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Exploited Trees: Some Very Brief Sketches.

The unethical & misleading marketing of the African Cherry: *Prunus africana.*

The extract/decoction of the bark of the slow-growing African Cherry or African Plum tree *Prunus africana* (Hook f.) Kalkman (Fam. Rosaceae) is used by local African peoples as a medicine to treat malaria. Other traditional uses include use as an inhalant for fever, to improve appetite, to treat chest and stomach pain, gonorrhea, inflammations & kidney diseases (Kokwaro 1976; Van Wyk *et al.* 1997; Neuwinger 2000: all through Janick & Whipkey 2007). Solvent extraction of the bark yields extracts rich in lipids and phytosterols, used in European medicine. *Prunus africana* extracts have been in high demand for over 40 years as a natural remedy for treating prostate disorders (benign prostatic hyperplasia) - the market value of the raw commodity being estimated at over US $4.36 million alone in 2000 (Stewart 2003), which represents US $220 million to the retail trade. The tree takes 100 years to develop, & grows mainly between 1200 and 2400 metres in mountainous areas in several African countries including Kenya. Equatorial Guinea, Tanzania, Uganda, S. Africa & Cameroon & Madagascar. Difficult local policing practicalities, and the fact that the tree has to be some 15 years old before bark harvesting can take place, have added to the problems. As a result of over exploitation, it is (only!) listed under Appendix II of CITES (as vulnerable), but WWF at http://www.wwf.org.uk/filelibrary/pdf/pafricana.pdf describe its position as critical. Cunningham presents an excellent trade status report on *P. africana* to the 16th Meeting of the CITES Plant Committee in Lima, Peru (see http://www.cites.org/eng/com/pc/16/E-PC16-10-02.pdf). Small-scale conservation programs (mainly domestication) exist in both Kenya & Cameroon and the genetic variation available in the species has been studied by Muchugi *et al.* (2005).

Stewart (2003) noted that Groupe Fournier of France and Indena of Italy produced 86% of the world's output of (up to 7.23 tons/annum) bark extract, for their own lines and for the free market, mostly being exported to Europe. [N.B. Groupe Fournier (Paris) is/was the parent company of Plantecom]. Nkuinkeu (undated) in an FAO publication describes how the licensed company Plantecom

oversaw the sustainable development of the tree at Mount Cameroon, and its controlled exploitation in the wild. Conversely, Stewart suggests that sustainable wild extraction is not, and never was, actually possible and describes the shut down of the Plantecom factory due to "complex ecological, social, and economic factors" but was more optimistic about domestication prospects. However, it remains a fact that all the bark extract on the market is gathered from the wild. A feature in *The Ecologist* (Anon 2006) suggests that a scheme to extract the drug from the trees' leaves at Brackenhurst Aboretum in Kenya is the way forward – but this gives Cropwatch a heavy sense of déjà vu if not actual foreboding. Remember the over-exploitation issues surrounding Brazilian Rosewood oil from *Aniba* spp., and the scheme to produce equivalent oil from leaves (critiqued by Cropwatch at http://www.cropwatch.org/cropwatch6.htm)? Further similarities are represented by the fact that as in Brazil, bark harvesters have to travel further & further distances to find large trees to exploit, this practice being unsustainable.

Meanwhile, you might want to note, that present & previous suppliers of *Prunus africana* extract have included:

Gaia Herbs (US);
Herb Pharm (US)
Inverni SpA (Milan)
Sarget (Spain); Inofarma (Spain)
Muggenburg Extrakt GmbH (Germany)
Société pour le Dévelopment Industrielle des Plantes (Madagascar) – sold to Inervi.

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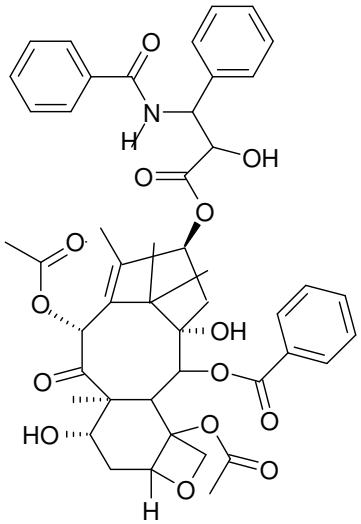
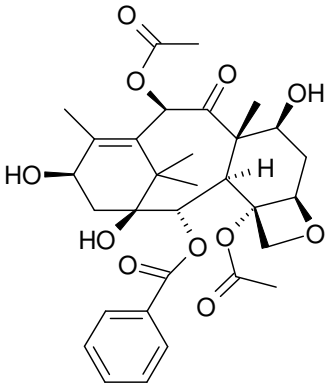
The Taxol Saga & the exploitation of *Taxus* spp.

Exploitation of drug-bearing species taken to the brink of extinction by pharmaceutical companies are not without precedent. Extracts from a Pacific Yew species *Taxus brevifolia* Nutt. were discovered in 1964 to be active against cultured murine leukaemia cells via a screening programme of plant actives conducted by the National Cancer Institute (NCI) in the US. The anti-tumour component taxol from these extracts was discovered in 1971 by Wall & Wani at the NCI, but the yield of this substituted diterpene was so low (~0.01%) that three 100 year old trees would be required to produce 1g of the drug. To cut a long story short – fully reported by Pandey G. (2000) – after trials the NCI eventually decided to treat 12,000 patients per year with taxol, for usefulness in combating ovarian & mammary cancers, melanoma etc., but this would have resulted in the disappearance of the Pacific Yew in the US (and in the disappearance of a creature called the 'spotted wol' that was dependent on this tree!), and so its' exploitation was therefore successfully opposed by environmentalists.

The attention of the drug barons therefore turned to *Taxus baccata* subsp. *wallichiana* (Zucc.) Pilger, another taxol-bearing species (and of a taxol-precursor: 10-deacetylbaccatin III). This tree which could live for 2,000 years grows in the N. India, Kumaon & other parts of the Himalaya, but was already under depletion and facing extinction in some areas.



taxol



10-deacetylbaccatin III

Indiscriminate further harvesting of bark for its taxol content threatened the species (decortication kills the tree) in spite of established regeneration programmes (Kumar *et al*. 1997), as the tree takes up to 100 years to obtain exploitable bark. Many pharmaceutical concerns made an issue of the fact that by using the taxol-containing needles of the tree, sustainable harvesting was possible – but they failed to allow for human greed, and large trees continued to be felled for both needles and bark. As with the history of Sandalwood and Agarwood exploitation (see relevant Cropwatch articles), the very slow growth of the trees in these planting programmes probably means that these measures would ultimately have been ineffective strategies to preserve the species in the long-term.

However, very luckily for the Himalayan ecology, in was discovered that *Taxus baccata* spp. also grew in the UK and US, and that English yew contained more 10-deacetylbaccatin III (to 0.1%) than the Himalayan tree, and in contrast could be harvested without apparent environmental consequences. Further, two fungi isolated from the Himalayan yew tree *Pestalotiopsis andreanae* & *P. microspora* showed promise for large-scale drug synthesis by fermentation. By 1991, 20 million yew trees were also under plantation in Ohio and Michegan, for the extraction of 10-deacetylbaccatin III from the needles. Bristol-Myers Squibb who were leaders in this taxol producing technology, eventually owning a semi-synthetic process to produce taxol, thereby obviating the need for yew bark, but they pulled out of taxol manufacture in 1993, as taxol derivatives began to be produced by other manufacturers. And so luckily, the development of cheaper chemical synthesis routes to taxol effectively saved the *Taxus* species from obscurity.

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