

## Review Article

# Current trends of Traditional Herbal Medicine Practice in Kenya: A review

Gabriel K. Kigen <sup>a,\*</sup>, Hillary K. Ronoh <sup>b,c</sup>, Wilson K. Kipkore <sup>d</sup>, and Joseph K. Rotich <sup>e</sup>

<sup>a</sup> *Department of Pharmacology and Toxicology, School of Medicine, Moi University, Kenya*

<sup>b</sup> *London School of Tropical Medicine and Hygiene, London, UK*

<sup>c</sup> *Kitale District Hospital, Ministry of Medical Services, Kenya*

<sup>d</sup> *Schools of Science and Technology, United States International University, Kenya*

<sup>e</sup> *Department of Epidemiology & Nutrition, School of Public Health, Moi University, Kenya*

\* **Corresponding author:** <sup>1</sup>Department of Pharmacology and Toxicology, School of Medicine, Moi University, P.O. Box 4606-30100, Eldoret, Kenya. **Tel:** +254-53-2030786; **Fax:** 254-53-2030786; **Email:** [kigengfk@gmail.com](mailto:kigengfk@gmail.com)

The use of herbal medicine is increasingly finding more relevance today, especially with the recognition that we are facing more challenges in the treatment of some medical conditions such as diabetes and cancer. To date, there are not many publications or records on the traditional herbal medicine use among the various Kenyan communities despite the widespread use. There is therefore an urgent need to document traditional medicines in Kenya for future reference and research.

The main objective of this review is to examine the current state of traditional herbal medicine practise in Kenya, the challenges facing the sector and the possible solutions to streamline the practice and maximize on the benefits. The method adopted in this research involved the analysis of the available records on herbal medicine in Kenya from various sources including internet and the available books. This information was then compared with those in other countries with established systems in order to establish the existing inadequacies. The various efforts to document herbal medicine incorporate into mainstream healthcare and the legal framework was also reviewed.

**Key words:** Herbal medicine, documentation, research

**Received:** November, 2012

**Published:** March, 2013

## 1. Introduction and Review

Ethnopharmacology may be broadly defined as the study of the indigenous drugs from plants and animals used in past and present cultures (Bruhn et al, 1982). The practice of traditional medicine (TM) is as old as the human race itself (Vickers et al, 2001). Several drugs have been derived directly or indirectly from plants including digoxin, taxol, vinblastine, nabilone and artemesin. It has been estimated that over 60% of the current anticancer and antihypertensive drugs are of plant origin (Cragg et al, 2005; Newman et al, 2003). Medicinal plants have therefore become important source of research and development of new drugs (Ebadi, 2006). Currently, many plants are being

investigated for potential therapeutic effects including the Graviola plant which has shown evidence of anticancer activities (Torres et al, 2012).

The World Health Organisation (WHO) estimates that up to 80% of the population in some developing countries use TM. In addition, trade in herbal medicine is gaining acceptance globally and is now a lucrative business generating lots of revenue. In sub-Saharan Africa, the traditional healers still play a major role in the provision of healthcare. This has been attributed in part to the unavailability of healthcare facilities and affordability (WHO, 2008; WHO, 2002).

The Kenyan situation is not any much different, and many communities especially from the poor rural areas still rely on herbal remedies. In addition, many Kenyans believe in the potency of herbal medicine, even when they can access modern medicine. In many cases they would choose to combine both herbal and modern medicine, especially if they are afflicted with chronic ailments such as HIV/AIDS, hypertension, infertility, cancer and diabetes (Nagata et al, 2011).

Like most other African countries, Kenya has a large number of tribes and each has its own peculiar customs and beliefs. The use of herbal medicine is equally different among the communities. Despite this, most of the medications have not been documented and scientifically evaluated to determine their efficacy and dosage vis-à-vis the alleged indications by the practitioners. These medications have been in use for centuries and it is quite possible that they could possess some degree of potency, and can potentially be used in therapy of some of the current conditions. Hence there is need to identify these plant and document them for future reference and research (IEA, 2011a).

