

Medicinal Plants and Traditional Medicine in Africa: Constraints and Challenges

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ABSTRACT

The majority of people in Africa use plant based traditional medicines for treating illness and ailments. Demand for medicinal plants is increasing in Africa as the population grows. The threat posed by over-exploitation of medicinal plants has serious implications on the survival of several plant species, many of which are faced with extinction. The pharmaceutical potentials of African medicinal plants are immense. But constraints and challenges exist at all levels. This paper discusses these constraints and challenges in relation to conservation, science and technology, use of medicinal plants at the local level, the domestic drug production sector, marketing, safety and efficacy requirements. Measures and strategies for enhancing the development of a medicinal and aromatic plants industry in Africa are suggested.

MEDICINAL PLANT USE IN AFRICA

In all countries of the world there exists traditional knowledge related to the health of humans and animals. The importance of traditional medicine as a source of primary health care was first officially recognised by the World Health Organisation (WHO) in the Primary Health Care Declaration of Alma Ata (1978) and has been globally addressed since 1976 by the Traditional Medicine Programme of the WHO. That Programme defined traditional medicine as: "the sum total of all the knowledge and practices, whether explicable or not, used in diagnosis, prevention and elimination of physical, mental or social imbalance and relying exclusively on practical experience and observation handed down from generation to generation, whether verbally or in writing."

In Africa, traditional healers and remedies made from plants play an important role in the health of millions of people. The relative ratios of traditional practitioners and university-trained doctors in relation to the whole population in African countries are revealing. In Ghana, for example, in the Kwahu district, there are 224 people for every traditional practitioner, compared to nearly 21,000 people for one university-

trained doctor. The same applies to Swaziland where the ratios are 110 people for every traditional healer and 10,000 people for every university-trained doctor. It is estimated that the number of traditional practitioners in Tanzania is 30,000–40,000 in comparison to 600 medical doctors.

Relegated for a long time to a marginal place in the health planning of developing countries, traditional medicine or, more appropriately, traditional systems of health care, have undergone a major revival in the last twenty years. Every region has had, at one time in its history, a form of traditional medicine. We can therefore talk of Chinese traditional medicine, Arabic traditional medicine or African traditional medicine. This medicine is traditional because it is deeply rooted in a specific socio-cultural context, which varies from one community to another. Each community has its own particular approach to health and disease even at the level of ethno-pathogenic perceptions of diseases and therapeutic behaviour. In this respect, we can argue that there are as many traditional medicines as there are communities. This gives traditional medicine its diverse and pluralist nature.

The World Health Organisation (WHO) has described traditional medicine as one of the surest means to achieve total health care coverage of the world's population. In spite of the marginalisation of traditional medicine practised in the past, the attention currently given by governments to widespread health-care application has given a new impetus to research, investment and design of programmes in this field in several developing countries in Africa and elsewhere.

The demand by most of the people in developing countries for medicinal plants has been met by indiscriminate harvesting of spontaneous flora including those in forests. As a result, many plant species have become extinct and some are endangered. It is therefore necessary that systematic cultivation of medicinal plants be introduced in order to protect threatened species. As Africa's population grows, demand for traditional medicines will increase, and pressure on medicinal plant resources will become greater than ever. While loss of habitat is the major factor contributing to the depletion of natural resources in Africa, collection of wild plants for traditional medical use is extremely detrimental to certain species. Documentation of medicinal use of African plants is becoming increasingly urgent because of the rapid loss of the natural habitat for some of these plants due to anthropogenic activities. The continent is estimated to have about 216,634,00 ha. of closed forest areas, and with a calculated annual loss of about 1% due to defor-

