Medicinal and poisonous plants of the tropics

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PREFACE

The present publication contains the proceedings of Symposium 5 - 35 "Medicinal and poisonous plants of the tropics" held on 30 July 1987 during the 14th International Botanical Congress at Berlin.

The contributions are by experts from all over the world. The great diversity of their papers on plants from different parts of the world makes it very attractive.

The compiler wishes to thank Professor Dr U. Jensen and Professor Dr N.G. Bisset for their advice; the Central Congress Committee, especially Professor Dr W. Greuter and Dr B. Zimmer for their efficient organization and invaluable assistance with the symposium; Dr I. Hedberg, who kindly replaced Professor Dr E.L. Ayensu, who was hindered, and chaired the symposium as symposium organizer.

A.J.M. Leeuwenberg

RESEARCH ON MEDICINAL AND POISONOUS PLANTS OF THE TROPICS - PAST, PRESENT AND FUTURE

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Summary

Plants have fed the world and cured its ills since time immemorial. A vast knowledge of medicinal and poisonous plants must therefore have accumulated, especially in the tropics, where the large majority of all higher plant species are found. But most of this knowledge only exists as verbal tradition and only a fraction is yet available to science. Less than 10% of all species have been subjected to investigations of secondary metabolites and their effects. Furthermore, the present trend is to concentrate the screening on relatively few species or groups of special interest. Since people in the tropics will remain dependent on herbal medicines for many years to come, the growing interest in those regions to save and utilize the knowledge found in traditional medicine is of utmost importance. In this connection it is alarming that it has become increasingly difficult to find young people willing to train as traditional practitioners, and that many of the plants used are threatened by extinction through exploitation of natural vegetation. The most urgent tasks for the future must therefore be documentation of the knowledge held by traditional practitioners, training of taxonomic botanists, development of tropical herbaria and conservation of ecosystems and medicinal plants.

Introduction

The use of plants in curing and healing is as old as man himself. But whilst industrialized countries during the last hundred years have gradually reduced the use of plant remedies these still play an enormous role in the tropics.

In tropical developing countries about 80% of the rural population depend for their health care on traditional practitioners, which also means that the people in the main have to rely on medicinal plants for treatment. This fact, together with the WHO programme launched in 1976 for the "Promotion and Development of Traditional Medicine" should, in my opinion, provide strong reasons for devoting considerable resources to research on medicinal plants in the tropics. In the developed world the use of such plants in medicine in developing countries is, however, often looked upon as obselete and largely based on superstition. Scientists in the western world working in so-called modern biology, like molecular biology and biotechnology, as well as those concerned only with the study of the compounds or with medicine as such, seem to have little understanding of the research need in this field. There are also strong antagonists to research programmes on medicinal plants among the decision-makers and funding agencies.

The past

In order to evaluate the prospects of medicinal plants research we must know something about the results already obtained. History is important since the past gives us the key to the present and should help planning for the future. Already many hundred years ago a vast knowledge had accumulated on plant species used for medicinal purposes. It is a matter of definition to state the time when the scientific research started on plants used in traditional medicine. But it would probably be safe to date it back to the late 18th century when investigations were carried out on the effect of, e.g., Digitalis (Withering, 1785).

Up to early 1800 the drugs were used raw or as simple extracts. A new epoch was initiated

when for the first time morphine was isolated from opium and from then on the interest seems to have gradually diverged from research on medicinal plants to research on plant medicines. In other words, the research became increasingly oriented towards the chemical aspects and the manufacturing of pure compounds (like strychnine, caffeine and quinine, etc.) and substances from tropical plants came to play a major role.

The improving possibilities to synthesize desirable substances meant that the searching of the plant kingdom for remedies diminished, more research instead being directed towards the synthesizing of new products. This downward trend is seen in the continuous decrease in the importance of medicinal drugs of plant origin, a fact that in 1941 made the Director of Harvard Botanical Museum, Dr. P. Mangelsdorf, predict that in another 25 years such drugs would be of little more than historical interest. In the new era the scientists obviously often forgot that the starting material for their research was nearly always natural compounds from plants known to be used in traditional medicine, and that their success in creating new medicines thus should largely be attributed to such substances.

It is possible that Dr. Mangeldorf's prediction might have come true - at least as far as the most sophisticated developed countries are concerned - were it not for a widespread tropical plant, extensively used in traditional medicine but until about 1950 ignored by the scientists. The discovery of potent substances in Catharanthus roseus in 1957 (Bernard,1967) turned the wheel. Although not explicitly stated, this discovery was probably a major reason for the changes in attitude towards research on plants used in traditional medicine, so eminently illustrated by the above-mentioned Dr. Mangelsdorf, who at a symposium in 1968 on "Plants in the development of modern medicine" made the following comment to his 1941 statement on the declining interest for such plants: "Twenty-seven years have now elapsed since I made this bold prediction and it turns out that I could hardly have been more wrong" (Mangelsdorf, 1972).

The discovery of oncolytic properties of the alkaloids in Catharanthus roseus has in 30 years resulted in hundreds of scientific reports and stimulated the search for other antitumour agents of plant origin.

In this context it is of considerable interest to note that the first report on Catharanthus roseus dates back to more than three hundred years. The first printed information on the species is given in 1658 in De Flacourt's "Histoire de la Grand Ile de Madagascar" (Boiteau, 1972). The description runs as follows: "Herbe ressemblante au Saponaria, qui a la fleure comme celle du Jassemine, l'une est blanche, l'autre est le coleur de pourpre, la racine est fort amère, de laquelle ils se servent contre le mal de coeur & est bonne contre les poisons; elle approche du Vincetoxicon ou Asclepias...." The comparison to the Asclepias is interesting since though it is obviously based more on medicinal properties of the plant than on morphology, it nevertheless indicates a relationship that has later been confirmed by systematists.

The case of Catharanthus roseus is by no means unique - as mentioned earlier, most of our modern medicines are based or modelled on compounds occurring in plants which have been used for hundreds or thousands of years in traditional medicine. In China attempts have been made for many years to integrate traditional and modern medicine, and the screening of plants for medical use is restricted to those used in folk-medicine; according to Chinese researchers random screening is not frequently used "since it requires much sowing but yields little harvesting" (Xiao Peigen, 1981).

It has also been shown by Perdue (1970) that screening of plants used in traditional medicine gives a significantly higher proportion of interesting substances than random screening.

A vast amount of knowledge on medicinal plants from the tropics has accumulated since ancient times. I will here only mention the documented knowledge in the Indian Ayurveda and the old Mexican herbals, and the knowledge carried for centuries through oral tradition in Africa.

The present

Literature on medicinal plants used in the tropics has proliferated during recent years,

ranging from exhaustive books on practically all scientific and traditional aspects in a country or an area to those based mainly on information about traditional use. Examples of the first kind are the renowned "Medicinal and poisonous plants of southern and Eastern Africa" (Watt and Brandt Breyerwijk, 1962) "Spices, condiments and medicinal plants in Ethiopia" (Jansen, 1981), "Medicinal plants in tropical West Africa" (Oliver-Bever, 1986), "Medicinal plants of East and Southeast Asia (Perry, 1980) and encylopedias like "The wealth of India" (1948-1976),. Examples of less extensive surveys, usually giving only the scientific and local names and accounting for reported local use are "Medicinal plants of West Africa" (Ayensu, 1978) and "Medicinal plants of East Africa" (Kokwaro, 1976). Furthermore, there are several journals dealing largely or exclusively with medicinal plants, like for example, Lloydia. This publication started in 1938 as "A quarterly journal of biological science", to be changed in 1961 (Vol. 24) into " A quarterly journal of pharmacognosy and allied sciences" and in 1970 (Vol. 33) into "A journal of natural products". Another relevant publication is the Journal of Ethnopharmacology, the first volume of which appeared in 1980.

A comprehensive survey of the present situation as regards research on medicinal plants in the tropics is given in "A world survey on medicinal plants and herbs" (Marini-Bettòlo, 1980).

Poisonous plants have been studied on and off for many years. Also in this field there is a considerable amount of literature; textbooks like "Giftpflanzen - Pflanzengifte" (Roth at al., 1984) as well as handbooks for certain areas, e.g., "Plantas tóxicas de Mexico" (Contreras et al. 1982), "Poisonous plants of Rhodesia" (Shone et al., 1965), and the above-mentioned volume by Watt and Brandt Breyerwijk.

Obviously, local knowledge about poisonous plants is rather limited, except for those with immediate effect, since plants known by scientists to be poisonous are used not only as vegetables but also for medicinal purposes. Thus, one reason for intensified research on poisonous and medicinal plants is that attention would be drawn to such plants, which could then be banned for further use.

Comprehensive studies in this field would also be very important with regard to plants consumed by cattle. According to recent studies (Aleljung, unpublished; Mugera et al., 1979, the high mortality especially in young cattle is probably often caused by consumption of poisonous plants. The cause of serious liver damage in calves has been traced back to milk from cows which have eaten such plants, e.g., Senecio spp. It is an intriguing question how such milk affects the children to which it is given. The effect on breastfed babies of poisonous plants eaten by their mothers, was discussed by Schoental already in 1955.

The renewed interest in the western world for plants used in traditional medicine, and the rapidly growing interest in developing countries to start research programmes in this area have, unfortunately, not emphasized the great importance of taxonomic botany and documentation for such research.

Taxonomic botany

Taxonomic botany often plays a significant role when it comes to grouping the plants for chemical analysis or to find a new source species for a desired substance. Presence or absence of a certain substance often coincides with morphological differences, earlier used in separating between species or groups. This refers, for example, to the distribution (presence or absence) of yeuhchukene in species of Murraya (But et al., 1986) and of certain alkaloids in Veratrum (Kupchan et al., 1961). Taxonomic studies can thus be of great importance in predicting the presence of active substance in certain groups.

Scientific names

Application of correct scientific names for plants used in traditional medicine also calls for botanical expertise. The WHO decision to adopt the most commonly used latin name for medicinal plants is most unfortunate - it goes without saying that it is essential to use in all contexts the correct scientific name of the plants.

Documentation

Proper documentation of any new phytochemical information requires that a voucher specimen is deposited in a public herbarium, so that the determination can be checked whenever required - erroneous namings, unfortunately, are quite common. Striking examples are given by Farnsworth and Morris (1976) of very expensive and elaborate research turning out to be a complete failure because of inadequate documentation. Only ten years ago Farnsworth and Bingel (1977) reported the following from a survey of the 1975 literature on the isolation of new chemical entities from higher plants: "Only 160 of the 2399 novel chemical compounds reported were isolated from plants for which the author(s) indicated that a voucher specimen was available for reference to the plant material investigated. There is even a 1975 paper, published in a reputable chemical journal, in which a new compound was reported isolated from a plant that was identified only as 'probably belonging to the Menispermaceae' "

In documenting the information on plants used in traditional medicine the blessing of recent decades, the computer, is of course of immense importance. However, when it comes to searching for literature, computer techniques have a considerable drawback in their limited possibilities to trace information. Only literature published after 1965 is available from data bases, which means that information published before that year stands a grave risk of being neglected.

One important difficulty in assembling and utilizing information on medicinal and poisonous plants is the uneven quality of existing information and the "spotty" character of scientific literature, as emphasized for poisonous plants by Kingsburg (1979). There has been too much uncritical compilation of poorly documented data.

The future

Judging from the large amount of useful substances already obtained from plants, and in view of the fact that only 7% of those now known to science have been properly investigated, research in this area offers a wide scope for the future. As mentioned earlier, programmes have been or are being elaborated in most developing countries and collaboration is now established between scientists in such countries and in developed ones. The fact that WHO encourages and supports such programmes should also be a stimulus towards extended research in this area. Unfortunately, there are serious obstacles and threats to such a development.

Constraints

One great problem is the lack of competent taxonomic botanists in developing countries as well as in developed countries. It is obviously very difficult to compete for funding with new or more directly applicable fields of biology. The situation is eminently summarized in a recent letter from one of my African colleagues: "It is difficult putting across convincing evidence for training of taxonomists but I wouldn't expect you to have that much difficulty in an enlightened and advanced society like yours. Research proposals are rejected because the benefits or end results of such proposals cannot be measured in money. The authorities have failed to realize that the knowledge of variation or diversity and the identification of wild species are of considerable potential to us in the tropics, where resources are diverse and probably still available."

Another profound difficulty is the lack of herbaria in many tropical countries. Quick and adequate naming of voucher specimens requires not only qualified botanists with access to relevant literature but also the availability of a reference herbarium, where determinations can be checked. Many developing countries still depend on the earlier colonial powers - or neighbours like south Africa - for such services, but dependence of this kind is a thoroughly unsatisfactory solution.

According to Fairbairn (1980) there are also a number of factors which at present hamper a

wider approach from the chemical side. One is the fact that scientists tend to look for compounds which are fairly easily isolated and crystallized. the very high proportion of alkaloids that figure in lists of active principles from plant sources during the last 150 years is probably due to their ability to dissolve in polar and non-polar solvents according to pH, which makes them easy to isolate, purify and produce in crystalline form. Isolation of the many other active principles in plants involves much more complicated processes, which means that phytochemical work on plants containing them is rather seldom initiated or may quickly be abandoned.

Another factor is the quantitative biological techniques - if a herbal drug does not produce a well-marked pharmacological effect which can be measured in animals, it will probably not be investigated scientifically (Fairbairn, op. cit.). This means of course that several traditional remedies that should be investigated are ignored because of lack of suitable techniques.

Also the requests from developed countries for clinical tests, toxicity testing and the study of possible side effects, which are very expensive and often take a considerable time, are factors which could easily turn away even the most devoted scientist.

Needs

I have mentioned earlier that screening of plants used in traditional medicine yields a much higher output of interesting substances than do plants sampled at random. From this it is obvious that a very important issue would be to inventorized the vast knowledge of the traditional practitioners in the tropics and to document it in an easily available system. This is an urgent task, often overlooked by scientists, since with the present rapid acculturation most of the present-day practitioners seem to be unable to find successors. This means that when they die their knowledge is lost forever. To quote a scientist who worked for many years in South America: "Each time a traditional healer dies it is as if a library has burnt down".

It is frightening that in most developing countries the half-life of existing local knowledge of traditional healers is probably not more than ten years.

Still more important is, however, to take steps towards a wiser use of the biological resources of the tropics. Plants have fed the world and cured its ills since time immemorial - now we are destroying their principal habitats at the rate of 50 acres every minute - or more than 100 000 square kilometers per year. In this simple fact lies one of the main threats for future development of research on and use of the medicinal plants of the tropics.

Gone are the days when lack of knowledge and understanding made it possible to regard the tropics as an inexhaustible source of new plants for food, medicines and technical products. Unfortunately the day has yet to come when governments and aid agencies realize the disastrous consequences of the present devastation of nature in the tropics.

For this the biologists are partly to be blamed since they should have the background knowledge to judge the effects of what is happening to the vegetation in tropical countries. The efforts of the few who, already twenty-five years ago, tried to influence aid agencies and governments were, unfortunately, left unheeded like voices crying in the wilderness.

Today, too many scientists are concerned only with their own very narrow field. It is extremely important for the future of research, not only on medicinal plants, that the scientists leave their ivory towers and make contacts with colleagues in other areas, as well as establishing better links with society.

In this connection it is essential to draw attention to one particular field, which is seldom regarded as scientific, viz. conservation. The fact that conservation of vegetation and species is impossible without scientific studies still seems to be difficult to grasp in most countries, be they developed or developing. The situation is already alarming in, for example, some parts of India where plants used for centuries in traditional medicine are on the verge of extinction (Jain and Mehar, 1980).

Without comprehensive effort to conserve the vegetation over large areas in the tropics not only species already known to be useful, but also many species not yet known to science,

will become extinct in the near future.

Certainly none of us would like to see that happen, but then we all have to make the needs for the future - not only our own sometimes very narrow ones - clearly visible to governments and to aid agencies and other funding bodies.

For far too many years the neglect in the field of conservation has played havoc with the biological resources in the tropics. We have now reached a fork in the road: Do we want to save what remains for the future use of mankind - or do we ignorantly allow it to be lost forever? The choice is ours!

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Medicinal Plants In Tropical Areas of China

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Summary

China is one of the world's leading countries in the use of medicinal plants. It has a long history in the use of herbal medicine -more than four thousand years. Today, medicinal plants and their preparations are very popular in China. Chinese herbal medicine plays an equally important role along with the use of synthetic drugs and antibiotics. The complex and diverse flora in tropical areas of China are important sources of Chinese herbal medicine. The multi-ethnic cultural backgrounds in the use of plants for preventions and remedies are an important medical heritage of China. A general introduction on medicinal plants in tropical China and a specific description about traditional uses of Dai herbs in southwest China will be presented using ethnobotany

Key words: herbal medicine, Nan Yao, Dai people, ethnobotany, ethnopharmacology.

Introduction

China is one of the leading nations in the use of medicinal plants. Chinese medicine is considered an integral part of Chinese cultures. This traditional knowledge based on human clinical trails and mainly derived from plants was systematically documented in a series of Bencao (Herbals) compiled throughout the last two millennia and refined in many books published in the last thirty-odd years. In China, Shengnongs Herbal is suggested to be one of the earliest sources of folk knowledge in the use of herbs since the period of Sheng-nong (3,000 B.C.). However the present literature validates that herbal medicine can be traced back to the Zhou dynasty (1,100 to 256 B.C.). An example is the book Shan-hai-Jing (Classics of the mountains and seas compiled during the period from Zhou to the former Han dynasty (403 to 221 B.C.) and annototed by Guo Pu of Qin dynasty. A large portion of the Chinese population today still depends on traditional Chinese medicine for their health care. This vast experience has frequently demonstrated conspicious effects on certain diseases such as less toxicity and undesired side effects often encountered in modern medicine. Today medicinal plants and their preparations are very popular in China. Chinese herbal medicine plays an equally important role along with the use of synthetic drugs and antibiotics. Chinese herbal medicine is estimated to amount to 30-50% of the total consumption of medicine, while in the remote mountain areas and minority regions the ratio may be 70-80%. Even in Hongkong where western medicine is readily available, a social studies survey in Hongkong conducted by the Chinese University of Hongkong, indicated that over 60% of the respondents often chose Chinese medicine as an alternative to western medications. In each of the last few years, Hongkong imported over one billion Hongkong dollars worth of traditional medicine.

The total Chinese medicinal plants number some 5136 species of which nearly 1,000 are commonlly used among different ethnic groups. The latest edition (1977) of Chinese Pharmacopoeia contains 641 listings of curde drugs derived from botanical origins. From floristic and phytogeographic points of view, nearly half of the medicinal plants are from the tropical areas of China, including Yunnan, Guangdong, Guangxi, Fujian and Taiwan, mainly in the areas where the latitude is below the Tropical of Cancer and the altitude extends from sea level to 1,400 meters (Yunnan). The total land area of tropical China is about 540,000 sq. km. of which mountainous and hilly terrain occupy nearly 70%. In this area live some 26 different ethnic groups with a population of approximately forty million. Each group has developed its own herbal medicine as part of its traditional culture. The richness in the flora and the diversity in the ethnogeography of tropical areas of China, provides us with a unique national treasure of plant lore for ethnobotanical and ethnopharmacological studies. Fundamental investigations on medicinal plants in tropical China have been carried out in the past two decades, using the following methodologies: ethnobotanical field studies in different areas; taxonomical identifications on vouchers in the herbariums; vital chemical compounds investigations at laboratories; and, pharmacology testing at modern standard levels, a number of new drugs, new plant resources for Chinese medicine, and new records for medicinal uses have been obtained. In this paper the anthor attempts to discuss the tropical components of Chinese medicinal herbs, and a brief introduction to the traditional herbal medicine of the Dai minority pepole in Xishuangbanna, Yunnan Province, as an ethnobotanical contribution to the Congress.

The Tropical Components of Commercialized Chinese Medicinal Herbs

In China, a specific term Nan Yao has been extensively used in classifying those commercial crude drugs from the south for thousands of years. Nan Yao can be explained as the tropical crude drugs components of commercialized Chinese herbal medicines. In the Chinese language Nan Yao means "drugs from the South". As Chinese civilization basically originated from central China, a relative concept of geographic location to indicate locations of objects was extensively used amongst Chinese culture since ancient times. Nan Yao not only means commercial crude drugs from southern China-the tropical areas of China-but emphasizes more the imported drugs from tropical Asia and Africa, which reached China by sea route via southeast Asia. Thus, Nan Yao is identified as commercial crude drugs from the tropica in Chinese medical culture.

Nan Yao is comprised of about 80 different species, 50 have botanical origins while the rest are from animal parts or products, Nan Yao makes up one-sixth of the total commercialized Chinese herbal medicines (about 500 species) that freguently are used by Chinese traditional hospitals and sold at herbal drugs stores or markets in the country. The same circumstances can be found in Tibetan medicine, Yang's report (1979) indicated that there are at least 40 types of Tibetan medicine used that are derived from tropical plants, occupying about one-tenth of the total Tibetan herbal medicine.

So far, there are about 40 species of tropical plants that can be used as Nan Yao. These have been recorded in tropical areas of China, and are listed below:

Table 1. Tropical Components of Commercialized Chinese Herbal Medicines in Tropical Areas of China

Herbal Name	Botanical Name	Constituents	Main Compounds	Indications	Distribution
Yang chun sha "Chinese Cardamom"	1. Amomum villosum Lour.	essential oil	Bornyl acetate camphor	stomachal distention	cult. Guangdong Guangxi Yunnan Fujian
Sushami "Wild Siamese cardamom"	2. A. villosum var. xanthoides T.L.Wu et Senzen	"	"	"	Yunnan
Rougui "Cassia bark"	3. Cinnamomum cassia (Nees) Blume	diterpenes tannin	cinazeylanol cincassiol cinnamtannin procyanidin	promotes absorption	cult. Guangxi Yunnan Guangdong
Ercha "Catechu gum"	4. Acacia catechu (L.) Will	tannin	melacacidin	astringent	cult. Yunnan
Tanxiang "Sandal wood"	5. Santalum album L.	essential oil	santalen santalol	analgesic, stomachal	cult. Guangdong Guangxi Yunnan
Maqianzi "Nux-vomica"	6. Strychnos nux-vomica L.	indole-alkoloid	strychnine brucine	antineoplastic	cult. Yunnan
(Substitute)	7. S. wallichiana Steud. ex DC.	"	"	"	Yunnan
Jiang zhenxiang (Substitute) "Sissoo of India"	8. Dalbergia odorifera T. Chen	quinone	Dalbergin Nordalbergin Isodalbergin	injury, stops bleeding, anti-rheumatic	Guangdong
Baidoukou "Krervanh"	9. Amomum kravanh Pierre ex Gagn.	essential oil	Lineole carvone	relieving dampness and stomachal	cult. Yunnan Guangdong
Caoguo "Tsao-ko"	10. Amomum tsao-ko Crevost et Lemarie	essential oil	eucalyptol geraniol	anti-rheumatism, stomachal	cult. Yunnan Guangxi Guangdong
Caodoukou "Tsao-kou"	11. Alpinia katsumadai Hayata	"	cardamomin alpinetin	relieving dampness, stomachae	Guangdong Guangxi
Dafengzi (Substitute) "Chaulmoogra"	12. Hydnocarpus hainanensis (Merr.) Sleum.	fatty acids	chaulmoogric acid, Hydnocarpic acid Garlic acid	antiseptic, antipruritic	Guangdong
Maboluo (Substitute)	13. H. merriliana Li	"	"	"	Yunnan
Shijunzi "Rangoon Creeper"	14. Quisqualis indica L.	amino acid	quisqualic acid	digestive, vermifuge	Yunnan

Herbal Name	Botanical Name	Constituents	Main Compounds	Indications	Distribution
Bibo "Jaborandi Pepper"	15. Piper longum L.	alkaloid	pipenin piplartine sesamin	stomachal stop-hiccup	Yunnan
Louye "Betel leaf"	16. P.betle L.	essential oil	chavibetol chavicol	diaphretic, stop cough	cult. Yunnan Guangdong Guangxi
Hujiao "Pepper"	17. P.nigrum L.	alkaloid	piperine piperitone	stomachal, corrective.	cult. Guangdong Yunnan
Shihu "Dendronbium"	18. Dendronbium nobile Lindl	alkaloides polysaccharide	dendrobine nobilonine	nourishing to the lung	Yunnan Guangxi Guangdong
Fengdou "Fengdou-dendronbium"	19. D.monili-forme (L.)Sw.	"	unknown	nourishing to the throat	Yunnan
Bajao "Star anise"	20. Illicium verum Hk.f.	essential oil	anethol	stomache, expectorant	cult. Yunnan Guangxi
Bichengqie "Cubeba seed"	21. Litsea cubeba (Lam.)Pers	essential oil	Citral limonene	indegestion, gastric pain	Yunnan Guangxi Guangdong
Qiannian-jian "Homalomena rhizome"	22. Homalomena occulta (Lour.)Schott	"	linalool	anti-rheumatica	Yunnan
Xuejie "Dragon's Blood"	23. Dracaena cambodiana Pierre et Gagn.	chromene	dracorubin dracorhodin	traumatic injury	Yunnan
Sanqi "Sanchi"	24. Panax notoginseng (Burk)F.H. Chen	saponin	ginsenoside Rb1, Rg1, etc.,	traumatic injury and tonic	cult. Yunnan Guangxi
Chenxiang "Aloes wood"	25. Aquilaria sinensis (Lour.)Gilg.	essential oil	agarospirol	promotes circulation, analgesic	Yunnan Guangdong
Anxixiang "Benzoin"	26. Styrax tonkinensis (Pierre) Craib	phenol	benzoic acid cinnamicacid	promotes circulation, expectorant	cult. Guangxi
Binlang "Betel nut"	27. Areca cathecu Lim.	tannin alkaloid	arecatannins arecoline arecaidiac	vermifuge, and digestive	cult. Yunnan Guangdong
Luhui "Curacao Aloe"	28. Aloe vera L.	anthroquinone	barbaloin	laxative	cult. Guangdong Guangxi
"Chinese Aloe"	29. A.vera L. var. chinensis (Haw)Berger	"	"	"	Yunnan
Sumu "Sappan wood"	30. Caesalpinia sappan L.	flavonoid	brazilin	promotes circulation and analgesic	Yunnan

Herbal Name	Botanical Name	Constituents	Main Compounds	Indications	Distribution
Kezi "Chebula"	31. Terminalia chebula Retz.	tannin fatty acids	chebulinic acid chebulagic acid	astringent tonic	Yunnan
Maokezi "Myrobalam"	32. T.belerica L.	tannin fatty acids	palmitic acid linoleic acid	astringent	Yunnan
Yuganzi "Emblica"	33. Phyllanthus emblica L.	tannin vitamin	ascorbic acid	antipyretic	Yunnan
Huhuanglian "Shensi"	34. Picrorhiza kurroa Royle ex Benth.	phenol glycoside iridoid glycoside	picroside Apocynin cathartic acid	relieving heat and dampness	Yunnan Tibet
Yadanzi "Brucea seed"	35. Brucea javanica (L.)Merr.	alkaloid	bruceantarin Bruceantin	antimalaria, diarrhoea wart	Yunnan Guangdong Guangxi
Fanxieye "Senna leaf"	36. Cassia angustifolia Vahl	dianthrone	sennoside A. B.C.D. Rhein	sennoside A.B.C.D. Rhein	cult. Yunnan Guangdong
"	37. C.acutifolia Delile	"	"	"	"
Dingxiong "Clove"	38. Eugenia aromatica Baill.	essential oil chromene	eugenin eugenitin acetyleugenol	aching teeth. stomachal, carminative, and corrective,	cult. Guangdong
Dayedingxiang "Broadleaf Clove"	39. E.caryophylla (Linn.) Thunb.	Chromene essential oil	eugenin eugenitin acetyl engenol	"	cult. Guangdong Yunnan
Pangdahai "Schaphium seed"	40. Schaphium lychnophorum Pierre	polysaccharide	Bassorin arabinose	throat-sore	Guangdong Yunnan

In the list above, many species are new records in tropical China, resulting from the botanical and medical research conducted by the author and his associates over the past two decades. The results of this study on basic medicinal plant resources of tropical China will provide an understanding of the value of that resource to the Chinese medical society, and will eventually reduce the traditional need for imported crude drugs from abroad.

The origin of Nan Yao in Chinese medical culture is particularly interesting to ethnobotany. From Table 1 above, we learned that more than half of the plants (28 spp.) in the list are native to China, many of them traditionally used as herbs by aboriginals for generations in tropical China, such as Sushami, Bibo, Xuejie, Keze, Qiannianjian, etc., but unknown to the Chinese druggists until the 1960's. Botanical investigations and ethnobotanical field studies revealed their distribution and medical uses in tropical areas of China, and ethnopharmacological testing proved these species worthy of medical value. Ethnobotanical speaking, it is important to know when and how the imported plant materials involved in Chinese herbal medicines became a part of the Chinese medical culture, because this reflects both the ancient

cultural exchanges and trading relationship between Chinese and people in tropical Asia and Africa, and it reveals different stages of human interections with those exotic species. For instance, some dyeing materials from tropical plants in the areas where they Originated, such as Dracaena draco, Daemonorops draco, Caesalpinia sappan, and Garcinia hanburyi have been used as Chinese herbal medicines for thousands of years. The history of appliance of those plants from dyeing materials among native people to herbal medicines in the Chinese medical culture should be studied in the context of ethnobotany.

Traditional Herbal Medicines of The Dai People in Xishuangbanna

Xishuangbanna covers 19,220 sq. km in the southern part of Yunnan within 21 10'—22 40' north latitude and 99 55'—105 51' east longitude. It has a tropical monsoon and hot—humid—river valley type of Climate which is typical of Southern Yunnan Province. Like other parts of tropical China, Xishuangbanna is inhabited by a number of different ethnic groups, in addition to the Han Chinese. These groups consists of the Dai, Hani, Yao, Jinuo, Bulong, Lahu, Lisu, Miao and other smaller groups in the mountain areas with a total population of 683,000 of which the Dai people comprise about one-third of the total population. Xishuangbanna as an autonomous prefecture of the Dai was established in 1952. The Dai people have their own traditional medicine called Dun-Ha-Ya Xishuangbanna in the Dai language. According to records from China's "A History of Yi Zhou Explained by Wang Hui," the Dai medicine has been put to practical use for more than one thousand years. They developed special medical skills and also more 500 prescriptions which were largely medicines taken from about 520 medicinal plants unavailable in other districts of China. These prescriptions have been put into a four volume set, Dai Medicine Herbs of Xishuangbanna, jointly published by the Yunnan Institute of Tropical Botany and the local government of Xishuangbanna. According to Dai traditional herbal medicine prescriptions, hand written on dried Palipot-palm Leaves and mulberry-paper, there were 111 ancient prescriptions recorded. These consisted of 105 plant and animal species belonging to 67 families and 97 generas frequently used by Dai's herbal doctors. These prescriptions have been translated and published in both Chinese and modern Dai language by the local government of Xishuangbanna in 1985.