Currently, there is little information regarding literature on the use of medicinal plants in Kenya, with only a few and far between authors having contributed. However, there are some few books that have been written on the subject (Dharani et al, 2010; Gachati, 1989; Gachati, 2007; Kokwaro, 2009; Watt et al, 1962); including other reference books on use of the plants which may provide some valuable information for researchers (Beentje, 1994; Blundell, 1992; Maundu, 1999). A number of authors have also published papers on the ethnobotanical plant use among the some select Kenyan communities (Busmann et al, 2006; Heine et al, 1988; Jeruto et al, 2008; Jeruto et al, 2007; Johns et al, 1990; Keter et al, 2011; Lindsay, 1978; Nanyingi et al, 2008; Okello et al, 2009). In addition, there are some important databases which provide information on some Kenyan medicinal plants including the KENRIK database at the National Museums of Kenya (NMK; Prelude).

However, the most encouraging bit is that there are several publications with regards to the products obtained from the extracts of these plants, with quite a number showing pharmaceutical activities and potential for the development of new pharmaceutical products (Irungu et al, 2012; Langat et al, 2012; Matheka et al, 2012). The development of a database containing information on both the ethnobotanical and the properties of the extracts from the plant is important for future research and development.

## Regulation

The regulation of herbal medicine practise is still a major challenge in Africa (Madiba, 2010). Several Asian countries have incorporated herbal medical practice into their National Drug Policies, but this is yet to be effected in Kenya (Xiaorui, 2000). TM was officially recognized in the 1990's and the patent law was revised to include TM in the 1999 (WHO, 2001). Since then, there have been little developments in the regulation of the TM practice in Kenya. Recently, a task force was constituted to draft the laws to regulate and practice with a view to incorporating the herbal practitioners in

mainstream healthcare. However, this is still in formative stages as there are several challenges to be overcome (Mwangi, 2004; NCAPD, 2008).

Currently, the Kenyan Pharmacy and Poisons Board (PPB) is involved in the registration of herbal and complementary products [the medicinal products that have been formulated in commercial manner] (PPB, 2010). Most of these products are imported from Asia, with the bulk coming from India and China. The registration of herbalists is done by the Ministry of Social services, but in essence most of the traditional herbalists are not even aware of this, unless they are practicing in urban areas whereby the local authorities enforce the registration. Hence there are scant records on the actual number of practicing herbalists. In addition, there are several fake herbalists. The regulating authority should develop guidelines and legal framework for the registration of herbalists in order to streamline the herbal practice and protect the citizen from this type of herbalists.

## Sociocultural issues

The practice of herbal medicine in Kenya, unlike Asia, has largely been considered primitive by the elite. Over the years, the practice of herbal medicine has been downgraded as a result of the introduction of conventional medicine that are available in more patient friendly (compliant) formulations such as syrups, capsules and tablets as opposed to traditional roots, barks and leaves which are often bitter to taste. In addition, the practice is also no longer a major income earner as it was previously. It has therefore been downgraded to poor and illiterate people (Thairu, 1975).

In most Kenyan communities, perhaps due to cultural reasons, the practice was considered a family affair and the practitioner would prefer to transfer the talent to one close relative. Unfortunately, most of the young people are not willing to take up the art for lack of financial gain, are engaged in other income generating activities, have trained in other professions, or are simply not interested as the practice as it is generally considered outdated (Lindsay, 1978; Nyamwaya, 1992).

Sadly, most of these practitioners end up dying with their valuable knowledge that may probably have been used to treat some of the conditions that currently have no cure such as cancer. Indeed most of the "true" herbalists are now at advanced age, perhaps over 70 years (Muchae, 2000). On the contrary, the Chinese traditional medicines were recorded and thanks to this we now have a leading cure of malaria from the wormwood (*Atemesia annua* spp.) that was used in China more than a thousand years ago (Hsu, 2006).

However, due to the recent upsurge of some chronic conditions such as diabetes, asthma, infertility, cancer and HIV/AIDS that do not respond very well to conventional medicine, there has been considerable interest in traditional medicine in Kenya. This has led to the emergence of several "quack" traditional healers especially in urban areas who are out to fleece and make quick bucks from desperate patients. Indeed, it is not easy to identify a genuine herbal practitioner in Kenya nowadays, especially in urban areas. Most have

put up adverts with claims that they can literally treat all known conditions, but for a fee (NCAPD, 2008). The genuine traditional healers tend to be more specific in their treatments, for example they may specialise in women's diseases, children diseases, asthma and other conditions (Sindiga, 1995).

