

Medicinal Plant Conservation



MEDICINAL
PLANT
SPECIALIST
GROUP

Volume 6

IUCN
The World Conservation Union

Newsletter of the Medicinal Plant Specialist Group
of the IUCN Species Survival Commission

Chaired by Uwe Schippmann



SPECIES SURVIVAL COMMISSION

Focus on *Harpagophytum*

- Conservation data sheet 2: Exploitation, trade and population status of
Harpagophytum procumbens in southern Africa - B. Hachfeld & U.
Schippmann 4
- The Sustainably Harvested Devil's Claw Project in Namibia - C. Lombard. . . 9
- In-vitro* micropropagation of fertile plants of *Harpagophytum procumbens*
and *H. zeyheri* (Devil's Claw) - G. Levieille, G. Wilson, J.R. Robin & M.
Cambornac 10

Chair's Note 2

MPSG News - D. Leaman

- Peter Scott Award presented to Tony Cunningham 2
- New programme office at CMN 2
- You are the "voice" of MPSG 3

Regional File

- The Plant Conservation Alliance - Medicinal Plant
Working Group - J. Lyke 11
- National Herbalists Association of Australia establishes
committee for medicinal plant sustainability and
ethical issues - A. Pengelly 12
- Sustainable supply of wildcrafted medicinal plant drugs:
Steps towards a balance between economy and
conservation - G. Harnischfeger 13
- Tibetan medicine and the environment in modern
Ladakh. A threat to medicinal plants - L. Pordié. 14

Taxon File

- CITES-News - U. Schippmann 17
- The exploitation of *Prunus africana* on the island of
Bioko, Equatorial Guinea - T. Sunderland
& T.C. Tanyi 18

Erratum *Prunus africana* - J. Acworth 20

- The exploitation of *Pausinystalia johimbe*
- T. Sunderland, Z. Tchoundjeu &
M.-L. Ngo-Mpeck 21

- Griffonia simplicifolia*, calling for information
on a west African medicinal plant in trade
- A. B. Cunningham & U. Schippmann 23

- Croton lechleri*, sustainable utilization of an
Amazonian pioneer species - J. Roberto Borges
& S. R. King 24

- Preservation of *Arnica montana* L.
- M. Cambornac 26

Conferences and Meetings

- Coming Up - N. Hofbauer. 27
- Workshop on Medicinal Plants and Local
Communities (Mamou, Guinea, 30 March -
2 April 1999) - C. Schäfer & R. Kutsch Lojenga . . 29
- Workshop on Conservation of Medicinal Plants
- S. Lee & S. Kang 30

Reviews and Notices of Publication 31

List of Members 41

Chair's Note

Just in time before the second *World Conservation Congress* of IUCN, which will be held 4-11 October 2000 in Amman, Jordan, we have finalized the sixth issue of our newsletter. And another venue just came to an end, the 11th Conference of the Parties to CITES (10-20 April, Nairobi, Kenya), which discussed a number of medicinal plant issues. We want to thank those of our members who have contributed to the process of assessing the proposals relating to medicinal plants.

After six years of co-chairing (together with Tony Cunningham) and later chairing the Medicinal Plant Specialist Group I have taken the decision to step down as chair. The main reason is the increasing workload I am experiencing as Head of the German CITES Scientific Authority for plants which does not give me enough room in the future to sufficiently take care of the group's needs. I will of course remain active as a member and contribute as much as I can to medicinal plant conservation activities. Out of the many members which I had the pleasure to work with, I want to specially thank the following four colleagues who have become friends over the past years: Danna Leaman, our Executive Officer, Tony Cunningham, my former co-chair, Wendy Strahm, SSC's Plants Officer, and Nina Marshall from TRAFFIC East-Southern Africa. I trust that SSC will take a good decision in selecting a new chair for the group. We will let you know about this as soon as possible.

My sincere thanks also go to Natalie Hofbauer, Federal Agency for Nature Conservation, for editing this issue of our newsletter.

Uwe Schippmann, 1 June 2000

MPSG News

Danna Leaman

Peter Scott Award presented to Tony Cunningham

The Peter Scott Award for Conservation Merit is presented annually by the IUCN Species Survival Commission to recognize significant achievements in

conservation. The 1999 Award was presented to Dr. A.B. (Tony) Cunningham for his outstanding contributions not only to the MPSG and SSC, but also in broader recognition of Tony's important and influential work on plant resource conservation, particularly in Africa. This 1999 Peter Scott Award marks the 50th anniversary of the IUCN, the SSC, and of the award itself. The award was presented by Dr. David Brackett, Chair of the SSC, at an SSC 50th Anniversary reception held during the International Botanical Congress in St. Louis, USA, last August. In his remarks, Dr. Brackett recognized Tony's long commitment to training young professionals and involving local communities in scientific research that is more useful to conservation, currently as Coordinator of the Africa component of the WWF/UNESCO/Kew People and Plants Initiative, as well as his contribution to the MPSG and SSC, initially as the MPSG's founding co-chair. Tony remains one of the group's most active members. Dr. Brackett emphasized an often forgotten element of leadership: "Tony has, day after day, with unfailing generosity, responded to letters, provided advice on research projects, recommended literature, and helped make the many connections between people that make the work of conservation both rewarding and possible."

Speaking more generally of the work of the MPSG and SSC, Dr. Brackett identified the MPSG as one of SSC's most active groups, and acknowledged the leadership and commitment of Specialist Group chairs, and the challenge to all SSC members of balancing the demands of volunteer work with paying jobs.

New programme office at CMN

The MPSG has a new programme office, hosted by the Canadian Museum of Nature. In September 1999, a Memorandum of Agreement was signed between the Canadian Museum of Nature in Ottawa, Canada, and the Species Survival Commission of the IUCN-the World Conservation Union. This agreement creates an institutional base for the MPSG within the Museum's Canadian Centre for Biodiversity. The Canadian Museum of Nature is a Crown Corporation of the Government of Canada, and also hosts the Canadian Committee for the IUCN. The MPSG programme office is located in the Natural Heritage Building of the Canadian Museum of Nature in Aylmer, Quebec. This agreement will facilitate programme development, institutional collaboration,

and fundraising for the MPSG's global and regional activities related to identification and conservation of threatened medicinal plants. The MPSG programme will be self-supporting, but will link with the CMN's Issues in Biodiversity Project. Establishment of an MPSG website and development of a fundraising strategy are being coordinated from this office by the MPSG's Executive Secretary, Danna Leaman. The coordinates of the new programme office are as follows:

Dr Danna J. Leaman · Executive Secretary · Medicinal Plant Specialist Group of the IUCN-SSC · Canadian Museum of Nature · P.O. Box 3443 · Station D · Ottawa, Ontario K1P 6P4 · Canada · Tel: +1/613/364-4140 · Fax: +1/613/364-4022 · E-mail: dleaman@mus-nature.ca.

You are the "voice" of MPSG

In the following items, I describe several recent events at which I have had an opportunity to represent the MPSG. I encourage all MPSG members to "wear your MPSG hat" when you participate in meetings and other events relevant to medicinal plant conservation – this is how we have our broadest voice and impact. And please tell us about these events so we can report them in this column in future issues of MPC.

MPSG members meet: A small group of MPSG members who attended the International Botanical Congress in St. Louis, Missouri, last August, took advantage of this opportunity to meet informally. It was not possible to locate every member in attendance during the meeting, unfortunately, and I apologize to those I missed contacting. I would appreciate a note or e-mail message from those members planning to attend the upcoming World Conservation Congress in Amman, Jordan, 4-11 Oct. 2000. All members of IUCN's commissions, including Specialist Groups, are invited to attend. The Species Survival Commission (SSC) has scheduled a two-day business and information meeting 3-4 October. Information about the Congress is posted on the IUCN website: www.iucn.org/amman/index.html (viewed 10.3.2000).

Consultation on the Sustainable Use of Wild Plants: The Second Ad Hoc Inter-Agency Consultation On Promoting Co-operation on the Conservation and Sustainable Use of Wild Plants of Importance for Food and Agriculture was held at FAO

Headquarters, Rome, Italy, 5-7 May 1999. This meeting was co-sponsored by FAO, UNESCO, UNEP/CBD Secretariat, IPGRI and DIVERSITAS. A travel grant from TRAFFIC International supported MPSG's participation in this meeting. The objectives of the meeting were to begin an inventory of activities in this area, and to identify action gaps, primarily as a contribution to the implementation of the Convention on Biological Diversity and the Global Plan of Action on the conservation and utilization of genetic plant resources. Further information about follow-up to this meeting is available from the DIVERSITAS Secretariat (E-mail: diversitas@unesco.org or Tel.: +33/1/4568-4093 or -4054, Fax: +33/1/4568-5832).

SSC Plant Conservation Subcommittee (PCS):

This advisory group, appointed by the Chair of SSC, held its annual meeting from 8-11 August 1999 at the Jerry J. Presley Conservation Education Center in the Ozarks region of Missouri. I attended this meeting as an observer on behalf of the MPSG. The group discussed implementation of the new SSC Plants Programme (Conservation for 2000 – Conserving the Centers of Plant Diversity in the New Millennium). Information about this programme as it develops will be posted on the group's new website: <http://www.cjb.unige.ch/BVAUICN/Bplants.htm> (viewed 10.3.2000).

MPSG's advisory role and its value – a call for information: Providing advice to the IUCN and to other organizations and agencies on medicinal plant conservation issues is part of our mandate as members of the SSC. Many of us have opportunities to "wear our MPSG hats" as advisors, both indirectly within our other professional activities, or directly on behalf of the MPSG. We (and the SSC) would like to document and acknowledge these activities, and their value to other organizations. Two examples follow:

1. *MPSG contributions to TRAMIL:* Over the last two years I have worked with other MPSG members – Dr Sonia Lagos Witte and Rafael Ocampo – to develop a conservation strategy for the TRAMIL medicinal plant research network in Central America and the Caribbean. Some of this work has been supported by the International Development Research Centre in Ottawa and by the GEF/UNEP Coordination Office, but much of it has been a voluntary contribution on behalf of the MPSG. This contribution is acknowledged as co-funding from the MPSG to the TRAMIL network in their project documentation.

2. *Advice to GEF/UNEP*: In May of last year, the MPSG was invited (together with TRAFFIC International and ICMAP, the International Council for Medicinal and Aromatic Plants) to provide advice to the GEF/UNEP Coordination Office on the sustainable use components of medicinal plant projects submitted to the GEF for funding. A substantial number of volunteer hours have been committed to this activity to date on behalf of the MPSG.

Focus on *Harpagophytum*

Conservation data sheet 2: Exploitation, trade and population status of *Harpagophytum procumbens* in southern Africa

Berit Hachfeld & Uwe Schippmann

The genus *Harpagophytum* has been recently proposed for listing in Appendix II of CITES (see also CITES News, p. 17). The data presented here is derived from the supporting statement of this amendment proposal.

Taxonomy and nomenclature

The genus *Harpagophytum* is a member of the family Pedaliaceae and comprises two species: *Harpagophytum procumbens* (BURCH.) DC. ex MEISSNER (Synonyms: *Uncaria procumbens* BURCH.; *Harpagophytum burchellii* DECNE.) and *Harpagophytum zeyheri* DECNE.

Trade and pharmaceutical names. Harpagophytum, Radix Harpagophyti (procumbenti), Harpagophyti tuberi

Common names. Beesdubbetje, Devil's Claw, Duiwelsklou, Grapple Plant, Grapple Thorn, Kanako, Kamangu, Kloudoring, Ouklip, Rankdoring, Sengaparile, Skerpioendubbeltje, Teufelskralle, Toutje, Tou, Tswana, Tubercule de griffe du diable, Woodspider (WENZEL & WEGENER 1995)

Distribution

The genus *Harpagophytum* occurs between 15 degrees and 30 degrees latitude in Namibia, Botswana, South Africa, Angola, and also to a lesser extent in Zambia, Zimbabwe and Mozambique

(IHLENFELDT & HARTMANN 1970). The two species of the genus have five subspecies, each with a distinct distribution area.

Habitat

Harpagophytum procumbens is a species occurring in areas with low annual rainfall (100-200 mm/year; BLANK 1973). It is found mostly on deep, red, sandy soils of the Kalahari but also in whitish sandy soils and clay pans (NOTT 1986). Typical habitats are alluvial or overgrazed plains and fossil dunes (BLANK 1973). The vegetation type which *Harpagophytum procumbens* mainly occurs in, comprises typical savanna vegetation with trees (e.g. *Acacia* spp.) and grass cover. The plant is reported to be sensitive towards grass dominance and favours open, trampled and partly overgrazed tracks or areas (IHLENFELDT & HARTMANN 1970, MOSS 1982, NOTT 1986).

Population status

The genus was formerly very abundant and considered a problem plant by Namibian farmers. This led to an intended and strong decrease of the species starting in the 1950's until the 1970's owing to uprooting of plants by the farmers. It was not before the medicinal value of *Harpagophytum procumbens* was widely recognized when large-scale exploitation began, at first starting on a very local basis and spreading to most of the distribution area by today. Due to rising demand the exploitation level has increased to a considerable extent.

The very patchy distribution of *H. procumbens* – even on favourable soil and suitable habitat – makes it difficult to estimate an overall figure of plants per hectare for the total area of distribution. The area covered by one population rarely exceeds 200 x 200 m (1-4 hectare) (STROHBACH, pers. comm.). NOTT (1986) states that wild populations of *H. procumbens* normally reach a density of 5-7 plants per ha, but locally population sizes of up to 1200 plants per ha may be reached. In South Africa, *H. procumbens* grows in scattered groups of about 10-50 individuals comprising mature large caudexes and smaller plants (CRAIB 1999).

Trends. Depending on the region and the country one finds not only a patchy natural distribution of the plant itself but also a varying decline in individual populations of *H. procumbens*. This is due to varying harvesting intensities and harvesting techniques of different ethnic groups as well as to the knowledge and access to markets and buyers respectively. It can

be stated that up to now the exploitation-related decrease of *H. procumbens* is mostly concentrated on the communal areas (owned and administrated by a local community) of Namibia. So far the commercial farm land (owned and administrated by private farmers) is only scarcely involved in the harvest. Nevertheless, recent studies in Namibia (HACHFELD & al., in prep.) show a growing interest of farmers in this additional income possibility and it can be expected that the exploitation of *H. procumbens* in commercial areas will increase soon.

Natural fluctuations occur depending on the amount of rainfall. These fluctuations have an effect on the harvesting techniques as well as the quantities of material harvested because in dry years also the small tubers of the young plants are likely to be dug out. This reduces the capability of the population to survive during and recover after the drought period.

Threats

Harvest. One of the main threats to populations of *Harpagophytum procumbens* is the large-scale harvest of the secondary storage tubers, especially when paired with detrimental harvesting techniques. The increasing demand for *H. procumbens* on the international market has already led to over-exploitation of the species, e.g. in Botswana and some parts of Namibia. MARSHALL (1998), OLIVIER (no date) and STROHBACH (1995) give evidence that (i) non-sustainable harvesting techniques have been applied in the past, (ii) over-exploitation has occurred already and (iii) increasing demand will be the major threat to the species in the future.

Harvesting has a severe impact on the wild populations especially in those areas where the plant has not been traditionally used by the local people. Traditional knowledge of sustainable harvesting techniques is so far only known by ethnic groups like the San people. In other areas where such a knowledge is lacking, quite often the whole plant is permanently removed from the soil instead of harvesting only the side roots with the tubers. A plant needs at least 3-4 years before new storage tubers are developed and have accumulated enough harpagoside to be harvested again.

Some populations of *H. procumbens* lately are under an increasingly higher harvesting pressure since the other species of the genus (*H. zeyheri*) is not officially registered as a medicinal plant and therefore is not authorised as an ingredient of any pharmaceutical products. The consequence is a shift

of exploitation activities from the distribution area of both species in northern Namibia to a strong concentration on areas with only *H. procumbens* within the last couple of years.