As a recent development, carried out by researchers at Kunming Institute of Botany, over 520 species of medicinal plants use by the Dai people have been identified botanically, and some of them are being examined for chemical constituents. A number of new drugs and some siginficant compounds with biological activities have been discovered from Dai's herbal medicine in the past two decades. Listed below are some of them:

Vernacular Name	Botanical Name	Main Compounds	Indications
Yahulu	Cissampelos pareira L.	hayatine, curine	Hallucinogenic, muscle-relaxation
Masangduan	Rauvolfia yunnanensis Tsiang et P.T.Li	reserpinine ajmalicine	hypertension
Menghuo	Kopsia officinalis Tsiang et P.T.Li	kopsinine A.B.C.	throat-sore

Vernacular Name	Botanical Name	Main Compounds	Indications
Maidingbie	Alstonia scholaris(L.)R.Br	alstonine akummidine	cough herb
Gaohahom	Stelmatocrypton khasianum (Benth.)Baill.	2-hydroxy-4-methoxyl, benzoaldehyde	Cold herb, tonic herb.
Maidinglan	Maytenus hookerii Loes	maytansine maytanprine maytanbutine	herb tea. antineoplastic
Mihuowa	Tacca chantrieri Andre	taccanoside	antipyretic, antidote
Mahan	Michelia hedyosperma Law	safrole	stomachal
Maliang	Amomum aurantiacum Tsai et S.W.Zhao	nerolidol linalool	stomachal. distention
Mazhong	Cinnamomum glanduliferum Meissn.	camphor	stomachal. cold.
Heihauhong	Marsdenia tenacissima Wight et Arn.	tenacigenin A.B.C.	Cold. antipyretic
Maguihua	Embelia oblongifolia Hemsl.	embellin	vermifuge
Maguilan	E. ribes Burm.f.	embellin	vermifuge

Herbal medicines among the Dai, are mainly collected from wild tropical plant species in the local area. Dai villagers also grow some herb-food plants in their home gardens for family use. They do not sell herbs at their local markets, but they do trade certain medicinal plants with outside vendors for other ethnic groups' needs. Most Dai villagers are familiar with herb species used for food, but herbs used for treatment of specific illnesses are normally known only by village herbal doctors.

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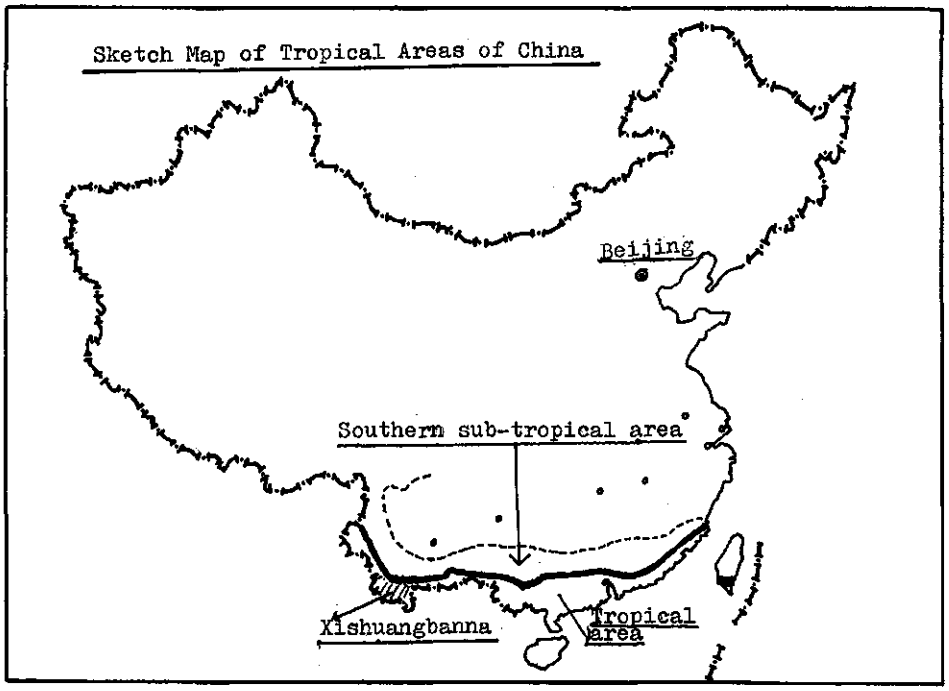

TROPICAL PLANTS USED IN CHINESE MEDICINE: POTENTIAL LEADS FOR PHARMACEUTICAL DEVELOPMENT

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Summary

Scientific studies on many tropical plants used in Chinese medicine, including those employed by ethnic minorities in southern China, have confirmed their reputed values and identified the active components, some of which have good potentials for pharmaceutical development. Our experience tends to support this observation. Selected leads based on ethnomedical information have helped us discover new bioactive compounds. For example, from Murraya paniculata was isolated a potent anti-implantation agent named yuehchukene (I). Further chemotaxonomic surveys on related species showed that yuehchukene is present only in members of Murraya section Murraya and in Merrillia. Similarly, abortifacient proteins are found in species of Momordica. To help us further advance in this field, a computer database is formed in collaboration with IBM, and a museum is established to document and verify the materials on the market.
Keywords: ethnopharmacology, Chinese medicine, tropical plants.

Introduction

Traditional Chinese medicine is a summation of over four thousand years of human experience in the selection of plants and other natural products for preventive and curative purposes in health care. This knowledge has been recorded systematically, in the last two millennia, in some 330 editions of bencaos (Chinese herbals). A unique feature of this series of bencaos is that they copied verbatim the key descriptions of each entry printed in preceding editions. This practice makes it possible for us to trace the development of Chinese medicine and identify the plants recorded in the bencaos with some certainty. A search through the major editions of bencaos indicated a gradual increase in the number of tropical plants, mainly through two channels: inclusion of medicinal materials selected by inhabitants in or near tropical parts of China and adoption of foreign medicines encountered in international trade and military expansion.

The oldest bencao known today is 'Shennong Bencao Jing', compiled around 100-200 A.D. It contains 357-367 entries (varying with different versions), of which 251-254 are plant materials. A few of the articles were derived from tropical plants, and they were available further north from the tropics mainly through cultivation, e.g., Benincasa hispida, Cinnamomum cassia, Dimocarpus longan, Lagenaria siceraria, Sesamum indicum, Zanthoxylum nitidum and Zingiber officinale. A few more are of rather wide distribution found also in tropical areas, e.g., Arthraxon hispidus, Centella asiatica, Cibotium barometz, Citrus maxima, C. reticulata, Coix lachryma-jobi, Croton tiglium, Cucumis melo, Dichroa febrifuga, Imperata cylindrica, Rostellularia procumbens, Vigna umbellata and Vitex trifolia.

In bencaos of the Tang dynasty (589-907 A.D.), there was a substantial

increase in the number of tropical elements, e.g., Abrus precatorius, Adenanthera pavonina, Aloe vera, Alpinia officinarum, Amomum villosum var. xanthioides, Anacardium occidentale, Aquilaria agallocha, Areca catechu, Blumea balsamifera, Caesalpinia sappan, Canarium album, Cassia fistula, Cocos nucifera, Curcuma aromatica, C. longa, C. zedoaria, Daemonorops draco, Dalbergia odorifera, Dolichos lablab, Dryobalanops aromatica, Garcinia morella, Ipomoea aquatica, Ixora chinensis, Luisia morsei, Metroxylon sagu, Musa sapientum, Myristica fragrans, Nephelium lappaceum, Phoenix dactylifera, Phyllanthus emblica, Piper betel, P. longum, P. nigrum, Pogostemon cablin, Pterocarpus indicus, Ricinus communis, Santalum album, Sapindus mukorossi, Styrax benzoin, Syzygium aromaticum, Terminalia bellirica, T. chubula and Uncaria rhynchophylla.

Bencaos of the Song dynasty (960-1279 A.D.) listed Alpinia galanga, A. oxyphylla, Amomum kravanh, Arenga pinnata, Baphicacanthus cusia, Litchi chinensis, Mangifera indica, Momordica cochinchinensis, Piper cubeba, Quisqualis indica and Vigna radiata.

In Ming dynasty (1368-1644 A.D.), the famous 'Bencao Gangmu' and 'Bencao Pinhui Jingyao' registered Acacia catechu, Alocasia macrorrhiza, Artocarpus heterophyllus, Averrhoa carambola, Bombax malabaricum, Clausena lansium, Jasminum sambac, Dracontomelon dupereanum, Elephantopus scaber, Garcinia mangostana, Hydnocarpus anthelmintica, Kaempferia galanga, Luffa acutangula, L. cylindrica, Momordica charantia, Pandanus tectorius, Tamarindus indica, Strychnos nux-vomica and Uncaria gambier.

In Qing dynasty (1644-1911 A.D.), the 'Bencao Gangmu Shiyi' as well as the 'Zhiwu Mingshi Tukao' and 'Zhiwu Mingshi Tukao Changpian' further added Acalypha australis, Afzelia xylocarpa, Annona squamosa, Brucea javanica, Capsicum frutescens, Carica papaya, Cinchona succirubra, Cycas revoluta, Eleusine indica, Homalomena occulta, Lantana camera, Melastoma dodecandrum, Mirabilis jalapa, Moghania philippinensis, Myroxylon pereirae, Opuntia dillenii, Oroxylum indicum, Phyllanthus urinaria, Plumeria rubra cv. acutifolia, Pratia nummularia, Psidium guajava, Rhodomyrtus tomentosa, Scaphium wallichii (Sterculia scaphigera), Spatholobus suberectus, Strychnos ignatii, Toddalia asiatica and Zehneria indica.

Since the 1930's, many Chinese pharmacognosy publications have appeared in modern formats, adding information on the binomials, chemistry and pharmacology of the medicinal plants. This trend reached its climax in the last three decades. By the directives of the Chinese government, a massive movement to document and utilize all the medicinal resources in China was organized. Detailed studies and extensive surveys were conducted in each province and by major institutions. The results were published in an array of monographs, handbooks, pictorials, floras, textbooks and pharmacopoeias. A preliminary analysis of these results revealed that a total of 1544 genera and 4941 species of vascular plants, as well as 171 genera and 332 species of nonvascular plants are known to be used in Chinese medicine (But et al., 1980,1985). Roughly two-thirds of the plants were not recorded in the major bencaos issued before the end of the Qing dynasty, and about half of these plants are found in tropical areas.

Biological activity

Among the tropical plants used in Chinese medicine, quite a number of them had their reputed values confirmed by scientific evaluation and the corresponding active constituents isolated. Some of the findings are

briefly summarised below:

1) Antineoplastic agents

Indirubin was isolated from the pigment refuse of the leaf of Baphicacanthus cusia. In a clinical trial of 314 cases of chronic myelocytic leukemia, 82 achieved complete remission, 38 partial remission and 87 beneficial effects; the total effective rate was 87.3%. Indirubin showed similar therapeutic effect as busulfan, but lower toxicity (Xiao, 1981). Two more active minor constituents, tryptanthrin and qingdainone, from this plant were found active against melanoma B_{16}. Qingdainone also showed inhibitory action against Lewis lung carcinoma in mice (Zou & Huang, 1985).

A number of quassinoids were isolated from the fruit of Brucea javanica. Some of them, including bruceolides, bruceantin, and bruceantinol, showed significant inhibitory action against P_{388} lymphocytic leukemia, L_{1210} lymphoid leukemia, Lewis lung carcinoma and B_{16} melanoma. Bruceantin has entered Phase II clinical trials in the U.S. National Cancer Institute (Cassady et al., 1981)

Perforatic acid was isolated from the root of Harrisonia perforata. Preliminary tests revealed that this compound markedly inhibited the incorporation of ^{3}H-TdR into mouse ascites hepatoma cells in vitro, the inhibitory rate being 91.19% (Wang et al., 1984).

An emulsion of the rhizome of Curcuma aromatica (C. wenyujin) has been used extensively in the clinical treatment of cervix cancer in China. Curcumol, curdione and ß-elemene isolated from the rhizome oil were identified as the active components (Anon., 1976a; Shi, 1981; Fu et al., 1984).

Two cytotoxic germacranolides named molephantin and phantomolin and a sesquiterpene lactone named molephantinin were isolated from Elephantopus mollis (E. tomentosus). Molephantinin showed significant inhibitory activity against Walker 256 carcinosarcoma in rats at 2.5 mg/kg, T/C=397% (Lee et al., 1975).

Maytansine, which has entered Phase II clinical trial in the U.S. National Cancer Institute for its antineoplastic activity, is found in many tropical and subtropical species of Maytenus in China. (Li et al., 1982). Nitidine chloride and 6-methoxy-5,6-dihydronitidine, from the root of Zanthoxylum nitidum, exhibited antileukemic activity against leukemia L_{1210} and P_{388} in mice and inhibited Lewis lung carcinoma. Allamandin from Allamanda cathartica, asperuloside, paederoside and deacetyllasperuloside from Oldenlandia diffusa, oldenlandoside from Hedyotis corymbosa, and daphnoretin from Wikstroemia indica also showed various degrees of antineoplastic or antileukemic effects (Lien & Li, 1985).

2) Parasiticidal agents

1'-Acetoxychavicol acetate from the rhizome of Alpinia galanga was identified as a fungicide against species of Trichophyton and Epidermophyton (Janssen & Scheffer, 1985).

Quisqualic acid was isolated from the seed of Quisqualis indica for the

treatment of ascariasis. L- and DL-quisqualic acids are the active forms, whereas the D-form has little effect (Gu et al., 1985).

Several quassinoids, isolated from the fruit of Brucea javanica, e.g., bruceantin, bruceantinol, bruceines and brusatol, showed in vitro and in vivo antimalarial activities against Plasmodia (O'Neill et al., 1987).

Yingzhaosu A and yingzhaosu B are probably artefacts formed in the root of Artabotrys hexapetalus (A. uncinatus) during storage in shade for two months. Both compounds have significant antimalarial activity in mice (Liang et al., 1979a,1979b).

Zincopolyanemine from the root of another member of Annonaceae, Polyalthia nemoralis, also showed antiplasmodial activty (Han et al., 1980).

Additionally, Dichroa febrifuga, a wide-spread species also found in tropical Asia, has been used for treating malaria for over two millennia. The active component was identified as febrifugine (dichroine), which has an anti-malarial activity about 98-152 times as strong as quinine hydrochloride (Xiao, 1981).

3) Anti-inflammatory and antimicrobial agents

1'-Acetoxychavicol acetate and 1'-acetoxyeugenol acetate, from the fruit and rhizome of Alpinia galanga, exhibited significant inhibitory action against ulcer in rats induced by pyloric ligation (Mitsui et al., 1976).

Good anti-inflammatory activity was exhibited by curcumin, isolated from the rhizome of Curcuma longa. This compound has entered phase II clinical trial in the Central Drug Research Institute, India (Rastogi & Dhawan, 1982).

Various preparations of Andrographis paniculata have been used in treating 7143 cases of bacterial infection; the total effective rate was 90.5%. The active components are andrographolide, deoxyandrographolide and neoandrographolide (Deng, 1978).

Fibraurea recisa has a high content of palmatine. Preparations of the plant and palmatine were used to treat over 1500 cases of infections; the total effective rate was 90% (Anon., 1977).

4) Cardiovascular agents

Rhynchophylline from the thorns of Uncaria rhynchophylla has antihypertensive effect (Anon., 1974). Recently, 3α-dihydrocadambine was isolated from the thorns of U. sinensis; its hypotensive activity was much stronger and longer lasting than that of rhynchophylline (Endo et al., 1983; Aisaka et al., 1985).

Dipotassium magnesium dioxalate dihydrate from the aqueous extract of the rhizome of Curcuma aromatica (C. wenyujin) exhibited significant antiarrhythmia effect (Zeng et al., 1982).

Four naphthalene derivatives from Eleutherine americana, namely, eleutherol, eleutherin, isoeleutherin and hangconin, increased coronary flow in isolated guinea pig hearts (Chen et al., 1984)

Nootkatol from the fruit of Alpinia oxyphylla has calcium-antagonistic and vasodilating activities (Shoji et al., 1984b). Another component of the fruit, yakuchinone A, showed cardiotonic action (Shoji et al., 1984a). Additionally, the latter compound strongly inhibites prostaglandin synthetase; its ID_{50} is 0.5 μM and thus its potency is about ten times stronger than that of indomethacin (Kiuchi et al., 1982a,1982b).

The total alkaloids of Rauvolfia verticillata have been used as a sedative and hypotensive in China. Reserpine, spegatrine and verticillatine exhibited acute hypotensive activity. Spegatrine was shown to be an α-adrenergic blocker, whereas verticillatine exhibited ganglionic blocking activity (Lin et al., 1985). Clinical application of verticillatine showed significant therapeutic effects in treating severe cases of hypertension, with little side effect (Zeng & Kao, 1986).

A synthetic derivative of febrifugine, changrolin, was found to have an anti-arrhythmia activity stronger than that of quinidine but lower toxicity. Clinical studies on 489 cases of arrhythmia showed an effective rate of 80.8% (Anon., 1978; Shen et al., 1983).

A number of cardiac glycosides, such as peruvoside, neriifolin, strophanthin and cerberin, were isolated from apocynaceous plants including Thevetia peruviana, Strophanthus divaricatus, and Cerbera manghas. Various preparations, such as thevetoside which is composed of neriifolin, cerberin and peruvoside, are used to treat cardiac failure (Anon., 1976b).

5) Agents acting on the nervous system

l-Curine, homoaromoline, methylcurine, hayatine and *d*-isochondodendrine were isolated from Cyclea barbata or C. hainanensis. A derivative of *l*-curine, *l*-curine dimethiodide, was tested in 210 cases; its muscle-relaxing effect was found comparable to that of α-tubocurarine (Tang et al., 1980). Dimethyl-*l*-curine dimethochloride, another derivative, was tested in 1252 cases of surgery, and showed satisfactory muscle-relaxing activity, with negligible adverse effect (Anon., 1981). Related taxa in Menispermaceae have also yielded an array of analgesic, muscle-relaxing and anti-arrythmia compounds, e.g., *l*-stepholidine, daijison and tetrandrine.

Piperine from the fruit of Piper nigrum was identified as an anticonvulsant. A series of derivatives of piperine were synthesized, and one of them, antiepilepsirine, was found to possess strong anticonvulsive action in clinical application (Pei et al., 1978,1979).

The aqueous extract of the stem of Erycibe obtusifolia caused strong miosis in rabbits. The miotic principle, baogongteng A, was subsequently isolated (Yao & Chen, 1979; Yao et al., 1981). A 0.025% solution of its benzoate was used as an eye drop in the treatment of over 350 cases of glaucoma, and its mitotic effect was equal to that of a 2% pilocarpine nitrate solution (Zhang et al., 1981; Anon., 1982).

6) Miscellaneous agents

Clinical evaluation of the root of Prismatomeris tetrandra confirmed significant therapeutic effect against silicosis. The active component was identified as an organic aluminum compound (Tu et al., 1981).

Rhizome of Costus speciosus contains significant amounts of diosgenin,

useful as a raw material for the production of steroidal hormones (Dasgupta & Pandey, 1970).

Gomphrena globosa, originally from tropical America, is used clinically to treat chronic bronchitis. 4',5-Dihydroxy-6,7-dioxomethylene-flavone-3-O-ß-D-glucoside was isolated from the plant and shown to have remarkable expectorant activity (Liu et al., 1981).

The polysaccharides from the bagasse of Saccharum sinense showed a range of nonspecific immunopotentiating activities by prolonging the survival time of mice irradiated with 8 Gy of X-rays, stimulated the phagocytic activity of macrophages, and antagonized the immunosuppressive action of prednisolone and cyclophosphamide (Jin et al., 1981).

Methyl helicterate, methyl helicterilate and helicterilic acid from the root of Helicteres angustifolia, exhibited hepatoprotective effect against SGPT elevation induced by CCl_4 (Liu & Wang, 1985).

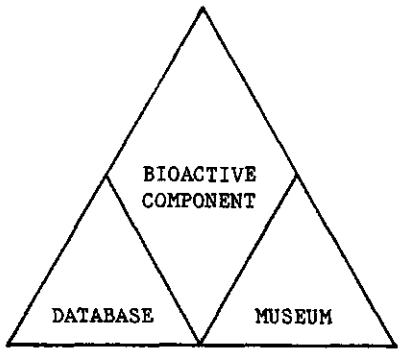
The above list of bioactive constituents from tropical plants used in Chinese medicine is not exhaustive, but serves to illustrate the range of potential therapeutic values of these agents. Indeed, a number of these compounds have been approved for commercial production as either fine drugs or semi-purified preparations in China, e.g., indirubin, antiepilepsirine, andrographolide, thevetoside, Curcuma oil, Prismatomeris tablet, and Uncaria alkaloids (Jiang, 1984; Xiao, 1983). Some of them have entered various phases of clinical trials in China and abroad, e.g., bruceatin, maytansine, nitidine chloride and curcumin. Although not all of them may pass the acid test of Western clinical scrutiny, their potentials in new drug development deserves further attention, either in the original or modified forms.

Besides the few examples cited here, there are many tropical plants included in Chinese medicines, waiting for chemical and pharmacological analysis. In my opinion, Chinese medicines derived from such tropical families as Acanthaceae, Annonaceae, Apocynaceae, Asclepiadaceae, Cucurbitaceae, Menispermaceae, Rubiaceae, Rutaceae, Simaroubaceae and Zingiberaceae are some of the best candidates for further studies, as they have a track-record of offering a wide variety of active components. Moreover, items employed by ethnic minorities in southern China have provided interesting leads, since some of their applications are different from those practiced in orthodox Chinese medicine. Some ethnic communities intentionally choose materials different from those used in orthodox Chinese medicine but retain the drug name used in the orthodox system, such as the substitution of Euphorbia ebracteolata with Alocasia macrorrhiza, and Albizia julibrissin with Magnolia coco. They are headaches to pharmacognosists working on standardization and quality control, but may also be leads to bioactive components of totally different structural designs from the ones known in the orthodox items. With the continuous progress in the development of new instruments, techniques and animal models, it is likely to increase the yield from such analysis.

Our experience

In 1979, Chinese Medicinal Material Research Centre was established in our University for organized multidisciplinary research on Chinese medi-

cines. Strategic programs conducted in the Centre can be graphically and symbolically presented in the following figure:

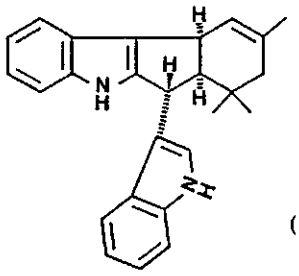


The supporting triangles represent the two key areas of devotion undertaken by the Centre, namely, a unique computer database on Chinese medicines and a museum of Chinese medicines. The computer database started in 1980 with the generous support from IBM which supplied both hardwares and softwares to the project, including the program STAIRS which is a very powerful and versatile system for information retrieval and matching. The database stores information on Chinese medicines translated in English and MESH terminology. It is continuously updated with new translations and abstractions of relevant papers on Chinese medicines published in Chinese (Lee et al., 1985). With this database and other international databases, we are able to screen published results and select the most promising and tangible leads for both chemical and biological assays. To share this database with colleagues interested in the subject, since October 1986 we have been issuing a quarterly journal in English, Abstracts of Chinese Medicines, which contains both abstracts of biomedical articles published in China (including Taiwan), as well as reviews on such topics as Chinese medicines with anti-atopy, anti-arrhythmia, anti-ageing, and radioprotective effects. The Museum, on the other hand, collects, documents and conducts research on the authenticity and standardization of Chinese medicines. For projects of the Centre, it helps to make sure that the correct material is used as decided by the project leaders. The diamond sitting on top of the two supporting triangles represents the research projects aiming at biological activity and bioactive components in Chinese medicines, including those derived from tropical plants. Projects currently undertaken include the search for bioactive agents for fertility regulation, heptatic diseases, cardiovascular malfunctions and immunopotentiation.

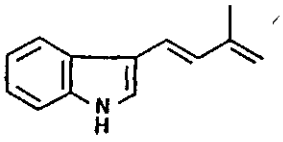
Some of our projects involved Chinese medicines derived from tropical plants. For example, the root of Murraya paniculata was noted to have been used as an ecbolic for delivery in women at full term (Anon., 1977b). Pursuing along this lead, Kong et al. (1985c) found a different fraction with strong anti-implantation activity. A chloroform extract of the root was shown to be 100% active in preventing pregnancy at 0.6 g/kg in a dose-dependent manner, when given to rats for ten consecutive days (PD_1-PD_{10}) right after successful mating and then autopsied on PD_{16}. Subsequent fractionation led to the isolation of a novel dimeric indole alkaloid, yuehchukene (I) (Kong et al., 1985a). Configuration of this compound was

confirmed by biomimetic synthesis (Cheng et al., 1985) and crystallography (Kong et al., 1985b). The pure compound was 100% active at 2.5 mg/kg dosing on PD_{1-2} or PD_{3-4}. Subsequent experiments pinned down the single dose/single day combination to 3 mg/kg on PD_2. Preliminary results with other bioassay models indicated insignificant estrogenicity, if any at effective dose levels (Kong et al., 1985c). It is safe to conclude that yuehchukene could be of tremendous value for further development as an oral-active postcoital interceptive (Kong et al., 1986a).

A search for yuehchukene and related analogs in other species of Murraya revealed that the distribution (presence or absence) of yuehchukene in members of the genus correlated with other morphological and chemical differences, for which reasons the genus was divided into two sections to reflect their infrageneric relationship (But et al., 1986; Kong et al., 1986b,c). The yuehchukene group was placed in Murraya section Murraya, and the carbazole group in Murraya section Bergera. This classification of Murraya into two sections has practical significance. Further search for the anti-implantation agent should concentrate on plants of section Murraya, but exploration for cytotoxic carbazole alkaloids should focus on taxa of the section Bergera.



(I)



(II)

Further taxonomic analysis led us to predict that the anti-implantation agent might be present also in Merrillia caloxylon, a plant belonging to a different subtribe of the Clauseneae. This tree is endemic to the Malay Peninsula and northern Sumatra. Subsequent analysis of the root and stem barks of the plant, indeed, showed the presence of yuehchukene and also its precursor, 3-(3-methylbuta-1,3-dien)indole (II). The yield of yuehchukene from this plant is higher than samples from Murraya studied. This exercise opens up an additional economic value of M. caloxylon, and helps to clarify the taxonomic relationship among Merrillia and the two sections of Murraya (But et al., 1987; Kong et al., 1987).

Similarly, in a study on trichosanthin, an abortifacient protein from Trichosanthes kirilowii which is extensively employed in China for population control, it was necessary to look into related species and genera for similar properties, with the hope that other abortifacient proteins may be present and offer clinical alternatives. Several new abortifacient proteins were thus isolated, including momorcochin from the seed of Momordica cochinchinensis and α- and ß-momorcharin from the seed of M. charantia (Yeung et al., 1980,1985,1987). These proteins were shown to prevent implantation and induce abortion in animal models (Chan et al., 1984,1985; Tam et al., 1984a,1984b,1985; Yeung et al., 1985). Moreover, these abortifacient agents from Momordica do not cross-react with the antibodies induced by trichosanthin, thus bypassing the hypersensitivity problems of the latter protein (Yeung, per. comm.).

As can be judged from the above two examples of the work done in our University, ethnopharmacological information serves as the basis of our selection of promising leads. Taxonomy often comes in to help us map the possible groups of plants for further analysis. This approach often optimises the yield of our search for bioactive agents. It also leads us to plants not previously known to have any medicinal value and new analogs with biological activity, such as in the case of Merrillia caloxylon. While along this subject, it should be mentioned that M. caloxylon is no longer available in the wild (D. Jones, per. comm.). This adds another example calling for proper conservation of the tropical flora and vegetation, especially when a high proportion of tropical plants have not been subjected to critical analysis and may thus offer new leads of pharmaceutical value.

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MEDICINAL PLANTS OF WIDE USE IN ZIMBABWE

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Summary

Information on Zimbabwe plants and their medicinal applications are presented. Botanical names, part used and manner of using preparations are described. Poisonous plants and their chemical principles are also given.
Keywords: traditional healer, disease, plant remedies.

Background

In Zimbabwe, as in most developing countries, the use of indigenous natural drugs is common place because modern life-saving drugs are beyond the reach of most people living in rural areas where the most accessible source of health care is the traditional healer. Indigenous plant remedies, whether prepared at home or prescribed by a traditional healer are therefore, widely used in the treatment of a variety of disorders in such areas (Chinemana, et al, 1985).

The reasons why many people in Africa tend to consult traditional healers have been enumerated (Bannerman, et al, 1983). Unfortunately, acute poisoning has at times followed a visit to a traditional healer (Joubert, 1984). History taking by the healer has often been unreliable and incomplete or non-existent (Nyazema, 1986). Most of the time, obtaining specimens of suspected poison is difficult or even impossible. When available, the specimens seen as crude extracts or a piece of root or bark, defy botanical identification.

There now is a growing interest in plant remedies on global basis (Bannerman, 1982). Traditional Medicine program was initiated after a review of a collaborative UNICEF/WHO study in 1973-4, concerning the health needs of the world. It was concluded in this study that alternative methods must be mobilised and used to meet minimum health care needs in the developing countries as opposed to the application of 'western' methods (including drugs) so that reasonable primary health care will be available for all people of the world by the year 2000, (Fransworth, 1984). Research into medicinal plants is therefore now being encouraged everywhere. In the long run, it is possible local pharmaceutical industry based on indigenous primary material might be established, (Velimirovic & Velimirovic, 1980).

