

**AN ETHNOBOTANICAL AND PHYTOCHEMICAL STUDY OF
MEDICINAL PLANTS USED TO TREAT GASTROINTESTINAL
DISORDERS IN CHILDREN IN SIAYA DISTRICT, KENYA.**

BY

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Master of Science in Botany**

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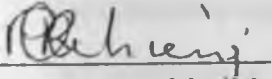
DEDICATION

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DECLARATION

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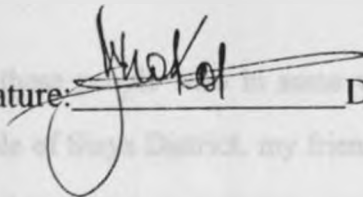
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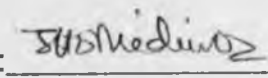
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ACKNOWLEDGEMENT

I am deeply indebted to my supervisors; Prof. J. O. Kokwaro and Prof. J. O. Midiwo for the invaluable expert advice they have accorded me at all stages of this work. I also extend my gratitude to the entire staff of the Botany Department, especially to Mr Simon Mathenge for his assistance in plant identification, Mrs Catherine Lukhoba for her critical discussions and advice during the writing of this work, and to Mr Gituanja for his assistance during chemical analysis. I am also indebted to Ms Lucy Ougo who was very helpful in the typing and editing of this work.

I extend my sincere thanks to the African Academy of Sciences (AAS) for kindly providing the bulk of financial support and the East African Wildlife Society (EAWS) for kindly financing part of this project.

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I thank my parents, brothers and sisters and well-wishers who gave me the support and encouragement to go on despite major constraints and moments of desperation, my family who had to bear with my absence and strain from work.

I take this chance to thank all those people who in some way contributed towards the success of this project: the people of Siaya District, my friends, relatives, informants and assistants. I am grateful to all of them.

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ABSTRACT

Although the local Siaya people attribute most of the diseases and misfortunes to spirits, magical and religious practices or animal sacrifices are seldom sought to get rid of diseases and illnesses, and these do not form part of the curative properties of plants thus have been ignored. The medicineman, '*ajuoga*', was found to play an important role in traditional medicine in some areas. However, there was a tendency for people to get herbs from their fellow villagers, close relations or friends as opposed to practitioners since non-practitioners either charged negligibly or gave their herbals freely.

While the district is reknowned to have a high proportion of learned people, a majority of the local people themselves have remained rooted to their traditions, customs, beliefs and practices; Therefore a lot of ethnomedical information can still be obtained from the area. Recently the area received survey attention through the ethnobotanic works of Johns and Kokwaro (1991) on herbal remedies and food plants of the region. The plants mentioned are still quite popular and enjoy a good reputation in their lore.

It was evident that most of the herbal preparations were orally administered, perhaps because the mode is most convenient and economical. This mode has limitations as it requires the patient's co-operation yet most of the drugs are very bitter to the taste. The other limitation is a possibility of incomplete absorption in the stomach and the gastric irritation which could result from oral administration. Other than oral administration which was the most popular, rectal and muscular applications of herbs were also cited.

Rectal administration for herbals such as *Gynandropsis gynandra* has the limitation of poor patient acceptability but has the advantage of avoiding causing gastric distress and other limitations of oral use. Muscular applications involving scarifications was also cited. This was commonly used where gut problems were linked to the 'evil eye' (sorcery). This mode was least used.

Herbal preparations took the form of powders (ash, dried and ground plant parts), scarifications, decoctions and concoctions, pastes, pomades, poultices, ointments of ghee amongst others as described by Kokwaro (1993).

Most of the herbals were harvested in broad day light between morning when dew has dried up and before sun set. In the wet seasons, plant harvest took place before rather than after the downpour. It was only in cases of emergency that plants were collected at otherwise odd hours, for example, night time or after sunset. As a rule, a nursing mother was not allowed to harvest a herbal for a fellow nursing mother's child, for reasons not clarified.

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Most preparations involved more than one plant source, and any given plant was also known to treat other diseases in addition, not necessarily the ones reported here, an added advantage of herbal remedies over western medicines which tend to be specific to diseases treated. It is as if to say that while treating disease X, the medicament goes further to treat or ward off others.

It was observed that , most preparations intended to treat stomach aches were often bitter (e.g. *Schkuria pinnata*, *Tithonia diversifolia*, *Cassia hildebrandtii*, *Lantana camara*, *Cassia occidentalis*, *Leonotis nepetifolia* etc.). Many interviewees asserted that bitter medicaments worked best as they quickly repelled causative agents of gut problems.

However, it is only scientific investigation that will be able to confirm or refute such claims. The most commonly used family was *Leguminosae* which had 14 plant species belonging to 10 genera. This was followed by *Compositae (Asteraceae)* with 11 species in 11 genera and *Labiatae* with 10 species in 7 genera. Perhaps *Leguminosae* took the lead because of its diversity in the region through its three sub-families which are all represented. In general, most genera only provided one species each except for *Acacia*, *Aloe*, *Capparis*, *Erythrococca*, *Kedrostis*, *Hyptis*, *Plectranthus*, *Lantana* and *Ocimum* which provided 2 species each and *Cassia* which provided 4 species.

In total, 82 plants species spanning across 60 genera in 38 families were documented as being useful herbals for gastrointestinal disorders in children in the district. Favoured species included *Zanthoxylum chalybeum*, *Harrisonia abyssinica*, *Lannea schweinfurthii*, *Kigelia africana*, *Hyptis pectinata*, *Euclea divinorum*, *Plectranthus barbatus* inter alia.

Some most commonly used plants were analysed for the general groups of compounds they contained, such as flavonoids, anthraquinone, saponins, and alkaloids. A possible scientific explanation was given where available for the medicinal plants thus cited.

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Chapter One

1. INTRODUCTION

In traditional societies where people enjoy an intimate relationship with the ambient vegetation, man has experimented with many of these species. Most were innocuous, a few nourished him, others relieved sickness symptoms and others with narcotic and hallucinogenic properties temporarily transferred him from his mundane existence into unreal realms which he could not understand. The last two became his medicines. (Ayensu 1978).

The people of Siaya District as many other traditional societies have been practising the use of plant resources as medicines to palliate, cure and prevent diseases for centuries. The experience accumulated from this practice has become an integral part of culture suited for their own primary health care systems. However, evidence shows that culture which has developed in and around medicinal plants is rapidly getting eroded. Since knowledge of medicinal plants was orally passed on from one generation to the next, this cultural erosion may destroy the traditions and knowledge concerning the medicinally useful plants before they are studied and documented. (IUCN 1984).

There is considerably a continued dependence on medicinal plants alongside modern medicine. This is largely dictated by economic and cultural factors. For example modern medical services are inaccessible to the vast majority of the people in the district. Even where accessible, the synthetic medicines are still supplemented by the herbal remedies most of which are within easy reach. Thus, traditional medicines continue to predominate in the health care systems despite the insufficient studies on their therapeutic value and potential (AETFAT, 1988).

It is in this light that a World Health body, The World Health Organisation, (W.H.O.), is currently taking cautious steps to encourage the utilisation of resources of traditional medicines in tropical countries. Following the 1976 W.H.O. report that 90% of rural dwellers receive health care from traditional healers, W.H.O. has promoted a co-ordinated approach between these healers, and, doctors and nurses of modern medicine. In effect, it is being increasingly recognised that all available resources need to be used for a better world-wide health care if health for all is to be achieved by the year 2000. In fact, faced with declining health standards the World Health Organisation has acknowledged the therapeutic potential and endorsed the use and development of medicinal plants in developing countries. (W.H.O 1986, 1987). In Siaya District, just like other parts of Kenya, despite government efforts to subsidise costs of primary health programmes, (such as curative care, communicable disease control, health education etc.), the objective of the programme has received little population coverage due to limited financial resources.

My study area, Siaya District, is a rural area where practitioners of herbal medicine remain active. In this district many people still take their sick children to hospital first before resorting to herbal medicine, while many more do the exact reverse partly due to lack of services or inadequacy of services rendered at most of the health institutions in the district. This explains why opportunities still exist to record and evaluate this aspect of the traditional health care of the Luo. This present study has identified 82 herbal remedies for gastro-intestinal disorders in this district. It has exposed various methods of plant harvest that render the very existence of these plants at stake especially considering that most plant harvesters do not cultivate these plants, and instead rely on wild resources.

Whereas many local people knew the uses and /or effects of plants on man, they never always knew them by their local names let alone their scientific names, a pointer towards the richness in herbal knowledge. To prove this were the new recordings in herbal medicine hitherto not reported in the medical botany literature of this region. Furtherstill, there have scarcely been any attempts to screen these plants for their potential values. This has been worsened by herbal-knowlege erosion compounded by rural to urban migration for gainfull employment by the youth, poor farming methods whereby large tracts of forests or bushes are cleared and burnt to pave way for cultivation and with it the medicinal plants, as well as charcoal burning using tree medicinal plants as the resource.

With such realities in mind, this survey was deemed neccessary, followed by some phytochemical screening of but a few plants. It is hoped that the results of this work will serve as an example for similar projects, that it will provide a database of usefull plants for future biological and physical screening, and be of use in our expanding pharmaceutical industries. Such studies will further reduce superstitions and the negative attitude of many people towards herbal medicine. Lastly, the potential benefits of herbal medicine will serve as a drive towards the need for the conservation and evaluation of drug plants while promoting their use as alternative medicine where need be.

1.1.0 The Need for Conservation

With the increasing use of medicinal plants in many countries, it has become apparent that their exploitation must be accompanied by conservation if they are to be preserved from depletion and even extinction. It is correct to assert that ethnomedicines in the past have provided clues that shortened the discovery of modern drugs either directly from the plants or their synthetic analogues. For example, species of *Agave* and *Dioscorea* have been used as a source of sapogenin for the synthesis of cortisone for contraception, *Rauwolfia serpentina* has been used as a source of reserpine for high blood pressure and epilepsy treatment, while *Catharanthus roseus* has provided vincristine and vinblastin a possible cancer chemotherapy. *Dioscorea* species have probably been exploited to the point of extinction as for example *D. sylvatica* Spreng of Southern Africa (Benz, and Santesson 1973), where the drug is obtained from the root tubers.

The fast growing projected population, unemployment, soaring costs and inaccessibility to modern medicines have placed an additional value on the medicinal plants. Over 1000 indigenous plant species are used as herbal medicines in disease management in East Africa alone (Kokwaro 1993). The demand for these drugs is seen in the increased activities of the practitioners and magnitude of trade in herbal medicines not only in rural areas, but also in Kenya's major urban cities. In their quest to meet demand, the practitioners and traders collect medicinal plants without regard for conservation practices. The deleterious methods include excessive bark stripping, uprooting of whole plants, digging out of roots and root tubers, while crucial factors such as range of dispersion, age, population density, regeneration rate and

reproductive biology *inter alia* are ignored. These factors have placed several medicinal plants which are popular and formerly widespread such as *Aloe* species (*Aloeaceae*) on conservation priority of the government. On the other hand, abundant popular species with confined distribution such as *Azadirachta indica* (*Meliaceae*) and *Waburgia salutaris* (*Canellaceae*) *inter alia* are steadily growing scarce due to over exploitation and poor methods of collection. (Pers-Com. Robertson, 1993). Although the evidence for the loss of medicinal plants is sketchy, it is inevitable that the most sought after species are or will be threatened from over exploitation, poor harvest methods and forest clearing leading to species loss. Although legislation and law enforcement dominate the approach to this problem, forest destruction continues in the wake of population increase.

It is generally agreed that people are actually exerting pressure on forests in demand for forest products putting at risk the medicinal plants in the threatened habitats. An example is Got Ramogi regarded to be sacred by Luos and recently studied by Sacred Forest Project volunteers (1993). Consequently, unless government policies and programmes are developed to increase and sustain these resources, there is real danger of extinction of the rare or abundant medicinal plants which are either restricted or widespread in certain parts of Kenya.

Until recently, medicinal plants have not been viewed with major concern by conservationists. To date, few countries actively protect their resources of medicinal plants. According to the IUCN-WWF Plants Advisory Group, some 6,000 plant species could become extinct by the year 2050 if the current trend continues unabated. This is a great loss indeed, especially to the people in the district to whom the plants mean health.

1.1.1 Medicinal Plants and Drug development: A historical perspective

The world of plants has been vital to mankind since intelligence began to glimmer. Branches and leaves sheltered early man, burning wood warmed him, fruits, seeds and roots fed him. Gradually by a process of trial and error he sorted out plants that he could eat and those he couldn't. Gradually he also discovered certain qualities beyond just edibility; painkilling, soothing, relief of fevers, sedating etc. (Huxley in Le Strange 1977) i.e. that some portions were effective against a number of diseases (Sofowora 1982). Beneficial plants appear to be 5000 years old in a Chinese pharmacopoeia. The ancient Sumerians recorded some thousand medicinal plants some 4000 years ago. The Assyrians recorded some hundreds of plants at about the same time followed by the Egyptians, the Greeks then gave a disproportionate attention to medicinals.

No one knows exactly how early man first came to use plants for his ailments for primitive man did not understand disease. He viewed it either as a malevolent influence of the gods or as due to some supernatural spell. To them, disease was of a magic-religious nature. Perhaps some of his experimental food had unexpected physiological effects that ameliorated the disease. Whatever the beginning, the interest and progression in curative plant products have been relentless. Today, the manufacture and marketing of medicinals is a major Industry.

The history of drugs which is largely the history of botany indicates that medicinal chemistry is an ancient science with the art of the use of medicinal plants being as old as mankind (Hamburger & Hostettman 1991). Earliest records by Chinese,

Indians, South American and Mediterranean cultures described plant preparations and their therapeutic uses. Some 4,500 years ago a Chinese scholar-emperor Shen Nung compiled a book of herbs and observed the anti-febrile effects of **CHIANG SHENG** a plant which has shown in modern times to contain anti-malaria alkaloids. Homer in his book, the *ODYSSEY* tells of herbals in Egypt many of which were poisonous yet medicinal. Many preparations are preserved in medical papyri which makes Egypt lead the rest of the world in herbal medical knowledge.

Hippocrates (400 BC) was the first of the Greeks to regard medicine as a science. He founded the discipline of medicine and introduced the use of salts for a variety of disorders. He was a widely travelled physician and at his death, left some 400 simple remedies to the world. Then came Theophrastus (370 BC), who wrote many manuscripts including *Historia Plantarum*, which became a standard botanical text. Pliny (A.D 50) wrote many volumes with Vol. 20 and 27 comprising medical botany. A Greek writer and medical man, Dioscorides (A.D. 60) described some 600 medicinal plants in *De Materia Medica*. This book was used for the 15 centuries that followed. All these people, including Galen (500yrs after Hippocrates), on whom the present allopathic and homoeopathic systems of medicine are based contributed to medicine hence science. He conducted animal anatomy, used assaying of preparations to control quality and quantity of dosages (Sofowora 1982). It is the advent of herbalists in the 15th to 17th centuries which saw the beginning of modern botany with the 'Doctrine of Signatures' being an important aspect of medicine. People got to know that some plants could heal, while others could harm. As a result, the desire for power led to the mythical use of plants by priests of early religions thus creating a link between plants and rituals, and magic and witchcraft which has not ceased to date.

But with the advance in knowledge, superstitions connected with reputable medicinals were revealed, and slowly most of the remedies fell into disrepute. Perhaps the lore of the centuries did not contain as much superstitions as it seemed.

A botanist, Leye (in Le Strange 1977) once observed that "Botany and medicine came down the ages hand in hand until the 17th C., when both arts became scientific and their ways parted. The botanical books ignored medicinal properties of plants and medical books contained no plant lore" (Le strange 1977).

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The next major advances were by Persia's Rhazes 10th C and Avrienna, 11th C, who introduced *Opium* pills for cough and *Colchicum* seed extracts for gout. To date, both remedies are still in use. In Europe, Paracelsus (16th C) introduced the virtues of antimony salts as cure-alls, and for some time metal therapy dominated herbs. The greatest herbals in the 17th C were introduced by the Jesuit missionaries who introduced *Cinchona* bark from the South American Indians who used it for chills, fevers, and malaria to Europe. The active principle *quinine* was only isolated 2 years later in 1820. In the 18th C. Withering introduced foxglove for dropsy, a heart condition characterised by the accumulation of excess liquid in the lower limbs. The active component *digitoxin*, which was later isolated is used to date for heart failure.

Its only in the last 150 years, that progress in all sciences has been made, the most beneficial being the agents of relieving pain during operations. Examples include nitrous oxide, first used by Davy, ether, introduced by Long (1842), chloroform, introduced by Simpson and phenol (In Le Strange 1977).

From these, it is seen that medicine and botany really came down the ages hand in hand. It is only later that these two disciplines separated. Separated though they are, botany still seems to hold a lot of untapped resources for medicine. These can be harnessed through ethnobotany and ethnobotanical researches.

The history of medicinal plants tells us how plants have been used in medicine. Indians recorded their plants in **Ayurveda**. The ancient Chinese recorded many more. The later civilisations of Egypt, Greece, Rome, Arabia and Europe recorded theirs. Most of such plants are either used today or have provided a model for their synthetic analogues. Plants and plant derived drugs are still widely used today in developing and eastern countries. With health for all by the year 2000 in the minds of many, and with little notable achievement, W.H.O. has taken measures to improve on the health for all by encouraging the use of traditional medicine for primary health care especially in the rural villages.

As a result, plants are now useful in pharmacology and are used directly as therapeutic agents, as starting materials for the synthesis of useful drugs and as models for pharmacologically active compounds during drug synthesis.

Ethnobotanical works have led to discoveries of new drugs. Such drugs include hypertensive drugs from **Rauwolfia** spp, oral contraceptives from diosgenin obtained from **Dioscorea** spp, anti-cancer drugs from **Catharanthus roseus**, sennosides A and B from **Cassia** spp., and cardiotoxic drugs from **Digitalis**. Others include etoposide, an anticancer drug from **Podophyllum peltatum** etc.

In Siaya District, it was observed that what makes people go traditional as far as primary health care is concerned is poverty, drug shortage and poor transport. Many parts of the district hardly have any roads and hospitals thus remain 'closed'. For those who get to hospital, the current exorbitant prices for drugs available from the stores, and the dearth of drugs at public hospitals only means that drugs will not be available to the common man and that herbals will become the cheaper alternative, for their life must go on with or without western medicine. This implies that medicinal plants' usage is widespread. It is actually based on beliefs that were in existence, often for hundreds of years before the development and spread of modern scientific medicine and which are still in use today meaning that each country or people have their own knowledge, handed down through generations (Akerele *et al* 1991).

It is significant to note that where safe and simple plants have been used for long in the treatment of self-limiting conditions, in the district establishing efficacy may not be so important provided their composition is known.

In China 40% of cases at primary health care level utilise traditional medicine whose supply is assured by the state-owned Chinese crude drugs company. There is a potential that plant reservoirs hold hope for the identification and isolation of useful chemical compounds for deadly diseases for which there is yet no cure (Akerele *et al* 1991).

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1.2.0 Medicinal Plants: their Significance

Many medicinal plants are also ornamental. *Melia azadirach*, *Cassia spp.*, *Lantana camara*, *Plectranthus barbatus* and *Markhamia lutea* are splendid examples. Plants such as *Tithonia diversifolia*, several *Cassia spp.*, *Acacia spp.*, *Lannea schwenfurthii* and *Markhamia lutea* also used as hedge-plants, live fences and landmarks. Some of our ever expanding industries need raw materials from plants. Some medicinal plants also provide timber for furniture making, construction, arts and crafts etc. Examples like *Markhamia lutea* are rated high in quality timber for quality furniture. Many are known as a source of fuel in the form of charcoal or firewood. Examples are *Eucalyptus, spp.*, *lantana spp.*, etc.

In the villages the plants have been used as insect and snake repellents. Commonly used are *Ocimum suave*, *Melia azedarach*, and *Lantana camara* while *Psiadia punctulata* has been used as a lightning arrestor. Not least is their use as forage crops. In fact goats feed on *Lantana camara* leaves and roasted *Aloe spp* leaves.

Plant sale can be income generating in the local and international markets. Plant parts or seedlings can be sold. Not to be underestimated is the role that some have played in the control of Schistosomiasis via their molluscidal properties (Mott, 1983, Verdcourt and Trump 1969). They are also a source of forage for both domestic and wild animals (ICRAF, 1992).

Other than food and shelter, the medicinal use of plants is probably one of the earliest of man's discoveries. This is clearly indicated in the history of medicinal plants which attempts to show medicinal plants use by various early civilisations and cultures.

However, currently, advances in modern technology and synthetic chemistry, has reduced man's dependence on plants as a source of medicine. Nonetheless, man continues to rely on plants to a much greater degree than is commonly realised. According to Ayensu (1977), nearly half of all prescription drugs produced in West Germany are initially derived from raw plant materials, and in the United States of America, over 25 % of the 1,500 million prescriptions dispensed annually are derived from medicinal plants and 50% of these medications contain a plant derived active principle. Generally in the industrialised world, substances derived from higher plants constitute 25% of prescribed drugs. Even today, plants are almost the exclusive source of drugs (Farnsworth and Bingel 1977). Japan's medicinal plants imports among the Asian countries rose from 21,000 tons in 1979 to 22,640 tons in 1988 falling slightly below the imports to the Hong Kong which amounted to 23,746 tons in 1981 (International Trade Centre, 1982). This further emphasises the importance of medicinal plants in the world.

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1.2.2 Ethnobotany defined and its role in modern research

In 1896, Harshberger defined 'ethnobotany' as the study of "plants used by primitive and aboriginal people". Robbins et al. (1916) having noticed the shortfall in this definition redefined it to include the investigation and evaluation of the knowledge of all phases of life amongst primitive societies and the effects of the vegetal environment upon the life, customs, beliefs and history of these tribal people.