### Herb - drug interactions

Several patients with chronic diseases often combine conventional medicine with TM. Herbal medicines like any other drugs are known to interact with conventional drugs through various mechanisms. The herbs may alter their pharmacokinetics leading to an increase or decrease in plasma concentrations, thus altering the therapeutic outcomes. The interactions may also lead to several other short or long term adverse effects (Chen et al, 2011; Hu et al, 2005; Izzo et al, 2009; Tsai et al, 2012). Despite this, to date there is little research that has been carried out to determine their active ingredients and document the potential interactions involving the Kenyan herbal products and prescription drugs.

### Deforestation

The wanton destruction of forests in Kenya is of serious concern for Kenya's biodiversity. Currently there are several non-governmental organizations (NGOs) that are actively involved in the conservation of forests including International Union for Conservation of Nature (IUCN), World Wide Fund for nature (WWF) and the Greenbelt Movement that was founded by the late Nobel laureate Wangari Maathai. The Kenyan forest cover has reduced drastically and now stands at about 2.5% down from about 12.5% in the sixties mainly due to rapidly expanding population, illegal logging and acquisition of land for cultivation (FSK, 2008; KFWG, 1999). This has had a major impact on the medicinal plants, like has happened in many other parts of the world. Indeed some of the species may have disappeared completely (Rukangira, 2001a; Shanley, 2003).

There is yet another form of commercial exploitation that targets the medicinal plants that have been identified to have direct medicinal uses. This practice is unlike that of early traditional herbalists who collected medicinal plants according to tradition ethics, and therefore protected the plants (Watt et al, 1962). An example of such a plant is the *Prunus africana* bark whose bark was discovered to be effective in the management of benign prostatic hyperplasia 35 years ago. The extract is formulated and sold as capsules (*Pygeum africanum*) by pharmaceutical companies mainly in Europe. This has led to increased harvesting to the extent that it was declared endangered by the Convention of International Trade in Endangered Species (CITES) in 1995 (K.M, 2003). Similarly, the sandalwood tree (*Osyris lanceolata*) has been illegally harvested for both medicinal and cosmetic purposes in Kenya and exported to Europe or Asia (WildlifeDirect, 2009). Several other plants have been exploited for medicinal uses including *Warburgia ugandensis*, *Pausinystalia johimbe* (used as an aphrodisiac), *Griffonia simplicifolia* (mood disorders), and *Harpagophytum procumbens* [pain management] (Wamalwa et al, 2006).

Uncontrolled harvesting of *Mondia* (*Mondia whytei*) locally referred to as "Mukombero", has been reported in Western Kenya. The local communities believe that its roots have aphrodisiac capabilities (RNW, 2011). Several *Aloe* species in Kenya have also been listed as threatened due to overexploitation for commercial activities (CITES, 2003).

In order to address this problem, the recognition of medicinal plants and establishment of medicinal botanical gardens and farms may have to be undertaken in order to achieve sustainable utilization and conservation of the plants. The participation of the local communities is pivotal in this process. This has been tried in Egypt with some measure of success (Rukangira, 2001a).

### Research

Research on TM is not very well co-ordinated in Kenya. The Kenyan universities and the Kenya Medical Research Institute (KEMRI) are currently undertaking some research in TM. Generally most of the research is academic, that is screening for active ingredients from the plant extracts for pharmacological and related activities. This is because of the fact that there is not much funding for the research on TM from the Pharmaceutical companies, unlike the Universities in the West. Indeed it is difficult to do research in most African countries owing to limited resources and specialized equipment. There have also been reports that some bioprospectors, both local and international have been individually collecting the medicinal plants from practising herbalists for purposes of research. In most cases, they do not reveal their findings to the herbalists who provided them with the samples (allAfrica, 2005; IEA, 2011b; Rukangira, 2001a).