Grazing. Especially in dry years with low rainfall and little herb cover, the sprouts and flowers of *H. procumbens* are grazed by sheep, goats and cattle. A report from South Africa states that the plants in the northern province (*H. procumbens*) are heavily grazed irrespective of the rainfall (CRAIB 1999). The tubers are able to sprout fresh shoots if they have been grazed back. Nevertheless, the grazing leads to a restricted production of new fruits and seeds and thus reduces the possibility of natural regeneration by seed germination.

Other factors. *H. procumbens* is reported to be sensitive to grass dominance and bush encroachment. The seed germination and establishment of seedlings require stable soil water conditions only ensured during good rainy seasons. In order to produce secondary storage tubers of a size suitable for exploitation, a growth period of a minimum of 3-4 years with only little grazing and no harvesting is required.

Utilization

Harpagophytum procumbens is used for a variety of medicinal purposes. The active ingredients are the glucosides Harpagosid, Harpagid, Procumbid, Furan, and Pyran (TUNMAN & BAUERSFELD 1975, TUNMAN & LUX 1962). The therapeutical effect is derived only from the complete extract, whereas isolated glucosides show only little to no effects (FLEURENTIN & MORTIER 1997). The medicinal uses of *H. procumbens* are numerous, it is used for the treatment of arteriosclerosis, gastro-intestinal problems, diabetes, hepatitis, and neuralgia. It also shows some indications for reduction of spasmodic blood pressure as well as positive effects on liver, gallbladder and kidney diseases (STÜBLER 1987, WENZEL & WEGENER 1995). The herb has potent anti-inflammatory characteristics and anti-arthritic activity with no notable side effects (ANON. 1998).

The highest amount of medicinally valuable ingredients is located in the secondary storage tubers which branch off the main tuber in up to 2 m depth and a range of 1.5 m (NOTT 1986, WENZEL & WEGENER 1995). These tubers can store up to 90 % water and can reach a length of 20-30 cm. To harvest the tubers, in most cases the whole plant is dug out, leaving big holes sometimes of 2 m depth and a

diameter of 1-2 m in the field (SCHNEIDER 1997). In some areas more sustainable techniques are used, e.g. the main tuber remains in its original position and is not removed from the soil at all. Or else, in the process of harvesting, the main tuber is removed from the soil, but is replanted at the end of the harvesting process. In both cases, the plant may recover and produce new tubers to be harvested in a few years time (DE JONG 1985, VEENENDAAL 1984). Unfortunately, due to rising demand for *Harpagophytum*, the incidence of non-sustainable harvesting techniques rises dramatically as well. The harvested tubers are cut into small slices when still fresh and are dried on the ground, grass or on paper for at least five days (KGATHI 1988).

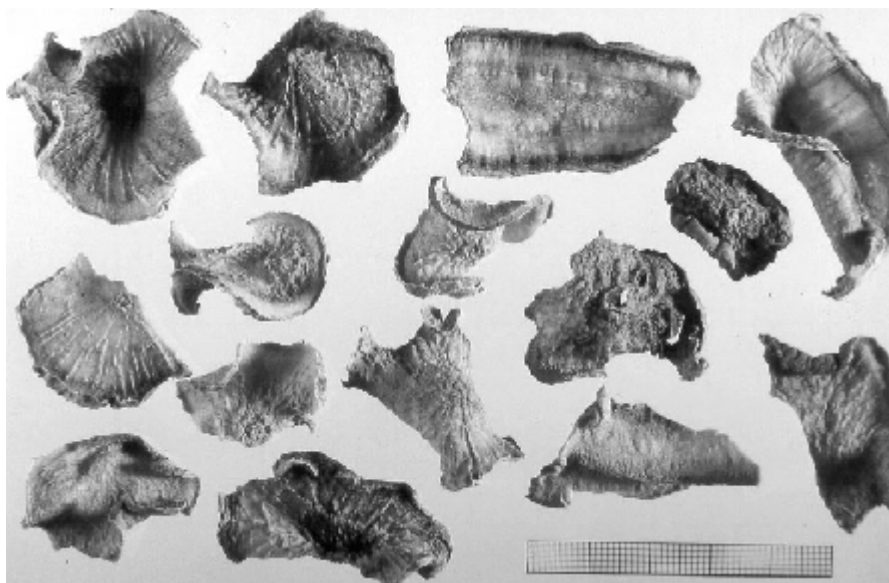


Figure 1. Dried sliced root tubers of *Harpagophytum procumbens*, the commodity in international trade. Photo: U. EULER.

Harpagophytum is primarily traded as dried sliced root tubers (figure 1). So far, processing to retail products does not take place in the range countries themselves but in Europe. Two German companies hold patents on extraction techniques for *Harpagophytum* (LOMBARD, pers. comm.) which raises concern in the region that source countries may lose ownership over the resource (LINDEQUE, pers. comm.). Retail products comprise teas, tablets and capsules. Recent interviews confirm a non-seasonal, all year round harvest of the resource which considerably intensifies the depletion pressure on *H. procumbens* (BERG, LOMBARD, pers. comm.).

Trade

Even though *Harpagophytum procumbens* is reported to be in high demand by traditional medical practitioners in Botswana and Namibia (MARSHALL 1998), trade in this species clearly focuses on international rather than on domestic markets. The material in trade consists almost entirely of dried and sliced root tubers and originates exclusively from the wild.

Export of *H. procumbens* from its three main range states (Botswana, Namibia and South Africa) is significant and strongly increasing. Exporting companies are still seeking for new markets. Among the range states, Namibia is the major exporting country. Figures for Namibia clearly show the significant rise of exports, in particular within the last six years (table 1).

Only fragmentary export figures are available for Botswana. According to KGATHI (1988), an average of 17 t of *Harpagophytum* material was annually exported between 1979 and 1985. DIPHOLO (pers. comm.) reports that annual exports have risen over the recent years to ca. 50 t in 1997/98 and that harvest is expected to increase. Total numbers do not reach Namibian magnitudes but a strong increase in exports of *H. procumbens* over the past five years is obvious.

Currently, no export figures are available for South Africa. Even though large Kalahari sandveld areas in South Africa harbour populations of *H. procumbens*, little exploitation takes place in this region so far. One exporter operating in this area claims to be the only harvesting, collecting and exporting operator in South Africa (OLIVIER, no date). KOEN (pers. comm.) reports that harvesting only takes place in the Northern Cape Province and exports amount to 6-7 t annually. There are a number of other companies also exporting *H. procumbens* from South Africa, but they obtain their stock from sources in Namibia and Botswana. These South African exporters seem to play an increasingly important role in the international trade of *H. procumbens* which is probably due to closer and more direct connections to the European markets compared with Namibian

traders. The number of containers (each container holding an average of about 8 t of dried plant material) of *H. procumbens* sold to South African exporters by Namibian traders rose from 2-3 containers in 1995 to 25 containers in 1998 (LOMBARD, pers. comm.).

Main importing countries are Austria, Belgium, France, Germany, Greece, Italy, Japan, United Kingdom, USA, Spain, Sweden, and Venezuela (MARSHALL 1998, NOTT 1986). Usually the raw material is exported from the countries of origin and is manufactured in the importing countries (e.g. Germany). As the demand for medicinal products of *H. procumbens* is still rising, it is expected that the exploitation will increase rapidly in the forthcoming years.

Table 1. Exports of *Harpagophytum procumbens* from Namibia. * Jan-April 1986; nd = no data available. Sources: NOTT (1986); MARSHALL (1998); Ministry of Environment and Tourism, Directorate Specialist Support Services.

Year	Export [kg]	Year	Export [kg]
1973	28,161	1986*	91,078
1974	nd	1987	nd
1975	180	1988	nd
1976	180	1989	nd
1977	190	1990	nd
1978	nd	1991	20
1979	nd	1992	95
1980	nd	1993	70
1981	84,35	1994	160
1982	133,619	1995	290
1983	124,291	1996	310
1984	107,8	1997	250
1985	183,37	1998	610

Cultivation

A German phyto-pharmaceutical company, in collaboration with a French researcher, is running a cultivation project for *Harpagophytum procumbens* in Namibia (SCHMIDT & al. 1998). They claim to have succeeded in vegetative propagation of high-yielding chemotypes and to have established the parameters for an increase in biomass production with limited irrigation. The magnitude of production is disputed by several observers of the industry in Namibia. Furthermore, the necessity of additional irrigation of the propagules could be in conflict with the limited water resources in the countries of origin. Cultivation trials are also being done in South Africa

and possibly Morocco (LOMBARD, LINDEQUE, pers. comm.). Hence, projects to cultivate *H. procumbens* do exist, but the quantities harvested from artificial propagation play a minor role in current international trade.

Legislation

In Namibia, *Harpagophytum* species are protected under Schedule 9 of the Nature Conservation Ordinance of 1975. From that year on a permit was required for the collection, transport, possession, and/or sale of *Harpagophytum*. In 1986 this system was considered to be ineffective and from 1987 on, permit requirements were restricted to commercial traders (MARSHALL 1998). From 1.8.1999 a new collection permit system was put into force. In order to export *Harpagophytum* from Namibia, an export permit and a phytosanitary certificate are needed.

In Botswana, *Harpagophytum* species are protected under the Agricultural Resources Conservation Act of 1977, by which harvest and trade are regulated and export requires a permit. To date, however, no export monitoring is done by the government, despite a continuing trade in *Harpagophytum* since enactment of the legislation in 1977 (MARSHALL 1998).

In South Africa, a permit system on the provincial level is in place (KOEN, pers. comm.) but no further information on the protection of *Harpagophytum* species is available.

Conservation management

For Namibia, the only public sector involvement in the trade of *Harpagophytum procumbens* is a project of the non-governmental organization CRIAA SA-DC, called the *Sustainably Harvested Devil's Claw Project* (see page 9). In this project rural communities are assisted to ascertain the quantity of their resource, to establish quotas and sustainable harvesting techniques for the production of high-quality products. Direct and economically feasible access to the market is aimed at in order to generate as much income as possible for the harvesters in the rural and almost exclusively marginalised and poverty stricken communities.

In Botswana, several studies of an environmental research programme of the University of Botswana had been carried out in the 1980's on the biology and population biology of *H. procumbens* under harvesting pressure, as well as on the resource potential and possible management strategies in Botswana (BURGHOUTS 1985, DE JONG 1985,

HULZEBOS 1987, KGATHI 1987 & 1988, KOK 1986, LELOUP 1985, NTSEANE 1993, SEKHWELA 1994, SEKHWELA & NTSEANA 1994, VEENENDAAL 1984).

Similar species

Even though *Harpagophytum procumbens* and *H. zeyheri* can easily be distinguished in the field, it is impossible to tell them apart in the form of dried and sliced tubers which is the trade commodity.

Both *H. procumbens* and *H. zeyheri* grow in Namibia with *H. zeyheri* occurring more in the northern and northeastern parts of the country (the higher rainfall areas). Both species are harvested and traded as Devil's Claw in Namibia. The various pharmacopoeias which cover the use of Devil's Claw in phytomedicines in the European Union and the USA stipulate that Devil's Claw is derived from *H. procumbens*. The level of inclusion of *H. zeyheri* in Namibian export stocks is high, which has implications, among other matters, for the increased pressure on the *H. procumbens* populations. Material originating from Angola, which certainly is *H. zeyheri*, is increasingly entering into export stocks in Namibia (LOMBARD, pers. comm.).

According to NOTT (1986), between 1985 and 1986, about 50% of the harvested wild material was mixed *H. procumbens* and *H. zeyheri* material. During that time most of the material came from the northern regions of Namibia (*H. zeyheri*), but only a very small amount from the Gobabis area in Namibia. The Gobabis area is located in the eastern part of the country and only harbours *H. procumbens*. Nowadays, after the active ingredients in both species were analysed, harvest clearly focuses on *H. procumbens*, and thus the Gobabis area is heavily exploited today (ENGELBRECHT, KRAFFT, VERSVELD, pers. comm.).

Other species harvested together with *Harpagophytum* are *Elephantorrhiza* spec. (Fabaceae) and *Acanthosycios naudiens* (Cucurbitaceae). Both can be easily distinguished by their bitter taste and dark colour and are therefore sorted out before export (CZYGAN & al. 1977; WENZEL & WEGENER 1995).

References

ANON. (1998): Devil's Claw Root. African herb offers natural pain relief. – <<http://www.asktom-naturally.com/naturally/devil.html>>, viewed 31.5.1999.

BLANK, R.J. (1973): Voraussetzungen und Möglichkeiten für einen feldmäßigen Anbau der Wildpflanze *Harpagophytum procumbens* DC. – Diplomarbeit, Universität Hohenheim.

BURGHOUTS (1985): Water balance and productivity of the Grapple plant *Harpagophytum procumbens* DC. – Gaborone, NIR.

CRAIB, C. (1999): Zur Ökologie von *Harpagophytum procumbens* ssp. *transvaalense* in der Nord-Provinz Südafrikas. – Kakteen und andere Sukkulenten 50: 249-253.

CZYGAN, F.C., A. KRÜGER, W. SCHIER & O.H. VOLK (1977): Pharmazeutisch-biologische Untersuchungen der Gattung *Harpagophytum* (BURCH.) DC. EX MEISSN. 1. Mitteilung: Phytochemische Standardisierung von *Tubera Harpagophyti*. – Deutsche Apotheker-Zeitung 117: 1431-1434.

DE JONG, F. (1985): Further aspects of regeneration and productivity of the Grapple plant (*Harpagophytum procumbens* DC.) under harvesting pressure. – Gaborone, NIR.

FLEURENTIN & MORTIER (1997): Entzündungshemmende und analgetische Wirkungen von *Harpagophytum procumbens* und *H. zeyheri*. In: CHINBERGIK, S. & H. WINK (Hrsg.): Rheumatherapie mit Phytopharmaka. – Hippokrates Verlag Stuttgart.

HACHFELD, B., C. LOMBARD, B. STROHBACH & U. SCHIPPMANN (in prep.): Population Status and Trade Survey of Devil's Claw (*Harpagophytum*) in Namibia. Plant Species Conservation Monographs 2.

HULZEBOS, E. (1987): Fruit development and production of a desert perennial, *Harpagophytum procumbens* DC. – Gaborone, NIR.

IHLENFELDT, H.-D. & H. HARTMANN (1970): Die Gattung *Harpagophytum* (BURCH.) DC. ex MEISSN. (Monographie der afrikanischen Pedaliaceae). – Mitt. Staatsinst. Allg. Bot. Hamburg 13: 15-69.

KGATHI, D.L. (1987): Aspects of grapple trade. Examples from two villages in sandveld Botswana. – Research Notes 24. Gaborone, NIR.

KGATHI, D.L. (1988): The Grapple trade in Botswana. – Botswana Notes and Records 20: 119-124.

KOK, E. (1986): Regrowth and tuber quality of juvenile plants *Harpagophytum procumbens* and their transpiration. – Gaborone, NIR.

LELOUP, S. (1985): An ecophysiological approach of the population dynamics of the Grapple plant *Harpagophytum procumbens* DC. – Gaborone NIR.

MARSHALL, N.T. (1998): Searching for a cure. Conservation of medicinal wildlife resources in east and southern Africa. – TRAFFIC International.

MOSS, H. (1982): The resource and its management. Vol. 1 & App. 1. In: TAYLOR, F.W. (ed.): The potential for commercial utilization of veldproducts. Base line data for consultancy plan no. T.B. 7/1/14/80-81. – Ministry of Commerce and Industry, Botswana.

NOTT, K. (1986): A survey of the harvesting and export of *Harpagophytum procumbens* and *H. zeyheri* in SWA/Namibia. – Etosha Ecological Institute, Okaukujo.

NTSEANE, P.G. (1993): Socio-economic survey on Grapple plant (*Harpagophytum procumbens* DC.). Utilization and commercialization. – Unpublished report National Institute of Development Research and Documentation. Gaborone.

OLIVIER, G. (no date): A document to keep tribal leaders informed. – <<http://www.harpago.co.za/leaders.htm>>, viewed 26.5.1999.