Jones in 1941, shortened this to 'the study of the interrelationships of primitive men and plants'. In 1967 Schultz expanded this definition to include "the relationships between man and his ambient vegetation."

It was Ford in 1980, who regarded ethnobotany as "the totality of the people with the plants in a culture and the direct interaction by the people with the plants.

The research area of 'ethnobotany' is significant today because it may provide a short-cut for the identification of those plants which are of greatest interest. The ethnopharmacological information obtained has its academic and practical value to all mankind, Ole Hamann, 1991 (in AETFAT). For most countries, there is no complete list of medicinal plants. Much of the knowledge on their use is held by traditional societies whose very existence is threatened. Little of this information has been recorded in a systematic manner. With this done and with data available and adequate, emphasis can be laid on conservation of these plants.

Within the same geographical area, it was observed that a medicinal plant could be considered to have some very important properties by some communities and not by others. Therefore, it is imperative that any conclusion about the relative importance of a particular plant must depend on the criteria applied and the context in which it is applied.

1.3.0 Advantages and Disadvantages of Herbal Remedies

These have been viewed against a background of the socio-economic status of Siaya District, the magnitude of their health problems and the few available resources. Like in many other parts of the developing world, systems that need to be developed are those through which effective health care can be made both accessible and acceptable to the people.

1.3.1 Advantages of herbal remedies

- a) Herbs are freely collected from the wild or obtained from sellers cheaply. This makes medicinal plants cheaper than the modern ones whose costs have become prohibitive in the district as in other parts of Kenya.

- b) Considering that only a few hospitals are available (e.g. Siaya District Hospital) against a large number of rural population, medicinal plants remain the most accessible.

c) Medicinal plants appeared readily acceptable among the people partly because the practice blends easily with their socio-cultural life. Even some health workers e.g. nurses conceded that herbals worked better and faster in alleviating gut problems in children and babies with such problems as greenish diarrhoea, blood stains in stool, coated tongue etc.

d) Medicinal plants provide a greater bioavailability to the body than the many synthetic formulations. There is a contention that their natural products are more acceptable in the human body than their synthetic analogues.

e) Medicinal plants' preparations are believed to heal several ailments.

1.3.2 Disadvantages of herbal remedies

a) Most claims of efficacy of herbs have not been scientifically proved.

b) Imprecise dosage; some people don't specify dosage and this could be potentially dangerous. This tendency has changed towards dosage provision.

c) Witchcraft and evil tendencies seemed to cause fear amongst the people and need to be discarded. They don't promote good health, nor do they remove physical, mental or social imbalance.

d) Some plants are known to be poisonous yet are used as medicines if taken in the right doses. The short term or even the cumulative effects of such compounds on the user have not been fully studied. Such studies are also not easy to carry out.

However, general medical properties often supersede poisonous qualities when taken in right quantities which accounts for their use as medicines.

e) Some plants may be ineffective yet are used as drugs or pot herb ingredients. This perhaps is an attribute of belief.

1.4.0. Role of plants in pharmaceutical industries

With consumers tending towards natural products, industries which have been going synthetic and biotechnological have been forced to change to satisfy their consumers.

Many consumers are satisfied when products are marked with their medicinal properties. The growing interest in health foods is suggestive of people's increasing concern with preventive as opposed to curative medicine.

This wave is not only in the developed world or eastern countries, it is right here with us in Kenya and the pharmaceutical products available from stores are proof enough. **Ashton**, normally given to teething babies is based on a plant belonging to the genus *Matricaria* and is widely used by mothers. Skin lotions and hair shampoos are coming up boldly displaying the names of plants from which some components have been extracted. Examples are *Aloe vera*, Cocoa Butter, and Coconut oil which are now common names in the stores and products containing them really sell.

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1.4.1 Dispensing of Plant Drugs

In Siaya district, plant are dispensed according to the type of disease to be treated. The aromatic drugs for treating influenza, fever and general body illness are customarily used in steam form. Drugs are frequently taken alone as concoctions, decoctions or as infusions. Rarely were drugs taken in milk, soup, honey, blood, various kinds of native beer or porridge especially that made from the East African millet flour (*Eleusine coracana*) finger millet. Plant parts used for preparing herbal remedies varied in taste from flat to sour, or bitter. In addition some drugs are used for baths in addition to the ingested portion.

Objectives

1. Identify and record medicinal plants used in the treatment of gastro-intestinal disorders in Siaya District.
2. To carry out a taxonomic classification of these medicinal plants.
3. To carry out chemical analysis on the most popularly used species

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2.0.0 LITERATURE REVIEW

Herbaria survey indicates that there are many medicinal plants in East Africa, Kenya included. Diseases treated are many and range from simple coughs and colds to others that require more vigorous treatment like venereal diseases and the 'socially' caused ones i.e. due to unnatural causes (Elliot 1975, Kokwaro 1993).

Ethnobotanical surveys have added more information on medicinal plants. Such surveys include that on the Hill tribes of Northern Thailand (Anderson, 1986), the Negrito Islanders of the Samoa Islands (Awasthi, 1991), The Tewa Indians (Robbins et al 1916), the Miskito of Eastern Nicaragua (Dennis, 1988), and the Samoa Islands (Uhe, 1974) amongst others.

The earliest and most comprehensive work on medicinal plants in Eastern and Southern Africa is by Watt and Breyer-Brandwijk (1962) who covered medicinal plants in different families right from their uses to their pharmacological properties and effects with notable families being (*Asclepiadaceae*, *Compositae*, *Labiatae* and *Loganiaceae*). However, the most extensive work in East Africa is by Kokwaro (1993) where plants used in the treatment of various diseases have been described.

In Kenya, similar studies have been carried out across various ethnic groups. Such surveys include that on the Samburu (Elliot, 1975), the Luo (Johns, Kokwaro *et al* 1991, Kokwaro 1990), the Marakwet (Lindsay, 1978), the Pokot (Timberlake 1987) and the Turkana (Morgan 1980) *inter alia*. A lot of detailed information have been recorded for the families Apocynaceae (Omino 1990) and the Labiatae (Githinji, 1990) in their respective M.Sc. theses. Kokwaro (1993) has given a list of plants used in the treatment of diseases of the mouth, tongue and teeth as well as those of the abdomen. Such plants include several *Acacia* spp., *Maytenus* spp., *Solanum* spp., *Ozoroa* and *Oxalis* spp., 50% of Labiatae species treat gastrointestinal disorders (Githinji 1990).

Plants that have been reported to be used in the treatment of gastro-intestinal diseases in Siaya district include *Cassia* spp., *Aphania senegalensis*, *Schkuhria pinnata*, *Ocimum* spp., and *Harrisonia* (Johns and Kokwaro, 1990).

Traditional Luo customs and beliefs relating to disease have been described (Odhalo 1962; Whisson 1964). Some data from Siaya are included in the Luo-English botanical dictionary (Kokwaro 1972), the herbal remedies of the Luo of Siaya (Johns and Kokwaro 1990) and the food plants of this area (Johns and Kokwaro 1991).

Considering that 72% of people in the district use untreated water (Standard Newspaper 11/12/93), proximity to the lake and the use of untreated water from swamps, pools, ponds and rivers raises the incidence of water-borne diseases and such other related disorders. For this reason, many plants have been used in the treatment of such diseases especially in children who often are hardest hit. Despite this no one has ever come up with an inventory of the medicinal plants used on children in this area hence part of the purpose of this project.

Kuris et al (1983) successfully propagated *Oregano vulgaratum* from stem cuttings. Several plants are under cultivation (Chicheley 1970) and many more are currently being cultivated by well known herbalists e.g. Githai (Pers-Com. Proprietor, Nyeri School of alternative medicine, 1995) as well as other lesser known herbalists.

Ethnobotany is a subject many are venturing into. More people are coming up with such surveys in relation to food and nutrition, medicine and traditional health care etc. Not as many people delve into their phytochemistry or their pharmacological effects. Its only unfortunate that where such tests have been done, results have remained scattered in various scientific journals.

Recent developments in pharmacology are however providing a basis for their evaluation and exploitation (Gbile *et al* 1988). In this research a preliminary analysis has been carried out on some of the most popularly used herbal remedies as reported in the fieldwork. This analysis is intended to give a general picture of the groups of compounds present which in turn could provide a clue on their active components. Most of the compounds tested for are those that generally occur in drug plants.

2.1.0 SECONDARY METABOLITES IN PLANTS

This field of natural product research is currently being carried out intensively though it remains far from exhaustion. An attempt to obtain bioactive agents from plants is a worthwhile exercise since only 10% of all plants have been investigated in detail (Sandberg and Bruhn 1979). Farnsworth and Bingel (Farnsworth and Bingel 1977) reported 400 patents issued on compounds isolated from plants, of these, 325 had

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relevance to their potential use as drugs. It was found that the majority of these bioactive compounds were alkaloids, followed by sesquiterpenes, diterpenes, triterpene saponins, triterpene aglycones, flavonoids, sterols, coumarins, quinone's and monoterpenes in that order. It is imperative that ethnobotanical researches and phytochemical tests may lead to some patent-able and industrially exploitable compounds for drug development.

Products of primary metabolism are often innocuous except for the rare toxic proteins. Most investigations, this one inclusive, involve secondary metabolites such as flavonoids and alkaloids, inter alia, since these are usually bioactive in man and animals though their potential role in plants remains obscure.

Phytochemical tests or surveys have been carried out by various individuals and organisations across the world. Thus Dayar Arbain *et al* 1989 surveyed West Sumatran plants for alkaloids and noted the negative test for *Coccinea grandis* leaf extract. There has been a survey of Indian plants for, amongst others, saponins, and alkaloids (Kapoor, *et al* 1971). Many chemists have analysed plants to determine the compounds present (Midiwo, Chemistry Professor, University of Nairobi, UoN, Pers-Com. 1991) and many plants have been investigated from a phytochemical and taxonomic rather than from a pharmacological viewpoint (Hamburger and Hostettmann 1991). However, a few researches incorporating phytochemistry and biological screening have also been done (Njiru-Gakunju 1993, amongst others).

In this project, phytochemical screening (i.e. searching for the compound itself) has been carried out on some of the plants reported from my field study. The biological screening exercise (i.e. searching for the physiological effects) will be considered later in another project.

2.1.1 Chemical Constituents of Drug Plants

Chemical constituents of most local drug plants are still unknown. There are however, some basic compounds which are commonly associated with medicinal plants.

1. Lipids (Oils and Fats)

These are a heterogeneous group of compounds not easily defined but are characterised as organic solvent solubles and have no solubility in aqueous systems and are common constituents of a number of drug plants. Fats are solids at ambient temperature and include resins and waxes, while oils are liquid at that temperature.

Fixed Oils do not distil at the temperature of boiling water, yet this is a common medium of preparing local herbal remedies. They occur in *Annona*, *Balanites* and *Trichilia* species where they used both emollients (softening) and ointment bases. *Euphorbiaceae* plants are characterised by strongly and saturated fatty acids which are not readily digested or absorbed. Thus, seed oil from (*Ricinus communis*) and *Croton* *sp.* are used as purgatives but they contain *toxalbumins* which should be destroyed by heat before use as they are poisonous.

Essential Oils are volatile usually odorous liquids responsible for the scent of flowers or other plant parts. They are usually non-nitrogenous compounds and are irritants of some kind. They regulate intestinal movements, prevent or control violent contractions and aid the orderly flow of the food through the gut hence their use as condiments (spice ingredients) with food. Also, they are used to hinder bacterial growth (treating

wounds). The less well absorbed oils for example from *Chenopodium sp.* are used as vermifuges and they are known to be reliable remedies for the roundworm and hookworm.

Resins are extremely irritating and or cause vomiting and purging if taken in large doses. They are found in *Boswellia* and *Commiphora*, and resemble essential oils in their drug activities. They are widely used for urinary tract ailments while members of the genus *Piper* and *Zingiber* are used as carminatives (medicine of abdominal pains and flatulence). The purgative resins from *Ipomoea sp.* are equally effective.

Waxes: are triglycerides, appear on plant surfaces e.g. cuticular lining.

2 Phenols

These are compounds derived from phenol, an aromatic- or benzene alcohol. They occur in the leaves, flowers and bark with phenolic content varying in various plant tissues. The most widely studied phenols are flavonoids, the largest group of naturally occurring phenols, occurring universally in all plants.

a) Tannins

These are water-soluble polyphenols which differ from other natural phenols in their ability to precipitate proteins such as gelatine from solution. This property (astringency) explains their use in tanning leather (Spencer *et al.* 1988) as they are protective against fungal spore germination. It is this binding action that gives them the medicinal value of preventing diarrhoea and controlling haemorrhage and dysentery while

explaining why they may be applied to wounds as a protective coating. They are known to reduce palatability and digestibility of plant tissues (Midiwo pers-Com Chemistry Profesor UoN 1991). They are amongst the most abundant of the active principles in plants especially in trees and shrubs. Large quantities occur in *Acacia*, *Diospyros*, *Kigelia*, *Spathodea*, *Pterocarpus*, and *Rhizophora*. Such plants are used as vermifuges and for diarrhoea. The tannins are normally extracted by boiling the bark or soaking it in cold water.

b) Flavonoids:

These are considered to be the physiologically active components in herbal teas with diuretic effects (Schilchu, *et al.* 1988). The basic structure is a tricyclic ring system which is hydrophobic. Transport in a watery physiological medium is by substitution of the skeleton by a hydroxyl group. Solubility is further improved by addition of sugar molecules which explains why flavonoids are found in cell vacuoles as glucosides of some sort.

3. Glucosides:

Other than tannins and flavonoids, anthelmintic glucosides also do occur in plants and have the power to kill intestinal worms as exemplified by *Albizia* (legume.) *Hagenia*, *Maesa*, *Myrsine*, *Phytolacca* etc.

Cardiac glucosides can restore the normal heartbeat (function as done by the genus *Digitalis* sp., a *Scrophularaceae*). Under the problems of heart failures, *Digitalis* increases contractility and improves the tone of the heart muscles resulting in a slower

but much stronger heartbeat. The usefulness of plants containing cardiac glucosides is however not well known to the local herbalists.

4. Alkaloids

These are heterogeneous group of compounds, difficult to define precisely. The term is commonly applied to basic organic nitrogen compounds of plant origin which have physiological effects on the nervous system. They exist in plants as soluble salts of organic acids or glucosides, or as colourless crystalline compounds (pure form). Their physiological effects on animals explains why they have been used as sources of medicines, magical syrups and potent poisons depending on the traditional society in question (Johns and Kokwaro 1990, Chemistry Profesor UoN 1991.)

There is yet no satisfactory definition or classification as chemists classify them according to their chemical nucleus e.g. Indole alkaloids, pyridine alkaloids or piperidine alkaloids; pharmacologists classify them according to their effects e.g. mydriatic poisons (cause dilation of pupils), curare alkaloids (highly poisonous); while botanists depend on their plant sources e.g. solanaceous alkaloids etc.(Midiwo pers-Com Chemistry Prof. UoN 1991.)

There are three structural categories recognised.

i) **True alkaloids:** derived from groups which can be related to parent bases, have a nitrogen containing heterocyclic nucleus and are derived from amino acids.,

e.g. Tropanes

Atropine from Ornithine in solanaceous alkaloids

indole alkaloids from phenyl alanine, possess indole ring

e.g. Isoquinoline

Are from phenylalanine and /or tyrosine. Most members are curare poisons. Morphine is hallucinogenic or stupefying

ii) **Protoalkaloids** have no ring, e.g. ephedrine

iii) **Pseudo-alkaloids** are not derived from amino acids but contain nitrogen e.g. caffeine. These are usually less toxic

Families: *Apocynaceae*, *Leguminosae*, *Rubiaceae* and *Solanaceae* are outstanding families with high quantities of alkaloids. Most alkaloids are characteristically bitter and are known to be intrinsically poisonous to organisms. Although the more active alkaloids are among the most potent vegetable poisons, a good number of them can be taken in fairly large doses without danger. A majority of them are however used as poisons rather than drugs. The less toxic alkaloids such as caffeine and spartein normally increase the renal secretion either by increasing the blood flow through the kidneys or via some direct action and therefore are used as diuretics and in the treatment of dropsy. Since they are toxic, they have to be used with a lot of caution and precision.

5. Toxalbumins

These are poisonous proteins usually irritating in nature and mainly found in plant seeds. They can induce inflammation of the mucus membrane such as those of the eye and/or nose and can cause violent vomiting and purging when swallowed since they are not digested. The powder or extracts of seeds from *Abrus precatorius* (leg, pap), *Cassia absuss* (Leg. *Caesal*), *Croton spp.* (*Euphorbiaceae*) have been reported to be applied to ulcers, or to congested eyes to induce an inflammatory reaction followed by healing.

6. Anthraquinones

May be found in plants uncombined or as glucosides. *Cassia* (Leg. *Caesal* and *Aloe* (*Lilaceae*) are the important genera containing these compounds.

An interesting variation in chemical constituents occurs in *Euphorbia* species most of which are toxic, and yet they are also medicinal at the same time. This is because the species contain several bitter principles such as alkaloids, bitter principles, hydrocyanic acids, resins, Ca out Chouc. Under normal dosage therefore, the medicinal active principle should supersede the poison in action.

Chapter Three

3.0 STUDY AREA: SIAYA DISTRICT

Siaya District is located in Nyanza Province of Kenya. It extends from latitude $0^{\circ} 13'$ south to $0^{\circ} 18'$ north, from longitude $33^{\circ} 58'$ east to $34^{\circ} 33'$ east. It falls within the K5 region of Kenya's seven Floral Regions (K1, K2 ...K7; as used in the Flora of Tropical East Africa, FTEA), see Map 1.

It is bordered by the following four districts: Busia District to the north, Kakamega District to the north-east, Kisumu District to the south-east and in the south and west is Lake Victoria.

The district has an area of $3,528 \text{ km}^2$ of which $1,005 \text{ km}^2$ are under lake Sare, Lake Kanyaboli and that portion of Lake Victoria which falls within the district (Kenya, Ministry of Finance and Planning 1984). Administratively, it is divided into 4 divisions, namely Ukwala, Yala, Boro, and Bondo. These are further subdivided into 18 locations and 135 sub-locations (Map 2).

The district is traversed by two main rivers, Yala and Nzoia; both of which flow south-westwards and enter Lake Victoria via the Yala swamp. Other rivers are mere streams of only local importance; some of these streams are tributaries of the Yala and Nzoia rivers.

The altitude of the district ranges from about 1140 m on the Lake Victoria shores in the south to about 1420m, which is the highest figure, in the north and east. However, scattered highlands rising to about 1280m occur near the shores of Lake Victoria, especially in parts of South Sakwa and Yimbo locations. These areas include Got Ramogi and Usenge Hills in Yimbo location and Got Abiero and Nango Highlands in South Sakwa. The north and north-eastern parts of the district have a rough terrain of sloping ridges and hills that rise to over 1420m above sea level.

3.1.0 The People

Due to rural to urban migration and free movement of people in Kenya, the district hosts several different ethnic groups with the Luos being the majority. The Luos who live in this Lake Region district of Kenya are therefore the focus of my interest.

They are classified as Nilotes speaking Dholuo, a language closely related to that spoken in Uganda by the Acholi, Alur, Lango and the Padhola. Related languages are spoken in the Sudan by the, Diinka, Nuer and Shilluk.

In Kenya, the language has 2 major dialects:-

- (i) The Trans Yala dialect
- (ii) The Lake Region dialect.

These appear distinguishable, but the differences are largely on matters related to lexical items and pronunciation rather than structure.

The people rely heavily on medicinal plants. This is evidenced by trade on herbs in the markets and the debarked trees and shrubs in the wild, See Plates 1 and 2.



PLATE 1

Commercial Herbalists: -selling an assortment of roots, twigs, leaves, fruits and bark to the people.

Place: Akala Market, Gem

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PLATE 2

Zanthoxylum chalybeum:
Note the scars on the stem, a sign of recent harvest by users.

Place: Nyang'oma Sakwa

3.1.2 Climate

Rainfall amounts and distribution are largely determined by the altitude and wind direction. The highlands in the north of the district receive higher rainfall of convectional and relief type, while the lowland areas in the centre, west and the south of the district receive lower rainfall, mainly of convectional type. The average annual rainfall increases from 800 mm at the shores of Lake Victoria to 2000 mm near the border with Kakamega District. Near Lake Victoria the average annual temperature is about 22.5 deg. C, while in the north-east it is 21 deg C. Humidity is relatively high. For the entire district, evaporation averages between 1800 mm and 2000 mm per year. The influence of climate on the crops growing in the district is discussed by Jaetzold and Schmidt (1982), See Map 4.

