THE AFRICAN HERBAL INDUSTRY:

CONSTRAINTS AND CHALLENGES

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ABSTRACT

The majority of people in Africa use plant based traditional medicines for their care. 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.

I. 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 Organization (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 Kwahu district, for every traditional practitioner there are 224 people, compared to one university trained doctor for nearly 21,000 people. 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. In Malawi, there are 17 000 traditional medical practitioners and only 35 conventional medical doctors in practice.

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.

The demand by majority 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 conserve biodiversity and protect threatened species. Systematic cultivation of these plants could only be initiated if there is a continuous demand for the raw materials.

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.

Table 1: Medicinal plants used by majority of the population and frequently cited by most traditional healers in Tanzania

Plant	Part used	Uses
1. *Cassis didymobotria L.*	Leaves	Anemia, Athlemintic, laxative
2. *Ficus stullmanii Walp.*	Stem bark	Treats chronic wounds
3. *Harrisonia abysinica Oliv.*	Roots	Bilharzia, chronic wounds
4. *Terminalia serica Burch.*	Roots	Diarrhea, vomiting, stomach problems
5. *Securidaca longipenduculata*	Roots	Treats infertility in both men and women
6. *Euphporbia quadrangularis pax*	Arial parts	General body weakness
7. *Entada abyssinica Steud.*	Root bark	Chronic cough, headache, stomach pains

8. *Albizia vesicolor Welw.*	Root bark	Anemia, Athlemintic, sterility in women
9. *Strychino heterodoxa Gilg.*	Roots	Inflammations and fevers
10. *Gnidia kraussiana*	Tuber	Constipation, swollen stomach

Source: Nshimo , 1888

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 deforestation, many of the medicinal plants and other genetic materials become extinct before they are even documented. Majority 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.

Africa has a long and impressive list of medicinal plants. *Securidaca Longepedunculata* is a tropical plant found almost everywhere in Africa. The dried bark and root are used in Tanzania as a purgative for nervous system disorders. One cup of its root decoction is administered daily for two weeks. Throughout East Africa, the plant's dried leaves are used for wounds and sores, coughs, venereal diseases sand snakebite. In Malawi, the leaves are used for wounds, coughs, bilharzia, venereal diseases, snakebite and headaches while in Nigeria they are used for skin diseases. According to one pharmaceutical researcher, the root is used in "Bechuanaland" and "Rhodesia" for malaria while the same part of the plant is used for impotence in "Tanganyika". Meanwhile, in Angola, the dried root is used as both a fish poison and (in botanical testimony to the power of love) as an aphrodisiac. The same dried roots have religious significance in Guinea-Bissau and are understood to have a psychotropic effect. The root bark is used for epilepsy in Ghana.

Table 2.Plants that are of common use in Africa and Madagascar; Source: Safowora, 1996.

Abrus precatorius L. (Leguminosae)
Acacia senegal (L.)Wild. (Mimosaceae)
Acokanthera ongiflora Stpf. (Apocynaceae)
Adansonia digitata L. (Bombaceae)
Agave sisalana Perine, ex Engelm. yllidaceae)
Ageratum conyzoides L. (Asteraceae)
Albizia anthelmintica A. Brongn. (Mimosaceae)
Quelques plante médicinales communes
Allium sativum L. (Liliaceae)
Aloe ferox Mill. (Liliaceae)
Alstonia boonei de Wild. (Apocynaceae)
Ammi visgana Lam. (Apiaceae)
Anchomanes difformis Engl. (Araceae)
Arachis hypogea L. (Lguminosae)
Aristolochia bracteata Retz. (Aristolochiaceae)
Astralagus gumifer Labill. (Fabaceae)
Azadirachta indica A. Juss. (Meliaceae)
Balanites aegyptiaca Del. (Zygophyllaceae)
Boerhavia diffusa Engelm. & A. Gray ginaceae)
Borreria verticillata L.G.F.W. Mey (Rubiaceae)
Calotropis procera Ait. F. (Asclepiadaceae)
Carapa procera Ait.f. (Meliaceae)
Capsicum minimum Mill. (Solanaceae)
Carica papaya L. (Caricaceae)
Carum carvi L. (Apiaceae)
Cassia senna L. (Leguminosae)
Catharanthus roseus G. Don (Apocynaceae)
Chenopodium ambrosioides L. (Chenopodiaceae)
Chrysanthemum cinerariaefolium Vis. (Compositae)
Cinchona succirubra Pavon. (Rubiaceae)
Cinnamomum zeylanicum Blume (Lauraceae)
Centella coreaceae Nannfd. (Apiaceae)
Crinum jagus (Thoriper) Dandy (Amaryllidaceae)
Cryptolepis sanguinolenta (Lindl) Schtlr. ocaceae)
Cymbopogon citratus Stapf (Graminae)
Datura stramonium L. (Solanaceae)
Euphorbia kamerunica pax (Euphorbiaceae)
Funtumia elastica Stapf. (Apocynaceae)
Glinus lotoides L. (Mollugo hirta L.) (aizoaceae)
Harrisomia abyssinica Oliv. (Simarubaceae)
Heliotropum indicum L. (Boraginaceae)
Hyoscyamus muticus L. (Solanaceae)
Jatropha curcas L. (Euphorbiaceae)
Kalanchoe crenata (Andr.) Haw. (Crassulaceae)
Lawsonia inermis L. (Lythraceae)
Mitragyna stipulosa (DC) O. Ktze (Rubiaceae)
Momordica charantia L. (Cucurbitaceae)
Morinda lucida Benth. (Rubiaceae)
Moringa pterygosperma Gaertn. ıgaceae)
Nauclea latifolia Sm. (Rubiaceae)
Nicotiana tabacum L. (Solanaceae)
Nymphaea lotus L. (Nymphaeaceae)
Ocimum gratissimum L. (Lamiaceae)
Olea europea L. (Oleaceae)