TABLE 1. MEDICAL PLANTS USED BY MAJORITY OF THE POPULATION AND FREQUENTLY CITED BY MOST TRADITIONAL HEALERS IN TANZANIA

Plant	Part used	Uses
1. <i>Cassia didymobotria</i> L.	Leaves	Anemia, Athlemintic, laxative
2. <i>Ficus stuhlmanii</i> Walp.	Stem bark	Treats chronic wounds
3. <i>Harrisonia abyssinica</i> Oliv.	Roots	Bilharzia, chronic wounds
4. <i>Terminalia serica</i> Burch.	Roots	Diarrhea, vomiting, stomach problems
5. <i>Securidaca longipendunculata</i>	Roots	Treats infertility in both men and women
6. <i>Euphorbia quadrangularis</i> Pax	Arial parts	General body weakness
7. <i>Entada abyssinica</i> Steud.	Root bark	Chronic cough, headache, stomach pains
8. <i>Albizia vesicolor</i> Welw.	Root bark	Anemia, Athlemintic, sterility in women
9. <i>Strychno heterodoxa</i> Gilg.	Roots	Inflammations and fevers
10. <i>Gnidia kraussiana</i>	Tuber	Constipation, swollen stomach

Source: Nshimo, 1888

estation, many of the medicinal plants and other genetic materials become extinct before they are even documented. Most of the plants found in Africa are endemic to that continent, the Republic of Madagascar having the highest rate of endemism (82%). Undoubtedly, medicinal plants and the drugs derived from them constitute great economic and strategic value for the African continent.

Parts of medicinal plants can be seen at every market in urban centres of Africa these days. In 1996, The Trade Records And Analysis Of Flora And Fauna In Commerce (TRAFFIC) East/Southern Africa, the wildlife trade monitoring programme of WWF and IUCN, initiated an 18 month review of wildlife medicinal resources trade, in East and Southern Africa and Madagascar. The aim of this review was to identify species most in need of conservation, management and/or research. This review also entailed collecting information about trade patterns, markets, source areas and impacts of harvest. Relevant information was collected in 17 countries: Botswana, Eritrea, Ethiopia, Kenya, Lesotho, Madagascar, Malawi, Mozambique, Namibia, Somalia, South Africa, Sudan, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe.

This study revealed that use of wildlife medicinal resources in East and Southern Africa is largely for traditional medicine while a few species are being exported. Traditional medicine is the most widely used medical system in the region. Not only is traditional medicine popular and accepted, but also in many areas it is the only system available. Western medicine is costly and often inaccessible. The vast majority of plants and animals used in traditional medicine, as well as those exported from the region, are collected from the wild. Some plant species are also cultivated on farms, for example as hedgerows, but this supply is still insufficient to meet growing demand. There are reports of increasing scarcity for many of the medicinal wildlife species. This situation represents a concern not only from the conservation point of view, but also because reduced availability of medicinal wildlife will have a negative effect on the health status of many people living in East and Southern Africa.

CHALLENGES AND CONSTRAINTS ON AFRICAN MEDICINAL PLANTS

Conservation

African medicinal plant resources may be doomed to extinction by overexploitation resulting from excessive commercialisation, habitat destruction and other natural and man-made destructive influences unless energetic conservation measures are taken to ensure their continued availability. This can be done through the establishment of medicinal plant gardens and farms. The acquisition of large scales of land required for cultivation can be a serious obstacle.

RESEARCH AND DEVELOPMENT (R & D)

Research in chemistry and bio-active components of medicinal plants of Africa has been ongoing for quite some time, funded by multi or bi-lateral aid or non-governmental donor organisations. A systematic and concerted approach to this activity has not been maintained, for want of sophisticated equipment and high-cost chemicals. Much of the research has been mainly academic. The concept of applied research in the industrial use of plants has not received much attention. Furthermore, research and training activities for traditional medicine has not received due support and attention. Research in support of industrial development should focus on related activities ranging from the propagation of medicinal plants, appropriate processing technologies to improve quality and yield, new formulations to new products and the marketing of finished products.

The main problem facing the use of traditional medicines is the proof requirement that the active components contained in medicinal plants are useful, safe and effective. This is required to assure the medical field and the public regarding the use of medicinal plants as drug alternatives. The proofs of pharmacology activity that are available at present are mostly based on empirical experience. The scientific proof then becomes the most important thing, in order to eliminate the concern of using medicinal plants as drugs for alternative treatment. Unfortunately, most African