3.1.3 Soils

The district is mainly a peneplain and slopes gently from the east to the west. Some of the plain soils are moderately deep. Inselbergs have shallow soils, while soils on hills and minor scarps are developed on undifferentiated tertiary volcanic rocks and are well-drained, dark-red to brown, shallow to moderately deep, rocky, and stony. The main soil type is sandy-clay-loam to clay. The soils on the upper middle-level uplands (the acrisols) are developed on granites and are well drained, very deep, dark-red to yellowish-red, friable to firm, sandy-clay to clay, with acid humic top soil. The soils on lower middle-level uplands are developed on basic igneous rocks and consist mainly of ferralsols which are well drained, moderately deep to deep, reddish-brown to yellowish-brown and friable clay. The soils on the lacustrine plains (delta) are

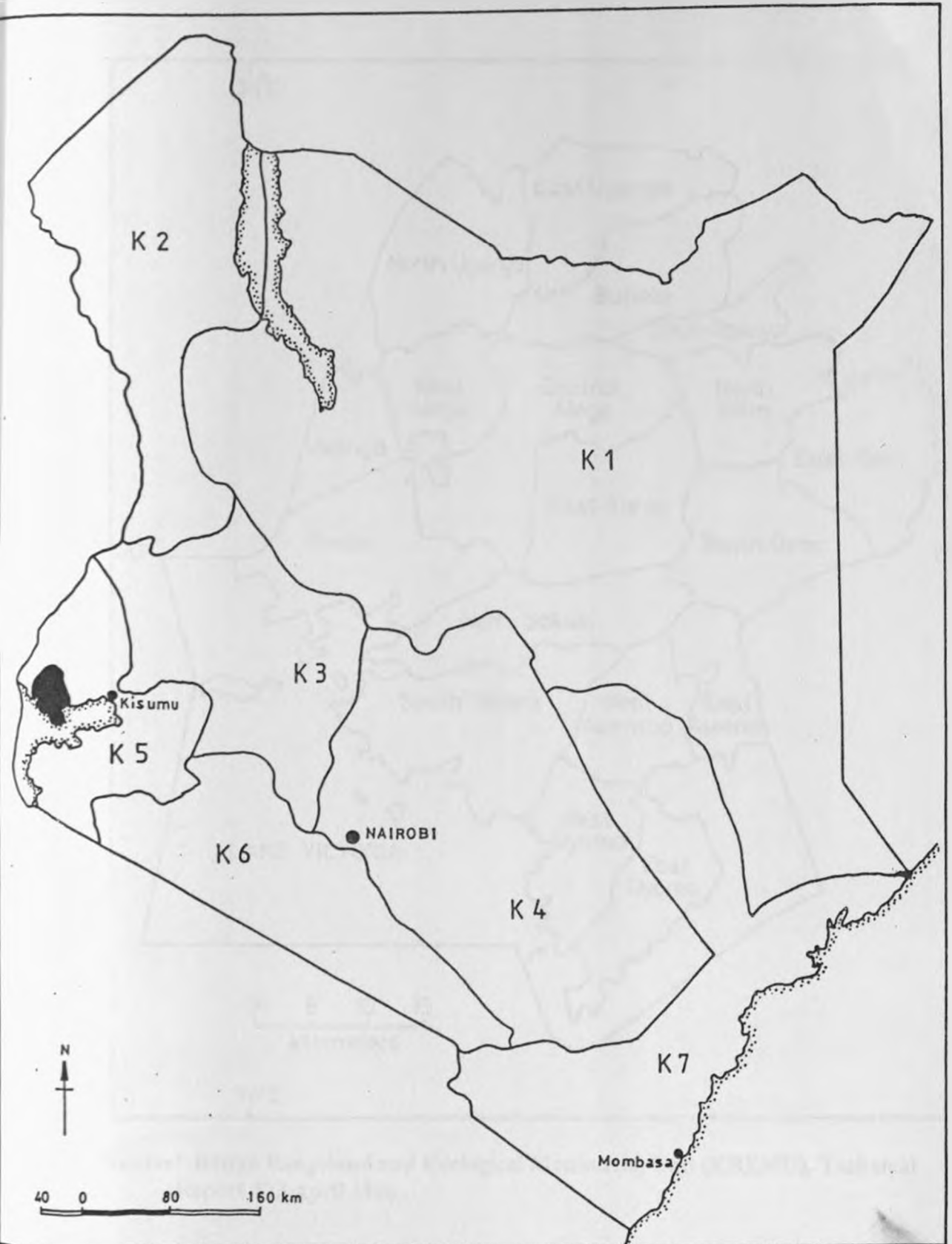
developed from sediments and mudstones which are poorly drained, very dark-grey to brown, slightly sodic, cracking clay with poorly drained, very deep, dark-grey to brown, mottled, friable to firm, sandy-clay to clay. These soils are found mainly along the Nzoia River valley and its tributaries. The fluvisols which are soils on the flood plains are developed on sediments from various sources. These soils are a complex of well drained to imperfectly drained very deep, dark-greyish to brown to dark-reddish-brown and are mainly found at the mouth of the Yala River. The soils in the minor valleys are a complex of drained to poorly drained deep, dark-reddish-brown to black, firm silty clay to clay; in places calcareous and/or cracking. These soils are found mainly in the southern parts of the district. Lastly, the soils on swamps (gleysols and histosols) are very poorly drained, very deep, very dark-grey to black firm, cracking clay with acid humic top soil. These soils are mainly found in the Yala swamp. A more detailed description of the soils in the district has been given by Jaetzold and Schmidt (1982). A generalised soil fertility map has been given (Map 3). This partly determines landuse patterns in the district.

3.1.4 Agro-Climatic Zones

The district falls under agro-climatic zones i to iv (Kenya Soil Survey 1980). About 765 Km² of the total land area lies in agro-climatic zone i, 508 sq. km in zone ii, 690 sq. km in zone iii and 508 sq. km in zone iv. Areas in agro-climatic zones i and ii (mainly Yala, Ukwala and Boro divisions) have the highest potential of growing various types of crops including maize, sorghum, beans, millet, groundnuts, cotton, sugar cane, coffee, etc.

MAP 1

FLORAL REGIONS AND THE LOCATION OF SIAYA DISTRICT IN KENYA



Source: From Flora of Tropical East Africa (FTEA)

MAP 2

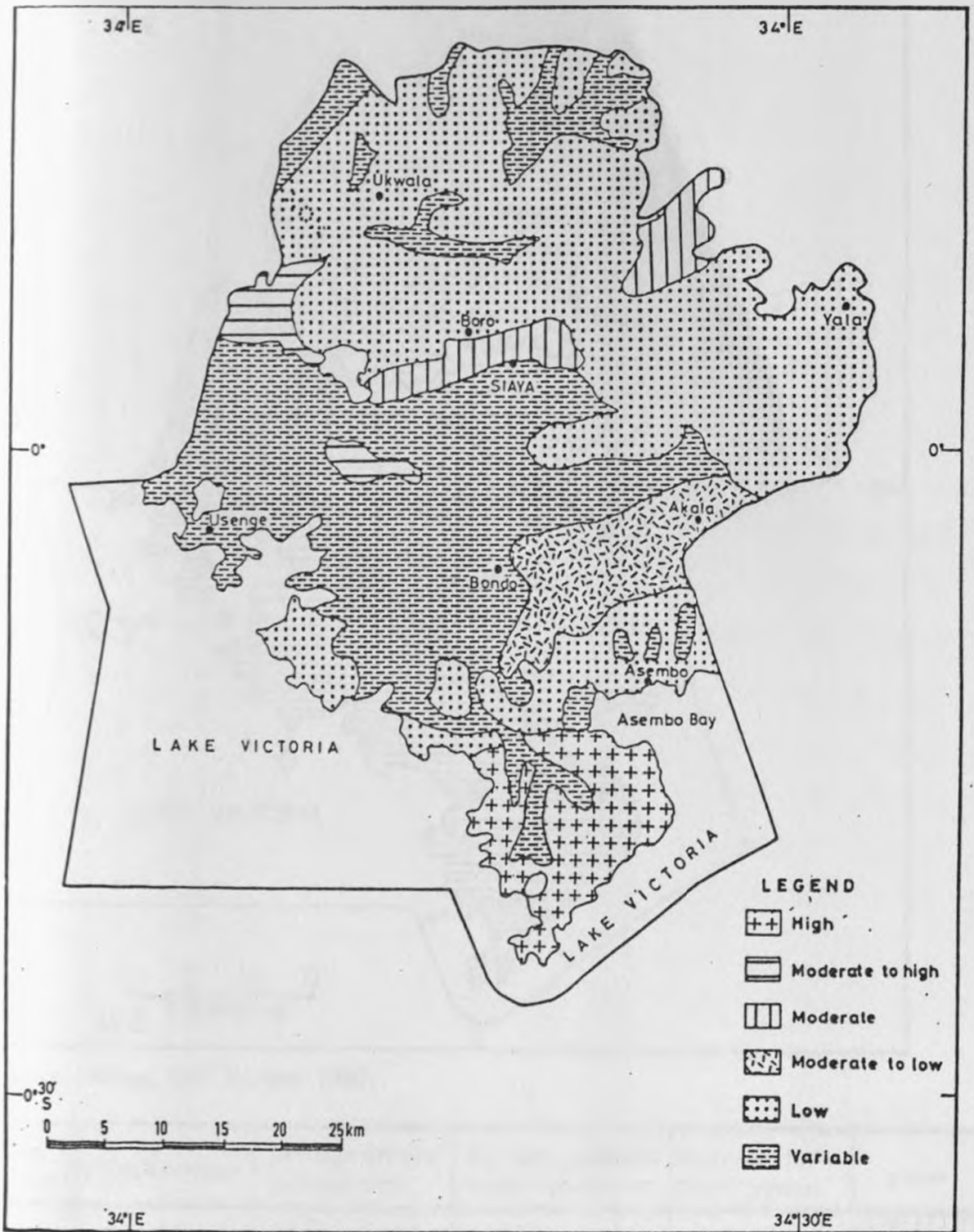
SIAYA DISTRICT: ADMINISTRATIVE DIVISIONS (LOCATIONS)



Source: Kenya Rangeland and Ecological Monitoring Unit (KREMU). Technical Report 123 April 1986

MAP 3:

SIAYA DISTRICT: GENERALISED SOIL FERTILITY MAP

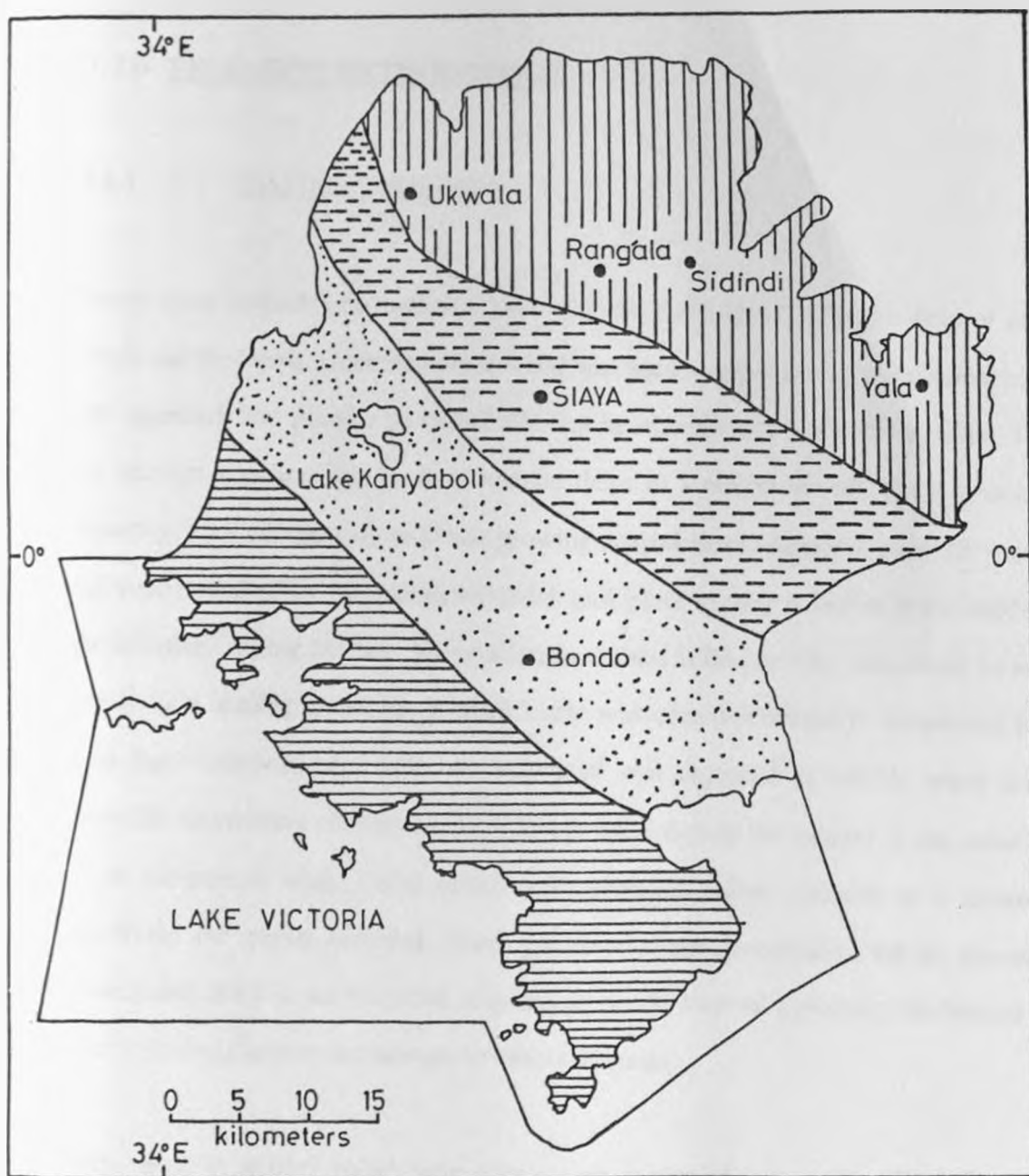


Source: Jaetzold and Schmidt 1982

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MAP 4

SIAYA DISTRICT: AGRO-ECOLOGICAL ZONES



Source: Kenya Soil Survey 1980.

zone	area km ²	classification	average annual rainfall-mm	av. ann. potential evaporation-mm	potential for plant growth	zone
I	765	Humid	1100 — 2700	1200 — 2000	Very high	
II	507.5	Sub-humid	1000 — 1600	1300 — 2100	High	
III	690	Semi-humid	800 — 1400	1450 — 2200	High to Medium	
IV	507.5	Semi-humid	600 — 1100	1550 — 2200	Medium	

3.2.0 RESEARCH METHODOLOGY

3.2.1 Field Data Collection

People knowledgeable on medicinal uses of plants were identified by the help of elders, chiefs and the locals. Questionnaire method was used to gather data on medicinal plants. The approach had peculiar problems inherent in ethnobotanic work (Timberlake, 1987). An attempt was however made to reduce these to a minimum. The method included inquiring from villagers about plants growing around them. Adults of over 18 years of age were preferred for the interviews which took place in their homes or in the field with the informant giving his/her information freely and willingly. Care was taken to avoid giving them leading questions. A plant usage was considered valid if mentioned by at least three independent people. An informant was regarded as reliable when he/she provided information consistently at different times during the enquiry in the same day or on subsequent visits. Local names were provided where available as a means of identifying the plants reported. Plant specimens were immediately taken, prepared, pressed and dried in the drier and later stored at the Nairobi University Herbarium for scientific identification and storage for future reference.

Herb sellers in market places were also a sure source of information. They provided plant samples and names of parent plants. This was tactfully done where sellers were not openly willing to part with their knowledge for fear of competition.

All these people needed money as inducement. This was relatively expensive considering the high cost of living and inflation. Follow-up interviews were carried out for those who appeared fruitful and consistent.

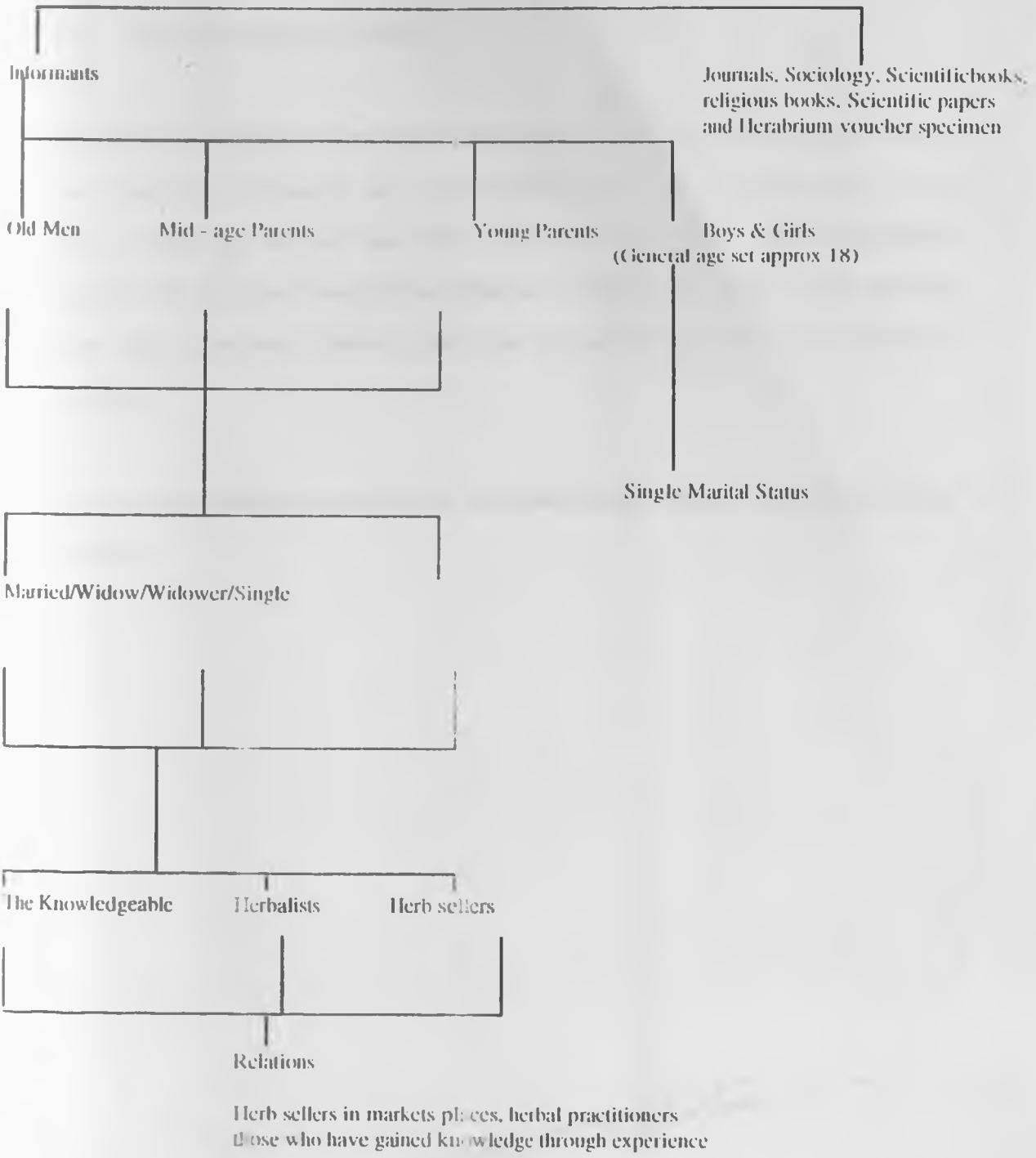
I then cross-checked the information I obtained in these field trips with the information available in papers, journals and scientific writings. Some sociology and religious books also provided more materials. Journals of crude drugs research, publications from the International Centre for Insect Physiology and Ecology (ICIPE) and from Kenya Medical Research Institute (KEMRI) and AMREF were also helpful.

A summary of the major stages involved in data gathering has been given in Chart 1.

This exercise was spread over 14 months during which fifty people were interviewed. The survey was done on a divisional basis (see study area Ch. 3) with respondents naming plant species used as medicines, how these are harvested, prepared and administered, and the dosage. Two to three independent reports of the same remedy was regarded to confirm the validity of the reported claim. The accuracy of the data depended on the certainty with which respondents identified the plant species. The Luo-English Botanical dictionary (Kokwaro 1972) provided more names.

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Source of Herbal Information (Summary)



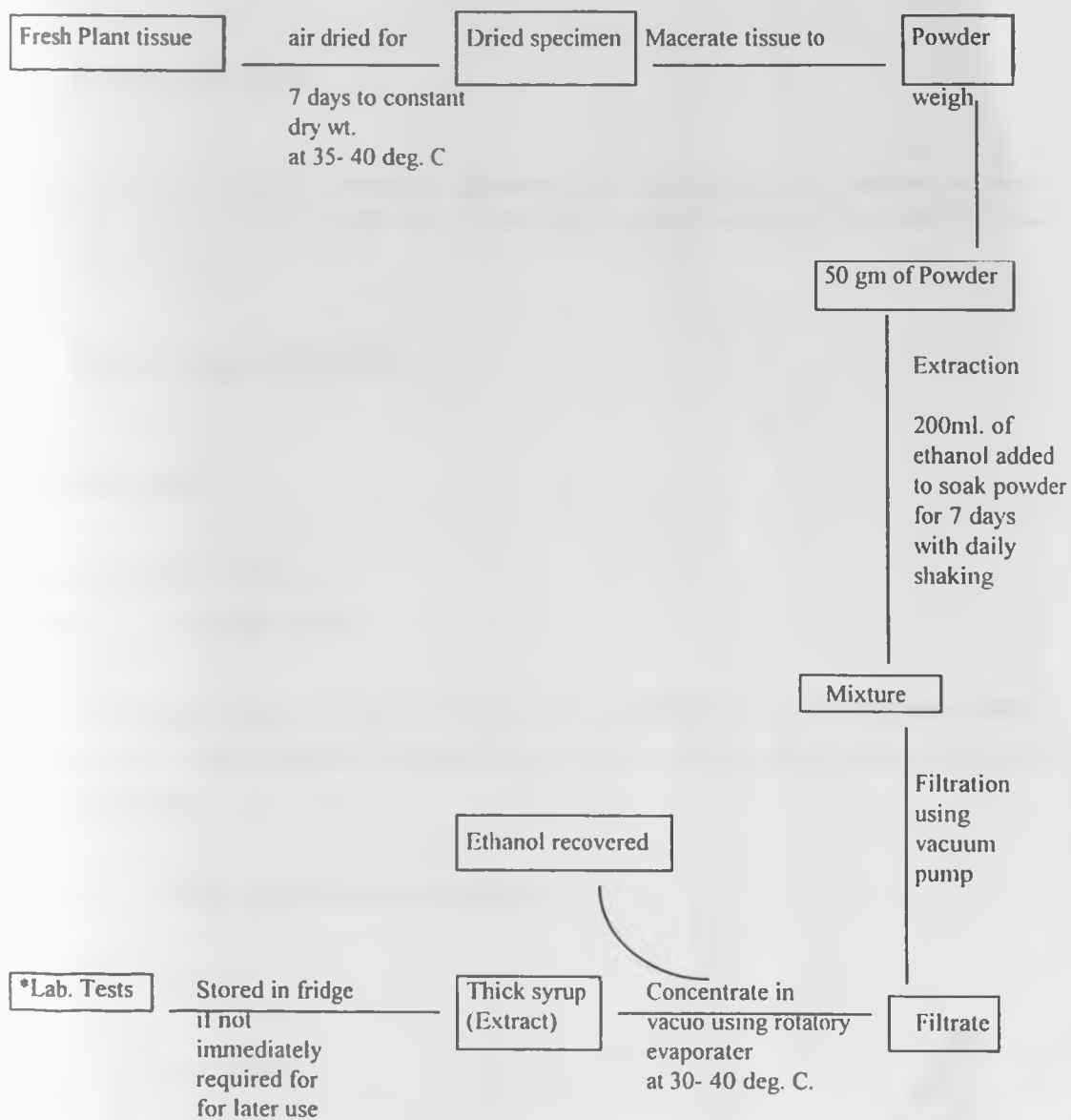
3.2.2 Data and Laboratory Analysis

Representative samples of plant parts were collected for phytochemical analysis. These were selected on the basis of their popularity and spectrum of diseases treated. These were air-dried and analysed later (See 6.0.0). Generally, two to three independent reports of the same said remedy was regarded to confirm the validity of the reported claim. Eight of the most commonly used plant species were selected for phytochemical screening.