Modern research in herbal medicine is quite expensive. It usually involves a random selection of plants and screening them for any active ingredients, followed by biological assays for targeted activities such as antibacterial, anticancer and other groups (Farnsworth, 1966). Natural Cancer Institute U.S.A (NCI) screened over 35,000 plant species for evidence of anticancer activity between 1960 and 1981. Some of the plants including taxol and camptothecin showed some pharmacological activity (Boyd, 1995). However, this is a very expensive method and sometimes considered wasteful since the plants in question may have other important pharmacological activities other than the targeted activity (Fabricant et al, 2001).

This kind of mass screening may not be applicable in most African countries owing to limited funds (Rukangira, 2001b). However, if there were documented records on the information from the plants and the conditions that the herbalists use, then it might provide an easier option for researchers in Africa. This is in terms of corroborating the extracts from the sample plants and the alleged medical uses or any other conditions.

The most challenging step for any potential researcher of TM in Kenya is the collection of ethnomedical information. This is because there are so many fake practitioners, and the identification of "genuine" herbalists is not an easy task. In addition, there are

currently no reliable records of herbal practitioners. One might therefore quite easily collect information from fake practitioners who would readily provide the information in exchange of some little token. They exploit the old tradition practised in many Kenyan communities whereby one was expected to offer some token of appreciation upon treatment by a herbalist (NCAPD, 2008).

Since most of the current practitioners operate within the rural areas, it is important for researchers to engage the opinion leaders who command the respect of their local communities. These include the provincial administration (local chiefs), religious leaders and local professionals such as teachers. This cadre of people would provide credible information about the genuine practising herbalists as well as the medical conditions by which they are known to treat. The use of inducements should be discouraged as much as possible as this would open way for the fake practitioners. Education is also very important in order to encourage the herbalists to provide the information without fear to other persons who are not members of their families. Educated close relatives of the herbalists may also be used to convince the herbalists on the need to provide the information. Renowned herbalists should be first approached and questionnaires may be used as a guide to select the eligible herbalists (IEA, 2011b).

Where there is evidence that an herbalist may have actually treated some specific conditions such as infertility, some form of patenting of the plant products in the name of the practitioner may be encouraged in order to stimulate them to provide the information. The herbalists should also be requested to provide the samples for identification by botanists from local universities and other institutions such as the East African herbarium. Databases on this can then be developed for future research (Christian, 2009).

## 2. Discussion

It is clear that there is a lot of potential in Kenyan herbal medicine judging from the published laboratory results from the screening of the plant exudates that have been analysed in our various institutions. However, in as much as we are doing well on this, there is need to document the information from herbalists in order to provide a database for future research and potential for the development of new drugs. There are some genuine concerns arising from the realisation that the old generation that holds this knowledge is fast aging and the young generation do not seem to take much interest in advancing this knowledge. The rapid deforestation exacerbates the situation. The knowledge for the potential cures for diseases such as cancer may therefore be extinct before it is even discovered. This could be replicated in other sub-Saharan African countries, as there are no proper records in most of these countries. This will certainly not be an easy task owing to the costs involved, and the pharmaceutical industry may not be willing to fund since it may not provide immediate gains. However, in the long run this will provide a very useful reservoir for future research and development of new drugs. Databases on the ethnomedical information from every region of the country should be compiled with a view to the development of centralised records for ease of

reference. The Universities, NGOs and perhaps WHO should take lead in this worthwhile project.

## 3. Conclusion

There is an urgent need to document information on traditional Kenyan herbal medicine because there are genuine concerns that this knowledge may be completely lost. There should also be development of legal frameworks to regulate the herbal practice in Kenya and possibility of incorporating herbal practise in mainstream health services as it has been successfully done in Asian countries.