TABLE 2. PLANTS THAT ARE OF COMMON USE IN AFRICA AND MADAGASCAR

<i>Abrus precatorius</i> L. (Leguminosae)	<i>Cinnamomum zeylanicum</i> Blume (Lauraceae)	<i>Phytolacca dodecandra</i> I. Herit. (Phytolaccaceae)
<i>Acacia senegal</i> (L.) Wild. (Mimosaceae)	<i>Centella coreacea</i> Nannfd. (Apiaceae)	<i>Piper guinense</i> C.D.C. (Piperaceae)
<i>Acokanthera ongiflora</i> Stpf. (Apocynaceae)	<i>Crinum jagus</i> (Thoriper) Dandy (Amaryllidaceae)	<i>Rapanea melanophoeos</i> Mez. (Myrsinaceae)
<i>Adansonia digitata</i> L. (Bombaceae)	<i>Cryptolepis sanguinolenta</i> (Lindl) Schltr. (Periplocaceae)	<i>Rauwolfia vomitoria</i> Afz. (Apocynaceae)
<i>Agave sisalana</i> Perine, ex Engelm. (Amaryllidaceae)	<i>Cymbopogon citratus</i> Stapf (Graminae)	<i>Ricinus communis</i> L. (Euphorbiaceae)
<i>Ageratum conyzoides</i> L. (Asteraceae)	<i>Datura stramonium</i> L. (Solanaceae)	<i>Securidaca longipedunculata</i> Fresen. (Polygalaceae)
<i>Albizia anthelmintica</i> A. Brongn. (Mimosaceae)	<i>Euphorbia kamerunica</i> pax (Euphorbiaceae)	<i>Securinega virosa</i> (Roxb. Ex Willd.) Baill. (Euphorbiaceae)
Quelques plante médicinales communes	<i>Funtumia elastica</i> Stapf. (Apocynaceae)	<i>Solanum nigrum</i> L. (Solanaceae)
<i>Allium sativum</i> L. (Liliaceae)	<i>Glinus lotoides</i> L. (Mollugo hirta L.) (aizoaceae)	<i>Spondias mombin</i> L. (Anacardiaceae)
<i>Aloe ferox</i> Mill. (Liliaceae)	<i>Harrisomia abyssinica</i> Oliv. (Simarubaceae)	<i>Strophanthus Kombe</i> Oliv. (Apocynaceae)
<i>Alstonia boonei</i> de Wild. (Apocynaceae)	<i>Heliotropum indicum</i> L. (Boraginaceae)	<i>Strychnos nux-vomica</i> L. (Loganiaceae)
<i>Ammi visgana</i> Lam. (Apiaceae)	<i>Hyoscyamus muticus</i> L. (Solanaceae)	<i>Syzygium aromaticum</i> L. (Myrtaceae)
<i>Anchomanes difformis</i> Engl. (Araceae)	<i>Jatropha curcas</i> L. (Euphorbiaceae)	<i>Terminalia glaucescens</i> Planch. Ex Benth. (Combretaceae)
<i>Arachis hypogea</i> L. (Leguminosae)	<i>Kalanchoe crenata</i> (Andr.) Haw. (Crassulaceae)	<i>Thalictrum rhynchocarpum</i> Q. Dillon A. Rich (Ranunculaceae)
<i>Aristolochia bracteata</i> Retz. (Aristolochiaceae)	<i>Lawsonia inermis</i> L. (Lythraceae)	<i>Thea sinensis</i> Camellia (L.) O. Kuntze (Theaceae)
<i>Astragalus gumifer</i> Labill. (Fabaceae)	<i>Mitragyna stipulosa</i> (DC) O. Ktze (Rubiaceae)	<i>Theobroma cacao</i> L. (Sterculiaceae)
<i>Azadirachta indica</i> A. Juss. (Meliaceae)	<i>Momordica charantia</i> L. (Cucurbitaceae)	<i>Trema orientalis</i> Blume (Ulmaceae)
<i>Balanites aegyptiaca</i> Del. (Zygophyllaceae)	<i>Morinda lucida</i> Benth. (Rubiaceae)	<i>Triclisia gillettii</i> (De Willd.) Staner (Menispermaceae)
<i>Boerhavia diffusa</i> Engelm. & A. Gray (Nyctaginaceae)	<i>Moringa pterygosperma</i> Gaertn. (Moringaceae)	<i>Voacanga africana</i> Stapf. (Apocynaceae)
<i>Borreria verticillata</i> L. G.F.W. Mey (Rubiaceae)	<i>Nauclea latifolia</i> Sm. (Rubiaceae)	<i>Warburgia ugandensis</i> Sprague (Canellaceae)
<i>Calotropis procera</i> Ait. F. (Asclepiadaceae)	<i>Nicotiana tabacum</i> L. (Solanaceae)	<i>Withania somnifera</i> Dun. (Solanaceae)
<i>Carapa procera</i> Ait.f. (Meliaceae)	<i>Nymphaea lotus</i> L. (Nymphaeaceae)	<i>Ximenia americana</i> L. (Olacaceae)
<i>Capsicum minimum</i> Mill. (Solanaceae)	<i>Ocimum gratissimum</i> L. (Lamiaceae)	<i>Zanha golungensis</i> Hiern (Sapindaceae)
<i>Carica papaya</i> L. (Caricaceae)	<i>Olea europea</i> L. (Oleaceae)	<i>Zanthoxylum (Fagara) Zanthoxyloides</i> Waterman (Rutaceae)
<i>Carum carvi</i> L. (Apiaceae)	<i>Parquetina nigrescens</i> (Afz) Bulloch (Periplocaceae)	<i>Zingiber officinale</i> Roscoe (Zingiberaceae)
<i>Cassia senna</i> L. (Leguminosae)	<i>Peganum harmala</i> L. (Zygophyllaceae)	
<i>Catharanthus roseus</i> G. Don (Apocynaceae)	<i>Pergularia daemia</i> Choiv. (Asclepiadaceae)	
<i>Chenopodium ambrosioides</i> L. (Chenopodiaceae)	<i>Plumbago zeylanica</i> L. (Plumbaginaceae)	
<i>Chrysanthemum cinerariaefolium</i> Vis. (Compositae)	<i>Phytostigma venenosum</i> Balf. (Leguminosae)	
<i>Cinchona succirubra</i> Pavon. (Rubiaceae)		