In summary the laboratory analysis was conducted through the main stages shown below in Chart 2.

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Chart 2. Laboratory analysis: summary of the main stages



*For details on methods applied for phytochemical screening, see Chapter 6.

Chapter Four

4.0.0 BOTANICAL DESCRIPTIONS OF MEDICINAL PLANTS

4.1.0 INTRODUCTION

Plants cited in the field were arranged alphabetically according to the families in which they appear. Below are such plant descriptions alphabetically arranged according to their families, genera or species.

4.2.0 PLANT DESCRIPTIONS

ACANTHACEAE

Crabbea velutina S. Moore

Luo name: Onyango arungu

This is a low turfted herb with shortly petiolate oblong elliptic leaves. Flowers are white to pale lilac with a yellow patch on the lower lip. Flowers open in the evening and die the following morning.

Habitat: Bush, grassland and woodland

Distribution: K 3 - 5

Altitude: 50 - 1000m

Propagation: Seeds

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ANACARDIACEAE

Lannea schweinfurthii (Engl.) Engl.

Luo name: *Kuogo*

Shrub or tree 3 - 15 (-22)m. high, irregularly branched, crown rounded and spreading with drooping branchlets; bark grey or brown, reticulate. Leaves clustered at apices of branchlets, 3-9 (-13). Foliate or rarely unifoliate. Radius 5-22cm long, glabrous. Inflorescence is a spikelike racemes, or little branched panicles, 2-20(-40) arising with the leaves. Flowers occur in scattered fascicles; pedicels 0.5-4mm long. The fruit, a drupe oblong-ellipsoid and compressed, 8 -12mm long, 5-8mm broad on the long diameter, red or brown, edible. See Plate 3

Habitat: Deciduous woodland and bushland, wooded grassland, dry forests, river valleys.

Distribution: K1 - 7

Altitude: 1 - 1820

Propagation: Seeds

APOCYNACEAE

Carissa edulis (Forsk.) Vahl

Luo name: *Ochuoga*

Much branched scrambling shrubs to 3m with simple or bifurcated spines. Leaves ovate to obovate-lanceolate, or elliptical, about 5cm long, acute and often mucronate, entire, rounded at base, glabrescent, with a short petiole. The fragrant pentamerous flowers, white inside, red outside, and 12 - 2cm. long are borne in terminal corymbose cymes. Berries 6 - 10mm in diameter red to purple, edible when ripe, milky latex, and indigenous species.

Habitat: Bush and forest edges with a fair rainfall

Distribution: K1 - 7

Altitude: 5 - 2000m

Propagation: Seedlings, wildings no presowing treatment necessary, difficult to establish.

BIGNONIACEAE

Kigelia africana (Lam.) Benth.

Luo name: Yago

Common name: Sausage tree

Low branched Savanna tree 9m in open woodland, to 18m riverine areas, crown rounded indigenous. Bark grey-brown, slash white. Leaves compound, growing in threes at the end of branches, leaflets 7 - 9, rounded at apex, but broadly oval in general, to 10cm long, very rough and hard to the touch with sharp tip, flowers on long rope like stalks, horizontal, reddish branches, in threes, bear upturned trumpet flowers, petals folded and wavy, dark purple or maroon inside, pale outside unpleasant scent. Fruit is unusually large, sausage shaped, indehiscent upto 10 kg and to 1m long. Hanging stalks remain on the tree. Seeds embedded in fibrous pulp are released when fruit rots. See Plate 4

Habitat Wet savanna, along rivers, in cool places around ponds and springs.

Distribution: K1 - 7, widespread in Africa

Altitude: 5 - 1850m

Propagation: Through seedlings

Seeds have a poor rate of germination and when they do germinate, they are slow growing. Pre-sowing treatment not necessary.



Plate 3

Kigelia africana: Even the young trees are not spared. Note the mutilated bark

Place: Kopollo, Sakwa



Plate 4

Lannea schweinfurthii: Note the healed and fresh scars on the trunk, signs of bark harvest.

Place; Nyan'oma, Sakwa

Markhamia lutea (Bak.) Sprague

Luo Name: *Siala*

Common name: Markhamia

An indigenous evergreen tree with a tall trunk and a high sometimes irregular crown, 10 - 15m tall. Light brown bark, fine fissures, leaves compound to 30cm, often in terminal groups, leaflets to 10cm, narrow at base, widen to the apex. Flowers bright yellow in terminal clusters, each is trumpet-shaped, to 6cm, long with 5 frilly lobes, throat striped orange-red. Buds are yellow-green and furry. Fruits are thin, long brown capsules to 75cm, hanging in clusters and tending to spiral, split while on the tree, thereby releasing the seeds. Seeds have transparent wings 2.5cm long.

Fast growing in good forest soil, drought resistant

Habitat: Lake basin and highlands and good rainfall areas.

Distribution: K4 - 5

Altitude: 1500 - 2000m

Propagation: Seedlings, wildings, coppicing.

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BURSERACEAE

Commiphora africana (A. Rich.) Engl.

Luo Name: *Arupiny*

This is a small indigenous tree or shrub to 5m. Sometimes 10m. Bark peels off in scrolls revealing green underbark; slash red, sap pale, non-resinous. Branchlets spiny-tipped. Leaves velvety, trifoliate, terminal leaflet largest upto 8cm. Long tapering to the base; margins coarsely toothed. Flowers tiny to 5mm, subsessile, green turning red, in axillary clusters, fruit rounded and pointed, pinkishly red, 1cm long, thinly fleshy, one stony seed. Leaves contain bitter tannins. Avoided by cattle, browsed by camels and goats.

Habitat: Dry areas rocky sites, clay or sand, minimal rainfall, thorn bush and woodland, savannah and desert.

Distribution: K1 - 7, well distributed in all dry areas in Kenya and Africa at large.

Altitude: 5 - 1800m

Propagation: Cuttings, slow growing

CAPPARACEAE

Capparis erythrocarpos Isert.

Luo name: *Omisu*

Climbing or scrambling shrub, 1-3 m or more tall or long. Leaves petiolate, blade elliptic or lanceolate, acute or slightly acuminate. Flowers solitary in the upper leaf axils, pedicels, appressed -pubescent, Sepals of 2 kinds - outer part 1 - 2.5 cm long, greenish, inner pair petaloid, oblong-obovate, 2-3cm long, whitish or greenish. Petals white or pale green like the petaloid sepals. Stamens 2.5-4 cm long. Gynophore 1 - 3 cm long. Fruits ellipsoid, upto 5cm long, 3cm in diameter, ribbed, red.

Habitat - Grassland with scattered trees deciduous woodland bushland often in termite hill and reverine thickets, secondary shrub.

Distribution: K2, 5, 6 - 7

Altitude: 5 - 1800 m

Propagation: Seeds

Gynandropsis gynandra (L.) Brig.

Luo Name: Akeyo, Dek

Common Name: Spider flower

Annual herb branched and rather stout, upto 1m tall. stem prickly and glandular, more rarely varying to glabrous. leaves petiolate, 3-7 foliolate; leaflets obovate to elliptic, commonly about 2.5(-6) cm long, (3.2 cm) wide. Petiole 3 - 11 cm long. Inflorescence showy, to 30 cm long; bracts much smaller than the leaves - sepals to 8mm long, glandular. Petals 1 - 2 cm long, white, pale pink or lilac. Androphore 2-2.5 cm long - Gynophore 1 - 2.5 cm long. Capsules to 12 cm or more, to 8mm broad, glandular pubescent. Seeds to 1.8mm diameter, dark brown.

Habitat: Weed of waste, disturbed or cultivated land, roadsides, wild in deciduous bushland

Distribution: K1-7

Altitude: 5 - 2400m

Propagation: By seed

CELASTRACEAE

Maytenus heterophylla (Eckl. and Zeyh.) N. Robson.

Luo Name: *Akudho*

Shrub or tree, spreading or straggling, or more rarely a shrublet (0.3)1-7 (a)m. Unarmed or with green to brown spines to 24 cm. Axillary or terminating short axillary branches, glabrous, without latex leaves petiolate, lamina pale to deep green. Cymes dichasial, solitary and axillary or 1 -7 on short axillary shoots, or rarely in axillary panicles, pedicels 1 - 7 mm long, flowers 2-24 or more in each cyme, rarely solitary always dioecious, unscented. Sepals 5(6), equal, petals 5(6), white male flowers 5(6) stamens shorter or longer than petals. Female flowers smaller with staminodes 5 shorter than ovary, ovary 2-3(4) - locular, style 0.2-0.5mm long - shorter than or exceeding the petals, shorter than or equalling the ovary, 2-3(4) spreading stigmas - capsule yellow or yellow-red or red. Seeds 1-3(4) reddish brown, glossy, with a thin yellowish coril.

Habitat: Forests, forest margin, thickets, woodland, on termite mounds, savannah bushland.

Distribution: K5, 7

Altitude: 5 - 2100m

Propagation: Seeds

COMPOSITAE

Bidens pilosa L.

Luo Name: *Nyanyiek mon, Onyiego*

Common name: Black Jack

Annual erect herb often branching above, associated with poor or exhausted soils. Has a fibrous root system, an erect stem to 100cm high, 4 angled without hairs. leaves are stalked, opposite and divided with little or no hairs. The inflorescence is terminal, branched, loose and composed of flower heads to 1.5cm in diameter or long stalks. Each flower head has yellow tubular florets and about 5 white ray florets and a double row of bracts surrounding the flower head. The fruit an achne, is black ribbed, 11mm long with 2-3 barbed bristles.

Habitat: Weed in nearly all crops of warmer areas

Distribution: Widespread K1-7

Altitude: 400 - 2400m

Propagation: By seed

Chrysanthellum americanum (L.) Vatke

Luo Name: *Nyalep tong'*

A small annual herb, ascending to erect branches, sub orbicular leaves divided into linear segments, See Plate 6.

Habitat: Roadsides, cultivated fields, homes and abandoned gardens.

Distribution: K5

Altitude: 1000 - 1900m

Propagation: Seeds

Gutenbergia cordifolia Benth. ex. Oliv.

Luo Name: *Rabuor*

Annual erect herb leaves opposite to alternate, obovate to ovate and oblong up to 7cm long and 3.5cm wide. Has a tap root system. Is 1.5m high and covered with silvery hairs. Leaf underside covered with woolly silvery hairs. Leaf stalk more or less absent, Leaf base clasps the stem. Inflorescence of flower heads on stalks to 13mm long in loose, branched terminal clusters. Flower heads are purple, 6 -8mm in diameter, composed of numerous tubular florets. Surrounded by several rows of bracts. Fruit an achene, ribbed, hairs with 0-8 pappua bristles.

Habitat: Rocky ground, weed of arable crops, grassland and waste ground

Altitude: 2 - 1800m

Distribution: Common in highlands. Widespread in K1-5

Propagation: Seeds

Launaea cornuta (Oliv. and Hiern) C. Jeffrey.

Vernacular name: *Achak*

Common Name: Wild lettuce

Perennial herb with milky latex. Has an erect stem to 1.2m high, usually unbranched beneath the inflorescence, hairless. Root fibrous from stem, base or rhizomes. Leaves arranged in a rosette at ground level and alternately on the stem., Variable up to 15cm long., linear lanceolate or elliptic, with 2-4 lobes and slightly toothed margins stalk absent. Inflorescence is a branched terminal panicle of shortly stalked flower heads, florets strap shaped, pale yellow, surrounded in compact head by shorter bracts. The fruits is an achene, with a pappua of long white hairs.

Habitat: Weed of arable land perennial crops and waste areas, along roadsides and disturbed areas.

Distribution: Widespread in the highlands, found in K1-5, 7

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Altitude: 1 - 2250m

Propagation: By seeds and rhizomes

Microglossa pyrifolia (Lam.) O. Kuntze

Luo Name: *Nyabung odide, Raywe tigo*

A scrambling though sometimes erect shrub with narrow-ovate acuminate, petiolate leaves. Some leaves are abruptly narrowed into the petiole. Ligules cream and spreading; often hanging corymbs of yellow heads 4-6 bisexual florets.

Habitat: Disturbed dry forest, almost everywhere

Distribution: K3, 4, 5, 6

Altitude: 450 - 2600m

Propagation: Seeds

Psiadia punctulata (DC.) Vatke

Luo Name: *Atilili*

An erect glabrous shrub with entire lanceolate elliptic leaves which are glossy with a gum like secretion when young; heads bright yellow, in terminal corymbs.

Habitat: Bush land, woodland, dry forest

Distribution: K3, 4, 5,

Altitude: 500 - 2000m

Propagation: Seeds

Schkuhria pinnata (Lam). Thell.

Luo name: *Akech, Onyalo biro*

Common name: Dwarf marigold

Aromatic herb, erect, to 50cm high, slender, ribbed, much branched creating a bushy plant. Leaves are alternate, up to 10cm. long, finely divided into very slender segments, sometimes becoming subdivided. Inflorescence of flower heads yellow, approximately 6 mm long and 5 mm in diameter, on slender stalks in a loose branched, terminal inflorescence. Flower heads bear 3-9 central tubular florets and an outer ring of strap-shaped florets. Fruit is an achene, 4 angled, hairy, black with a pappus of 8 brownish scales. Introduced from S. America.

Habitat: Disturbed ground, weed of arable land

Distribution: Limited to highlands K1, 3-5

Altitude: 1500 - 2000m

Propagation: By seed

Tithonia diversifolia (Hemsl) Gray

Luo Name: *Akech, Maua*

Branched, soft shrub with simple 5-lobed, opposite or alternate leaves and a large head of orange-yellow flowers 7 cm across. Forms a large bush. Introduced from central America.

Habitat: Waste ground, roadside, hedges

Distribution: K 4-5

Altitude: 1500 - 2300m

Propagation: Seeds

CUCURBITACEAE

Coccinia grandis (L.) Voigt.

Luo Name: *Mutkuru, Nya mutkuru*

A perennial climber or trailer to 20m, tuberous rootstock, young stem green, herbaceous, angled, glabrous except at nodes becoming white dotted with age. Perennial eventually woody. leaf blade broadly ovate to sub-pentagonal or orbicular in outline with distinct reddish glandular teeth, glabrous, 3-4-11-5 cm long, palmately (3-5) lobed. lobes variable, corolla lobe (female) 2.1-3.2mm. long, 7-13mm. wide, (male) 1.4-2.0cm long, 1.0-1.6cm wide. Simple tendrils. Male flowers solitary or paired (rarely 3 to 4, receptacle tube expanded above, slightly glandular - hairy internally. Corolla campanulate, blade yellow or pale apricot, orange, green veined, lobes united in lower half, sometimes red-tipped, female flowers solitary on 4 - 2.5mm long stalks, receptacle tube cylindrical, lobes filiform, Conceolate or triangular, also often red-tipped. Ovary green. Fruit is fleshy, red when ripe.

Habitat: Deciduous bush land, woodland, eroded, grassland, dry evergreen forest and evergreen woodland.

Distribution: Uncommon, K 1-7

Altitude: 1 - 1680 m

Propagation: By Seed

Cucumis figarei

Luo Name: *Buth apwoyo, Otangre, Otange*

Perennial herb trailing or climbing with spiny hairs and soft bristles. leaves tripalmatifid. Fruits bears blunt spines, green when raw, yellow when ripe.

Habitat: Dry Acacia country

Distribution: K1-7 Uncommon

Altitude: 1 - 1600m

Propagation: By seed

EBENACEAE

Euclea divinorum Hiern

Luo Name: *Ochol*

Common name: Magic quarri

Much branched small tree with elliptic leaves, apex obtuse, margin wavy, lamina coriaceous, sometimes glaucous, glabrous except for some reddish or pale scale beneath. Flowers fragrant, cream coloured, males 10 or more together in lax racemes, female in stouter and shorter racemes, calyx lobes short, acute or sub acute.

Habitat: Evergreen forests or thickets, disturbed ground, woodland, secondary bushes.

Distribution: Widely spread in the highlands, becomes dominant in regrowth K4, 5

Altitude: 1000 - 2400m

Propagation: Root sucker production, coppice easily and inexhaustibly.

EUPHORBIACEAE

Erythrococca trichogyne (Muell. Arg.) Pain.

Luo Name: *Hariadho*

A rather weak struggling shrub 2-4.5m tall. Bark pale grey. Twigs greyish brown young shoots and petioles densely pubescent. Male inflorescence simply racemose, 1-3cm long, bracts 0 or minute, in male flowers, pedicels are slender 1-3mm long, stamens 9 - 24. Flower inflorescence simply racemose, (1-2) 2-4 flowered, 1-4cm long. In female flowers, pedicels are a bit thicker than in males, 1-2mm long. Fruit dicocous, the cocci 3-4mm diameter. Seeds 2.5-4mm diameter.

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Habitat: Forest undergrowth, edges and associated bush land, along rivers and lakesides.

Altitude: 1440 - 2750 m

Distribution: K 5.

LABIATAE

Fuerstia africana T.C.E.Fr.

Luo Name: *Oluwo chiel*

This is a herb to shrub. Source of an orange dye

Habitat: Varied, wooded grasslands, bushlands, thickets

Altitude: 1- 1800m

Distribution: K345

Propagation: Cuttings

Hyptis pectinata Poit.,

Luo Name: *Oluwo chiel*

Annual. stem erect, branched pubescent, 1.2-1.8m high leaves petioled, small ovate, crenate, pubescent, Inflorescence dense terminal racemes of small flowers, flowers pale cream and purple. Fruit calyx pubescent 0.3-0.4m long; tube oblong; villous at the throat inside; teeth small, setaceous corolla not longer than calyx.

Habitat: Dry bush land at lower latitudes

Distribution: K 3-6

Altitude: 5 - 1500m

Propagation: Cuttings

Leonotis nepetifolia (L.) R.Br.,

Luo Name: *Nyonyodhi, Osene*

Large erect annual, to 2-63m. high, woody at base, obtusely 4-angular with thickened rounded angles, deeply grooved at opposite sides, finely tomentose, medullated. Upper leaves ovate-lanceolate, 5.6-8-5x1.5-2-6cm acute at base, lower ones ovate to broadly ovate, 4-20x2.9-15cm, broadly rounded or truncate at base., all acute to sub-acute coarsely crenate-serrate, glabrous or finely tomentose above, minutely glandular-punctate beneath and puberulous along nerves, petioles 1-5-12cm long. Verticils on a stem. Floral leaves linear-lanceolate, 12x2mm. spinously tipped calyx 7 toothed, teeth unequal, Corolla 1.9-2.8cm long. orange red, tube 1.0-1.4cm long. densely and stiffly pilose at back, lower lip 7-8mm long, browning with age. Filaments flattened. Pilose towards base. style branches unequal, linear. Nutlets 3-4mm long, linear-cuneate, trichogynous, black, densely poxed with white gland dots.

Habitat: Waste ground, roadsides, hollows in rocks

Distribution: K,1-7

Altitude: 5 - 2100m

Propagation: Seeds

Ocimum basillicum L.,

Luo Name *Bwar*

Aromatic annual to perennial herb, 20-60cm tall, stems round-quadrangular, erect or ascending, glabrous, rarely puberulent. leaf blade glandular-punctate, narrowly ovate to elliptic, entire to shallowly serrate, petiole 2-40mm. Inflorescence lax, verticils 8-20mm apart; bracts deciduous or not, pedicel 3-4mm at anthesis, upper lip large, rounded at tip, decurrent, median teeth of flower lip lanceolate, fruiting calyx 6mm long. Corolla pink, white or creamy yellow, 5-8mm; stamens exceeding corolla by 2-5mm, ovaries glabrous. Nutlets black, ovoid, longer than broad 1.5-2mm long \pm smooth, mucilaginous when wet.

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Habitat: cultivated on disturbed ground ,grassland, dry areas.

Distribution: Introduced from Asia, locally naturalised in the tropics. Cultivated in N. Africa, Europe and S.W Asia. K 1- 7.

