

### *Cinchona officinalis*

[Synonyms : *Cinchona academica*, *Cinchona amygdalifolia*, *Cinchona angustifolia*, *Cinchona bonplandiana*, *Cinchona calisaya*, *Cinchona chahuarguera*, *Cinchona coccinea*, *Cinchona colorata*, *Cinchona condaminea*, *Cinchona condaminea* var. *chahuarguera*, *Cinchona condaminea* var. *lanceolata*, *Cinchona condaminea* var. *vera*, *Cinchona crispa*, *Cinchona elliptica*, *Cinchona euneura*, *Cinchona glabra*, *Cinchona josephiana*, *Cinchona lanceolata*, *Cinchona lancifolia*, *Cinchona lancifolia* var. *lanceolata*, *Cinchona lancifolia* var. *nitida*, *Cinchona ledgeriana*, *Cinchona lucumaefolia*, *Cinchona lucumifolia*, *Cinchona lucumifolia* var. *stupea*, *Cinchona macrocalyx*, *Cinchona macrocalyx* var. *lucumifolia*, *Cinchona macrocalyx* var. *obtusifolia*, *Cinchona macrocalyx* var. *uritusinga*, *Cinchona nitida*, *Cinchona obtusifolia*, *Cinchona obtusifolia* var. *bonplandiana-colorata*, *Cinchona obtusifolia* var. *bonplandiana-lutea*, *Cinchona obtusifolia* var. *condaminea*, *Cinchona obtusifolia* var. *crispa*, *Cinchona obtusifolia* var. *uritusinga*, *Cinchona palton*, *Cinchona parabolica*, *Cinchona pubescens* var. *heterophylla*, *Cinchona stupea*, *Cinchona subcordata*, *Cinchona suberosa*, *Cinchona uritusinga*, *Cinchona violacea*, *Cinchona weddelliana*, *Hindisa subandina*, *Quinquina coccinea*, *Quinquina lancifolia*, *Quinquina officinalis*]

**CINCHONA** is an evergreen tree. Native to the Andes in South America (from Colombia to northern Peru) it has small and very fragrant, yellow-pink, deep rose or purple flowers. It is also known as Brown peru bark, Calisaya, *China* (Italian), *Chinarindenbaum* (German), Countess's bark, Countess's powder, Crown bark, Fever tree, *Gelber Chinarindenbaum* (German), Jesuits' bark, Ioxa, Ioxa bark, *Kînā* (Arabic), Ledger cinchona, Loxa bark, Pale bark, Peruvian bark, Quinine, Quinine bark, Quinine tree, *Quinquina* (French), *Quinquing* (French), Red bark, and Yellow cinchona.

The stem bark is removed from the tree in strips and dried. The tree has often been lopped for this purpose and in any event the bark-stripping would ultimately lead to its death – unlike, say, cascara (*Rhamnus purshiana*) that is more resilient and capable of re-sprouting.

Warning – overdoses or prolonged use of cinchona will induce poisoning. It can cause vomiting, symptoms of deafness and blindness, headaches, abdominal pain, rashes and morbidity. Apart from malarial patients it should not be taken internally during pregnancy.

*Officinalis* means 'of the shop (usually the apothecary's or herbalist's)'. Certain plants used for medicinal purposes, whether of actual or legendary value, were kept readily available and acquired this name.

The Spanish conquerors in South America learnt of the properties of cinchona bark through personal experience when some of them succumbed to fevers. They introduced it to their home country in 1639 (from whence it also reached Rome) – and even by 1670 it was held to have cured many different types of fever. The Jesuits, who themselves used the powder to treat fevers as a whole, tried to promote the use of the bark throughout Europe. But they met widespread opposition not only from the European medical fraternity, many of whom believed that the 'fraternity's' financial interests were better served by continuing ineffective 'cures', but also from many Protestants who objected to or were

wary of Jesuit influence. The drug was so effective however that its benefits gradually overcame opposition and prejudice. In Britain cinchona received a particular boost when in the 1670s or early '80s Charles II (1630-1685), who was at that time on the British throne, contracted malaria himself. [Malaria has inflicted itself on human beings for thousands of years. It is said to have contributed to the deaths of such famous people as Alexander the Great (356- 323 BC), king of Macedonia, and the more recent stern English statesman and soldier, Oliver Cromwell (1599-1658).] The recovery of Charles II (1630-1685) was achieved with cinchona bark prescribed by a London apothecary, Robert Talbor. Now cinchona could no longer be ignored in England and enthusiasm to identify it scientifically and document the source of the remedy accelerated rapidly.