Parquetina nigrescens (Afz) Bulloch (Periplocaceae)
Peganum harmala L. (Zygophyllaceae)
Pergularia daemia Choiv. (Asclepiadaceae)
Plumbago zeylanica L. (Plumbaginaceae)
Phytostigma venenosum Balf. (Leguminosae)
Phytolacca dodecandra I. Herit. (Phytolaccaceae)
Piper guinense C.D.C. (Piperaceae)
Rapanea melanophloeos Mez. (Myrsinaceae)
Rauwolfia vomitoria Afz. (Apocynaceae)
Ricinus communis L.(Euphorbiaceae)
Securidaca longipedunculata Fresen. (Polygalaceae)
Securinega virosa (Roxb. Ex Willd.) Baill. (Euphorbiaceae)
Solanum nigrum L. (Solanaceae)
Spondias mombin L. (Anacardiaceae)
Strophanthus Kombe Oliv. (Apocynaceae)
Strychnos nux-vomica L. (Loganiacee)
Syzygium aromaticum L. (Myrtaceae)
Terminalia glaucescens Planch. Ex Benth. (Combretaceae)
Thalictrum rhynchocarpum Q. Dillon A. Rich (Ranunculaceae)
Thea sinensis Camellia (L.) O. Kuntze (Theaceae)
Theobroma cacao L. (Sterculiaceae)
Trema orientalis Blume (Ulmaceae)
Triclisia gilletii (De Willd.) Staner (Menispermaceae)
Voacanga africana Stapf. (Apocynaceae)
Warburgia ugandensis Sprague (Canellaceae)
Withania somnifera Dun. (Solanaceae)
Ximenia americana L. (Olacaceae)
Zanha golungensis Hiern (Sapindaceae)
Zanthoxylum (Fagara) Zanthoxyloides Waterman (Rutaceae)
Zingiber officinale Roscoe (Zingiberaceae)

In Africa, parts of medicinal plants can be seen at every market in urban and peri-urban centres these days. Traditional healers are now becoming more professional and organised making it easier to approach if only to seek information. The market for indigenous medicinal plants will continue to grow to absorb the products from the producers.

In 1996, TRAFFIC East/Southern Africa - the wildlife trade monitoring programme of WWF and IUCN - initiated an 18-month review of trade in wildlife medicinal resources in East and Southern Africa and Madagascar with the aim of identifying 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.

The study, published in the September 1998 Species in Danger Report *"Searching for a cure: Conservation of medicinal wildlife resources in East and Southern Africa"*, identified 102 medicinal plant species and 29 medicinal animal species as priorities for conservation and management action.

Plant species range from the well-known afromontane tree *Prunus africana*, to the Sudanese succulent *Aloe Sinkatana*, valued locally to treat a variety of ailments including skin diseases, fever, constipation and inflamed colon. Species regarded as common in some countries have also been identified as becoming scarce in others, such as the Baobab *(Adansonia digitata)*, which despite its wide distribution is experiencing a decline in Eritrea and Sudan.

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 these wildlife medicinals, and this situation represents a concern not only from the conservation point of view, but also because reduced availability of wildlife medicinals will have a negative effect on the health status of many people living in East and Southern Africa.

Table 3. TRAFFIC Evaluation of priority plant species in the region

Species	Countries reporting concern	Species	Countries resporting concern
ZINGIBERACEAE		SAPOTACEAE	
Siphonochilus aethiopicus	SW, ZA	*Chrysophyllum boivinianum*	MG
AMARYLLIDACEAE		GUTTIFERAE	
Boophone disticha	ZA	*Psorospermum febrifugum*	UG
Clivia miniata	ZA	MYRSINACEAE	
ASPHODELACEAE		*Rapanea melanophloeos*	ZA
Aloe polyphylla	LE	CAPPARIDACEAE	
Aloe sinkatana	SD	*Boscia salicifolia*	KE
Haworthia limifolia	ZA	*B. senegalensis*	SD
DRACAENEACEAE		*Cadaba farinosa*	TZ
Dracaena steudneri	ET	*Capparis erythrocarpos*	UG
HYACINTHHACEAE		SALVADORACEAE	
Boweia volubilis	ZA	*Salvadora persica*	SD
Eucomis autumnalis	LE, ZA	PITTOSPORACEAE	

