

THE RICH DIVERSITY AND THE POTENTIAL MEDICINAL VALUE OF THE SRI LANKAN FLORA

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Introduction

Early cultures developed their own traditional systems of medicine, by trial and error, based on a long process of interaction between man and the habitat. The historical use of plants in the treatment of ailments resulted in several organized systems of traditional medicine. The therapeutic properties of a large number of plants were recognized and documented in *Materia Medica* and *Ola* leaf manuscripts. These form the basis of much of Sri Lanka's traditional systems of medicine. Today there are two main systems of medicine practiced in Sri Lanka, namely the traditional system and the allopathic (Western) system. A survey by the WHO estimates that 70% of the population in Sri Lanka still rely on the indigenous system of medicine based mainly on plant formulations (Anon., 1978). The 'Ayurveda', 'Deshiya Chikitsa', 'Siddha' and 'Unani' are four systems widely practiced in the island. Ayurveda and Deshiya Chikitsa systems use mainly plant and herbal products. The former uses about 2,000 plant species and the latter about 500. Traditional preparations like 'arishta', 'kasaya', 'guli' and 'kudu' contain more than 90% of material derived from plants. A large number of plants of medicinal value has been listed in a compilation called 'Sinhalese *Materia Medica*' (Attygalle, 1917). Information on the chemistry and the pharmacology of some Sri Lankan and Indian plants (Chandrasena, 1955) and medicinal plants used in Sri Lanka (Jayaweera, 1980-82) are also documented.

Sri Lanka, formerly known as Ceylon, is an island approximately 65,000 km² in extent, located 29 km south of the southern tip of peninsular India. The Island is centrally situated in the Indian Ocean between latitudes 50° 55' - 90° 51' North and longitudes 79° 41' - 81° 53' East. Two main mountainous regions in the central and the south central parts of the island constitute about 20% of the land area over 300 meters altitude. Temperatures in the island range from about 0° C in the nights in the hill region to about 78° to 85° F in the lowlands and about 13 °- 16 ° C in the high elevations of the country. The average rainfall varies between 1270 and 2570 mm per year. In the absence of marked temperature differences, the rainfall factor more or less determines seasonal variation in the climate in the island. The Central, Western and the Southern regions are more humid than other regions.

Rich Biodiversity Unmatched in the Region

The flora of Sri Lanka occurs in a wide range of environments- dry zone, coastal regions, tropical rain forests, high altitude forests and mangroves - and is easily accessible. The variety of soil conditions, temperature and humidity is reflected in the wide range of flora. Both climatic and geomorphological features contribute to the ecological differentiation of forest types in Sri Lanka: The "wet zone" in the Southwest lowlands receiving over 5,000 mm of annual rainfall is the richest in flora in Sri Lanka and all of South Asia as well; the lowland "dry" and "arid" zones in the peripheral areas of the island, with less than 1200 mm of annual rain, has a poorer representation of flora; the central highlands region with its montane zone is as rich in flora as the "wet zone".

The earliest botanical description of Sri Lankan plants is contained in a series of books (Trimen, 1893-1931) and these have been later revised (Dassanyake and Fosberg, 1980-2000). This revision has also expanded and modernized the National Herbarium at the Royal Botanical Garden in Peradeniya and ensures the correct identification of the plants collected. The National Herbarium currently houses about 125,000 specimens of Sri Lankan flora.

The World Conservation Monitoring Centre has designated Sri Lanka as a "hotspot" in terms of biodiversity (Caldecott *et al.*, 1994). With the development of transoceanic navigation since the 15th century, many new plants were introduced to the country mainly by

Europeans. These species were eventually naturalized and became part of the island's flora. The indigenous flora of Sri Lanka comprises about 7,500 plant species (Table 1). Of the 3360 flowering plants about 830 (25%) species are endemic to the island. Also, there are 314 species of pteridophytes (57 endemics), 110 species of lichens in the family Thelotremataceae (39 endemics) 575 mosses (endemism unknown), 190 liverworts (endemism unknown), 1920 species of fungi and some 900 species of algae. Sri Lanka is a repository of a rich variety of flowering plants, lower plants, reptiles, mammals and amphibians and contains one the highest diversity, per unit area, in the whole of Asia. The variety, richness and abundance of flora in Sri Lanka in general and the high percentage of endemic plants found in the island - compared to most countries in the region - makes it a fertile testing ground for a systematic drug discovery program.

