



Medicine trees of the tropics

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Medicinal plants play an important role in the lives of rural people' particularly in remote parts of developing countries with few health facilities.

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Tropical forests are the source of a large proportion of the world's recognized medicinal plants. It is variously estimated that there are between 200000 and 700000 species of tropical flowering plants. Such a wealth of identified species, which have been in no sense thoroughly investigated, constitutes an enormous potential source of plant-derived chemicals useful to man.

Tropical forests are disappearing at a frightening rate and man is unwittingly observing the decrease of a natural resource which has been described as a "power-house of evolution" and a major source of "wild medicine". FAO, UNEP, Unesco and IUCN have realized the implications of this steady loss and are trying to stem such destruction of forests, largely caused by shifting cultivation arising out of rural poverty and a hunger for land for subsistence farming.

Since May 1978 the World Health Organization has been making a study of medicinal plants. This study prompted the initial identification of 20000 species of medicinal plants and a more detailed investigation of a short list of 200. A great many of these plants have their origins in the world's tropical forests and their present use is largely rooted in traditional medicines which play a major part in maintaining the health and welfare of both rural and city dwellers in developing countries.

The disappearance of the natural vegetation and even its replacement with artificially established forests of exotic species are changing the ecology of the environment with a consequent disappearance or change in occurrence of many medicinally useful species, thus depriving rural communities of their benefits.

How can FAO assist in the conservation of these species? The most appropriate programmes appear to be those dealing with forest conservation and management and forestry for local community development. The former provides the rationale and systems for managing forests and the latter helps identify and promote the cultivation and use of forest-derived species, which are appropriate for establishment by rural communities because of their potential

multiple use.

What appropriate species of medicinal value are already known? The following are relevant examples and there are no doubt many others awaiting discovery both from literature as well as from field identification and study.

One of the medicinal plants that thrives in humid tropical forests is *Mallotus philippensis* (Lamk.) Muell-Arg. (fem. Euphorbiaceae) commonly known as "kamala". The natural range of kamala extends from the rain forests of tropical Australia, Papua New Guinea, the Philippines and southern China to the moist evergreen or semi-evergreen forests of India, where kamala is often a secondary species.

The tree itself is generally narrow-stemmed and grows up to 15-20 m in height whereas in India a smaller many-branched evergreen tree with a short buttressed bole is found. Kamala is recognizable by its deep red slash and the downy reddish glandular underside to its shiny-surfaced leaves. The fruit is a globose capsule densely covered with a reddish-brown glandular pubescence from which the main medicinal products are derived.

Kamala has a wide variety of medicinal uses. All parts of the tree can be used as external applications for parasitic infections of the skin. The powdered glands and hairs of the fruit are a useful anthelmintic and extracts of kamala and hexachlorethane have given encouraging results in treating fascioliasis (liver fluke) in cattle. The fruit is also used to treat intestinal worms.

Other functions of kamala include the use of its leaves as fodder; its oil as a fixative in cosmetic preparations, colouring of foodstuffs and beverages and the use of kamala wood in light construction, tool handles, turnery and even for paper pulp. In Australia the wood is used for brushware, flooring, and packing cases. It is also the long-valued source of the dyeing substance used on silk and wool, also known in the trade as "kamala".

Another genus of medicinal value from the humid tropics is *Rauwolfia* (fem. Apocynaceae). Like kamala, it is pan-tropical and comprises 100 species. The two most important species appear to be *Rauwolfia vomitoria* Afz. from the humid tropical secondary forests of Africa, ranging from Senegal to the Congo, Uganda and East Africa and *Rauwolfia serpentina* Benth and Kurz, from the moist deciduous forests of tropical Asia.

The *Rauwolfia* species have three main medicinal uses: raw material for the extraction of isolated alkaloids, preparation of extracts with a standardized alkaloid content and the production of powdered *Rauwolfia* roots. The pharmaceutical derivatives are used mainly as antihypertensives and as sedatives. Folk medicinal uses of the root bark and roots are extensive, particularly for their aphrodisiac, emetic, purgative, antipsoric, dysenteric, sedative, abortive and insecticidal properties. Decoctions of the leaves of *R. vomitoria* have a powerful emetic effect and chopped leaves stewed with animal fat are applied to swellings. In India, *R. serpentina* root preparations have been used for centuries in the relief of disorders of the central nervous system, as an anthelmintic and for the treatment of intestinal disorders as well as the stimulation of uterine contractions.