Source: Safowora, 1996

countries are not able to conduct research or provide scientific proof of pharmacology. International collaboration is important for African countries, as it would enhance the development of drugs obtained from medicinal plants to their benefit.

Reasons for the lack of research data involve not only policy problems, but also the research methodology for evaluating traditional medicine. There is literature and data on the research of traditional medicine in various countries, but not all scientists may accept them. As the characteristics and application of traditional medicine is quite different from western medicine, how to evaluate traditional medicine and what kinds of academic research approaches and methods may be used to evaluate the safety and efficacy of traditional medicine are new challenges which have emerged in recent years.

MARKETING AND VALUE ADDED PRODUCTS

There is a need to initiate, support and promote formulation and development of projects that are aiming at value-added traditional medicinal plant products. Investment in supply and market development should be undertaken given an assured market for indigenous medicinal products. New opportunities should be investigated as demand grows, and export opportunities investigated and developed. Research should be carried out into the development of efficient packaging and storage of plant medicines. Many plants originating from Africa have become sources of important drugs. However, hardly any effort has been made towards adding value to local natural products. By value-added processing, communities in these countries would have earned more income and thereby become more aware of the value

TABLE 3. AFRICAN MEDICINAL PLANT SPECIES IN INTERNATIONAL TRADE SHOWING QUANTITIES TRADED EXPORTING AND IMPORTING COUNTRIES. PERCENTAGE OF TOTAL DEMAND IS GIVEN WHERE POSSIBLE.