Altitude: 0 - 2350m

Propagation: Seeds,

Ocimum gratissimum L.,

Luo Name: *Mieny*

Aromatic perennial herbs 60-250cm tall. stems erect, quadrangular, much branched, often striated, woody at base with epidermis often peeling in strips, glabrous or with patent hairs below, becoming pubescent at nodes and on the inflorescence-axis, or pubescent, leaf blade glandular-punctate or not; indumentum of scattered short hairs mostly confined to veins, pubescent overall. Inflorescence lax or dense, calyx horizontal downward pointing or strongly reflexed against the inflorescence - axis, 2-3mm at anthesis, fruiting calyx 6mm long, tube closed. Corolla green or dull white or pale yellow, 3.5mm; tube straight, funnel shape, scarcely exceeding calyx tube. stamens exerted 1mm from Corolla.

Habitat: Disturbed ground, forest areas, bush, lake shores.

Distribution: Widespread in the tropics from India to W. Africa, S. Africa and naturalised in India.

Altitude: 1 - 1500m

Propagation: By seeds

Plectranthus barbatus Andr.

Luo Name: *Okita*

Erect Bushy, semi-succulent, unpleasantly aromatic, 3-4m high, 4-angled stem, herb or shrub, stem with red gland dots. leaves semi-succulent, petiole 1-2cm. long; blade ovate to elliptical, densely tomentose on both surfaces, copiously gland dotted below. Inflorescence a terminal spike-like raceme 20-32cm long. Flowers in sessile 3-4 flowered cymes verticillaters 1-2.5cm apart, pedicels erect, 4-5mm long, glandular-puberulous calyx 4mm long at flowing enlarging to 7mm long in fruit, glandular. Corolla pale blue, mauve, 1.7-2cm long, sparingly pubescent and gland dotted. Stamens united at the base for 3mm and curved within the lower lip with the anthers slightly exserted. style finally exserted by 4-5mm. See Plate 5.

Habitat: Forest margins, among rocks in shady places, frequently cultivated.

Distribution: K3, 4, 5,

Altitude: 1000 - 2400m

Distribution: K3, 4, 5

Propagation: Cuttings

Plectranthus prostratus Guerke

Luo Name: *Api, Atoch toch*

A low trailing succulent herb with erect stems bearing opposite obovate-elliptic leaves grading into bracts of the few flowered racemes; flowers are very small, inconspicuous.

Habitat: Dry rocky, grassland, bush land, woodland.

Distribution: K3, 4, 5

Altitude: 800 2000m

Propagation: Cuttings, seeds

Tinnea aethiopica Kotschy and Peyr.

Luo Name: *Arech*

An erect or straggling pubescent shrub, elliptic coarsely toothed leaves, paired flowers with red calyx and black corolla.

Habitat: All upland forest areas, wood and bush land.

Distribution: K3, 4, 5, 7

Altitude: 5 - 2300m

Propagation: Seeds

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LEGUMINOSAE

Subfam. CAESALPINIOIDEAE

Cassia didimobotrya Fres

Luo Name: *Owinu*

A poisonous shrub or small tree, to 6.5m high. Bright yellow flowers, 3cm across, flat pods. See Plate 8

Habitat: Ditches, depressions, roadside, abandoned gardens

Distribution: K1 - 7

Altitude: 600 - 2100m

Propagation: By seed

Cassia occidentalis L.

Luo Name: *Ohingla tiang'*

Erect herb, to 2m high. Sub-glabrous stem. leaves to 25cm long, leaflets 3-6 ovate, flowers 1-15cm long, racemous, short yellow petals, narrow pods, semi flattened.

Habitat: A weed of cultivation, roadsides and waste places near villages and buildings in grasslands and lakeshores.

Distribution: K1 - 7

Altitude: 5 - 1740m

Propagation: By seed

Cassia hildebrandtii Vatke

Luo Name: *Akech*

Prostrate perennial with annual branches, woody roots, oblong leaves, 6-7 pairs of leaflets. Plant is hairy, flowers yellow, 4 - 12 mm long, 3.5 - 10mm broad, flat pods.

Habitat: Common in stony grassland

Distribution: K1 - 6

Altitude: medium, 760 - 2130m

Propagation: By seed

Piliostigma thonningii (Schum.) M. Redh.

Luo Name: *Ogalu, Otagalu*

Shrub or tree to 6m. thick fissured bark. Leaves simple, bilobed, cordate at base Racemes alternately leaf opposed and axillary along each branch borne horizontally. Male and female trees, flowers white fragrant, petals. See Plate 7

Habitat: Savannah, bush land,

Distribution: K 3, 5, 6, 7

Altitude: 5 - 2000 m

Propagation: By seed

Cassia hildebrandtii Vatke

Plate 5

Plectranthus barbatus:

In cultivation

Place Ajigo, Asembo



Plate 6:

Chrysanthellum americanum: Held by the hand.

Common in Alego and Ugenya

Place: Madungu, Uholo Location, Ugenya



Plate 7

Piliostigma thonningii: Note the harvested bark, and the seedlings.

Place: Nyang'oma Sakwa



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Tamarindus indica L.

Luo name: *Chwa*

Common name: Tamarind

Tree evergreen to 16m high, compact rounded crown, pinnate leaves to 15cm long, leaflets 10 - 15 pairs, opposite, oblong. Flowers racemes, small 4 sepals yellow inside, reddish outside, 3 petals, yellow with red streaks, hairy pods, indehiscent, thick, rough bark.

Habitat: Dry savannah, along ant hills

Altitude: 1 - 1500m

Distribution: K1,2,5,7

Propagation: By seed

Tylosema fassoglensis (Schweinf.) Torre & Hillc.

Luo name: *Ombasa*

Large trailing climber with tendrils and cordate notched leaves. Flowers conspicuous, 55mm, across, ranging from yellow to pink flat pods, 1 - 2 seeded.

Habitat: Hedges, disturbed grounds, rocky/stony soil

Distribution: K5

Altitude: 90 - 1800m

Propagation: By seeds, tuber

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Subfam. *MIMOSOIDEAE*

Acacia hockii De wild.

Luo Name: *Oriang'*

A shrub to small tree. Bark red brown to green brown, peeling. Short straight spines. Flowers many and yellow, in round heads. Pods are sickle shaped, narrow with wavy margin.

Habitat: Semi arid zones in tropical Africa, wooded grasslands, river valleys.

Distribution: K2, 3, 4, 5

Altitude: 5- 2400m

Propagation: Seedlings, wildings, coppicing

Albizia coriaria Welu ex.Oliv.

Luo Name: *Ober*

Deciduous tree to 26m (60m in forest) Bark is red-brown to brownish black scaling raggedly- slash yellow-white, hard. Pinnae 2-8 pairs, leaflets 5-12 pairs, glabrous, narrowly oblong, rounded at apex; leaf rachis slightly hairy, Corolla white, upper half of the stamens red. Pod glossy brown, straight, brown with darker streaks, coarse grained.

Habitat: Riverine forest, open grassland, woodland left in fields.

Propagation: seedlings, wildings

Altitude: 850 - 1700m

Distribution: (K5) widespread in Nyanza

Propagation: By seed

Subfam. **PAPILIONOIDEAE**

Alysicarpus rugosus (Wild) DC.

A tufted perennial from a woody rootstock with linear lanceolate leaves and pink to mauve flowers in terminal false racemes.

Habitat: Flooded areas, dry woody grassland

Distribution: K3, 4, 5

Altitude: 1000 - 2000m

Propagation: Seeds, rootstock

MALVACEAE

Hibiscus fuscus Garcke

Luo Name: *Owich*

Herb. branched, to 1.8m high, covered with dark brown hairs. Simple ovate leaves, hairy, flowers white, calyx hairy, seeds with hairs, bark yields fibre.

Habitat: Cool places, under shade

Distribution: K45

Altitude: 800-2000m

Propagation: By seed

Sida tenuicarpa Vollesen

Luo Name: *Amoyo*

Erect to spreading, shrub or shrubby heels 1m tall branchlets and leaves with sparse appressed many rayed hairs. leaves glabrous above, petiole 1.5-5mm long; stipules 1-4mm long. Flowers solitary and usually also in terminal heads of up to 8 flowers. Subsessile. Calyx 3-4.5mm long, scattered evenly distributed many rayed hairs. Petal 7-10mm long. Staminal tube 1.5-2.5mm long. Style branches protruding by 2-4mm. Mericarps sparsely puberulous, smooth without any sculpturing lateral walls thin, papery, disintegrated and release seeds, See Plate 9.

Habitat: Upland grassland, secondary or overgrazed or disturbed, roadsides, old abandoned cultivations.

Altitude: 1200 - 2400m

Distribution: K 1-7

Propagagtion: By seeds

MELIACEAE

Melia azedarach L.,

Luo Name: *Dwele*

Common name: Persian lilac

A small tree, can reach 10m, usually deciduous, Bark grey, later rough and brown. compound leaves, pale then dark shiny leaves, hanging in terminal bunches. Flowers pale lilac, in rounded clusters, fragrant. Each tiny flower with a dark purple Centre. Fruits in clusters, fleshy yellow berries, poisonous to some animals. Each fruit with 4 - 6 seeded.

Habitat: Tropics and sub-tropics, planted for ornament, wood and medicine

Distribution: K3, 4, 5, 7

Altitude: 5 - 2200m

Propagation: Seedlings, windings, direct sowing, coppicing



Plate 8:
Cassia didymobotrya:
In fruit and flower.
Place: Alego, Mwer



Plate 9:
Sida tenuicarpa:
In flower in a pastureland
Place: Sirembe, Gem

NYCTAGINACEAE

Boerharvia diffusa L.

Luo Name: *Rachier mar nam*

Common name: Jar vine

A perennial herb with fleshy rootstock and branches arising from the base which are prostrate at first, then ascending. The simple leaves are in equal pairs and the small flowers are grouped in umbels at the end of the branches of the much branched inflorescence. leaves stalked, broadly ovate and blunt at the tip with wavy margin, leaf undersurface paler than upper. Inflorescence is leafless, Umbels terminating the branches are 2-4 flowered. flowers are red, perianth 5-lobed, 3 stamens. Fruits covered with sticky glandular hairs readily sticking to passers by

Habitat: Weeds of cultivated and waste land

Distribution: K1 - 7

Altitude: 5 - 2000m

Propagation: By seed

OLACACEAE

Ximenia americana L.

Luo Name: *Olemo*

Common name: Wild plum

Scrubby deciduous usually spiny savannah bush or tree, to 4-7m. Bark dark brown to black, with small rectangular scales. Lenticles crimson, fibrous, spines 1cm., straight. Sharp and slender. leaves alternate, simple or turfts, oblong 7 x 3 cm blue-grey-green, fold upwards along midrib, tip round or notched, petiole short. Flowers white, fragrant, tetramerous, usually axillary, pedunculate, bracteate cymes; petals bearded inside, stamens and styles sharp persisting as a pointed tip to the fruit, fruit yellow or red, thick-skinned, plum-like, edible, (large stone seed, contains oil, wood yellow to yellow-red, scented. Fruit edible, refreshing, almond taste.

Habitat: Stony slopes, open sandy woodland deciduous savannah bush land, and semi-arid zones.

Altitude: 5 - 2000m

Distribution: K 1 - 7

Propagation: Seedlings

PLUMBAGINACEAE

Plumbago zeylanica L.

Luo Name: *Rachier*

A trailing hairless shrub with ovate leaves and white flowers 16mm across, grouped in terminal spikes. Calyx is tubular with stalked glands. Corolla tube is cm long with spreading lobes.

Habitat: Dry bush and woodland throughout Kenya.

Distribution: K1 - 7

Altitude: 5 - 2000m

Propagation: By seeds

RHAMNACEAE

Ziziphus mucronata Willd.

Luo Name: *Lang'u*

A much branched spiny tree, drooping angular branches, crown rounded. Grey back recurved thorns. leaves alternate, shiny above, white below, rather small. Yellowish flowers, round fruits.

Habitat: Woodland, bushland, dry areas

Distribution: K 5, 7

Altitude: 5 - 1400 m

Propagation: Seedlings, direct sowing, root suckers, cuttings, coppicing (low germination rate).

RUTACEAE

Zanthoxylum chalybeum Engl.

Luo Name: *Roko*

Common name: Knob wood

A spiny shrub to tree, up to 8m. Crown is round, but open. The hole has characteristic large conical woody knobs with sharp prickles. Dark scales and prickles protect buds. leaves are compound, exude a strong lemon smell when crushed, have gland dots. leaf stalk has hooked prickles below 6 - 9 pairs of shiny leaflets. Flowers yellow green. Fruit red-brown-purple, like berries, open to release shiny black seeds. is indigenous.

Habitat: Dry woodland, bush land or grassland often on termite mounds.

Distribution: K 4, 5

Altitude: 5 - 1500m

Propagation: Seedlings, wildings

SIMAROUBACEAE

Harrisonia abyssinica Oliv.

Luo Name: *Pedo*

A much branched prickly shrub or small tree to 6m. grey bark. Slash white. leaves very variable, Imparipinnate, with pairs of prickles at the base; rachis more or less broadly winged, especially at the distal end. Leaflets in 1- 6 pairs, sub-orbicular to narrowly ovate - elliptic or obovate, one size of leaflet depends on available water supply. margins are entire

-crenate or crenate-serrate. Flowers small and yellow in axillary or terminal inflorescence; Fruit is a small black 4 - 5 lobed berry.

Habitat: Woodland, bushland, eroded soil

Attitude: 5 - 1700m

Distribution: K1 - 7

Propagation: By seeds

SCROPHULARIACEAE

Striga hermontica (Del.) Benth.

Luo Name: *Hayongo*

Annual herb, parasitic on maize, millet, sorghum, sugarcane and upland rice. Root is much reduced and attached to host plant.. Stem is erect, branched to 60cm. hairy and 4 angled. leaves are stalkless and rough. Inflorescence is terminal spike. Spike; to 15cm long; Flowers are pink and occasionally white. A narrow leaf bract of about 1 cm long subtends each stalks flower. Calyx is 5-ribbed. The fruit is a capsule with numerous seeds. Seeds are stimulated to grow by exudes from roots of the host plants.

Habitat: A weed of arable land, mostly sandy soils of low fertility.

Distribution: Widespread, K3, 5.

Altitude: 1000 - 2000m

Propagation: By seeds

SOLANACEAE

Solanum nigrum L.

Luo Name: *Osuga*

Common name: Black night shade

Annual herb, variable, widespread in arable land and wasteland. Has a tap root system, an erect stem to 60cm high, branched and hairless. Leaves are alternate, ovate, to 8cm long and 4cm wide with wavy lobed margins stalk to 2.5 cm long Flowers hang in clusters on common stalk, are white, 5-lobbed. Stamens are yellow and project from flower centre. Fruit is a berry with many flattened seeds.

Habitat: weed in cultivated land below 2100m. Not found in very dry areas.

Distribution: K 1 - 7, Widespread throughout Africa

Altitude: 0 - 2100 m

Propagation: By seed

VERBENACEAE

Lantana camara L.

Luo Names: *Atek, Atek tagwari, Nyamridh, Magwagwa*

Common name: Curse of India, lantana, tick berry, cherry pie

Perennial shrub forming impenetrable thickets, throughout the average to above-average rainfall areas of the region. It poisons cattle and provides cover for tsetse. The stem is erect, to 3-6m high, square sectioned, prickly, branched leaves are opposite, ovate to 8-7 cm. long with toothed margins, upper surface rough, lower surface hairy, distinctively aromatic; stalk about 1cm long. The inflorescence is composed of flower heads, terminal and axillary, stalked yellow, white or purplish depending on variety, fruit, a drupe, shiny black when ripe with 2 seeds.

Habitat: Disturbed ground, abandoned fields, waste ground, coastal thickets, grasslands, pastures

Habitat: Disturbed ground, abandoned fields, waste ground, coastal thickets, grasslands, pastures

Distribution: K 1 - 7

Altitude: 5 - 1800m

Propagation: Copious re-growth of suckers, roots and seeds.

Lantana trifolia L.

Luo Name: *Nyabende, Nyabend winy.*

Shrub to 2m high with a hairy but not prickly stems. Leaves opposite, and usually in threes, ovate lanceolate. Flowers pink or pale purple, fruit purple.

Habitat: Disturbed ground, abandoned fields, grasslands,

Distribution: K1-7

Altitude: 2 - 2000m

Propagation: Seeds

VITACEAE

Cyphostemma serpens (A. Rich.)Descoings.

Luo name: *Bwombwe madongo*

Climbing a trailing, rarely erect, emerge from a tuberous tap root, +/- tendrils, leaflets 3 - 7, linear-elliptical, densely pubescent below; glands present on all parts except flowers and fruit variable habit.

Habitat: Bushland, grassland, thicket, woodland

Distribution: K5, 6

Altitude: 500 - 1500m

Chapter Five

5.0.0 ETHNOBOTANICAL SURVEY

5.1.0 .Introduction

With all the advances in modern and orthodox medicine, traditional medicine is still very much alive and plays an important role in health care (Gbile *et al.*, 1988). This implies that the use of plant medicine is still a popular practice especially in the rural areas where modern medicine is inadequately distributed (Kokwaro 1983), or too expensive, hence beyond reach. There were problems typically inherent in ethnobotanical work This could in part be solved by using some criteria in arriving at a general consensus (Johns, Kokwaro and Kimanani, 1991). In the study, many people have been interviewed and relevant information recorded.

5.2.0 Research Methodology

Data on species use was derived from a questionnaire survey of 55 people. The survey was done on a divisional basis. In the survey, the respondents were asked the names of plants they used as medicines, how these were harvested, how these were prepared and administered, how and when and for what purpose they were administered. Most questions related to their medicinal use, other uses came later.

In addition, I have used some information from the aerial survey of 1981 of KREMU report of 1984 on land use patterns of Siaya District which have not changed much since then. The accuracy of data depended much on the certainty

with which respondents identified the plant species. The Luo-English botanical dictionary (Kokwaro 1972) provided some local names and their botanical equivalents where applicable. It was encouraging to note that the interviewees could identify the plants consistently, for they confessed plants whose names they didn't know.

5.3.0. Results

The result of the survey on plant uses have been described below. Plant names have been listed alphabetically according to families and the taxa in which they appear in the order applied for the plant descriptions in chapter 4. A total of 82 species in 38 families were identified as being used in the area. Local names have been provided. RO are from the author's work, JOK as reported by Kokwaro in MPEA and CG as reported by Githinji C in her MSc thesis.

ACANTHACEAE

Crabbea velutina

Local name: *Onyango arungu*

Whole plant is uprooted, washed if dirty then boiled in water. This is orally taken in case of gut erosion. A portion is used to bathe the child. The herb also clears a skin condition 'mhaha' in addition to a well balanced diet.

In case of scabies the pounded leaves are mixed with jelly and applied on the skin thrice daily after bath. This clears other problems such as 'kidayi' and malaria.

Dyschoriste radicans

Local Name: *Akech*

The herb is boiled in water and the bitter extract is orally administered to the children suffering from stomach ache. The herb, together with *Ricinus communis* leaves are pounded and a little warm water added. This is used to massage mother's abdomen gently to expel the afterbirth.

ALOEACEAE

Aloe sp.

Local Name: *Ogaka lang'o*

The ash from the burnt dried leaves is painted on the tongue if coated, a manifestation of gut erosion. If very sore, the ash is applied three times a day for three days. Salt may be added to taste. Alternatively the leaves may be boiled in water and the resulting decoction is orally taken by children and adults.

Aloe sp.

Local Name: *Ogaka*

Chopped pieces of de-spined green leaves are boiled in water. This treats gut erosion, effects of sorcery, and distended belly in children. Adults take 1 cup first thing in the morning in case of STD.

ANACARDIACEAE

Lannea schweinfurthii

Local Name: *Kuogo*

The bark decoction is a remedy for stomach-ache in children and adults. The sieved extract from water soaked pounded leaves clears gut problems. For faster remedy the plant can be mixed with others such as *Kigelia africana* etc.

Mangifera indica

Local Name *Maembe*

The ripe fruit is a laxative when consumed in excess. The raw fruits are sour and not so likeable

APOCYNACEAE

Carissa edulis

Local Name: *Ochuoga*

The root bark is pounded and boiled in water. The decoction orally taken is said to clear gut erosion, a skin condition 'mbaha', and general body illness. The dose is age dependent. Adults take 1 cup older children take a half of the cup, nursery age about 3-4 tablespoon while babies take about two to three teaspoons. The ripe fruits are edible and can be made into juices..

Catharanthus roseus

Local Name: *Maua*

The roots are boiled in water. The bitter extract thus formed is orally administered to calm down stomach ache. Relief follows soon after.

BIGNONIACEAE

Kigelia africana

Local Name: *Yago*

The tea made from boiled bark is given to child to clear most infantile diseases including gastrointestinal problems. Bathing the child in this tea speeds up the healing process. The plant is even more effective when mixed with others such as *Maytenus heterophylla*, *Oxygonum sinuatum*, *Ocimum gratissimum* amongst others, when it clears general body illness and gut erosion/corrosion.

Markhamia lutea

Local Name: *Siala*

The root bark is boiled in water and the concoction administered orally in case of stomach ache and diarrhoea. The diarrhoea stops within three days but drug administration continues until recovery is complete. This type of mixture is also used in case of dysentery, and gut erosion in children. In case of '*mbaha*' and gut erosion the roots are boiled and given to the child. Pounded leaves are pressed against the new-born's gums to stop premature emergence of false milk

teeth. If present at birth however, they disappear with frequent rubbing. Adults don't normally use this remedy.

BURSERACEAE

Commiphora africana

Local Name: *Arupiny*

The roots or bark are water boiled and orally administered to the child in case of *mbaha*. The smoke from the dry smouldering twig is used on problematic eyes, especially those that exude pus

CAPPARACEAE

Boscia angustifolia

Local Name: *Akado*

This is a pot herb. It helps clear gut related problems.

