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An African knowledge of ethnosystematics and its application to traditional medicine, with particular reference to the medicinal use of the fungus *Engleromyces goetzei*

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ABSTRACT

Botany and medicine have been closely related fields of knowledge throughout the history of man's development. Consequently a folk knowledge of botanical classification (ethnosystematics) is often rooted in traditional medicine.

Four factors have contributed to ethnosystematics being particularly well developed in Africa. They are: the continuing importance of traditional medicine; the importance of the spoken word in handing down traditional botanical and medical knowledge; the richness and diversity of the African flora; and the many different languages and dialects used by the African people.

Some of the plants used in African traditional medicine are being investigated as sources of antibiotics and other useful substances. An example is the investigation of the fungus *Engleromyces goetzei* P. Hennings, whose medical use is described for the first time.

INTRODUCTION

Gradually, through trial and error, primitive man learned the uses of plants, especially those that served as food and as remedies for disease. To be lasting, this kind of classification of plants required the existence of names, and the practice of giving names to useful plants marked the beginning of systematic botany. This ability to know the names of plants and to identify them in their natural habitats is what I refer to as 'ethnosystematics' i.e. a folk knowledge of botanical classification.

There are several reasons why ethnosystematics is particularly well developed in Africa. Firstly, Africa has a very rich and diverse flora, which has served her people for many thousands of years. Plants are by far the most widely used sources of medicaments in the traditional medicine of Africa. In this traditional medicine man is regarded not simply as an organism on his own, but his sociological environment is also taken into account. Africans have long associated plants with ritual, symbolism and religious beliefs. More ritual symbols are drawn from the plant Kingdom (particularly trees) than from any other part of the environment.

A second reason for ethnosystematics to be well developed in Africa is that the continent is particularly rich in languages and dialects and every ethnic group has names for the plants growing in its environment. In many cases knowledge of plants (and their names) is shared by neighbouring cultures. This is probably because some of the people who make the greatest use of herbal remedies are pastoral tribesmen, who come in contact with other ethnic groups whilst travelling great distances in search of grazing for their livestock.

A good knowledge of ethnosystematics has survived in Africa largely because traditional medicine is still widely practised. In most African countries the majority of people usually live in rural areas where some of the common problems are: lack of communication (transport and telephone) services, low income, and lack of modern medical facilities. The nearest hospital or dispensary may be many kilometres away, and out of reach. Even if he can reach a hospital, the sick person may prefer traditional medicine. Well established traditional practitioners usually have many customers in rural areas — and they all have to be able to identify and know their plants.

The last factor in the survival of a well-developed ethnosystematics in Africa is 'the oral tradition,' which results in knowledge being widely held in the community. Knowledge of traditional medicines is handed down orally by medicine men/women, parents, elders or priests. This involves naming the plants to be used and the diseases to be treated, and observing the preparation and application of the medicaments. This tradition of relaying medical information orally is found in all African countries. Even Ethiopia, which has had its own written language for over 2 000 years, has no written record of traditional medicine.

This oral tradition has all the advantages of a living culture, being continually enriched and reflecting attitudes, beliefs and style of life.

It also has drawbacks. Some of the knowledge is liable to be distorted or lost completely during transfer, therefore becoming both erroneous and dangerous to the recipient. In the absence of an African pharmacopoeia, there is a need to place our knowledge of African traditional medicine and the ethnosystematics on which it relies, on a firmer basis.

TRADITIONAL PRACTITIONERS

The traditional medicine men and women have continued to occupy an important position in our societies. Probably at this stage, we should try to classify them and know who they are. They are

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sometimes referred to as traditional practitioners, healers, witch-doctors and so on. According to their practice, we can group them as follows:

—herbalists who use plants for treating their patients;
—divines (diviners) who are also herbalists but use divinatory procedures for treatment;
—spiritualists who hardly use plants at all for treatment;
—great therapists (also spiritualists) who have power of incantation (charm, magic, spell or formula) and rites.