Family species	Part used	Export country	Year	Quantity traded in tons/yr	Import country and % of demand imported	Source of collection*	Reference **
Annonaceae							
<i>Dennettia tripetala</i>	?	Ghana				w	1
Apocynaceae							
<i>Hunteria eburnea</i>	bark	Ghana				w	1
<i>Rauvolfia vomitoria</i>	root	DRC Rwanda Mozambique				c	
<i>Strophanthus gratus</i>	fruit	Cameroon	1985-86 1990-91	1.1	Luxembourg Belgium (38%) Italy (23%) Holland (13%) Germany (12%) France (11%) Spain (2.4%)	w	8
<i>Strophanthus kombe</i>	fruit					w	3
<i>Tabernaemontana elegans</i>	seed	Mozambique	1981	0.6		w	9
<i>Voacanga africana</i>	seed	Cameroon Côte d'Ivoire	1985-86 1990-91		France	w, c	3
<i>Voacanga thouarsii</i>	seed	Cameroon				w, c	1, 2, 5
Combretaceae							
<i>Terminalia sericea</i>	bark	Mozambique		24-25	Germany?	w	9
Euphorbiaceae							
<i>Ricinus communis</i>	seed						
Fabaceae							
<i>Duparquetia orchidacea</i>	seed	Ghana Ghana Côte d'Ivoire	75-80		Germany	w	1, 2, 5
<i>Griffonia simplicifolia</i>		Cameroon					
<i>Physostigma venenosum</i>	fruit	Côte d'Ivoire Nigeria				w	1, 2
Liliaceae							
<i>Gloriosa superba</i>	seed	Mozambique	1981	0.1			9
Menispermaceae							
<i>Jateorhiza palmata</i>	root	Tanzania		0.7-24		w	4, 9
Pedaliaceae							
<i>Harpagophytum procumbens</i>	root	Namibia Mozambique Botswana	1981	200 9	Germany (80.4%) France (12.8%) Italy (1.5%) USA (1.0%) South Africa (1.2%)	w	4, 9
<i>Harpagophytum zeyheri</i>	root	Namibia Mozambique Botswana				w	4
Ochnaceae							
<i>Brackenridgea zanguebarica</i>	bark	Mozambique	1981	0.1		w	9
Rosaceae							
<i>Prunus africana</i>	bark	Cameroon Madagascar Kenya, DRC Uganda	1995	3190	France Italy Spain	w	3, 6
Rubiaceae							
<i>Corynanthe pachyceras</i>	?	Ghana				w	1
<i>Pausinystalia johimbe</i>	bark	Cameroon	1985-91	286	Holland (65%) Germany (18.3%) Belgium/Luxembourg (10.9%) France (5.9%)	w	3, 5, 8

*Source of collection: w=wild; c=cultivated; n=naturalised

**Reference: 1. Abbiw (1990); 2. Ake Assi (pers. comm.); 3. Cunningham & Mbenkum (1993); 4. Nott (1986); 5. J. Seyani (pers. comm.); 6. FAO (1986); 7. Catalano et al. (1985); 8. Seme (1989); 9. Atal (1993).

Source: Marshall, N.T. 1998.

of conserving the medicinal plants. Each medicinal and aromatic plant that is used in abundance in local and export markets should be thoroughly studied and continually monitored for composition of its constituents. It is therefore of paramount importance to enhance Africa's capacity to do this.

LEGISLATION

Despite its existence over many centuries and its expansive use during the last decade, in most African countries, traditional medicine, including herbal medicines, has not yet been officially recognised, and the regulation and registration of herbal medicines has not been well established.

Although, in most African countries more than 80% of the population rely on traditional medicine for their primary health care needs, the governments have not yet promulgated edicts or decrees vis-à-vis regulation and recognition of the practice of traditional medicine. Even in countries where there is an apparent recognition, appropriate budgeting to facilitate the functioning of the Traditional Medicine Board is usually inadequate or totally lacking.

In many countries in Africa, the entire traditional medicine community seems to be operating outside the framework of national legislation on the collection and trade in wild species. There is also a large inter-African trade in medicinal plants, again almost entirely outside the usual international trade controls. There is thus a need for the formulation and development of national as well as regional policies and legislation in terms of the trade and access to these resources if maximum benefits are to be reaped in order for such policies to be successful. Many African countries do not have procedures to register medicinal plant preparations although they are widely used for the health care needs of a majority of the people. The regulations, if any, are very stringent, requiring the same standards expected of modern medicines.

CONCLUSION

Africa has a rich tradition of plant use, an immense range of climates, cultures and species and has the human and natural resources to become an even greater producer of natural plant products. The pharmaceutical potentials of African medicinal plants are immense. In order to improve the situation of medicinal plants in Africa, a number of options come to mind. Urgent action is needed for research that focuses on the generation of baseline information on medicinal and aromatic plants and for promoting value-added processing of herbal medicines from local materials for local industries with simple dosage forms being standardised and packaged at low cost using appropriate technology.

