MEDICINAL AND AROMATIC PLANTS

Healthcare, economics and conservation in South Africa

by Gillian Scott, National Botanical Institute

Have you ever considered where the medicines that line the shelves of your pharmacy come from? You might think that the ingredients listed on a bottle of cough mixture or a box of headache tablets are all synthesized in some stainless steel laboratory, but you could be wrong. The chances are that approximately one-third of those ingredients were derived from plants.

Codeine, for example, is a common ingredient of syrups used to suppress an irritating cough or of analgesic preparations taken to relieve various aches and pains. This compound can be synthesized by a competent pharmaceutical chemist, but not as efficiently and economically as by the opium poppy, Papaver somniferum. The latex of the poppy capsule is a rich source of various alkaloids, of which codeine is only one. Another is morphine, a more potent analgesic than codeine, with additional sedative properties. Named after Morpheus, the Greek god of sleep, morphine remains, nearly 200 years after it was first isolated from poppy latex, an extremely useful drug.

The birth control 'pill', too, a major medical achievement of the 20th century, is today produced from natural starter materials. The components of most 'pill' formulations belong to a group of chemicals known as steroids, large complex molecules whose laboratory synthesis is an expensive multi-stage process. Pharmaceutical chemists have taken advantage of the capacity of some plant species to manufacture large quantities of steroid-like principles which can be chemically tailored to fit the requirements of the 'pill'. Yams (Dioscorea spp.), sisal (Agave spp.) and some members of the tomato family (Solanaceae) have all proved to be good sources of steroid starter materials.

Traditional remedies and indigenous medicinal plants.

The plant-derived pharmaceuticals that constitute 30% of prescription drugs used in western medical systems are obtained from only about 120 plant species - a mere handful of the 250 000 (and possibly many more) known to science. Chinese medicine makes far greater use of natural products; some 5 600 plant-derived medicines are listed in the Chinese Pharmacopoeia. In India, Ayurvedic, Siddha and Unani medicine is likewise dependent on plants, to the extent of about 2 300 species. An estimated 80% of the world's peoples rely on various traditional medical systems, all of which use plant-derived remedies. In South Africa it appears that 70 - 80% of
Black people visit traditional doctors on a regular basis and use the locally available herbal preparations prescribed.

As far back as 1976 the World Health Organization (WHO) recognized the importance of plants in global health care. Its recommendations were that traditional remedies be critically assessed and, where appropriate, used in primary health care to replace expensive, imported pharmaceuticals. While recognition that a long history of usage was a form of clinical trial, the WHO nevertheless took cognizance of the inherent variability of all natural products and laid down strict standards aimed at ensuring quality, safety and efficacy of these herbal remedies. The health authorities of many countries, particularly in the developing world, have followed the advice of the WHO regarding traditional medicine. In South Africa most people concerned with health policy agree that some way will have to be found of formally recognizing the contribution to health care of traditional doctors.

Getting to grips with indigenous medicinal plants has the potential to benefit not only the health of individual countries but that of the entire human race. Medical science lacks adequate, effective drugs to treat, for example, certain forms of cancer, parkinsonism, viral diseases (especially AIDS) as well as some allergic and stress-related disorders. The potential of plants to produce compounds of pharmaceutical interest has hardly been investigated. Perhaps 15% of all known plant species have been screened for therapeutic potential and only about 1% exhaustively examined.

The plant kingdom has in the past been referred to as 'the sleeping giant of drug development' but pharmaceutical companies have generally been slow in taking up the challenge. As a starting point for plant-screening programmes, traditional herbal remedies have always been profitable: three-quarters of the plant-derived prescription drugs in common use today were dis-
covered by following folkloric ‘leads’. Traditional medical practice in South Africa goes back thousands of years, to the establishment of Khoikhoi and Bushman tribes in the region. These people made extensive use of locally-available plants as medicines and they became economic botanists par excellence - because their lives depended on it. Only a fraction of their extensive knowledge has come down to us, but it is enough to whet the appetite, provide the impetus for modern research and give added rationale for the conservation of South Africa’s extremely rich flora.

A major problem is the rapidly dwindling reserve of raw material. Most of the plants used both in traditional medicine and by the pharmaceutical industry come from the wild. Cultivation, globally, is not extensive and the potential loss of species as a result of habitat destruction, climatic change or burgeoning populations is a matter of international concern.