An attempt has been made to provide information on indigenous plant remedies and some poisonous plants of wide use in Zimbabwe. This communication tries to answer the question, 'How can the well be dry when it is filled with water?', (Farnsworth, 1984). In Zimbabwe, we can say there is before us, a well filled with very clear water; only the

disinterested, ill-informed or naive scientist or health professional can look into the well and conclude that it is dry.

Information on the medicinal use of plants has been obtained from over 250 traditional healers practising in most parts of Zimbabwe and also from a household survey carried out in 1985. Most of these plants have been collected, prepared and deposited in the National Herbarium (Gelfand, et al., 1985: Chinemana, et al., 1985). The scientific name of the plant, its local name, collector and region it grows in Zimbabwe have been recorded. A reference of plants said or known to be poisonous is also available in, 'The Poisonous Substances File', at the Herbarium. Information on plants continues to be collected and the necessary phytochemical and ethnopharmacological studies on some of the plants have been started.

The flora in Zimbabwe contains more than 5000 species of flowering plants and ferns, of these not more than 1000 have vernacular names. A vernacular name implies that the plant has some use and the lack of vernacular name indicates possibly, that it is not used for medicinal purposes. A number of plants may not have any vernacular name because they are not indigenous. However, some medicinal plants introduced into Zimbabwe now have vernacular names.

As a rule, the traditional healers collect herbs personally from rural or peri-urban areas and either use them soon afterwards or dry and then pulverise them for easy storage. Some plants are seasonal, rare or grow at great distances. Often more than one plant will be used as a remedy by the traditional healer, cooked with food such as meat and beans. Wild animals parts and some insects might also be included in the mixture. A plant may be used for more than one disease as can be seen in the catalogue that follows. For example, **Cassia abbreviata** both the bark and root are used for abdominal pains, constipation and gonorrhoea. This implies that the plant constituents have both laxative and antibacterial properties. **Mondia whitei** is used for abdominal pains, anorexia, aphrodisia and constipation, meaning that the plant has appetite stimulating, approdisiac and laxative properties.

Most of the complaints that make people consult a traditional healer are symptoms of disease. One traditional healer may prescribe a certain herb for a particular disease, whereas the same herb is given by another healer from another region of the country, for a very different complaint. For example, some healers use **Aloe spp** for diarrhoea whilst others employ it as a purgative. The later would be more in line with the chemical constituents of **Aloe spp.**, aloin and methyl anthraquinone.

Catalogue of medical problems and medicianal plants used, (Gelfand, et al., 1985).

Abdominal pains

Cassia abbreviata, Oliv. bark and root, infusion or decoction taken orally.

Aloe spp. leaves, infusion taken orally.
Mondia whitei (Hook.f.) Skeels, root, powder taken orally.
Warbugia salutaris, Bertol.f., bark, decoction or powder taken in porridge.
Cissampelos mucronata A. Rich., root infusion taken orally.
Dicoma anomala Sond. tuber, infusion taken orally.

Abortifacients

Gnidia Kraussiana Meisn. tuber, infusion taken orally.
Aloe spp. leaves, decoction taken orally.
Trichilia emetica Vahl, bark, infusion taken orally.
Ricinus communis L. leaves, crushed, warmed and inserted into vagina in 1st trimester only.
Indogofera arrecta A. Rich. root, inserted into vagina.

Abortion, avoidance of

Ozoroa insignis.
Subsp. reticulata, Del. root, infusion taken orally.
Triumfetta welwitschii Mat, tuber, powder taken orally.
Terminalia sericea DC. root, powder taken orally.
Peltophorum africanum Sond. root, powder taken orally.
Maytenus senegalensis (Lam) Exell, root, powder taken orally.

Amenorrhoea

Vernonia amygdalina Del. root, infusion taken orally.
Steganotaenia araliacea Hochst. root, infusion taken orally.
Strychnos cocculoides Bak. root, decoction taken orally.

Anti-emetic

Terminalia sericea DC, root, decoction taken orally.
Dolichos kilimandscharicus Taub. tuber, infusion taken orally.
Dicoma anomala Sond. tuber, taken orally.
Anselli a africana Lindl. stem, decoction taken orally.
Annona stenophylla Engl. & Diels., root, infusion taken orally.

Aphrodisiac

Albizia antunesiana Harms, root, infusion taken orally.
Mondia whitei (Hook.f.) Skeels, root infusion taken orally.
Ozoroa insignis Del. root, decoction or infusion taken orally.
Cassine matabelica (Loes) Steedman, root and bark, infusion mixed with O. insignis & A. antunesianna.
Trichodesma physaloids (Fengl) A.D.C. tuber, powder taken orally in porridge or beer.

Asthma

Datura strammonium L, leaves, smoke inhaled.
Myrothamnus flabellifolius (Sond) Welw. leaves, smoke inhaled.
Euphobia ingens Boiss. latex, mixed with mashed B. speciformis dried and burnt, smoke inhaled.

Backache

Securidaca longepedunculata Fresen. ointment rubbed on back and infusion taken orally.
Dicoma anomala Sond. tuber mixed with Trichaderma physaloides root, infusion taken orally.
Ozoroa insignis Del. root or bark, infusion taken orally.
Maytenus senegalensis (Lam.) Exell, root taken orally.
Cissampelos mucronata A. Rich. root, infusion taken orally.

Bilharzia

Vigna unguiculata (L.) Walp. seeds cooked with Euclea divinorum root, then taken orally.
Lannea edulis (Sond.) Engl. root, infusion or decoction taken orally.
Terminalia sericea DC. root, cooked with seeds of Vigna unguiculata and taken orally.
Cissampelos mucronata A. Rich. root, infusion taken orally.

Constipation

Gnidia kraussiana Meisn. tuber, infusion taken orally.
Mondia whitei (Hook.f.) root, infusion taken orally.
Cassia abbreviata Oliv. bark, root and fruit, infusion, decoction or powder taken orally.
Elephantorrhiza goetzei (Harms) root, infusion taken orally.

Convulsions

Chenopodim ambrosioides L. leaves, rubbed on face.
Acacia amythehophylla Steud, ex A. Rich. root, infusion taken orally and washed with infusion.
Acacia karroo Hyne, root, infusion taken orally and face also washed with infusion.
Clerodendrum myricoides (Hochst.) Vatke leaves, head washed with decoction.
Lippia javanica (Burm.f.) Spreng. leaves, rubbed on face.

Diarrhoea

Elephantorrhiza goetzei (Harms), root, infusion taken orally.
Terminalia sericea DC, bark, infusion taken orally.
Aristolochia heppii Marxm. root, infusion taken orally.
Alepidea amatymbica Eckl. & Zeyh tuberous root, infusion taken orally.
Combretum molle G. Don, root, infusion taken by mouth.

Fever

Artemisia afra Jacq, leaves, decoction taken orally.
Blumea alata (D.Don) leaves, used as an enema.
Lippia javanica (Burm.f.), Sprang. leaves, a little sugar added to decoction taken orally.
Elephantorrhiza goetzei (Harms) root, infusion taken orally and patient sits in infusion.

Headache

Clematopsis scabiosifolia (DC) Hutch, root, powder sniffed.
Securidaca longepedunculata Fresen, root, powder sniffed.
Zanha africana (Radlk), root, powder sniffed and root powder applied to 'nyora', root boiled, steam inhaled.
Warburgia salutaris (Bertol.f.) Chiov. bark, applied to 'nyora' made on temples.
Alepidea amatymbica Eckl. & Zeyh. tuberous root, powder rubbed into 'nyora' made over temples.

Infertility

Vernonia amygdalina Del. root infusion taken orally.
Cissampelos mucronata A. Rich. root, infusion taken orally.
Cyphostemma junceum (Webb) Wild & Drummond, root taken orally.
Heteromorpha trifoliata (Wendl.) Eckl & Zehyh. root, powder taken orally.
Zemin caffra Sond. leaves, powder taken orally.

Madness

Securidaca longepedunculata Fresen, root, boiled and patient inhales steam.
Chenopodium ambrosioides, leaves, burnt and smoke inhaled.
Dioscorea spp, tuber, powder or infusion taken orally in food.
Tulbaghia leucanth Bak. whole plant, powder taken orally.

Malaria

Aristolochia petersiana Klotzsch root, infusion taken orally.

Measles

Dicerocaryum zanguebarium (Lour.) Merr. leaves, body washed and decoction taken orally.
Ricinus communis L seed, ointment applied to whole body.
Grewia flavescens Juss. leaves, nose and ear drop, infusion taken orally.

Pains

Securidaca longepedunculata Fresen. ointment applied to body.
Zanha africana (Radlk) root powder sniffed.
Aspilia pluriseta Schweinf. root, body washed in infusion.
Dicoma anomala Sond, body washed with infusion.

Rheumatism

Securidaca longepedunculata Fresen. root, applied to 'nyora' made on painful part.
Albuca melleri (Bak) Bak bulb, juice rubbed on body.
Urginea altissina (L.F.) bulb, juice rubbed in 'nyora' made on painful part.

Dioscorea spp. tuber, applied on 'nyora' made on painful part.
Clematopsis scabiosifolia (DC) Hutch. root, applied on 'nyora' made on painful part.
Venereal diseases

Gonorrhea

Cassia abbreviata Oliv. root, infusion taken by mouth.
Aloe spp, leaves, infusion taken orally.
Melia azedarach L. leaves, decoction taken orally.
Staganotaenia araliacea Hochst. root, infusion taken orally.
Schkuhria pinnata (Lam) Thell, leaves, decoction taken orally.

Syphillis

Annona stenophylla Engl. & Diels root, infusion taken orally.
Trichodesma ambacense Welw tuber, applied into 'nyora'.
Dichrostachys cinerea (L.) Wight & Arn, fruit powder applied on penile sores.
Swartzia madagascariensis. Desv. pod, powder applied on peline sores.
Ricinus communis L. root, juice applied on penile sores.

It is known pharmacologically that a therapeutic action of a drug in one situation can be a toxic or side effect in another. In other words, drugs are useful poisons if used properly. The only thing that distinguishes a poison from a remedy is the dose. Plants are known to be toxic at one stage of their growth and comparatively innocuous at another, for example, Aloe spp. Table 1 lists out poisonous plants that have been identified over the years by phytochemical research. But much remains to be done. It is possible that some of the toxic plants used may have real medicinal value when administered in subtoxic doses.

Table 1

Poisonous plants and their poisonous constituents
(Watt and Breyer/Brandwyjk, 1962; Frohne and Pfander, 1985)

Plant	Part	Constituents
Abrus precatorius L	seed	abric acid & abrin
Aloe spp.	leaves	methylanthraquinone
Boophane disticha Herb.	bulb	alkaloids
Bowiea volubilis Harv.	bulb	bufadienolides
Capparis tomenstosa Lam.	root	sulphur oil
Chenopodium ambrosiodes L	leaves	-

Table 1 (continued)

Combretum platypetalum Laws	fruit	-
Croton megalobotrys Muell. Arg.	bark & root	phorbol esters
Cucumis spp.	fruit	cucurbitacins
Dalbergiella spp	root	-
Datura stramonimum L	leaves & fruit	belladona alkaloids
Dichapetalum cymosum (Hook) Engl.	leaves	fluoroacetate
Dioscorea spp	tuber	histamine-like, substance Ca oxalate
Erythrophelum africanum (Beth) Harms	bark	muavin, cardiotoxin
Euphobia spp	latex	iugenol deriv.
Gloriosa superba L	tuber	colchicine
Gnidia Kraussianna	whole	mezerein
Manihot esculenta Crantz	tuber	manihotoxine, and hydrocyanic acid
Melia azedarch L	fruit	oil & azedarachtin
Monadenium lugardiae N.E. Br.	whole plant	toxic lectins
Nerium oleander L	whole plan	cardenolides
Nicotiana glauca R. Grah	leaves	nicotine
Peddiea africana Harv.	whole plant	mezerein
Phytolacca dodecandra L'Herit.	seed & leaves	lemmatoxin
Ricinus communis L	seed	vein
Securidaca longepedunculata Fresen.	root	methylsalicylate
Solanum spp	fruit	solanines (phytosteroids)

Table 1 (continued)

Spirostacys africana Sond	whole plant	diterpene esters
Strychnos cocculoides Bak.	fruit	strychnine
Trichilia spp	bark	-
Urginea sanguinea Schinz.	whole plant	cardioactive glycosides
Zantedeschia albomaculata (Hook) Baill.	rhizome	volatile acrid substances

Conclusion

People in rural areas of Zimbabwe will continue using herbal medicines as long as they are available because they have strong faith in them. Medicinal plants may be analysed for various constituents but there is no certainty as to which are the effective principles. It will obviously require painstaking scientific research to test the validity of these palative remedies. Whether these medicinal plant remedies will eventually be found to be effective or not, is of course, quite defensible from the ethnopharmacological perspective.

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SOME COMMON AFRICAN HERBAL REMEDIES FOR SKIN DISEASES: WITH SPECIAL REFERENCE TO KENYA

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ABSTRACT

Kenya like many other African countries, has a long history of traditional medicine which has been practised for many years and continue to play a major role in our primary health care. Before the arrival of the European missionaries and explorers with their modern medicine, our ancestors continued to live in this country, and naturally they would fall sick or get injured at certain times. There is no doubt that the largest human organ and the most susceptible to both diseases and physical attacks is the skin. I am therefore, going to discuss in this paper those indigenous drug plants used by Kenyans for the treatment of different skin diseases. Since not all skin diseases mentioned would always respond positively to traditional plant therapy, I am applying the term treatment in a broader context and avoiding the time curing. A disease such as Leprosy is even known to the herbalists as a difficult one to cure, however, the various plants listed under it are the ones which have been tried for treating it.

INDTRODUCTION

The skin is the membranous covering of the body which can be summarised into one medical term, cutis.

Starting from without moving inwards, the skin has the following layers:- horny layer (stratum corneum), clear layer (stratum lucidum),granular (stratum germinativum) and basal-cell layer (stratum basale), the last two layers being referred to as the germinative zone. All these layers collectively form what is known as the epidermis. The skin is the largest organ of the body, and apart from being the protective cover of the body surface, it also acts as a regulator of body temperature, controls excessive loss of water as well as organic and inorganic materials, and synthesizes several important substances used in the body. The outer cells of the skin are constantly being shed. But below the epidermis is a tough, flexible and elastic layer called the dermis which contains many blood vessels and is thicker than the epidermis. There are a variety of pigments in the skin, while skin colour is largely due to the presence of melanin and carotene. Melanin is a yellow to black pigment located in the basal epidermal layer found in all epidermal layers in all Kenyan of African origin. Exposure to ultraviolet radiation increases the amount and darkens the colour of melanin, thus leading to tanning and protection against radiation. Carotene, a yellow orange pigment is found in the fatty areas of the dermis and outer epidermal layer in Kenyans of Asian origin.

There are many kinds of diseases affecting the skin and some of the related terms are:- skin bleeding

(dermatorrhagia) blistering (epispastic, vesigatory), deficiency of pigment (albinism, alphosis, leucopathia), disease (dermatosis, dermatopathy), dryness (xeroderma), inflammation (dermatitis, dermitis), pain (dermalgia, dermatalgia) and many others. In modern medicine, the science of skin diseases is called dermatology or dermatopathology, while any relations to it is dermal or cutaneous or integumentary. Following closely the classification of skin diseases outlined in chapter 10 of the "Medicinal Plants of East Africa" (1976), we will now look at specific diseases and include some recent information I have gathered in this field. Wounds caused by snake bite and ectoparasitic diseases are not however, included in this discussion. The vernacular names following each scientific name are from the tribes who supplied the information about the plant.

There are four major groups of skin diseases to be covered in a tabular form as follows: Section A: Wounds (including sores and ulcers), Section B: Dermatitis, itches and rashes, Section C: Leprosy and Section D: Ringworm. Each section has a brief description of the disease concerned, and is followed by a table giving the botanical and local names of the plant used, part of the plant used, the preparation of the plant drug and how it is dispensed.

SECTION A. WOUNDS (INCLUDING SORES & ULCERS)

A wound is a breach in the continuity of body tissue, and is usually accompanied with bleeding due to the rupture of blood vessels. Most plants used in traditional medicine against wounds are of certain balsams and resins to stop bleeding and to help the wound heal. The other plants used for this purpose have astringent (binding) properties possibly due to the presence of such compounds like tannin. Both wounds and bleeding are common body problems, and have a wide range of plant remedies. The list being too long, I have decided to cover mainly the dicotyledons used in this purpose.

Table I: Wounds herbal remedies

BOTANICAL NAME	NATIVE/TRADE NAME	PLANT PART USED	PREPARATION/COMMENT
Acanthaceae			
Justicia striata	Kikalamion (Mar)	Whole plant	Crushed and juice used or burnt and ash applied.
Apocynaceae			
Tabernaemontana holstii	Kibombo (Digo)	Latex	Latex from leaves or stems applied directly onto the wound.
T. usambarensis	Kitondo (Luhya)	"	As above.
Asclepiadaceae	Kawala (Kamba)	Sap	Sap from crushed stems used.
Periploca linearifolia	Sinidet (Mar)	Latex	Latex from crushed stem. Contain glucoside periplocin
Stapelia semota	Kawala (Kamba)	Sap	Whole plant crushed and the sap used.
Bignoniaceae			
Kigelia africana	Masina, Mvongonia, (Taita), Muratina (Kik), Rotio (Mar), Yago (Luo)	Fruit	Juice from crushed fruit. Contain tannin.
Stereospermum kunthiamum	Maholu (Luhya)	Leaves	Infusion of crushed leaves.

Table I contd. Wounds herbal remedies

BOTANICAL NAME	NATIVE/TRADE NAME	PLANT PART USED	PREPARATION/COMMENT
Boraginaceae			
Ehretia cymosa	Murembu (Meru), Shekutu (Luhya)	Leaves	Infusion of crushed leaves.
Trichodesma zeylanicum	Nyalak-dede (Luo)	Leaves	Infusion of crushed
Burseraceae			
Commiphora africana	Mbambara (Swa), Mutungu (Kamba), Tola (Giriama)	Sap	Gum resin form.
Capparaceae			
Cadaba farinosa	Eren (Tur) Mvunya-vumo (Swa)	Leaves	Pounded dry leaves used.
Capparis cartilaginea	Chepteretwa (Mar)	Roots	Juice from crushed roots. Contain sulphur oil.
Maerua triphylla	Chokotwa (Pokot) Lito (Dor) Ol-oiresoi (Mas) Mulingula (Kamba) Mlala-mbuzi (Swa)	Roots	Root infusion used.
Combretaceae	Eguyen (Tur)		
Combretum molle	Kembel (Seb), Keyo (Luo), Kiama (Kamba) Mwama (Tai) Ol-mororoi (Masai)	Leaves	Used in place of cotton to cover the drug before finally using the dry banana peeudostem as a bandage.

Table I contd. Wounds herbal remedies

BOTANICAL NAME	NATIVE/TRADE NAME	PLANT PART USED	PREPARATION/COMMENT
Compositae	Ilusa (Luhya)		
Ageratum conyzoides	Kundambara (Swa), Oluoro-Chieng (Luo)	Leaves	Crushed and soaked in water or pounded and applied direct. Very popular with the Luo as a haemostatic.
Aspilia mossambicensis	Lilelie (Luhya), Mutanzi (Digo), Muti (Kamba), Raywetigo (Luo)	Leaves	Pounded and applied.
A. pluriseta	Muti (Embu, Kamba) Ol-oiyabase (Mas)	Leaves	Pounded and applied.
Crassocephalum crepidioides	Lifululwa (Luhya)	Leaves	Pounded and juice squeezed on to the wound.
Galinsoga parviflora	Jepkondewa (Mar),	Stems and Leaves	Pounded and juice squeezed onto the wound.
Gutenbergia fischeri	Ol-makirikirieny (Mas)	Leaves	Crushed and applied.
Gynura valeriana	Imbuni (Luhya)	Leaves and flowers	Powder from leaves or flowers applied.
Notonia sp.	Ini-la-ng'ombe (Digo)	Leaves	Pounded and juice applied.
Senecio lyratipartitus	Rwinkithia (Meru)	Roots	Dried, pounded and the powder applied.

Table I contd. Wounds herbal remedies

BOTANICAL NAME	NATIVE/TRADE NAME	PLANT PART USED	PREPARATION/COMMENT
Vernonia aemulans	Fuka (Digo)	Leaves	Dried and burnt and the ash rubbed on fresh wounds. Digo women use this to cure fresh cuts made on their abdomen as decoration. Vernonia have alkaloids.
Vernonia karaguensis	Muya (Luo) Navimuli (Luhya)	Leaves	Boiled and the decoction used for washing the wound.
V. lasiopus	Muatha (Meru), Muhasha (Swa), Muvatha (Kamba)	Leaves	Pounded and the paste put on the wound.
V. wakefieldii	Kiluma-ng'ondi (Taita)	Bark	Crushed and applied.
Crassulaceae			
Kalanchoe densiflora	Kuserwet (Kips) Kavila-mbodza (Gir)	leaves	The succulent leaves are are heated and the juice squeezed onto the wound.
Euphorbiaceae			
Acalypha racemosa	Mwadzaji (Digo)	Leaves	Burnt and ash used.
A. villicaulis	Mbagiria (Gusii)	Leaves	Soaked or boiled and the infusion used for washing the wound.
Croton macrostachyus	Musutsu (Luhya), Mutundu (Kamba, Kik) Mutundu (Meru)	Leaves	Crushed, soaked in water and the juice used.

Table I contd. Wounds herbal remedies

BOTANICAL NAME	NATIVE/TRADE NAME	PLANT PART USED	PREPARATION/COMMENT
Euphorbia grantii	Muthuri (Meru)	Branches, stem	Latex applied onto the wound to stop bleeding and as a cure.
E. hirta	Muziyaziya (Digo), Mwache (Swa)	Branches, leaves	The wound is covered with fresh leaves.
E. inequilatera	Lokile (Tur)	Branches, stem	Powder from dried and pounded parts used.
Hymenocardia acida	Okang'o (Luo)	Bark	Dried and pounded into powdery form.
Jatropha curcas	Mbogo-komo (Gir)	Latex	Fresh latex from leaves or stem used.
J. nogalensis	Jilba-dig (Som)	Latex	Used as above.
Synadenium grantii	Fangafa, Ofangafa (Luo)	Latex	Fresh latex from leaves and stems applied on fresh decoration marks cut on the surface of women's abdomen. The healing is accomplished with little swelling which is the decoration.
Ricinus communis	Castor oil plant (Trade), Libono (Luhya), Mbono (Swa) Mbonu (Taita), Odagwa (Luo)	Leaves	Young leaves crushed and applied onto the wound.

Table I contd. Wounds herbal remedies

BOTANICAL NAME	NATIVE/TRADE NAME	PLANT PART USED	PREPARATION/COMMENT
Labiatae			
Hoslundia opposita	Mdahamwita (Swa) Mutserere (Digo, Gir), Ofwong'o (Luo), Omufwofwo or Shikuma (Luhya)	Leaves	Crushed, soaked in water and applied.
Plectranthus sylvestris	Muoro (Meru), Nginga (Taita)	Leaves	Crushed and the juice squeezed onto the wound.
Satureja abyssinica	Kamungala (Kamba)	Whole plant	Decoction used for bathing by circumcised boys.
Lauraceae			
Ocotea usambarensis	Kivumba, Manyolo (Taita), E. African camphorwood (Trade), Muura (Meru), Muzaiti (Kik)	Bark	Pounded and the powder used for dressing wounds.
Leguminosae			
Acacia polyacantha	Falcon's claw acacia (Trade), Mkengewa (Bajun, Swa)	Leaves	Dried, pounded, mixed some oil and applied.
Cassia singueana	Muhumbu (Gir), Mukengaka (Kamba) Sisilamosa (Luhya)	Roots	Crushed soaked in water and infusion used for washing the wound.
Dalbergia melanoxylon	Mwengo (Meru)	Bark	Decoction used for cleaning wounds.
Dichrostachys cinerea	Dunguu (Taita), Etirai (Tur), Jirime (Bor), Mkingiri (Swa), Msativu (Boni), Mundua (Kamba), Okiro (Luo)	Bark	Pounded and applied

Table I contd. Wounds herbal remedies

BOTANICAL NAME	NATIVE/TRADE NAME	PLANT PART USED	PREPARATION/COMMENT
Erythrina abyssinica	Mjafari (Swa), Gorggorwa (Mar), Murembe (Luhya, Luo), Muuti (Meru)	Bark	Burnt and ash used.
Indigofera arrecta	Sarkelat (Mar)	Leaves	Crushed and juice used.
Leucaena leucocephala	Munyaa (Digo)	Roots	Burnt and the ash called "Kago" (Digo) rubbed onto cuts.
Malvaceae			
Abutilon fruticosum	Bolambal (Som)	Roots	Dried and pounded or burnt and ash applied.
Sida ovata	Uvyaio (Kamba)	Bark	Dried, pounded and applied.
Menispermaceae			
Cissampelos pareira	Libugu (Digo)	Roots and leaves	Burnt and the ash applied.
Monimiaceae			
Xymalos monospora	Mwawusungu (Taita)	Leaves, roots	Dried and pounded into a powdery form applied.
Ochnaceae			
Brackenridgea zanguebarica	Mchonga Mahana (Digo)	Roots	Dried and pounded into a powder (yellow).
Ochna mossambicensis	Muchu, Mpamapama (Digo)	Bark	Crushed and the paste applied.

Table I contd. Wounds herbal remedies

BOTANICAL NAME	NATIVE/TRADE NAME	PLANT PART USED	PREPARATION/COMMENT
Oleaceae			
Olea hochstetteri	Elgon Olive (Trade), Musharagi (Kik), Murguiwet (Nan), Ol-loliondo (Mas)	Bark	Burnt and the ash applied.
Pedaliaceae			
Josephinia africana	Comudu (Boni)	Roots	Pounded into powdery form, mixed with sheep's fat and used for dressing the wound.
Polygalaceae			
Securidaca longipedunculata	Mzigi (Digo, Swa)	Roots	Dried and pounded.
Polygonaceae			
Rumex abyssinica	Kinyonywe (Kamba)	Roots	Dried and pounded.
Rubiaceae			
Heinsia crinita	Mvunja-jembe (Digo)	Leaves, roots	Burnt and ash used.
Salvadoraceae			
Salvadora persica	Ethokoni (Tur), Kizungumoto (Taita), Mueza-moyo (Digo), Oremit (Mas)	Bark	Crushed and juice used.
Scrophulariaceae			
Rhamphicarpa herzfeldiana	Chepneskut (Kips) Esegi-elop (Mas)	Leaves	Crushed or pounded and juice squeezed on bleeding wound to stop bleeding.

TABLE I contd. Wounds herbal remedies

BOTANICAL NAME	NATIVE/TRADE NAME	PLANT PART USED	PREPARATION/COMMENT
Simaroubaceae			
Brucea antidysenterica	Kingame (Kamba)	Leaves	Pounded and mixed with ghee.
Solanaceae			
Solanum incanum	Sodom apple (Trade), Mtunguja (Swa) & many vernacular names	Fruits	For fresh wound, break the fruit and apply the juice. Contain alkaloid solanine, and is believed to be antibacterial.
S. nigrum	Ndulu (Kamba), Osuga (Luo)	Leaves	Pounded, soaked in water and the infusion used.
Withania somnifera	Kipkogai (Mar), Muanzo (Kamba)	Leaves	Burnt and the ash used, contain alkaloids.
Tiliaceae			
Grewia occidentalis	Aroya (Luo) Chomisiat (Dor), Ekeli (Tur), Mutuva (Kamba), Ol-neligwe (Mas)	Bark	As above. Both species contain tannin mucilage.
Triumfetta rhomboidea	Lohandi (Luhya), Miungu-moto (Digo), Tumone (Boni)	Roots	Crushed and juice squeezed onto the circumcision wound.

TABLE 1 contd. Wounds herbal remedies

BOTANICAL NAME	NATIVE/TRADE NAME	PLANT PART USED	PREPARATION/COMMENT
Verbenaceae Lippia javanica	Ang'we-rao (Luo), Murithi (Kamba), Ol-sinoi (Mas), Sulasula (Luhya)	Leaves	Pounded and applied.
Vitaceae			
Cissus quadrangularis	Macheso (Digo	Stem	The fibre from the stem used.
Rhoicissus revoilii	Mtambaa-dume (Swa)	Stem, roots	Dried, pounded and powdery form used; or crushed onto the wound.
R. tridentata	Durutua (Luhya)	Stem	Crushed and the juice squeezed onto the wound.

SECTION B. DERMATITIS, ITCHES AND RASHES

Dermatitis is broadly the inflammation of the skin, but strictly speaking, they can be of many types. Itch is a common symptom of many skin conditions, and refers to a peculiar irritating sensation in the skin. Rash is a lay term used for any skin eruption, but more commonly for acute inflammatory dermatoses. Rashes and dermatitis due to allergic or other causes are frequently treated with antihistamines which suppress histamin release. We also know that most antihistamines also relieve pruritus (itching). I have also found that a traditional remedy for itches are similarly used for rashes and other kinds of dermatitis. Drugs for traditional treatment of these diseases are often mixed with some oil or fat, notably ghee. This gives it both anti-inflammatory and cooling effects.

Table 2: Dermatitis, itches and rashes herbal remedies

BOTANICAL NAME	NATIVE/TRADE NAME	PLANT PART USED	PREPARATION/COMMENT
Acanthaceae			
Crabbea velutina	Jumao (Som), Kitabcheptarbus (Mar)	Whole plant	Dried, pounded and mixed with some oil.
Amaranthaceae			
Psilotrichum scleranthum	Chibiriti, Mkibiriti (Digo)	Leaves	As above
Asclepiadaceae			
Pergularia daemia	Kipche (Mar)	Leaves	Crushed and juice applied.
Bignoniaceae			
Spathodea companulata	Flame of the forest, Nandi flame (Trade) and many local names	Bark	Decoction used for bathing babies with rashes.
Compositae			
Aspilia pluriseta	Muti (Kamba) Ol-oiyobasa (Mas)	Leaves	Pounded and the paste rubbed on the infected part.
Crassocephalum mannii	Tergekwa (Mar)	Leaves	Decoction used for washing the body.
Sphaeranthus kirkii	Chipepo, Mupepo (Digo), (Digo), Kivrumbani (Swa)	Whole plant	As above
Euphorbiaceae			
Croton macrostachyus	Musutsu (Luhya), Mutundu (Kamba, Kik), Mutundu (Meru)	Bark & roots	Decoction used for bathing babies with rashes.

