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An inventory of medicinal plants that the people of Nandi use to treat malaria.

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1 SUMMARY

In Kenya, most people use traditional medicine and medicinal plants to treat many diseases including malaria. Malaria is one of the major diseases burden worldwide affecting more than 90 countries inhabited by 2.4 billion people (40% of the world's population). In Kenya, it is an endemic disease affecting more than 4 million people with the highest incidences being recorded in the Rift valley, Western, Central and Eastern provinces. It threatens the life of around 25 million out of the country's total population of 39 million people. It is of national concern in view of development of resistant strains of *Plasmodium falciparum* to drugs. There is need for alternative and affordable therapy. Many antimalarial drugs have been derived from medicinal plants traditionally used to treat malaria by the Nandi community. An ethnomedicinal study was conducted on the use of medicinal plants for treatment or prevention of human ailments by Nandi people. Semi-structured questionnaires were used. Data were mainly collected through individual interviews conducted with selected knowledgeable professional healers. Plants were collected, pressed, dried, preserved, mounted and identified through available literature and voucher specimens at the University of Nairobi and Kenya National Museum Laboratories. Forty four (44) species in 40 genera and 27 families were encountered during the study. Labiatae, Euphorbiacea and Compositae families represented the species most commonly cited.

2 INTRODUCTION

Man uses Wild plants to supply medicine, crafts and cosmetics to rural and urban areas. In addition, wild plants are a source of income and employment particularly in the rural areas (Olembo, 1995; Balick, 1996 *et al.* and Karori, 2003;). Important herbal products are spices, herbal teas, functional food ingredients, medicinal raw materials, aromatic plants, essential oils and dietary supplements. Plants have also been used directly as medicine for thousands of years by people all over the world. World Health Organization estimates indicate that 80% of the population (mostly in developing countries) still relies on plant-based medicines for primary care (Balick, 1996 *et al.,* Karori, 2003).

In any given year 10% of the global population will suffer a bout of malaria (Omulokoli and Chhabra, 1997). It causes about 400-900 million cases of fever and approximately one to 3 million deaths annually. More than 90 percent of illnesses and deaths due to malaria occur in sub-Sahara Africa. Children and pregnant women are at a higher risk. In Kenya, it is an endemic disease affecting more than 4 million people with the highest incidences being

recorded in the Rift valley, Western, Central and Eastern provinces. It threatens the life of around 25 million out of the country's total population of 39 million people. Malaria is estimated to cause more than 20 percent of all deaths in children under the age of 5 year. Every Kenyan family spends an average of Kshs 1,400 every year to treat cases of malaria (Elueze *et al.,* 1996).

Malaria is caused by protozoan parasites of the genus *plasmodium*, which are transmitted by the female *anopheles* mosquitoes. A mosquito becomes infected when it sucks blood from an infected human being. The parasitic plasmodium species include; *P. malariae, P. ovale, P. vivax* and *P. falciparum*. The mosquito then carries the infections plasmodium sporozoites in its salivary glands and spreads the disease by biting other humans .The victims falls sick 7 to 10 days after being bitten (Elueze *et al.,* 1996). Malaria can hide behind a range of symptoms, like diarrhoea and vomiting, cerebral problems-convulsions and unconsciousness, anaemia and fever, chills, headache, malaise, hepatosplenomegaly, dehydration, anorexia, nausea, abnormal pains and kidney dysfunction (Gessler *et al,*. 1995).

In this study, several herbalists in Nandi district were interviewed on the plants they use to treat malaria and other related symptomatic diseases like fever. Thus the main objective of this study is to carry out an ethnobotanical survey of some medicinal plants used for treatment of malaria and its symptoms.

The Study area is situated in the western part of Rift Valley province and borders Uasin Gishu **d**istrict to the north and East, Kericho district to the south-east, Kisumu district of Nyanza Province to the south east and Vihiga district Kakamega district of Western Province to the north–west and west (Anon, 1997-2001) (see Appendix 1). The South Nandi District lies within latitudes 0^0 and $0^0$34" North and Longitudes 34^0 44" and 35^0 25" East. There are four administrative divisions in the District (Figure 1). South Nandi forest covers an area of 1800ha between attitudes levels1700-2000m (Kigomo, 1991).

3 METHODOLOGY

3.1 Ethnobotanical studies: An ethnobotanical survey was realized to identify plants used in traditional medicine against malaria. Traditional practitioners, herbalists were interviewed using semi-structured questionnaires in order to obtain information on medicinal plants traditionally used for management of malaria. During the survey, information gathered included; the vernacular name, the part used, preparation, administration and dosage.