Medicinal types

Abortifacient: inducing abortion

Anthelmintic: expelling or destroying parasitic worms, especially of the intestines

Antipsoric: relieving itches

Aperient: gently moving the bowels: a laxative

Astringent: drawing together soft organic tissues; a styptic

Bechic: tending to cure or relieve a cough; an expectorant

Cardiotonic: tending to increase the tonus of heart muscle

<p>Diaphoretic: increasing perspiration Dysenteric: dispelling dysentery or severe diarrhoea Emetic: inducing vomiting Emmenagogic: inducing menstruation Expectorant: promoting discharge of mucus from the respiratory tract Haemostatic: stopping bleeding Hypotensive: causing low blood pressure or a lowering of blood pressure Febrifugic: mitigating or removing fever Purgative: purging or tending to purge: cathartic Rubefacient: inducing redness of the skin by external application Vulnerary: speeding the healing of wounds</p>

The main buyers of products derived from *Rauwolfia* in the early 1970s were the Federal Republic of Germany, Italy, Switzerland and the USA. Prices then were US\$ 3.75-4.00 per 0.5 kg (1 lb) for powdered root of *R. serpentina* and US\$ 0.30-0.40 per gram for the alkaloid, reserpine. The root and root bark of *R. vomitoria* commanded a price of DM 46 per kg/c.i.f. and at that time the market appeared "remarkably stable".

A third important medicinal plant comes from the tropical forests of South America. Various called "Tofu balsam." "Peru balsam" or "Quinoquino," *Myroxylon balsamum* (L.) Harms. (fem. Leguminosae) is another large forest tree growing up to 35 m in height. It is a native of the forests of Venezuela, Peru, Nicaragua, El Salvador, Guatemala and Colombia, ranging from subtropical dry to wet to tropical dry zones.

The species can be distinguished by its yellow-spotted grey bark and evergreen, oddly pinnate, oblong leaflets 6-9 cm long and 3-4 cm wide. The white flowers are borne in axillary racemes 10-20 cm long and produce a winged indehiscent pod (samara) 5-10 cm long with a single seed.

The medicinal product is a balsam: an important ingredient of tincture of benzoin. It is also used in ointment as an antiseptic, in cough syrups as an expectorant, as an inhalant for catarrh and bronchitis and is said to have bactericidal, pectoral, tonic and vulnerary properties. An ethanol extract is an antibiotic against *Mycobacterium tuberculosis*. It is also used to treat skin complaints, haemorrhoids and bedsores.

Tolu balsam's other non-medicinal uses include the flavouring of cough syrups, soft drinks, confectionery, ice-cream and chewing-gum. Oil of Tolu balsam is used in cosmetics and soaps. The wood can be used for purposes ranging from railway ties to cabinet work. The seed provides flavouring for the alcoholic drink, *aguardiente*; the tree provides shade for cultivated crops and it is also used ornamentally.

Annual world production (1981) of Tolu balsam is about 65 tonnes of which El Salvador exports 48 tonnes or 74 percent. The price of Peru balsam is US\$ 1.30-2.40 per 0.5 kg (1 lb), and roughly half the world's production is exported to the USA.

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Less generally useful but of considerable pharmaceutical interest is another representative of the family Apocynaceae, the red or Madagascar periwinkle *Catharanthus roseus* (L.) G. Don - syn. *Lochnera rosea* (L.) Reichb. f. or *Vinca rosea* (L.), which originates in the tropical forests of Madagascar and is now found pan-tropically.

Its unprepossessing common name (red periwinkle) belies the potency of the alkaloids

produced from the whole plant, such as vincristine and vincalurekoblaline, which helped in producing a breakthrough in the chemotherapeutical treatment of Hodgkin's disease and leukaemia. Parts of the plant are also used in the preparation of remedies for diabetes in places as far apart as Natal, Viet Nam and Queensland. A wealth of folk remedies are prepared from the plant, which is regarded as having astringent, diaphoretic, emmenagogic, abortifacient, bechic, cardiotoxic, hypotensive, febrifugic and tranquillizing properties.

The primary active chemical constituents which are most concentrated in root bark are the alkaloids ajmaline, serpentine and reserpine, but at least 12 others have been positively identified, including leurosine and vincalurekoblaline. Vinceine, tetrahydroalstonine and lochnerine, which are also present in the root bark, are important for pharmaceutical purposes.

There are commercial preparations known as Velban, Covincia and Vinlin, but the main extract is vincristine which sells for around US\$ 200000 per kg and requires about 530 tonnes of plant material for its production. The worldwide trade in vincristine is worth about US\$ 50 million per annum.