SCHMIDT, M., J. EICH, J. KREIMEYER & G. BETTI (1998): Improvement of pharmaceutical drug quality: A Cultivation project for *Harpagophytum procumbens* in Namibia. – Drogenreport 19: 3-9.

SCHNEIDER, E. (1997): Sustainable use in semi-wild populations of *Harpagophytum procumbens* in Namibia. – Medicinal Plant Conservation Newsletter 4: 7-9.

SEKHWELA, M.B.M. (1994): Grapple plant (*Harpagophytum procumbens* DC.). Resource Potential and Management Studies. – Unpublished Report. National Institute of Development Research and Documentation, Gaborone.

SEKHWELA, M.B.M. & NTSEANA, P.G. (1994): Developing Grapple plant (*Harpagophytum procumbens* DC.) management strategies in Botswana. People's agenda for effective and sustainable resource utilization and management. – Unpublished Report. National Inst. of Development Research and Documentation. Gaborone.

STROHBACH, M. (1995): The Devil's Claw, *Harpagophytum procumbens* DC. Potential for development? – National Botanical Research Institute, Windhoek.

STÜBLER, M. (1987): Die Behandlung chronischer Gelenkerkrankungen mit *Harpagophytum*. – Allgemeine Homöopathische Zeitung 232: 60-62.

TUNMAN, P. & H.J. BAUERSFELD (1975): Über weitere Inhaltsstoffe der Wurzel von *Harpagophytum procumbens* DC. – Arch. Pharm. 308: 665-657.

TUNMAN, P. & R. LUX (1962): Zur Kenntnis der Inhaltsstoffe aus der Wurzel von *Harpagophytum procumbens* DC. (Isolierung und Eigenschaften von Harpagosid und Harpagid). – Deutsche Apotheker-Zeitung 102: 1274-1275.

VEENENDAAL, E. (1984): Regeneration of productivity of the Grapple plant, *Harpagophytum procumbens* DC, under harvesting pressure. – Gaborone, NIR.

WENZEL, P. & T. WEGENER (1995): Teufelskralle, ein pflanzliches Antirheumatikum. – Deutsche Apotheker-Zeitung 135: 15-28.

Berit Hachfeld • Universität Köln • Botanisches Institut • Gyrhofstrasse 15 • 50931 Köln • Tel: +49/221/9404-756 • E-Mail: bhach@novell.biolan.uni-koeln.de.

The Sustainably Harvested Devil's Claw Project in Namibia

Cyril Lombard

Since 1996 the sustainable production and supply of wild harvested Devil's Claw (*Harpagophytum procumbens*) has been researched and developed in Namibia. Amongst the objectives of the Sustainably Harvested Devil's Claw (SHDC) Project is the improvement of the benefits derived from the harvesting of, and trade in, this important resource by

the remote rural communities in the Omaheke region of eastern Namibia.

The project initially focused on Vergenoeg (Afrikaans for "far enough"), a 10,000 hectare resettlement farm. Members of the Vergenoeg community are principally San (Bushmen) and Nama Damara. Land and resource tenure is communal. Following the success of the first two phases at Vergenoeg the project was expanded in 1998/1999 to include another 17 resettlement farms and other communal areas, comprising three "supply groups". More recently another supply group, comprising 35 commercial farms, has been introduced to the supply network. For the 1999 production season the project comprised a total of 53 farms or areas, covering a total of 307,415 hectares of land, and worked directly with 328 harvesters and households.

Where necessary, harvesters are provided with training in good harvesting practice and other resource management issues. This includes dissemination of the appropriate traditional knowledge of experienced harvesters. All harvesters are registered with the project. Selected members of the community are trained in quality control, act as monitors and coordinators, and record the supply from each harvester. Prior to the harvesting season an ecologist conducts a survey of the resource and calculates a sustainable off-take quota. This quota is negotiated and shared by the registered harvesters. Other resource management tools and techniques are employed to suit the local conditions and land tenure status of the particular groups. The harvesting communities trade directly with the exporter. The minimum on-farm price paid to harvesters was N\$ 12 per kg in 1999 (= US\$ 2). This higher-than-average price is conditional on compliance with good resource management practices and the high quality of the traded product. Last season 10,210 kg of certified organic/biological, dried and sliced Devil's Claw was produced.

Results generated so far from post-harvest compliance checks, successive resource surveys by the ecologist, community resource monitoring efforts, and other sources of information, indicate that, despite the extreme poverty of the harvesters, the remoteness of the harvesting areas, poor infrastructure, and the difficult land and resource tenure conditions which prevail in these areas, communities are able and willing to manage their resource. Whilst certain issues need further attention some results warrant highlighting. The first Devil's Claw resource

survey at Vergenoeg by the ecologist established a sustainable off-take quota of 1,900 kg for the 1998 harvest. Off-take of one tonne was recorded, which represented a dramatic increase over any previous season. Using the same methodology the ecologist established the sustainable off-take for 1999 to be 3,450 kg. An off-take of 1,683 kg was recorded. For the 2000 season the ecologist has recently established a sustainable off-take of 3,873 kg.

Should problems with compliance with good resource management practices occur, or should rainfall levels or other factors which influence the ecological status of the resource cause concern, a system to allow remedial action, such as dropping quotas at the appropriate place, is operational. This may be immediately around a household or a section of a farm, a farm, a supply group, or even the entire supply network.

Future plans of the project include detailed population status studies, the development of commercial partnership between the harvesting communities, the exporter, and selected importers and manufacturers, the scaling-up of production, and the phased transfer of external management and public sector support to the commercial sector.

A particular interest to the project is the potential to transfer propagation and cultivation technology to organized rural communities. The importance of the income generated by the harvesting of and trade in this resource to the household food security of some 12,000 rural peoples in Namibia can easily be underestimated. The lucrative worldwide market for products based on this resource has been developed over the past 30 years with material secured from these rural harvesters. It is therefore considered appropriate that the commercial sector and other research institutions provide improved levels of support to the present suppliers of Devil's Claw, and consider options to keep this supply sector in the industry in the longer-term.

The Sustainably Harvested Devil's Claw Project has been supported by Oxfam's Omaheke Integrated Development Programme, The Canada Fund for Local Initiatives, NAMDEB Social Fund, the Delegation of the European Commission in Namibia and the National Planning Commission, ILO's INDISCO Programme, and Intermon. The project is managed and implemented by CRIAA SA-DC (Southern Africa - Development and Consulting) in co-operation with the Ministry of Environment and

Tourism and the National Botanical Research Institute.

Cyril Lombard • CRIAA SA-DC • P.O. Box 23778 • Windhoek • Namibia • Tel: +264/61/220117; 225009 • Fax: +264/61/232293 • E-Mail: criaawhk@iafrica.com.na.

***In-vitro* micropropagation of fertile plants of *Harpagophytum procumbens* and *H. zeyheri* (Devil's Claw)**

G. Levieille, G. Wilson, J.R. Robin & M. Cambornac

Extracts of the tubers of Devil's Claw are used widely as ingredients in pharmaceutical preparations, in herbal remedies and in cosmetics for their properties as anti-inflammatory, antiarthritic and muscle relaxants. The main active molecules are the iridoid monoterpenes: harpagoside, harpagide, procumbine, and harpagogenine. Only a restricted number of plant families (including Pedaliaceae) exhibit free iridoid monoterpenes, more often they are conjugated or exist as a constituent of more elaborate alkaloids. Although it is the dried radix of *Harpagophytum procumbens* that is listed in pharmacopoeias, it is likely that both *H. procumbens* and *H. zeyheri* are present in many commercial preparations since they are difficult to distinguish when dried (BAGHDIKIAN & al. 1997). In their review of the exploitation, trade and population status of *Harpagophytum procumbens* in southern Africa, HACHFELD & SCHIPPMANN (2000; see page 4) report that the genus *Harpagophytum* is over-utilized and has been proposed for inclusion in Appendix II of CITES.

The anti-inflammatory properties of the extract are comparable to cortisone and phenylbutazone, but without their side effects. Data on the biopharmaceutical quality of the *Harpagophytum* preparations and on their antirheumatic effectiveness were proven in pharmacological and clinical studies for the treatment of osteoarthritic pain. Safety in the clinical use of the extract has been shown and fewer adverse side effects accompany the *Harpagophytum* treatment as compared to treatment with corticosteroidal and Non Steroidal Anti-Inflammatory Drugs (NSAIDs) (CHRUBASIK & EISENBERG 1999, CHRUBASIK & al. 1999).

Research collaboration between the Department of Botany, University College Dublin and the Laboratoires de Biologie Végétale Yves Rocher has developed a new method for the *in vitro* micropropa-

gation of *Harpagophytum* (LEVIEILLE & WILSON, in prep.). Nodal stem sections were regenerated using a two-step protocol depending on root induction on an auxin-containing medium. After a week, roots started to grow at the base of the stem and axillary bud dormancy was broken leading to the development of new shoots. The new plantlets were transferred onto sterile vermiculite supplemented with a nutrient solution without an organic carbon source and maintained in autotrophic conditions. The *in vitro* produced plants were weaned by exposing them progressively to reduced humidity. Acclimatization of the micropropagated plants into soil was achieved in a glasshouse where they grew into mature fertile plants producing their characteristic fruits as well as the tuberised secondary roots. This micropropagation technique offers a new and innovative approach to an alternative source of the therapeutically active compounds.



Figure 1. *Harpagophytum zeyheri* in the greenhouse of Laboratoires de Biologie Végétale Yves Rocher. Photo: M. CAMBORNAC.

References

BAGHDIKIAN B., M. C. LANHERS, J. FLEURENTIN, E. OLLIVIER, C. MAILLARD, G. BALANSARD & F. MORTIER (1997): An analytical study. Anti-inflammatory and analgesic effects of *Harpagophytum procumbens* and *Harpagophytum zeyheri*. – *Planta Medica* 63: 171-176.

CHRUBASK S. & E. EISENBERG (1999) Treatment of rheumatic pain with kampo medicine in Europe. 1. *Harpagophytum procumbens*. – *Pain Clinic* 11: 171-178.

CHRUBASK S., H. JUNCK, H. BREITSCHWERDT, C. CONRADT & H. ZAPPE (1999) Effectiveness of *Harpagophytum* extract WS 1531 in the treatment of exacerbation of low back pain: a randomized, placebo-controlled, double-blind study. – *Eur. J. Anaesthesiol.* 16: 118-129.

HACHFELD, B. & U. SCHIPPMANN (2000) Conservation data sheet 2: Exploitation, trade and population status of *Harpagophytum procumbens* in southern Africa. – *Medicinal Plant Conservation* 6: 4.

LEVIEILLE, G. & G. Wilson (in prep.). Micropropagation *in vitro* and regeneration of fertile plants of the endangered medicinal species *Harpagophytum procumbens* and *H. zeyheri*.

For author's address (M. Cambornac) see list of members.

Germain Levieille • Laboratory of plant tissue culture • Department of Botany • University College Dublin • Dublin 4 • Ireland • E-mail: germain.levieille@ucd.ie

Special Features

The Plant Conservation Alliance - Medicinal Plant Working Group

Julie Lyke

The market for medicinal herbs in the United States is worth US\$ 600 million and is growing at a rate of more than 100 percent per year (BREVOORT 1998). At least 175 species of plants native to North America are offered for sale in the non-prescription medicinal market in the United States; and more than 140 medicinal herbs native to North America have been documented in herbal products and phyto-medicines in foreign countries (ROBBINS 1999). Dozens and possibly hundreds of these are collected in large quantities from the wild in the United States (ROBBINS 1999).

Recognizing that commercial demands may cause overharvesting of native plants in the United States, representatives from industry, government, academia, indigenous communities, and environmental organizations joined together to form the Medicinal Plant Working Group (PCA-MPWG) under the umbrella of the Plant Conservation Alliance (PCA). The PCA is a consortium of ten US federal government Member agencies and over 145 non-federal Cooperators representing various disciplines

of plant conservation who work collectively to solve the problems of native plant extinction and native habitat restoration, ensuring the preservation of our ecosystems. The PCA also serves as the North American Plant Specialist Group of the IUCN Species Survival Commission.



The Medicinal Plant Working Group's primary focus is to facilitate action on behalf of medicinal plants native to the United States that are of

particular conservation concern, in order to balance biological and commercial needs and, in the long term, minimize regulatory intervention.

To this end, the objectives of the group include:

- 1) generating and sharing information regarding species of medicinal and economic importance and conservation concern;
- 2) promoting appropriate conservation measures for native medicinal plants;
- 3) promoting sustainable production of native medicinal plants;
- 4) increasing participation in native medicinal plant conservation;
- 5) encouraging active participation by indigenous communities and other holders of traditional ecological knowledge pertaining to native medicinal plants; and
- 6) generating financial support for native medicinal plant projects. The PCA-MPWG's strategic plan is available on the Internet at <http://www.nps.gov/plants/medicinal/strategy.htm> (viewed 10.3.2000).

Since its inception in June 1999, membership in the PCA-MPWG has grown to over 100 individuals from at least 28 states and indigenous communities and three foreign countries. Participants have established Committees to address each of the six main areas of emphasis identified above, and selected representatives from Paracelsian, the USDA Forest Service, the Department of Defense, the University of Maryland, Wilcox Natural Products, Ticonderoga Farms, the US Botanic Gardens, and TRAFFIC North America as Chairs.

A "Core Group" of members, including the Committee Chairs and interested others, meets regularly by conference call to discuss progress. Currently, the Working Group is finalizing its

Strategic Plan and each Committee is beginning to take steps to achieve its objectives. For example, the Conservation Committee is selecting specific "species of concern" for each region of the country for which conservation measures will be developed. The Participation Committee is developing a list of things the public can do to help conserve medicinals, like buy products from cultivated sources. The entire PCA-MPWG shares information and keeps in touch on significant issues via a listserver.

The PCA Medicinal Plant Working Group is facilitated by the U.S. Fish and Wildlife Service. It is open to all who are interested in medicinal plant conservation. If you are interested in the Working Group and want further information, visit the PCA-MPWG web site (<http://www.nps.gov/plants/medicinal/>; viewed 10.3.2000). If you would like to participate, please contact the PCA-MPWG Chair for more information: *Julie Lyke* · U.S. Fish and Wildlife Service · Office of Scientific Authority · 4401 N. Fairfax Drive · Arlington, VA 22203 · Tel.: +1/703/358-1708 · julie_lyke@fws.gov.

References

- BREVOORT, P. (1998): The Booming U.S. Botanical Market - A New Overview. *Herbalgram* 44: 33-45.
- ROBBINS, C. (1999): Medicine from U.S. Wildlands: An Assessment of Native Plant Species Harvested in the United States for Medicinal Use and Trade and Evaluation of the Conservation and Management Implications. The Nature Conservancy. Washington, DC, 28 pp.

National Herbalists Association of Australia establishes committee for medicinal plant sustainability and ethical issues

Andrew Pengelly

Following the success of the "Medicinal Plants for the Future" conference of August 1999 held in Byron Bay, Australia, the National Herbalists Association of Australia (NHAA) has established and funded an Ethics and Conservation Committee in order to help address some of the problems of sustainability of herbal medicines, as identified at the Byron Bay conference.

On the 21st November a meeting was convened at the NHAA office whose purpose was the formation, naming and mode of operation of the working group referred to above. The ten people who attended the meeting represented the profession, growers,

wildcrafters, TRAFFIC Oceania, and academia. No representatives of the herb industry were present. The main purpose of the group is to (1) act as a resource to set and promote ethical guidelines and principles, and develop policies within ethical frameworks; and (2) to implement the resolutions from the Medicinal Plants for the Future Conference.

The group will operate informally and communicate through email and phone link ups if necessary. A steering committee to facilitate operation of the group was elected, consisting of Andrew Pengelly (chair), Rob Santich (secretary), Ses Salmond and Alison Walsh (publicity), and several task coordinators to deal with specific issues such as native herb conservation, wildcrafting, intellectual property rights and patenting, and ethical research issues.