TABLE 2 contd. Dermatitis herbal remedies

BOTANICAL NAME	NATIVE /TRADE NAME	PLANT PART USED	PREPARATION/COMMENT
Labiatae			
Ajuga remota	Chebonyirar (Mar) Mataliha (Luhya)	Leaves	Pounded and juice rubbed on the infected part.
Leguminosae			
Acacia brevispica	Kiptare (Mar) Mughobari (Luhya), Ol-girigiri	Roots	Decoction for bathing. Contain mucilage and tannin.
Albizia gummifera	Mughonzulu (Luhya), Seet (Kips, Mar)	Roots	Pounded roots soaked in water for bathing. Contain kosotoxin.
Erythrina abyssinica	Kivuti (Kamba), Mjafari (Swa), Murembe (Luhya, Luo), Ol-goroshe (Mas)	Bark	Burnt and ash used.
Meliaceae			
Ekebergia rueppelliana	Kerbut (Mar)	Bark	Decoction used for bathing. Contain tannin.
Myricaceae			
Myrica salicifolia	Kitaloswa (Mar)	Leaves	Pounded, mixed with ghee and rubbed on the infection.
Myrsinaceae			
Maesa lanceolata	Kalatera (Luo) Lisebesebe (Luhya), Mborio (Mar)	Bark	Decoction used for washing the infection. Contain the glucocide embelic acid.

TABLE 2 contd. Dermatitis herbal remedies

BOTANICAL NAME	NATIVE/TRADE NAME	PLANT PART USED	PREPARATION/COMMENT
Oleaceae			
Olea africana	Wild Olive (Trade) Mutamaiyu (Kik), Tamiyai (Samb), Ol-orien (Mas), Yemit Tugen , Mar, Sebei)	Bark	Decoction used for bathing and some drunk.
Podocarpaceae			
Podocarpus falcatus	Podo (Trade), Benet Tugen , Elgy, Mar), Musengera (Kik)	Bark	As above
Polygalaceae			
Polygala erioptera	Agwonyo (Luo)	Whole plant	Crushed, mixed with ghee and rubbed on the rashes.
Polygonaceae			
Polygonum salicifolium	Burika (Luhya)	Leaves	Crushed, mixed with a little water and rubbed on the infection.
Proteaceae			
Faurea saligna	Mosambonet (Nan), Bwonget (Elgeyo), Sirirte (Mar)	Bark	Decoction used for bathing, and some drunk.
Rubiaceae			
Spermacoce princeae	Gakungathe (Kik), Murkugwet (Kips), Omotakiebo (Gusii)	Whole plant	Pounded, mixed with ghee and rubbed on the infection.

TABLE 2 contd. Dermatitis herbal remedies

BOTANICAL NAME	NATIVE/TRADE NAME	PLANT PART USED	PREPARATION/COMMENT
Sapindaceae			
Cadiospermum halicacabum	Binyna (Luo)	Leaves & roots	As above.
Sapotaceae			
Manilkara sulcata	Kurag (Boni), Mkuraki (Bajun)	Leaves and roots	Pounded and the paste rubbed on the infection.
Solanaceae			
Solanum incanum	Sodom apple (Trade) and many local names	Fruits	Cut the fruit and apply the content. contain the alkaloid solanine.
Withania somnifera	Kipkogai (Mar), Muanzo (Kamba)	Fruits	Cut the fruit and apply the content.
Vitaceae			
Cyphostemma cyphopetalum	Kiptora (Mar)	Leaves	Crushed and the paste applied on the infection.

SECTION C. LEPROSY is a chronic disease which affects primarily the nerves and skin but other organs can also be affected. It is caused by Mycobacterium leprae, and occurs in two forms: Tuberculoid leprosy, affecting the skin and nerves mainly; and Lepromatous leprosy. The two major types of leprosy: Tuberculoid and Lepromatous can occur in four forms depending on the individual resistance or tissue response to the bacilli. The four forms are Indeterminate, Tuberculoid, Borderline and Lepromatous. It is endemic to tropical and subtropical areas, and is an old disease mentioned in the biblical times. Although leprosy has not been easy to cure, the traditional medical practitioners have also played their part. Plant extracts, particularly oils have long been used to treat leprosy, though with limited success.

TABLE 3: Leprosy herbal remedies

BOTANICAL NAME	NATIVE/TRADE NAME	PLANT PART USED	PREPARATION/COMMENT
Amaranthaceae			
Cyathula cylindrica	Ng'atunyat (Kips)	Whole plant (including roots)	Boiled and the decoction drunk and used for bathing.
Asclepiadaceae			
Calotropis procera	Boah (Som), Etithuru (Tur), Mpamba-mwitu (Swa)	Bark and roots	As above
Boraginaceae			
Cordia ovalis	Sandpaper tree (Trade), Msasa (Swa), Muthia (Kamba), Mukuo (Meru, Kik), Ol-seki (Mas), Oseno (Luo)	Leaves and roots	The patient is exposed to a steambath of the decoction, the body is then washed with the decoction, and a pounded paste of the bark rubbed on the infections.
Combretaceae			
Combretum apiculatum	Kiama (Kamba)	Roots	Decoction drunk for the treatment of the disease during its initial stages.
C. molle	Eguyen (Tur) Kembel (Seb), Keyo (Luo), Kiama (Kamba), Mwama (Taita), Ol-mororoi (Mas)	Roots	Decoction drunk.

TABLE 3 contd. Leprosy herbal remedies

BOTANICAL NAME	NATIVE/TRADE NAME	PLANT PART USED	PREPARATION/COMMENT
Euphorbiaceae			
Acalypha ornata	Mtsatsa (Digo)	Roots	Decoction drunk 2 - 3 times a day, and also used for bathing.
Simaroubaceae			
Brucea antidysenterica	Kingame (Kamba)	Leaves	Pounded, mixed with ghee and rubbed.
Vitaceae			
Ampelocissus africana	Munwamadzi (Gir)	Roots	Decoction drunk and some used for bathing.

SECTION D. RINGWORM is a fungus infection of the skin and its appendages, and comprises infection by a number of genera of fungi of class Hyphomycetes. Some may only affect the skin e.g. Malassezia furfur and Cladosporum werneckii, whereas others go to the hair e.g. Piedraia hortai and Trichosporon beigelii. Cutaneous mycoses involving the hair and skin are produced by species of Microsporum and Trichophyton, and this is the group of various types of ringworm. The traditional treatment of the commonest type of ringworm which affects chirldren's head, is done by first shaving the head and thereafter apply whatever herbal medicine is prescribed.

TABLE 4: Ringworm herbal remedies

BOTANICAL NAME	NATIVE/TRADE NAME	PLANT PART USED	PREPARATION/COMMENT
Chenopodiaceae			
Chenopodium album) C. opulifolium) C. pumilio)	Nyatigotigo (Luo)	Leaves	Pounded, mixed with oil and the paste smeared on the infection. For head infection, the hair is cut short to the scalp before the drug is applied. Contain some oil like ascaridole and can be very effective.
Compositae			
Aspilia mossambicensis	Lilelie (Luhya), Muhepe (Digo), Muti (Kamba), Raywetigo (Luo)	Leaves, fruits	Pounded and rubbed on the infection.
Leguminosae			
Cassia didymobotrya	Ithaa (Kamba), Lubino (Luhya), Kilao (Meru), Mshua (Taita), Mwino (Kik), Omovenyu (Gusii), Owinu (Luo), Ol-senetoi (Mas), Senetwet (Kips, Mar,Nan),	Leaves	Pounded, mixed with oil and the paste smeared on the infection. Or burnt, as mixed with oil and smeared on the infection, the hair is cut short before the application of the drug.
Melastomataceae			
Dissotis senegambiensis	Manyas-olele (Luo)	Leaves	Pounded and the paste rubbed on the infection. Note the vernacular name manyas = medicine for, olele = ringworm.

TABLE 4 contd. Ringworm herbal remedies

BOTANICAL NAME	NATIVE/TRADE NAME	PLANT PART USED	PREPARATION/COMMENT
Oxalidaceae			
Oxalis corniculata	Awayo (Luo)	Whole plant	Pounded, mixed with ghee and the paste smeared on the infection. Contain oxalic acid in the form of acid potassium oxalate.
Sapindaceae			
Allophylus abyssinicus	Lusasari (Luhya)	Roots	Crushed, mixed with salt and oil and rubbed.
Cardiospermum grandiflorum	Burili (Luhya)	Leaves	Pounded and the paste rubbed on the infection.
Solanaceae			
Datura stramonium	Barutu, Chemongong' (Kips), Mwalola (Taita) Silulu (Luhya)	Leaves and seeds	Dry, grind, mix with ghee and smear on the infection. The plant is poisonous and contain alkaloids hyoscine, hyoscyamine and atropine.
Solanum incanum	Sodom apple (Trade)	Fruit	Cut or break the fruit and smear the juice on the infection. Widely used and believed to be effective. Contain alkaloid solanin, and is probably both antibacterial and antifungal.

CONCLUSIONS

The lore of the herbalist is unquestionably the treasure of Black African as a whole, a patrimony which we as modern scientists should preserve, propagate and improve on at all costs. We are currently experiencing a fast disappearance of the genuine traditional herbalists and a decline of authentic knowledge in traditional medicine. It is therefore, for the modern Kenyan biologists, chemists and doctors to find out the active principles contained in these plants and suggest how best such compounds can be made into modern medicines. In fact, these are the kinds of research which are giving the American and European scientists new discoveries in modern antibiotics and drugs.

ABBREVIATIONS

Bor.	= Boran	Kips.	= Kipsigis	Seb.	= Sebei
Dor.	= Dorobo	Mar.	= Marakwet	Som.	= Somali
Elgy.	= Elgeyo	Mas.	= Masai	Swa.	= Swahili
Gir.	= Giriama	Nan.	= Nandi	Tai.	= Taita
Kik.	= Kikuyu				

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PLANTS AS SOURCES OF ANTIMALARIAL AND AMOEBICIDAL COMPOUNDS

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Summary

A range of plant species is used in traditional medicine for the treatment of malaria and of amoebiasis. In vitro tests with Plasmodium falciparum and with Entamoeba histolytica have been used as a guide to the fractionation of active principles from a number of such plants. Some recent findings are reported and discussed.
Keywords: traditional medicine, malaria, amoebiasis, in vitro tests, active principles, Plasmodium falciparum, Entamoeba histolytica.

Introduction

In the struggle for survival, man wages constant war on a whole series of infectious diseases caused by viruses, bacteria, protozoa and fungi. Natural products, derived either from micro-organisms or from higher plants, have provided a wide range of drugs which are useful for the treatment of many of these infections. Chemotherapeutic pharmaceuticals are not necessarily available or affordable for the majority of the world's population and recourse is made to traditional remedies, primarily those derived from plants.

Two major diseases encountered in the tropics are malaria and amoebiasis, both due to protozoal parasitic infections. Higher plants provide the potent drugs quinine and emetine which are used for the treatment of malaria and amoebiasis, respectively. Eradication of malaria seemed to be practicable in the mid 1950s because of the introduction of a series of synthetic antimalarial drugs such as chloroquine, primaquine and pyrimethamine. In addition, the use of the potent and cheap insecticide DDT meant that it was possible to kill the anopheline mosquitoes which act as vectors for the malarial parasite. Since the mid 1960s there has been a dramatic change in the fight against malaria because multi-drug-resistant strains of parasites have emerged on a worldwide scale whilst the vector mosquitoes have developed resistance to insecticides (Nickel, 1983).

Today, malaria remains the single greatest infectious disease threat to the health of the world (Anon., 1984). In 1986, it was estimated that 400 million people live in countries where malaria is endemic and that 1600 million people may be exposed to the disease (Targett, 1986). There are four species of Plasmodium which are the causes of human malaria, P. falciparum (malignant tertian malaria, often fatal), P. vivax (benign tertian malaria), P. ovale (ovale tertian) and P. malariae (quartan malaria). In recent years, strains of P. falciparum, which are resistant to the commonly prescribed drug chloroquine and also to

other antimalarials, have spread throughout Asia, C. And S. America and parts of Africa.

Amoebiasis is caused by infections with the protozoan Entamoeba histolytica which exists in the large intestine as either mobile trophozoites or as cysts. Invasive trophozoites cause local ulceration in the large intestine with dysenteric symptoms which may lead to perforation and fatal peritonitis. If trophozoites move to other organs such as liver, they form abscesses and such widespread infections may be fatal. It has been estimated that in Asia, Latin America and Africa for 1977-1978 there were 400 million infections annually with 30,000 deaths and 1.5 million cases of the disease (Warren, 1986). A series of pharmaceuticals is available for the treatment of amoebiasis including emetine, chloroquine, diloxanide furoate, paramomycin, 8-hydroxyquinolines and metronidazole. The latter drug is currently the drug of choice but it does have some disadvantages in that it is not well tolerated by some patients and has been reported to cause tumours in experimental animals.

Plants and malaria

Quinine, from the bark of Cinchona species, was considered to be an obsolete drug in the 1950s but due to the current resistance crisis it has been re-introduced into malaria treatment. In addition, the successful clinical use of Artemisia annua (qinghau) and its active principle, artemisinin, for the treatment of cerebral malaria in China, has also helped to highlight the role of plants as potential sources of new antimalarials. Species from some 152 genera of higher plant are listed in the natural product data base NAPRALERT for their use in the treatment of malaria by traditional medicine (Farnsworth, 1985). These medicinal plants are not restricted to a narrow geographical range but are distributed pantropically.

Despite the widespread use of plants as antimalarials, there has been only one extensive research investigation which has attempted to assess their activities against Plasmodium species (Spencer et al., 1947). Some 600 different plants representing 123 families of flowering plants were selected largely on the basis of literature references to their use as antimalarials or as febrifuges. Species were collected from tropical countries throughout the world and extracts were prepared using either water, methanol or ethanol. The antiplasmodial activity of the extracts was estimated by comparing their ability to reduce infections of P. gallinaceum in chicks and of P. cathemerium and P. lophurae in ducklings in comparison with quinine. Two families, in particular, produced a series of active extracts. Some 68 different plant collections from the Simaroubaceae were investigated and notably active were Castela tortuosa, Simaba cedron and Simarouba amara. However, the antiplasmodial activity was generally associated with toxicity to the avian hosts and hence the therapeutic usefulness in man was questioned. The Amaryllidaceae yielded a number of active extracts from the 48 plants which were tested and of specific interest was the activity of Cooperia pedunculata and Hymenocallis caribea. In both cases, activity was associated with alkaloidal fractions but the low yields and somewhat erratic results hampered a more definitive exploration. Active extracts were obtained from leaves, roots and stems of Dichroea febrifuga and the bark of Cornus florida whereas varying degrees of activity were reported for extracts of Aristolochia species, Cissampelos pareira, Croton species, Datisca

glomerulata, Eryngium foetidum, Gentiana species, Remijia peruviana and Schultesia lisianthiodes.

The conclusion was made (Spencer et al., 1947) that none of the plants offered unqualified therapeutic promise for malarial infections in man. However, it was noted that the projection of results of treatment of experimental malaria infections in poultry to the clinical treatment of malaria infections in man is difficult and requires extensive experimentation. Thus it was pointed out that further research into the structure determination of isolated compounds, their synthesis and synthetic modifications were needed and might lead to useful drugs for parasitic infections.

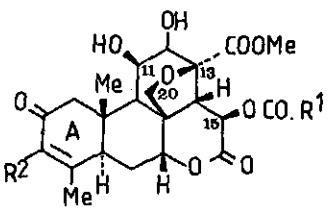
The study of Spencer et al. (1947) revealed that several plant extracts possessed antiplasmodial activity in birds and that these plants deserve further detailed study. It should be emphasised that, when this work was undertaken 40 years ago, there was no good model for testing activity in vitro against human malaria and that the chromatographic techniques which are now invaluable for the separation and isolation of natural products were only in their infancy whilst spectroscopic methods for structural determination of active compounds were merely flights of fancy.

We have undertaken a programme of research which follows directly from the work of Spencer et al. (1947). In recent years, with the successful cultivation of malaria parasites (Jensen and Trager, 1977), in vitro antimalarial tests have been described which have made it possible to assess the ability of compounds to inhibit the growth of P. falciparum by measuring the reduction in incorporation of [^{3}H]-hypoxanthine into the parasite (Desjardins et al., 1979; Fairlamb et al., 1985). We have used this test successfully with crude extracts of plants in order to determine their activity against a multi-drug resistant strain of P. falciparum and have shown that the test system differentiates clearly between the Chinese antimalarial plant Artemisia annua and the British mugwort, A. vulgaris (IC_{50} values of ethanolic extracts 3.9 and 250 µg ml^{-1}, respectively) (O'Neill et al., 1985). Three species of Simaroubaceae, Brucea javanica from Thailand, Simaba cedron from Panama and Ailanthus altissima introduced into the U.K. from India, were extracted sequentially with light petroleum, chloroform and methanol and the extracts evaluated for their in vitro antiplasmodial activity. In each case, the most active fraction proved to be that extracted by chloroform; elution on polyamide columns resulted in a series of fractions which were monitored by the in vitro antiplasmodial test (O'Neill et al., 1985). Active compounds were isolated and identified by means of their spectral characteristics. All of the active compounds were quassinoids which are bitter terpenoids derived biosynthetically by the degradation and rearrangement of triterpenoids.

The in vitro antiplasmodial activity of quassinoids has been reported independently from several laboratories (Trager and Polonsky, 1981; Guru et al., 1983; O'Neill et al., 1985, 1986, 1987; Chan et al., 1986; Pavanand et al., 1986; Bray et al., 1987). The average in vitro IC_{50} values of the three major quassinoids obtained from the fruits of Brucea javanica, namely bruceines A,B and C, against at least 4 natural isolates of P. falciparum have been reported as being 8.66, 8.15 and 1.95 $ngml^{-1}$, respectively (Pavanand et al., 1986), comparable with mefloquine which has an IC_{50} value of 6.26 ng ml^{-1}. These values are comparable to our

results using the multi-drug resistant K-1 strain of P. falciparum in which the IC_{50} values for bruceines A, B and C proved to be 11, 11 and 5 ng ml^{-1}, respectively (Table 1) (O'Neill et al., 1987). A further eight quassinoids from B. javanica fruits have also been isolated using the in vitro antiplasmodial test as a guide to the presence of active principles. Bruceantin, the most active compound, had an IC_{50} value of 0.8 ng ml^{-1} whereas the least active quassinoid, the glucoside yadanzioside I, had an IC_{50} value of 22,000 ng ml^{-1} (Table 1) (O'Neill et al., 1987).

Table 1. In vitro antimalarial activity of some quassinoids isolated from Brucea javanica fruits against Plasmodium falciparum (K-1 strain).



Quassinoid	R^1	R^2	IC_{50} (ng ml^{-1})
bruceantin	CH=C(Me)$CHMe_2$	H	0.8
bruceantinol	CH=C(Me)$C(OAc)Me_2$	H	2
bruceine A	CH_2CHMe_2	H	11
bruceine B	Me	H	11
bruceine C	CH=C(Me)$C(OH)Me_2$	H	5
yadanzioside I	Me	glucose	22,000

In assessing the in vitro antiplasmodial activity of some 14 quassinoids, we have ascertained the effect of various structural parameters (O'Neill et al., 1986). In particular, variation in ring A substitution and oxidation levels, methylene-oxy bridge from C-20 to either C-11 or C-13 and differing ester functions at C-15. It has been possible to make these comparisons because of the range of structural types of quassinoids which are produced in the different genera within the Simaroubaceae.

In evaluating plant products for potential chemotherapeutic activity, it is important to discover at an early stage of the investigation whether the activity is specific against micro-organisms or merely generally cytotoxic. We have compared the in vitro antimalarial and cytotoxic activities (from work with KB cells, human epidermoid carcinoma of the mouth) and the results are sufficiently encouraging to indicate that it may be possible to isolate or to modify quassinoids so that antimalarial activity may be retained and cytotoxicity reduced (O'Neill et al., 1986).

A limited number of quassinoids has been evaluated for in vivo activity utilising a test system with P. berghei in mice (Fandeur et al., 1985; Monjour et al., 1987; O'Neill et al., 1987). in vitro activity does not necessarily parallel in vivo activity as exemplified by bruceines A and B which have identical in vitro activities (Table 1) but in vivo the former is ten times more active than the latter. It is essential that further work be undertaken on the quassinoids in order to obtain more in vivo data and to determine the mode of action against the malarial parasite.

Species from the Rutaceae and Meliaceae, families which are closely related to the Simaroubaceae, are also used in traditional medicine for the treatment of malaria (Farnsworth, 1985). These two families contain a series of limonoids which are bitter principles closely related biosynthetically to the quassinoids. We have tested some 19 limonoids for their in vitro antimalarial activity and have shown that gedunin, dihydrogedunin, nimbolide and nimbinin are active with IC_{50} values ranging from 0.5 - 3.0 μg ml^{-1} (Bray et al., 1985). These latter two limonoids are constituents of the nim tree, Azadirachta indica which is used in traditional medicine in Africa and Asia for the treatment of malaria. An investigation of 21 compounds from 9 African species used in traditional medicine has also shown that gedunin has in vitro antimalarial activity (Khalid et al., 1986). IC_{50} values in the range of 1 - 6.4 μg ml^{-1} were reported for specific coumarins, a lignan and the ubiquitous flavonoid, quercetin. Although we have not been able to demonstrate direct antiplasmodial activity for several flavonoids, we have demonstrated that casticin causes a three to five fold reduction in the IC_{50} value of artemisinin whereas it does not affect the activity of chloroquine (Elford et al., 1987). These findings suggest that flavonoids indigenous to Artemisia annua from which artemisinine is obtained, may alter the clinical potential of this novel antimalarial drug in the treatment of chloroquine-resistant malaria by plant extracts.

Plants and amoebiasis

Species from some 139 genera, which have a worldwide distribution, have been reported to be used for the treatment of amoebiasis (Farnsworth, 1985). In common with malaria therapy, the classic drug for the treatment is a natural product, emetine, an isoquinoline alkaloid which is obtained from the roots and rhizomes of Cephaelis ipecacuanha. Alkaloids are reportedly the active ingredients of several species of higher plant which are used in traditional medicine for the treatment of amoebiasis e.g. Acacia nilotica (tryptamine, tetrahydroharman), Alstonia scholaris (alstonine), Borreria verticillata (borrerine), Carica papaya (carpaine), Holarrhena floribunda (connessine) (Keene et al., 1986; Oliver-Bever, 1986). Other alleged active principles in traditional medicines include flavonoids (e.g. Phyllanthus niruri) and terpenes (e.g. Curcuma domestica, Euphorbia hirta, E. tirucalli). In addition to possessing antimalarial activity, quassinoids may also be active against Entamoeba histolytica and a number of simaroubaceous species are used in traditional medicine for the treatment of amoebiasis e.g. Ailanthus altissima, Brucea antidysenterica, Castela nicholsoni, Picrasma excelsa, Quassia amara and Simarouba glauca (Keene et al., 1986).

It is of only relatively recent years that in vitro test methods have

been developed with Entamoeba histolytica (Diamond, 1978; Neal, 1983) and we have demonstrated that such an in vitro test is effective in assessing the activity of plant extracts (Keene et al., 1986). Useful leads for new anti-amoebic drugs may well be obtained by the systematic investigation of plants used in the traditional treatment of amoebiasis. However, this approach is not necessarily the only one and there are other rational approaches which may be made from studies of plant products as exemplified by our studies with Cinchona alkaloids (Keene et al., 1987). It is well known that Cinchona bark is used for the treatment of malaria and that it is a rich source of the active quinoline alkaloids, quinine and quinidine. In contrast, the leaves of Cinchona species are relatively low in their alkaloidal content and apparently have not attracted the attention of man to the same extent as the bark. Nevertheless, alkaloids are present in Cinchona leaves and a group of alkaloids known as the cinchophyllines have been isolated from C. ledgeriana (Zeches et al., 1980; Keene, 1985). The cinchophyllines may be regarded as indole analogues of emetine and their biosynthesis via condensation of one molecule of the iridoid glycoside secologanin with two molecules of tryptamine, is closely related to that of emetine in which one molecule of secologanin condenses with two molecules of dopamine (Figure 1). We have investigated a series of eighteen cinchophylline-type alkaloids for their amoebicidal activity and although none was found to be as potent as emetine against E. histolytica in vitro (IC_{50} value 0.07 µg ml^{-1}), the most active compounds had IC_{50} values in the range of 0.4 - 2.2 µg ml^{-1} (Keene et al., 1987).

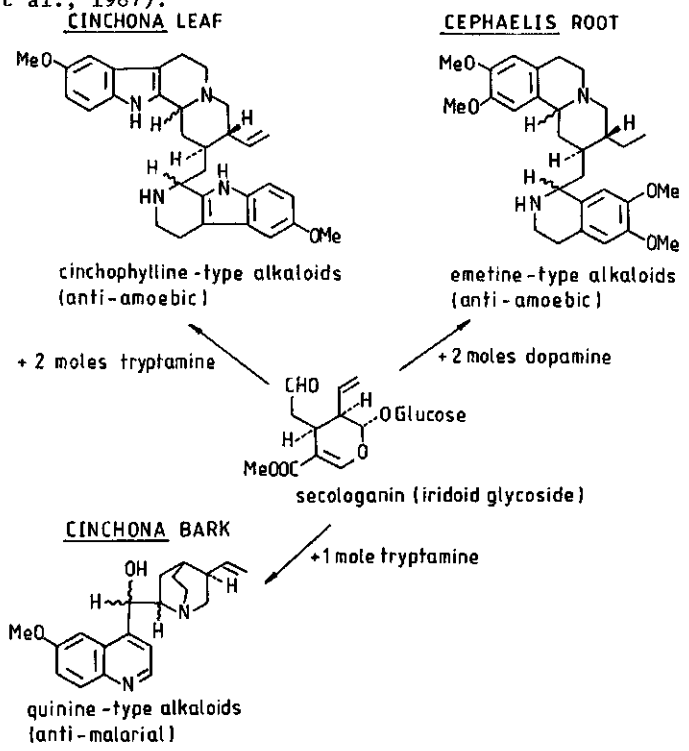


Fig. 1 Biosynthetic relationship of alkaloids from Cinchona ledgeriana and Cephaelis ipecacuanha

More recently, we have developed a more rapid and sensitive procedure for assessing in vitro activity of plant extracts against E. histolytica utilising microdilution techniques in microtitre wells (Wright et al., 1987a, 1987b). Validation of the test has shown that metronidazole and emetine are assessed as being highly active against E. histolytica whereas some commonly used antibacterial and antifungal drugs are either relatively or totally inactive. Solvent partition techniques have been used to fractionate extracts from the fruits of Brucea javanica, a traditional Chinese medicine used for the treatment of amoebic dysentery and it has been shown that the microdilution test can be used successfully as a guide for the fractionation of active principles (Wright et al., 1987c). Four isolated bruceolides, bruceines A, B, C and bruceantin (Table 1) possessed IC_{50} values in the range of 0.1 - 0.3 μg ml^{-1} comparable to metronidazole which has an IC_{50} value of 0.32 μg ml^{-1}. Clearly, this new in vitro test method has great potential for identifying the active principles of plants which are used in the traditional treatment of amoebiasis or which are suspected to contain active compounds.

Conclusions

It has been demonstrated recently that sensitive in vitro tests for assessing activity against Plasmodium falciparum and Entamoeba histolytica are applicable to the bioassay-guided fractionation of plant extracts. We have identified a number of potentially valuable antimalarial and amoebicidal compounds and have provided scientific evidence for the validation of some traditional plant medicines. Many plants used throughout the world for the treatment of malaria and amoebiasis need to be investigated scientifically in order to assess their efficacy as plant medicines and their potential as sources of new drug molecules.

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PLANTS IN THE HEALTH CARE DELIVERY SYSTEM OF AFRICA

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Summary

This paper examines the relative merits of plant medicine and concludes that its development on scientific basis is warranted on the following grounds. While there is a continued economic recession and rapid rate of population growth many African countries cannot avail themselves of the service of modern medicine and, therefore, the time-old plant remedies have to be scientifically promoted if the health care delivery system is to reach maximum number of people in the shortest posssible time. The second argument in favour of developing traditional medicine is that it embodies potential source of new or superior drugs that are effective in treating some of the diseases which do not succumb to existing means of modern therapeutic agents. Finally, substantial amount of foreign exchange that can be earned from an insight into traditional plant remedies is also discussed.

Keywords. synergetic, hypoglycaemic, bacteriostatic

Introduction

I hope you will all agree with my presumptuous statement that nothing has been more important to man either in the past or at present and there won't be one in the future than to secure maximum number of years of healthy life. This instinct to live longer and to seek relief from pain or disease prompted man to explore his natural environment. The result of this exploration led to the discovery of plants which helped him, with a reasonable degree of success, to fight off the diseases that have undermined his physical and mental wellbeing. The choice of a plant certainly was based neither on a scientific knowledge of the constituents nor entirely on trial and error, but mostly on years of observation of animal habits and experiments on human beings, some of whom might have lost their lives in the process. The empirical knowledge, thus acquired on the helpful plants was passed on by word of mouth and in some instances by writings on vellum or parchment, and much later on paper.

Africa is still abundantly rich in such experiences and as a matter of fact herbal medical care continues to remain the only type of health care available to nearly 80 per cent of the population in many countries of the continent while the remaining 20 per cent swing between the modern and the traditional system of medical care. Consequently, in the African milieu, it is difficult to draw a line showing where one system ends and the other begins. Therefore, though economic conditions play an important part, they are by no means the ultimate decisive factors which determine whether the patient chooses to be treated by a traditional medical practitioner or by a modern health professional. For example, owing to embarrassment or fear of being ostracized most patients with hemorrhoids, leprosy, V.D., etc. do not disclose their cases to anyone else but the traditional

medical practitioners, who command the implicit trust and confidence of their clientele, as they form an integral part of the village community. Apart from a common language that facilitates mutual understanding, the traditional practitioners have not only ample time for their patients but also they are easily accessible than the modern health workers.