Scilla natalensis	LE, ZA	*Pittosporum mannii*	UG
DIOSCOREACEAE		*P. senacia*	MG
Dioscorea dumetorum	TZ	*P. virdiflorum*	MG
ORCHIDACEAE		**ANISOPHYLLEACEAE**	
Ansellia africana	MZ	*Anisophyllea fallax*	MG
Vanilla decaryena	MG	**CRASSULACEAE**	
V.madagascariensis	MG	*Kalanchoe integrifolia*	MG
CUPRESSACEAE		**ROSACEAE**	
Juniperus procera	ER	*Hagenia abyssinica*	ET
STANGERIACEAE		*Prunus africana*	KE, UG, MG
Stangeria eriopus	ZA	**LEGUMINOSAE**	
CANELLACEAE		*Acacia mellifera*	TZ
Cinnamosma macrocarpa	MG	*Acacia seyal*	SD
Warburgia salutaris	MZ, ZA, ZW, SW	*Aeschynomeme abyssinica*	MW
W. stuhlmannii	KE	*Albizia brevifolia*	NA
W. ugandensis	KE, UG	*Baudouinia rouxevillei*	MG
LAURACEAE		*Caesalpinia volkensii*	KE
Cryptocarya aromatica	MG	*Cassia abbreviata*	MW
Ocatea bullata	ZA	*Dalbergia madagascariensis*	MG
HYDNORACEAE		*Delonix adansonioides*	MG
Hydnora abyssinica	SD	*Dolichos trinervatus*	MW
MENISPERMACEAE		*Elephantorrhiza elephantina*	ZW
Burasaia madascariensis	MG	*E. goertzii*	ZW
Jateorhiza bukobensis	MW	*Erythrophleum suaveolens*	MW
PASSIFLORACEAE		*Lanchocarpus bussei*	UG
Adenia olaboensis	MG	*Swartzia madagascariensis*	ZW
CUCURBITACEAE		**PROTEACEAE**	
Kedrostis foetidissima	KE	*Protea gaguedi*	NA
Momordica balsamina	NA	**GUNNERACEAE**	
DROSERACEAE		*Gunnera perpensa*	LE
Drosera madagascariensis	MG	**COMBRETACEAE**	
BOMBACACEAE		*Terminalia brownii*	SD
Adansonia digitata	SD, ER	**CORNACEAE**	
MORACEAE		*Curtisia dentata*	ZA
Ficus pyrifolia	MG	**CELASTRACEAE**	
Milicia excelsa	TZ	*Apodostigma pallens*	UG
EUPHORBIACEAE		*Maytenus buchananii*	UG
Acalypha fruticosa	TZ	*M. senegalensis*	UG
THYMELAEACEAE		**RHAMNACEAE**	
Synaptolepis kirkii	ZA	*Rhamnus prinoides*	KE
POLYGALACEAE		**ASCLEPIADACEAE**	
Securidaca longipedunculata	UG, ET, KE	*Asclepias glaucophyllus*	ZW
SAPINDACEAE		*Fockea angustifolia*	NA
Zanha africana	KE	*Solenostemma argel*	SD
BURSERACEAE		**BORAGINACEAE**	
Comniphora glaucesens	NA	*Ehretia amoena*	TZ
C. mollis	NA	**LAMIACEAE**	
ANACARDIACEAE		*Hoslundia opposita*	UG
Rhus lancea	ZW	*Plectranthu pseudomarrubioides*	KE
Rhus natalensis	UG	**PEDALIACEAE**	
Rhus vulgaris	UG	*Harpagophytum procumbens*	BW, NA
SIMAROUBACEAE		*H. zeyheri*	BW, NA
Balanites aegyptiaca	SD, ER	**COMPOSITAE**	
MELIACEAE		*Brachylaena ramiflora*	MG
Khaya senegalensis	SD	*Dicoma anomala*	MW, LE
PTAEROXYLACEAE		*Wedelia mossambicensis*	TZ
Cedrelopsis grevei	MG	**RUBIACEAE**	
RUTACEAE		*Gardenia spatulifolia*	NA
Haplophyllum tuberculatum	SD	*Rubia cordifolia*	ZW
Harrisonia abyssinica	KE, TZ	*Tarenna madagascariensis*	MG

Zanthoxylum chalybeum	KE, UG		
Z. gillettii	KE		
Z. usambarense	KE		
UMBELLIFERAE			
Alepidea amatymbica	ZW, LE, SW, ZA		
Steganotaenia araliacea	KE, TZ, MW		
GENTIANACEAE			
Anthocleista madagascariensis	MG		
APOCYNACEAE			
Cabucala erythrocarpa	MG		
Cerbera venevifera	MG		
Holarrhena pubescens	MW		
Rauvolfia conferiflora	MG		
R. oxyphylla	UG		
R. vomitoria	UG		

Source: Marshall, N.T. (1998).

Some of the general constraints with regard to medicinal plants and traditional medicine can be summarised as follows:

- **Lack of institutional support, strategies and programmes for production and dissemination of key species for cultivation.**
- **Lack of appropriate technology for post harvest and pre-processing purposes adapted productively and effectively.**
- **Lack of appropriate documentation and scientific experimentation for verification of herbalists' claims.**
- **Poor preservation of medicinal extracts for extended shelf life.**
- **Low prices paid for traditional medicinal plants by herbal medicine traders and urban herbalists.**

Some of the constraints associated with the processing of medicinal plants which may result in reducing their competitiveness in global markets and which have to be remedied are (Tuley de Silva, 1997):

- **Indiscriminate harvesting and poor post-harvest treatment practices.**
- **Lack of research on the development of high-yielding varieties, domestication etc.**
- **Poor agriculture and propagation methods.**
- **Inefficient processing techniques leading to low yields and poor quality products.**
- **Poor quality control procedures.**
- **High-energy losses during processing.**
- **Lack of current good manufacturing practices.**
- **Lack of R & D on product and process development.**
- **Difficulties in marketing.**
- **Lack of trained personnel and equipment.**
- **Lack of facilities to fabricate equipment locally.**
- **Lack of access to latest technological and market information**

II. AFRICAN NATURAL COSMETICS

Local peoples' perception and attitude towards skin care/beauty

Skin care practice in Africa is undertaken under several different practices. Among the common practices are:

Skin care and beauty

Skin care for beauty reason is common among females and particularly among urban dwellers. This is partly so because skin care perception among rural communities is closely associated with sexuality. The more a female cares for her skin, the more sexually active she is presumed to be. In a rural society where marriage is strictly guarded, skin care practices are at a low scale.

Skin care and individual peace of mind

A number of persons especially in urban areas undertake skin care practices for personal satisfaction and peace of mind. Skin care products on the market are favoured choices.

Skin care for newborn baby care

A common practice for skin care among newborn babies is associated with the perception that it protects the new born from illness. Herbs that are used daily to bathe and soak the newborn for 'skin care' may have relatively safe effects.

Skin care for secondary purposes

It is interesting that skin care in some communities is undertaken as a secondary activity. Cultural practices that range from heaping/digging potatoes, beer /wine making while using bare feet, to purposeful application of 'mud' during cultural rituals, care for pregnant mothers and new born, are known to have positive impact on skin appearance. Local techniques are therefore available that combine aspects of skin care using specific mineral and plant extracts for skin care.

Challenges in skin care in Africa

Demand for skin care products for skin toning and rejuvenating damaged or aged skin is a new area of concern in Africa. There has been a surge in skin care products to the extent that misuse of skin care products has emerged. De-pigmentation of skin and especially the face is a common problem especially among urban females. Partial cause for this problem is inadequate public education and an inadequate regulatory mechanism. Interests to refer to natural products for skin care is therefore an emerging area. Strategic mechanisms to harness available natural plant-based products for skin care and treatment is an urgent area to be addressed. Coupled with that is the need for conservation of the commonly harvested species.