We are working towards a comprehensive statement of purpose or mission statement. Initial activities to be undertaken include:

- A code of ethics for wildcrafters.
- Baseline mapping of wild species.
- Identify major players involved in native flora and invite them to contribute to the working group.
- Develop a list of rare and endangered imported species and investigate their potential as cash crops.
- Develop close links with indigenous groups through local land councils or other means.
- Develop policies and a public profile on genetic modification issues.
- Maintain an awareness of plant cloning techniques and impacts on biodiversity and existing gene pool.
- Network with relevant groups such as the US Medicinal Plants Working Group, United Plant Savers, Seed Savers Network etc.

The membership and responsibilities of the group will be dynamic and flexible. We would love to hear from anyone who can contribute in any way.

Andrew Pengelly • Medical Herbalist • Stanley, Golden Highway • Merriwa NSW 2329 • Australia • Tel./Fax: +61/2/65485189 • E-mail: pengelly@hunterlink.net.au.

Sustainable supply of wildcrafted medicinal plant drugs: Steps towards a balance between economy and conservation

Götz Harnischfeger

In spite of great efforts of modern chemistry, plant drugs still constitute worldwide the main staple of medicinal starting material, though their use is largely restricted to traditional forms of therapy. In Germany alone more than 1600 taxa are in use. However, about 95% of these are not obtained by agriculture but have to be supplied by wildcrafting. They are either unsuitable for cultivation or are in such rare demand that cultivation is simply not feasible for economic reasons.

Wildcrafting carries a bundle of well known risks, overharvesting being most prominent among them. It occurs frequently to such a degree that a given population is reduced to a level of genetic instability and sometimes subsequent extinction. As a counter-measure several proposals for conservation with an emphasis on sustainable supply have been put forward. Such efforts are mostly designed to apply a double approach, i.e. education of the collectors and supervision of the harvesting activities by official authorities. The latter includes a supporting administrative framework like the passing of respective laws, the setting of quotas and their implementation through on-the-spot inspections. Shortcomings of this approach originate chiefly in the lack of insight into government-imposed restrictions and an inborn distrust for such measures by the actual collectors.

Strong motivation for aspects of conservation for sustainable use of natural resources can therefore be generated only through economic advantages favouring conservation and it seems that the presently ongoing discussion about ensuring high quality supply of starting materials for herbal medicinal products provides such a lever. On the purchaser's side it will ultimately lead to a change in quality expectations, higher prices and, as an offspring, to conservation of valuable resources.

A starting point is provided by the requirement of the European Medical Evaluation Agency (EMA) with its subgroup on herbal medicines, that the quality of herbal drugs has to be in analogy to the demands set for synthetically manufactured active pharmaceutical materials (APIs). Written documentation is required down to the level of plant origin, harvesting,

processing, transportation, and storing, all signed by a responsible person.

A logical first step was the introduction and implementation of a guideline for cultivated medicinal herbs and their corresponding drugs (Good Agricultural Practice, GAP). In a second step, a similar guideline to ensure the quality of wildcrafted drugs (Good Harvesting Practice, GHP) was proposed by industrial manufacturers and is presently under discussion. The proposal will shortly be published in *Journal of Herbs, Spices and Medicinal Plants* and a copy can be obtained from the author.

This proposed guideline has some inbuilt safeguards to assure sustainable use and supply. It requires supervision of the collectors by a responsible person knowledgeable in the particular plant harvested, its ecology, reproductive period, population density, optimum harvesting time, etc. This person is chiefly responsible for collecting under aspects of conservation and legal restrictions which includes also educating the collectors in all manners of recognition of the "true" plant, techniques of harvesting with minimum damage to the parent plant and environment, including the timing, climatic conditions etc., so that only high quality material is obtained.

Other parts of the proposed guideline include a listing of the minimum required knowledge of the collectors themselves, a framework of rules to be adhered to in collecting, but also for the drying and processing, packaging, equipment, and facilities of storage. Basics are also laid out for the proper way of documentation and quality assurance.

It is hoped that the drug-collecting-organizations will in the long run be committed by market pressures to reorganize their practices to include and adhere to these guidelines. Such expectations seem to be within reach since the purchasers of wildcrafted drugs are in most cases also manufacturers of registered herbal medicinal products. Their specific requirements for documented starting material will ultimately force the drug-collecting organizations into compliance.

Götz Harnischfeger • Schaper & Brümmer GmbH & Co KG • Bahnhofstrasse 35 • 38259 Salzgitter-Ringelheim • Germany • Tel: +49/5341/307-400, -401 • Fax: +49/5341/307-405 • E-Mail: goetz_harnischfeger@schaper-bruemmer.de.

Tibetan medicine and the environment in modern Ladakh. A threat to medicinal plants

Laurent Pordié

Ladakh is a district of the state Jammu & Kashmir in the Indian Himalayas. Known as 'Little Tibet', this Buddhist region is now developing and opening itself to the 'modern world'. The consequences for the local environment, both social and natural, are many and form part of a complex system in which many parameters are interrelated. It is therefore necessary to investigate development, economy, politics, environment, health systems, demography, climate, tourism, religion, etc., in order to obtain a global and accurate understanding of the unique relationship between Tibetan medicine (locally named *amchi* medicine) and the environment in this era of modernization. This approach will take into account the relation between the transformations of environment and way of life, and the change of mentality and behaviour. This article aims to present a panorama of the actual situation reminding us that the plants are not only biological objects but also social and cultural objects.

The Tibetan medicine reflects a holistic way of thought in which sickness is treated as a physical, emotional and spiritual whole. The *rGyud-bZhi*, or 'Four Tantras', is the sacred book containing the body of medical knowledge (CLARK 1995, YESHI 1997). It describes, from a scientific perspective, the theoretical relationship between humankind and the environment in which observed phenomena are understood according to the links which unite them and give them coherence. The fundamental concept of Tibetan medicine is based on the theory of five cosmo-physical elements: *Sa* (earth), *Chu* (water), *Me* (fire), *rLung* (air or wind) and *Nam-kha* (space), and three *nes-pa* or humors: *rLung* (wind), *mKris-pa* (bile) and *Badkan* (phlegm). These *nes-pa* are the functional physiological expressions of the five cosmo-physical elements and the natural humoral constitution produces certain physical, physiological and emotional characteristics (MEYER 1988, YESHI 1986). According to this theory, the *rGyud-bZhi* states that the composition of the body is the same as that of the universe and this similarity between the macrocosm and the microcosm explains the reciprocal influences that one element has on the others and the interdependence that connects the human beings to the environment. Considering this

sacred biological relationship, any changes in our environment whether positive or negative, constructive or destructive, bring similar changes in the body system. This is reminiscent of the law of interdependence as we find it on the religious aspects of the medical practice.

However, the medical theory is only known by the traditional practitioners and the religious aspects of the practice are now declining in favor of the biological aspects.

Purposely or inadvertently, the Ladakhi environment continues to be polluted and harmed in a grab for

modernization. The changes brought by development (in its western sense) are leading to an environmental degradation in Ladakh (MALON & PRODON 1995), causing a gulf between the theory presented above and reality. Table 1 shows the actual conservation status of medicinal plants in the state of Jammu & Kashmir according to the CAMP Workshop for high altitude medicinal plants of Jammu-Kashmir and Himachal Pradesh, held in Kullu using the revised IUCN threat categories¹ (from VED & TANDON 1998). It should be mentioned that the threat assessments in table 1 are focussed on the state of Jammu & Kashmir and are only indicative for Ladakh. Few experts investigate Ladakh's botany mainly due to accessibility problems and most recently because of the Indo-Pakistan military conflict, and the army researchers (Himex Project) keep their findings confidential. An indepth local survey should be conducted in Ladakh itself to complete this data.

The medicinal plants are threatened by a plethora of factors. First of all the 'professional collectors', mainly Tibetans are putting pressure on the Ladakh flora. The renowned Tibetan Medical & Astrological Institute (Men-Tsee-Khang) of

Dharamsala is the primary consumer and exporter of plants used in Tibetan medicine. Tenzin Cheudrak, physician of His Holiness the Dalaï Lama, says: "When I arrived in India, the Tibetan doctors had less than 80 substances to make their medicines. I work hard to find raw materials, today they are sent from Tibet and Ladakh" (TAGER 1999). THINLEY states that the Tibetans of the Men-Tsee-Khang are producing 25 times more medicines than ten years

Table 1. Conservation status of medicinal plants in the state of Jammu & Kashmir (including Ladakh). The plants were assessed at the CAMP Workshop for high altitude medicinal plants of Jammu-Kashmir and Himachal Pradesh, held in Kullu using the revised IUCN threat categories¹ (from VED & TANDON 1998).

Critically Endangered – CR	Endangered – EN
<i>Aconitum chasmanatum</i>	<i>Aconitum dienorrhizum</i>
<i>Arnebia benthamii</i>	<i>Aconitum heterophyllum</i>
<i>Dactylorhiza hatagirea</i>	<i>Angelica glauca</i>
<i>Fritillaria roylei</i>	<i>Arnebia euchroma</i>
<i>Gentiana kurroo</i>	<i>Artemisia maritima</i>
<i>Saussurea costus</i>	<i>Betula utilis</i>
Vulnerable – VU	<i>Ephedra gerardiana</i>
<i>Aconitum violaceum</i>	<i>Jurinea dolomiaea</i>
<i>Allium stracheyi</i>	<i>Meconopsis aculeata</i>
<i>Bergenia stracheyi</i>	<i>Picrorhiza kurrooa</i>
<i>Ferula jaeschkeana</i>	<i>Podophyllum hexandrum</i>
<i>Heracleum lanatum</i>	Lower Risk/ Near Threatened – LR / NT
<i>Malaxis muscifera</i>	<i>Hippophae rhamnoides</i>
<i>Physochlaena prealta</i>	<i>Hyoscyamus niger</i>
<i>Polygonum multiflorum</i>	Lower Risk/ Least Concern – LR / LC
<i>Polygonum verticillatum</i>	<i>Selinum tenuifolium</i>
<i>Rheum australe</i>	<i>Selinum vaginatum</i>
<i>Rheum moorcroftianum</i>	Data Deficient – DD
<i>Rheum spiciforme</i>	<i>Ferula nartex</i>
<i>Rheum webbianum</i>	Not Evaluated – NE
<i>Rhododendron anthopogon</i>	<i>Inula racemosa</i>
<i>Rhododendron campanulatum</i>	<i>Nardostachys grandiflora</i>
<i>Rhododendron lepidotum</i>	
<i>Saussurea gossypiphora</i>	
<i>Saussurea obvallata</i>	

¹ [Editor's note: The IUCN threat categories were designed for global threat assessments. It has to be kept in mind that they are applied here to the region or local area even. E.g.: *Ephedra gerardiana* is assessed as EN in Jammu & Kashmir but at the same time it is widely distributed through the dry Himalayan, across to NW Pakistan and Afghanistan.]

The Tibetan medicine was elaborated in the 6th Century on Buddhist foundations and the related philosophy gives great emphasis to the sacred nature of the environment and the intrinsic inter-relationship between all flora and fauna, beings and elements (MARTIN 1997). Considering just the medical theory and the Buddhist principles would lead one to believe that Ladakh was a natural haven for medicinal plants.

ago and they are nowadays accused by environmentalists of damaging natural resources, particularly in Ladakh (THINLEY 1997). This collection is illegal as Tibetan medicine is not officially recognized in India. The situation produces a paradox: on the Tibetan side the collection does not seem to cause any harm and on the Ladakhi side nobody stems these unwanted activities (some justifying it in favor of their respect for the Dalai Lama, others quietly arguing about Indian Rupees). The Department of Forestry offered in 1998 to set up a licence for plant collection, but the local organization concerned (the main association for *amchi* medicine) did not take this proposal seriously and the change of the forest officer in 1999 turned this project into one more forgotten file on a desk.

The local *amchi* practitioners are totally dependant on their environment, and their methods of collecting the plants can have terrible consequences. At an individual level, when an *amchi* arrives at a plant locality he has a tendency to collect all of them. This is viewed as nature's payment for days of trekking in the high Himalayas. But the following year the chance is high that he will not find any plants in the same spot. An educational project on plant collecting is currently being conducted by the international non-governmental organization NOMAD 'Health & Education' involved locally in the development of Tibetan medicine. This organization promotes plant conservation in Ladakh through seminars with traditional healers, field work, and IPR related issues.

Ladakh is suffering from ignorance of local practitioners of environmental preservation and the developmental activities of the Tibetan refugee community. But the local environment is also under pressure because of the demographic growth (three times more inhabitants in the last 50 years according to the Census India Handbook of 1981), the increase in livestock and inhabited areas, the development of cultural tourism and adventure tourism, the rapid increase in polluting engines, the new kinds of wastes, etc. All these local human related matters are reinforced by more global changes affecting the Ladakhi climate. The winters are warmer and precipitation, particularly rain in summer, is drastically increasing. Ladakh is a high altitude cold desert and the flora is very sensitive to climatic changes. The cumulative effects of the local and global disturbances have to be considered to realize the gravity of the problem. The situation is not beyond repair but at a critical transitional stage in

which the course of future will primarily depend on local motivation.

We can hope that, as environmental preservation is becoming a 'modern' concern, the local institutions will use it for their political end. The plants represent an economic resource because of their therapeutic potential. Nowadays, international pharmaceutical companies are showing interest in them. Thus, the plants symbolize knowledge and tradition, rooted in ancient medical science, in opposition to the modern technological world. In this respect, the plants form part of the cultural identity of the Ladakhis who claim a proprietary interest in them, setting up very strict local controls and resisting any foreign applicants for botanical research (PORDIÉ 1998). Beyond juridic protection, ethnic identity is expressed through the plants. Thus, the plants stimulate local awareness about the natural environment, its value and wealth (as well as socio-cultural environment) and must therefore be central to conservation policies. The plants are a symbol of modernity, the subject of environmental conservation, but preserving tradition. In this respect, we can understand why the plants, in their diverse aspects, can be seen as valuable political tool, able to catalyse traditional and modernist networks, annihilating the presupposed incompatibility between 'tradition' and 'modernity' (PORDIÉ 1999).

Some wise *amchis*, guided by the desire to preserve the serenity of nature, have come up with their own solutions to the problem of environmental degradation. They keep the places secret where the last *Meconopsis* or *Aconitum* can be found. Being so close to the sky, on the roof of the world, they understand that the ecosystem is a whole, that nature is a gift and its preservation a condition for our survival.

References

- CLARK, B. (1995): (*trad. of rGyud-bZhi*), The Quintessence Tantras of Tibetan Medicine, Snow Lion Publications.
- MALON D. & R. PRODON (1995): Ecology and Conservation in Ladakh, in: OSMASTON H. & P. DENWOOD, Eds., Recent Research on Ladakh, Vols. 4 & 5, Motilal Barnasidass Publishers.
- MARTIN J., Ed. (1997): Ecological Responsibility, A dialogue with buddhism, Tibet House.
- MEYER, F. (1988): Gso-Ba-Rig-Pa, Le système médical tibétain, Presses du CNRS.
- PORDIÉ, L. (1998): Tibetan Medical Practice in Indian Himalaya, a socio-medical essay, French Society of Ethnopharmacology [in French].

PORDIÉ, L. (1999): Entre lotus et nénuphar, ou l'ambiguïté de la dialectique entre médecines traditionnelles et modernisation, DEA Anthropologie, University of Aix-Marseille.

TAGER, D. K. (1999): Tenzin Cheudrak vu de l'intérieur, L'actualité des religions, No 3.

THINLEY, P. (1997): Tibetan Medicine: Too successful for its own good?, Tibetan review.

VED, D.K. & V. TANDON, Eds. (1998): Conservation assessment and management plan workshop for high altitude medicinal plants of Jammu-Kashmir and Himachal Pradesh, Kullu, Himachal Pradesh, 16-18 April 1998. – 75 pp., FRLHT, Bangalore.

YESHI, D. (1986): Health Through Balance, Motilal Banarsidass Publishers.

YESHI, D. (1997): The Ambrosia Heart Tantra, Library of the Tibetan Works and Archives.