Plants were collected from different habitats where they grew in Nandi south district and identified at the Department of Botany University of Nairobi and authenticated at East Africa Herbaria (Leenhout, 1968 and Stace, 1993). Voucher specimens were deposited in the Botanical Garden herbarium of Maseno University.

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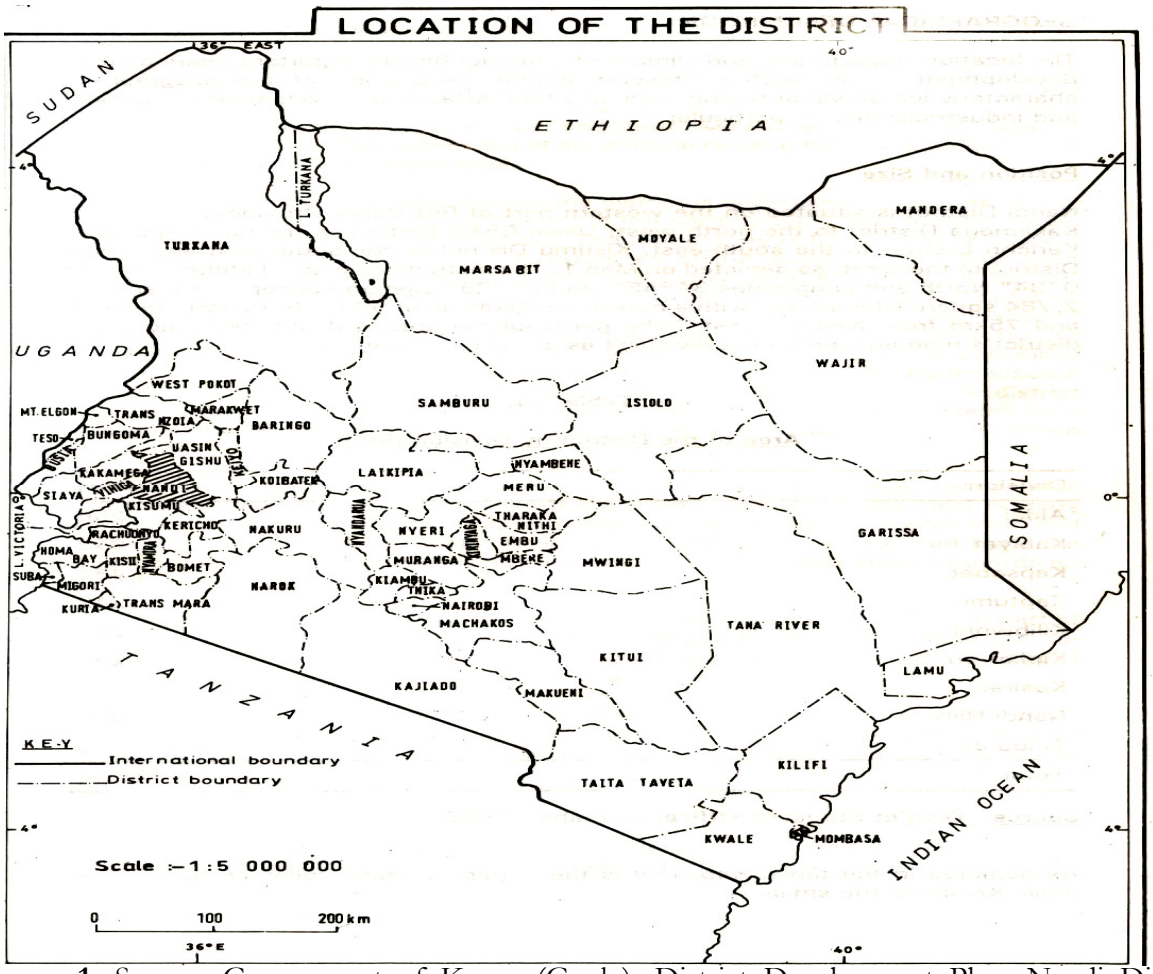

Figure 1: Source: Government of Kenya (G.o.k.): District Development Plan, Nandi District; Ministry of Economic planning Kenya.

4 RESULTS

The results of the survey are presented in table1, in which the plants are arranged in alphabetical synopsis according to families.