It is the diviners, spiritualists and the great therapist spiritualists who normally perform ritual ceremonies and prepare ritual medicines to protect people from 'unnaturally' caused diseases, curses or sorcery. What is interesting here is that there is no cure in the world, including western medicine, for a person who has been cursed or bewitched — except via his own traditional beliefs. The victims of mystical misfortunes caused by the sorcery of an enemy or curse of a family member (living or dead) can be treated only by those I call 'advanced' traditional practitioners. A ritual diviner or spiritualist will determine, usually by divination with animal shells or marbles, whether the man has actually been cursed or bewitched, and if so, treat him with magical medicine. The treatment here involves primarily a ritual purification, removal of the original curse or sorcery, and thus removing the physical symptoms as well.

Traditional medicine as practised in Africa, embraces a wide field of medicine and pharmacology including pharmacognosy. These distinct professions as recognized in modern medicine, are usually combined by a single traditional practitioner. A good herbalist must have an excellent memory in order to carry all this information in his head. A traditional practitioner generally provides health care by using plant, animal and/or mineral substances as tangible objects for treating his/her patients. Of the three kingdoms mentioned, plants are by far the most widely used in African traditional medicine. I have observed that in fields of traditional paediatrics, obstetrics and gynaecology, women are excellent and authentic herbalists. Women are also much more liberal in passing on their herbal knowledge to their daughters than men. A man will normally wait until he is old, before choosing one of his sons (usually the first born) and teaching him his medical art. Although the medicine man is usually the more prominent and more popular in our society, the woman was the first physician, probably because of her close association with children who need the most medical attention in a family. One finds that, whereas there may be many practitioners here and there who have mastered small lists of herbal remedies, only a few attain eminence. It must be appreciated that a whole traditional pharmacopoeia known to each practitioner is carried in his/her head, and it includes the recollection of where the plant is to be found as well as the identification of the already prepared decoctions, infusions, ash or other dried leaves, roots and bark stored in the personal pharmacy. The respect the medical practitioner's command among African tribes is reflected by the very eminent names they are referred to in every dialect. And the reputation of 'Bwana Mganga' (Swahili) depends on appreciation of his medicine, therefore, he is usually credited with having 'good medicine' rather than being a 'good doctor'.

THE CONCEPTS OF DISEASES

The concepts of diseases among Africans reflect their culture and can be broadly grouped into two categories. The first group, 'naturally' caused diseases, are those which are due to tangible material which affect the body organs. Such natural diseases are regarded as minor or normal because they can be described by the patient and treated by the doctor in strictly physical terms. It is a common and preconceived belief (fear) that as soon as a disease becomes more acute or severe, it is due to 'unnatural' cause or 'intangible forces' which implies that a hostile person is using supernatural powers against the patient, or that the victim may have transgressed the moral code and incurred the wrath of ancestors. This second group of diseases is generally classified among our people as complicated and serious. Cases are characterized by persistent illness. Bewitched or cursed persons require special types of treatment, medicine and traditional doctors. It is due to such complicated cases that traditional treatment does not only make use of material substances like herbs, but sometimes includes resources drawn from the 'immaterial world.' Perhaps we should at this juncture, define Traditional Medicine as 'the sum total of all the knowledge and practices used in diagnosis, prevention and elimination of physical, mental or social imbalance, and relying exclusively on practical experience and observation handed down from generation to generation.' The term 'medicine' as used here, refers not only to herbs or drugs, but also includes a whole range of charms and amulets, spells and incantation.

PREPARATION AND DISPENSING OF DRUGS

The part of a plant used for preparing a drug depends primarily on the structure of the species. For trees and shrubs, it is a common practice to use the bark and/or roots. It is from such usage that East Africans have coined a colloquial Swahili name for herbal medicine 'miti shamba' meaning 'medicine from the tree.' With small plants and herbs the tendency is to use the whole plant and (by contrast with trees) the leaves are also frequently used. Traditional pharmacognosy is limited in that an extract from one plant is usually dispensed alone. Only occasionally is an infusion with extracts from two or more plant species given to a patient. The methods of preparing plants drugs by African healers are uniform, and are usually accomplished by one or two of the following procedures.

1. *Boiling:* is a common method, especially with roots and bark of trees or shrubs. The decoction is then taken orally or used for

bathing, depending on the nature of the disease.