In the arid tropics there is another medicinally valuable species worth mentioning: *Jatropha curcas* L. of the family Euphorbiaceae, commonly known in Portuguese as "Pinhão de Purga" or "Pinhão de Paraguai" and in English as "Physic nut" or "Purging nut". The species was originally found in tropical America but has now spread to all parts of the tropical world.

In Burma, the seeds are used as an aperient and are edible once the embryo has been removed. Oil from the seeds has been described as laxative, emetic and even drastically purgative. It is also a rubefacient for rheumatism as well as in alleviating toothache. The leaves are antiparasitic and a decoction of these is used as a vulnerary or with natron for gonorrhoea. It can also be used as a cough remedy, if the roots are included, and as an antidiarrhoeic.

Jatropha curcas forms a large shrub 3-4 m high with broadly ovate, cordate, acute, lobed, glabrous leaves measuring 10-15 cm long by 7.5-12.5 cm wide. Its small yellowish-green flowers are in loose panicles of cymes; its fruits are 2.5 cm long, breaking into three 2-valved cocci containing ovoid-oblong dull brownish-black seeds.

Jatropha curcas is drought resistant, and has spread naturally in many tropical countries. It is now even found in the arid Cape Verde Islands from sea-level to 1000 m and thrives particularly well at 450-750 metres.

The shrub is grown readily from cuttings 45-100 cm long, and can also be propagated by seed although growth from cuttings is more rapid. Bushes start to yield seeds at 4-5 months of age and have a life span of about 50 years. When dry, the seeds are retained on the bush for a long time. The leaves are not browsed by goats and the bush stands lopping and trimming well. This, together with its ability to sprout from cuttings, makes it a good hedge plant. The species could also be considered for soil and water conservation purposes on eroded catchments as it is extremely adaptable to most soil conditions.

The seed oil contains curcasine or curcin, a toxalbumin resembling ricine and a resinous substance (resinolipoid) which are both poisonous. Another component is curcas oil which contains myristic, palmitic, stearic, arachidic, loecic and linoleic acids. The seeds owe their purgative property to the above oils.

The abundant sap contains 10 percent tannin and is soapy to the touch; it can be used as marking-ink. The bark contains 37 percent tannin and is said to yield a dark blue dye.

The species is commonly grown for hedges and fences and was introduced by the Portuguese into Asia and Africa where it is still cultivated as an oil-seed crop in the Cape Verde Islands

and Madagascar. In Madagascar it is also grown as a support for the vanilla plant. The plant can be used as fish poison and the seed oil is used commercially for the production of soap, a textile lubricant and as an illuminant. Tender leaves are often eaten cooked in Java and Malaysia and used to cultivate the Eri silkworm in Assam.

Commercial yields of seed are said to be in the order of 400-1200 kg/ha in Cape Verde. The seeds are collected and exported mainly to Portugal and France for oil extraction.

The well-known acacia, *Acacia nilotica* (L.) Del. and *A. arabica* Willd, of the family Leguminosae are other arid-zone species of medicinal plants. The former covers an area from northern Nigeria to dry tropical East Africa and the latter spreads from South and East Africa through Arabia to northwest India and Pakistan.

The high tannin content of the soap, leaves, bark and young pods makes their extract very astringent and therefore useful as a haemostatic and a remedy for diarrhoea and dysentery. The gum of both species is edible and is useful for the relief of throat and chest complaints. The pods and young leaves are good fodder, and the wood of both species is hard, durable and commonly used for wooden handles, agricultural implements, turnery and cabinet work. It also provides good fuel and charcoal. The trees afford valuable shade in dry hot regions and their bark is a rich source of tannin for processing leather. The gum can serve as a substitute for the "gum Arabic" normally harvested from *A. senegal*.

The use of medicinal plants plays an important role in the lives of rural people, particularly in remote parts of developing countries which are poorly served with health facilities. Products derived from plants found in the tropical forests are not only useful for traditional medicine, but also often have a considerable market value. The sale of raw materials for pharmaceutical purposes can be especially important for subsistence farmers.

There is therefore, a need to identify tree species which are capable of multiple uses, such as wood production as well as alternative products such as medicines. This would promote recognition of the value of particular species and result in their inclusion and consideration in forest management planning.

It is evident that certain trees, of which only a very few have been described here, can serve man's medicinal and many other needs while assisting in protecting the environment upon which he and other living creatures depend. The cultivation of this type of tree amongst others (whose main uses may be the production of food, wood energy, fodder and wood for industrial purposes) can help to rehabilitate degraded forest lands. Research into the identification of such multiple-use species should continue and be intensified.

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