The mechanisms of action of modern drugs, as would be expected, are far less understood by the largely uneducated rural population and consequently they are often misused or abused, thereby producing serious side effects and resistance to several pharmacetical products, particularly the antibiotics. Herbal preparations are, therefore, becoming more trustworthy and increasingly popular like in the Western World itself where there is undeniable intention to return to plant medicine despite so many medical discoveries over the last few decades.

An effective drug, according to the views of many traditional African societies, must be bitter, pungent, some what scented and it should have an impact that can be felt from the moment of administration or application. Thus, the efficacy of modern sugar coated or tasteless and odourless tiny tablets with their insidious actions are often viewed with scepticism. On the other hand, the patient has full trust in the healing power of traditional herbal preparations which is of crucial importance since such an attitude involves the mind which can play a significant role in the recovery process and eventual purge of the disease.

Africans are gregarious people with strong social and family ties. In time of ill-health the bond becomes even more strong. Fortunately, the herbalist who can provide bedside care as well as the plants are both within easy reach and, the patient does not need to part from his or her relations and close associates - a condition which is favourable in facilitating convalescence. For minor injuries and complaints there are many effective plants (eg. Centella asiatca, for wound dressing, Chenopodium ambrosoides as broad spectrum vermifuge) known by most people in the villages and hence one does not need to be put off from the routine daily activities which otherwise would have necessitated a sacrifice of both time and money if the patient had to get modern medical attention in remotely located clinics and/or hospitals.

Medical assistance by the herbalist is not only limited to a family member who needs immediate attention but also to those that are reluctant to report their cases, who nevertheless, suffer from seemingly simple, chronic or incurable diseases. The herbalists are often regarded as spiritual leaders by the community and, therefore, apart from their role in providing medical service, they are usually called upon to settle social problems in a family - a role which is of enormous significance in preventing potential health hazards including many of the underlying causes that can aggravate or even induce psychological or psychosomatic disorders. As they are custodians of proven plant knowledge, they warn their community members about some of the poisonous, hallucinogenic and abortifacient plants. In areas where there are snakes and scorpions, antivenom plant preparations are carried by the herblists or kept within easy reach to provide treatment readily for a potential victim. Actually, one cannot help feeling confident while on plant collection trip with herbalists, even in the most hostile areas since they seem to have medical solution to many of the potential health hazards, though this is not to say that they do not know the limits of their knowledge.

Apart from their medicinal uses, some plants are alleged to have a power that goes to the extent of stopping rain, detering attack by a beast, etc.

although the validity of these and other similar claims obviously remain to be scientifically verified. In the meantime we find it reassuring to see that identical plants are being used for identical complaints in different geographical regions with different socio-cultural systems.

Ethnobotanical Information - Its Significance in the Future Development of Our Plant Products

In most African countries, the resource to provide adequate modern health care coverage is extremely limited. According to a report released by the World Bank, annual government health expenditures in 50 of the 86 developing countries is US $ 5 or less per person (1). Therefore, of necessity, the peoples in these countries continue to rely on their own time-old skills and natural resources to alleviate their health problems, despite the misgivings by some professionals in the orthodox medical system who are only keen to follow already established research paths and who think that modern drugs are always superior even if these are scarce or beyond the economic reach of the majority of the population. Admittedly, some traditional medical practices have their own weak points but these are often blown out of all proportions. On the other hand it is also certain that behind the façades of superstition and absence of perceptible logical patterns, herbal medical care still represents an important heritage comprising rational principles and numerous plants that are effective against the prevalent diseases which afflict human and animal lives.

It is common knowledge that traditional medical practice is largely uncodified as a result of which it does not only suffer from distortion as time progresses but is also sinking fast into oblivion with every passing generation. This trend has been even more accelerated in contemporary Africa due to the displacement of communities that is brought about by, among other things, the recurrent drought and ironically, by the spread of modern education. Although we have been more or less in a helpless situation with respect to the former, there has been and there still is a possibility to blend this important cultural legacy with all higher forms of learning as well as with the national health care delivery system by adopting the Chinese experience to our own local conditions.

In order for this to materialize, a comprehensive collection of ethnobotanical information is not only a pre-requisite but also of utmost urgency as we are left with the last generation of practitioners who are mostly within the age brackets of 45 and 85.

In the continuous search for potential source of superior or new cheaper drugs, the availability of ethnomedical information is of crucial importance since it helps to hasten the discovery and to save scarce resources. For example, had there been no data on Cinchona spp or Rauvolfia serpentina which are traditionally used in the management of malaria and hypertension respectively, we would have perhaps still been looking for the right drugs even after screening hundreds of species as well as many synthetic products. According to Farnsworth (2), more than 4000 chemical substances have to be tested for every new marketable drug. He continues to remind us that there is a great possibility of new plant-derived drugs being discovered in developing countries during the next two decades than of their being produced by all of the chemists in the developed countries combined.

The discovery may not necessarily be in line with the traditionally reputed uses but entirely new therapeutic agents for treating other

diseases from the same starting material. The Jamaicans, for example, used to rely on Catharanthus roseus for its hypoglycaemic activity which, however, could not be proved by modern scientific experiments. However, the compounds isolated from the same plant have been found to be useful in the chemotherapy of leukaemia (3).

The actual and potential values of African plants go far beyond curing diseases. Famine foods, for instance, are drawn from several wild species in the genera Asparagus, Crotalaria, Dioscoria, etc. to serve as a substitute for the cultivated root or cereal crops in time of food crisis. Kwashirkor and other signs of malnutrition are often taken care of by these and other plants which under normal circumstances are prescribed for disorders that are unrelated to food. In herbal medical practice prevention of diseases also occupies a central position. To emphasize this aspect of medical care I cannot do better than to quote a saying which literally goes,

"Why the sickness of your children;
haven't you planted Withania in the front garden."

Withania somnifera is a popular medicinal plant in Ethiopia which has a bacteriostatic property (4), that may explain the above folklore claim. There are general disinfectants such as Senecio gigas, Vernonia amygidalina, Allium sativum, etc. which are believed to be effective in warding off epidemics. Several taxa, including Oenanthe palustris, Clematis simensis, Maeura subdecandra are utilized as pesticides and water clarifiers to combat insect-and water-born diseases. Remedies also exist which prevent repeated miscarriages, regulate menstrual cycle, restore lost sexual feelings, to overcome infertility, to counter the effect of ageing and even to increase the memory or intellectual power of teenagers.

Treatment and Relevant Data on the Plants Employed

The information about the therapeutic action of a particular plant varies from one herbalist to the other. Thus, a single species could have upto 30 or more uses or none at all. However, some taxa like Croton macrostachys, Gnidia involucrata, Gomphocarpus fruiticosus, Verbascum sinaiticum are employed by most practitioners in the treatment of diseases ranging from sore throat to complex cardiovascular or neurotic conditions.

The vernacular name of the plant, sometimes takes the name of the disease or of its aetiological agent against which it is applied. Thus, medicine for snake bite denotes Haploscidium abyssinicum or medicine of fever refers to the various species of Lippia. Out of obsession for secrecy, mentioning the name of the plant is sometimes avoided although the herbalists claim that this would reduce its potency. Among the herbalists with a background of Ethiopian Coptic church education, the plant often has a name composed of two words. The first is applicable to all species regardless of their affinities or differences. The second one is a specific epithet which usually depicts the characteristics of the taxon when employed as a drug. Thus, "etse sioul" which literally means "plant of hell" indicates the burning sensation that is felt by applying Ranunculus multifidus. Similarly, "etse yihayu" means " restorative plant" describing the effectiveness of Habenaria sp. in overcoming impotence (5).

The whole plant or the different parts may be used for the same or different purposes or even to produce diametrically opposite results. The fruits of Ficus vasta, for example, are said to have a laxative effect while the root from the same species is claimed to stop diarrhoea. Similarly, the fatal effect from ingestion of Oenanthe palustris is neutralized

by taking Ferrula communis or vice versa. Therefore, from long experience, the herbalists not only recognize the poisonous plants but also readily prescribe the antidotes.

Sometimes, two or three closely related species often with overlapping distributions are considered as one plant and may be used interchangeably in the treatment of diseases. For example, Clematis simensis and C. hirsuta have the same vernacular names and are considered to have identical therapeutic actions. This is an important reminder to the researcher who should not only focus on a single plant but rather on allied species and higher taxonomic groups while looking for a potential source of new drugs because they are likely to contain active principles with similar if not identical pharmacological results. The synergetic actions of chemical constituents in different plants is well known in herbal treatment. Thus, unspecified complaints which do not succumb to a single plant are often treated with ingredients from several species whose individual curative effects on a given recognizable disease is well established.

Aetiology, Diagnosis and Preparation of Drugs

In herbal medical practice, aetiology of diseases is less important than symptoms and is often attributed to super natural causes by most herbalists. Evil eye and the machination of the devil are often held responsible for conditions of ill-health. However, the herbalists are also well aware of the effect of unhygenic conditions such as bad food and unsafe drinking water on the body which usually predispose most of the African people to infectious diseases.

Diagnosis of diseases are based mainly on systematic questioning and physical examination although some more enlightened practitioners have started to use sphygmomanometre and the stethoscope.

Some claim to be diviners who diagnose many diseases including hepatitis and rabies just by observing finger tips, the eye or the palm. At the moment, we may not be in a position neither to give scientific explanation to these practices nor to completely dismiss them as unfounded. Many of the diseases can be diagnosed with relative ease, but there are times when this seems to be difficult or even impossible, and in such cases, the patient is referred to a better qualified herbalist or better still to the nearest health institution.

Traditional medical preparations consist of ingredients from natural substances, viz. animal products, minerals and vegetables. The end products include powders, decoctions, infusions, etc. to be administered through nasal, oral, anal, vaginal, and other routes. Over 95% of theses preparations are of plant origin particularly of higher plants. The identification of the plants is carried out mostly by relying on several inherent characteristics including some bizzar, nevertheless important features such as colour of the exudate, the time it takes for the latex to solidify etc. Environmental regimes and geographical distributions are also included as factors in determining the identity of the plant. The sweet, bitter or soury characteristics are also taken into account to clarify doubts. Village dwellers are sometimes called upon to assist in the determination process, or traditional "pharmacopoeias" written in Arabic are consulted as standard Floras to finalize the identification.

Collection of the plants is often carried out in any season and at any time of the day although dry season collections are believed to be more effective than the corresponding parts collected during the rainy periods.

Dusk or dawn collections are similarly preferred to those collected during the night or day time. Post-flowering is considered as the ideal period of collection since it is generally assumed that this is the time when the poisonous principle of some of the plants is at its lowest or the therapeutic effect of most of the species becomes more pronounced. Drugs from lowland plants are thought to be more potent, but with occasional drastic effects than their highland counterparts.

Dosages and Conditions of Treatment

Dosages of the prescription are often measured out as handful for fruits, seeds, leaves; pinch or spoon for powders and glass for liquids. The dosages to be given are not only determined by the stage of the illness (eg. mild, serious, or chronic) but also by the physical condition of the patient. Drugs which require nasal, oral and vaginal administration are not given to pregnant mothers unless it is absoultely essential, and even then the dosage is half or a third of what is recommended for other adults. Besides examining several ambulatory patients daily, there could often be upto 15 inpatients at any one time who are given the prescription under the strict supervision of the paractitioner. Rather than supplying large doses of the prescription, the herbalists often prefer to make house calls, so that they can evaluate the efficacy of the drug.

To speed up convalescence or to prevent a relapse, the patient is often advised to refrain from taking alcbholic drink, smoking or in some cases to change eating habits. For example, raw meat or milk and uncooked vegetables are not to be used while taking drugs against intestinal parasites. Some of the practices do not only seem illogical but they can also pose possible risk to the patient. Many of the undesireable components which can be weaned away from the positive aspects are often nothing more than a simple orchestration to conceal the identity of the plants and hence do not have a direct bearing on the actual healing effect of the drugs.

Traditional Medicine in Maximizing Health Care Coverage

Traditional medicine, like conventional medicine has only one objective, i.e. restoring the physical and mental wellbeing of the patient, and in Africa it will continue to remain a vital part of the peoples' own health care system, although a large sum of money is continuously being injected into Africa by national and international organizations to provide adequate modern health care coverage. However, there is very little likelihood of this being achieved in the foreseeable future considering the underlying upward trend in population growth. For example, the present population of Ethiopia is expected to double over the next 25 years, thereby increasing the competition for the resources that are already fully stretched. With a declining economy, most African countries do not seem to be in a position to spare foreign exchange to import even the most essential drugs and, therefore, they have little or no choice but to resort to the local manpower and material resources in order to improve or expand the health care delivery system.

Most of our health problems in Africa are attributable to unsafe drinking waters, lack of personal hygiene and malnutrition. It is only by educating the community about prevention of diseases that we can overcome these and many other health problems. No one else is in a better position to fulfil this than the herbalist and other traditional medical practitioners. They are not only numerous but they are also part of the community,

they have the time, the devotion and acceptance by the public to change the existing health outlook of fellow villagers. The most prevalent infectious diseases have widely recognized plant remedies. For example, Bersama abyssinica, Xanthium abyssinicum and Embellia schimperii are commonly known to be effective against ascaris, taenia and fungal infection of the skin. The list of plants with potential antibacterial, antifungal and parasiticidal properties is endless. Unfortunately, not so much scientific work has been done to prove their efficacy and to use them at least at the primary health care level if not at all levels of the national health care delivery system. The major reason for this neglect is the absence of comprehensive ethnobotanical information to serve as a base line for researchers and clinicians. The second reason is the fear among the modern health practitioners regarding about the probable short and long term side effects. Of course, there are some medicinal herbs like Datura stramonium, Argemon mexicana, Conium maculatum, etc. which are not only known for their virtues but also for their vices that could even lead to death. The rest of the plants, however, could not have been in use for centuries if they were known to cause serious adverse effects. Therefore, a rational and unbiased attitude shoud be adopted towards traditional medicine and its promotion on a scientific basis is the most economically viable proposition to achieve "health for all by the year 2000". This system of medical care is not only a solution to our present day health care problems, but it also represents an immense store-house of empirical knowledge and raw materials for future development of drugs against such serious diseases as cancer, diabetes, mental illnesses, etc. which are rarely amenable to existing modern means of treatment. For example, in China, out of the 104 new drugs developed over the last 37 years, 60 originated from plants used in herbal remedies (6). On a world wide basis, 40% of the drugs with an estimated commercial values of US$ 40 billion per annum are obtained partially or fully from plant origin (7). For example, since 1974:

3000 tonnes of aloes;
5000 " " Cinchona bark;
1000 " " datura leaves;
5000 " " senna;
10000 " " artichoke leaves etc. have been used by the big industries for pharmaceutical preparations (8). Therefore, in addition to finding effective, safe and cheaper drugs of plant origin for the health care need of their people, many African countries can also benefit from the export of unprocessed or semi-processed crude drugs.

Many African countries have now began to recognize the use of herbal remedies as important partners to the conventional health care system and not a temporary solution that would eventually be replaced. In Madagascar, Tanzania, Ghana and Ethiopia practical steps are already being taken to ascertain efficacy and determine optimum dosages for several herbal drugs.

In Ethiopia, these and other responsibilities are undertaken by the Coordinating Centre for Research and Development of Traditional Medicine. In the last two years and covering just less than a third of the country, the Centre has been able to collect over 250 species of plants together with their ethnopharmaceutical information. Most widely used species claimed to be effective against the prevalent diseases of the country are being selected for biological screening. For efficient sorting and rapid retrieval of information a computerized data base has been set up. Thus,

using the menu-driven Friday! programme we have been able to produce an electronic data file for over 95 families of plants claimed to alleviate nearly 160 physical and mental problems. The file contains 28 fields of information, including the following: Family, and species names;vernacular names, locality; altitude; habitat; use; part used are the major fields employed as an index cards in the retrieval rule. The file also provides space to enter the form of use, i.e. preparation, dosage and application. Symptoms, aetiological concepts about diseases and the veterinary uses of the drugs are also entered. The weight and concentration of the crude extract of the plant material intended for bioassay or pharmacological tests and the results of the test are recorded.

Bearing in mind that most of the plants have been in use for many generations, it is assumed that they could have little or no lasting serious effects, although they could probably be mild or taking too long to produce the desired result. Therefore, the Ethiopian Centre has designed an alternative approach which concentrates on efficacy and acute toxicity tests of the crude extract as opposed to the methods in the classical procedure which require sophisticated analytical instruments, expertise and years of deliberation. The former approach is not only economical but also quicker to find effective, cheap and easily available drugs of plant origin, thereby reducing the pressure on the hard-earned foreign currency or our dependence on external aid.

Conclusions

Like almost everything else, the traditional health care system apparently suffers from some drawbacks. Except for those that may be related to overdose, most of these drawbacks, however, do not have a direct bearing on the drugs prepared from plants and there can be no justification to put off open-minded scientists from undertaking research to promote the positive aspects. In most African countries only 20% of the people get modern health care facilities and even this coverage is not expected to increase but rather to thin out with the upward trend of population growth and the declining economic conditions. However, with open-minded approach devoid of rigid dogmas, we can provide reasonable health care coverage to maximum number of people in the shortest possible time by using the available material and manpower resources that are rooted in traditional medicine. Anything that is beneficial could be integrated with the national health care delivery system, while the ineffective, detrimental, or false claims should be eliminated through systematic research.

Many of the writings on parchment produced several centuries ago indicate that most of the intellectual works were devoted to describing the plants which were supposed to mitigate human sufferings. So many years were spent not only in search of effective plants but also in refining the practices. Every successful treatment has served as a driving force to know more plants and to combat more diseases. In fact anyone who has had the chance to work with herbalists cannot help but wonder whether there is any physical or mental problem that cannot be overcome by the power of plants.

Unfortunately, many of these plants, for example, *Warburgia ugandensis*, *Brucea antidysentrica* are becoming endangered as a result of over exploitation, environmental destruction and the recurrent drought in the Sahel region of the continent. Only a consistent and redoubled effort by the government of the concerned countries and the International Community can stop such an irreparable damage to plants which are

the actual and potential source of effective and/or cheaper drugs against schistosomiasis, malaria, trympanosomiasis, cancer, etc. for which modern medicine has neither economical nor satisfactory cures. Since we are all dependent (directly or indirectly) on plants, the loss of one species does not only affect a particular nation but humanity at large. Hence, we all have a collective responsibility to work together to preserve our natural resources for our own benefit and for the benefit of future generations to come.

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THE INVESTIGATION AND RESEARCH ON HSENYI -- NATURAL RESOURCES OF HENAN

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ABSTRACT

"Hsenyi" is a traditional chinese. The buds of many Magnolia plants are called Hsenyi to be used as medicine. The authers makes the systematic inve-stigate and research upon the distribution, growing enviroment, species of plant, natural type and properties of " Hsenyi ". A new species, Mag-nolia elliptilimba and two new forms, M. biondii Pamp. f. purpurasceens and M. biondii Pamp. f. flavescens, are reported. Through diterming essential oils, it is found that the highest of essential oil (5.8%) is in M. elliptilimba. The second is M. biondii (5.0%) and the lowest M. biondii f. purpurascens (4.3%).

"Hsenyi" is a traditional chinese medicine. It was recorded as early as in " Tang Bencao " and is used cure cold, rhinitis, stuffy nose teethache and so on. It sell well on foreign and domestic markets. Recordding to the records in anciont and present books, the buds of many Magnolia plants have been used as medicine, which can cause confusion. Henan is one of Hsenyi -- producing areas in our country and more than 60 % output of Hsenyi is produced in Henan. In order to exploit and to use of this natu-ral resource and make the superiority of Henan. We have made systematic investigations and researches on the habital, distribution, natural type and medicinal quality of the plant in Henan Hsenyi-- producing areas and report the studies as follows.

I. The research on Hsenyi plants in producing areas of Henan.

Henan Hsenyi has a concentrated distribution in six villages: Xiaodian, Huanghou and Yunyang of Nanzhao county, and Jizhong, Sikeshu and Xongbei of Lushan county. It has been formerly considered that the plants of Hsenyi in these areas is merely Magnolia biondii Pamp. Through more than three years investigation on this subject. We have collected the flower, fruit, twig and leave samples at different periods, and with the help of Huanan institute of botany in systematical stuoy we discovered two new forms, M.biondii Pamp. f. purpurascens Law et Gao and M. biondii Pamp. f. flavescens Z.Y.Gao, which are in the same section as M. biondii Pamp. in the plants of Hsenyi, besides these new forms we also discovered a new species M. elliptilimba Law et Gao, which is in the different section.

Key to the species

1. Tapels similar in size and shape, 9-12 in number, the outer three not sepaloid; leaves elliptic, ovate-elliptic, very few obovate-elliptic (sect.Yulania)..... M. elliptilimba Law et Gao
1. Tapels similar in size, 9 in number, the outer three sepaloid, as ¼ long as those in two inner cycles; leaves elliptic-lanceolate or ovate-lanceolate (sect. Buergeria).
   2. The tapels in two inner cycles white, only little purple-red at the

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bases of the outers..... M. biondii Pamp.
2. The tapels in two inner cycles not white.
3. The tapels in two inner cycles purple-red.....
..... M. biondii Pamp. f. purpurascens Law et Gao
3. The tapels in two inner cycles light yellow, only little purple-red at the bases..... M. biondii Pamp. f. flavescens Z.Y.Gao

1. Magnolia elliptilimba Law et Gao in Bull. Bot. Research 4(4): 190,1984. (Fig 1)
Henan: Nanzhao Xian, Yunyang, alt. 400-800 m.
Species affinis M. zenzii Cheng sed foliis ellipticis ovato-ellipticis vel obovato-ellipticis apice acuminatis, tepalis 9-12, pedicellis 4-8 mm longis differt.

2. Magnolia biondii Pamp. in Nuov. Giorn. Bot. Ital. n. ser. 17: 275, 1910; Dandy in Not. Bot. Gard. Edinb. 16: 123, 1928; Qin Ling Zhi Wu Zhi 1: 339, 288.———— M. conspicua Salisb. var. fargesii Finet. et Gagnep. in Bull. Soc. Bot. France Mem. 4: 38, 1906.———— M. denudata var. fargesii Pamp. in Bull. Soc. Tosc. Ort., ser. 3(22): 200,1916. ———— M. aulacosperma Rehd. et Wils. in Sargent Pl. Wils. 1: 396,1913. Rehd. in Journ. Arn. Arb. 5: 145, 1924.———— M. fargesii (Finet. et Gagnep.) Cheng in Zhong Guo Zhi Wu Xue Za Zhi. Chines 1: 296, 1934; Cnong Rong, Zhong Guo Shu Mu Fen Lei Xue 286, 1937.

2a. Magnolia biondii Pamp. f. biondii (Fig.2)
This species is distributed in south-east part of Gansu province, south part of Shanxi province, south and north slopes of Qinling, west part of Henan province, north of Sichuan province, north-west part of Hubei and Hunan province and grow in mountain forest with an elevation of 400-1200 m. Types were collected from Xingshan, Hubei province. Distributed widely, it has some variations in size and shape of the flowers. The main characte is the sharp leaves with the widest part bellow middle, elliptic-lanceolate and ovate-lanceolate, acuminate at apex. Tapels are very different from each other, the outer three are sepaloid, about $\frac{1}{4}$ long as the inners, when fleshy aril is removed, depressed trough and stalk on seed coat can be seen.

2b. Magnolia biondii Pamp. f. purpurascens Law et Gao in Bull. Bot. Research 4(4): 192, f.1, 1984
Henan: Nanzhao Hian, Yungang, alt. 400-800 m.
This form is different from M. biondii Pamp. in that the flower of the former are all dark-purple, and the characteristic is stable so that we defined it as a new form.

2c. Magnolia biondii Pamp. f. flavescens Z.Y.Gao in Journal of the Henan Academy of Sciences 4: 66, 1984.
Henan: Nanzhao Xian, Yunyang, alt. 400-800 m.
This form is different from M. biondii Pamp. in that the flowers of the former are light-yellow, only purple-red at the base of the tapels and the characteristic is stable so that we defined it as a new form.

II. The distribution and habitat of some Magnolia plants in Henan producing areas.
Distributed widely and growing in Shanxi, Gansu, Hubei, Sichuan province, M. biondii Pamp. is distributed alone the north subtropics of our country, and grows in every county of Funu mountain area of Henan. M. elliptilimba Law et Gao are only grows in Nanzhao county now. Both are antient species.

Acorddin$_g$ to the documents, t$_h$ere were Magnolia plants in Funu mountain area as early as in Neogene. The palynology fossils from the sample of Sanjaoguo, Lusni group of Henan ($E^{s}_{2}^{1}$-LS) in pliocene provide a evidence that Ma$_g$nolia plants were quite luxuriant in that time. Later, because of the influence of tne fourth glacial period, these plants became surviving and M. biondii Pamp., M. elliptilimba Law et Gao, M. denudata Desr and some others have remained existin$_g$ to this day. After the appearance of mankind, Magnolia plants have become semi-wild in some areas because of artificial intervene, Forexample in Xiaodian, Huanghou, Yunyang of Nazhao county and Sikechu, Jizhan$_g$, Xongbei of Lushan county, where people have a time-honoured habit of transplanting the wild seedlings of M. biondii Pamp. and M. elliptilimba Law et Gao to the places around their houses and as a result these areas became the central growing areas of Hsenyi. Wild species are mainly grow in broadleaf forests at feet of hills valleys and mountain slopes with an elevation of 600-1200 m. Slopesanel feet of mountains with deep soil, rich humus and good water permeability are best places for them to grow. The soil of distributed areas is yellow-brown soil of weathered granite with little acidity. Above the elevation of 600 m. there plants grow with no selectivity between slope directions, but below this height mainly on shady slopes. The year's average temperature of distrebited areas is 14.6-19.8 c, the highest temperature above 40 c. gnerally in July, and the lowest bellow -13 c, mostly in January, annual rainfall is 800-1000 mm, the most rainwater in July and August up to 235-550 mm and making up 40-50 % of the annual rainfall. Total sunshine time during ayear is 2001.9-2235.9 hours, the longst sunshine in summer up to 203.1-239.5 nours in July. The information above shows there are rich resources of light, heat water in these areas in summer and autumm, which are favourable to plants in growth and accumulation of dry substance.

III. The determin$_a$tion of essential oils in flower buds of some Magnolia plants.

Essential oil is the main component of " Hsenyi ". Inorder to gain a clear idea of the relation between medicinal quality of " Hsenyi " and the " Hsenyi "-ploducing plants and to develop the medicine on purpose, we collected " Hsenyi " samples of various species and with different flower-buds forms and habitals in " Hsenyi " gatnering season to determine the contents of essential oils. The method and result are as follows.

The samples tested were collected in Huanghou, Yunyang, Xiaodian of Nanzhao county and Sikesnu, Jizhong of Lushan county on 18-21, november, 1983. The forms and shapes of flower buds and the habitat of plants were recorded in details. The samples were spreaded on floor to cool and all the twigs in the samples were removed. Then the samples were cracked to catkin and 10g of each sample were placed into essential oil-determing unit then adding distilled water and heated to boiling with direct distillation for 5 hours. After cooled, the volums of essential oils were recorded. Watercontents of the samples were determined in water-determine unit with methylbenzene.

The results are showed in table I.

Table I shows that essential oil content is related to age, habitat, natural form of " Hsenyi " trees, but the difference in essential oil content of different species of Magnolia is more evident. The new species M. elliptilimba Law et Gao has the highest essential oil content with an average of 5.8 %, the second is M. biondii Pamp. with an average of 5 % and the lowest M. biondii f. purpurascens Law et Gao, average 4.3 %. Because M. elliptilimba has the highest essential oil content, we ought to take vigorous action to protect and develop this rare species.

IV. Investigation of the natural forms of " Hsenyi " in Henan producing areas.

Some Magnolia plants in " Hsenyi " growing areas of Henan has different types of variation because of the influence of external environment in their long growing period, and certain distinguishing variations are quite stable. They are classified into some natural types accordding to main characteristics of variation by local people. Accordding to the form of flower buds (the shape of crude drug) they are devided into five types: Maotao, Laoshushi, Fanmaoji, Yangtao, Lunaitou. Through our observation we found that not only the flower buds of Magnolia plants were evidently different in various species, but also there were obvious differences among the flower buds of same species in size and shape (Fig.3). Thus it can be seen that the variation of flower buds have close relations to age, habital and health condition of the plants.

Fig. 1. Magnolia elliptilimba Law et Gao 1.Branch. 2-3.Flower. 4-5. Abaxial of apathe. 6-7. Inner cycle tepal. 8. Gynaecium. 9. Ditto, the away parts stamens showing the gynaecium and receptacle(enlarge). 10. Stamen(enlarge). 11. Aggregate fruits. 12. Seed of take away exotesta.

According to the habit of blooming and fruiting they are classified as Chuanyu and Houbazhang. When the growing condition is fine and the annual twigs are long and thick, the mixed buds can grow almost in every leaf axil (Fig. 4-1). This type is called as Chuanyu and has high output of crude drug. When annual twigs are short and crowded, only 1-2 mixed buds occur at each end of the twigs, generally none in leaf axil (Fig. 4-3). This type are called as Houbazhang and has high output also. Some terminal buds and lateral buds in biennial branches of some Magnolia plants can become longer terminal and lateral twigs, but the lateral twigs sprouting are generally 80-90 anglesto trunks. Because of shortage of nutrition, mixed buds grow only at the ends of the twigs (Fig. 4-2). This type has lower output of flower buds. Some plants can sprout out many medium long twigs on upper parts of the biennial brancnes and on uppor parts of the every twigs can grow into concentrated groups of terminal and lateral mixed buds. This type are mainly in M. elliptilimba Law et Gao.

In the light of the information above, we suggest ideal individual plant of Maotao, Yangtao, Chuanyu, Houbazhang, M. elliptilimba and some other natural types be selected and breeded to increase the oroduction of " Hsenyi ".

V. Suggestion for exploitation and utilization of " Hsenyi " resource in Henan " Hsenyi " growing areas.

According to our investigation and research, we have made following suggestions for exploitation and utillization of " Hsenyi " resource in Henan " Hsenyi " growing areas.