Capparis erythrocarpos

Local Name: *Omisu*

The roots are boiled in water and the decoction given to the baby or child with general illness, gut erosion or skin problems. Two teaspoonfuls twice daily till symptoms disappear. The expectant mother takes 1 cup in the morning to ward off general illnesses. The root bark is pounded together with that of *Ziziphus sp.* and *Capparis erythrocarpos*. The paste is then tightly corked. The perfume exuded is inhaled in case of asthma, but with a lot of care as it is very powerful and effective in bringing about instant relief.

Gynandropsis gynandra

Local Name: *Akeyo, Dek*

The leaves are pounded. The sap is instilled once daily into the anus of the child having rectal problems associated with prolonged exposure to gut erosion. This mode of administration is said to be very effective.

The shoot, especially young leaves, are cooked and eaten as a vegetable in times of scarcity and plenty. The dish is especially liked by the Luos and Luhyas (K5) who believe that the vegetable not only cures gut problems, but is also capable of keeping them at bay for as long as it is regularly included in the diet.

CARICACEAE

Carica papaya

Local Name: *Popoyi, Kipoyo*

The ripe fruit is good for children in health and in illness. Taken as a fruit, it is believed to be good in cases of diarrhoea, or loose stool in both infants and children.

CELASTRACEAE

Maytenus heterophylla

Local Name: *Kudho, Nyamderme*

The roots are boiled together with those of *Harrisonia abyssinica* and *Carissa edulis*. The decoction is taken in case of general illness, gut erosion/corrosion and 'mbaha'. The child is normally given one spoon while the adult takes 1 glass on daily basis. Normally the plant is used with others.

COMPOSITAE

Aspilia mossambicensis

Local Name: *Osend oyieyo*

This is used as a pot herb and cures general illnesses which include those affecting gut.

Bidens pilosa

Local Name: *Nyanyiek mon, Onyiego*

The leaves are mixed with the aerial parts of *Chrysanthellum americanum* then burnt to ash. Salt is added to taste. The ash is painted on sore or coated tongue as a remedy for the problem as well as gut erosion, the root cause. The leaves can be pounded and the sap expressed into inflamed eyes as a remedy.

Chrysanthellum americanum

local Name: *Nyalep tong'*

In emergency the aerial parts are pounded and soaked in water. The child is given 1 teaspoonful in case of *orianyanja* or coated tongue. Alternatively pounded leaves are dried and burnt to ash. The ash is applied on the tongue in case of coated tongue and "*orianyanja*". Salt may be added to taste. The plant can be used alone or with leaves of *Bidens pilosa*.

Gutenbergia cordifolia

Local Name: *Akech*

This is pounded, soaked in water and given to a child in case of stomach-ache whose cause is not precisely known.

Launaea cornuta

Local Name: *Achak*

The roots are boiled and the decoction taken orally in case of gut erosion. The baby is given two teaspoons twice daily for four to five days. The older babies are given slightly more. Symptoms normally clear after about five days.

Microglossa pyrifolia

Local Name: *Nyaywe tigo, Nyabung odide*

The leaves are pounded together with those of '*osol olaw*' and soaked in water. This is taken four times a day in case of *orinyanja*. The child is bathed in the root decoction to treat measles. The pounded leaves are used to massage the child in case of '*okulbat*' (muscle fatigue?), eye infections or wound disinfection.

Psiadia punctulata

Local Name: *Atilili*

Ash from burnt dry leaves painted on coated tongue clears the coating. Alternatively, tea from boiled leaves have a similar effect when orally administered.

Schkuhria pinnata

Local Name: *Akech, Onyalo biro*

The shoot is harvested, pounded while fresh and soaked in water

The bitter concoction is taken as a remedy for stomach-ache.

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Spilanthes mauritiana

Local Name: *Osol olaw*

The leaves are pounded and soaked in water. This is sieved and the liquid taken in case of gut erosion and associated diarrhoea. The leaves are chewed in case of toothache and the juice sput out.

Tithonia diversifolia

Local Name: *Akech, Maua*

The green leaves are pounded and soaked in water. The bitter extract is taken in case of acute stomach-ache.

Vernonia lasiopus

Local Name: *Olusia, Olulusia*

The leaves may be used alone or with those of *Boscia angustifolia* to effect relief from constipation in new-born. The medicament is said to be a laxative and purging is immediate.

CONVOLVULACEAE

Ipomoea hildebrandtii

Local Name: *Nyadeg dani*

This is a potherb. Its used for general gut problems in children

CRUCIFERAE

Farsetia stenoptera

Local Name: *Nyadeg dani*

The herb is pounded and soaked in water. The infusion is sieved and given to the child or baby suffering from effects of sorcery, e.g. severe stomach ache, vomiting etc. The child recovers as the problems are relayed back to the sorcerer who now suffers instead. How the 'radionic' works was not easy to explain but residents confirmed the effect.

CUCURBITACEAE

Cucumis figarei

Local Name: *Otange, Otangre*

The sap from the roasted ripe fruit is expressed into the anus dropwise in case the child is suffering from gut erosion. Pounded green leaves mixed with jelly are used to massage baby if suffering from '*okulbat*' (muscle fatigue).

Kedrostis gijef

Local Name: *Obuolo, Rabuon*

The pounded root tuber is soaked in water and given to child in case of '*mbaha*' and gut erosion. To speed up relief, bath child in a portion of the decoction.

EBENACEAE

Euclea divinorum

Local Name: *Ochol*

This is a pot herb that yields a navy blue to black extract. The herb is a laxative and is normally administered to constipating children and adults, the extract also checks gut erosion. If boiled together with *Euphorbia tirucali*, the extract that results is able to cure gonorrhoea.

The roots, preferably root bark if boiled together with that of *Tylosema fassoglensis* and *Kedrostis gijef* is orally administered. Purging ensues in case of constipation, general body illness and gut erosion in children.

EUPHORBIACEAE

Erüthrococca bongensis Pax

Local Name: *Hariadho*

The leaves are pounded into a paste. This is added into water and allowed to soak for several hours. The infusion is sieved and taken orally to treat gut related anomalies. The paste can also be mixed with that from leaves of *Flueggea virosa* and tied round the neck or at the door as a protective charm against adulterous parents or those who handle the baby/child. In case of thinning disease (*chira*) the plant is pounded ,soaked in water then drunk The leaves are a relish in times of stress.

LABIATAE

Hoslundia opposita

Local Name: Owich

This is a pot herb used to treat general body illness, in children and grown ups, the gut included. In case of constipation, the leaves are chewed and a little water taken on swallowing the sap for laxation.

Hyptis pectinata

Local Name: *Oluwo chiel*

The leaves are pounded and soaked in cold water. The child is given some orally while the rest is for bathing him. This is believed to clear 'mbaha' and gut erosion. Expectant mothers also take a cup of this preparation to ward off illness from the unborn. Babies normally take three teaspoons. Older children take more.

Hyptis suaveolens

Local Name: *Onyalo biro*

The leaves are pounded and soaked in cold water. The child is given some orally while the rest is used to bathe him. This clears gut erosion. Babies take three teaspoons while older children take more. Expectant mothers take a cup to ward off any illness from the unborn child.

Leonotis nepetifolia

Local Name: *Nyonyodhi, Osune*

The leaves are pounded and water added. This is given to the child suffering from stomach-ache or other gut related problems arising from effects of sorcery (the evil eye). Pounded leaves are soaked in previously boiled and cooled water. The new born is given 1 teaspoon to alleviate the stomach-ache that's characteristic of that age.

Ocimum gratissimum

Local Name: *Mieny*

In case of gut erosion the roots are boiled in water for about 2 hours. The baby takes two to three teaspoons, older children three tablespoons, while adults take one cup. Alternatively the pounded leaves are soaked in warm water. It is sieved and taken as above. The paste from ground leaves is plastered onto painful tooth to ease pain.

Plectranthus barbatus

Local Name: *Okita*

The leaves are boiled in water and orally taken to treat stomach-ache and expel worms. The child takes one to three tablespoons till symptoms clear, or the leaves are soaked in pre-boiled cool water. This is sieved and used for gut erosion.

Plectranthus prostratus

Local Name: *Api, Atoch toch*

Whole herb is pounded and the sap expressed out. This is given to the infant with 'migongo' (chain-like beads in stool, or bloodstains, probably dysentery), advanced gut erosion. A teaspoon is adequate for infants three times a day. The dried herb when burnt to ash is used as a tongue paint in case of a coated tongue. The plant is said to be effective for most childhood diseases.

Tinnea aethiopica

Local Name: *Arech*

The leaves are pounded and soaked in warm water. This is orally administered in case of stomach trouble caused by sorcery.

LEGUMINOSAE

Sub fam: **Caesalpinioideae**

Cassia didymobotrya

Local Name: *Owinu*

Whole leaves are boiled and taken thrice a day for three days in case of constipation. The roots are boiled to alleviate gut problems in adults and to expel worms in babies. Pounded flowers are applied on the face in case of *mbaha* while the child is bathed in some. This is done for four days after which the mixture is discarded. Pounded leaves soaked in water can also be taken in case of *mbaha*.

Cassia hildebrandtii

Local Name: *Akech*

This is a bitter drug. The leaves are pounded and a little water added. The infusion is given to the child or grown up having severe stomach-ache.

Cassia occidentalis

Local Name: *Ohingla tiang'*

The roots are pounded and some water added to it to make a bitter medicament used to manage stomach-ache in infants.

Cassia siamea

Local Name: *Bao, Oyioko*

The decoction from the boiled bark is used to clear gut problems associated with sorcery especially children.

Piliostigma thonningii

Local Name: *Ogalu, Otagalu*

Whole bark is boiled in case of gut erosion and general body illness. The young emerging leaves are nicely sour to the taste and are chewed by children. Older people use the leaves in place of lemon when preparing porridge. Mothers use them to prepare baby's gripe water as it reduces flatulence, gripping and colic (ARO.). The plant is used to treat cough, lung diseases and gum infection (Watt and Breyer 1962)

Tylosema fassoglensis

Local Name: *Ombasa*

The roots are chopped up then boiled in water. The child is given a portion of this orally while the rest is used for bathing him in case of general body illness, and most common childhood infections. The baby takes two teaspoons. The older child takes two tablespoons or more. In case the problem is advanced, plants such as *Maytenus sp.*, *Ocimum sp.* etc. may be added.

Sub-fam: MIMOSOIDEAE

Acacia hockii

Local Name: *Oriang'*, *Kudho*

The young leaves are pounded and used to rub the tongue if coated to clean it, or treat it if coating is due to gut erosion.

Albizia coriaria,

Local Name: *Ober*

The bark is pounded and soaked in water. Air is blown in through pipe until frothy. Some of this is taken orally while the child is bathed in the rest in case of gut erosion and 'migongo', an advanced stage of gut erosion.

Sub fam **PAPILIONOIDEAE**

Alysicarpus rugosus

Local Name : not provided

The leaves are pounded, then soaked in water. This is orally administered to a baby with a coated tongue or gut erosion. 1 tablespoon thrice a day is adequate for the baby.

Crotalaria brevidens

Local Name: *Mtoo, Mto, Mito*

The leaves of this herb are boiled in water either alone or with leaves of *Sesamum angustifolia* or *Corchorus olitorius* to make the preparation slippery. This is consumed with starchy staples such as sweet potatoes, ugali etc. or on its own. The vegetable is medicinal in that it cures gut disorders such as stomach ache, ulcers, etc. If normally included in the diet, gut problems are kept at bay. The relish is especially a favourite of the older generation in society. The roots are boiled together with that of *Rhoicissus* in case of dysentery or bloodstains in stool of the child or grown up.

Indigofera circinella

Local Name: *Odol*

The herb is pounded and a little water added. This is anthelmintic in children.

Ormocarpum trichocarpum

Local Name: *Det, Atam liech*

This treats severe diarrhoea, stomach problems and a coated or sore tongue as is common with infants. The leaves are pounded and just a little water added. The infusion is sieved and given to the child to ease the above mentioned problems. For faster relief, the paste itself is used to clean the tongue. The effect of this medication is discernible by the end of the day. The medication is highly regarded in Asembo and Sakwa where the plant was readily available.

MALVACEAE

Hibiscus fuscus

Local Name: *Owich*

In case of dysentery, the leaves are pounded into a thick paste to which water is added and sieved. The slippery fluid thus obtained is then added into porridge made out of millet flour until the porridge also feels slippery. This resulting porridge is taken once to stop diarrhoea immediately, the dysentery clears soon afterwards.

Sida tenuicarpa

Local Name: *Amoyo*

The leaves are pounded and the paste rubbed around the genitals in case of gut erosion and 'migongo' (thrush? dysentery?). In case of backache the pounded root paste is bandaged onto the back.

Tragia brevipes

Local Name: *Yadh nyinyo*

The herb is dried, ground into powder and roasted to ashes. The ash is licked to clear allergic reactions to certain ingested foods e.g. stomach aches, skin irritations, vomiting, nausea etc. The ash is also said to be effective in the management of measles.

MELIACEAE

Melia azedarach

Local Name: *Dwele*

The leaves of this plant, together with those scented *Eucalyptus* and *Ocimum basilicum* (*bwar*, scented) are boiled together and used to steam bath children having measles. The disease, together with its associated gut related anomalies are said to clear. For faster relief, the extract is also orally administered after the steam bath. About 3 tablespoons are given to the infant. Older children take more (ARO.). Bark decoction is anthelmintic and is also used on skin problems.

MYRTACEAE

Eucalyptus citrodora.

Local Name: *Kaladal*

The leaves are boiled and the child steam bathed in case of general illness.

NYCTAGINACEAE

Boerharvia diffusa

Local Name: *Rachier mar nam.*

In case of 'kidayi' the ash from burnt dried leaves are mixed with jelly to be used on the skin. The oral form is made by soaking pounded leaves in water. The baby takes 1 teaspoon while adults take 1 bottle per day. For faster relief the child is bathed in the mixture.

OLACACEAE

Ximenia americanum

Local Name: *Olemo*

The root or root bark are boiled and the decoction given to infants with general illness, gut erosion *mbaha*. The baby is given two teaspoons twice a day till symptoms disappear. The expectant mothers take 1 glass in the morning to clear ante-natal problems. The root decoction is orally administered for dysentery.

OLEACEAE

Jusminum fluminense

Local Name: *Olandra, Yadh chok rech*

This herb is pounded, soaked in water and given to a child for de-worming. The herb is also used to treat cough, and in situations where a fish bone is stuck along the oesophagus after, having been swallowed accidentally.

Jasminum fluminense

Local Name: *Rateng'*, *yadh duol*

The roots are boiled and the tea given to an infant with 'yamo', gut erosion or corrosion, or 'mbaha'. Two teaspoons are given to the child twice daily till symptoms clear. Expectant mothers take one cup in the morning for their health and that of the unborn child. For sore throat the leaves are chewed and the sap swallowed. For eye treatment the roots are chewed and the fluid blown into the eye by mouth as vapour droplets.

OXALIDACEAE

Oxalis cornuta

Local Name: *Awayo*

The leaves are chewed and used in case of heart burn and nausea.

PEDALIACEAE

Sesamum angustifolia

Local Name: *Onyulo*

This is a vegetable used together with *Crotalaria* spp. or cowpeas leaves and is good for the gut.

PLUMBAGINACEAE

Plumbago zeylanica

Local Name: *Rachier*

The whole plant is boiled and taken in the treatment of gut related diseases. Often it is used in addition to other plants. The above can also be used to steam bathe a child suffering from general body illness. The burnt seeds are inhaled in case of asthma. The dried leaves are burnt and mixed with oil which is then applied on the skin to treat 'kidayi', a skin condition. The plant is believed to be highly poisonous. Care has to be taken in its administration.

POLYGONACEAE

Oxygonum sinuatum

Local Name: *Nyatiend gweno*

The root decoction is taken for stomach-ache. The baby is given one to two teaspoons three to four times a day.

RHAMNACEAE

Ziziphus abyssinica

Local Name: *Lang'u*

The root decoction is a carminative and is given to a child or adult in case of stomach trouble especially due to flatulence. Together with *Capparis fascicularis* and *C. erythrocarpos* root bark, the pounded mixture is tightly corked in a bottle and opened once in a while in case of asthma.

RUBIACEAE

Gardenia lutea

Local Name: *Rayudhi*

A little water is added to the pounded leaves. This is used as an antidote for the thinning disease, which is often associated with ritual impurity, leading to gut problems.

RUTACEAE

Zanthoxylum chalybeum

Local Name: *Roko*

The decoction from boiled roots or bark or twigs clears a wide spectrum of diseases, gut disorders included. Adults take 1 cup, babies take two teaspoons, the older children take more. The twigs are used as toothbrushes and are said to alleviate toothache.

SIMAROUBACEAE

Harrisonia abyssinica

Local Name: *Pedo*

The roots together with those of *Ocimum suave* and *Maytenus*, and, the barks of *Kigelia africana* and *Lannea schweinfurthii* are boiled in water. This decoction is taken in case of stomach-ache, gut erosion and diarrhoea. The root bark alone is pounded dried and used as a snuff.

SCROPHULARIACEAE

Striga hermonthica

Local Name: *Hayongo*

The leaves when pounded and soaked in water form a medicament used to control oral thrush in children

SOLANACEAE

Solanum nigrum

Local Name: *Osuga*

This is a bitter leaf soup herb. It is used as a vegetable and is known to be good at restoring normalcy to the intestines. Its regular inclusion in the diet keeps at bay gut problems. The vegetable reduces nausea, while improving appetite. The raw leaves are also used to treat ulcers.

TILIACEAE

Corchorus olitorius

Local Name: Apoth

This is a vegetable ingredient of *Crotalaria* spp. or cow peas. It is slippery and has medicinal properties in relation to the normal functioning of the gut..

VERBENACEAE

Lantana camara

Local Name: *Atek, Atek tagwari, Nyamridh*

The leaves are pounded, soaked in water and given to the patient (baby, child or adult) in case of stomach-ache and/or diarrhoea. The effect is immediate. In case of measles the leaves together with that of *Melia azedarach* are pounded and boiled. The child is bathed in it.

Lantana trifolia

Local Name: *Nyabende, nyabend winy*

The leaves are pounded and the juice expressed into the anus of the child suffering from gut erosion or a sore anus. For coughs, the leaves are pounded and soaked in pre cooled water and taken. Salt (or '*bala*') is added to taste. Children take three spoons thrice a day while adults take a cup.

VITACEAE

Cyphostemma serpens

Local Name: *Bwombwe madongo*

Root decoction stops diarrhoea. The leaves are chewed and the sap swallowed in case of cough and sore throat. Alternatively the leaves may be pounded and soaked in water and taken orally. The decoction also helps clear general illness, gut erosion and *mbaha*, a skin condition. The herb is suitable for children of all ages and is taken till symptoms clear. The expectant mother takes one cup in the morning as a prophylactic medicine.

Rhoicissus revoilii

Local Name: *Rabong'o*

The twigs are boiled in water and used to treat a congested and/or constipated gut. The extract is administered orally. The drug is diuretic in action. The potato-like tubers when boiled in water produces a concoction which improves fertility in men and women. Ladies take this medication at the end of their menses. The tubers are chopped and boiled in water alone or with *Cassia siamea*. The resulting tea is a remedy for gut disorders. The child is given one teaspoon thrice a day.

5.3.1 Plant Use and Availability

The use of plant species appears to be determined by the degree of availability (Campbell, 1988). An example is *Chrysanthellum americanum*, a very common herb in Ugenya and Alego is a house-hold plant for most nursing mothers who use its ash to treat sore and coated tongue in children. The plant is incidentally very common in most parts of the district. *Kigelia africana* is also heavily harvested and used in these same areas. In Sakwa and Asembo, these plants, though occasionally mentioned, were not as easy to come by and the people relied heavily on other herbals for similar ailments. Thus *Euclea divinorum*, a very common plant in Bondo Division was a household name for a plant used to treat stomach ache, gut corrosion, constipation and general body illness across different age groups just in the same way they mentioned *Lannea schweinfurthii*. In Ugenya, Alego and Gem, *Tithonia diversifolia* topped the list as a remedy for stomach ache and diarrhoea.

There were many other plants mentioned as seen in the main text, but none can be said to be superior without scientific validation. From the results, it is evident that people use varied plant species in the traditional management of gastro-intestinal disorders (G.I.D.) on their sick as a curative measure or on those who are well for prevention. In other words, the notion of prevention of disease being better than cure has been in existence since time immemorial.

The most commonly used family was *Leguminosae* which had 13 plant species belonging to 10 genera. This was followed by compositae (*Asteraceae*) with 10 species in 10 genera and *Labiatae* with 10 species in 7 genera. Perhaps *Leguminosae* took the lead because of its diversity in the region through its

three sub families. In general, most genera only provided one species each except for *Acacia*, *Aloe*, *Erythrococca*, *Kedrostis*, *Hyptis*, *Plectranthus*, *Lantana* and *Ocimum* which provided 2 species each and *Cassia* which provided 4 species.