Table 4. Some plants used as cosmetics in Mozambique

Scientific name	Family	Use	Part Used
1. *Diurocaryum zanguebarium*	Pedaliace	Shampoo	Leaves, stem
2. *Sesanum alatum*	Pedaliacea	Shampoo	Leaves
3. *Albizia versicolor*	Leguminosae	Detergent	Bark, roots
4. *Securidaca longepediculata*	Polygalaceae	Detergent	Roots
5. *Olax dissitiflora*		Beauty Cream	Stem's powder
6. *Euclea natalensis*	Ebenaceae	Dentifrice	Roots
7. *Diospyros vellosa*	Ebenaceae	Dentifrice	Roots
8. *Vepris lanceolata*	Rutaceae	Aromatic	Leaves

9. *Zanthoxylon capensis*	Aromatic	Leaves, bark

In Mauritius lay people routinely use the following plants as cosmetics:

- **Henna (*Lawsonia inermis*): The juice extracted from the leaves of the plant is mixed with lemon juice and applied to the hair as a conditioner and also as a natural dye. The natural dye is also used to stain hands and feet in rituals and celebrations.**
- **Curcuma (*Curcuma longa*) roots. The juice extracted from the roots is used as a skin conditioner and also to prevent skin infections. Curcuma forms part of hindu mariage rituals.**

Other plants commonly used for dermatological problems or for the improving skin conditions include:

- ***Sarcostemma viminale* (Asclepiadaceae): To remove warts.**
- ***Agave sisalana* (Agavaceae), *Centella asiatica* (Apiaceae), *Ipomoea pes-caprae* (Convolvulaceae): Improves skin conditions and heals.**
- ***Acacia concinna* (Leguminosae), *Cassytha filiformis* (Lauraceae), *Jatropha curcas* (Euphorbiaceae): Hair loss.**
- ***Aloe barbadensis* (Liliaceae), *Euphorbia prostrata* (Euphorbiaceae), *Manihot esculenta* (Euphorbiaceae): Skin rash.**
- ***Pongamia pinnata* (Leguminosae), *Plantago major, P. lanceolata* (Plantaginaceae), *Danais fragrans* (Rubiaceae), *Gaertnera psychotrioides* (Rubiaceae), *Mussaenda arcuata* (Rubiaceae), *Wikstroemia indica* (Thymelaceae): Skin lesions.**
- ***Danais fragrans* (Lam.) Pers. (Rubiaceae) : Cicatrising , treatment of skin diseases**
- ***Curcuma longa* L. Zingiberaceae : antiseptic**

In Zimbabwe the following plant materials are formulated as ointments, lotions and creams for cosmetics: *Aloe excelsa*, Pepper, Camphor, Coconut milk, Coconut oil, *Cymbopogon nardus, Heteromorpha tripholiata.*

Some plants used as cosmetics in West Africa:

SAPOTACEAE
***Vittelaria paradoxa* Gaertn.f.) ; Syn : *Butyrospermum parkii* (G. Don) Kotshy)**
LYTHRACEAE
***Lawsonia inermis* L**
***Centella asiatica* (L.) Urban: cicatrising**
BALSAMINACEAE:
***Impatiens balsamina* L. : insecticide , treatment of wounds.**
CUCURBITACEAE
***Luffa acutangula* (L.) Roxb.**
ERICACEAE
Agauria salicifolia (Lam.)Hook.f. ex Oliver var. salicifolia
Treatment of skin diseases.
EUPHORBIACEAE
Acalypha indica L.
treatment of dermatosis
LYTHRACEAE
***Lawsonia inermis L* : antimicrobial**
MELASTOMATACEAE
***Tristemma mauritianum* J. F. Gmelin**
(Syn.: *Tristemma virusanum* Vent.) : Treatment of skin diseases
MELIACEAE
***Turraea casimiriana* Harms –skin diseases**

MIMOSACEAE
Acacia concinna **(Willd.) DC.**
Skin protection,Insecticide
PAPILLIONACEAE
Desmodium triflorum **(L.) DC. : dermatosis.**
Pongamia pinnata **(L.) Pierre: cicatrising, insecticide**
ANNONACEAE
Annona squamosa **L. essential oil, perfumery**
Xylopia aethiopia **(Dunal) A. Rich.: Essential oil, perfumery**
APOCYNACEAE
Plumeria rubra var.acutifolia **(Ait) Woods, essential oil, perfumery**
ARECACEAE
Cocos nucifera **L. Massage oil for skin and hair, washing milk**
Elaies gunensis **Jacq. Cleansing cream, body soap**
BOMBACACEAE
Ceiba pentandra **(L) Gaertn. Massage oil for skin, makeup remover, and tonic lotion**
CAESALPINIACEAE
Cassia absus **L.: Washing lotion**
Cassia alata **L.: shampooing**
Cassia tora **L. : Makeup remover**
Daniella Oiliver **(Rolfe) Hutch et Dalz : Perfumery, hair care**
Tamarindus indica **L.: Makeup remover**
CACTACAE
Opuntia tuna Mill: **Makeup remover**
COCHLOSPERMACEAE
Cochlospermum tinctorium A. Rich. **Makeup remover, tonic lotion**
COMBRETACEAE
Anogeissus leiocarpus **(DC) Guill. et Perr. : Lotions**
CONNARACEAE
Cnestis ferruginea **DC. : Tonic lotions**
CONVOLVULACEAE
Ipomea batatas **(L) Lam: body cream**
CUCURBITACEAE
Cucurbita citrullus **L. : Body lotion, shampooing, and hair tonic**
Cucurbita maxima Duchesne: **hair lotion, body lotion, shampooing**
Cucurbita pepo **L.: Body and hair lotion**
Momordica balsamina **L.: Body soap**
CYPERACEAE
Cyperus articulatus **L. Perfumery**
Cyperus esculentus **L. Body lotion and hair tonic**
FABACEAE or PAPILLONNACEAE
Indigofera arrecta **Hochst.ex.A. Rich: shampooing**
LYTHRACEAE
Lawsonia inermis **L.: shampooing, hair tonic and perfumery**
MALVACEAE
Hibuscus esculentus **L: makeup remover, cream and lotion**
Carapa procera **D.C. Massage oil for skin and hair, hair lotion, washing milk**
MIMOSACEAE
Acacia nilotica var. adansonii **(Gnill et Perr.) O. Ktze : tonic lotion**
Albizzia lebbek Benth. **Shampooing, make up remover, washing lotion**
MORINGACEA
Moringa oleifera **Lam.: body lotion, washing milk, soap.**
OLACACEAE
Ximenia americana **L. washing milk**
PAPAVERACEAE
Argemone mexicana **L.: washing milk**
PEDALIACEAE
Carathoteca sesamoides **Endl. : Body soap and lotion**
Rogeria adenophylle **J. Gay ex. Delike: body soap, shampooing, and lotion and body milk**