One economist went so far as to predict that the projected loss of 50 000 species by the end of the century would mean the loss to the pharmaceutical industry of some twenty-five prescription drugs, with a market value of US$ 25 billion. The International Board for Plant Genetic Resources (IBPGR) recommends that medicinal plant gene banks be established worldwide, that heavily exploited species be domesticated as crop plants and that traditional knowledge be recorded before it vanishes forever.

Careful husbanding of South Africa’s medicinal plant resources would not only be sound conservation policy but good economic sense. Alternative crop development, expansion of the pharmaceutical industry, creation of a natural products industry geared to tourism - these could all spell economic diversification and new job opportunities. South Africa’s plants are a much-neglected natural resource and have played second fiddle to our mineral reserves for too long. Not that overseas markets aren’t interested. On the contrary, the consumption of plant-based pharmaceuticals in western Europe has doubled in the last ten years.

**Food and cosmetics**

The ‘green wave’ has spilled over into the food and cosmetics industries as well, with vastly increased demands for plant oils as flavours or fragrances, a significant trend when one considers that four of South Africa’s twenty largest plant families are rich in aromatic oils - most of them unknown to agriculture or industry. Indigenous members of the Geraniaceae, Asteraceae, Rutaceae and Lamiaceae families, for example, often possess not only attractive flowers, but fragrant foliage and also a capacity to flourish in semi-arid areas where other crops might not succeed. Local organic chemists, botanists and horticulturists often receive requests for plant material from foreign pharmaceutical or essential oil companies but the problem has always been one of maintaining a constant high quality supply.

Domestication of suitable species using selected propagation material and maintaining good agricultural practices would go a long way towards overcoming these difficulties. There is no lack of expertise necessary for meeting these demands - merely a lack of communication between research, industry and agriculture in this country.

**Hands off our medicinal and aromatic plants!**

Consider the loss of income that would result were our medicinal and aromatic plants to follow many of their horticultural counterparts - straight into the hands of foreign entrepreneurs. Think of the Pelargoniums that tumble...
from every window box in Europe - all derived from South African parent stock. And the Gladiolus cut-flower industry, one of the top ten in international trade, which was developed entirely from two or three South African species.

We need to be more careful with our genetic resources. It is perhaps time for some regional co-operation in southern Africa on the question of medicinal and aromatic plants. What one country is able to offer in the way of technological expertise, another may have in good plant resources and a third in experience concerning traditional medicine.

With this in mind, the National Botanical Institute, in collaboration with Gencor, the Southern Foundation and the Foundation for Research Development, recently convened a workshop for the purpose of developing a national and ultimately regional programme for indigenous plant use. Medicinal plants were a major focus of interest. Much the same topic was addressed, at international level, by delegates to the first World Congress on Medicinal and Aromatic Plants for Human Welfare held in Maastricht in July 1992. Representatives from fifty-six countries in the developing and developed world met to discuss global collaboration on matters such as the conservation, industrial development and quality control of medicinal and aromatic plants.

Using plants to synthesize chemical compounds
The congress objectives were succinctly summarized by one speaker who posed the question: 'Why not use solar energy instead of fossil fuel to pro-
duce our medicines?' What he meant was that plants, using only sunlight, are capable of synthesizing a variety of chemical compounds. To do the same in a laboratory generally would be far more costly, in terms of the electrical energy required to drive the manufacturing process.

The complexity of many plant chemicals, too, would tax the ingenuity of the most inventive organic chemist. Many thousands of natural products are known to science and more are isolated annually - in 1988 alone some 2 618 new chemical compounds were extracted from plants. Known as secondary metabolites because they do not appear to play a role in essential primary plant processes such as photosynthesis or respiration, these compounds are not universally distributed throughout the plant kingdom. Biologists believe that they form part of the plant's defence against attack by microbes, insects or larger herbivores and there is no real reason why they shouldn't be medically useful to humans. That many secondary compounds are also valuable therapeutic agents is the good fortune of mankind.

Making greater use of our plants as medicines than we do at present may take South Africa a step nearer to attaining the WHO goal of 'health care for all by the year 2000'. The vital role played by indigenous medicinal plants in the health care system of the country will be one of the themes highlighted at FLORA '93, to be held in Cape Town in September this year. It is also the main thrust of a traditional medicines programme for South Africa currently being developed by the National Botanical Institute in collaboration with the Department of Pharmacology at the University of Cape Town. By emphasizing the current and future utilitarian value of our medicinal plant resources we put a price tag on conservation which will perhaps convince politicians that good health should come before party ideals.

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The pineapple lily, Eucomis autumnalis, is virtually extinct in many places mainly due to commercial gathering by herbalists.

Photo Percy Sipande

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