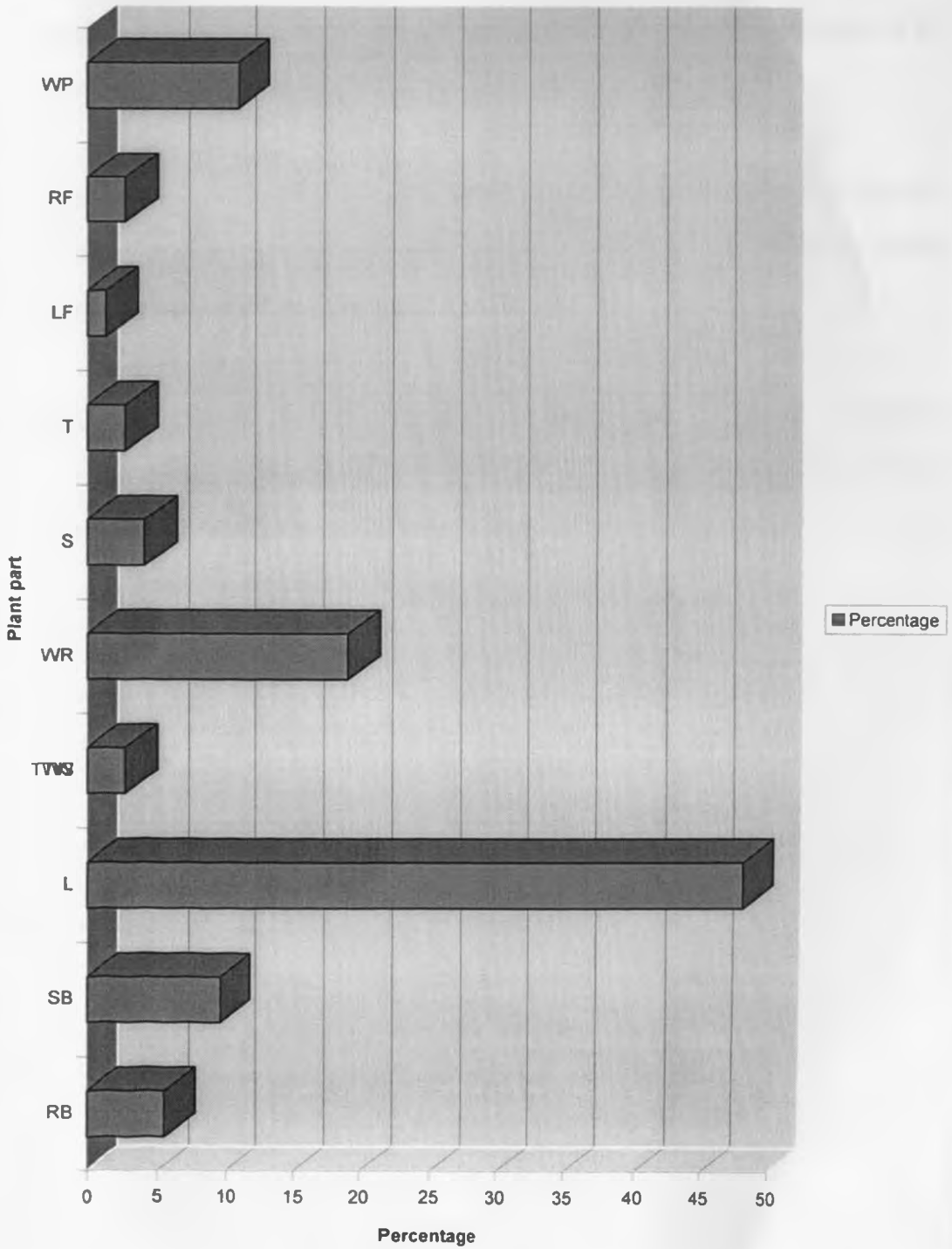
Some herbalists also provided information. They however cited only a few plants each rather than revealing all that they know on herbal medicaments.

With small plants and herbs, the tendency is to use the whole plant, and by contrast with trees, the leaves, roots or bark are also frequently used. This research reveals that most herbal remedies involve plant leaves. This is followed by whole roots and whole plants. (See graph 1). This is understandable considering that the leaves are the main photosynthetic organs in plants and that the manufactured products are translocated later to roots etc. The relative low usage of whole plants in ethnomedicine in the area can be attributed to the few herbs used as medicine as per this report. In the Luo traditional pharmacognosy, an extract from a single species can be dispensed alone, or with extracts from 2 or more species.

LEGEND: Plant Part Used

- RB Root and bark (5.48%)
- SB Stem bark (9.59)
- L Leaves (47.95)
- TWS Twigs and Whole Stem (2.74%)
- WR Whole root (19.18%)
- S Shoot (4.11 %)
- T Tubers (2.74%)
- LF Leaves and flowers (1.37%)
- RF Ripe fruit (2.74%)
- WP Whole Plant (Herb, 10.96%)

PLANT PART USED



Preparation methods are basically uniform, and is usually accomplished by one or two of the following procedures to obtain whatever active principle that were contained in the plant before dispensing the drug.

1. **Boiling:** Is a common method especially with roots and barks of trees and shrubs. The extract obtained, called decoction, or concoction is taken orally and/or is used for bathing depending on the nature of the disease.

2. **Soaking in cold water:** is generally used with pounded leaves or small herbaceous plants. The extract obtained, called infusion, is used as in the 1st method. This is advantageous where heat labile or volatile components are involved.

3. **Burning:** Is also used with leaves and small plants (herbs) usually after material has been dried. The ash obtained can be licked, rubbed directly onto the tongue, soaked in water and drunk or gurgled in the mouth.

4. **Chewing:** is a first aid method of preparing a drug especially for the treatment of snake bites, mouth or throat disorders or stomach ailments.

5. **Heating (roasting):** is normally for preparing succulent leaves or other plant parts used as a poultice (in modern medicine is a kind of moist dressing applied on an inflamed body part), or some other medicament as explained in the ethnobotany of the text.

6. Crushing or pounding: Normally precedes other methods such as boiling, soaking, or burning. Crushed material may be applied directly onto a wound usually after having been mixed with some kind of oil such as ghee, or sometimes the juice is expressed out and used as the case may require, e.g. through anus, or mouth or drops instilled into eyes.

Although the local people attribute most of the diseases and misfortunes to spirits, magical and religious practices or animal sacrifices are seldom sought to get rid of diseases and illnesses, and these do not form part of the curative properties of plants thus have been ignored. The '*ajuoga*' was found to play an important role in traditional medicine in some areas. However, there was a tendency for people to get herbals from their fellow villagers, close relations or friends as opposed to practitioners since non-practitioners either charged negligibly or gave their herbals freely.

The district is fortunate in having so many learned people, but a majority of the local people themselves have remained rooted to their traditions, customs, beliefs and practices. That is why a lot of information can still be obtained from the area as stated in the ethnobotanic works of Tim Johns and Kokwaro (1991) on herbal remedies and food plants of the region.

It was evident that most of the herbal preparations were orally administered, (See Graph 2) perhaps because the mode is most convenient and economical. This mode has limitations as it requires the patient's co-operation yet most of the drugs are very bitter to the taste and hence difficult to make a child swallow. The other limitation is a possibility of incomplete absorption in

the stomach and the gastric irritation which could result from oral administration. Such bitter drugs include *Tithonia diversifolia*, and *Cassia hildebrandtii*. Less popular modes include rectal and muscular applications of herbs. Rectal administration for herbals such as *Gynandropis gynandra* has the limitation of poor patient acceptability but has the advantage of avoiding causing gastric distress and other limitations of oral use. Muscular applications, the least mode used, involved scarifications on the skin. This was commonly used where gut problems were linked to the 'evil eye' (sorcery).

Herbal preparations took the form of powders, (ash, dried and ground plant parts), decoctions and concoctions, pastes, pomades, poultices, ointments of ghee amongst others (Kokwaro 1993).

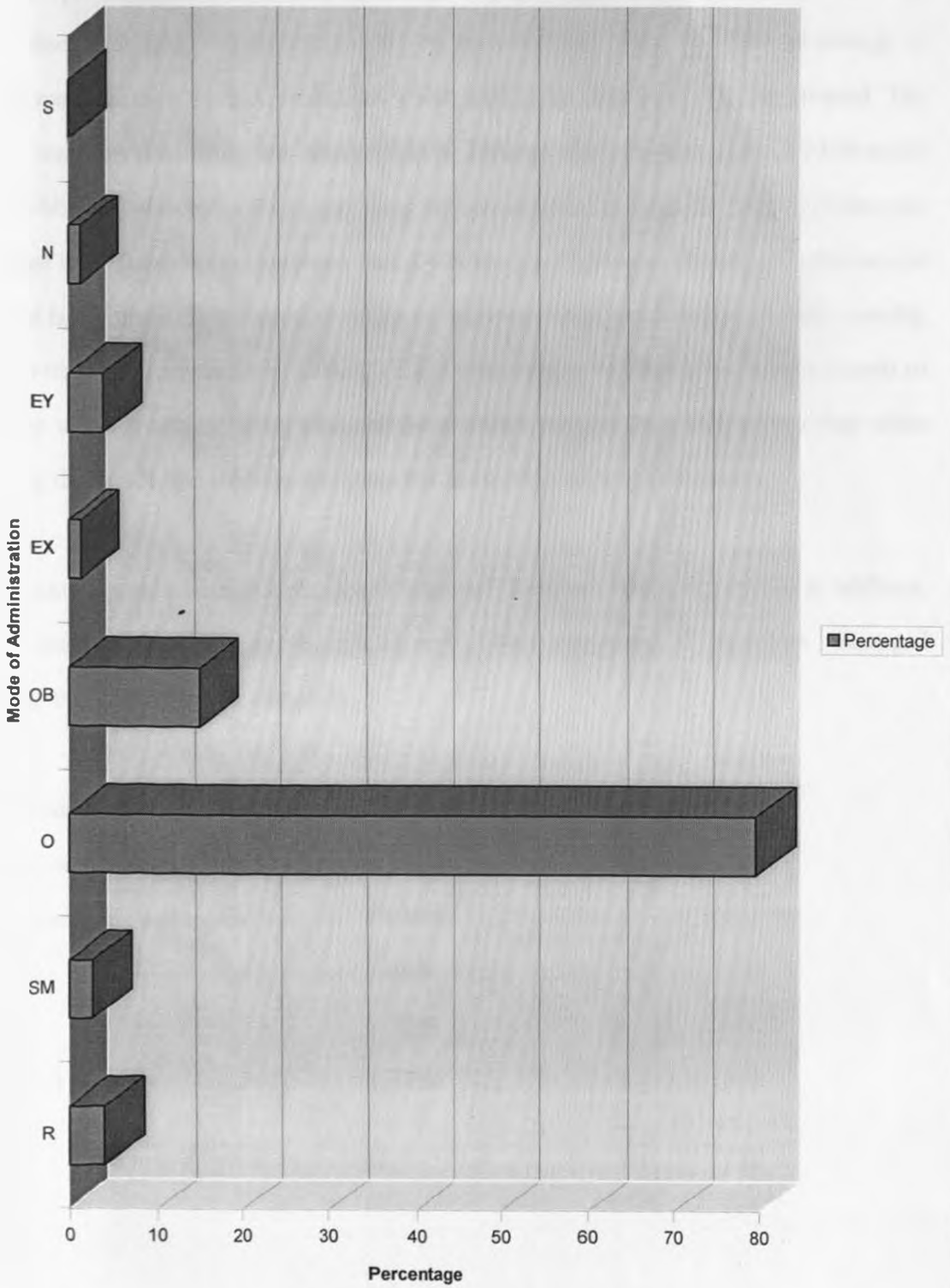
Most of the herbals were harvested in broad day light between morning when dew has dried up and before sun set. In the rainy seasons, the plants are harvested before the rains rather than after the downpour for reasons not given, probably physiological processes, or the safety of the individual in the animal infested bushes or forests. It was only in cases of emergency that plants were collected at other times e.g. night time or after sunset etc. As a rule, one nursing mother was not allowed to harvest a herbal for a fellow nursing mother's child, for reason not clarified, perhaps to avoid witchcraft or sorcery.

LEGEND: MODE OF DRUG ADMINISTRATION

- R Rectal (4.11%)
- SM Skin/ Massages (2.74%)
- O Oral (79.47%)
- OB Oral and Bath (15.07%)
- EX External/ Worn (1.37%)
- EY Eyes (4.11%)
- N Nasal (1.37%)
- S Scarifications (0%)

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MODE OF DRUG ADMINISTRATION



Most preparations involved, concoctions and any given plant was also known to treat other diseases in addition, not necessarily the ones reported here, an added advantage of herbal remedies over western medicines which tend to be specific to diseases treated. The herbal remedies used singly are exemplified by *Tithonia diversifolia*, *Cassia hildebrandtii* and *Schkuhria pinnata*. Others are used in concoctions as seen in *Euclea divinorum* together with *Tylosema fassoglensis* and *Kedrostis gijef* for constipation, gut erosion and general body illness. Whether used singly or in concoctions, most herbal remedies usually end up treating more than one ailment. E.g. *Ormocarpum trichocarpum* which is used to manage stomach trouble, diarrhoea and or a coated tongue. It is as if to say that while treating disease X, the medicament goes further to treat or ward off others.

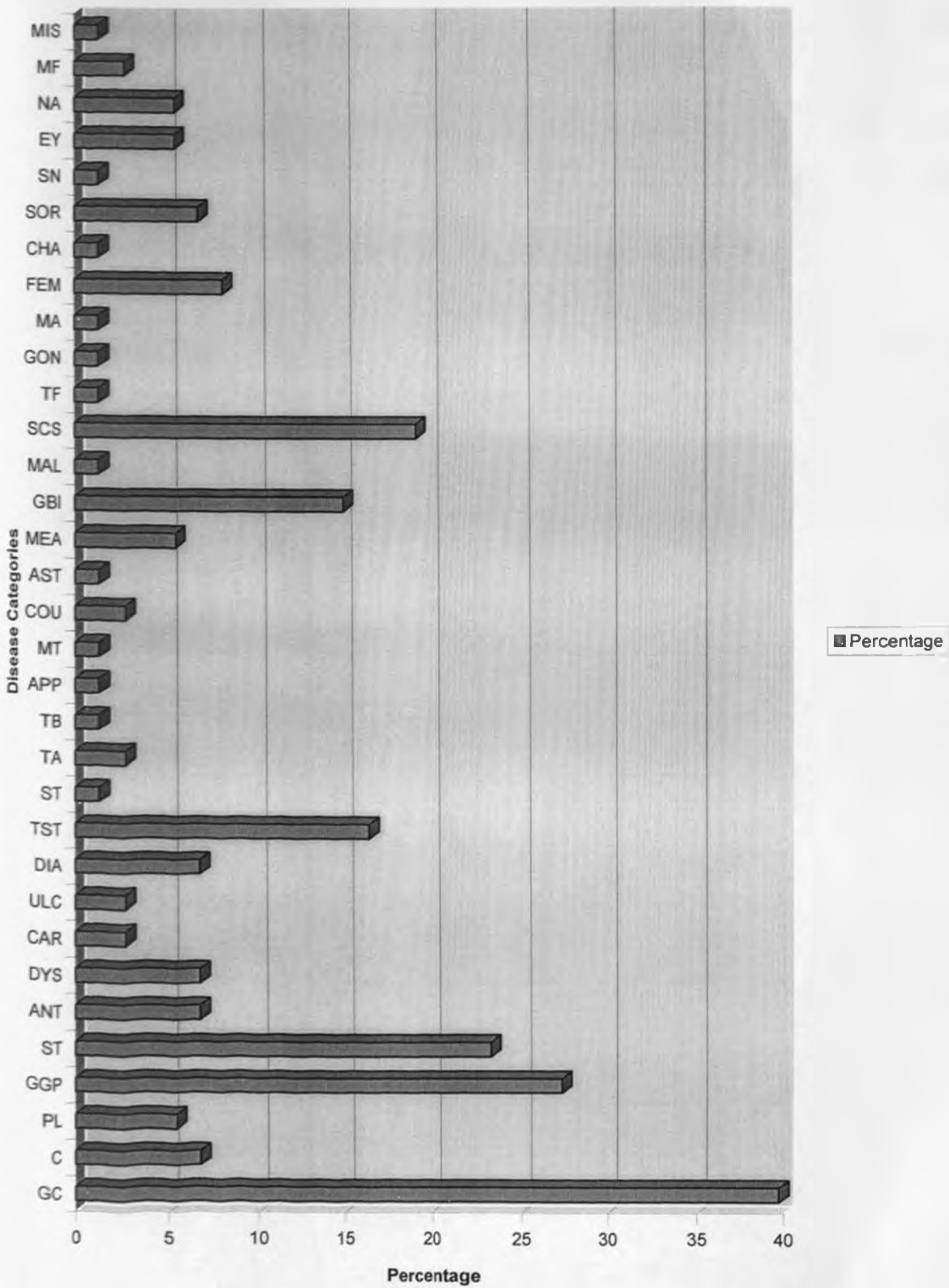
The plants reported here all treat gastro intestinal disorders (GID) i.e. 100%. In addition, other diseases/ disorders are treated as well. Other categories of disorders managed include the following (See Graph 3):

dysmenorrhoea	8.22%
respiratory diseases	4.11%
skin conditions and topical use	19.18%
measles	5.48%
fever	1.37%
venereal diseases	1.37%

CATEGORIES OF DISEASES TREATED

		CODE	Percentage
Abdominal	Gut corrosion	GC	36.2
	Constipation	C	6.8
	Purgative Laxative	PL	5.4
	General Gut Problems	GGP	27.4
	Stomachache	ST	23.2
	Anthelmintic	ANT	6.8
	Dysentery	DYS	6.8
	Carminatives	CAR	2.74
	Ulcers	ULC	2.74
	Diarrhoea	DIA	6.8
	Buccal	Thrush/ Sore or coated tongue	TST
Sore throat		ST	1.3
Toothache		TA	2.74
Toothbrush (Dental hygiene)		TB	1.3
Appetiser		APP	1.3
Milk teeth (to do with)		MT	1.3
Respiratory	Cough	COU	2.74
	Asthma	AST	1.3
Systemic	Measles	MEA	5.4
	General body illness	GBI	15.6
	Malaria	MAL	1.3
Topical	Skin conditions, scabies	SCS	19.1
Allergy	To food	TF	1.3
Sexually transmitted diseases	Gonorrhoea	GON	1.3
Feminine/ Male conditions	Male	MA	1.3
	Feminine	FEM	8.2
Witchcraft and Superstition	Charms	CHA	1.3
	Sorcery	SOR	6.8
Head	Snuff	SN	1.3
	Eyes	EY	5.4
Others	Nausea	NA	5.4
	Muscle fatigue	MF	2.74
	Miscellaneous	MIS	1.3

CATEGORIES OF DISEASES TREATED



From their tastes, most preparations intended to treat stomach aches were often bitter (e.g. *Schkuhria pinnata*, *Tithonia diversifolia*, *Cassia hildebrandtii*, *Lantana camara*, *Cassia occidentalis* roots, *Leonotis nepetifolia* etc.). It was asserted by many interviewees that bitter medicaments worked best as they quickly repelled causative agents of gut problems. However, it is only scientific investigation that will be able to confirm or refute such claims.

In total, 82 plant species spanning across 60 genera in 38 families were documented as being useful herbals for gastro intestinal disorders in children in the district. Favoured species included *Zanthoxylum chalybeum*, *Harrisonia abyssinica*, *Lannea schweinfurthii*, *Kigelia africana*, *Hyptis pectinata*, *Euclea divinorum*, *Plectranthus barbatus* inter alia.

The most common method of drug preparations were concoctions and decoctions. Infusions were not as common. Sometimes buccal problems were solved by chewing plant parts and spitting it out as in *Spilanthus mauritiana*. Occasionally, the plant parts were ground up and the juice extracted as in *Gynandropsis gynandra* for the anus or *Plectranthus prostratus* drops for the mouth.

Inhalation was popular for several ailments. Steam inhalation through steam bath for measles (e.g. *Melia azedarach*), concentrated scent from stuff corked in a bottle (e.g. *Capparis erythrocarpos*, *C. fascicularis*) steam bath for fevers (*Plumbago zeylanica*).

Poultices, ointments, lotions and washes were preferred for skin conditions such as fungal infections and other infectious skin diseases using plants such as *Cassia didymobotrya*, or diseases caused by ritual impurity.

Otherwise oral administration topped the list and topical applications and inhalation came in handy to speed up effects of the orally administered medicament.

A summary of the plants of medicinal value as obtained in Siaya District has been attached. See Table 3.

Chapter 6

PRELIMINARY STUDIES OF SECONDARY METABOLITES IN SELECTED MEDICINAL PLANTS

6.0.1 Phytochemical analysis

Plant specimens were collected from Siaya District. These were sundried and positively identified at the University of Nairobi Herbarium (NAI) and confirmed at the East Africa Herbarium (EA). The dried samples were later on ground into fine powder. 50 gms of each sample was placed in previously washed and cleaned 500ml pyrex flasks and sealed with aluminium foil.

Extraction was carried out cold with 400ml of 95% ethanol for 8 days with daily shaking. Each sample was separately filtered with the help of a vacuum pump. The filtrate was later concentrated in vacuo using a rotatory evaporator. The weight of the thick syrup formed was noted. The Syrup that stuck on flask walls was re-dissolved in 4-6ml of 95% ethanol then transferred into bottles which were then corked and stored in the freezer for use when required. Phytochemical tests were carried out in replicas to eliminate the element of doubt.

Below is a list of the plant specimens used for phytochemical analysis, the plant part used, and the percentage yield per mass of plant tissue.

TABLE 1: PLANT SPECIMENS USED FOR PHYTOCHEMICAL ANALYSIS

Name of Specimen	Plant Part	Mass (gms)	Yield (gms)
<i>Cassia occidentalis</i>	Whole root	50	16
<i>Euclea divinorum</i>	Root bark	25	9.0
<i>Kigelia africana</i>	Stem bark	50	8.2
<i>Lannea schweinfurthii</i>	Stem bark	50	9.2
<i>Piliostigma thonningii</i>	Stem bark	50	9.1
<i>Tylosema fassoglensis</i>	Root tuber	50	7.5
<i>Zanthoxylum chalybeum</i>	Root bark	25	6.0
<i>Zanthoxylum chalybeum</i>	Stem bark	50	7.0
<i>Ziziphus mucronata</i>	Root bark	25	8.0

6.1.0 Procedures for Phytochemical Analysis

6.1.1 Test for Flavonoids.

Approximately three grams of the extract was defatted by several washings with petroleum ether. The defatted residue was washed in 30ml 80% ethanol and filtered.