2. *Soaking in cold water:* is generally used with crushed leaves or small herbaceous plants, and the concoction used as in the first method.
3. *Burning:* is also used with leaves and small herbs after the material has been dried. The ash can be licked, rubbed directly onto the wound, soaked in water and drunk or gargled in the mouth.
4. *Chewing:* is a first aid method of preparing a drug, especially for treatment of snake-bite, stomach disorders or for mouth and throat ailments.
5. *Heating or roasting:* is usually for preparing succulent leaves or other plant parts as a poultice (a kind of moist dressing applied on an inflamed part).
6. *Crushing or pounding:* normally precedes other methods such as boiling, soaking or burning. Crushed material may alternatively be applied directly onto a wound, usually after being mixed with some kind of oil.

What is interesting about all the six methods of preparing herbal remedies is that each of them attempts to extract whatever active principle is contained in the plant before it is dispensed to the patient. To the herbalists, the preparation is done in order to obtain the 'power force' of the drug. Practically all herbalists have some kind of pharmacy with ready made decoctions, infusions, instillations, powdery ash, inhalations, plasters, fomentations, enemas, embrocations, fumigations and bandages (usually made from dry pseudostem portions of banana). Another common feature of leading herbalists is the tendency to own a private garden where they grow special medicinal plants. In such a garden, they normally grow valuable herbs which are not growing naturally within their village. In this way, the supply of fresh drugs is made available to the customers as the demand may arise.

The method of dispensing the drug depends largely on the type of disease to be treated. Aromatic drugs for treating influenza or similar diseases are customarily used in steam form. Traditionally, drugs are frequently taken with various types of food stuffs. The pastoral tribes usually take their drugs in milk, others use soup, porridge (especially that made from the African millet flour, *Eleusine coracana*), honey, blood, and various kinds of native beer. It should be noted that the majority of the food stuffs used are in liquid form, and are both nutritious and appetising. Remember that most plant parts used for preparing herbal remedies can be sour, bitter or with offensive smell. Such drugs are usually mixed with a favourite food to make them more palatable.

AFRICAN USE OF HIGHER PLANTS IN TRADITIONAL MEDICINE

The overall number of drug plants used in Africa is so large that it would be unrealistic to try to list them in this paper. Specific examples can be read in the already available literature, e.g. Kokwaro (1976).

Apart from indigenous plants, a number of introduced or naturalized plants have now encroached into traditional medicine. A number of gum trees (*Eucalyptus* species) introduced from Australia usually have their aromatic leaves used for treating influenza. The same usage is employed on Citrus. Pride of India (*Melia azederach*) bark is used in Zaire and West Africa as an anthelmintic. Castor oil plant (*Ricinus communis*) which grows widely all over Africa is widely used as a purgative.

AFRICAN USE OF LOWER PLANTS IN TRADITIONAL MEDICINE

Lower plants are not as frequently used by Africans in their traditional medicine as are higher plants. Africans living in the East African highlands have, however, learnt to use a particular fungus which grows in the montane bamboo forests. This plant, is probably the fungus most widely and successfully used medicinally in East Africa. Its scientific name is *Engleromyces goetzei* P. Hennings. Although I had been studying its use in the Kenyan highlands since 1968, I had insufficient information to include it in my 'Medicinal Plants of East Africa' (1976). This is the first full report on the occurrence and use of the plant.

Engleromyces goetzei

General notes

Engleromyces is a monotypic genus belonging to the family Xylariaceae. It is usually placed in the order Sphaeriales of the Pyrenomycetes, but some authorities prefer to regard it as an ascomycete.

It is a semi-solid structure which can grow to the size of a football and weigh up to 4 kg. The flesh of the interior is like a heavy cake, resembling the local maize-bread 'ugali.'

Its Kikuyu name 'Kieha-kia-Murangi' means 'that which sits on the bamboo' and *Engleromyces goetzei* is in fact a parasite found only on the upper stems of the mountain bamboo *Arudinaria alpina*. It partially envelopes the bamboo stem, often forming two lobes, hence its English name 'baby's bottom' (Figs 1–4). Early specimens sent to European herbaria fascinated botanists, who also likened them to human skulls.

General distribution

Engleromyces goetzei has been reported from the Rungwe Mtns of southern Tanzania, the Ruwenzori Mtns (Uganda and Zaire), Echuya Forest in Kigezi District of Uganda and on the Virunga Mtns of Kivu Province in Zaire. In Kenya it occurs on Mount Kenya and the Nyandarua Mtns (Fig. 5).