Governments should establish the necessary institutional and financial support to promote the potential role of the herbal industry in socio-economic development. Priority should be given to the development of herbal medicine by means of the following measures: inventorying and documenting the various medicinal plants and herbs, which are used to treat common diseases in each country; setting up a network of laboratories and pilot plants with adequate facilities for the assessment of the efficacy of medicinal herbs, and establishing dosage norms and production of the most efficacious of herbal extracts, whether in tablet, capsule, powder, syrup, liquid or other forms. Conservation and production of medicinal plants primarily in community gardens must be given priority along with other conservation options and market incentives, for the preservation of essential medicinal herbal plants.

TABLE 4. INDIGENOUS PLANTS THAT ARE HARVESTED AS A SOURCE OF ACTIVE INGREDIENTS FOR EXPORT PURPOSES, INDICATING WHAT PART OF THE PLANT IS HARVESTED FOR EXTRACTION OF ACTIVE INGREDIENTS AND WHETHER THE PLANTS ARE USED IN TRADITIONAL MEDICINE OR NOT.

SPECIES	PART USED	INGREDIENT	SOURCE AREA	TM
<i>Adhatoda robusta</i>	?	?	Ghana (1)	-
<i>Allanblackia floribunda</i>	fruit	fat**	Cote d'Ivoire (2)	*
<i>Ancistrocladus abbreviatus</i>	?	?	Ghana (1)	-
<i>Corynanthe pachyceras</i>	?	corynanthine corynanthidine yohimbine	Ghana (1)	*
<i>Dennetia tripetala</i>	?	?	Ghana (1)	-
<i>Duparquetia orchidacea</i>	?	?	Ghana (1)	*
<i>Griffonia simplicifolia</i>	seed	BS11 lectin	Cote d'Ivoire Cameroon & Ghana (1,2,5)	*
<i>Harpagophytum procumbens</i>	root	glucoiridoids	Namibia (3)	*
<i>Harpagophytem zeyheri</i>	root	glucoiridoids	Namibia (3)	*
<i>Hunteria eburnea</i>	bark	eburine and other alkaloids	Ghana (1)	*
<i>Jateorhiza palmata</i>	root	palmatrin jateorhizine colambamine	Tanzania (4)	*
<i>Pausinystalia johimbe</i>	bark	yohimbine	Cameroon (5)	*
<i>Pentadesma butryacea</i>	fruit	fat**	Cote d'Ivoire (2)	*
<i>Physostigma venenosum</i>	fruit	physostigmine (eserine)	Cote d'Ivoire (2) Ghana (1)	*
<i>Prunus africana</i>	bark	sterols triterpenes n-docosanol	Cameroon Kenya, Madagascar (6)	*
<i>Rauvolfia vomitoria</i>	root	reserpine yohimbine etc	DRC, Rwanda, Mozambique	*
<i>Strophantus spp</i>	fruit	ouabain	West Africa	*
<i>Voacanga africana</i>	seed	voacamine	Cote d'Ivoire, Cameroon, Ghana (1,2,5)	*
<i>Voacanga thouarsii</i>	seed	voacamine	Cameroon (1,2,5)	*

Note: Fat from *Allanblackia stuhimannii* fruits, used in soap making and cosmetic industry (Lovett, 1988).
Use of products from *Jateorhiza* now limited mainly to veterinary medicine (Oatley, 1979).
References: 1=(Abbiv, 1990); 2= L Ake Assi, pers. comm.; 3= (Nott, 1986); 4= J. Seyani, pers. comm.;
5= (FAO, 1986) ; 6= (Catalano et al., 1985).

Source: Cunningham, 1993

REFERENCES

- Ake-Assi, L. 1978. Contribution à l'Identification et au Recensement des Plantes Utilisées dans la Médecine Traditionnelle et la Pharmacopée en Centrafrique, Agence de Coopération Culturelle et Technique, Paris, France.
- Albano, G. 1998. The Value and Conservation of Medicinal Plants in Mozambique, Department of Forestry Eduardo Mondlane University, Maputo, Mozambique.
- Asfaw, Z. 1998. Conservation and Production of Traditional Medicinal Plants in Home Gardens: The Case of Ethiopia: Addis Ababa University, Addis Ababa, Ethiopia.
- Balick, J.B., Elisabetsky, E. and Laird, A.S., 1996. Medicinal Resources of the Tropical Forest, Biodiversity And Its Importance to Human Health, Columbia University Press, New York.