POACEAE
***Vetiveria nigritana* Stapf. : Perfumery**
RUBIACEAE
***Borreria verticillatta* (L) G.F. W. Mey: makeup remover**
***Gardenia triacantha* DC. : Tonic milk and lotion, shampooing**
RUTACEAE
***Afraegle paniculata* (Shum et Thonn.) Engl : massage oil for skin, antiwrinkle milk and lotion**
***Fagara leprieurri* (Gnill et Perr) Engl. : Body and milk lotion, after-shave**
***Fagara zanthoxyloides* Lam: perfumery**
SAPINDACEAE
Paulinnia pinnata L: shampooing, milk and lotion tonic
SAPOTACEAE
Butyrospermum parkii (G.Don) Kotschy : massage oil for skin and hair, cream, protection against sun, emulsion after shave, toothpaste
SOLANACEAE
Solanum aethiopicum L.: body lotion and milk
STERCULIACEAE
***Sterculi setigera* Del: make up remover**
TAMARICACEAE
***Tamarix gallica L. (de F.T.A):* tonic milk and lotion**
TILIACEAE
***Corchorius olitorius L.:* make remover**
***Grevia bicolor Juss. :* Body milk and lotion, toothpaste**
***Grevia mollis Juss :* lotion and milk makeup remover, body milk and lotion**
VERBENACEAE
***Vitex doniana Sweet:* body and milk lotion, toothpaste**
***Vitex madiensis oliv :* cream, cleansing milk, shampooing, tonic milk and lotion**
ZINGIBERACEAE
Costus afer*. Ker : *skin nourishing creams and milk
***Balanites aegyptiaca (L.) Del:* body soap, shampooing, body cleansing milks, creams, and toothpaste**
***Tribulus terrestris L.* : perfumery, hair lotion, antiwrinkle body lotion and milk ant wrinkle creams, cleansing creams**

III. CHALLENGES AND CONSTRAINTS ON AFRICAN MEDICINAL PLANTS

Conservation and Cultivation

In order to sustain the sensible utilisation of medicinal and aromatic plants, conservation has to be kept as the central focus. In conducting research and development activities, plant parts from which the extracts are obtained have to be such that will not destroy the plant. Furthermore, the methods of harvesting the desired plant parts should take cognisance of the conservation of the plant. Ex situ cultivation of the desired medicinal and aromatic plants would be necessary so as to obtain raw plant materials grown under the same conditions of climate, ecology etc. The acquisition of large scales of land required for ex situ cultivation from government agencies can be a serious obstacle.

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 protection and conservation of medicinal plants does not take high priority on the agenda for natural resources management. Government programmes give priority to agricultural and wildlife resources. This is mainly due to the identified potential of such resources in contributing positively to national development. On the other hand, it could be that there is so much information about agricultural, forestry and wildlife resources as compared to medicinal

plants. This allows programmes to be developed for those systems that are better understood. The area of medicinal plants is left alone as a niche for traditional doctors.

Challenges in R & D

Research in chemistry and bioactive components of medicinal plants of Africa has been ongoing for quite some time, funded by multi-/ bi- lateral aid or non-governemental 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. 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 highly 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 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.

Furthermore research and training activities for traditional medicine has not received due support and attention. As a result, the quantity and quality of safety and efficacy data are far from sufficient to meet the demands of the use of traditional medicine in the world.

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 all scientists may not 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.

The economies of most African countries are subjected to immense and diverse pressures with varied competing interests. Science and Technology is usually the sacrificial lamb in view of the general notion that such investments do not yield immediate tangible results. Generally, therefore, the funds allocated for research equipment are indeed insignificant.

Process technology

Traditional herbal medicines are produced by the practitioner him/herself who was able to identify the correct plant species. As a result, there is no guarantee of the authenticity and quantity of plant material used in the preparations. The quality of traditional medicines so produced varies widely and may not even be effective. Therefore, there is a need to select proper and appropriate technologies for the industrial production of traditional medicines such that the effectiveness of the preparation is ensured. Traditional methods used have many disadvantages, which can be corrected by selecting suitable technologies to make them more effective, stable, reproducible, controlled and in dosage forms that can easily be transported. Hence the introduction of an appropriate, simple and low-cost technology should be encouraged maintaining as much as possible the labour-intensive nature of such activities, conservation of biodiversity through small-scale production and preservation of cultural knowledge.

Quality assurance

The control of the quality of raw materials, finished products and of processes is an absolute necessity if one is to produce goods for world markets and human consumption. The quality requirements for medicinal plant preparation are stringent in terms of content of active principles and toxic materials. Whereas the production of traditional medicines for local use does not require such stringent standards, what is produced will be a much more improved version of the already produced medicines using traditional methods. Quality has to be built into the whole process beginning from the selection of propagation material to the final product reaching the consumer.

Human resource development

Many African countries have a core of trained personnel in the fields of chemistry, biology, agriculture, pharmacology and pharmacy. They lack human resources in such fields as chemical engineering and technology. This can be considered a major constraint to industrial development.

Marketing

Marketing is an insurmountable problem besetting the development of the plant-based industry in African countries and marketability will be a crucial factor in determining the failure or success of these industries. The market outlets can be for local use or export. For local use, some products could reach the consumer directly while others have to be either further processed or used as secondary components in other industrial products. Hence user industries have to be promoted so that locally produced extracts can be used to save foreign exchange needed for importation of modern medicines. Substantial market promotion has to be undertaken in order to penetrate the world market. There is 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.

Value added products

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 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.

