>gegekong'onto</td>
<td>whooping cough</td>
</tr>
<tr>
<td>ichinkera</td>
<td>wasting infantile illness</td>
</tr>
<tr>
<td>eng'oma</td>
<td>swelling</td>
</tr>
<tr>
<td>omogomba</td>
<td>infertility in women</td>
</tr>
<tr>
<td>omochuru</td>
<td>mad person</td>
</tr>
<tr>
<td>omotogo goranyatia/ gondeye</td>
<td>venereal diseases</td>
</tr>
<tr>
<td>egesonono</td>
<td>malaria</td>
</tr>
<tr>
<td>amameria</td>
<td>navels</td>
</tr>
<tr>
<td>insisa</td>
<td>'leaking' pregnancy</td>
</tr>
<tr>
<td>andaerausi amanje</td>
<td>fibrositis</td>
</tr>
<tr>
<td>iriheme</td>
<td>wounds</td>
</tr>
<tr>
<td>ebisese</td>
<td>eczema rashes</td>
</tr>
<tr>
<td>irihute</td>
<td>foot and mouth disease</td>
</tr>
<tr>
<td>isinabi</td>
<td>skin fungal disease</td>
</tr>
<tr>
<td>amabehi</td>
<td>eczema</td>
</tr>
<tr>
<td>obusisa</td>
<td>small pox</td>
</tr>
<tr>
<td>surura</td>
<td>jaundice</td>
</tr>
<tr>
<td>manjano</td>
<td>tooth ache</td>
</tr>
<tr>
<td>ebioso</td>
<td>tuberculosis</td>
</tr>
<tr>
<td>ubusisa</td>
<td>persistent watery boils/ rashes</td>
</tr>
<tr>
<td>amaino gomon/ a</td>
<td>plastic teeth</td>
</tr>
<tr>
<td>orobere romoreye</td>
<td>swollen breast</td>
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<tr>
<td>amaiso gakureye</td>
<td>aching eye</td>
</tr>
<tr>
<td>amaino gamoreye</td>
<td>tooth ache</td>
</tr>
<tr>
<td>itiha</td>
<td>tuberculosis</td>
</tr>
<tr>
<td>iritotorwa/ amatotorwa</td>
<td>cattle bloat</td>
</tr>
<tr>
<td>ichinda ivimbire</td>
<td>measles</td>
</tr>
<tr>
<td>ekeena</td>
<td>navel swollen</td>
</tr>
<tr>
<td>ekeemu</td>
<td>mumps</td>
</tr>
<tr>
<td>iring'weina</td>
<td>boils</td>
</tr>
<tr>
<td>irihute</td>
<td>swollen neck glands</td>
</tr>
<tr>
<td>ibichoncho</td>
<td>severe stomachache</td>
</tr>
<tr>
<td>irikobi/ irikebi</td>
<td>bruises</td>
</tr>
<tr>
<td>omotere</td>
<td>measles</td>
</tr>
<tr>
<td>obogaga</td>
<td>oral thrush</td>
</tr>
<tr>
<td>mumps</td>
<td>abscess</td>
</tr>
<tr>
<td>sabura/ iching'weina</td>
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<td>inzimana</td>
<td></td>
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<tr>
<td>endomerwe ni njoka</td>
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<td></td>
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</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>46. nkoroïye</td>
<td>cough</td>
</tr>
<tr>
<td>47. ekiaigeso</td>
<td>hiccups</td>
</tr>
<tr>
<td>48. ndaromwa</td>
<td>sore throat</td>
</tr>
<tr>
<td>49. endori</td>
<td>epilepsy</td>
</tr>
</tbody>
</table>
APPENDIX 7

INTERVIEW SCHEDULE

Participants of the interviews will take part on a voluntary basis and not be paid. There will be no pressure on them to answer the questions and they can refuse to answer any questions they do not feel comfortable with.

NB: The interview schedule was developed after a pre-test survey.

INTERVIEW GUIDE NUMBER.................................................................................................................................
DATE........................................................................................................................................................................
LOCATION................................................................................................................................................................

PART 1:
Name of interviewee (this is optional):-----------------------------------------------------------------------------------------------------------------
Locality:--------------------------------------------------------------------------------------------------------------------------------------------------------
Age:----------------------------------------------------------------------------------------------------------------------------------------------------------
Sex: □ Male □ Female
Ethnic origin:__________________________________________________________________________
Have you attended school? □ yes, □ no
What is your highest year of school completed?
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23+
(primary) (high school) (college/ university) (graduate school)
How did you become a healer?

SECT. A: PLANT UTILIZATION
How many diseases do you treat? Name them please (probe)
........................................................................................................................................................................
Please specify the name(s) of the plant(s) used in managing these diseases (probe)?
Name the plant parts used---------------------------------------------------------------------------------------------------------------------------------------------
........................................................................................................................................................................
How is/ are the plant part(s) prepared (probe)?-----------------------------------------------------------------------------------------------
........................................................................................................................................................................
How much of the mixture(s) have to be taken?-----------------------------------------------------------------------------------------------------------------
Where are the plants collected?-------------------------------------------------------------------------------------------------------------------------------
What are the other uses of the plants you have mentioned above?--------------------------------------------------------------------------------------------
What are the meanings of the names of the plants above?-----------------------------------------------------------------------------------------------------

OBSERVATIONS IN THE HOMESTEAD
Observe for the following
Medicinal plants planted around the home or preserved in the fields, reaped, medicinal plant material, and woodlot. Reasons for having these observations (probe further)

Thank you very much for your cooperation
APPENDIX 8
FOCUS GROUP RESULT SHEET FOR MEDICINAL PLANTS

VILLAGE_________________________________DATE:_____________________

DISEASE: ................................

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Aetiology</th>
<th>Plant remedies</th>
<th>Preparation</th>
</tr>
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<tr>
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DISEASE: ................................

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Aetiology</th>
<th>Plant remedies</th>
<th>Preparation</th>
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Medicinal Plant

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<th>Local Name</th>
<th>Uses</th>
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<td></td>
</tr>
</tbody>
</table>
GROUP INTERVIEW GUIDE

1. What do you term as good health? 

2. Which diseases are common in this area? 

3. Which plant(s) are used in managing these diseases (probe)? 

4. How are these plants prepared? 

5. Which are the most popularly used medicinal plant species? 

6. Can you distinguish the different traditional healers?