Laurent Pordié • Laboratory of Human Ecology and Anthropology • University of Aix-Marseille/CNRS (UMR 6591) • 38 Av. de l'Europe • 13100 Aix-en-Provence • France • E-mail : nomadplant@hotmail.com.

CITES News

Uwe Schippmann

The 11th Conference of the Parties to CITES (COP 11) was held in Nairobi, Kenya, from 10-20 April 2000. 21 proposals were put forward to amend the CITES Appendices regarding plants. It is interesting to note that eight of these were proposals to delist taxa from the Appendices which were submitted on the basis that trade is not a threat to the species involved. Six amendment proposals related to medicinal plant species.

The plant decisions had been discussed at length at the 9th **Plants Committee** which was held from 7-11 June 1999 in Darwin, Australia. The implementation of the Appendix II listing of *Prunus africana* was discussed to some extent. Concerns of some delegates that extraction and exports from western African countries and Madagascar exceed sustainable levels were disputed by participants from trade organizations. The second major medicinal plant issue on the Plants Committee's agenda was the report "Trade in medicinal plants" (Doc. 9.1.3) tabled by the German delegation which gives a picture of the trade patterns of 16 medicinal plant species listed in CITES Appendices. The 88-

paged report was not discussed in detail. Some delegates felt that recommendations in the report were premature or too openly stating what was indeed the understanding of many delegates: that the implementation of CITES with respect to medicinal plants included in Appendix II is far from being satisfactory. It was decided to send the draft report to range states concerned for comments.

As for previous CITES conferences the MPSG was asked by Alison Rosser and Mandy Haywood from the IUCN/SSC Wildlife Trade Programme to assist in their task to assess the scientific and technical merits of the medicinal plant proposals. These Analyses are produced in a joint effort with the TRAFFIC network and are a most valuable source of conservation related information. A number of our members have contributed to this process and the Analyses are available on the internet at <http://www.iucn.org/themes/ssc/cites> (viewed 25.2.2000). The text also was circulated to all CITES Parties in printed form before COP 11 and was available to all delegates at the COP as an information document.

Additional information on the plant proposals is available on the website of the CITES Secretariat at <http://www.wcmc.org.uk/cites> (viewed 25.2.2000). The TRAFFIC Network has published recommendations regarding the compliance of the proposals with CITES listing criteria (<http://www.traffic.org/cop11/recommendations/>, viewed 1.3.2000).

The following proposals related to medicinal plants have been put forward by CITES parties:

Species	Proposed Appendix	Proponent	Recommendations	
			Secretariat	TRAFFIC
<i>Adonis vernalis</i>	II	Germany	accept	accept
<i>Camphoteca acuminata</i>	II	China	reject	reject
<i>Cistanche deserticola</i>	II	China	reject	accept
<i>Guaiacum sanctum</i>	II → I	USA	reject	reject
<i>Harpagophytum</i> spp.	II	Germany	accept	accept
<i>Panax ginseng</i>	II	Russian Fed.	accept	accept

A more technical proposal (11.53) aimed at streamlining the various annotations that exist in the CITES Appendices to regulate which parts and derivatives are actually covered by CITES controls. It was proposed to use the annotation "...except... chemical derivatives and finished pharmaceutical products" for the species *Podophyllum hexandrum*, *Rauvolfia serpentina* and *Taxus wallichiana*.

>>> Stop Press <<<

Plant Decisions at CITES COP 11	
Taxon	Decision
<i>Adonis vernalis</i>	accepted
<i>Camptotheca acuminata</i>	withdrawn
<i>Cistanche deserticola</i>	accepted
<i>Guaiacum sanctum</i>	withdrawn; Plants Committee directed to prepare report
<i>Harpagophytum</i> spp.	withdrawn; Plants Committee directed to prepare report
<i>Panax ginseng</i>	reduced to Russian populations only and accepted

>>> Stop Press <<<

Taxon File

The exploitation of *Prunus africana* on the island of Bioko, Equatorial Guinea

Terry Sunderland and Tako Charles Tanyi

The bark of the Afro-montane trees species *Prunus africana* is utilized for the treatment of benign prostate hyperplasia, and has a current market value of around \$150 million per annum. (CUNNINGHAM & al. 1997). Until 1992, the exploitation of *Prunus* bark was concentrated primarily in Cameroon, Kenya and Madagascar, Tanzania and, to a lesser extent, the Democratic Republic of Congo. However, recent research has indicated that the island of Bioko, Equatorial Guinea is becoming of increasing importance for the export of *Prunus* bark to Europe and this, as yet relatively unexploited resource, may become increasingly important as supplies from other countries become scarce or are subject to increased regulation (SUNDERLAND & TAKO 1999).

The Republic of Equatorial Guinea, a former Spanish colony, consists of three diverse and disparate territories: the island of Bioko (2,017 km²), the mainland territory of Rio Muni (26,017 km²) and the island of Annobon (17 km²). The rectangular-shaped island of Bioko (formerly Fernando Póo) lies 32 km from the coast of Cameroon and is the largest in the Gulf of Guinea forming part of a volcanic chain which includes Mount Cameroon, São Tomé and Príncipe, and Annobon. Bioko island itself is dominated by three volcanic peaks, Pico de Basilé

(3,010 m) in the north, and Pico Biao (2,010 m) and Gran Caldera de Luba (2,261 m) in the south. The montane forest and alpine savannah characteristic of these highland areas have, to date, experienced relatively little disturbance aside from some coco-yam cultivation in the immediate vicinity of settlements (JUSTE & FA 1994, COLLEL & al. 1994).

Prunus africana is found throughout these montane forests of Bioko in two main areas. Although relatively patchy in distribution, the species seems to occur in an almost continuous band around the island within an altitudinal range of between 1,200 m to 2,500 m. Despite this relatively widespread distribution, the bark of *Prunus africana* is currently only harvested from two key sites. However, there are plans to extend the exploitation to other, less accessible, areas in the future (SUNDERLAND & TAKO 1999).

Currently, only one company exports the bark of *Prunus africana* from Bioko. *Aprovechamiento Agrícola* (APRA) is a subsidiary of NATRA, a Spanish conglomerate concerned mainly with the export of agricultural products such as cocoa and coffee. APRA is a Spanish company but is registered in Equatorial Guinea. Although agricultural cash crops comprised the bulk of their exports in 1992, APRA began to look at the feasibility of exporting *Prunus* bark to diversify their commodity base in Equatorial Guinea. Commercial-scale harvesting operations began in 1992/93. Although official export data is only available from 1995, it is estimated that 200 tonnes per annum were exported from Bioko between the years 1992 and 1994 (J. PEREZ DE VAL, pers. comm.; TOMAS pers. comm.). Initially, only dried, raw bark was exported, but in 1997, APRA began to macerate the bark into powder prior to export. The bark is shipped directly to Spain, then sold on from NATRA to EUROMED and then on to MADAUS in Germany.

In contrast to Cameroon, Kenya and Madagascar, the amounts of *Prunus africana* bark currently exported from Bioko are still rather modest and do not even reach the 500 tonnes per annum quota set by the Equato-Guinean Government in 1992. Between 1992 and 1998, an average of 210 tonnes per annum were exported from Bioko (table 1).

APRA currently enjoys a monopoly on the exploitation of *Prunus africana* on Bioko – a situation that has probably contributed to the limited exploitation of *Prunus africana* bark from the island

to date. However, this monopoly is under threat from a number of outside interests with a long history of bark exploitation elsewhere who also wish to benefit from the rich *Prunus* resource on Bioko and it is unlikely that APRA will be the sole exploiter of *Prunus* bark from Bioko for much longer. Undoubtedly, the presence of future commercial competition will result in a corresponding increase in the amount and intensity of bark exploited from Bioko and will have a significant, and probably negative, impact on the wild resource. This is especially the case if adequate management regimes, based on sound inventory data, are not established prior to the issue of licenses and the determination of quotas.

Table 1. Quantities and value of *Prunus africana* bark exported from Bioko by APRA S.L. to Spain. (Source: Cámara Agrícola, Government of Equatorial Guinea). Note: Numbers in italics are estimated (based on personal communications and projections and probably err on the high side). * For 1998, data is incomplete after August; projected export total is estimated to be 120 tonnes.

Year	Amount (kg)	Value (USD)	Price (USD)/kg
1992	<i>200000</i>	<i>61344</i>	31
1993	<i>200000</i>	<i>61344</i>	31
1994	<i>200000</i>	<i>61344</i>	31
1995	97830	127893	31
1996	177930	53430	31
1997	266683	149058	57
1998*	92,266 (<i>120,000</i>)	51,553 (<i>68,478</i>)	57

Since 1992, when commercial harvesting of *Prunus* began, bark exploitation on Bioko has been limited to two main sites: the road leading to the summit of Pico Basilé (on the north side of the island) and the forest in the environs of Moca (on the southern end of the island), with harvesting beginning in the latter region in 1996. The main reason for this limited exploitation is that these areas are serviced by motorable roads; there are very few other sites elsewhere on the island where this is the case. Initially, the Forestry Department suggested that exploitation should occur on a rotational basis i.e. not in simultaneous sites, but this conditionality has broken down and both exploitation sites have been particularly active since 1995.

The road to Pico de Basilé lies within a protected military zone; at the summit is a radio relay station and TV antenna that services the whole of Equatorial Guinea. Along the roadside between 1,400 m to 2,500 m, occur large, often mono-dominant stands of

emergent *Prunus africana* trees. SUNDERLAND & TAKO (1999) report that almost all the trees within 500 m of the road have been harvested at some point in the past, some of which have been stripped of their bark more than once. Harvesting is undertaken by roving labourers engaged by APRA, often based in Malabo. The nearby village of Rebola was offered the opportunity to supply bark directly to APRA but disputes regarding the price of bark led to this proposal being shelved. It is important to note that village control of the forest on Pico de Basilé is limited due to the strong domination of the State in land and security issues, hence the villagers have little or no recourse to imposed access to their forest environs by outsiders.

In general, the harvesting of *Prunus* bark is undertaken from standing trees. The majority of exploited trees are stripped to a height of 3-4 m only, and often around the whole bole, with the bark on the remainder of the bole and lower branches being left untouched. This extensive removal of bark from the complete bole is causing significant early senescence and the crowns of many exploited trees are already displaying considerable die-back. SUNDERLAND & TAKO (1999) found that on Pico Basile, 21% of exploited trees are actually dead, with a further 47% showing varying degrees of die-back and reduction in leaf area. Only 32% of the recorded trees could be classed as healthy, with many of these being the most recently-exploited individuals and probably not yet exhibiting the effects of bark harvesting.

Aside from stripping of standing trees, HEARN & al. (1998) report that a number of *Prunus* trees have been felled and fully stripped, and the presence of a number of cut stumps was confirmed by SUNDERLAND & TAKO (1999). It is known that some selective felling was undertaken by harvesters in 1996 but was noted by the Forestry Department and subsequently stopped. It says something about the power of the State in Equatorial Guinea that the recommendation to stop felling has since been strictly adhered to.

Harvesting around the village of Moca began in early 1996. APRA has an unofficial representative in the village who co-ordinates the exploitation of *Prunus* bark, almost exclusively undertaken by young men from the village. The majority of the exploitation is undertaken within 30 m of the path from Moca to Lago Baio. Bark stripping, as on Pico Basilé, is undertaken only 3-4 m up the bole, with the remainder of the bark remaining untouched. Ring-barking, or harvesting all around the bole, is common

and again, considerable crown senescence and death has been observed (SUNDERLAND & TAKO 1999). A recorded 4% of the trees harvested since 1996 are dead and a further 93% show considerable amounts of crown die-back and reduction in leaf area. Only 2.5% of trees showed no immediate crown effects of harvesting, although, again, these were the most recently harvested individuals. There is also some evidence of felling and complete removal of older individual trees. Again, as on Pico Basilé, the Forestry Department has halted this activity.

Despite the huge unexploited resources of *Prunus africana* on Bioko, the current exploitation practices employed on Bioko are currently unsustainable and although the harvesting intensity is still at a rather modest level, the impacts on the particular harvested populations are both significant and, in the long term, deleterious.

The fact that there remain significant unexploited stands of *Prunus africana* in other parts on the island, makes the exploitation from Bioko that much more attractive to outside interests – many of whom are now trying to gain access to the resource in light of increase scarcity and restrictions on exploitation elsewhere. In this respect, it is highly recommended that a full-scale inventory and resource assessment of *Prunus africana* be completed on Bioko. This should be undertaken as soon as possible to allow the preparation of appropriate management plans. We are at a critical point in the exploitation of *Prunus africana* from Bioko: if an inventory and associated management plan are not undertaken and implemented, the exploitation will undoubtedly follow the same pattern as the exploitation of *P. africana* bark from other source countries: unsustainable harvesting, inadequate legislation and control, and, ultimately, the loss of the resource itself.

References

- COLLEL, M., C. MATÉ & J.E. FA (1994): Hunting among Moka Bubis: dynamics of faunal exploitation at the village level. *Biodiversity and Conservation*. 3: 939-950.
- CUNNINGHAM, M., A.B. CUNNINGHAM & U. SCHIPPMANN (1997): Trade in *Prunus africana* and the implementation of CITES. – 52 pp., Bundesamt für Naturschutz, Bonn.
- HEARN, G.W. & al. (1998): Census of diurnal primate groups in the Gran Caldera de Luba, Bioko Island. Report to the Government of Equatorial Guinea.
- JUSTE, J.B. & J.E. FA (1994): Biodiversity conservation in the Gulf of Guinea islands: taking stock and preparing action. *Biodiversity and Conservation*. 3: 759-771.

SUNDERLAND, T.C.H. & C.T. TAKO (1999): The exploitation of *Prunus africana* on the island of Bioko, Equatorial Guinea. – 15 pp. <http://www.gcgst/bioko/bioko_prunus.htm> (viewed 21.3.2000).

Terry C.H. Sunderland • African Rattan Research Programme • Herbarium • Royal Botanic Gardens Kew • Richmond • Surrey TW9 3AB • United Kingdom • Tel.: +44/20/8332-5224 • Fax: +44/20/8332-5278 • E-Mail: afirattan@aol.com.

Tako Charles Tanyi • Mount Cameroon Project • Limbe Botanic Garden • BP 437 • Limbe • Cameroon.

Erratum

James Acworth

[Editor's note: This erratum is referring to a paper published in MPC 5: 15-18 ("*Prunus africana*: Striving for sustainable and equitable resource management in Cameroon") by J. Acworth & B.N. Ewusi.]

- The original text published on page 16:

"The final bill for the ONADEF inventory of *P. africana* on Mt. Cameroon was over US\$ 60,000. Given that the sustainable yield estimate based on this inventory was 300 tonnes, the costs of inventory alone amount to over US\$ 0.20 per kg of sustainably harvested bark, more than half the price paid for *P. africana* bark on the local market."

- The error:

The sustained yield is 300 tonnes freshweight per annum, but in fact this was assuming a 5 year cycle giving a total productive capacity of 1,500 tonnes. Thus the cost of the 1996 inventory (US\$ 60,000 for Mt. Cameroon) should be shared between the full 1,500 tonnes, and not just the 300 tonnes annual quota, giving a revised inventory cost of US\$ 0.04 per kg finally harvested (1/5th of that published in the MPC article), equivalent to 11% of the current local market price for raw bark (US\$ 0.35/kg fresh-weight). Even though it is not obviously to their advantage to do so, Plantecam (the exploiter) were kind enough to point out this error, but still claim that it is too much for an exploiter to pay.

The present recommendation is that an inventory should be repeated every 5 years, to assess the impact of the previous 5 year cycle (each tree being harvested once), so that the quota can be adjusted accordingly. A new National Inventory of *Prunus africana* (using an improved survey methodology) began on Mt. Cameroon in November 1999, and will proceed to cover the entire country. The improved methodology is expected to reduce inventory costs and/or increase the accuracy of the population estimate.

The costs of the inventory are being borne by the Ministry of Environment & Forestry with some assistance from donors (notably GTZ). It is expected that at the time of allocation of permits, the inventory bill will be recouped from the licenced exploiter, as part of the taxes associated with the permit issue.