Increasing local support for R & D

Little input is at the moment forthcoming from local sources for research and development of medicinal and aromatic plants. Much of the meagre support is obtained from external sources and it is therefore important that there should be a matching fund from within. Majority of natural products chemists in Africa are, in the main, limited to work without access to expertise for identification of the constituents of medicinal and other plants of interest. They are often forced to work in the absence of or with inadequate facilities, particularly modern equipment as well as the manpower and technical resources for maintaining them. Under such circumstances, researchers are forced to seek the assistance of laboratories in developed countries. This situation

coupled with inadequate financial resources is a serious stumbling block to the development of natural products research in the continent.

Patenting

The cost of patenting any new drugs is relatively high for most African Scientists and institutions. In some cases, patent experts to advise on the various processes are not available. Furthermore, it is also known that plant materials cannot be patented in their native form. All those involved in R & D of herbal medicines should take cognisance of patent right requirements in their countries, Africa and the world. This is important in view of the varied requirements of different Patent Licensing Offices. Although it is true that plant materials cannot be patented in their natural form, efforts should be made to protect the processes involved in the development of herbal medicine as well as the novel uses of the product.

Traditional healers' associations have identified the high costs of filing patent applications as the biggest obstacle to the acquisition of patents by practitioners of traditional medicines. They have pointed out that the transaction costs of the formal system are beyond the capacity of the majority of informal innovators. In order to make the patent system more accessible to TK holders, one of the possible measures to reduce transaction costs could be collecting and filing of patent applications by traditional healers' associations on behalf of groups of informal innovators, which may allow TK holders to share transaction costs for acquiring and exercising patent rights.

International Market

The various markets available in the Western World for plant parts and extracts are not usually available to institutions and companies in Africa. Also, the quality requirements of standardised plant extracts are generally not met by most researchers in Africa due to lack of personnel and inadequate facilities and resources. Furthermore, the regular supplies of plant raw materials in adequate quantities on long-term basis cannot be guaranteed.

Table 5. 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							
Dennettia tripetala	?	Ghana				w	1
Apocynaceae							
Hunteria eburnea	bark	Ghana				w	1
Rauvolfia vomitoria	root	DRC Rwanda Mozambique				c	
Strophanthus gratus	fruit	Cameroon	1985-86 1990-91	1.1	Luxembourg Belgium (38%)	w	8
Strophanthus kombe	fruit				Italy (23%) Holland (13%) Germany (12%) France (11%)	w	3

					Spain (2.4%)		
Tabernaemontana elegans	seed	Mozambique	1981	0.6		w	9
Voacanga africana	seed	Cameroon Côte d'Ivoire	1985-86 1990-91		France	w, c	3
Voacanga thouarsii	seed	Cameroon				w, c	1, 2, 5
Combretaceae							
Terminalia sericea	bark	Mozambique		24-25	Germany?	w	9
Euphorbiaceae							
Ricinus communis	seed						
Fabaceae							
Duparquetia orchidacea		Ghana					
Griffonia simplicifolia	seed	Ghana Côte d'Ivoire Cameroon		75-80	Germany	w	1, 2, 5
Physostigma venenosum	fruit	Côte d'Ivoire Nigeria				w	1, 2
Liliaceae							
Gloriosa superba	seed	Mozambique	1981	0.1			9
Menispermaceae							
Jateorhiza palmata	root root	Tanzania Mozambique		0.7-24		w	4 9
Pedaliaceae							
Harpagophytum procumbens	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
Harpagophytum zeyheri	root	Namibia Mozambique Botswana				w	4
Ochnaceae							
Brackenridgea zanguebarica	bark	Mozambique	1981	0.1		w	9
Rosaceae							
Prunus africana	bark	Cameroon Madagascar Kenya,	1995	3190	France Italy Spain	w	3, 6

		DRC Uganda					
Rubiaceae							
Corynanthe pachyceras	?	Ghana				w	1
Pausinystalia johimbe	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.

Pilot Plant

Many R&D institutions and Universities in African countries do not have process facilities and are therefore unable to pass on their R & D findings to the industry. Since most African countries have not established pilot plants it is not possible to establish the process technology required for upgrading the R&D findings to semi industrial scale. Until the war in Rwanda, it was the only country known to produce plant-derived drugs as a viable activity.

The establishment of a good functional pilot plant needs a lot of investment. It is relatively expensive for most institutions and researchers involved in R & D of herbal medicine in Africa. Most entrepreneurs will not invest in phytomedicines vis-à-vis large-scale production, commercialisation and marketing until such products have been appropriately scaled up to pilot stage.

Lack of Basic Infrastructure

Infrastructural facilities like water, electricity, telephone, transport, communication etc., which are easily taken for granted in developed countries, are serious problems in various parts of Africa. This situation hampers R&D activities to varying degrees in different African Countries.

Political Environment

Civil unrest and change of government, common in Africa, has affected progress in the industrialisation of medicinal and aromatic plants in the continent. The cases of Rwanda and Guinea have been cited as examples. The recent civil war in Rwanda has seriously affected personnel and the productivity of the model pilot extraction plant in Butare while political change in Guinea has resulted in the closure of a company established to produce drugs from plants.

The political will of governments to develop traditional medicine and medicinal plants is paramount. Lack of government policy to develop medicinal plants industrially has been advanced as the reason for inactivity in some countries. Appropriate legislation and machinery to implement the provisions of the law are responsibilities of the government. Registration of TMP, establishment of curricular and laws to regulate traditional medicine practice all fall within the premise of government.

Foreign investors also consider the political situation in Africa, which they believe, is not favourable for serious investment. As a result, the badly needed financial resources for development of a traditional medicine industry remain a mirage.

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 intra-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.

Registration and property rights

Many African countries do not have procedures to register medicinal plant preparations although they are widely used for the health care needs of majority of the people. The regulations if any, are very stringent requiring the same standards expected of modern medicines. WHO published guidelines for the assessment of herbal medicines taking into account their long and extensive usage. These guidelines should encourage developing countries to relax some of the current regulations to be realistic in recognising the role of traditional medicines in the health care delivery systems.