During the 18<sup>th</sup> Century in France the Jussieu family numbered not one but several noted botanists. One of these men, as a member of a non-Spanish expedition that reached South America in 1735, was the first to record (over a period of nearly 30 years) detailed scientific data on the cinchona species found and identified in the Andes. But disaster struck. On the eve of his return to France in 1761 everything was stolen, including his collection of specimens. Jussieu had accompanied Charles Marie de Lacondamine (1701-1774), a French mathematician and scientist, who had been sent to Peru to measure a degree of the meridian. While in South America Lacondamine also explored the Amazon and in 1739 had himself sent a brief description of cinchona (with specimens of it) to the celebrated Swedish naturalist, Carolus Linnaeus (1707-1778). Disaster struck. The specimens were washed overboard while being transferred to a larger vessel at the mouth of the Amazon. At the end of that Century, Josè Celestino Mutis (1732-1808) was physician to the Spanish viceroy of what is now Colombia. For over 20 years he also researched cinchona and had collected specimens but protected his acquired knowledge by recording the information obscurely. Yet again disaster struck. He died before disentangling his notes.

In the 19<sup>th</sup> Century things improved. From 1799 to 1804 Baron Alexander von Humboldt (1769-1859), the German naturalist and traveller, and Aimé Bonpland (1773-1858), the French botanist who 12 years later was to be named professor of natural history at Buenos Aires, explored unknown territory in South America. On their return to Europe, amongst much other material, the two men provided accurate information on the cinchona species. In 1820 two Frenchmen, the Director of the School of Pharmacy in Paris, Pierre Pelletier (1788-1842) and his colleague, Professor Joseph Caventou (1795-1877), then isolated one of the elements of the malarial remedy from some cinchona bark, quinine. This was so-named as a corruption of the tree's general name in South America, *Quinaquina*, meaning 'bark of barks'. From that point on there was a massive surge in interest in the malaria cure.

A new twist in the saga now emerges. By the mid-19<sup>th</sup> Century the very existence of the wild cinchona trees in South America was threatened because of the dramatic increase in demand for the root bark. At the same time the South American governments concerned declared their recognition of this threat and imposed restrictions on the quantity of root bark available for exportation. Authorities then, and historians since, have suspected that this environmental concern was likely to have been motivated to a major extent by a desire to maintain the price for a sought-after commodity. Malaria was rampant, particularly in the thriving and bustling respective, Dutch and British, African and Asian colonies. Both the Dutch attempts to cultivate cinchona in Java (now part of the Indonesian republic) and those of the British in Ceylon (now Sri Lanka) and India were unsuccessful as it was found that the potency of the drug was variable, not only between cinchona species but within the same species. A British plant collector in South America, Charles Ledger (1818-1905), received some seeds from one of his own local collectors,

Manuel Incra Mamani, a Bolivian Aymara Indian. These seeds from a particularly potent stand of a species of cinchona (not this one) growing in Bolivia were sent to Europe and in due time their bark was shown to contain 13% quinine. Many describe what followed as the most desirable investment ever made. In London in 1865 the British Government (which had already experienced several earlier expensive disappointments with cinchona seeds) rejected the chance to purchase seeds of this potent strain from Charles Ledger. Instead the Dutch bought 1 lb. of the seeds of *Cinchona ledgeriana* for £6.7s.0d. from which it grew 12,000 trees in Java. These were to control all but a tenth of the world's supply of quinine for nearly 100 years to World War II and provide the Dutch with a multi-million guilder commodity. The story is not over.

For the allied troops in the tropics in the 1940s quinine was essential. Although in 1942 the last plane leaving Java (ahead of the Japanese invasion) carried cinchona seeds, these could not mature as trees in sufficient time to provide any bark for the troops. So the United States' Board of Economic Warfare sent botanists to Colombia and 12½ million pounds of dried bark was gathered. Subsequently plantations of cinchona were established in Mexico, Peru and Africa. With the development of a synthetic alternative in 1944 by two American scientists, and the other antimalarial drugs that followed, demand for cinchona bark then relaxed and stocks of the tree deteriorated. However by the 1960s strains of the offending parasite were becoming resistant to the synthetic material, although they would still succumb to the natural product. The search for further synthetic alternatives has been unrelenting and yet another possible breakthrough for some malarial strains was reported in the 1990s and again in 2004 (this latter is believed to have been successful). At the same time however there is a shortage of the trees.

Quinine, isolated from the bark was, and to this day, is used in the treatment of malaria (as well as other drugs including synthetic alternatives), a disease that is still understood to be one of the foremost fatal illnesses in tropical climates. The main source of the bark today is Indonesia and Zaire and the bark is now collected from 12 different species of cinchona. Apart from its use in easing fever the dried stem bark can also be used in an astringent throat gargle, in a tincture as a preventative medicine for the common cold and, in orthodox Western medicine, for the relief of muscle cramps. Additionally astringent toothpowders can include the powdered bark as one of the ingredients.

On a commercial basis cinchona is used today by the pharmaceutical industry to produce quinine, and by the drinks industry in tonics, apéritifs and alcoholic drinks.

Cinchona is depicted in the Peruvian coat of arms.