- Bodeker, G. 1994. Traditional Health Knowledge and Public Policy. *Nature and Resource* 30(2): 5-16.
- Cunningham, A.B. 1997. An Africa-wide Overview of Medicinal Plant Harvesting, Conservation and Health Care, Non-Wood Forest Products 11: Medicinal plants for forest conservation and health care, FAO, Rome, Italy.
- Cunningham, A.B. 1993. African Medicinal Plants: setting priorities at the interface between conservation and primary health care. Working paper 1. UNESCO, Paris.
- Dagne, D. 1998. Baseline Chemical Studies That Aid In The Development of Essential Oil and Medicinal Plant Industry In Africa, Department of Chemistry, Addis Ababa University, Addis Ababa, Ethiopia
- Darshan Shankar and Bertus Haverkort, 2000. *Compass Newsletter* No3, Leusden. The Netherlands.
- De Smet Peter A.G.M 1999. Herbs, health and healers: Africa as Ethnopharmacological treasury, Africa Museum, Berg en Dal, The Netherlands, 1999.
- Duraffourd et al. 1997, *La plante médicinale : de la tradition à la science : de l'usage empirique à la phytothérapie clinique*, J. Grancher Ed. Paris.
- FAO, 1999. *Non-Wood News* 6, Rome, Italy
- Kerwegi S. A., 2001: *Traditional Skin Care Using Plant Extracts*, Kampala, Uganda
- Kokwaro, J.O., 1993. *Medicinal plants of East Africa*, Second Edition, University of Nairobi.
- LeBeau, D. 1998. *Urban Patients' Utilisation of Traditional Medicine: Upholding Culture and Tradition*, University of Namibia, Sociology Department, Windhoek, Namibia.
- Marshall, N.T., 1998. *Searching for a Cure: Conservation of Medicinal Wildlife Resources in East and Southern Africa*, TRAFFIC International.
- M.S. Swaminathan Research Foundation Chennai, 1998. *A conceptual framework for promoting benefit sharing in the area of conservation and use of plant genetic resources*, Report prepared for the United Nations Environment Programme, India.
- Nshimo C. 1888. *Utilization And Conservation of Medicinal Plants in Africa*, Faculty of Pharmacy, Muhimbili University College of Health Sciences, Dar Es Salaam, Tanzania.
- Mwangi, J.W., 2000. *Traditional herbal medicine in Kenya*, University of Nairobi, Nairobi, Kenya.
- Myles M. 1998. *The Marketing of Indigenous Medicinal Plants in South Africa: A Case Study in Kwazulu-Natal*, Institute of Natural Resources, Natural Resource Management Programme South Africa.
- Posey, D.A. & Dutfield, G., 1996. *Beyond Intellectual Property: Towards Traditional Resource Rights for Indigenous Peoples and Local communities*, Ottawa, Canada; International Development Research Centre
- Safowora, A., 1982. *Medicinal Plants and Traditional Medicine in Africa*, John Wiley and Sons Limited, Chichester.
- Tuley de Silva, 1997. *Industrial Utilisation of Medicinal Plants in Developing Countries, Non-wood Forest Products II: Medicinal Plants for Forest Conservation and Healthcare*, FAO, Rome, Italy
- UNESCO, 1994. *Traditional Knowledge in Tropical Environment*, *Nature & Resource*, Volume 30, No 1, UNESCO, Paris.
- UNESCO, 1994. *Traditional knowledge into the twenty-first century*, *Nature & Resources*, Volume 30, No2, UNESCO, Paris.
- Wambebe C, 1998. *Development and Production of Standardised Phytomedicines*, National Institute for Pharmaceutical, Abuja, Nigeria.
- Walter V. Reid et al., 1993. *Biodiversity Prospecting: Using Genetic Resources for Sustainable Development*, World Resources Institute (WRI).
- World Intellectual Property Rights Organisation (WIPO), 1998. *Asian Regional Seminar on Intellectual Property Issues in the Field of Traditional Medicines*, New Delhi.

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