James Acworth • Mount Cameroon Project • Botanic Garden • P.O. Box 437 • Limbe • Cameroon • Tel: +237/ 431885 • Fax: +237/431883 • E-Mail: jacworth@compu.serve.com.

The exploitation of *Pausinystalia johimbe*

Terry Sunderland, Zacharie Tchoundjeu & Marie-Laure Ngo-Mpeck

Pausinystalia johimbe (K. SCHUM.) PIERRE EX BIELLE is a tree native to the coastal forests of Central Africa and is distributed from SE Nigeria to the Congolese Mayombe (VIVIEN & FAURE 1985). Its bark contains up to 6% of a mixture of alkaloids, the principle one being yohimbine (TYLER 1993) which is also known as aphrodine, quebrachine or corynine (ANON. 1993). *P. johimbe* is used extensively as part of traditional health care systems, and is used for a wide range of vascular-related ailments. However, the primary use of the bark of *P. johimbe* is as an "aphrodisiac" (SUNDERLAND & al. 1997, 1999).

In addition to this widespread local use, the species has been long exported to Europe for Western medicine in both prescription and herbal markets. The most common use of yohimbine-based prescription drugs today is in the treatment of diabetes-related male organic impotence (ANON. 1993, VAUGHAN, pers. comm.). Sexual stimulant products available over-the-counter often contain yohimbine. In the UK, yohimbine-containing drugs have become fashionable as one of the "herbal highs" recently reported in the British press (CASTLE 1997) and yohimbine-based products have long been a common sight in "sex-shops" in Europe and the US (TYLER 1993). Recent interest in such products, stimulated by the release onto the market of Viagra[®], has resulted in a corresponding increase in market sales of other aphrodisiac products, including those that are yohimbine-based.

All *P. johimbe* bark is exploited from wild populations (SUNDERLAND & al. 1997, 1999). This exploitation currently takes place exclusively in Cameroon and, to a lesser extent, SE Nigeria. Plantecam, a subsidiary of Groupe Fournier, are the sole supplier of *P. johimbe* bark to Europe and supply around 100 tonnes annually (120 tonnes in 1996) (SIMONS 1997). All of the *P. johimbe* bark supplied to Plantecam is exploited by outside contractors. These contractors are registered local businesses who have licenses to exploit medicinal plants. These licenses are provided, on application, by the Forestry Department. Plantecam state that they will not accept plant material from companies or individuals without valid licenses. However, despite this, the issue of licenses does not necessarily control the means of exploitation, and Plantecam themselves

admit that during exploitation "... 98% of the trees exploited are probably felled" (NKUINKEU pers. comm.).

Many harvesters interviewed suggest that whilst the *P. johimbe* trees callus well after a small amount of bark removal, removal of large quantities of bark leads to an attack by an (as yet unidentified) stem borer which penetrates the unprotected stem, killing the tree. That is given as the reason why many harvesters prefer to fell the tree, "as...it would die anyway" (MANA pers. comm.). *BaKola* (pygmy) harvesters, who are commonly employed to harvest yohimbe along the Edea - Campo road in southern Cameroon, not only fell the trees but cross-cut them into portable pieces. The bark is removed from the cut logs, carried to the roadside and sold to the licencees. The remaining logs are then used for fuelwood by the forest community.



Figure 1. Exploited bark of *Pausinystalia johimbe* in Southern Cameroon. Photo T. SUNDERLAND.

Much of the exploitation of *P. johimbe* is also directly related to timber prospecting with individual stems of the species being identified during the inventories that precede exploitation for timber. After the timber harvesting activities are completed, the yohimbe trees are then also felled and the bark stripped, often by the logging company employees themselves. The bark is then sold at the roadside, again to licencees who then supply Plantecam directly (fig. 1).

Despite current levels of exploitation, *P. johimbe* currently exhibits healthy recruitment and there does not seem to be a problem with regeneration (SUNDERLAND & al. 1997, 1999; fig. 2). However, these data are rather deceiving as, although the current regenerative capacity of the species is not yet compromised, removal through the constant felling of reproductive individuals especially at current rates of

exploitation in certain areas will ultimately affect future regenerative potential (i.e. less seed trees = less seedlings = reduced recruitment = less future harvestable trees).

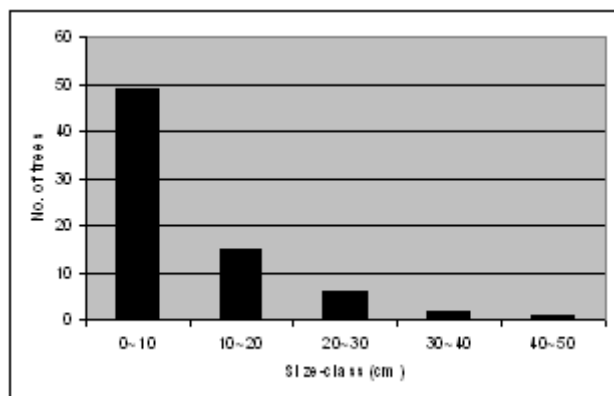


Figure 2. Cumulative size-class distribution curve of *Pausinystalia johimbe* in field sites in Cameroon and Equatorial Guinea.

A related species, *P. macroceras*, also contains a number of alkaloids, especially large quantities of the inactive alkaloid yohimbine (HENRY 1939). Yohimbine is also present in *P. macroceras*, although in very small quantities, and certainly not in sufficient quantities to warrant exploitation. However, it is long established that consignments of *P. johimbe* bark are often adulterated with that of *P. macroceras*, albeit unwittingly, as these two species are very closely related, and both are utilized as an aphrodisiac at the local level (SUNDERLAND & al. 1997, 1999). This has led to *P. macroceras* being named by the trade as "false yohimbe" and rigid trade guidelines were established to enable importers to determine the differences between the bark of both species (SMALL & ADAMS 1992). More recently, Plantecam have complained about the wide variation in alkaloid content in bark received by them (NKUINKEU pers. comm.) and field observations suggest that both species are being felled and stripped (SUNDERLAND & al. 1997, 1999). However, a simple field guide prepared for collectors highlighting the differences between these species, would ensure that all bark received for processing is *P. johimbe*. This would avoid the unnecessary felling of individual trees of *P. macroceras*, whilst ensuring profitability (i.e. obtaining the maximum amount of yohimbine per kilo of bark). This field guide is currently in preparation.

Due to these destructive harvesting methods employed and the rapidly-growing market for aphrodisiac remedies, ICRAF (International Centre for Research in Agroforestry) has recently initiated a

research programme to investigate the potential of *P. johimbe* for domestication and inclusion into their agroforestry systems programme. Initial vegetative propagation trials have been extremely positive and a large-scale bulk-propagation programme is now under way (TCHOUNDJEU & al. 1999).

The ecology of *P. johimbe* (fast-growing, reproductively gregarious, light demanding) suggests that a reasonable assessment could be made regarding the quantities that could be harvested from natural populations. Developments to this end include an ongoing assessment of a pre-emptive mortality system that could be implemented for this species. This would entail the felling and stripping of selected senescent trees on a (strictly controlled) rotational basis thus allowing the remaining members of the population to survive and reproduce, ensuring the long-term integrity of the population.

It is also essential that local communities benefit from the exploitation of a forest resource such as *P. johimbe*. In many countries of Central Africa, moves towards the formal community management of forest resources should ensure that the communities managing such resources not only benefit from their exploitation but are accordingly paid a fair price for the resource. This is not the case at present and *P. johimbe* could undoubtedly provide a good case study for the equitable and sustainable management of such high-value forest products in the context of community forest management.

References

- ANON. (1993): Yohimbe. – 2 pp., Facts and Comparisons, St. Louis (The Lawrence Review of Natural Products).
- CASTLE, S. (1997): Jail for retailers of "herbal highs". – The Independent, 24th August.
- HENRY, T.A. (1939): The plant alkaloids. – J. & A Churchill, London.
- SIMONS, T. (1997): Cameroon trip report. 1-10 May. – ICRAF, unpublished report.
- SMALL, J. & F.M.J. ADAMS (1992): Yohimbe bark. Its history and identification in commerce. – *Pharmaceutical Journal* 108(3051): 282-286.
- SUNDERLAND, T.C.H., M.L. NGO-MPECK, Z. TCHOUNDJEU & A. AKOA (1999): The ecology and sustainability of *Pausinystalia johimbe*. An over-exploited medicinal plant from the forests of central Africa. In: SUNDERLAND, T.C.H., L.E. CLARK & P. VANTOMME (eds.). The non-wood forest products of central Africa. Current research issues and prospects for conservation and development. pp. 67-77, FAO, Rome [also available at ftp://carpe.gecp.virginia.edu/carpe/may97_limbe_04a.pdf, viewed 23.3.2000].

SUNDERLAND, T., A. NJIAMNSHI, A. KOUFANI, M.L. NGO-MPECK & C. OBAMA (1997): The ethnobotany, ecology and natural distribution of Yohimbe (*Pausinystalia johimbe*). An evaluation of the sustainability of current bark harvesting practices and recommendations for domestication and management. – 31 pp., Appendices, ICRAF. Unpublished report, s.l. loc.

TCHOUNDJEU, Z., B. DUGUMA, M.L. TIENCHEU & M.L. NGO-MPECK (1999): The domestication of indigenous agroforestry trees: ICRAF's strategy in the humid tropics of west and central Africa. In: SUNDERLAND, T.C.H., L.E. CLARK & P. VANTOMME (eds.). The non-wood forest products of central Africa. Current research issues and prospects for conservation and development. pp. 161-169, FAO, Rome.

TYLER, V.E. (1993): The honest herbal. A sensible guide to the use of herbs and related remedies. 3rd edition. – Haworth Press, London [info on yohimbe on pp. 327-330].

VIVIEN, J. AND J.J. FAURE (1985): Arbres des forêts denses d'Afrique Centrale. – Ministère des Relations Extérieures Coopération et Développement et Agence de Coopération Culturelle et Technique, Paris.

Personal communications

MANA, BaKola hunter, Lolabe, South Province, Cameroon.

Robert NKUINKEU, botanist, Plantecam, SW Province, Cameroon.

Dr John VAUGHAN, Diabetes Specialist, Royal Sussex County Hospital, United Kingdom.

For first author's address see list of members.

Zachary Tchoundjeu, Marie-Laure Ngo-Mpeck • ICRAF • BP 2123 • Messa, Yaoundé • Cameroon.

***Griffonia simplicifolia*, calling for information on a west African medicinal plant in trade**

A. B. Cunningham & U. Schippmann

International trade in several West African medicinal plants has been generated by western health problems and demand. *Prunus africana* is used to treat benign prostatic hypertrophy. *Pausinystalia johimbe* is utilized as treatment of impotence and as an aphrodisiac. More recently, the seeds and extract from the liana *Griffonia simplicifolia* (Caesalpiniaceae) are in demand to treat eating, anxiety and sleep disorders. This forest liana occurs in Liberia, Côte d'Ivoire, Ghana, Nigeria, Cameroon, and through to the Democratic Republic of Congo. Major trade in the seeds is from Ghana and Cote d'Ivoire.

Demand continues to rise rapidly for this species in North America and Europe as the seeds contain the active ingredient 5-hydroxytryptophan, known in the dietary supplements trade as L-5-HTP. This is

considered to stimulate neurotransmitters in the brain to produce serotonin and is marketed as being a "natural alternative to Prozac and similar drugs". As a result, there is growing market for herbal treatments to treat depression, anxiety, insomnia, and obesity, and studies which have indicated that 5-hydroxytryptophan may be used to treat these conditions (KAHN 1985, CANGIANO & al. 1992).

When the extract is produced, it is either described as a grey-white powder or as pale brown crystals. In both cases this extract contains 95-98 % 5-HTP. This is sold by companies based in the USA, Germany (and probably elsewhere in Europe) and even as far afield as China (where it is exported in 25 kg drums for US\$ 810 per kg). The extract is then usually sold in capsules mixed with vitamins C and B-6 (60 capsules for US\$ 40-45) or mixed with Green Tea and Yerba Mate.

Although many people assume that if seed or fruit harvesting takes place, then it must be sustainable, this is not always the case. In fact where there is a high commercial value on fruits or seeds that are difficult to reach (tall trees or lianas) and tenure over these species is weak, then felling often takes place. This destructive harvest was taking place in Côte d'Ivoire over 10 years ago (CUNNINGHAM 1993). What is of real concern is the massive expansion of this trade due to the commercial interest in the products made from this species for sale in Europe and North America. In 1999, two companies in Ghana were advertising 80 and 100 tonnes of seed in stock available for export (at US\$ 8-9 per kg). Even if a small proportion of the *Griffonia* lianas that are a source of this seed are felled, these large quantities are cause for concern.

As this species would be an important focus for a trade study, due to concerns about the effect of this trade on natural populations of *G. simplicifolia*, we are calling for information MPSG members may have on trade in this species, which could be sent to either of us.

References

CANGIANO, C., F. CECI, A. CASCINO & al. (1992): Eating behavior and adherence to dietary prescriptions in obese subjects treated with 5-hydroxytryptophan. *Am. J. Clin. Nutr.* 56: 863-868.

CUNNINGHAM, A.B. (1993): African medicinal plants. Setting priorities at the interface between conservation and primary healthcare. – 50 pp., UNESCO, Paris (People and Plant Working Paper 1).

KAHN, R.S. & H.G.M. WESTENBERG (1985): L-5-Hydroxytryptophan in the treatment of anxiety disorders. *J. Affect. Disord.* 8: 197-200.

For author's address see list of members.

***Croton lechleri*: sustainable utilization of an Amazonian pioneer species**

José Roberto Borges & Steven R. King

Distribution. *Croton lechleri* is an important pioneer tree species commonly found in the Amazon regions of Bolivia, Brazil, Colombia, Ecuador, and Peru, ranging in elevations from 100 m to 2,500 m (fig. 1). It produces a red viscous latex used traditionally by indigenous peoples and other local communities to treat diarrhea, gastrointestinal disorders, respiratory problems, skin infections and wounds, as well as other diseases. Five species of the genus *Croton* are known to produce red latex: *Croton lechleri* Muell. Arg., *C. sordidus* Benth., *C. urucurana* Baill., *C. draco* Schlecht., and *C. xalapensis* H.B. & K. However, *Croton lechleri* is the best known and most widespread. Its distribution density ranges from 3 to 15 individuals per hectare, but sporadically it can also be found in densities of 90 to 150 trees per hectare. It is found frequently

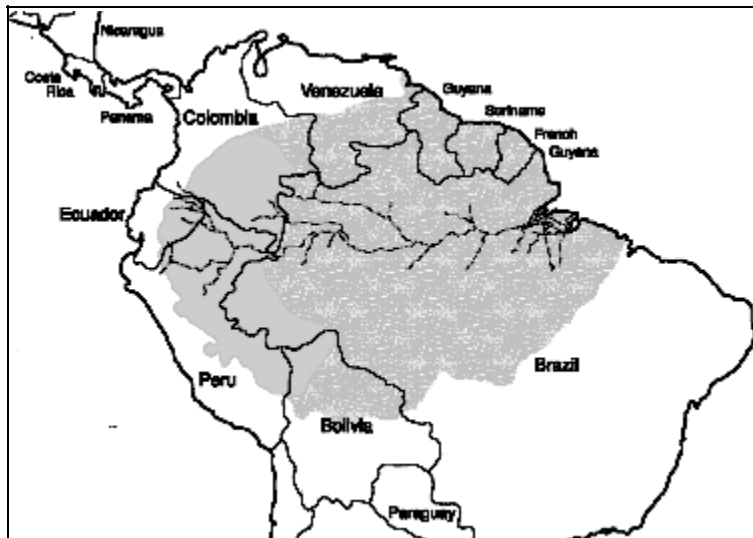


Figure 1. Limits of the Amazonian vegetation [dotted pattern] and the range of *Croton lechleri* [solid grey]

along rivers and streams, preferring disturbed and cultivated soils as a classic pioneer species (MEZA & al. 1998).