(1). The species of Magnolia plant in Henan are high trees, grow rapidly and have long lieves. After grafted the seedlings can bloom and bear fruits in 2-3 years. The chest diameter of ten-years old trees is 8-10 cm. In Tianqao, Huanghou village, Nanzhao county there is a plant of M. biondii Pamp. which is over one hundred years old, but still blooming in lusters. Not only the flower buds of these Magnolia plants are traditional chinese medicine, but also the wood of them is solid, fine and smooth and the trees themself are tall, straight, graceful and magnificent with luxuriant foliage. So these trees are fine timber tree ornamental tree and avenue tree. We shoud develop these species energetically and grow them in great amount especially in mountain areas of north subtropics above the elevation of 600 m. These areas are suitable for some Magnolia plants to grow. Planting these trees there not only can make the mountain green, recover the vegetation, and coordinate ecological balence, but also will economic benefit will increasing year by year and the resource will last very long time.

Fig. 2. Magnolia biondii Pamp.

1.Branch and leaf. 2.Flower buds. 3.Flower. 4.Spath. 5.Outer cycle Tepal. 6.Middle cycle Tepal. 7.Inner cycle Tepal. 8.Gynaecium and Stamens. 9.Stamen. 10.Aggregate fruits. 11. seed.

(2). M. elliptilimba Law et Gao that we discovered is the rare, extincting species in our country, it's flower is white with purpule and having many tapels. When blooming, the flower shows characteristic style the fragrance is elegant and pure. For this reason we should protect and develop this species, further study the chemistry of lower-boiling-point part of the essential oil and develop the species to perfume plants. M. biondii f. purpurascens Law et Gao a new form of M. biondii, has purpule-red flowers like red lotus when blooming. After selected, this species can be developed to a kind of precious ornamental plant in our country.

Table 1. The determination of essential oils in flower buds of some Magnolia plants

Species	Shape of mixed bud	Locale(in Nanzhou)	Growing environment	Content of essential oil
1. M.elliptilimba	short ovate with long hair	Yunyang	near villagy alt. 600m.	4.13 %
2. M.elliptilimba	ditto	Huanghou	sunny slope alt. 600m.	5.24 %
3. M.elliptilimba	short ovate to nearly spherical	Yunyang	Implanted alt. 400m.	6.7 %
4. M.elliptilimba	short ovate	Xiwodian	shady slopes alt.300m.	6.5 %
5. M.elliptilimba	taper, smaller	ditto	ditto	6.5 %
6. M. biondii	short ovate,two mixed buds in bract	ditto	feet of hills, shady, alt.650m.	5.82 %
7. M. biondii	ditto	Xiaodian	ditto, alt.400m.	5.42 %
8. M. biondii	long ovate	Huanghou	sunny slopes, alt. 600m.	4.4 %
9. M. biondii	ditto	Yunyang	shady slopes, alt. 3500m.	4.3 %
10. M. biondii	ditto	Xiaodian	ditto	4.85 %
11. M. biondii	ditto	Huanhou	sunny slopes, alt. 600m.	4.85 %
12. M. biondii	nearly elliptic	ditto	ditto	5.6 %
13. M. biondii f. purpurascens	taper	Yunyang	ditto, alt.360m.	4.73 %
14. M. biondii f. purpurascens	ditto	Huanghou	ditto, alt. 600m.	3.7 %
15. M. biondii f. purpurascens	long taper	ditto	ditto	3.45 %
16. M. biondii f. purpurascens	taper	Xiaodian	ditto, alt. 820m.	4.11 %
17. M. biondii f. purpurascens	ovate	Yunyang	planted in countyards,having been fertilized and pruned,alt. 240m.	5.65 %

Fig. 3. Type of flower buds of different spcies of Magnolia plants
1-4. Type of flower buds of M. elliptilimba.
5-7. Type of flower buds of M. biondii.
8-9. Type of flower buds of M. biondii f. purpurascens.

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Fig. 4. Characteristics of different blossom and bear fruit of some Magnolia plants

1-2. Branch of M. biondii.
3-4. Branch of M. elliptilimba.

INDEX

INTRODUCTION TO THE ETHNOBOTANICAL PHARMACOPEIA OF THE AMAZONIAN JIVARO OF PERU

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Summary

The Jívaro of north-central Peru are an independent group of Amerindians who until recently were largely sheltered from outside influences. With acculturation progressing at a rapid rate, this situation is changing in the 1980s. Therefore, it is critical to record now their medical uses of the vast plant resources available to them before they are irretrievably lost. This is important not only because such a loss would effect their long-range traditional health care, but it would prevent the introduction of potentially valuable medicinals into both Western and traditional medical systems elsewhere. Illustrations of effective medical uses of plants by the Jívaro have been selected from the Apocynaceae, Aquifoliaceae, Bignoniaceae, Cyperaceae, Euphorbiaceae, Fabaceae, Rubiaceae, and Solanaceae.
Keywords: ethnobotany, Jívaro, medical plants, pharmacopeia, Peru.

Introduction

As the Jívaro of the upper Amazon basin of South America gave Western medicine the benefits of both curare and quinine, other contributions to health care may exist among the wide diversity of plants they use medically. This is important information to learn now, for their knowledge of medicinal plants is being lost irretrievably in this strictly oral culture as rapid acculturation continues during the 1980s.

Based on five expeditions to Peru, 1982-87, this report describes certain aspects of those plants used medically by three of the four Jívaroan subtribes, the Achual, Huambisa, and Mayna, as they occur between the Tigre and Morona rivers, and just south of the Ecuadorian border for about 150 km south. The area is a low tropical rainforest, mostly 150-250 m elevation, traversed by many largely north-south flowing muddy rivers draining into the Marañon-Amazon. Between these meandering rivers are low ridges and hills giving considerable tracts of terra firma on which the Jívaro usually build their small villages (50-250 persons), and from which our data largely emanate. We have not worked with the Aguaruna Jívaro who live in the Andean foothills and to the southwest.

Results and discussion

The Jívaro use plants from 125 families of angiosperms largely for food, construction, and medicine. By far the greatest number of different plants are used medically (a broad interpretation of 'medical' is used throughout this paper to include any plant eliciting a physiological effect). From this total we have selected eight families for discussion, six medium- to large-sized ones and two comparatively small ones, at least in this region. Among the first group in descending order of size are the Fabaceae, Rubiaceae, Solanaceae, Euphorbiaceae, Bignoniaceae, and Apocynaceae, and in the second, the Cyperaceae and Aquifoliaceae.

Fabaceae

The bean family is a large one of cosmopolitan distribution which is represented in tropical regions by many woody shrubs, trees, and lianas. These plants contain many diverse constituents, such as alkaloids (isoquinolines, quinolizidines; pyrrolizidines, etc.), lectins, saponins, cyanogenic glycosides, isoflavones, and phytoestrogens, and so members of the family are understandably in frequent use as medicines and poisons. The Jívaro utilize ethnobotanically species of 28 genera or 24% of those found in Peru (Table 1), but as only a fraction of genera are available to them, this frequency is certainly much higher. Of these, 18 genera find a place in the Jívaroan pharmacopeia, mostly a single species per genus, but as many as nine species of Cassia (including Senna) are used.

Of particular note because of multiple use for the same purpose are the stunning of fish by sprinkling crushed roots of Derris, Lonchocarpus, and Tephrosia in streams, as reported elsewhere (Heizer, 1949), the treatment of body aches and swellings and of bloody diarrhea by drinking stem decoctions of Bauhinia, the use of bark poultices of Erythrina to treat inguinal hernia and other body swellings, and the preparation of inner bark decoctions of Parkia drunk to treat chronic stomachache and of Swartzia ingested to invigorate and strengthen the body. The Jívaro also use five species of Pithecellobium in different ways, viz., to treat fever, malaria, and stomachache, and as an analgesic, blowgun ingredient, dandruff shampoo, emetic, and tonic, all usually drunk as bark decoctions. They also apply the resin from several Cassia species to skin ailments, infections, and infestations,

Table 1. FABACEAE: Medical Plants of the Jívaro.

Genera (Sp. no.)[1]	To treat (aid)
Andira	body swellings
Bauhinia (3)	body aches/swellings*; diarrhea (bloody)*[2]
Cassia (9)	constipation; fever; hepatitis*; skin ailments (itching*, nits, pustules, ringworm*); as tonic
Centrolobium (?)	body swellings
Dalbergia	thrush
Derris	as fish poison
Dimorphandra	aching body/legs*
Dipteryx	thrush
Erythrina (2)	body swellings*
Hymenaea (2)	skin ailments (boils); rheumatism; stomachache
Inga (2)	diarrhea; stomachache
Lonchocarpus	body aches; as fish poison*
Machaerium	skin ailments
Myrocarpus	toothache
Parkia	stomachache*
Pithecellobium (5)	as analgesic; in blowgun poison; dandruff shampoo; emetic*; fever*; malaria*; stomachache; as tonic*
Swartzia (4)	body swellings; cuts/wounds; skin ailments; as tonic*
Tephrosia	as fish poison*

Medical 18 (38); Ethnobotanical 28 (71); Fl. Peru (1943) 119 (754)

[1] Not indicated when one species per genus
[2] An * indicates multiple reports

and ingest decoctions of fruits, flowers, branches, and roots to treat hepatitis (B?). Examples of the latter are now undergoing bioassays.

Rubiaceae

Standley (in Macbride, 1936) recorded 86 genera and 472 species of Rubiaceae in Peru; of these, 33 (73 species) genera are used in some way by the Jívaro and 28 genera (54 species) are used medically. Among this extensive utilization are: Bertiera species for treating skin ailments and thrush; Borreria for diarrhea; Capirona for swellings of the body and legs; Coussarea for stomachache and addition to hallucinogenic drinks; Faramea for thrush; Genipa for blackening body and hair in order to deter, at least in part, insects and lice, and for extracting teeth (Lewis & Elvin-Lewis, 1983); Geophila for shingles (herpes zoster); Hamelia for body and leg swellings, fever, and blackening teeth; Hemidiodia for postpartum recovery; Isertia for body swellings; Manettia for blackening teeth; Palicourea for body swellings, contusions, hemorrhaging of menstruation, skin ailments, thrush, and as a tonic; Pavonia added to hallucinogenic drinks; Psychotria for aching bodies, broken bones, contusions, diarrhea, malaise, and also added to hallucinogenic drinks and as a tonic; Sabicea for ringworm and scabies; Uncaria for respiratory diseases and whooping cough (pertussis); and Warscewiczia for body and leg swellings.

The repeated use of many of these plants implies some efficacies, but at present this information is largely anecdotal. For example, chewing of Manettia fruits is the preferred means of blackening teeth and those who still practice this technique have limited dental disease compared to nonblackeners. Very possibly the fruits contain substances that alter the cariogenic process by affecting mechanisms associated with bacterial adherence and plaque formation in addition to serving as a sealant (Lewis & Elvin-Lewis, 1983). Because of acculturation only the more traditional Jívaro believe that tooth blackening prevents tooth decay and continue this practice. The pulp from immature pericarps of Genipa is also used in dental care. When it is placed on teeth requiring extraction they are anesthetized and disintegrate over the next week or so without further application. Genipa fruits possess genipin, a monoterpene with broad spectrum antibacterial action (Djerassi et al., 1961), but it is unknown if this compound is responsible for these actions.

Solanaceae

Alkaloids are widespread secondary metabolites in the Solanaceae (e.g., nicotine, tropanes, solanines) and all are medically active, so the use of most if not all genera known to the Jívaro for medicines or various physiological effects can be expected. Ten genera (27 in Peru) are included in their pharmacopeia: Brugmansia for treating aching bodies, broken bones, sprains, contusions, and as a basic component of an hallucinogenic drink; Brunfelsia for body pains, arthritis and rheumatism, fever, malaise, malaria, and toothache; Capsicum for toothache and as an aid in parturition; Cestrum for blackening teeth, contusions, fever, and skin ailments; Cyphomandra for colds/flu, coughs, colic, malaria, respiratory congestion, skin ailments, snakebites, and swollen limbs; Lycianthes for improving the skin; Markea for fever and malaise; Nicotiana for headaches and as an additive to hallucinogenic drinks; Physalis for measles and skin ailments/infections; and Solanum for malaise, measles, skin ailments, snakebites, stomachache, and also as an additive to hallucinogenic drinks.

Chemical analyses of several of the more widely used solanaceous species common in the upper Amazon Basin will undoubtedly reveal important new sources for tropane and other alkaloids widely used in Western medical care. Indeed, the family is a potentially valuable resource of indigenous products for Peru and other developing countries in the tropics.

Euphorbiaceae

Species of 13 euphorbiaceous genera are used medically by the Jivaro (Table 2), not surprising considering the wide range of chemical constituents found in the family. Thus, alkaloids originating from diverse biosynthetic pathways, cyanogenic and mustard-oil glycosides, polyphenols, saponins, volatile oils, and lectins occur widely. Based on multiple utilization for the same purpose, some of the most interesting plant uses include placing the latex of Chamaesyce hirta (L.) Millsp. and C. thymifolia (L.) Millsp. on athlete's foot (tenia pedis) with healing rapidly achieved, and drinking whole plant decoctions of Phyllanthus niruri L. to treat kidney ailments, particularly to obtain relief from kidney stones. The latter is also used prevalently among the Mestizo of eastern Peru.

Of widest use by the Jivaro and others in Peru, however, is the sap drained from the trunk of Croton lechleri M.-Arg. for treating external cuts, wounds, various abrasions (mosquito and chigger bites), as well as for internal wounds, like ulcers, while at the same time reducing bleeding. Perdue et al. (1979) showed that the red sap of this species contains the alkaloid taspine and they demonstrated that taspine hydrochloride had significant anti-inflammatory activity in three assays in rats at dosage levels considerably below those producing lethal effects. Our data confirm the presence of high levels of pure taspine in sap used by the Jivaro to reduce inflammation prior to healing and to arrest bleeding.

Table 2. EUPHORBIACEAE: Medical Plants of the Jivaro.

Genera (Sp. no.)	To treat (aid)
Acalypha	fever
Amanoa	malaria
Chamaesyce (2)	cuts/wounds*; tenia pedis*
Croton (2)	body pains; cuts/wounds*, bleeding*; diarrhea; stomachache
Hevea	ectoparasites
Jatropha (2)	conjunctivitis*; cuts*; diarrhea*; fever; hepatitis; respiratory congestion; skin ailments; sinusitis; swollen legs; thrush*
Margaritaria	stomachache
Pedilanthus	skin ailments
Phyllanthus	kidney ailments/stones*; liver ailments/hepatitis*
Ricinus	sprains, broken bones
Sagotia	earache
Senefeldera	aching body/bones; skin ailments; stomachache; toothache
1 indet.	endoparasites

Medical 13 (16); Ethnobotanical 21 (31); Fl. Peru (1951) 48 (269)

Bignoniaceae

Although little studied chemically, this predominantly neotropical liana family may be characterized by high levels of biodynamic compounds (Gentry & Cook, 1984). If medical use of the Bignoniaceae by the Jívaro, who use representatives of 12 genera or a high proportion of those available to them, is an indication of the frequency of active principles, then Gentry & Cook are certainly correct. Interestingly, only one genus is used exclusively by the Jívaro for nonmedical purposes.

Instances of multiple uses for the same purpose are particularly noteworthy (Table 3). For instance, leaves of Arrabidaea chica (H. & B.) Verl. are chewed chiefly by women to turn their teeth purplish-red and then a clay mordant is taken orally to blacken them, a procedure followed for caries prevention. Crushed leaves of Jacaranda copaia (Aublet) D. Don and J. glabra (C.DC.) Bur. & K. Sch. are applied to the skin for treating sores, wounds, and infected cuts, and leaf dococtions are placed on leischmaniasis ulcers for healing. Juice from the roots of Macfadyena uncata (Andr.) Spr. & Sandw. and Martinella obovata (H.B.K.) Bur. & K. Sch. (Gentry & Cook, 1984), the latter sometimes mixed with mother's milk for children, is routinely used to treat conjunctivitis. The most widely used plants, however, are Mansoa alliacea (Lam.) A. Gentry and M. standleyi (Steyerm.) A. Gentry for treating aching and swollen parts of the body (roots), arthritis and/or rheumatism (roots), and colds, influenza, coughs, and sore throats (leaves). Like Jacaranda, leaves or scraped stems of Memora cladotricha Sandw. are applied as infusions to treat various skin ailments and infections. Finally, stem or root infusions, often in alcohol, of Tynanthus polyanthus (Bur.) Sandw. are widely ingested as strengtheners to revive virility in older men, and to relieve rheumatic pain. Even though few bignoniaceous plants have been subjected to rigorous chemical analyses, the above data clearly suggest important sources for isolating potentially useful new medicinals.

Table 3. BIGNONIACEAE: Medical Plants of the Jívaro.

Genera (Sp. no.)	To treat (aid)
Arrabidaea	redden & blacken teeth (with mordant)*; thrush
Callichlamys	cuts/wounds; leishmaniasis; skin ailments
Crescentia	bronchitis; parturition; toothache
Cuspidaria	as tonic
Jacaranda (2)	cuts/wounds*; leishmaniasis*; skin ailments* (mites, nits, scabies)
Macfadyena	conjunctivitis*; heavy hemorrhaging of menstruation*
Mansoa (2)	aching/swollen body*; arthritis/rheumatism*; colds/grippe*, coughs, sore throats; insect repellent; stomachache; tuberculosis
Martinella	conjunctivitis*
Memora	skin ailments*
Mussatia	skin ailments
Paragonia	as tonic
Tynanthus	as aphrodisiac/tonic*; hepatitis; rheumatism*

Medical 12 (14); Ethnobotanical 13 (15); Fl. Peru (1961) 45 (106)

Apocynaceae

Species of six apocynaceous genera of a total of 30 for Peru are used medically by the Jívaro (Table 4). Like the Bignoniaceae few chemical studies have been completed using neotropical material, though elsewhere there are numerous examples known of important compounds being incorporated into Western medicine (e.g., Rauvolfia with alkaloids treating hypertension; Strophanthus with cardioactive glycosides for congestive heart). The Jívaro use Aspidosperma for treating body pains and stomachache, Condylocarpon for coughs and as an antiemetic, Himatanthus for body aches and swellings, skin ailments and infections, snakebites, stomachache, and typhoid fever, Lacmellea for ectoparasites and as a tonic, Prestonia for conjunctivitis, and Tabernaemontana for coughs and sore throats, diarrhea, leischmaniasis, malaria, postpartum recovery, stomachache, toothache, and as a tonic and expectorant. Because of the diversity of taxa and medical applications Tabernaemontana in particular ought to be examined for novel compounds.

Cyperaceae

Unlike members of the preceding families, those of the Cyperaceae have little acclaim for use in medicine or for possessing important biodynamic principles. Therefore, we were surprised to learn that several sedges were cultivated routinely in most household gardens as highly prized possessions of women. These plants were traded and sold with great care, they were taken with other important items whenever the family relocated, and they were used largely to treat women and children for specific purposes. Diplacrum and Scleria decoctions or infusions were drunk by children and adults to treat liver pains or *hepatitis*, and decoctions of Hypolutrum were drunk to treat septic sore throat, but by far the most commonly used plants were those of Cyperus. Five species, C. articulatus L., C. laxus Lam., C. luzulae (L.) Retz., C. odoratus L., and C. prolixus H.B.K., were employed: (1) in gynecology to treat heavy or prolonged hemorrhaging; (2) in obstetrics as female contraceptives leading to infertility for a few months or "forever," to restore fertility when desired, as galactagogues, to aid in parturition, and to assist in postpartum recovery; (3) in pediatrics to treat anemia, colic, diarrhea, fever, liver ailments and hepatitis (also adults), and in learning to walk; and (4) other uses for children and adults including treatment of body pains, bronchitis, cuts, snakebites, stomachache, and to induce weight loss. Obviously a number

Table 4. APOCYNACEAE: Medical plants of the Jívaro.

Genera (Sp. no.)	To treat (aid)
Aspidosperma	body pain; stomachache
Condylocarpon	coughs; vomiting (antiemetic)
Himatanthus (6)	body aches/swellings*; skin ailments/infections*; snakebites; stomachache; typhoid fever
Lacmellea (2)	ectoparasites*; as tonic
Prestonia	conjunctivitis
Tabernaemontana (9)	coughs*, sore throats*; expectorant; diarrhea*; leishmaniasis; malaria; postpartum recovery; stomachache*; toothache*; as tonic

Medical 6 (19); Ethnobotanical 14 (28); Fl. Peru (1959) 30 (117)

of these claimed efficacies ought to be examined thoroughly, particularly those in Cyperus relating to obstetrics and in the family as a whole concerning hepatitis.

Aquifoliaceae

Only one species in the Aquifoliaceae, Ilex guayusa Loes., is found in the Jívaro territory and usually as a cultivated shrub (Schultes, 1972). Nevertheless, the first author observed a large (35 m) indigenous tree near Puranchim (Lewis et al. 13123 MO, USM), but such specimens are very rare in the jungles of northern Peru. A fresh or dried leaf decoction of I. guayusa is consumed daily by Achual Jívaro men in the early morning as a stimulant and to a certain extent as an appetite depressant. About one-half hour after consuming ± 300 ml of the liquid, vomiting is induced (there is little else in the stomach so the vomitus is not unpleasant) in order to "feel good for the remainder of the day." The leaves contain high concentrations of caffeine (Holmstedt & Lindgren, 1972), which we have confirmed (a minimum of 1.7% w/w following methylene chloride extraction of dried leaves of Lewis et al. 11492 MO, USM). The vomiting ritual is thus simply the method by which the men eliminate caffeine and so prevent excessive amounts from being absorbed. If this is not practiced they feel nervous, irritable, and "bad" all day. Women and children also use wayus, but in much smaller amounts either as a stimulant or as a mouth wash.

This introduction to the utilization of plants by the Jívaro with medical implications shows a wide use of their rich flora in health care. The extent and presumed efficacy of this pharmacopeia is only now being appreciated. Its value for future introductions of medicinals to Western medicine and traditional medical care in developing countries worldwide is yet to be evaluated, but the preservation of this knowledge in a rapidly acculturating society where such data may soon be irretrievably lost is undoubtedly relevant to future generations of Jívaros.

Acknowledgements

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ANALYSIS OF THE VOLATILE CONSTITUENTS OF PIPER BETLE L. CULTIVARS - A CHEMOSYSTEMATIC APPROACH

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Summary

Five cultivars of betelvine (Piper betleL.) were recognized from India on the basis of leaf morphology, characteristic flavour and aroma. Gas liquid chromatographic study of essential oil showed that volatile constituents viz. eugenol, methyl eugenol, anethole, terpineol, terpenyl acetate etc. and their proportion in the oil were observed to be consistent and reliable parameter for identification of these cultivars.
Keywords: Piper betle L., volatile constituents, chemosystematics.

Introduction

Betelvine (Piper betle L. belonging to the family piperaceae is a perennial, dioecious liana. The leaves of this plant have been traditionally used for chewing purpose in the form of morsel alongwith arecanut (Areca catechu L.), lime, katha (Acacia catechu L.), cardamam, clove, fennel and even tobacco throughout the south east Asian region. In India, it is cultivated as a cash crop and more than 100 types have been recognized by traders and growers. There has been a great deal of confusion in the nomenclature and classification of these cultivars. The main reason for this state of affairs is partly due to lack of accurate and complete description of all the cultivars (Anon. 1969).

With a view to study the characteristics of the existing betelvine cultivars in the country about 85 types from different commercial growing regions of the country have been introduced in the experimental conservatory and are grown under uniform cultural conditions. Of these nineteen types were selected for detailed study with the objective of classifying the existing betelvine cultivars on the basis of leaf morphology and volatile constituents of the leaves.

Results and discussion

Morphological observations regarding leaf size, shape, colour, apex, base of lamina, venation pattern, petiole shape and texture were recorded from large samples of matured leaves. On the basis of these characters these types can be categorized into five cultivars viz. 'Bangla', 'Desawari', 'Kapoori', 'Meetha' and 'Sanchi' (plate 1). The representative types under each cultivar have diagnostic features in common Eg. the six types belonging to cv. 'Bangla' have cordate to roundish leaves with short and accuminate tip and prominent basal lobes. Similarly two types belonging to cv. 'Desawari' have ovate leaf shape with curved apex and asymmetrical leaf base. Four types grouped under cv. 'Kapoori' have common characters such as narrow-ovate, yellowsih green leaf, secondary veins running almost parallel to the midrib, the later being divergent in other cultivars; cv. 'Meetha' standout by characteristic yellowish spots all over the leaf lamina and blunt leaf apex. The six types of cv. 'Sanchi' can only be recognized by its dark green colour, broad ovate leaves with accuminate apices coupled with short, channelled and characteristically oriented petiole (petiole forms an angle of 40° with Stem.).

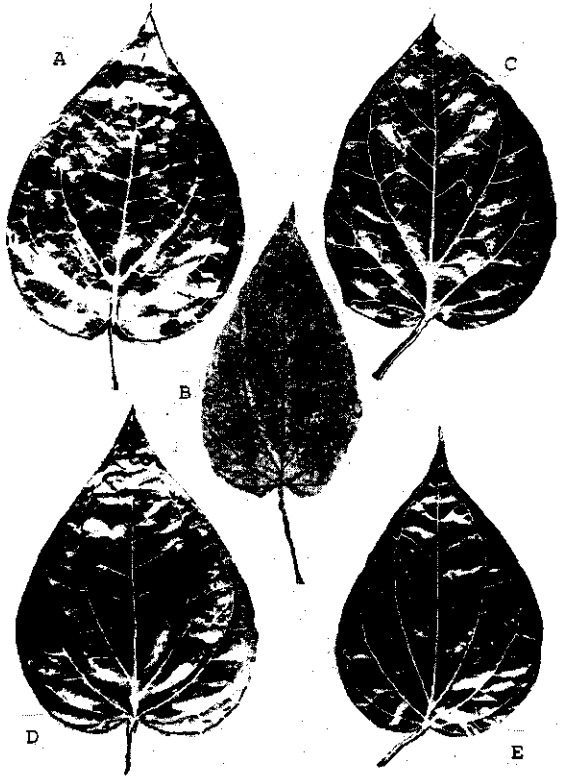

Plate-1. Leaves of Piper betle L. cultivars. A- 'Bangla' B-'Kapoori' C-'Meetha' D-'Sanchi' E-'Desawari'

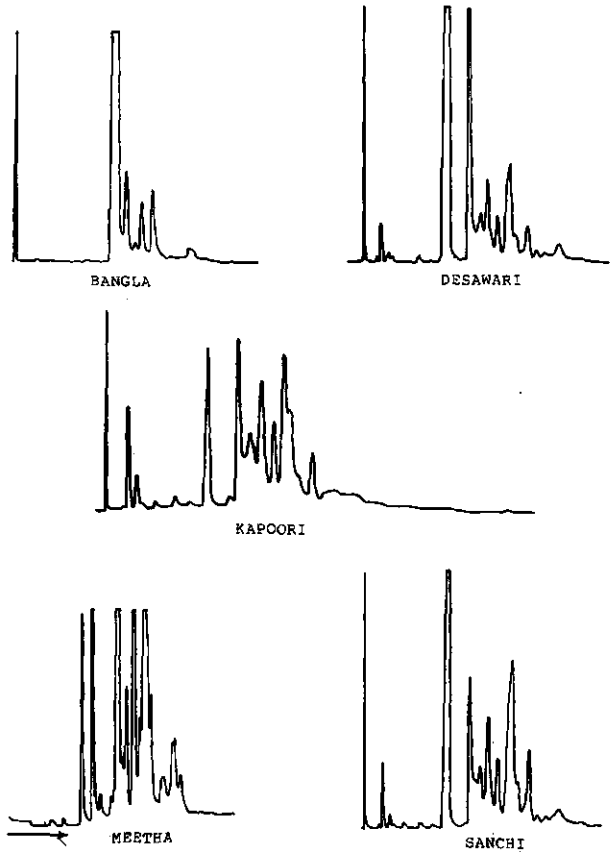

Plate-2. GLC of essential oil of Piper betle L. cultivars.

Morphological and anatomical characters have been traditionally considered as major basis of plant classification since Linnaeus' time. Sometimes similar morphological characters of the cultivars/types create confusion. Some specific chemical compounds/secondary metabolites have been used as an aid in the study of taxonomic variation and definite identification of cultivars/types. (Harborne, 1973; Hegnauer, 1978; Heywood, 1973 and Gottieb & Kubitzka, 1981). In the present studies the chemical characteristics of essential oil of leaves have been taken as a parameter for identification of different betelvine cultivars. Uniform matured leaves were collected from the experimental conservatory and after weighing, the leaves were hydrodistilled in clevanger's apparatus. The oil was collected after a few hours of distillation. In order to findout the chemical composition, the oil was examined by gas liquid chromatograph (AMIL-NUCON cat. No. 5500) having stainless steel column of 1.0 m. length and 0.3 cm diameter. SE-30 on chromosorb W. of 100 mesh was used as stationary phase. Nitrogen was used as carier gas. The other conditions were maintained as below:

Injecter temperature	250°C
Column temperature range (at the rising rate of 4°C/min.)	80°C to 200°C
FID Temperature	270°C
Gas flow rate	35ml/min.
Chart speed	10mm/min.

The identification of the components was accomplished by comparing the retention data with those obtained with reference samples run under similar conditions.

The leaves on hydrodistillation gave the essential oils bearing light to dark yellow colour and having pleasant aromatic to spicy, mild pungent to sharp pungent taste followed by sweetness in some cases (Sharma et al. 1982, 1983). The oils distilled from the types under study were subjected to Gas liquid chromatography and on the basis of pattern of the recorded chromatograms pertaining to the number and size of peaks, the nineteen types were grouped into five distinct cultivars viz. 'Bangla', 'Desawari', 'Kapoori', 'Meetha' and 'Sanchi' (Plate 2). The chromatograms of the types within the corresponding group have similar pattern but have marked differences from one group to another; thus confirming to the categorization of these types on the basis of leaf morphological characters.

Analysis of volatile constituents and their proportion in the essential oil of different cultivars were observed to be consistent and reliable tool for the identification of betelvine cultivars (Table 1).

Table 1. Chemical constituents in essential oil of Piper betle L. cultivars (in per cent).