Table 1. Composition of the Indigenous Flora of Sri Lanka (Gunatilleke & Gunetilleke, 1990)

Group	No. of Species	No. of Endemics
Angiosperms(Flowering Plants)	3360	830
Ferns and Fern Allies	314	57
Mosses	575	Unknown
Liverworts	190	Unknown
Gymnosperms	1	-
Algae	896	Unknown
Fungi	1920	Unknown
Lichens	> 600	Unknown
(Thelotremataceae)	110	39
Total	7966	

Of the 830 endemic flowering plants in Sri Lanka, about 230 are rare (but not endangered). As such, there is an urgent need to investigate their therapeutic potential before they disappear forever. Our flora has great scientific value as it has at least one species among the most primitive of vascular plants namely *Psilotum*, *Equisetum*, *Isoetes*, *Selaginella* and *Lycopodium* (all Pteridophytes). The relict rain forest taxa of Gondwana-Deccan ancestry are now found only in some isolated forest pockets in Peninsular India and South-western Sri Lanka. Deccan flora evolved in isolation in the late Cretaceous and early Tertiary periods, during the drifting of the Indian plate. The strong presence of an Indo-Sri Lanka element in the Sri Lankan flora indicates the past linkage between Sri Lanka and Peninsular India. The endemic genera *Hortonia* (Family. Monimiaceae) and *Schumacheria* (Family. Dilleniaceae) have probably been derived from the Gondwanaland flora of 100-120 million years ago (Somasekaram *et al.*, 1997).

Based on the distribution of Angiosperm flora, 15 different floristic regions have been recognised. Endemics in Sri Lanka are within easy access as more than 90% of the endemic species are located in a small area of about 15,000 km² in the low country wet zone and the montane zone (Table 2).

Table 2. Distribution of the Endemic Flowering (Angiosperm) Species in Different Vegetation Zones (Peeris, 1975)

Zone	Trees	Shrubs	Herbs	Total
Montane	72	84	128	284
Montane & Moist Low-Country	46	32	51	129
Moist Low-Country	156	82	88	326
Moist Low-Country & Dry	15	15	9	39
Dry	9	13	12	34
Dry & Intermediate	6	3	4	13

Intermediate	2	1	2	5
Total	306	230	294	830

In the Sinharaja forest (120 km²) in the low country wet zone some families such as Dipterocarpaceae show almost 100% endemism (Kostermans, 1992). Other families which include high endemism are Anacardiaceae, Dilleniaceae, Melastomataceae, Myrtaceae, Orchidaceae and Rubiaceae. Of the 211 woody trees and lianas found in the Sinharaja forest, 66% (about 139 species) are endemic. Although Dipterocarps are widely distributed in the Far East, their ancestors are found in the hills of Sri Lanka.

Due to overexploitation, many species of medicinal plants have become rare. Some species such as *Rauvolfia serpentina*, *Strychnos nux-vomica*, *Capparis moonii*, *Woodfordia fruticosa* and a series of other plants have become rare in the wild. A rare, medicinally important wild orchid *Anoectochilus setaceus* and the stem of the liana "Weniwel" (*Coscinium fenestratum*) are used widely in the traditional system of medicine.

In Sri Lanka, there has not been a large-scale systematic search for therapeutics from its flora so far. Thus the therapeutic potential of Sri Lankan endemics remains completely unknown. The nonendemics on the other hand, are more accessible (due to abundance and the relatively small area of the island) compared to most countries in the South Asian region. In general, little emphasis has been placed on the scientific basis of the medicinal properties of Sri Lankan plants.

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