Utilization and Trade. A variety of latex-based products, such as pills, liquid extracts, soaps and shampoos, are sold in medicinal plant markets and

regional health food stores in Bolivia, Colombia, Ecuador, and Peru (ALARCON & AL. 1994). Current market prices paid to collectors vary from 12 to 25 US\$ per gallon, depending on the point of sale.

SP-303, a complex molecular compound, proanthocyanidin oligomer, has been isolated from the latex of *Croton lechleri* (UBILLAS & al. 1994). This compound became the chemical marker for SB-Normal Stool Formula, a dietary supplement product. This phytomedicine has been clinically demonstrated to treat acute and chronic diarrhea.

Sustainable Management. *Croton lechleri* is a good multipurpose pioneer tree for agroforestry systems. Throughout the western Amazon basin it is cultivated in homegardens, plantation crop combinations, and silvopastoral systems, spaced from 100 to 400 trees per hectare. Propagation can be done from seeds or seedlings. Seedlings can be transplanted when they reach 25 to 35 cm in height.

Croton lechleri reproduces early and profusely. Seed dispersal occurs by wind, birds and other animals, and it has no specialized pollinators. Mature mother trees produce up to 600,000 seeds per tree per season, which at times can occur twice in a year. On average, 1 kg of dry weight of seeds will contain about 70,000 seeds. Seed germination is quite successful, especially under the disturbed conditions of a forest clearing. As a result, natural regeneration is widespread, wherein dozens of seedlings compete for light and nutrients at the base of mother trees. *Croton lechleri* grows very fast, about one foot per month (KING & al. 1997). Latex harvesting for commercial purposes can start in the sixth or seventh year and/or once the tree reaches a BH of approximately 25-27cm. At this point, individual trees consistently yield an average of 2-3 liters of latex (fig. 2). To harvest large volumes of latex the tree needs to be felled, which is the most common practice of extraction for local markets in Colombia, Ecuador and Peru. The non-articulated laticifers present in the bark of *Croton lechleri* do not regenerate to allow continual tapping for large volumes of latex (MEZA 1999).

Reforestation. Extensive scientific studies have been conducted over the past ten years to obtain sound baseline data on the primary ecological, biological and socioeconomic characteristics of *Croton lechleri* production. Some of these studies were recently published in MEZA 1999. This book

discusses in-depth biological, ecological, anthropological, and legal aspects of *Croton lechleri*. Shaman Botanicals has sponsored some 20 multiple community workshops on the sustainable management of *Croton lechleri* and produced and distributed 5,000 copies of a Spanish language field manual on the sustainable management and reforestation of *Croton lechleri*. The Peruvian Ministry of Agriculture has produced thousands of brochures promoting the production of *Croton lechleri*. The Convenio Andrés Bello in Colombia has recently published a book on the agrotechnology of medicinal plants in Latin America, dedicating a chapter to *Croton lechleri* (FORERO 2000).

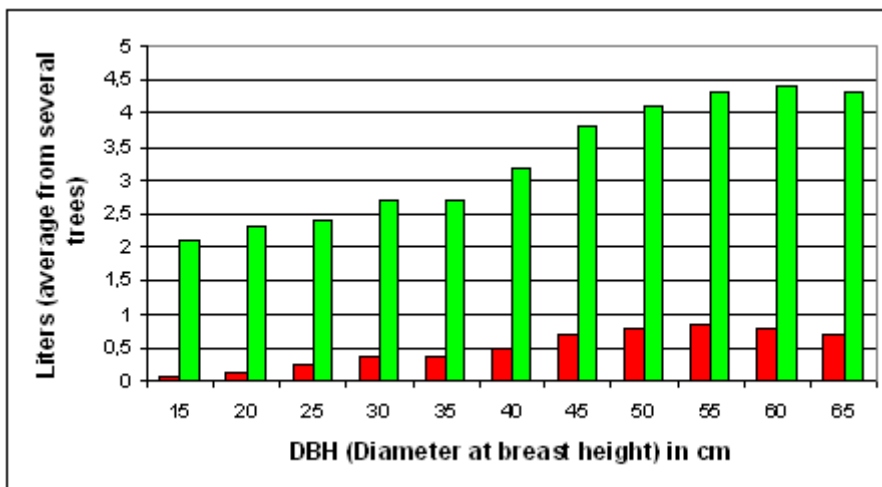


Figure 2. Comparison of *Croton* latex yields obtained using the felling and tapping methods in relation to the DBH in Ecuador.

Shaman has also been promoting wide-scale reforestation of *Croton lechleri*. To date, the company has directly financed the reforestation of 300,000 *Croton* trees by paying an added value to the price it pays for *Croton* latex. During product development the company paid for the reforestation of approximately 100,000 trees and for the research conducted on reforestation, such as survivorship, associations with other species, etc. After product launch, Shaman has been paying a value added to the price of latex so that for every one tree felled, at least three *Croton* trees are reforested. This important step is part of the supply contractual agreement between Shaman and its suppliers. Reforestation audits are carried out regularly by Shaman's staff, independent experts and government agencies with the Ministry of Agriculture. Between years 2000 and 2001 an additional 700,000 trees are going to be planted. The International Tropical Timber Organization (ITTO) supported the planting of 82,000 trees in the Ucayali region of

Peru. The Peruvian Ministry of Agriculture has plans to reforest 2 million trees nationwide, starting with 400,000 trees in 1,000 to 2,000 hectares in the Loreto region.

Conservation. *Croton lechleri* is becoming a viable Non-Timber Forest Product (NTFP) in the western Amazon basin as its market demand increases at the local and international levels. *Croton lechleri*'s botanical and ecological characteristics are quite favorable for agroforestry cultivation and reforestation purposes. Its medicinal and traditional use by numerous indigenous cultures has contributed to this tree's adaptation in sustainable management systems. The economic incentive of sustainably

managing *Croton lechleri* is already assisting many forest communities to shift from logging timber to harvesting latex. Because of these considerations *Croton lechleri* is being incorporated into conservation initiatives in the Amazon basin.

In the case of Shaman Botanicals, *Croton lechleri* has been produced in both agroforestry systems and in forests. As the trees planted in agroforestry systems mature, latex harvest will gradually shift to 25% coming from forests and 75% from agroforestry cultivations. The

reliance of partial supply from forests provides NTFP incentives and income generation which contribute to the valuation of secondary and primary forest management, as well as maintains the management of native germplasm of *Croton lechleri*. A preliminary assessment of *Croton lechleri* potential for certification as a sustainable NTFP has just been completed and will be published by Rainforest Alliance in the next few months. Essentially, Shaman continues to work with indigenous communities, farmers, small forest based entrepreneurs, NGOs, and the scientific community to incorporate sustainable management practices in the cultivation and harvesting of *Croton lechleri*, contributing to its integration in conservation strategies for tropical rainforests. The use of medicinal plants to reclaim degraded lands and to provide income in buffer zones is an important conservation strategy in the Amazon and beyond.

References

- ALARCON, R., P. MENA & A. SOLDI (1994): Ethnobotanica valoración economica y comercialización de recursos florísticos silvestres en El Alto Napo, Ecuador – *Ecociencia*: 161-162.
- FORERO, L.E. (2000): Agrotecnología para el cultivo de sangre de grado o sangregado – Convenio Andrés Bello, Santafé de Bogota, Colombia.
- KING, S.R., E. MEZA, F. AYALA, L.E. FORERO, M. PENA, V. ZAK & H. BASTIEN (1997): *Croton lechleri* and the sustainable harvest and management of plants in pharmaceuticals, phytomedicines, and cosmetics industries. – International Symposium on Herbal Medicine, Workshop III-Environmental Protection Concerns, Honolulu, Hawaii.
- MEZA, E.N., Ed. (1999): Desarrollando nuestra diversidad biocultural. 'Sangre de Grado' y el reto de su producción sustentable en el Perú. – 259 pp., Universidad Nacional Mayor de San Marcos, Lima.
- MEZA, E., F. AYALA, M. CASTEÑEL, L.E. FORERO, M. PEÑA, A. ORTIZ, S. KING & J.R. BORGES (1998): Sustainable harvesting of sangre de drago or sangre de grado. Educational material. – Shaman Pharmaceuticals and The Healing Forest Conservancy, San Francisco.
- UBILLAS, R. & al. (1994): SP-303, an antiviral oligomeric proanthocyanidin from the latex of *Croton lechleri* (Sangre de Drago) – *Phytomedicine*. 1(2): 77-106.
- José Roberto Borges • Manager of Sustainable Harvesting • Shaman Botanicals • E-mail: bborges@shaman.com
- Steven R. King • Senior Vice President Ethnobotany and Conservation • Shaman Botanicals • for address see list of members.

Preservation of *Arnica montana* L.

Michel Cambornac

History

The arnica and its properties were discovered at the time of Hildegard during the 12th century, but it is mainly from the 16th century that in Germany and Austria this plant has become the panacea for falls and small accidents. All different parts of this plant - flowers, leaves, roots - were adopted for external use (arnica tincture) and for internal use in homeopathy. Traditionally, the flowers and the whole plant were picked at wild stage from the alpine massif to the Carpathian mountains and in several local areas (Vosges, Pyrenees, Central Massif) in France.

Situation

Generally, when there is an important demand, the agriculture takes over from wild picking. But all attempts carried out in Germany and in France never succeeded to control the agricultural production of

Arnica in a long-lasting and profitable way. Additionally, the diminution of agricultural activities and the changes in agricultural practices in the Arnica areas largely contributed to its rarefaction.

Finally, the market's disorganization following the political troubles in eastern Europe has emphasized pressure on the natural areas of western Europe. The consequences were that on the one hand *Arnica montana* became a protected plant in Germany, and that on the other hand, it appeared in France on several regional lists of protected plants.

Facing threats, protection and risk of shortage, industrial companies using arnica looked for alternative solutions. Then arnicas of different origins appeared on the market (USA, Mexico, Brazil), plants of the genus *Arnica*, but also others of different genera: *Heterotheca* or *Solidago*. It was necessary to clarify the situation, which was carried out during the second half of the 1980s.

Solution

The genus *Arnica* comprises some 30 species with about 150 synonyms. Most of them origin in the North of America, two are European and about ten are Asian. The idea was to find among them the species with the closest chemical composition to *Arnica montana*, and which could be cultivated. The species *Arnica chamissonis* Less. and particularly the subspecies *foliosa* has the most comparable chemical composition. The European and German pharmacopéias have therefore registered this species as an equivalent of *Arnica montana* L.

In the agricultural field, the cultivation has been confirmed by the National Museum for Medicinal Plants of Milly la Forêt and by the Institute for Medicinal Plants of Chemillé, in France, at the end of the 1980s.

Activities of Yves Rocher

Substitution

As soon as 1983, conscious of the dangers threatening *Arnica montana*, the Yves Rocher laboratories experimented with *Arnica chamissonis* in Austria. The agricultural results were very satisfactory. In France the production was developed with success by using *in vitro*-propagation to get very quickly a great deal of plants (CASSELS & al. 1999, ELLENBERGER 1999). In the same way, the checking of the chemical composition has been carried out

(thin layer chromatography and gas chromatography).

In the field of physiological characteristics, a series of in vitro tests (enzymatical and chemical methods) have been carried out to control the analogy between *Arnica montana* and *A. chamissonis* extracts in cosmetic applications. In conclusion, the results obtained for both species are very close: *Arnica chamissonis* subsp. *foliosa* appears to be a good candidate to replace *Arnica montana* (CAMBORNAC & al. 1998). Since 1999 Yves Rocher has not used *Arnica montana* in any of its products.

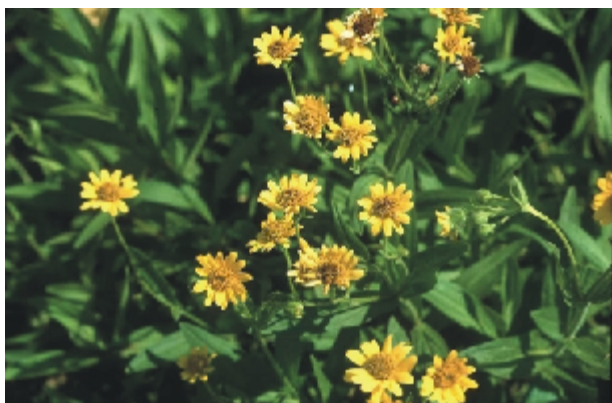


Figure 1. *Arnica chamissonis* in field production at the Laboratoires Yves Rocher in La Gacilly, France. Photo: M. CAMBORNAC.

Conservation

In cooperation with the *Land* Baden-Württemberg, the Yves Rocher German subsidiary has built a protection programme in the Black Forest for the protection of *Arnica montana*, which started in 1995. The action consists in the economical support of local farmers to help them maintain an extensive grazing ground, avoiding the edaphic changes due to the application of fertilizers, and preserving meadows from the encroachment of bushes after the abandonment of grazing.

The main focus of the project work with eight sites was to achieve a flowering stage of *Arnica* as well as the species' multiplication and dissemination. After five years the project results were assessed by the Ministry for Rural Area Baden Württemberg to be very successful. The *Arnica* plants have developed very well at each project site. F.e. in Sasbachwalden/Breitenbrunn and at Schauinsland/Gießhübel populations increased from zero to 1000 specimens. In Breitenbrunn, Gießhübel (with 2 sites) and in Furtwangen/Brend a long-term livestock grazing,

which had been the primary utilization of these grazing areas, was agreed with the local farmers. Additionally, owing to the Yves Rocher sponsorship, the site of Schauinsland has been declared nature conservation area.

Additional information regarding the German *Arnica* conservation project can be received from Sabine Fesenmayr who is responsible for Yves Rocher's actions of conservation and education in Germany (E-mail: sabine.fesenmayr@yrcnet.com).

References

CAMBORNAC, M., J. CREPIN, L. FLAVET, F. GUELLEC, G. REDZINIAK & J.R. ROBIN (1998): *Arnica chamissonis* Less., an alternative to *Arnica montana* L., plant under threat. – Proceedings of the 20th IFSCC Congress held at Cannes, France, in September 1998.

CASSELLS, A.C. C. WALSH, M. BELIN, M. CAMBORNAC, J.R. ROBIN & C. LUBRANO (1999): Establishment of a plantation from micropropagated *Arnica chamissonis*, a pharmaceutical substitute for the endangered *A. montana*. – *Plant, Cell Tissue and Organ Culture*, 56: 139-144.

ELLENBERGER, A. (1999): Assuming responsibility for a protected plant. Weleda's endeavour to secure the firm's supply of *Arnica montana*. In: TRAFFIC Europe (Ed.): *Medicinal plant trade in Europe*. Proceedings of the first symposium on the conservation of medicinal plants in trade in Europe, 22-23.6.1998, Kew – pp. 127-130, TRAFFIC Europe, s. loc.

For author's address see list of members.

Conferences and Meetings

Coming Up

Natalie Hofbauer

International Conference on Science and Technology for Managing Plant Genetic Diversity in the 21st Century. 12-16 June 2000, Kuala Lumpur, Malaysia.

Objectives are to critically review the state of the science concerning the conservation and sustainable management of plant genetic resources and to develop a global vision for the next century.

Contact: Patti Sands • Programme Assistant to the Deputy Director General (Programmes) • IPGRI • Via delle Sette Chiese 142 • 00145 Rome • Italy • Fax: +39/06/5750309 • E-mail: p.sands@cgiar.org • Internet: www.cgiar.org/ipgri/sosindex.htm (viewed 13.4.2000).

2nd International Symposium: Breeding Research on Medicinal & Aromatic Plants. 11-16 July 2000, Chania, Crete, Greece.

Contact: Melpo Skoula • Department of Natural Products • Mediterranean Agronomic Institute of Chania • Alysion Agrokepion, P.O. Box 85 • 73100 Chania • Greece • Tel.: +30/821/81151 x 552 • Fax: +30/821/81154 • E-mail: melpo@maich.gr • Internet: <http://www.maich.gr/confer/breed.htm> (viewed 4.5.2000).