Ethno botanical data of each species, include their botanical and local names, parts utilized and drug preparation methods. In this study a total of forty four (44) species in 40 genera distributed in 27 families were identified to be used to treat malaria in South Nandi District (Table 2).

The family reported with the highest number of medicinal plant species was Labiatae (6 species, 13.64%).This was followed by Euphorbiaceae (4 species, 9.09%) then Compositae (3 species, 6.82%). Other families had two species each and Aloaceae/Liliaceae, Asclepiadaceae, Apocynaceae, Verbenaceae, Ceasalpinioideae, Meliaceae, Melianthaceae, Oxalidaceae, Rutaceae, Rosaceae, Sapotaceae, Vitaceae, Rhamnaceae, Capparidaceae, Ebenaceae, Boraginaceae had one species each. Roots (58.06%) were the most frequently used parts of the plant followed by the bark (40.32%) then leaves (32.26%). The whole plant (4.84%), bulb (1.61%), seed (1.61%), and flowers (1.61%) are least used in that order (Table 1).

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Table 1: Medicinal plants used in South Nandi District.

Local Name	Specific Name	Family	Habit	Part Used	Preparation
Tangaratwet	*Aloe kedongensis* Reynolds	Aloeaceae	Shrub	Leaf, root	Infusion (internal external)
Namgwet	*Cyathula schimperiana* non Moq	Amaranthaceae	Herb	Leaf, root	Decoction (internal)
Ng'atumyat	*Cyathula cylindrica* Moq	Amaranthaceae	Herb	Root	Decoction (internal)
Legetetiot (Tamuryekiat)	*Carissa edulis.* (Forsk.) Vahl.	Apocynaceae	Shrub	Root	Decoction (internal)
Simatwet	*Curroria volubilis* (Schltr.) Bullock	Asclepiadaceae	Liana	Bark	Decoction (internal)
Mororwet	*Ehretia cymosa* Thonn	Boraginaceae	Shrub	Leaf, root	Infusion (internal)
Senetwet	*Cassia didymobotrya* Fres.	Caesalpinioideae	Shrub	Leaf, root	Infusion (internal)
Isakiat	*Cleome gynandra* L	Capparidaceae	Herb	Leaf, root	Decoction (internal)
Kimogit	*Sonchus luxurians* (R.E.Fries) C.Jeffrey	Compositae	Herb	Root	Decoction (internal)
Rirmosok (Nanwaket)	*Microglossa pyrifolia* (Lam.) O.Kuntze	Compositae	Shrub	Root root	Decoction (internal)
Tebeng'wet	*Vernonia auriculifera* (Welw.)Hiern	Compositae	Shrub	Leaf, root	Decoction (internal)
Cheptenderet	*Momordica foetida* Schumach	Cucurbitaceae	Liana	Leaf, root	Decoction (internal)
Manereriat (Kimanererit)	*Zehneria minutiflora (Cogn.) C.Jeffrey*	Cucurbitaceae	Liana	Leaf, root	Decoction (internal)
Usuet	*Euclea divinorum* Hiern	Ebenaceae	Tree	Root bark	Decoction (internal), tooth brush
Imaniat	*Ricinus communis* L	Euphorbiaceae	Shrub	Roots seed	Decoction (internal)
Kulelwet	*Croton dichogamus* Pax.	Euphorbiaceae	Shrub	Whole plant	Decoction (internal)
Kurmenyat (Turmenyat)	*Clutia abyssinica* Jaub. & Spach	Euphorbiaceae	Shrub	Leaf, root	Decoction (internal)
Tebeswet	*Croton macrostachyus* Del.	Euphorbiaceae	Tree	Leaf, root	Decoction (internal)
Chepkererlong	*Trimeria grandifolia* (Hochst.) Warb	Flacourtiaceae	Shrub	Root	Decoction (internal)
Nukchat (Nokok)	*Dovyalis abyssinica* (A. Rich.) Warb	Flacourtiaceae	Shrub	Leaf, root	Decoction (internal)
Chelelgatiat	*Ajuga remota* Benth.	Labiatae	Herb	Leaf, root	Decoction (internal)
Chepkari	*Leucas martinicensis* (Jacq.) Ait.f.	Labiatae	Herb	Flower leaf	Infusion (internal)
Cheroronit (Cherungut)	*Hoslundia opposita* Vahl.	Labiatae	Shrub	Whole plant	Decoction (internal)
Chuchuniat	*Leonotis mollissima* Guerke	Labiatae	Shrub	Leaf, root	Decoction (internal)
Ng'ejepchiat	*Leucas calostachys* Oliv.	Labiatae	Shrub	Leaf root	Decoction (internal)
Sisiyat	*Ocimum lamiifolium* Benth.	Labiatae	Shrub	Root	Decoction (internal)
Seet	*Albizzia gummifera* (J.F.Gmel.)	Leguminosae	Tree	Root, bark	Decoction (internal)
Kakaruet	*Erythrina abyssinica* DC.	Leguminosae	Tree	Bark, root	Decoction (internal)
Menjeiwet	*Sida cordifolia* L	Malvaceae	Shrub	Leave	Infusion (internal)
Chemanjililiet (Chepsabuni)	*Pavonia kilimandscharica* Gurke	Malvaceae	Herb	Root	Decoction (internal)