Constituent	Rt (min.)	Bangla	Desawari	Kapoori	Meetha	Sanchi
α-pinene	7.30	-	0.37	0.05	Trace	0.099
β-pinene	7.40	-	Trace	Trace	Trace	Trace
1-8 cineole	9.05	-	1.55	5.75	-	-
Camphene	9.30	-	Trace	1.26	-	-
p-cymene	10.62	0.02	2.47	1.76	-	-
Methyl chavicol	14.50	-	1.55	0.80	0.187	-
Terpineol	15.00	0.02	Trace	0.66	0.234	Trace
Terpenyl acetate	15.60	0.06	44.93	21.98	15.61	37.95
Eugenol	20.45	82.00	26.65	15.93	18.90	24.50
Methyl eugenol	21.85	4.10	0.37	1.65	0.09	0.58
Anethole	26.10	-	9.17	-	32.30	-
Caryophyllene	30.10	0.63	0.09	Trace	Trace	1.023

The characteristic clove-like aroma of 'Bangla' leaves was due to the high concentration of eugenol ($\leq$ 80%) in the oil, while the sweet taste and fennel-like aroma of 'Meetha' leaves were due to the presence of anethole (32.3%) and the mild pleasant taste of 'Kapoori' leaves was due to terpenyl acetate (22%). Similarly the mild pungency of 'Sanchi' and 'Desawari' cultivars was due to comparatively low concentration of phenolic constituents. The common constituents in all the cultivars were eugenol, methyl eugenol, caryophyllene, p-cymene, etc. Anethole was present in 'Meetha' and 'Desawari' cultivars; whereas α-pinene, β-pinene, methyl chavicol, 1-8 ceniole and camphene were absent in cv. 'Bangla', the same were observed in all the other four cultivars studied. Earlier, similar studies have been effectively used in identification of number of chemotypes at infra-specific level. Forsen and Schantz (1973) evaluated the oil composition of about 600 cultivars of Chrysanthemum vulgare L. growing in finland and grouped them into eleven chemotypes on the basis of specific compounds present in the essential oil. Similarly Grandi (1976), Adzet et al (1971), Stahl and Kubeczka (1977), Yano (1975) and Ntezurubanza et al (1984) reported idfferent chemotypes of genus Achillia ageratum L., Thymus vulgaris L., Artemisia capillaris, Thumb., Pastinaca sativa L. and Ocimum kilimandscharicum Guerke respectively on the basis of gas liquid chromatographic studies of the essential oil.

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MEDICINAL AND POISONOUS PLANTS IN THE WEST INDIES

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Summary

A significant number of plants in the West Indies are poorly known taxonomically. The local names of the medicinal plants are preserved by oral tradition, and are quite diverse. Some species, like Peperomia pellucida are used to make beverages for preventive therapy. Other plants are the sources of decoctions (bush teas) taken as aphrodisiacs, or, as cures for ailments ranging from abscesses through colds and fevers to yaws. These plants may include food plants like Eryngium foetidum, or even toxic species like Asclepias curassavica. There is much ignorance about the uses of poisonous plants in bush teas in these islands, even though the West Indies is essentially a set of rural communities. Toxic plants should be better identified for the benefit of all, including the herbalists and the livestock managers, who live in these tropical islands.

Keywords: tropical island floras, medicinal plants, Caribbean names, plant toxins.

Introduction

When Christopher Columbus visited the West Indies in 1493, it is said that he discovered stands of chili peppers (Capsicum annuum) and of allspice (Pimenta dioica) growing in these tropical islands. Agriculture is the mainstay of the economies of these territories; and, three decades ago, Jamaica (with allspice, and ginger Zingiber fragrans), and Grenada (with nutmeg and mace, Myristica fragrans) became major producers of spices for the world (Rosengarten, 1969). Unfortunately, they are not so well placed today.

The natural environment still favours the lush growth of aromatic plants (useful as carminatives and digestives), and, of several other species, like Aloe vera (Grindlay & Reynolds, 1986). These plants contribute in diverse ways to the local folk medicine systems ('bush medicine') of the West Indies. Several poisonous plants also are used as medicinal agents. This paper draws attention to the array of species used in bush medicine from among the plant resources of this tropical region.

Materials and methods

This study involved an extensive literature search, interviews, and field work. Herbarium material was examined, with the guidance of the Curator, Dr. C.D. Adams, at the national herbarium, St. Augustine, Trinidad. Over the last two decades, interviews were held with herbalists across the West Indian islands. Good plant specimens were collected by local names, together with the precise rules for their administration as healing agents. Spelling the local names of the

plants represented our interpretation of the spoken word, and was checked through re-hearing on different occasions. The spelling was determined often with the help of staff on the Caribbean Lexicography Project of this University. The plants were identified by scientific names, and, specimens were deposited in the national herbarium at St. Augustine, Trinidad. Many of the plants were screened by chemical methods (Farnsworth et al., 1966) for important classes of biologically-active compounds: some plants were selected for further chemical examination.

Results and discussion

Three decades ago, Asprey and Thornton (1953; 1955) wrote that .... "many of the plants used for the treatment of colds and indigestion provide the normal morning drink" ...."Among the poorer families the morning meal frequently consists of nothing more than a cup of bush tea prepared by steeping the leaves in hot water"... ..."the term 'breakfast' is not used but 'taking' or 'drinking' tea is substituted." Taking bush tea continues to be popular both in preventive and in curative medication in the West Indies (Wong, 1967; Long, 1973; Honychurch, 1980). Based on the oral tradition of the descendants of immigrants from Africa and Western Europe, and, of the original Carib peoples, bush medicine, usually, is both ritual and herbal (Barrett, 1973; Weniger et al., 1986a).

The identification of medicinal plants in the West Indies (Wong, 1976; Kelly & Dickinson, 1985) is not easy; partly because, these plants may be known only by local names of English or French or Spanish origin, with varying influences from West Africa, and, sometimes from continental India. (The same applies to the plants of Guyana (Haynes, 1969), a country which is culturally integrated with the West Indian islands). Confusion arises when the same local name is given to two or more different plants. The popular temperate species Salvia officinalis is called sage, and sage is Lantana camara in the West Indies. The West Indian lime is Citrus aurantifolia whereas the lime tree of temperate countries is Tilea europaea. Clearly scientific names must be used in order to avoid confusion among these different medicinal plants.

When a plant is known by several different local names its identification may not be easy to determine. For instance, the pantropical weed, Catharanthus roseus is better known as ram-goat rose (in Jamaica), or old maid (in Grenada), or, caca poule (in Dominica), or, as periwinkle in most West Indian places, where people use it to treat diabetes mellitus. Early pharmacological studies (Noble et al., 1958) were done in Canada on the leaves of the white-flowered plants sent by a Dr. C.D. Johnson from Black River in Jamaica. (Adams et al., 1963). The plant extracts were tested for the reputed antidiabetic activity, and, the results were disappointing. Subsequently, the range of tests was expanded: it was then that the fortuitous discovery was made that carcinostatic activity resided in the plant extracts. Catharanthus roseus today is a most important source of anti-cancer drugs, such as vincaleukoblastine (Duke, 1985): but West Indian people still believe that teas made from the plant can cure diabetes and hypertension.

Several West Indian medicinal plants have been highlighted in recent publications (Honychurch, 1980; Morton, 1981; Ayensu, 1982; Seaforth et al., 1983), in which, the plants have been arranged alphabetically by botanical names, and illustrated by line-drawings. The folk medicinal

applications and, wherever possible, the other uses, chemical constituents and toxicities of the relevant plant parts have been included in these books. It is important in publications of this kind that, where justification for the therapeutic uses of a plant is suggested, the plant constituent(s) responsible should be identified. The assumption should not be made that the bio-active constituent(s) of one plant would necessarily be found in another (as yet untested) sister species. Recorded pharmacological studies of West Indian medicinal plant extracts are few and scattered (Durand et al., 1962; Feng et al., 1964; Hooper & Leonard, 1965; Thorburn, 1975). A multidisciplinary approach, involving many skilled man-hours, is required for the successful isolation and identification of those phytocon-stituents responsible for a specific physiological activity. It is not very surprising that ninety percent of plants of the world remain untested for their reputed pharmacological activities (Farnsworth & Bingel, 1977).

The scope and quality of published West Indian Floras vary greatly; and, most islands of the Eastern Caribbean have never had a complete Flora of any kind. The flora of Trinidad is South American rather than Caribbean. The flora of the whole of the West Indies comprises some 10,000 species in about 3,500 genera and 200 families of vascular plants spread over a land area of about 200,000km^2. In Cuba there are over 7,000 species, half of which may be endemic, and, 1,300 medicinal species are the subject of current scientific evaluation (ECLAC Workshop, 1986). Among the documented plants (3,000 species) in Jamaica and (2,280 species) in Trinidad, about 300 species are reputed medicinal plants. They are implicated in folk therapy for over 50 ailments ranging from abscesses to yellow fever (Asprey & Thornton, 1953, 1955; Seaforth et al., 1983). Data on Haitian plants pertinent to fertility regulation has been published recently (Weniger et al., 1982), in the context of a special programme of the World Health Organization. Specific groups of West Indian medicinal plants are highlighted below.

A number of plants are highly esteemed as the sources of male-virilizing agents in the West Indies. They are known as bois bande´ in Grenada, Haiti and Trinidad, and, the stem bark decoctions are used. These species include Parinari campestris, Richeria grandis and Roupala montana, the extractives of which appear not to have been thoroughly studied. Popular beverages, for 'cooling', or as tonics (for 'tired blood') are made, for instance, from the stem bark of mabi (Colubrina arborescens) or from the leafy tops either of man-better-man (Achyranthes indica) or of shiny bush (Peperomia pellucida).

Perhaps the largest grouping of plants can be made from those used in the treatment of colds and various fevers. Leaf decoctions of the single plant or of a mixture of plants are used for these conditions. Almost every plant in this category is known by at least two local names. Some of them are presented here by their French or patois names, with their scientific names in brackets, namely - z'herbe à femme (Ageratum conyzoides), du the´ pays (Capraria biflora), bois canon (Cecropia peltata), citronelle (Cymbopogon citratus), chardon beni (Eryngium foetidum), chandelier (Leonotis nepetifolia), gueritoute (Pluchea symphytifolia), vervine (Stachytarpheta jamaicensis) and cousin maho (Urena lobata). Often, these plants are used to treat other ailments as well. In the case of herbe à pique (Neurolaena lobata), the bitter leaf decoction is taken for malaria and other fevers and for diabetes.

Some interesting chemical constituents of this herb have been described in the literature, but these do not correlate with the reputed efficacies of the plant extracts; and, more recent pharmacological study (Gupta et al., 1984) has demonstrated hypoglycemic activity in the leaf extracts.

The aromatic herb Eryngium foetidum was used as a cure-all by the Carib Indians. It is still used throughout the West Indies to treat fits in children. Two local names for the plant are fit weed and spirit weed. In Trinidad, it is known as bhandanya, and its leafy tops are used to spice certain meat dishes. The popular name bhandanya (derived from Hindi) serves to illustrate the East Indian (Hindu) influence on Caribbean usage of food and medicinal plants. Similarly, karaila (or, corailee) is a local name for Momordica charantia, which is known elsewhere in the archipelago by other names such as balsam pear, cerassee and maiden's blush (Morton, 1981). The fruit is eaten in stews and curries, and, the leaf decoctions are used to treat diabetes and other conditions. Recent studies have shown the presence of abortifacient proteins and of other insulin-like compounds in the plant (Ng et al., 1986). The boundary between the medicinal and the nutritional values of some plants can be quite imprecise. In the case of Artocarpus altilis, the fruit is cooked and eaten (as breadfruit) in all the islands; whilst the decoctions made from the yellow mature leaves of this tree are taken to lower blood pressure. Teas from the soursop (Annona muricata) have been studied pharmacologically for sedative principles (Bourne & Egbe, 1979). A variety of banana/plantain (Musa paradisiaca) is eaten, according to folk medicine practice, for good nutrition and also for stomach complaints. This fruit has been shown recently to contain anti-ulcerogenic substances, namely sitoindoside-III and sitoindoside-IV (Ghosal, 1985; Goel et al., 1986).

Jamaica's national fruit the ackee belongs to a tree, (Blighia sapida), introduced from West Africa. The leaf decoctions have limited use in folk medicine in Cuba and Jamaica. This plant is often documented as poisonous, because the unripe fruit may contain toxic levels of water-soluble compounds called hypoglycin. The content of hypoglycin in the arils of the ripe fruit is about 0.008 percent; and this toxin may be leached out when the fruit is parboiled and the liquor containing the hypoglycin is discarded. Consequently, when properly cooked, the ackee makes a safe and nutritious food (Plimmer & Seaforth, 1964).

Lantana camara is toxic to animals due to its triterpenoid constituents called lantadenes (Sharma et al., 1980). The aromatic decoctions of the tops of this plant are esteemed in the West Indies as bush tea cures for colds, fever and hypertension, and as diuretics. The plant is known as grater wood (in Tobago), cariaquite or ramongsi (in Trinidad), ma bizou (in Dominica), and also as, sage, red sage, wild sage or white sage in most of the islands. Another toxic plant is Asclepias curassavica (Hocking, 1976), which in the Caribbean islands, carries names such as - matac, wild ipecac, pain de seda and pwentan. Its aqueous extracts are taken as an emetic for snake bite and for other afflictions. Teas made from sonnette (Crotalaria retusa) and cough remedies from consumption bush (Crotalaria fulva) (Thorburn, 1975) continue to be popular, even though the plant extracts contain significant levels of hepatotoxic alkaloids.

Several noxious plants in the countryside produce their undesirable effects by irritant actions, due to the mechanical action of hairs or due to chemical substances in the sap or in special glands. These include - dumb cane (Dieffenbachia seguine), manchineel (Hippomane mancinella), milkweed (Euphorbia hirta), and the stinging nettles (Laportea aestuans and Tragia volubilis), (Evans & Soper, 1978; Evans & Schmidt, 1980; Duke, 1985) - which have been used also as West Indian medicinal agents. The islands are essentially rural communities, but the scientific literature is rather scarce concerning human encounters with plants containing poisonous substances (Adams et al., 1963; Lucy & Odera, 1981; Dreisbach, 1983; Keeler & Tu, 1983). Good herbalists may be aware of the adverse effects of over-dosing with the extracts of these plants. It is also necessary that modern medical practitioners and persons charged with the care of livestock should know more about the toxins in plants in the West Indian environment.

Since the West Indies consists of island communities, the marine flora should be a significant resource base for pharmacodynamic substances. Few records have been found concerning folk medicinal uses of Caribbean marine plants and plant products (Diaz-Piferrer, 1979). In these islands, the scientific infra-structure is too weak to support the collection of physiologically-active marine species in a systematic way. On the other hand, terrestrial plants contribute significantly to the folklore and to the bush teas of the region (Hodge & Taylor, 1957; Groome, 1970; Weniger et al., 1986b) - even though many of these plants are poorly known taxonomically.

The West Indies has a rich flora, and, the environmental conditions are suited for the cultivation of herbs with food and medicinal value. Herbs are a natural candidate for the small farmers to consider (Duke, 1982). The development of modern agro-industry, in the West Indies, should include the cultivation and processing of medicinal plants into higher-valued commodities, such as food additives from nutmeg and mace, and, cosmetics from Barbados aloe.

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SOME MALVACEAE OF MOZAMBIQUE WITH MEDICINAL PROPERTIES

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Summary

Abutilon angulatum, Gossypium herbaceum var. africanum, Hibiscus surattensis and Sida acuta, four malvaceous species, are studied in respect to their medicinal properties. Fresh and dried material has been used. A short description of each species is presented, their ecology, distribution and traditional medicinal uses are discussed, their vernacular names mentioned. A list has been compiled of their medicinal uses.

Introduction

In a country like Mozambique it is common practice to use local plants for the treatment of some diseases. Even so, only a limited number of people know how to use plants and which plants are to be used for certain diseases. Here, four malvaceous species are presented, giving information on medicinal use by traditional practitioners (indicated by "TP" in the text), who are called "curandeiros".

Discussion

Abutilon angulatum (Guill. & Perr.) Mast.

Vernacular names
Maputo: licupécupé; Manica: guenderi; Tete: varvura.

Description
Shrublets or shrubs, 1-5 m high. Leaves alternate, petiolate cordate-ovate, up to 27 x 26 cm. Flowers yellow or orange to apricot. Fruit depressed-globose, up to 1.3 x 1.3 cm, densely stellate-tomentose. Mericarps 20-39; seed reniform, verruculose or smooth.
Occurs in Maputo, Gaza, Sofala, Manica, Tete, Niassa and Cabo Delgado provinces in open and riverine forests, on mountains and along roads, on different types of soils. Flowering from March to May, fructification May to September.

Medicinal uses
Infusion of the roots is taken orally in case of epilepsy and heart pains. The roots of Abutilon angulatum are mixed with those of Croton dichogamus Pax and a porridge is prepared with this infusion.

Gossypium herbaceum L. var. africanum (Watt) Hutch. & Ghose

Vernacular names
Maputo: uchale; Gaza: tonge, nuba.

Description
Shrublets or shrubs, 2.3 m high, branches pubescent and glandular. Petiole up to 3.5 cm long, leaf-lamina 6 x 8 cm, cordate, suborbicular in outline, 5-7-lobed. Flowers yellow with purple centre; fruit a globose

capsule, 1.5-2.5 x 1.5-2 cm; seeds with white long hairs.
Occurs in Maputo, Gaza, Inhambane, Sofala, Manica and Tete provinces, in open forests and in grassland. Flowering November to February, fructification February to August.

Medicinal uses.
To prevent abortion an infusion of Gossypium herbaceum var. africanum and of Cynodon sp. is taken orally 2 x per day (TP). Lack of appetite is cured by administration of an infusion of the roots, orally 2 x per day (TP). For mothermilk purification, an infusion of the roots together with roots of Cardiogyne africana Bur. is taken orally 2 x per day (TP).

Hibiscus surattensis L.

Vernacular names
Maputo: licumba-cumba; Gaza: coaca-coaca; Sofala: tunde; Manica: garusa; Zambézia: nhakhurkhue; Nampula: punho; Cabo Delgado: m'tama-m'tama.

Description
Annual herb, prostrate or scrambling, up to 5 m; stems hispid, aculeate. Petiole 9 cm long, leaf-lamina suborbicular in outline, 8 x 8 cm, hispid, deeply 3-5-lobed. Flowers yellow with purple centre. Fruit ovoid or globose, capsular, 2 x 1.3 cm; seed reniform , 3-4 x 2-3 mm.
Occurs in Maputo, Gaza, Inhambane, Sofala, Manica, Zambézia, Nampula and Cabo Delgado provinces in hygrophile and open forests, in grassland ;on sandy soils. Flowering and fructifying March to September.

Medicinal uses
Poor appetite: porridge is prepared with decoction of roots and taken 3x per day (TP). Vomiting: a decoction of the leaves is taken orally 3 x per day (TP). Female infertility: crushed leaves are inserted into the vagina for six concecutive days (TP).

Sida acuta Burm. f.

Vernacular names
Maputo: muba homu; Sofala: mat'zai: ru, mupsairo.

Description
Annual herb or shrublet, up to 2 m high. Petiole short, leaf-lamina ovate-lanceolate, 10 x 3 cm. Flowers yellow, axillary. Mericarps 5-7, birostrate; seeds angulate.
Occuring in Maputo, Gaza, Inhambane, Sofala, Manica, Zambézia, Tete, Nampula and Cabo Delgado provinces along rivers, road sides and cultivated land; on sandy soils or on compact argile soil. Flowering from December to April, fructification April to October.

Medicinal uses
In case of painful menstruation (dysmenorrhoea), an infusion of the leaves is taken orally half a teacup 2 x per day (TP); depressed fontanelle ; a decoction of the roots is taken orally 3 x per day a teaspoonful (TP). A feverish patient is cured by inhalation of the damp of water in which the leaves are put (TP). In case of sharp pain in the side, leaves of the plant and of the Markhamia obtusifolia (Baker) Sprague are cooked and applied as hot compresses on the region.

The plants and their medicinal uses

Plant name	Symptoms, diseases or other reasons for prescription	Part of plant used	Method of administration	Province
Abutilon angulatum	Heart pains	Roots	Mixed with roots of Croton dichogamus. The mixture is taken orally; partly as infusion, partly in porridge	Tete
	Epilepsy	Roots	Infusion with roots of Croton dichogamus, mixture taken in porridge or as an infusion	Tete
Gossypium herbaceum var. africanum	To prevent abortion	Roots	Infusion with roots of Cynodon sp. is taken orally.	Maputo
	purification of mothermilk	Roots and leaves	Infusion made with Cardiogyne africana Mixture taken orally.	Maputo
	Poor appetite	Roots	Infusion taken orally	Maputo
Hibiscus surattensis	Vomiting	Leaves	Decoction orally	Maputo
	Female infertility	Leaves	Crushed and inserted into vagina	Maputo
	Poor appetite	Roots and leaves	Porridge prepared with decoction, taken orally	Maputo
Sida acuta	Painful menstuation	Leaves	Infusion orally	Maputo
	Depressed fontanelle	Roots	Decoction orally	Maputo
	Fever	Leaves	Damp of leaves inhaled	Maputo
	Sharp pain	Leaves	Cooked with leaves of Markhamia obtusifolia, as hot compresses	Maputo

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MEDICINAL USE OF SOME PHILIPPINE PLANTS

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The Philippines has a highly diverse natural vegetation of wild and cultivated species. These have varied economic importance including medicinal use.

Medicine available in the market for common illnesses have become increasingly expensive. Thus, we have to seek alternative medicine that are low-cost and readily available. There is thus a need to develop the use of local medicinal plants, particularly in the Metropolitan Manila Area.

Four cities, including Manila (the capital city) and thirteen municipalities make-up the Metropolitan Manila Area. It covers a total area of 665.98 kilometers, with a population of 7.5 million.

A list of some of the common medicinal plants found in the metropolis is as follows:

Bixa orellana L. Bruised leaves are applied on forehead to cure headache. Ground seeds are applied to burns to prevent blister and scar formation.

Psidium guajava L. Decoction of young leaves is used as astringent and mouthwash for swollen gums. Chewed leaves are used to cure toothache. Pounded leaves are applied on wounds and covered with a clean cloth. Young leaves are squeezed in water. The leaf-water extract solution is used to wash face as a cure for pimples.

Manihot esculenta Crantz. Pounded leaves are applied as a compress to the head when fever and headache persist.

Quassia amara L. Stem infusion is mixed with salts, aromatics and gingers to cure gout.

Lantana camara L. Pounded leaves are applied as a poultice on sprains, swellings and cuts.

Coleus scutellarioides L. Leaf poultice is applied on forehead to cure headache. Pounded leaves are applied to bruises.

Clitorea ternatea L. Leaf poultice is applied as a remedy for swollen joints. Root decoction, taken orally,

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removes phlegm in chronic bronchitis.

Jasminum sambac (L.) Ait. Flower decoction is taken orally to cure fever and cough. Pounded roots are applied as poultice on sprains and fractures.

Ricinus communis L. Leaf poultice is applied on the forehead to relieve headache. Leaves mixed with salt is made into a plaster to relive sharp pains.

Catharanthus roseus (L.) Don. Fresh stems are boiled in water. The decoction, taken orally, is a remedy for hypertension.

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RECENT EFFORTS OF PRESERVATION AND EXPLOITATION OF MEDICINAL AND AROMATIC PLANTS

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Summary

The increasing utilization of medicinal and aromatic plant species is often accompanied by the decrease of the natural plant sources. Thus, in Hungary as many as 27 of the collected species have became a rare one in the last decade. To avoid this thinning, even speed up productivity, the investigations should be oriented as follows: 1. Production oriented dinamic intervention for the exploitation of the biological rules of the natural habitats to increase their productivity or to create new agro-systems. 2. Preservation oriented static-like interventions may help the future by creating special botanical gardens, preserved communities, model reservations,developing gene and tissue culture banks.
Keywords: medicinal and aromatic plants, ecosystem, agrosystem, gene reservation.

Introduction

The renaissance of medicinal and aromatic plants is becoming quite pronounced indeed in the developed, industrialized countries. This is a part of the "back to Nature" movement. However, it is really evident too, that almost 90 % of mankind takes medicaments of basically natural origin (Ayensu, 1985) and this "renaissance" is of another nature. One of the most important question nowadays how to establish the biological, production-ecological background for the increased utilization of medicinal plants. In this paper I evaluate the biological aspects of the exploitation and preservation of the medicinal plants on the basis of our activity in the ISHS Working Group and using results of own studies.

Results and discussion

Medicinal and aromatic plants in the production system

In spite of the wide-spreading cultivation of the medicinal and aromatic plants the majority of the material source originates from the natural production systems. In most of the developing countries this ratio may even reach 100 %. However one can see the following factors of decay in natural systems:

direct effects	indirect effects
-decrease of the forest area	-industrial waste
-pesticides,tillage of medows	-spreading of pesticides
-clearing rudeal sites	-changing of plant communities

-drainage
-overloading due to collection
The seriousness of the species reduction is illustrated by Fig.1., where the number of species that became extinct in some countries of Europe up to middle of the seventies is shown (Csapody, 1982). This reduction of the species spectrum may also mean the extinction of chemotaxa existing in given natural systems only, and their potential therapeutical effect or aroma is lost forever. Thus, in Hungary as many as 27 of the collected species have became a rare one in the last decade.

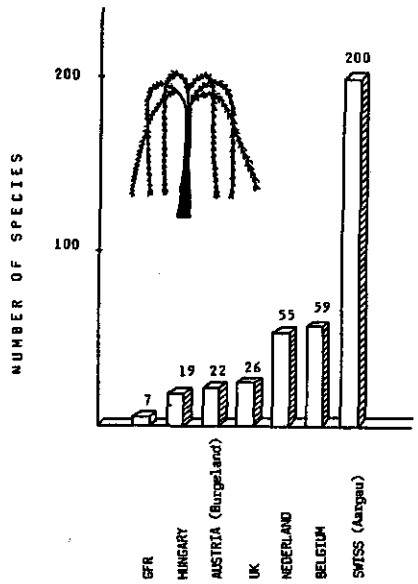

Fig.1. Plant species became extinct in 70-ies in Europe (on the basis of Csapody's data, 1982)

The actual situation of the plant preservation

On the basis of ISHS Working Group questionaries received back from 45 countries, the preservation work of medicinal and aromatic plants and the proposed methods are summarized in Fig.2.

Some aspects of the investigation strategy

A methodical difference arises if the study is aimed at maintaining and increasing the productivity of the system or at conserving a given state only. The former can be considered a dynamic, the latter a static intervention.
1.Production oriented dynamic intervention as a goal can be reached from various directions:
a) increasing the dominance and/or the productivity of the "productive species" in the ecosystem,
b) limiting the unfavourable factors influencing the productive systems,
c) knowing the ecological demand of the "producent"

species, a production site may be chosen where the natural equilibrium, a prerequiste of the production may be developed (Bernáth, 1986),

d) creation of new (agrarian) systems.

2. Preservation oriented static intervention helps the conservation of a given state or provides a basis for the further investigations are of strategical importance in the production of medicinal and aromatic plants. This goal can be realized by different methods:

a) establishing botanical gardens on chemotaxonomical basis as we made it using Dahlgren's "two-dimensional" model,

b) preserving natural communities in original form or developing model reservations (We have started to build up the model reservation of Buda-Pilis Mountains),

c) it is required to put the medicinal and aromatic plants in gene banks for the long-term seed and tissue culture preservation. This type of work was started by us in 1986.

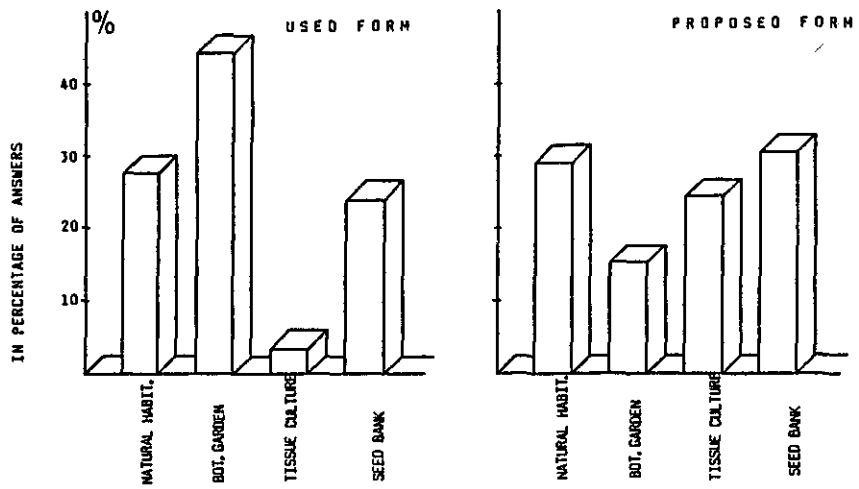

Fig.2. Research methods applied and proposed for medicinal and aromatic plant preservation (on the basis of ISHS questionaries)

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DRUMSTICK (*Moringa oleifera* Lam.) - A MULTIPURPOSE PERENNIAL INDIAN VEGETABLE TREE OF CONSIDERABLE MEDICINAL VALUE

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The Hindustan centre of crop origin is the cradle of many economically important vegetable crops. Ashgourd (Benincasa hispida cogn.), bittergourd (Momordica charantia L.), Kundru (Coccinia indica L.), pointed gourd (Trichosanthes dioica L.), snakegourd (Trichosanthes cucumerina L.), egg plant (Solanum melongena L.), hyacinth bean (Dolichos lablab L.), sword bean (Canavalia gladiata L.), jack bean (Canavalia ensiformis L.) and many other vegetables originated in this part of the world. There is yet another vitamin rich mineral packed and nutritious vegetable of this tropical and sub-tropical centre of crop origin, originally grown by the Dravidians and later by Aryans in each and every homeyard and presently getting extinct from cultivation, called drumstick and synonymed as "Horse Radish Tree", "West Indian Ben" and "Never Die". The name drumstick derives from the shape of pod resembling the slender and curved stick used for beating the drum. Probably the name "radish tree" derives from the pendulous slender and thin shape of immature fruits of the tree resembling very much the siliqua of radish.