Mount Kenya is located on the Equator and is, at 5 195 m, the second highest mountain in Africa.

FIG. 1.—*Engleromyces goetzei* growing on a bamboo stem, near Kiondogoro Gate, Nyandarua Mountains, Kenya. Photo: J. O. Kokwaro.

FIG. 2.—Adaxial surface of a mature *Engleromyces goetzei* showing the point of attachment to the bamboo stem. Photo: J. O. Kokwaro.

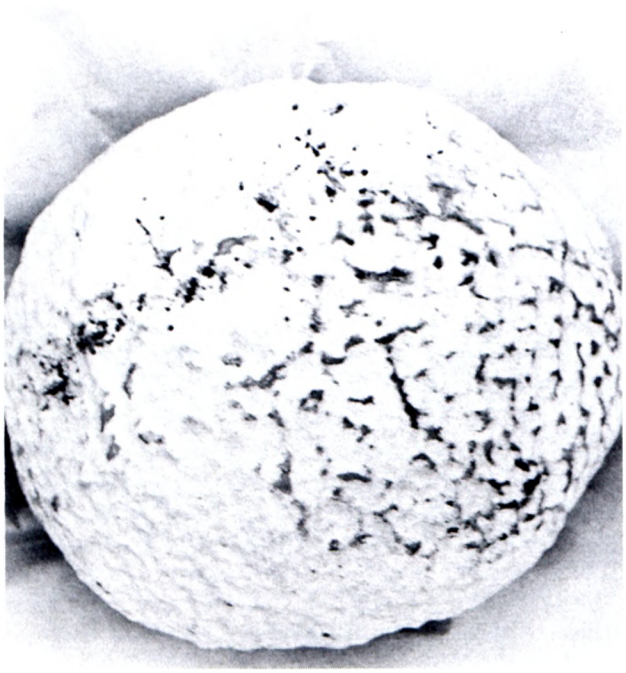

FIG. 3.—Abaxial surface of a mature *Engleromyces goetzei* showing the characteristic foveolate pattern. Photo: J. O. Kokwaro.

FIG. 4.—The lower part of the photograph shows why *Engleromyces goetzei* was called 'Baby's bottom,' and the horizontal upper surface shows its similarity to a human skull. Photo: J. O. Kokwaro.

The Nyandarua mountains consist of a 100 km long range, running from north to south between the Great Rift Valley and the Laikipia Plateau. Its northernmost summit, Satima (3 000 m) is close to the Equator. Other peaks include Kinangop (3 906 m), the Elephant (3 589 m), and Kipipiri (3 349 m).

Ecology in Kenya

Both Mount Kenya and the Nyandarua Mtns are volcanic and, despite their location on or close to the Equator, both mountains have cold, wet climates. Frost is common on Nyandarua above 2 750 m, and

Mount Kenya has a permanent snow-cap and a number of glaciers. The annual rainfall in the Bamboo zone, where *Engleromyces* occurs, varies from 750 mm to 1 750 mm on Mt Kenya, and from 750 mm to 2 000 mm on Nyandarua. On the western slopes of Nyandarua, the bamboo zone lies between altitudes of 2 700 m and 3 200 m, whereas on the Eastern slopes it is between 2 400 m and 3 000 m. The bamboo zone is very extensive on the Nyandarua Mountains and forms conspicuously distinct stands on Kinangop and Satima peaks at altitudes of 3 100 m to 3 300 m. Bamboo distribution is fairly constant and continuous on the lower zones of both Mt Kenya and the Nyandarua Mtns, except on their northern flanks.

Traditional uses

Although this fungus occurs in other bamboo forests of East Africa and Zaire, its medicinal use has only been reported from Kenya. My professor, Olov Hedberg, first collected *Engleromyces* from Mt Kenya in 1948, and was told by his field assistants that 'it is good against fever.' I was told the same story in 1968 and 1970 (Mt Kenya), 1972 and 1979 (Nyandarua). During and after the emergency periods, from 1952 to 1963, a number of Mau Mau freedom fighters lived in the forests of the two mountains. Since they could not use normal medical facilities, they frequently resorted to traditional medicine for treating their ailments. The climate on the mountains is cold, and some of the frequent diseases there are, pneumonia, colds and fever. The 'baby's bottom' is a reputed medicine among the Kikuyu against these ailments as well as headache (malaria being associated with it), psychosomatic problems, and liver diseases. They have discussed other internal diseases, but it is rather difficult to know exactly what they mean unless they mention a particular organ.