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Local Name	Specific Name	Family	Habit	Part Used	Preparation
Mwarubaini	*Melia azedarach* L	Meliaceae	Tree	Leaf, bark	Decoction (internal)
Kibuimetiet	*Bersama abyssinica* Fres.	Melianthaceae	Tree	Bark	Decoction (internal)
Kibabustanyiet	*Maesa lanceolata* Forssk	Myrsinaceae	Shrub	Root	Decoction (internal)
Kibong'ong'inik	*Embelia schimperi* Vatke	Myrsinaceae	Tree	Seed	Decoction (internal)
Nyonyoek	*Oxalis corniculata* L	Oxalidaceae	Herb	Whole plant	Infusion (internal)
Tilyamook	*Rhynchosia hirta* (Andrews) Meikle & Verdc.	Papilionaceae	Liana	Root	Decoction (internal)
Kosisitiet	*Rhamnus prinioides* L. Her	Rhamnaceae	Shrub	Root	Decoction (internal)
Tendwet	*Prunus africana* (Hook.f) Scweinf.	Rosaceae	Tree	Bark, leaf	Decoction (internal)
Cheroriet	*Pentas longiflora* Oliv.	Rubiaceae	Herb	Leaf, root	Decoction (internal) & paste (external)
Kimoluet	*Vangueria volkensii* K.Schum	Rubiaceae	Shrub	Root	Decoction (internal)
Noiywet	*Fagaropsis angolensis* (Eng.) H.M.Gardner	Rutaceae	Tree	Root	Decoction (internal)
Lolwet	*Mimusops bagshawei* S.Moore.	Sapotaceae	Tree	Bark, root	Decoction (internal)
Singoruet	*Clerodendrum johnstonii* Oliv	Verbenaceae	Shrub	Leaf	Infusion (internal)
Torotwet	*Rhoicissus tridentata* (L.f) Willd & Drum.	Vitaceae	Shrub	Bulb	Juice (internal)

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Table 2: Diversity of medicinal plant species in Nandi South District.

Plant Families	Number of medicinal plant species	Percentage of total species mentioned as medicine.
Amaranthaceae	2	4.55
Aloaceae/Liliaceae	1	2.27
Asclepiadaceae	1	2.27
Apocynaceae	1	2.27
Compositae/Asteraceae	3	6.82
Cucurbitaceae	2	4.55
Verbenaceae	1	2.27
Euphorbiaceae	4	9.09
Flacourtiaceae	2	4.55
Labiatae/Lamiaceae	6	13.64
Papilionaceae	1	2.27
Ceasalpinioideae	1	2.27
Leguminosae	2	4.55
Meliaceae	1	2.27
Myrisinaceae	2	4.55
Malvaceae	2	4.55
Melianthaceae	1	2.27
Oxalidaceae	1	2.27
Rutaceae	1	2.27
Rosaceae	1	2.27
Rubiaceae	2	4.55
Sapotaceae	1	2.27
Vitaceae	1	2.27
Rhamnaceae	1	2.27
Boraginaceae	1	2.27
Capparidaceae	1	2.27
Ebenaceae	1	2.27
TOTAL = 27	44	100

The results show that habit of the most frequently used plants for medicines were shrubs (21 species) and trees (10 species) followed by herbs and lianas (4 species) in table 3 below.

Table 3: Life forms of medicinal plant species used in management of malarial disease in Nandi south district.

Habit	Number of species
Shrubs	21
Trees	10
Herbs	9
Lianas	4

5 DISCUSSIONS AND CONCLUSION

The present research provides information about some malarial therapeutic uses of 44 traditional medicinal plants species distributed in 27 families. This reinforces the importance of these types of ethno botanic surveys. This is indicative of the richness of medicinal floristic diversity of Nandi south district supported by favorable land, soils and climatic conditions.