Botany and nomenclature

It belongs to the family Moringaceae. The family is monogeneric -- Moringa-- and the botanical name being Moringa oleifera Lam. There are two common species oleifera and concanensis, the former being the vegetable species. The oleifera species is being distinguished by leaves usually tripinnate, leaflets 12 - 18 mm. long; petioles yellow or white without red streaks and the tree being medium sized. The concanensis species is distinguished by leaves bipinnate, leaflet 15 - 30 mm. long, petioles with red streaks or redish at base and the tree being large sized. A few of the species of Moringa related to oleifera are M. pterygosperma Gaertn. and M. longefolia.

Origin and distribution

The tree is indigenous to North-West India. It is found growing wild in the sub-Himalayan tract from river "Chinab" eastwards to "Sarda" and in the Tarai tract of Uttar Pradesh in India. Stretches of wild forms of the tree can be seen in the Tarai belts of Uttar Pradesh and Bihar. The tree is widely distributed in India, Egypt, Phillippines, Ceylon, Thailand, Malaysia, Burma, Pakistan, Singapore, West Indies, Cuba, Jamaica and Nigeria.

Chromosome number

The tree is reported as a true diploid with 2n = 28. The presence of a higher gametic chromosome number (n = 14) leads to the evolutionary process of allopolyploidisation or a possible diploidisation.

Nature of pollination

The flowers are bisexual, oblique, stalked, axillary and heteromorphic. The plant is highly cross-pollinated due to heteromorphism and is entomophilous, bees being the pollinators.

Breeding methods

The tree can be propagated from seed or from cuttings. The stem cuttings are usually preferred which root very easily. Plants raised from seeds produce fruits of unpredicted quality. Further cuttings of fairly large size planted in moist soil strike root readily and grow to sizeable trees within a few months. Large limb cuttings of 1 to 1.35 m. in length with 14 to 16 cm. in cirfcumference are plants in situ during rainy season (June - August). In Salem district of Tamil Nadu (India) uneconomic trees are cut down leaving a stump from which 1 to 2 shoots are allowed to grow. From these shoots, cuttings of 2 cm. in diameter are selected and used as planting material. In Kanyakumari district of Tamil Nadu "Shield budding" has been found to be successful and the budded trees begin to bear in 6 months and continue to give good crop for about 13 years. Being essentially a vegetatively propagated crop, breeding methods like single plant selection, mass selection and exploitation and maintenance of vigour observed in transgressive segre-

gants could be used. The prospects of going for mutation breeding and polyploidy breeding are yet to be explored. Being a perennial tree vegetable, information on inheritance of qualitative, quantitative and threshold characters in the crop are rather limited.

Varieties

There are only a few named varieties. A type named "Jaffna" grown in certain parts of South India produces fruits 60 to 90 cm. in length with a soft flesh of good taste. The other types are "Chavakacherri murunga", also a "Jaffna" type, bearing fruits as long as 90 - 120 cm. long and "Chemmurunga" (red tipped fruits, said to flower throughout the year and yield heavy crops). Trees growing wild ("Kadu murunga") usually bear small and inferior fruits. In Tirunelveli district of Tamil Nadu (India) a variety known as "Palmurungai" with thick pulp and better taste and another called "Puna murungai" are grown. In Trichy district of Tamil Nadu a variety known as "Kodikal murungai" producing very short fruits of 15 - 23 cm. is seen. In West Indies there are forms which rarely flower and are principally cultivated for their foliage and others which can fruit abundantly and are cultivated for fruits.

Prospects

The medicinal virtues of this crop are known and appreciated in India. It has been frequently mentioned in Sanskrit works on medicine. Almost all the parts of the plant -- roots, leaves, flowers, seeds etc.-- have been used in one way or other in the treatment of ailments in indigenous system of medicine.

The tree is not affected by any serious disease in India. A foot rot caused by Diploida sp. has been observed in Tamil Nadu. The hairy caterpillar Eupterote mullifera Wlk. causes defoliation in drumstick. The caterpillars of Tetragonia siva, Metanastia hyrtaca and Heliothes armigera, and aphid Aphis craccivora, the scale insect Cerophlastodes cajani, the borer Diaxenopsis apomecynoidea and fruit fly Gitonia sp. were observed in the plant.

There is considerable scope for the genetic improvement of this vegetable. A lot of variability is available in the Tarai tract (India). The utility

of plant parts in medicinal preparations needs intensive research for confirmation and general recommendations. It is only the lack of awareness that causes the extinction of this important perennial vegetable.

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Glycoside formation in Digitalis lanata Ehrh leaves with special reference to growth hormones and mineral nutrients treatments

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Abstract

Analysis of daily variations of glycoside formation in rosette leaves of D.lanata Ehrh revealed that its content reached maximum during early hours of the day. It was also noticed that glycoside formation remained associated with the increased contents of reducing sugar and total nitrogen. Studies established that glycoside content in rosette leaves was most pronounced during initiation of bolting. Axial leaves showed high glycoside contents when rate of flower formation was maximum. GA_3 treatment particularly hastened bolting time whereas treatments with Mg and Mn markedly augmented glycoside content in both axial and rosette leaves.

Introduction

The leaves of D.lanata Ehrh yield cardiac glycosides which increase the force of contraction of heart. Studies on growth and developmental physiology of this plant are not frequently reported and no specific information is available in the area of biosynthesis of glycosides in this species. Sharma et al (1982) analysed the effect of NPK on growth and digoxin content in this plant. Cytological, genetical and physiological studies have been done by Michalea and Silva (1972), Kennedy (1978), Gille and Ghiorgite (1982), Chatterjee et al (1979) and Diettrich et al (1985). The present paper reports the regulatory control of vegetative and reproductive growth as well as improvement of glycoside content by treatments with GA_3 and mineral nutrients in Digitalis lanata leaves.

Material and Methods

Sixty days old seedlings of Digitalis lanata Ehrh (Scrophulariaceas) were planted in experimental plots in a randomised block design. The plots contained organically rich loamy soil having average composition of N_2-0.35%, P_2O_5-0.04%, K_2O-0.03% and CaO-0.02%. The pH of the soil was 4.8. The spacing was maintained 2' x 2' from plant to plant and row to row. Seventy days' old plants were subjected to following treatments:

a. 25µg and 200µg/ml gibberellic acid (GA_3).

b. 1µg and 10µg/ml Mg ($MgCl_2$, $6H_2O$ as source) and

   Mn ($MnCl_2$, $4H_2O$ as source).

The plants were fed with 30 ml/plant of GA_3 and mineral nutrients solutions through leaves during morning hours in five equal installments followed by covering the plants with polyfilm for one hour. The results of optimum effective doses have been included in this report.

Extension growth (bolting), formation of rosette leaf (R-leaf), axial leaf (A-leaf), and flower was recorded every 15 days intervals according to the method described by Nandi (1980). The total glycoside (TG) content of leaves was extracted and estimated following the method of AOAC (1960) during different developmental stages of growth (Nandi, 1980). In daily variation study, the total nitrogen (TN) content was estimated following the method of Vogel (1961) at every hour of the day.

Results and Discussions

The contents of total glycosides (TG) in rosette leaves of D.lanata showed diurnal variation and registered a minimum level at 6 pm and later gradually increased becoming maximum at 6 am. It was also revealed that high glycoside formation in D.lanata remained associated with the increased content of total nitrogen (TN). Nandi and Chatterjee (1975) reported daily variation in alkaloid contents in Datura innoxia which became most favoured during the early hours of the day.

In normal plants of D.lanata, bolting phenomenon started at the age of 130 days of the plant (Table 1). The total glycoside content of the rosette leaves gradually increased and became maximum when plants attained the age of 160 days and thereafter declined. The TG content in axial leaf became maximum at the age of 175 days and later declined. GA_3 treatments (200µg/ml) increased glycoside content and hastened the initiation of bolting in the plant (Table 2).

The TG contents of rosette and axial leaves treated with GA_3 became maximum during 145 and 160 days respectively. In tables 3 and 4, the effects of Mg and Mn on bolting and glycoside formation have been shown. Mg and Mn increased the glycoside contents in both rosette and axial leaves. TC content became maximum during 160 days in rosette leaves and during 175 days in axial leaves. Bolting behaviour could not be changed by the treatments of Mg and Mn.

An analysis of rate of growth of bolting axis and formation of glycoside in D.lanata has been shown in table 5. In normal plants, a maximum rate of bolting growth was noticed during 130-140 days when the rate of TG formation in rosette leaves was also maximum. The

rate of TG formation in axial leaves was maximum during 150-160 days period. GA_3 treatments hastened the bolting time and the rate of increase of bolting growth was maximum during 110-120 days during which period the rate of TG formation was also maximum. The rate of TG formation in axial leaves became maximum during 130-140 days in GA_3 treated plants.

Rate of formation of glycoside in both rosette and axial leaves as well as flower formation during different developmental stages of the plant have been shown in table 6. The TG content in axial leaves gradually increased upto initiation of reproductive stage of development (i.e. late bolting stage) and its rate of formation in these leaves became highest when rate of flower formation was maximum. In rosette leaves, though TG formation increased upto initiation of reproductive stage (i.e. late bolting stage), its rate became highest in these leaves before initiation of flower took place on the bolted axis.

Phenomenon of bolting in relation to different growth and biochemical parameters in other rosette-type of plants like Nicotiana plumbaginifolia was reported by Gupta (1970) and Nandi (1980). It had been observed that the bolting in this species was accelerated by treatments with GA_3. In the present study, a clear correlation of bolting growth, glycoside formation in leaves as well as flower formation has been shown in a medicinally important plant like D.lanata. The study has also established a regulatory role of bolting phenomenon and flower formation on glycoside formation and its augmentation by treatments like GA_3, Mg and Mn, the findings of which could be comercially exploited.

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TABLE 1. Glycoside contents in axial and rosette leaves of D.lanata in relation to bolting growth.

Parameters	- After days (age) -									
	70	85	100	115	130	145	160	175	190	205
Bolting growth (cm).	0	0	0	0	1.50	9.31	15.37	23.78	27.32	28.51
TG of rosette leaves (mg/100mg)	0.8	0.87	0.96	1.06	1.19	1.37	1.42	1.35	1.24	1.18
TG of axial leaves (mg/100mg)	0	0	0	0	0.68	0.73	0.82	0.85	0.83	0.79

TABLE 2. Effect of GA_3 (200µg/ml) on glycoside contents in axial and rosette leaves of D.lanata in relation to bolting growth.

Parameters	- After days (age) -									
	70	85	100	115	130	145	160	175	190	205
Bolting growth (cm)	0	0	0	1.30	8.95	17.32	25.10	30.43	34.19	36.33
TG of rosette leaves (mg/100mg)	0.80	0.89	1.01	1.20	1.39	1.51	1.46	1.40	1.36	1.23
TG of axial leaves (mg/100mg)	0	0	0	0.81	0.89	1.02	1.05	1.00	0.98	0.91

TABLE 3. Effect of Mg (10µg/ml) on glycoside contents in axial and rosette leaves of D.lanata in relation to bolting growth.

Parameters	- After days (age) -									
	70	85	100	115	130	145	160	175	190	205
Bolting growth (cm)	0	0	0	0	1.40	8.92	15.24	24.0	28.52	29.82
TG of rosette leaves (mg/100mg)	0.8	0.89	0.99	1.15	1.39	1.79	1.82	1.75	1.71	1.66
TG of axial leaves (mg/100mg)	0	0	0	0	0.88	0.96	1.09	1.13	1.06	0.99

TABLE 4. Effect of Mn (10 µg/ml) on glycoside contents in axial and rosette leaves of D.lanata in relation to bolting growth.

Parameters	- After days (age) -									
	70	85	100	115	130	145	160	175	190	205
Bolting growth (cm)	0	0	0	0	1.50	9.59	16.46	24.32	29.01	30.32
TG of rosette leaves (mg/100mg)	0.8	0.87	0.96	1.08	1.36	1.75	1.78	1.74	1.69	1.64
TG of axial leaves (mg/100mg)	0	0	0	0	0.83	0.94	1.06	1.10	1.03	0.95

TABLE 5. Variation of glycoside contents in leaves with the rate of growth of bolting axis of D.lanata.

Parameters	During days					
	80-90	110-120	130-140	150-160	170-180	190-200
CONTROL						
Bolting axis	0	0	+360.32	+135.65	+8.05	+3.16
TG in R-leaf	+9.33	+13.19	+15.16	+2.43	-5.12	-8.43
TG in A-leaf	-	-	+8.10	+12.28	+1.09	-4.62
GA_3 (200)						
Bolting axis	0	+520.18	+192.17	+10.62	+4.68	+1.32
TG in R-leaf	+11.5	+16.42	+5.40	-6.22	-10.19	-11.15
TG in A-leaf	-	+10.15	+14.05	-2.06	-6.67	-8.33

TABLE 6. Rate of glycoside formation in relation to flowering in D.lanata.

Parameters	% increase (+) or decrease (-) during:			
	Vegetative	Bolting	Reproductive	Post-reproductive
CONTROL				
Flower formation	0	0	+380.45	+5.10
TG in R-leaf	+10.52	+15.16	+2.43	-5.12
TG in A-leaf	0	+8.10	+12.28	-4.31
GA_3 (200)				
Flower formation	0	0	+512.19	+8.22
TG in R-leaf	+12.32	+17.42	+5.40	-6.22
TG in A-leaf	0	+10.15	+14.05	-2.06

PLANT REMEDIES USED AGAINST 'FEVERS' IN A MIXE LOWLAND COMMUNITY, OAXACA, MEXICO

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ABSTRACT:

Ethno-botanical research, undertaken in the Mixe lowland community of San Juan Guichicovi (Oaxaca, Mexico) from October 1985 until December 1986 indicates a great variety of folk medical treatments to cure diseases popularly associated with a rise of the body-temperature ('toy'). Treatment consists in bathes and alcoholic frotations with 'fresh' and aromatic leaves. In cases which are perceived as more severe, teas and/or enemas are applied. The plant remedies used and the merits and dangers of these treatments are discussed.

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INTRODUCTION:

The rise of body temperature is one of the most frequent symptoms of illnesses. Mixe medicine of San Juan Guichicovi (Oaxaca, Mexico) has developed a great number of folk categories to distinguish illnesses associated with a rise of body temperature: 'Toy'. It is difficult to correlate these folk illnesses with diseases recognized by western bio-medicine. The only exception is xiim, which due to its distinct symptoms and blood smear examinations can be identified as malaria (Heinrich i. pr.).

RESULTS:

Despite the great number of folk illnesses associated with the rise of body temperature, the popular treatment is generally very similar (see table I). Bathes (b) or frotations (f) or ritual cleansing (limpias-l) with aromatic plants are among the procedures most frequently used if the fever is seen as less severe and if it is not enduring. If a fever is regarded as more dangerous enemas (e) and teas (t) are also used. Of all the plants recorded as folk remedies to treat fever

-24 are used exclusively externally,
-6 externally and orally,
-8 externally and rectally and only
-3 and 1 exclusively as tea or as enema, respectively.

Xiim (malaria) is also treated using bathes with aromatic plants (table I), but teas using other plants (table II) are additionally applied. All but Siparuna andina, which is an aromatic plant, are used because of the bitter principles they contain.

DISCUSSION:

Great attention has to be given to the modes of application of the plants used. Bathes, frotations and limpias will certainly give some relief from the major symptoms and will thus help the patient to recover more rapidly. These remedies are difficult to evaluate pharmacologically. The use of enemas in the treatment of fever is unlikely to produce positive effects, while its dangers due to the additional loss of water are potentially enormous. The teas used might help to cure the underlying cause of the illness, but this has to be evaluated on a more detailed basis. Plants used as teas -especially the ones used in the treatment of xiim (malaria)- are currently screened pharmacologically and phytochemical investigations are being started on some of these plants.

TABLE 1 PLANTS USED IN THE TREATMENT OF 'FEVER' (TOOY)

Scientific Name	Mixe Name	Mode of application	plant parts used	Other uses
ANACARDIACEAE:				
Mangifera indica L.	Mang aay	b,f	v	-
ANNONACEAE:				
Annona purpurea Moc. & Sesse	Noajy aky	b,e	v	body pain
Annona reticulata L.	Anona aay	b,f	v	-
ASTERACEAE:				
Epaltes mexicano Less.	Piix	b,f	v	head-ache
Parthenium hysterophorus L.	Artemis ujts	b,f	v	body pain
Tagetes erecta L.	Pikøn'k pøjy	b,f	a,w	'susto, malaire'
Tagetes filifolium Leg.	Anis ujts	b,f,t	v	-
Tithonia diversifolia (Hemsl.) Gray	Notaamtsy	b,f,t	v	muscular cramps, malaria
BALSAMINACEAE:				
Impatiens balsamina L.	Espiritu ujts	f	a	head-ache
BIGNONIACEAE:				
Tecoma stans (L.) Juss.	Tronadora	f,t	v	'to facilitate birth','infections'
BORAGINACEAE:				
Cordia curassivica L.	Xobarora	b	v	measels, haemorrhage
BURSERACEAE:				
Bursera simaruba (L.) Sarg.	Tsøk	b,f,e	c	measels, 'tis'
CAESALPINACEAE:				
Cassia fistula L.	Tsap tsina'an	b,t,e	v	cough
Cassia sennae L.	Hoja Sen	e	v	-
Chaemaecrista hispidula (Vahl.) I. & B.	Senn aay	b,e,t	v	stomach pain, haemorrhage
Senna occidentalis L.	Pa xuxky	t	v	'strong fever'
Senna skinneri (Benth.) I. & B.	Pa xuxky	t	v	'strong fever'
Senna spectabilis (D.C.) I. & B.	Poop Tsina'an	b	v	cough
Tamarindus indicus L.	Tamarindo	b,f	v	'susto, espinillo'
CAPRIFOLIACEAE:				
Sambucus mexicanus Presl.	Toxeem	b,f	w	'susto', cough
CRASSULACEAE:				
Kalanchoe calcycinum Salisb.	Tøds ujts	f	v	headache

TABLE 1 (continued)

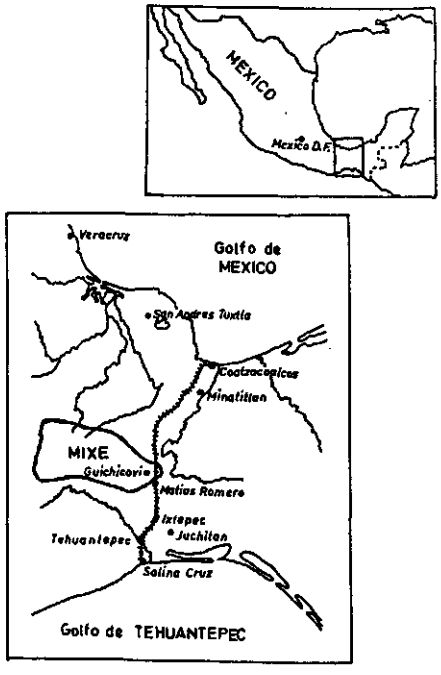
Scientific Name	Mixe Name	Mode of application	plant parts used	Other uses
CUCURBITACEAE:				
Momordica charantia L.	Manzanina	b,f,e	v	head-ache, colds
ELAEOCARPACEAE:				
Muntingia calabra L.	Mujty	b,f	c	diarrhoea, 'empacho'
FABACEAE:				
Gliricidium sepium (Jacq.) Steud.	Tsooky	b,f	v	'fever in the stomach'
Poiretia punctata (Willd.) Desu.	Malin ujts	b,f	v	body-pain
LAMINACEAE:				
Ocimum basilicum L.	Xuuiky	b,f,l	a	'susto', skin infections
Ocimum micanthum Willd.	Pa Xuuiky	b,f,l	a	'susto'
MALVACEAE:				
Sida acuta Burm.	Poop Tukaatsy	b,e	v	'susto',tooth ache
Sida rhombifolia L.	Tsap Tukaatsy	b,e	v	'susto',tooth ache
MELIACEAE:				
Cedrela odorata L.	Ajk	b,f,e	c	'susto'
MONIMIACEAE:				
Siparuna andina (Tul.) Bert.	Atsømtsi'ixy	b,f	v	malaria, 'susto'
MORACEAE:				
Cecropia optusifolia Bert.	Jood	b,f,t	v	body-pain, 'diabetis'
PIPERACEAE:				
Piper aff. aduncum L.	Yo'on	b,f,l	v	-
Piper amalgo L.	Yuk Yo'on	b,f,l	v	-
Piper auritum H.B.K.	Woo	b,f	v	'susto', skin infections
Piper aff. schiedeanum Steud.	Yuk Woo	b,f	v	'susto', skin infections
RUTACEAE:				
Citrus aurantium L.	Tsuiky	t	c	-
SOLANACEAE:				
Datura innoxia Mill.	Campana pojy	f	w	Dengue, body pain
Solanum schlechtendalium Walp.	Hoja de balsamo	f	v	headache
Solanum torvum Sw.	Kamatøøts	b,f	v	headache

Legend:
Mode of application:b-bathes, f-frotations, e-enemas, l-limpias, t-teas
Plant parts used: a-aerial parts, c-bark, v-leaves, w-flowers

TABLE 2 PLANTS USED IN THE TREATMENT OF 'MALARIA' (XIIM).

Scientific Name	Mixe Name	Mode of application	plant parts used	Other Uses
ASTERACEAE.				
Calea urticifolia (Mill.) D.C.	Tsaptaam ujts	t	v	stomach-ache
Calea zacatechichi Schlecht.	Pooptaam ujts	t	v	-
Tithonia diversifolia (Hemsl.) Gray	Notaamtsy	t,b	v	fever, muscle cramps
FABACEAE:				
Acosmium panamense (Benth.) Yakov	Nøøtxk	t	c	haemorrhage, stomach-ache
MONIMIACEAE:				
Siparuna andina (Tul.) A.D.C.	Atsømtsi'ixy	f,t	v	fever
SCROPHULARIACEAE:				
Russelia sarmentosa Jacq.	Anemats	t	v	-

Legend: see table I.



Map I: Location of the area of study.

INDIGENOUS MEDICINAL PLANTS OF GARHWAL HIMALAYA (INDIA) : AN ETHNOBOTANICAL STUDY

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Summary

Garhwal Himalaya (India) is inhabited by several aboriginal populations. The natives are still dependent for much of their therapeutic needs on the plants of their vicinity. The present paper incorporates the results of an extensive ethnobotanical study from the area and has brought in light some little known uses of indigenous plants in medicine.
Keywords: ethnobotany, aboriginals, ailment, remedy.

Introduction

Garhwal Himalaya comprises the central part of the Western Himalaya and lies between 29°26'N - 31°28'N and 77°49'E - 80°06'E. It makes the northern boundary of Indian state Uttar Pradesh and comprises the districts of Chamoli, Pauri, Tehri, Uttarkashi, and part of Dehradun. Physiographically, it is a mountainous terrain (350 m a.s.l. to 7800 m a.s.l.) with the vegetation of submontane, montane and alpine types.

The traditional systems of the inhabitants including the uses of plants are changing rapidly with the arrival of modern civilization, supplemented by degradation of forests. Though reports on floristics, ethnography and plant resources including the medicine in general, are available from this area, only a few attempts have been made on the ethnomedicinal aspects of plants (Gaur et al., 1983, 1984). The present communication includes the cummulative information on the uses of indigenous plants in medicine, drawn from different aboriginal groups. A comparison of various monographs, reports, floras and important medicinal treatises (Kirtikar & Basu, 1935; Anonymous, 1948-1976; Chopra et al., 1956, 1969; Agarwal, 1986), has indicated some little known aspects of medicinal plants which are included in the present text.

Inhabitants

The natives in general are called 'Garhwalis' or 'Paharis' and speak a dialect akin to the Hindus of Rajputana (Atkinson, 1882). Ethnically they belong to Indo-Aryan or possibly Indo-Iranian race which migrated from north-west of India and interbred with the ancient people already living in these areas (Atkinson, 1882; Joshi, 1929; Majumdar, 1962). Besides Garhwalis, the area is inhabited by some other aboriginal groups, which have

more or less distinct origin. They include- Bhotias, Marchhas, Tolchhas, Jads, and sub-populations of Garhwalis- the Jaunsaris, Koltas and Gangwals (Atkinson, 1882; Walton, 1911). The Bhotias, Marchhas, Tolchhas and Jads are marked with Mongolian features and are Tibeto-Burmese speaking people (Srivastava, 1958). Basic occupation of the inhabitants is agriculture and cattle rearing (Pant, 1935; Jinha, 1961).

Materials and methods

The study involved field work, interviews, study of specimens and comparison from literature. Extensive field trips during different seasons of the year were made in the area since 1982 to 1986. The plant specimens were collected and the therapeutic uses and vernaculars of plants were recorded through interviews with the peasants, shepherds, local medicinal practioners and elderly persons. The specimens were identified at the Herbarium of -Garhwal University, Srinagar (GUH), -Forest Research Institute, Dehradun (DD), and -Botanical Survey of India (Northern Circle), Dehradun (BSD) and are deposited with collector's number at GUH.

Results and discussion

There are common beliefs of the inhabitants regarding various types of ailments, however, sometimes variations in the remedial measures are also observed. In most of the cases the plant parts are taken as raw or in the form of juice or decoction for internal administration, while applied as juice, paste or poultice in external applications. Usually a single plant makes the remedy but use of combination of plants is also practised. Only such uses of plants which are otherwise less popular have been annotated in the following text, thus leaving much of the well known indigenous plants in medicine. In the following text Bentham and Hooker's system of classification (1862-1883) has been followed in the arrangement of families, while the genera and species within the family are treated alphabetically. The botanical names have been followed by family name, vernacular(s), GUH number, and local uses.

Aconitum atrox (Bruhl) Mukerjee. Ranunculaceae. Bish. 5053. Roots in very minute quantity are given in fever and used to cauterise the snakebites.

Thalictrum javanicum Bl. Ranunculaceae. Kirmul. 3707. Root powder is given to children in emesis and diarrhoea.

Michelia kisopa Buch.-Ham. ex DC. Magnoliaceae. Garuri, Kanjira. 4249. Bark decoction is given in fever.

Tinospora cordifolia (Willd.) Miers. Menispermaceae. Gilai. 1663. Stem is minced and put under water for 12-15 hours, after decanting the water the white layer left in the pot is given in gonorrhoea.

Geranium wallichianum D.Don ex Sw. Geraniaceae. Kaphlya. 2643. Roots are given with mother's milk to children in diarrhoea, dysentery, spasmodic pain and general fatigue

of body.

Aegle marmelos (L.) Corr. Rutaceae. Bel. 4183. Pulp of ripe fruit (50 gm) mixed with flowers of Anogeissus latifolia Wall. (50 gm) and fruits of Helicteres isora L. (10 gm) is given in the doses of 5 gm in amoebic dysentery.

Picrasma quassioides (D.Don) Benn. Simaroubaceae. Kuth, Koot. 4209. Bark and wood paste is applied in herpes-zoster.

Rhus parviflora Roxb. Anacardiaceae. Tungla. 1463. Stem ash is applied on the abdomen of children in suppressed urination.

Butea monosperma (Lam.) Taub. Papilionaceae. Dhak. 5564. Seeds mixed with asafoetida are taken as abortifacient.

Sorbaria tomentosa (Lindl.) Rehdr. Rosaceae. Kyans. 4548. Seeds mixed with tobacco are smoked in asthma.

Prunus cerasoides D.Don. Rosaceae. Payian. 4717. Wood infusion is given to women supposedly to check abortion. The inner portion of bark is cooked with jaggery in an iron vessel and applied as plaster on fractures.

Pyrus pashia Buch.-Ham. ex D.Don. Rosaceae. Melu. 4689. Fruit is crushed with teeth and the juice forced into the eyes of cattle in the early stages of cataract.

Anogeissus latifolia Wall. Combretaceae. Dhauru. 4694. Root ash is given to women in puerperal fever.

Luffa acutangula (L.) Roxb. Cucurbitaceae. Godra. 5536. Seed and fruit paste is applied on the supra-pelvic region of women suppose to cause abortion.

Nardostachys grandiflora DC. Valerianaceae. Maasi. 4823. Root powder is given internally as well as given as incense in hysteria.

Artemisia gmelinii Web. ex Stechm. Asteraceae. Chhamri. 4883. Roots are chewed in fever, diarrhoea and dysentery.

Cirsium verutum (D.Don) Spreng. Asteraceae. Kandar. 2648. Root mixed with the plant juice of Hydrocotyl asiatica L. and stem juice of Tinospora cordifolia (Willd.) Miers. is given in typhoid.

Saussurea obvallata (DC.) Edgew. Asteraceae. Brahmkaunl. 2786. Flower heads are warmed in mustard oil and the mild hot preparation applied in rheumatic arthritis.

Cuscuta reflexa L. Convolvulaceae. Akashbel. 4229. Plant mixed with the twigs of Vitex negundo L. is warmed and applied as fomentation on the abdomen of children in kwashiorkor.

Caryopteris odorata (D.Don) B.L. Robinson. Verbenaceae. Karwi. 1575. Leaf juice is applied on worm-infested sores of cattle.

Origanum vulgare L. Lamiaceae. Jogpua. 4591. Plant juice is given to children in fever and kwashiorkor.

Achyranthes aspera L. Amaranthaceae. Sajji. 3150. Root juice is given to women as oxytocic, and to children in fever.

Chenopodium album L. Chenopodiaceae. Bathhu. 4622. Seed decoction is given to women to expel the dead foetus.

Fagopyrum tataricum (L.) Gaertn. Polygonaceae. Oagal. 4595. Leaf paste is applied in herpes-zoster.

Euphorbia royleana Boiss. Euphorbiaceae. Sullu. 5542. Stem is used as cautery in cataract of cattle.

Sapium insigne (Royle) Benth. Euphorbiaceae. Khinna. 1641. Latex is applied in alopacia-areata; prior to its application the area is scratched with dry cow-dung.
Boehmeria rugulosa Wedd. Urticaceae. Genthi. 5713. Plaster of bark is applied on fractures and paste applied on cuts.
Pinus roxburghii Sarg. Pinaceae. Kulain. 4472. Decoction of saw-dust is given in renal calculi. Plaster of resin is applied on fractures in cattle.
Taxus baccata L. Taxaceae. Thuner. 15041. Decoction of wood is given in asthma and bark tea in general colds.

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