The elderly Kikuyus know the fungus so well that those now living in Nairobi can easily identify it. On 16th June 1979, I collected a sample near Kiandogoro Gate of Nyandarua Mtns. I brought the specimen to the department of Botany at the University of Nairobi, and I was met with remarks such as, 'Ah, you have brought the medicine!', 'May I have a piece of it, please.' In the forest, this fungus is a rare and precious commodity to get. This is obviously because it grows in real thick bamboo forest where there are lots of elephants, and also because it is heavily hunted for by those who know its medicinal value.

Medicinal use of 'baby's bottom' is also recorded from the Mau Range along the western massif through Elgeyo Escarpment to Cherangani Mtns wherever bamboo occurs. It is most likely that the Ndorobo, the original forest dwellers in Kenya, made use of it. The Marakwet know its medicinal value and call it 'Mandewap tegat.'

Treatment

All fevers (flu and colds), pneumonia, headaches, malaria, mental diseases, and thrush are treated by burning the fungus and inhaling the smoke, boiling the fungus and inhaling the steam, chewing fresh material or licking burnt ash. As a purgative, a decoction or infusion is used. It is also used for several systemic diseases including liver diseases and abdominal pains.

Since *Engleromyces* is reputedly effective in curing conditions caused by viruses and bacteria it was thought that it might contain antibiotics active against both groups of organisms. These antibiotics could possibly be similar to Aureomycin (a tetracycline drug which is used in treating penicillin-resistant viruses or bacteria), or erythromycin (another antibiotic group currently used against infections which have become resistant to penicillin). But the 'baby's bottom' is apparently closer in activity to aureomycin than to erythromycin because the latter is active against gram-positive organisms except Heissoria, ± *Haemophilus influenzae* and inactive against gram-negative bacteria. The Kenyan fungus may contain cytochalasins, (recently discovered anti-biotic mould products). The Germans recently discovered antibiotics from *Phoma* species *(Deuteromycetes)*, which they named Phomins, antibiotics with cytostatic activity (preventing the multiplication and growth of cells). Phomins are, however, simply another group of cytochalasins from a different group of fungi.

These deductions have proved well founded, since, from the material supplied by author of this paper to the Department of Chemistry, Odense University in Denmark, a new cytochalasan has been isolated and named *Engleromycin.* It remains for *Engleromycin* to undergo clinical testing.

CONCLUSIONS

It is quite evident that one of the many uses of African flora is in traditional medicine, and from traditional medicine we can discover new compounds which can be used in modern medicine. We are also aware that populations in most African countries are increasing at a more rapid rate than their respective national incomes. Much African natural vegetation has to be cleared to give way for agricultural land to feed the nation. In a number of cases, important medicinal plants are simply harvested from the natural vegetation, but no replanting is done. This poses the problem of extinction of species, particularly trees. African governments are, therefore, encouraged to preserve indigenous forests, include in their botanical gardens a section on medicinal plants, and have seed banks of indigenous economic plants apart from the cultivated crops. There is also an urgent need for chemical, pharmacological and clinical work to be done on the already known African medicinal plants before the knowledge is lost and the plants become extinct.

UITTREKSEL

Plantkunde en medisyne is regdeur die geskiedenis van die ontwikkeling van die mens, vakgebiede wat na aan mekaar verwant is. Vervolgens spruit 'n