The filtrate was used as follows:-

A) To 3ml of the filtrate in a test tube, 4mls of 1% Aluminium chloride in methanol was added. Development of a yellow colour was indicative of the presence of flavonols, flavones and/or chalcones.

B) To 3mls of the filtrate 4mls of 1% potassium hydroxide was added.

The development of a dark yellow colour indicated the presence of flavonoids.

6.1.2 Tests for anthraquinones

A) A sample 2g. plant extract was shaken with 10ml of Hexane and filtered. A 10% ammonium hydroxide solution (5ml) was added and the mixture shaken. A violet colour if observed in the ammoniacal phase indicated the presence of free anthraquinones.

B) Approximately 2g of the hexane washed plant extract was boiled with 20ml of 1% HCL and filtered while hot. The filtrate was shaken with 5ml Hexane. The hexane layer was removed and 10% ammonium hydroxide added. A violet colour if observed was indicative of the presence of bound anthraquinones.

6.1.3 Test for sterols and saponins

A) Approximately 2.5g of the prepared extract was stirred with Hexane to remove most of colouring materials. The residue was extracted with 200ml of chloroform. The chloroform solution was dehydrated over anhydrous sodium sulphate. 5ml portion of chloroform solution was mixed with 0.5ml acetic anhydride followed by two drops of concentrated sulphuric acid. A gradual appearance of green to blue colours was indicative of sterols.

B) About 1g of the plant extract was shaken with water in a test tube. Frothing which persisted for at least half an hour signified a positive test for saponins.

6.1.4. Test for alkaloids

A) A sample of 2g of the extract was mixed with 40ml of 2NHCl and heated in a water bath for 10 minutes. The mixture is cooled and filtered. To the portion of the filtrate a few drops of Mayors reagent was added. A slight turbidity or heavy precipitate was taken to show the presence of alkaloids.

B) A confirmatory test of alkaloids was performed thus: about 100mg of the plant extract was heated with methanol: chloroform (1:1) mixture and the solution chromatographed on silica gel plate using the solvent systems:- (a) chloroform/methanol (9:1) (b) chloroform/ ethyl acetate (8:2) and (c) methanol/ammonia (100:3).

On drying the developed plates and spraying with Drangendorff's reagent orange spots if observed confirmed the presence of alkaloids.

Below is a table of results of phytochemical screening.

Results Of Phytochemical Screening

The result of the preliminary analysis have been provided below in tabular form.

Table 2: Results for 6.1.1 - 6.1.4

Plant source	Plant part	T		E		S		T
		6. 1. 1		6. 1. 2.		6. 1. 3		6. 1. 4
		A	B	A	B	A	B	
<i>Cassia occidentalis</i>	Whole Root	+	+	-	+	+	-	-
<i>Euclea divinorum</i>	Root bark	+	-	+	+	+	++	+
<i>Kigelia africana</i>	Stem bark	+	+	-	+	+	+	-
<i>Lannea schweinfurthii</i>	Stem bark	+	+	+	+	+	-	-
<i>Piliostigma thoningii</i>	Stem bark	+	+	+	+	+	-	+
<i>Tylosema fassonglensis</i>	Root tuber	+	+	+	+	+	+	-
<i>Zanthoxylum chalybeum</i>	Root bark	+	+	+	-	+	+	+
<i>Zanthoxylum chalybeum</i>	Stem bark	+	+	-	+	+	+	+
<i>Ziziphus mucronata</i>	Root bark	+	+	+	+	-	++++	+

LEGEND

6.1.1 A Test for flavonoids i.e, flavones and/or chalcones

B Test for flavonoids

6.1.2 A Test for free anthraquinones

B Test for bound anthraquinones

6.1.3. A Test for sterols

B Test for saponins

6.1.4 Test for alkaloids

+ Positive test (number of signs denotes quantities present) detected

- Negative test, trace amounts, negligible, not detected

6.2.0. Discussion and conclusion

The tests carried out on some selected plants for flavonoids confirmed the generally agreed notion that all vascular plants contain flavonoids. Flavonoids, a colouring plant pigment is normally present in most plant parts, the flowers, leaves, stem, roots, and external leaf surfaces. Their role in plants though obscure, is thought to be protective (Midiwo, Pers Comm.) and this could be exploited by man. Being typical phenolics, flavonoids act as anti oxidants and metal chelaters (P7 Swain in Harbone 1984). They are known to interfere with viral, bacterial, fungal and animal feeding, reproduction, growth and development (P8 Swain in Harbone 1984). This supports the use of the mentioned drug plants in the management of gut infections right from the buccal cavity all the way to the anus. The fact that flavonoids are not poisonous to large organisms (Harbone 1984) explains why fairly large quantities of the medicament can be consumed without danger. In addition, the search for new active compounds is made easier due to their universal occurrence (Harbone 1984). The *Acacia* spp. contain robinin and acaciin and are useful herbs.

The presence of bound or free anthraquinones, in the plants tested supported their use as laxatives, purgatives and carthatics (Cody V. et. al. 1987), apart from their anthelmintic properties. The use of plants as laxatives and purgatives are considered to be important by herbalists where purging or bleeding are common for it is a way of making the body get rid of all its poisons. This view is still held by many, and routine weekly evacuants are carried out on especially children who are most vulnerable. Laxatives are mild while irritant purgatives and carthatics are more drastic.

Laxatives increase volume of colonic content thereby stimulating peristalsis e.g. pectins in fruits such as *Mangifera indica*; while purgatives and carthatics stimulate peristalsis through irritant action on intestinal mucosa e.g. *Aloe* which contains aloinoside A and B and aloin both of which are purgative, as well as barbaloin homonataloin which is a carthatic anthraquinone. Some of such purgatives occur in traditional vegetables e.g. *Senna* leaves, known to contain purgative sennosides A and B.

Alkaloids are known to act on the central nervous system (Storrs and Pearce 1982). Most of them are bitter and tend to promote gastric function and stimulate salivation and appetite by some local or reflex action. Included are gentian violet from *Gentiana lutea* used on the tongue and is both anti fungal and antibacterial, indole alkaloids which are psychotic, and ephedrine, and menthol which are stimulants. Many bitter tonics treat anorexia and dyspepsia. These support the use of these alkaloid bearing plants as medicines. Evidence from the table of results also reveals that many herbals contain alkaloids; *Ziziphus*, *Zanthoxylum*, and *Piliostigma* are examples. Alkaloids are known to occur in *Solanum nigrum* and *Crotalaria* sp. both of which are used as relish. *Cassia didymobotrya* is known to contain an alkaloid cassein, a glycoside flavonoid, and anthraquinones (emodin, physcion & chrysophanol) which make the drug have diuretic, purgative and anthelmintic properties (Phytochem. 91 30:6) The drug is known for its purgative properties (Watt and Breyer 1962).

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The presence of oils and oil toxins further explains the use of these plants as purgatives and this agrees with most herbal remedies which initially induce purging followed by healing, and this agrees with the view that most oils and oil toxins act as purgatives (Storrs and Pearce (1982). Essential oils or volatile oils are carminatives. They allow gas to be released from the stomach by lowering surface tension of water and also act by increasing peristalsis to relieve distention of excessive eating. This supports the use of *Zanthoxylum* spp., *Labiates* e.g. *Ocimum* spp., *Mentha* and even *Piliostigma thonningii* which is added to porridge or made into juice for children and adults alike. The essential oils, gums and resins in *Commiphora africana* makes it a useful herbal medicine. (The Eucalyptus oil is equally good but for steam bathing). Saponins are haemolytic and act on cell surfaces. In this way, its possible that the pathogens are rendered ineffective if not killed resulting in healing if taken in the right doses, such that cells lining the gut are not destroyed in the process. Another advantage is that most saponins are not absorbed by the small intestines as they are innocuous resulting in no poisoning. Poisoning only results in fish where they interfere with respiration through gills hence their use as fish poisons. Only sapotoxins are absorbable by the small intestines resulting in poisoning through interference with cellular respiration. (Storrs and Pearce 1982). This explains why practitioners emphasised the need to be cautious when administering poisonous formulations as medicine.

Tannins is amongst the principles responsible for the curative properties of many medicinal plants (e.g. *Acacia* spp, *Kigelia africana* and *Ximenia americana*. It is an astringent and is a useful anti diarrhoeal agent. In fact, the uniqueness of tannins is their inherent capacity to complex with other metabolites; proteins carbohydrates and alkaloids.

Some herbal preparations are used raw. Others are boiled first before they can be used alone or with others. There are a few others that are normally used in the form of ash or carbon (charcoal), e.g. *Chrysanthellum americanum* though they can also be used in raw form in emergency. Such medicines probably function by adsorbing toxins responsible for gut infection while building bulk in the colon. The ash or charcoal dust is first licked or used to clean the sick child's tongue before it is finally swallowed. Some meals preferred during gastro intestinal distress e.g. wheat flour or arrow root starch probably provide a protective coating to the irritated mucosal lining of the gut. In this way intestinal contents build in bulk and consistency.

Most plant components are toxic. Toxalbumins, saponins and alkaloids etc. are toxic. However, if taken in the right quantities their medicinal properties normally supersede their poisonous principles in action hence their curative property. (Kokwaro 1993). The presence of a wide range of groups of compounds suggests their potential therapeutic role in medical care and attempts to explain their use in a wide range of ailments.

Chapter Seven

7.0.0 RECOMMENDATION AND GENERAL CONCLUSION

7.1.0 GENERAL CONCLUSION

The project revealed that there are many medicinal plants used to treat gut diseases in the district, (See Graph 3). With the rising cost of living, and the ever skyrocketing prices of even the very basic drugs, it has become apparent that the use of traditional medicine be encouraged alongside western medicine. Western civilisation and drugs are factors that have led to erosion of herbal medicine hence the need to document the knowledge before it disappears.

Herbs have been found to be used in a multitude of other ways. They are used :-

- i. as molluscicides and hence could play a key role in the control of schistosomiasis.
- ii. in the management of feminine conditions such as amenorrhoea, dysmenorrhoea etc.
- iii. in the management of other diseases e.g. measles, fever, toothaches etc.
- iv. as insect repellents especially mosquitoes. This especially will reduce incidence of malaria considering that the area is mosquito infested and the repellents or insecticides available from stores are very expensive.

Herbal medicine needs to be given a better approach and the people need to be encouraged to use such alternatives with proper hygiene.

Many of the plants tested showed the presence of an array of compounds many of which are potentially injurious to the body implying that the herbs really need to be thoroughly evaluated and used with caution. Laboratory tests can however give false positive or false negative results leading to false interpretations. This implies that strictly speaking, evidence from the laboratory should not be used to summarily and categorically reject or approve the use of a particular herbal i.e. the plants may or may not produce certain bio-active compounds depending on the surrounding biotic and abiotic factors, and the plants' physiological state.

The presence of certain compounds in the plants, e.g. anthraquinones, provided evidence that supported their use as medicines. Consequently, a thorough comprehension of herbal knowledge, the environmental influence on biosynthetic pathways hence compounds to be produced, and the plant parts to be used in addition to the age of the plants is really a pre-requisite before drawing any just conclusion.

Since some herbs provide food despite their poisonous content, a good background knowledge is essential in the manner in which such herbs are handled. Superstitions should be discarded and the positive roles of herbs highlighted. People should be made to understand that even the western drugs which they so much adore have components derived from plants or had synthetic analogues of compounds produced

by plants. They should be made aware that herbs, when properly administered, by virtue of the varied compounds present could treat a wide spectrum of ailments simultaneously. Finally, being poor people, depending on farms which often fail due to droughts, cheaper alternative health care forms would go along way in saving many sick children from imminent death where parents cannot afford drugs prescribed as they often are too expensive. The media should also continue to portray a better picture of herbal medicine. Traditional medicine is not as bad as people were made to think by colonialists, it was merely due to a misconception by whites attributed to the inadequacy of the African ethno-medicine and ethnopharmacology, and the scarce literature on the subject. After all, the earliest physicians were actually botanists, with botany & medicine going hand in hand. It was only later that the two disciplines separated.

The world of nature abounds in organic compounds. This array of organic compounds, most of which are synthesised by living cells through complex and intricate activities are of practical importance to mankind. It is now up to man to study these activities, study these compounds, study their physiological effects and finally determine how they can be practically made useful to mankind. An attempt towards this is through ethnobotanical surveys of useful plants followed by chemical screening to determine groups of compounds they contain. Further researches on their bio-activities and their physiological effects would really lead to drug production even if it is to be in its crude form for use by mankind.

Plants mentioned in this project are still quite popular and enjoy a good reputation in their lore. In spite of extensive modernisation programmes to uplift rural health standards, traditional medicine is still widely accepted and practised due to the advantages it confers.

It is worth noting that some plants are significant in some areas and not others. As such, any conclusion on a medicinal plant's relative importance must depend on the criteria applied and the context in which it has been applied. That is why, it is necessary that a comprehensive approach is taken to bring together the main disciplines and interests concerned to act as a co-ordinating mechanism. This body would assess needs and priorities, formulate a national policy, help mobilise resources, and ensure the orderly development of work and research in this field. Thanks to IUCN, WWF, KEFRI, KEMRI etc., who have shown interests in medicinal plants and are determining how these could be conserved.

7.2.0 Recommendation

1. Health-care can best be improved through community action if health for all is to be achieved by the year 2000 in the district. Ethnobotanical researchers can help in the identification of cheaper primary health care alternatives that would inevitably lead to a healthy people. The Siaya people need to be encouraged to grow medicinal plants for domestic use and for sale. The development of nurseries for such useful plants would also provide job opportunities while sale proceeds would elevate the standard of living of these poor people. Community action would be beneficial as it involves the people's democratic and willed participation in improving themselves.

The reality of this step lies in the fact that decisions imposed from outside are normally not given as much support as those that arise democratically from among the people themselves by the people. Those arising from within are more supportable by the people if the original support is withdrawn.

- 2 The reproductive biology of the medicinal plants need to be studied to facilitate their domestication
3. The plant harvesters need to be educated on better methods as most of their current methods are deleterious; excessive de-barking and bark ringing, uprooting of whole plants, and de-rooting.
4. As a signatory in the World Health Assembly, Kenya should initiate comprehensive programmes for the identification, evaluation, preparation, cultivation and conservation of medicinal plants used in traditional medicine in the districts, hence, Siaya.
5. If drugs are ever to be produced from the herbs, the government should ensure control of these drugs through use of modern techniques, suitable standards and good manufacturing practices.

6. The visionary herbal college in Nyeri envisaged to offer Diploma Certificates on herbal remedies under Githai should be given the encouragement it deserves, and a curriculum that will enable its graduates to compete effectively with those from other medical colleges in such a manner that they are able to provide complimentary services to the needy.

7 A medicinal botanic garden and/or reserves need to be set up in strategic places to ensure a regular supply of the plants that are sought most for sustainable use. Such sites would include places like Got Ramogi Hill, and Mbaga Hill where forests are being degraded instead of replacing them with pure monoculture stands of exotic plants e.g. Cypress.

LEGEND: Codes used in the table on Plants of medicinal value as obtained from the field

Code: Habit Code: Plant use

- 1 Tree
- 2 Shrub
- 3 Herb
- 4 Climber
- 5 Trailer

Code: Plant part used

- a Whole plant
- b Shoot
- c Leaves
- d Flowers
- e Fruits (raw, ripe)
- f Roots (whole or bark only)
- g Stem (whole or bark only)
- h Seeds

Code: Plant use

- i Medicine
- ii Edible fruit
- iii Edible part e.g. as vegetables
- iv Hedges
- v Ornamental
- vi Land mark, boundaries
- vii Craft
- viii Dye/ resins/ gum
- ix Fodder
- x Superstition/ Sorcery

TABLE 3: A list of plants of medicinal value used to treat children in Siaya District as obtained from the field (Pg. 134-137)

Family	Sci. name	Habit/ Plant part used/ Use
Acanthaceae	<i>Crabbea velutina</i>	1, a, i
	<i>Dyschoriste radicans</i>	3, b, i
Aloeaceae	<i>Aloe sp.</i>	3, c, i, iv, ix
	<i>Aloe sp.</i>	3, c, i, iv, x
Anacardiaceae	<i>Lannea schweinfurthii</i>	1, g, i, vi, vii, viii
	<i>Mangifera indica</i>	1, e, i, ii, vi, viii
Apocynaceae	<i>Carissa edulis</i>	2, f, i, ii,
	<i>Catharanthus roseus</i>	3, f, i
Bignoniaceae	<i>Kigelia africana</i>	1, g, i, iii, vi, x
	<i>Markhamia lutea</i>	1, f, i, x,; g,v, vi, viii
Burseraceae	<i>Commiphora africana</i>	1, f, i; g i
Capparaceae	<i>Boscia angustifolia</i>	1, c, i
	<i>Capparis erythrocarpos</i>	1-3, f, i
	<i>Gynandropsis gynandra</i>	3, c, I, iii; b, iii
Caricaceae	<i>Carica papaya</i>	1, e, i, ii
Celastraceae	<i>Maytenus heterophylla</i>	2, f, i
Compositae	<i>Aspilia mossambicensis</i>	3, b, i
	<i>Bidens pilosa</i>	3, c, i
	<i>Chrysanthellum americanum</i>	3, c, i
	<i>Gutenbergia cordifolia</i>	3, c, i
	<i>Launaea cornuta</i>	3, c, iii; f, i
	<i>Microglossa pyrifolia</i>	2, c, i
	<i>Psiadia punctulata</i>	2, c, i
	<i>Schkuria pinnata</i>	3, b, i
	<i>Spilanthes mauritiana</i>	3, c, i
	<i>Vernonia lasiopus</i>	2, c, i
Convolvulaceae	<i>Ipomoea hildebrandtii</i>	2, b, i
Cruciferae	<i>Farsetia stenoptera</i>	3, b, i, x

Cucurbitaceae	<i>Coccinia grandis</i>	4, c, i
	<i>Cucumis figarei</i>	5, e, i
	<i>Kedrostis gijef</i>	4, c, i
	<i>Kedrostis foetidissima</i>	4, c, i
Ebenaceae	<i>Euclea divinorum</i>	1-2, e, i, viii
Euphorbiaceae	<i>Erythrococca bongensis</i>	2, c, i, iii, x
	<i>Flueggea virosa</i>	1,
Labiatae	<i>Fuerstia africana</i>	3-2, c, i, viii
	<i>Hoslundia opposita</i>	3, b, i
	<i>Hyptis pectinata</i>	2, c, i, v
	<i>Hyptis suaveolens</i>	3, c, i
	<i>Leonotis nepetifolia</i>	3, c, i
	<i>Ocimum basilicum</i>	3, c, i; f, i
	<i>Ocimum gratissimum</i>	3, c, i; f, i
	<i>Plectranthus barbatus</i>	2, c, i
	<i>Plectranthus prostratus</i>	3, a, i
	<i>Tinnea aethiopica</i>	2, c, i

Leguminosae		
Caesalpinioideae	<i>Cassia didimobotrya</i>	2, c, i, f, i
	<i>Cassia occidentalis</i>	3, f, i
	<i>Cassia hildebrandtii</i>	5, c, i,
	<i>Cassia siamea</i>	1, g, i, x
	<i>Piliostigma thonningii</i>	1, b, i; g, i, vii
	<i>Tamarindus indica</i>	1, e, i, ii
	<i>Tylosema fassoglensis</i>	5, f, i; h, ii
Mimosoideae	<i>Acacia hockii</i>	1, c, i
	<i>Albizia coriaria</i>	1, g, i, vii.
Papilionoideae	<i>Alysicarpus rugosus</i>	3, c, i
	<i>Crotalaria brevidens</i>	3, c, i, iii
	<i>Indigofera circinella</i>	5, b, i
	<i>Ormocarpum trichocarpum</i>	1, b, i
Liliaceae	<i>Asparagus falcatus</i>	2, c, i
Malvaceae	<i>Hibiscus fuscus</i>	4, c, i
	<i>Sida tenuicarpa</i>	3, c, i
	<i>Tragia brevipes</i>	3, a, i
Meliaceae	<i>Melia azaderach</i>	1, a, v; c, i
Myrtaceae	<i>Eucalyptus citriodora.</i>	1, c, i, vi, vii
Nyctaginaceae	<i>Booerhavia diffusa</i>	3, c, i
Olcaceae	<i>Ximenia americana</i>	1, e, ii; f, i
Oleaceae	<i>Jasminum fluminense</i>	4, c, i
Oxalidaceae	<i>Oxalis cornuta</i>	3, c, i
Pedaliaceae	<i>Sesamum angustifolia</i>	3, c, i, iii
Plumbaginaceae	<i>Plumbago zeylanica</i>	2, a, i, h, i
Polygonaceae	<i>Oxygonum sinuatum</i>	5, c, i, iii

Gramnaceae	<i>Ziziphus mucronata</i>	1, f, i
Rubiaceae	<i>Gardenia lutea</i>	2-3, c, i, x
Rutaceae	<i>Zanthoxylum chalybeum</i>	1, a i; c, i; f i; g, i
Simaroubaceae	<i>Harrisonia abyssinica</i>	1-3, f, i
Scrophulariaceae	<i>Striga hermontica</i>	3, c, i
Solanaceae	<i>Solanum nigrum</i>	3, c, i, iii
Tiliaceae	<i>Corchorus olitorius</i>	3, c, i, iii
Verbenaceae	<i>Lantana camara</i>	2, c, i, e, ii
	<i>L. trifolia</i>	2-3, c, i; e, ii
Vitaceae	<i>Cyphostema orondo</i>	5, f, i
	<i>Rhoicissus revoili</i>	3, f, i; g, I

8.0 BIBLIOGRAPHY

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