Access to information

Data on medicinal plants is available in international journals and a number of databases. Many African countries lack the resources to subscribe to research journals or acquire access to these databases. In fact the data required by scientific personnel in developing countries with respect to technologies and methods used for processing and formulation of medicinal plants is not readily available in the literature or in the databases as some of these are patent-protected.

IV. ACCESS AND BENEFIT SHARING

The Convention on Biological Diversity, has as one of its objectives, "the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilisation of the genetic resource, including by appropriate transfer of relevant technologies, and by appropriate funding".
In recent years, many examples of agreements on benefit sharing and access to genetic resources have been developed. These are meant to ensure monetary and non-monetary benefits in the short and long term to the source country and communities.

Table 6. Example of main benefits obtained from bio prospecting (Source: FAO, 2000)

	Monetary benefits	Non-monetary benefits	Beneficiaries
Short-term benefits	Employment in research and development	Training in nursery, agronomic techniques and sustainable sourcing strategies	Local communities

		Training, capacity building, infrastructure, equipment and supplies, scientific exchange, supply of research results	National level
Long-term benefits	Potential alternative income generating scheme, Village Development Fund (funded by potential royalties) Potential royalties from commercial product		Local Communities

Short-term benefits, which are already provided during the research and development ("prospection") phase, are more promising and realistic. These so-called "process" benefits include advance payments, access fees provided in the form of lump sums or milestone payments. Advance payments are often used to establish trust funds that can provide immediate benefits to stakeholders. Short-term, non-monetary benefits include capacity building, training, technology transfer, equipment, and infrastructure and research collaboration.

Table 7. SOME IMPORTANT PLANT-BASED INGREDIENTS OF MEDICAMENTS (Source: FAO, 2000)

Ingredient	Plant species	Application		Climate zone	Main product basis
		Industrial	Traditional		
Aspirin	*Salix alba*	Pain-killer		Temperate	Synthetic
Atropine	*Atropa belladonna, Duboisia myoporoides*	Pupil dilatation, bradycardia, Parkinson's disease, asthma, traveller's diarrhoea	Same	Tropical	Synthetic
Digoxin	*Digitalis sp.*	Hearth failure, arrhythmia	Same	Temperate	Synthetic
Ephedrine	*Ephedra sinica*	Nasal decongestant	Same	Temperate	Synthetic
L-Dopa	*Mucuna deeringiana*	Treatment of Parkinson's disease	Same	Tropical	
Picrotoxin	*Anamirta cocculus*	Nervous system stimulus	Same	Tropical	Plant source
Pilocarpine	*Pilocarpus jaborandi*	Treatment of glaucoma	Same	Tropical	Plant source
Quininde	*Cinchona sp.*	Treatment of arrhythmia	Same	Tropical	Plant source
Quinine	*Cinchona sp.*	Antimalarial	Same	Tropical	Synthetic
Reserpine	*Rauwolfia serpentina*	Antihypertensive agent	Same	Tropical	
Scopolamine	*Hyoscyamus niger*	Treatment of motion sickness	Same	Tropical	Plant source
Taxol	*Taxus brevilifolia*	Ovarian cancer		Temperate	Plant source
Vinblastine	*Catharanthus roseus*	Treatment of Hodgkin's disease		Tropical	Plant source
Vincristine	*Catharanthus roseus*	Childhood leukaemia		Tropical	Plant source

Research undertakings and the commercial use stemming from that research have always relied on information provided by local communities that, in many cases, have hardly benefited from the research results. Any and all activities that seek to develop natural products from these regions need to

incorporate explicit reciprocal benefit programmes in early phases of their planning for the people and places from which the products come. TMP should be given due recognition and support in the development **of herbal medicines. Local communities need to be convinced about the purpose and willingness to share with them the future benefits of any new phytomedicine under development, if it finally scales through the clinical trial and registration processes. Training programmes should be organised for TMP so as to expose them to various ways of improving their formulations and practice as well as their limitations.**

Table 8. 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
Adhatoda robusta	?	?	Ghana (1)	-
Allanblackia floribunda	fruit	fat**	Cote d'Ivoire (2)	*
Ancistrocladus abbreviatus	?	?	Ghana (1)	-
Corynanthe pachyceras	?	corynanthine corynanthidine yohimbine	Ghana (1)	*
Dennetia tripetala	?	?	Ghana (1)	-
Duparquetia orchidacea	?	?	Ghana (1)	*
Griffonia simplicifolia	seed	BS11 lectin	Cote d'Ivoire Cameroon & Ghana (1,2,5)	*
Harpagophytum procumbens	root	glucoiridoids	Namibia (3)	*
Harpagophytem zeyheri	root	glucoiridoids	Namibia (3)	*
Hunteria eburnea	bark	eburine and other alkaloids	Ghana (1)	*
Jateoriza palmata	root	palmatrin jateorhizine colambamine	Tanzania (4)	*
Pausinystalia johimbe	bark	yohimbine	Cameroon (5)	*
Pentadesma butryacea	fruit	fat**	Cote d'Ivoire (2)	*
Physostigma venenosum	fruit	physostigmine (eserine)	Cote d'Ivoire (2) Ghana (1)	*
Prunus africana	bark	sterols triterpenes n-docosanol	Cameroon, Kenya, Madagascar (6)	*
Rauvolfia vomitoria	root	reserpine yohimbine etc.	DRC, Rwanda, Mozambique	*
Strophantus spp.	fruit	ouabain	West Africa	*
Voacanga africana	seed	voacamine	Cote d'Ivoire, Cameroon, Ghana (1,2,5)	*
Voacanga thouarsii	seed	voacamine	Cameroon (1,2,5)	*

Note: **Fat from *Allanblackia stuhimannii* fruits, used in soap making and cosmetic insustry (Lovett, 1988). Use of products from Jateorhiza now limited mainly to veterinary medicine (Oatley, 1979).**

References: 1=(Abbiw, 1990); 2= L. Ake Assi, pers. comm.: 3= (Nott, 1986); 4= J. Seyani, pers. comm.; 5= (FAO, 1986) ; 6= (Catalano et al., 1985).