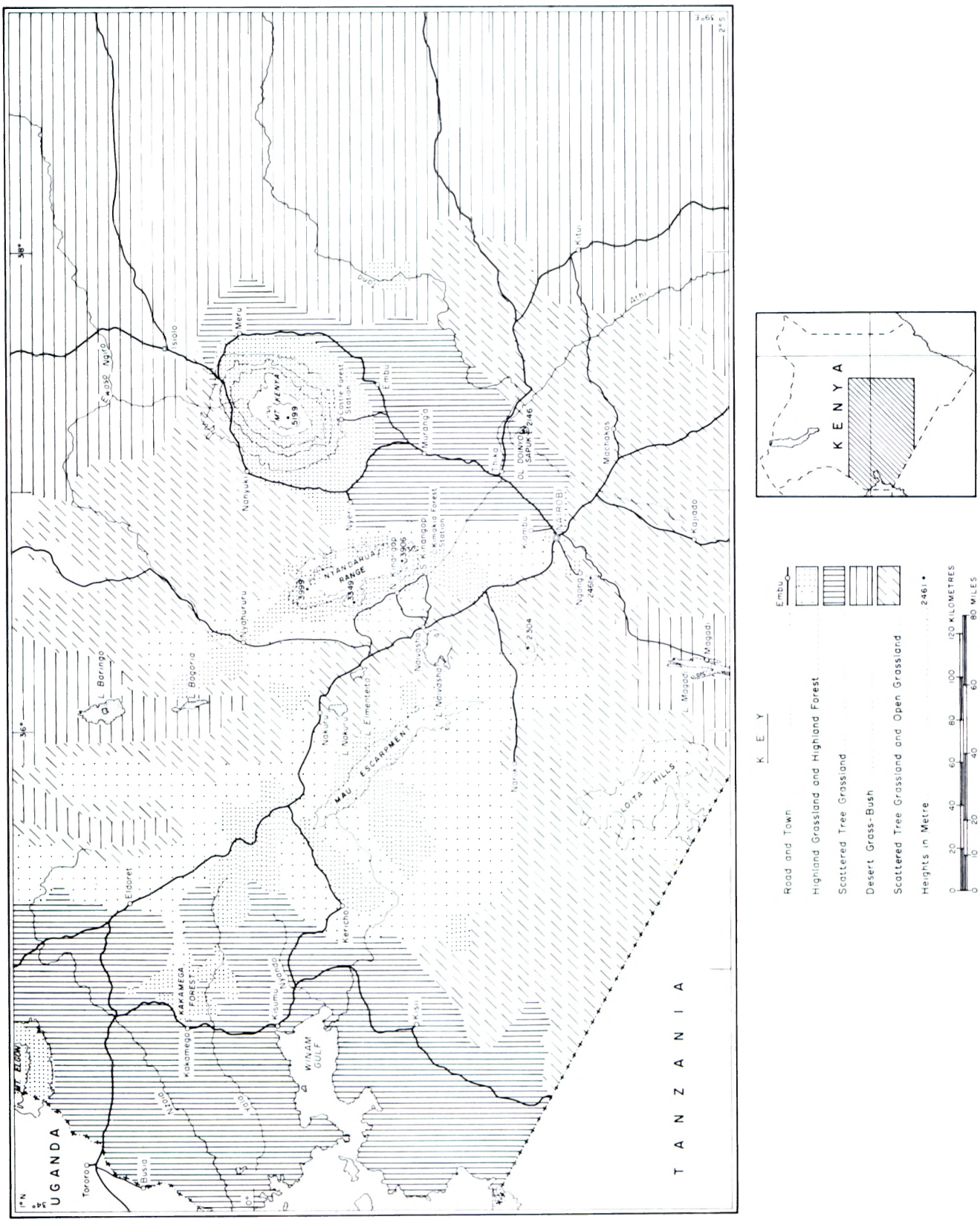

FIG. 5.—Map of Kenya showing main vegetation types. The small map shows the distribution (hatched) of *Engleromyces goetzei*.

volkskennis van botaniese klassifikasie (etnosistematiek), dikwels voort uit tradisionele medisyne.

Vier faktore het bygedra tot die besonder goed ontwikkelde etnosistematiek van Afrika. Dit is: die deurlopende belangrikheid van tradisionele medisyne; die belangrikheid van die gesproke woord by die oorlewering van tradisionele botaniese en mediese kennis; die oorvloed en verskeidenheid van die flora van Afrika en die baie verskillende tale en dialekte gebruik deur die mense van Afrika.

Sommige plante wat gebruik word in die tradisionele medisyne van Afrika word ondersoek as bronne van antibiotika en ander bruikbare stowwe. 'n Voorbeeld hiervan is die navorsing op die fungus Engleromyces goetzei *P. Hennings, waarvan die mediese gebruik vir die eerste keer beskryf word.*

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