The most frequently used preparation for drug methods were concoctions and decoctions. Use of concoctions suggests that the drugs may only be active in combination, due to synergistic effects of several compounds that are active singly (Gessler *et al*., 1994). It is possible that some of the compounds that are active *in vitro* could exhibit activity in *vivo* due to enzyme catalysed transformation into potent derivatives and therefore are playing the role of prodrugs (Omulokoli and Chhabra, 1997). This phenomenon has been demonstrated for *Azadirachta indica* extracts (Parida *et al., 2002*). The use of more than one plant especially for the bitter remedies may be to neutralize the poison (antidote).

The herbal remedies preparations were evidently prepared by different methods. These included decoctions, infusion, poultices, roasting, concoctions, paste, pomades, ointment of ghee and powder (ash). Preparation of compounds from dry parts of one plant or several plant drugs and ashes by using grinding stones. Burning, chewing, heating/roasting, pounding, and boiling or soaking in hot or cold water and milk and various other solvents like honey and this way, orally administered. This may be because the mode is convenient. Preparations for application to the skin such as ointments, liniments, foam to lotion, and baths, are frequently precutanaeous, by rubbing or covering (including poultices, by washing or baths) occasionally complimented by massage.

Most methods of extraction of the active ingredients require crushing of the plant tissue and homogenizing with water. Tissues are also boiled in water to improve extraction. Application of crushed plant juice without water is used but not common. Chewing plant tissue directly is one of the methods not commonly used.

Although most plant parts were utilized for the preparation of herbal remedies in this area, majority of the medicines were obtained from the roots (58.06%) followed by bark and leaves (Table 1). Except where the drugs are obtained from leaves, the use of bark, roots or uprooting the whole plant of a given species was found to be destructive means of obtaining the herbal remedies. These unfavorable extraction methods contribute to the loss of the flora (Balick and Cox, 1996)

Most herbalists claimed to administer remedies for malaria, cough and cold, pneumonia and other respiratory diseases. These were reported as the prevalent diseases, and this concurs with other reports (G.o.K, 1997- 2001) report. The high disease incidence may be due to low temperatures brought about by high rainfall and consumption of untreated water. Other diseases mentioned to be common include; skin diseases, intestinal worms, rheumatism and HIV/Aids (G.O.K, 1997-2001).

Conventional treatment is inadequate in Nandi South District as there is only one government hospital and a few health centers. This explains why several plant species from the wild are still being used for treating a variety of medical and other conditions (Table 1). Trade in medicinal plants was not frequently encountered during the study. Only one person was found to be selling roots and barks from *Carissa edulis, Ajuga remota* and *Toddalia asiatica* in Kaptumo market.

The parts most utilized in the preparation of most of the herbal remedies are the roots (74.34 %), bark, leaves, seeds, and fruits and sometimes the whole plant is uprooted (Table 1). Some of the medicinal plants such as *Prunus africana* are already known to be over-exploited and in some parts of Kenya are rare (Beentje, 1994). This survey has shown that many of these harvesting methods contribute to the destruction of the medicinal plants, making them unavailable. There is need therefore for better drug collections methods so as to facilitate sustainable utilization of these plant resources.

Comparison of the folk phytotherapeutical data in our study with data from other researches has concurred with many previous researches about the medicinal uses of several species for instance *Carissa edulis, Ajuga remota* and *Prunus africana* (Kokwaro, 1993; Begum and Nath,

2000). *Trimeria grandifolia* and *Pentas longiflora* were reported to be used as antimalarials. This confirms the need for further and more regular ethno botanic surveys.

It is encouraging that most of herbal drug are from shrubs (Figure 3), as they can be propagated as they grow fast and therefore can provide a continuous supply of the medicinal products. When household needs are met, the surplus can be sold for income generation. Some of these medicinal plants are leguminous and hence will also contribute to soil fertility due to their ability to fix nitrogen. The shrub, herbs and liana species can be grown on farm edges or on the boundaries, where there is little interference with crop plants.

If grown near farms, these medicinal plants can be a valuable agro biodiversity component in this region. Domestication of medicinal plants is a suitable option for optimizing resource utilization, as well as decreasing over-dependence on wild habitats. Encouraging such domestication will reduce pressure on wild habitats such as South Nandi forest, forming part of the solution to sustainable management of these ecosystems.

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