## Conflict of Interest declaration

The authors declare no conflict of interest

## References

- allAfrica (2005) **Kenya: Drug Companies Under Fire**:The Standard: 2/9/2005: <http://allafrica.com/stories/200509020582.html>.
- Beentje H (1994). Kenya Trees, Shrubs, and Lianas; National Museums of Kenya
- Blundell M (1992). Collins Guide to the Wild Flowers of East Africa; Herper Collins Publishers.
- Boyd M (1995). The NCI In Vitro Anticancer Drug Discovery Screen. *Concept, Implementation, and Operation, 1985-1995*.
- Bruhn J and Holmstedt B (1982). Ethnopharmacology : Objectives, Principles, and Perspectives. *In: Natural Products as Medicinal Agents*. Reinhard E, Beals JL (Eds). Hippokrates, Stuttgart, pp 405-430. .
- Bussmann R, Gilbreath G, Solio J, Lutura M, Lutuluo R, Kunguru K, Wood N and Mathenge S (2006). Plant use of the Maasai of Sekenani Valley, Maasai Mara, Kenya. *J. Ethnobiol. Ethnomed.* **2**: 22.
- Chen XW, Serag ES, Sneed KB, Liang J, Chew H, Pan SY and Zhou SF (2011). Clinical herbal interactions with conventional drugs: from molecules to maladies. *Curr. Med. Chem.* **18**: 4836-4850.
- Christian, G (2009). Digitization, Intellectual Property Rights and Access to Traditional Medicine Knowledge in Developing Countries - the Nigerian Experience: A Research Paper prepared for International Development Research Centre (IDRC) Ottawa, Canada.
- CITES (2003) Review of Significant Trade East African Aloes : <http://www.cites.org/eng/com/pc/14/E-PC14-09-02-02-A4.pdf>.
- Cragg GM and Newman, DJ (2005). Plants as a source of anti-cancer agents. *J. Ethnopharmacol.* **100**: 72-79.
- Dharani NAY (2010). Medicinal Plants of East Africa; An Illustrated Guide; Sterling Publishers Pvt. Ltd, India.