Source: Cunningam ,1993

V.CONCLUDING REMARKS:

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.

In order for medicinal plants to be accepted in the medical field as alternative drugs, pharmacology research and the safety test of active ingredients have to be carried out. Production of standardised phytomedicines requires specialised expertise and pilot plant facility. 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 for and production of the most efficacious of herbal extracts, whether in tablet, capsule, powder, syrup, liquid or other form. 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 in order to ensure a sustainable supply of safe, effective and affordable medicinal herbs

VI. APPENDICES

Box 1 .*Ravensara aromatica* : a threatened aromatic species of Madagascar

***Ravensara aromatica* is one of 26 species of the genus *Ravensara* endemic to Madagascar. De Flacourt first described it in 1642, reporting that local people cut the tree simply to collect clove-flavoured seeds, which provide a well-appreciated dish when cooked together with ginger and fish. The plant grows mainly in the evergreen, humid eastern forests at mid-altitude, but is also found, albeit less frequently, in eastern coastal forests. Kostermans established its exact botanical identity in 1950, putting an end to confusion over whether R. *aromatica* and *R. anisata* were the same or distinct species.**

The plant has acquired commercial significance because of its essential oil content. Estragole (methyl chavicol) represents by far the major essential oil component of the stem barks, accounting for 90 percent.

Reasonable qualities of essential oils are exported although lack of adequate information makes it difficult to know the exact quantity exported.

The commercial success of *R. aromatica*, however, poses threats to its long-term survival. Massive destructive harvesting of stem bark takes place to produce small quantities of essential oils.

Indiscriminate collection occurs in some areas in response to growing demand from exporters and to farmers' requirements for additional income-generating activities. Therefore, forestry authorities in Madagascar should consider suitable measures for the long-term conservation and survival of *Ravensara aromatica*; (Source: Medicinal plant conservation, Vol. 4, December 1997, IUCN).

FAO, 1999

Box 2. Medicinal plants and patents in Zimbabwe
By Professor G. L. Chavunduka
President: Zimbabwe national traditional healers association (Zinatha)

More than 500 different types of plants are used for medicinal purposes in Zimbabwe. Many people use these traditional medicines every day. About 80% of the people in the country use these plant medicines at some stage of their illness. There are about 50,000 registered traditional health practitioners in Zimbabwe. They derive their income from harvesting, preparation and the sale of medicinal plants, and they also attend to patients. Besides the 50,000 professional healers, there are also hundreds of traders who derive much of their income from selling indigenous medicinal plants at the various urban markets. The medicinal plant industry, therefore, plays a critical role in empowering large numbers of people. The traditional health sector is an important segment of the Zimbabwean society in another way. It is estimated that around 4,000 tons of plant material with a value of Z$150m is used annually for medical purposes.

But the country is slowly losing some of these valuable medicinal plants and medical knowledge. Besides the destruction of forests our traditional healers have been victims of exploitation of their knowledge and medicines since the beginning of this century. Exploitation of the knowledge and medicines of traditional healers takes various forms. Many academics interview traditional healers and publish the results of such interviews without acknowledging the source of much of the information. Some modern medical scientists also interview and even observe traditional healers at work and then pass on the results of their investigations to established pharmaceutical companies. Traditional healers are also aware that many agents of foreign governments, pharmaceutical companies and research organizations have been coming into the country to collect specimens from traditional healers which they screen for specified biological activity at home then isolate active compounds and apply for patents for these active compounds. Traditional healers do not receive any form of compensation although a few are known to have agreed to sell off their knowledge and resources for a few hundred dollars. Thus, many medical scientists here and abroad seek access to our traditional knowledge for the primary purpose of developing more profitable products. Once healers share this information, they lose control over that knowledge. Moreover, if the material is eventually patented, monopoly patents can legally restrict access to this material.

The long-term consequences of the present trend are clear, as listed below:

- **a.) Thousands of traditional healers will loose their major source of income, they will become unemployed,**
- **b.) Many medicinal plant traders will be squeezed out of this indigenous market,**
- **c.) Many households will loose access to their basic consumer good,**
- **d.) Biodiversity and health care will be negatively impacted,**
- **e.) The declining supply of indigenous medicinal plants will generate significant economic losses to the country.**

Paper read at: National Workshop on the Development of Sui-Generis Legislation on Intellectual Property Rights (IPR) - Patents for Zimbabwe, Kadoma Ranch Motel Conference Centre, 6-10 September, 1998

BOX 3. Benefit sharing Model: The case of endod.

In Ethiopia, the berries of the African soapberry (Phytolaccadodecandra) are used to make a natural soap. In 1964, an Ethiopian researcher found that, in rivers where the women used endom (the indigenous name for the soap) to wash their clothes, the zebra mussel (Biomphalaria) seldom occurred. Apparently, endod was capable of killing the mussel. Since the zebra mussel can act as a host to the parasite causing the human disease bilharzia, the molluscicidal effect of endod was extremely useful to indigenous Ethiopian communities.

Endod can be produced without highly sophisticated technologies. The soapberry must be harvested-while still unripe, dried in the shade and then ground to powder. About 300 million people worldwide suffer from bilharzia, so a cheap alternative to synthetic molluscicides seemed very attractive. The only synthetic product available with similar toxicity and degradability characteristics was about 50 times as expensive. However, the chemical industry did not show much interest in producing endod. A product that can be produced that easily is not commercially attractive to them, according to one of the researchers involved. Obtaining funding for public-sector research and development also proved difficult: donor agencies such as the World Health Organization (WHO) target the bulk of their funds to research on AIDS

and malaria.

In the end, a research group at the University of Toledo, in the USA, picked up the research and began investigating whether endod could be used to remove the zebra mussel from the pipes of hydroelectric power plants. The University has now been granted a United States patent on the use of endod. To get the patent, it conducted one day of experimentation, then spent four months on legal and scientific work to verify the initial evidence. Opponents to the claim argue that the real work was done by Ethiopian scientists and, above all, by poor Ethiopian communities. ***(Cited by Bunders et al (1996))***

Source: M.S. SWAMINATHAN Research Foundation CHENNAI, 1998

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