- Natural Products as a Resource for Established and New Drugs. In: Pharmacodynamic Basis of Herbal Medicine, 2<sup>nd</sup> Edition (2006). Ebadi M (Ed). pp 49-64: CRC Press.
- Fabricant DS and Farnsworth, NR (2001). The value of plants used in traditional medicine for drug discovery. *Environ. Health Perspect.* **109** (Suppl. 1): 69-75.
- Farnsworth, NR (1966). Biological and phytochemical screening of plants. *J. Pharm. Sci.* **55**: 225-276.
- FSK (2008). Forestry Society of Kenya: Forest Landscape And Kenya's Vision 2030.
- Gachati FN (1989). Kikuyu Botanical Dictionary of plant names and uses.
- Gachati FN (2007) Kikuyu Botanical Dictionary, A Guide to Plant Names, Uses and Cultural Values.
- Heine B and Heine ICK (1988). Plant Concepts and Plant Use. An Ethnobotanical Survey of the Semi-Arid and Arid Lands of East Africa. Seibel HD (Ed). Fort Lauderdale, Breitenbach.
- Hsu E (2006). Reflections on the 'discovery' of the antimalarial qinghao. *Br. J. Clin. Pharmacol.* **61**: 666-670.
- Hu Z, Yang X, Ho PC, Chan SY, Heng PW, Chan E, Duan W, Koh HL, Zhou S (2005). Herb-drug interactions: a literature review. *Drugs* **65**: 1239-1282.
- IEA (2011a). Biodiversity, Traditional Knowledge and Intellectual Property in Kenya: [www.ieakenya.or.ke](http://www.ieakenya.or.ke) (Accessed on 31/07/2012).
- IEA (2011b). Intellectual Property Initiative Community Awareness Workshops: A Case of the Kakamega Environmental and Education Programme (KEEP) : [www.ieakenya.or.ke](http://www.ieakenya.or.ke) (Accessed on 31/07/2012).
- Irungu NB, Mbabu MJ, Kiboi DM, Moindi E, Kinyua J and Romano M (2012). In vivo antimalarial and acute toxicity properties of hexane and chloroform extracts from *Clausena anisata* (Willd.) Benth. *Afr. J. Pharmacol. Ther.* **1**: 24-29.
- Izzo AA and Ernst E (2009). Interactions between herbal medicines and prescribed drugs: an updated systematic review. *Drugs* **69**: 1777-1798.
- Jeruto P, Lukhoba C, Ouma G, Otieno D and Mutai C (2008). An ethnobotanical study of medicinal plants used by the Nandi people in Kenya. *J Ethnopharmacol.* **116**: 370-376.
- Jeruto P, Lukhoba C, Ouma G, Otieno D and Mutai C (2007). Herbal treatments in Aldai and Kaptumo divisions in Nandi district, Rift valley province, Kenya. *Afr. J. Tradit. Complement. Altern. Med.* **5**: 103-105.
- Johns T, Kokwaro J and Kimanani E (1990). Herbal remedies of the Luo of Siaya District, Kenya: Establishing quantitative criteria for consensus. *Economic Botany* **44**: 369-381.
- Stewart KM (2003) The African cherry (*Prunus africana*): Can lessons be learned from an over-exploited medicinal tree? *J. Ethnopharmacol.* **89**: 3-13.
- KEMRI. Centre for Traditional Medicine and Drug Research (CTMDR): <http://www.kemri.org/index.php/ctmdr>.
- Keter LK and Mutiso PC (2011). Ethnobotanical studies of medicinal plants used by Traditional Health Practitioners in the management of diabetes in Lower Eastern Province, Kenya. *J. Ethnopharmacol.* **139**: 74-80.
- KFWG (1999). Kenya Forest Working Group: Forest Cover And Forest Reserves In Kenya: Policy And Practice.
- Kokwaro JO (2009). Medicinal Plants of East Africa, 3<sup>rd</sup> Ed. University of Nairobi Press.
- Langat BK, Siele DK, Wainaina C, Mwandawiro C, Ondicho J, Tonui WK, Anjili, Clreri LN, CK, M (2012). Larvicidal effect of *Mundulea sericea* (Leguminosae) plant extract against *Aedes aegypti* (L.) (Diptera: Culicidae) *Afr. J. Pharmacol. Ther.* **1**: 106-109
- Lindsay RS and Hepper FN (1978). Medicinal plants of Marakwet, Kenya. Royal Botanic Gardens, Kew, UK, pp 49.
- Madiba SE (2010). Are biomedicine health practitioners ready to collaborate with traditional health practitioners in HIV and AIDS care in Tutume sub district of Botswana. *Afr. J. Tradit. Complement. Altern. Med.* **7**: 219-224.
- Matheka DM, Alkizim FO, Kiama TN and Bukachi F (2012). Glucose-lowering effects of *Momordica charantia* (Karela) extract in diabetic rats. *Afr. J. Pharmacol. Ther.* **1**: 62-66.
- Maundu P (1999). Traditional Food Plants of Kenya (National Museum of Kenya, 1999).
- Muchae J (2000). Indigenous Knowledge and Industry Property Rights: Kenyan Experience, Inter-Regional Workshop on intellectual Property Rights in the Context of Traditional Medicine, Bangkok.
- Mwangi JW (2004). Integration of herbal medicine in national health care of developing countries. *East Afr. Med. J.* **81**: 497-498.
- Nagata JM, Jew AR, Kimeu JM, Salmen CR, Bukusi EA and Cohen CR (2011). Medical pluralism on Mfangano Island: use of medicinal plants among persons living with HIV/AIDS in Suba District, Kenya. *J. Ethnopharmacol.* **135**: 501-509.
- Nanyingi MO, Mbaria JM, Lanyasunya AL, Wagate CG, Koros KB, Kaburia HF, Munenge RW, Ogara WO (2008) Ethnopharmacological survey of Samburu district, Kenya. *J. Ethnobiol. Ethnomed.* **4**: 14.
- NCAPD (2008). National Coordinating Agency for Population & Development (NCAPD) Policy Brief No. 1: Seeking Solutions for Traditional Herbal Medicine: Kenya Develops a National Policy [www.ncapd-ke.org](http://www.ncapd-ke.org). (Accessed on 22/06/2012).
- Newman DJ, Cragg GM and Snader KM (2003). Natural products as sources of new drugs over the period 1981-2002. *J. Nat.Prod.* **66**: 1022-1037.
- NMK National Museums of Kenya, <http://www.museums.or.ke/>.
- Nyamwaya D (1992). African Indigenous Medicine, Nairobi: KEMRI.
- Okello SV, Nyunja RO, Netondo GW and Onyango JC (2009). Ethnobotanical study of medicinal plants used by Sabaots of



- Mt. Elgon Kenya. *Afr. J. Tradit. Complement. Altern. Med.* **7**: 1-10.
- PPB (2010) PPB (2010) Registration of Herbal and Complementary Products: [http://www.pharmacyboardkenya.org/assets/files/HERBAL\\_GUILDLINE.pdf](http://www.pharmacyboardkenya.org/assets/files/HERBAL_GUILDLINE.pdf), Adapted on 16/11/2011.
- Prelude Medicinal Plants Database. Metafro-Infosys, Royal Museum for Central Africa, Tervuren, Belgium ([http://www.metafro.be/prelude/view\\_plant?pi=10770](http://www.metafro.be/prelude/view_plant?pi=10770)) (Accessed on 26 th February, 2013).
- RNW (2011). Radio Netherlands Worldwide Africa; Kenyans chew potency drug to extinction: <http://www.rnw.nl/africa/article/kenyans-chew-potency-drug-extinction>. (Accessed on 19/12/2011).
- Rukangira E (2001a). The African Herbal Industry: Constraints And Challenges.
- Rukangira E (2001b). Medicinal Plants and Traditional Medicine in Africa: Constraints and Challenges. Conserve Africa International, Nairobi, Kenya ([www.conserveafrica.org](http://www.conserveafrica.org)), adapted on 16/11/2011.
- Shanley P, (2003) The Impacts of Forest Degradation on Medicinal Plant Use and Implications for Health Care in Eastern Amazonia. *BioScience*. **53**: 573-584.
- Sindiga I, Nyaigotti-Chacha C, Kanunah MP (1995) Traditional Medicine in Africa, East African Publishers; Chapter 3: [http://books.google.co.ke/books/about/Traditional\\_Medicine\\_in\\_Africa.html](http://books.google.co.ke/books/about/Traditional_Medicine_in_Africa.html). (Accessed on 31/07/2012).
- Thairu K (1975). The African Civilization. Nairobi: Oxford University Press.
- Torres MP, Rachagani S, Purohit V, Pandey P, Joshi S, Moore ED, Johansson SL, Singh PK, Ganti AK, Batra SK (2012) Graviola: a novel promising natural-derived drug that inhibits tumorigenicity and metastasis of pancreatic cancer cells in vitro and in vivo through altering cell metabolism. *Cancer Lett.* **323**: 29-40.
- Tsai HH, Lin HW, Simon Pickard A, Tsai HY and Mahady GB (2012). Evaluation of documented drug interactions and contraindications associated with herbs and dietary supplements: a systematic literature review. *Int. J. Clin. Pract.* **66**: 1056-1078.
- Vickers A, Zollman C, Lee R (2001). Herbal medicine. *West. J. Med.* **175**: 125-128.
- Wamalwa N, Oballa P and Gicheru J (2006). Genetic variation of *Warburgia ugandensis* in Kenya and implications for its cultivation. Kenya Forestry Research Institution (KEFRI), Nairobi, Kenya, pp. 90-93.
- Watt JM and Breyer-Brandwijk MG (1962). The Medicinal and Poisonous Plants of Southern and Eastern Africa, 2<sup>nd</sup> Ed. E. and S. Livingstone Ltd., Edinburgh and London.
- WHO (2001). Legal Status of Traditional Medicine and Complementary/Alternative Medicine: A Worldwide Review. <http://apps.who.int/medicinedocs/pdf/h2943e/h2943e.pdf>. (Accessed on 19/112/2011).
- WHO (2008) Traditional Medicine, Fact sheet: <http://www.who.int/mediacentre/factsheets/fs134/en/>. (Accessed on 19/112/2011).
- WHO (2002) WHO Traditional Medicine Strategy 2002-2005, WHO Geneva 2002: [www.who.int/topics/traditional\\_medicine/en/](http://www.who.int/topics/traditional_medicine/en/); (Accessed on 19/112/2011).
- WildlifeDirect (2009). WildlifeDirect Inc; Saving Kenya's Forests: Perfumery sends Sandalwood numbers down (<http://kenyaforests.wildlifedirect.org>). Adapted on 17/12/2011.
- Xiaorui Z (2000). Integration of traditional and complementary medicine into national health care systems. *J. Manip. Physiol. Ther.* **23**: 139-140.