2000 International Academic Conference on Tibetan Medicine. 15-17 July 2000, Lhasa, Tibet.

China Medical Association of Minorities, the Health Department of Tibet Autonomous Region and Tibet College of Tibetan Medicine jointly sponsor this conference, with the aim of inheriting, developing, expanding, and cooperating in the field of Tibetan medicine.

Contact: China Medical Association of Minorities • No. 11, Bei San Huan Dong Lu • Chaoyang District • Beijing, 100029 • China • Tel.: +86/10/642-20890 • Fax: +86/10/642-87404 • E-mail: cinbucm@bj.col.com.cn.

XVIth AETFAT International Congress. Plant Systematics and Phytogeography for the Understanding of African Biodiversity. 28 August - 1 September 2000, Meise, Belgium.

AETFAT is the Association for the Study of the Flora of Tropical Africa, which has an active ethnobotany group. The congress will focus strongly on the taxonomy of African plants and phytogeography and the contacts and collaboration of researchers in these fields.

Contact: Prof. Dr. J. Rammeloo • National Botanic Garden of Belgium • Domein van Bouchout • 1860 Meise • Belgium • Tel.: +32/2/2693905 • Fax: +32/2/2701567 • E-mail: rammeloo@br.fgov.be • Internet: www.br.fgov.be/RESEARCH/MEETINGS/AETFAT/index.html (viewed 13.4.2000).

Ethnopharmacology 2000, Challenges for the New Millennium. Joint Meeting of the International Society for Ethnopharmacology (ISE) with the Society for Medicinal Plant Research. 4-7 September 2000, Zürich, Switzerland.

Contact: Congress ISE 2000 • Pharmacognosy - Phytochemistry • Department of Pharmacy • ETH Zürich • Winterthurststrasse 190 • 8057 Zürich, Switzerland • Fax: +41/1/635-6882 • E-mail: pharmacognosy@pharma.ethz.ch • Internet: www.pharma.ethz.ch/pharmacognosy/ (viewed 13.4.2000).

European Congress of Phytotherapy/Medicinal Plants & Nutritherapy. 30 September - 1 October 2000, Montpellier, France.

Contact: A.M.P.P.M. • 4, rue Maguelone • 34000 Montpellier • France • Tel.: +33/4/670606-80 • Fax: +33/4/670606-89.

IUCN's Second World Conservation Congress. 4-11 October 2000, Amman, Jordan.

Under the theme "Ecospace" the congress will especially cover conservation and sustainable development issues, and the Union's focus for the first years of the new millenium will be set. In the Member's Business Sessions, the President and all other IUCN officials will be elected, and debates and adoption of IUCN Resolutions will take place.

Contact: For information, please contact your local Regional or Country Office or the Congress Unit at jth@iucn.org. Or view the congress homepage at: www.iucn.org/amman/content/about.html (viewed 27.1.2000), which also gives a link to *SAWSAN*, the Amman Congress Newsletter.

7th International Congress of the International Society of Ethnobiology. 23-27 October 2000, Athens, Georgia, USA.

Theme of this congress: Earth 2000: Ethnobiology, biocultural diversity and benefits sharing. It takes place in the Georgia Center for Continuing Education, Athens, Georgia, USA.

Contact: Dr Elois-Ann Berlin • Department of Anthropology • University of Georgia • Athens, GA 30602 • USA • E-mail: eaberlin@arches.uga.edu.

10th Asian Symposium on Medicinal Plants, Spices and other Natural Products (ASOMPS): Research and Development of Natural Products for Human Survival in the 21st Century. 19-23 November 2000, Dhaka, Bangladesh.

Contact: Prof. Nilufar Nahar • Secretary Organizing Committee ASOMPS X • Room 305 • Khundkar Biggan Bhavan • Department of Chemistry • University of Dhaka • Dhaka 1000 • Bangladesh • E-mail: asompsx@bangla.net.

Conference on Medicinal and Aromatic Plant Production towards the 21st Century. July 2001, Budapest, Hungary.

Contact: Dr. Jenő Bernáth • Kerteseti es Elelmszeripari • Egyetem • Gyogy Noveny Temesztesi • Tanszek • 1502

Budapest • Hungary • Tel.: +36/1/664998. Or: Edit Smaroglay • Secretary • National Institute for Agricultural Quality Control • P.O. Box 30 • 93 H - 1525 Budapest • Tel.: +36/1/212-3127 • Fax: +36/1/212-2673 • E-mail: map.congr@ammi-hu.

International Ginseng Conference, The Globalization of Ginseng. November 2003, Melbourne, Australia.

Contact: Conference Secretary, IGC2003 • P.O. Box 250 • Gembrook, Victoria 3783 • Australia • Tel.: +61/3/5968-1877 • Fax: +61/3/5968-1322 • E-mail: ginseng@nex.net.au.

Recent Events

Workshop on Medicinal Plants and Local Communities (Mamou, Guinea, 30 March - 2 April 1999)

Christine Schäfer & Rik Kutsch Lojenga

From 30 March to 2 April 1999, a national workshop on medicinal plants was held at Mamou, Guinea. The workshop brought together some 35 representatives from different sectors working on issues related to medicinal plants. Among them, traditional healers from local communities, scientists, government representatives, and Guinean representatives of NGOs, development projects and international organizations (World Bank, WHO, FAO, etc).

The objective of the workshop was to develop an action plan in support of a national strategy for the conservation, sustainable use and commercialization of medicinal plants.

The workshop was organized by the Guinean NGO "Guinée Ecologie", with support from the project "Implementing the Biodiversity Convention" of the Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) and the BIOTRADE Initiative of the United Nations Conference on Trade and Development (UNCTAD). The workshop was organized in close co-operation with the Guinean Ministry of Environment and the Division for Traditional Medicine of the Ministry of Health. The authors of this article attended the workshop on behalf of GTZ and UNCTAD.

The workshop followed an integrated approach towards the issues of conservation and sustainable use, taking into account the different backgrounds of the participants of the workshop. To facilitate discussions of the workshops, five studies were carried out in advance by local experts (copies of the studies are available from C. SCHÄFER). These studies, which served as the basis of the discussions, included the following themes:

- Conservation and promotion of sustainable use of medicinal plants
- Legislation on access to biological resources in Guinea
- Integration of traditional medicine in primary health care
- Pharmacological studies on medicinal plants
- Opportunities and constraints to the commercialization of medicinal plants on a national scale.

Following the presentations and small roundtable discussions on each theme, an action plan was drafted by the workshop. The plan includes a list of objectives and activities, which different actors agreed to develop or integrate in their activities in the near future.

The workshop considered that attention for conservation and sustainable use of medicinal plants is essential for any attempt to sustainably commercialize medicinal plants for regional and national markets. In this context the participants stressed the importance of the training of traditional healers in sustainable harvest techniques, of inventories and of the monitoring of stocks. The workshop also suggested the creation of community gardens for plants that could be cultivated for local markets. It also recommended the inclusion of over-harvested and endangered medicinal plant species in these gardens, as well as the rehabilitation of national arboreta. Finally, the workshop was of the opinion that the inventories should be differentiated according to species and regions.

Furthermore, the workshop discussed ways to promote pharmacological research in universities, including a strengthening of information exchange with traditional healers. The education and training of traditional healers and other stakeholders in the medicinal plant sector, as well as better access to equipment and information were regarded to be important issues.

With respect to access regulations and intellectual property rights, the workshop discussed the existing regulations. During the workshop, traditional healers described cases of unmonitored bioprospecting activities of foreign companies or researchers.

Finally, the marketing of medicinal plants as a means of generating income for those whose livelihoods depend on biodiversity was discussed. It was agreed that small-scale commercialization could help to create incentives for conservation. Generation of benefits is currently difficult because of the lack of organization at community level of the commercialization, and the low quality of the marketed products.

The NGO "Guinée Ecologie", in close collaboration with the Guinean focal point on biodiversity, has taken up the co-ordination of the implementation of some priority activities of the action plan. Activities developed so far concentrated on development of inventories and assessment of threats in certain regions, the training of traditional healers and the exchange of information with "best practice" cases in the region. Fund raising activities are currently underway to support the implementation of other activities, such as the sustainable use of medicinal plants for the national market.

Dr. Christine Schäfer • Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) • Project "Implementation of the Biodiversity Convention" • P.O. Box 5180 • 65726 Eschborn • Germany • Tel.: +49/6196/79-4200 • Fax: +49/6196/79-6190 • E-mail: christine.schaefer@gtz.de.

Rik Kutsch Lojenga • United Nations Conference on Trade and Development (UNCTAD) • BIOTRADE Initiative • Palais de Nations • 1211 Geneva 10 • Switzerland • Tel.: +41/22/9175607 • Fax: +41/22/9070044 • E-mail: kutsch@unctad.org.

Workshop on Conservation of Medicinal Plants

Samuel Lee & Sue Kang

A workshop on conservation of medicinal plants was held on 25 November 1998 in Seoul. It was co-organized by TRAFFIC East Asia (TEA) and the Association of Korean Oriental Medicine (AKOM), and officially supported by the Ministry of Health and Welfare and the Ministry of Environment. 22 participants took part in the workshop including government officials, academics, botanists, local

conservation NGOs, representatives of traditional East Asian medicine (TEAM) associations, and senior researchers of the Korea Institute of Oriental Medicine, a government-subsidized research institute.

The workshop was officially opened by the chairman of AKOM which consists of 7,000 government-licensed TEAM doctors. The welcoming speech by KIM YONG-HO, the director of the TEAM Bureau at the Ministry of Health and Welfare, stressed the conservation of fauna and flora that are the ingredients of TEAM and the importance of CITES and the Convention of Biodiversity (CBD).

Speaker LEE YOUNG-JONG from Kyongwon stressed the social and economic importance of medicinal plants. South Korea relies heavily on the import of Hanyakjae (TEAM ingredients), which increased 12-fold between 1985 and 1995, whereas domestic cultivation went up merely 3.3 times during the same period. Self-sufficiency in production of Hanyakjae in South Korea has decreased from 77% in 1990 to 44% in 1996.

SUE KANG, the Korea Representative (KR) of TEA, described relevant events and activities such as the Chiang Mai Declaration, medicinal plant projects, the IUCN Medicinal Plant Specialist Group (MPSG), and the World Bank Report on Conservation of Medicinal Plants. KANG reported that 96% of the 13 CITES-listed medicinal plants used in South Korea are imported from China. Of 58 threatened plant species designated by the Ministry of Environment, 33 species are used for medicinal purposes or are mentioned as medicinal plants. To secure sufficient supplies of medicinal plants without endangering wild species, it is important to organize medicinal plant networks at the national and international levels, to obtain information on medicinal plants, stop illegal trade, and review the existing laws.

SUNG NAK-SOOL, a senior medicinal plant researcher at the Agriculture Promotion Institute of the Ministry of Agriculture, suggested that South Korea is capable of growing imported species domestically, but people import because of competitive prices. In 1997 South Korea imported 50,000 tonnes of medicinal plants, 69% of the total import from China and the rest from Vietnam and North Korea. He also presented production ratios by province and by year and stressed the long-term strategy of self-sufficiency. In the coming years the demand for medicinal plants within China will increase steadily due to the increasing wealth of the Chinese people and this may

prevent them from exporting to other countries. He concluded that more research should be conducted on imported medicinal plants so as to cultivate them domestically.

The proceedings are available from the TEA office (E-mail: tea@asiaonline.net).

Samuel Lee • TRAFFIC East Asia • Room 2001, Double Building • 22 Stanley Street • Central, Hong Kong • China (Hong Kong SAR) • Tel: +852/2530-0587 • Fax: +852/2530-0864 • E-Mail: samuelee@wlink.net.

Sue Kang • address as above • E-mail: skang@asiaonline.net.

Reviews and Notices of Publication

Abbreviations

abc: Tony Cunningham; Leaman: Danna Leaman; NH: Natalie Hofbauer; roh: Ralf Ohlemüller, schp: Uwe Schippmann; Shah: N.C. Shah.

AAGESEN, D. (1998): Indigenous resource rights and conservation of the monkey-puzzle tree (*Araucaria araucana*, Araucariaceae). A case study from southern Chile. – *Economic Botany* 52: 146-160.

ACWORTH, J., B. NJOMBE EWUSI & N. DONALT (1999): Sustainable exploitation of *Prunus africana* on Mt Cameroon. In: TRAFFIC EUROPE (Ed.): Medicinal plant trade in Europe. Proceedings of the first symposium on the conservation of medicinal plants in trade in Europe, 22-23.6.1998, Kew – pp. 205-214, TRAFFIC Europe, s.loc.

ANON. (1998): Pau rosa, les larmes de la forêt. – *La Garance Voyageuse. Revue du Monde Vegetal* 43: 18. <*Aniba rosaeodora*, *Aniba duckei*>

ANON. (1998): Contribution to an evaluation of tree species using the new CITES listing criteria. – 440 pp., World Conservation Monitoring Centre, Cambridge.

ANON. (1999): Shaman entering herbal dietary supplement business. – *Herbalgram* 46: 57.

ANON. (1999): New export restrictions imposed for ginseng. – *TRAFFIC North America* 2(2): 4.

ANON. (1999): Where have all the flowers gone?. – *The American Herb Association Quarterly Newsletter* 15(1): 14.

The brief report describes examples of illegal harvesting of *Echinacea* in the state of Montana (US) and the lack of appropriate fines for these frauds. Similar situation is found in ginseng, goldenseal and black cohosh. (schp)

Anon. (2000): Free Searchable Non Timber Forest Product Bibliography Online. – <<http://www.ifcaae.org/cgi-bin/ntfp/db/dbsql/db.cgi?db=bib&uid=default>> (viewed 18.1.2000)

This international bibliographic database on NTFPs is a free, non profit venture provided by the Institute for Culture and Ecology (IFCAE), Portland, USA. It contains over 1,300 entries, most of them in English. Visitors of the website are asked to contribute actively keeping the database up-to-date by filling out submission forms online to add information regarding publications about NTFPs. (NH)

BARDEN, A. (2000): Agarwood. Threatened multicultural resource? – *TRAFFIC Dispatches* 13: 4, 11. <*Aquilaria malaccensis*>

BARR, A., J. CHAPMAN, N. SMITH, G. WIGHTMAN & al., Eds. (1993): Traditional aboriginal medicines in the Northern Territory of Australia by aboriginal communities of the Northern Territory. – xxiv+650 pp., Conservation Commission of the Northern Territory, Darwin.

BATANOUNY, K.H. (1999): Wild medicinal plants in Egypt. An inventory to support conservation and sustainable use. – xii+13-207 pp., Academy of Scientific Research and Technology, Cairo.

The book deals with 13 taxa listed in pharmacopoeias and 39 traditionally used species, most of them native to Egypt. Besides their distribution in the phytogeographical regions in Egypt information is presented on common names, ecology, drug authentication, folk uses, pharmacological actions and economic potential in Egypt. Information is less detailed for the 39 traditionally used taxa, but rarely fails to give an assessment in text form of the population status of the taxa in Egypt. IUCN threat categories have not been assigned, though descriptions like 'endangered' or 'vulnerable' are used. Besides *Bryonia cretica* (almost extinct) 13 taxa have been assessed as 'endangered', 9 other taxa are regarded as overcollected or otherwise threatened. (schp)

BENNETT, B.C. & J.R. HICKLIN (1998): Uses of saw palmetto (*Serenoa repens*, Arecaceae) in Florida. – *Economic Botany* 52: 381-393.

BERNATH, J. & E. NEMETH (1999): Changes in the medicinal plant sector of Hungary since the fall of communism. In: TRAFFIC EUROPE (Ed.): Medicinal plant trade in Europe. Proceedings of the first symposium on the conservation of medicinal plants in trade in Europe, 22-23.6.1998, Kew – pp. 55-65, TRAFFIC Europe, s.loc.

BETTI, G.J.R. (1999): The cultivation of medicinal plants. A necessity for supplying the pharmaceutical industry with drug raw material. In: TRAFFIC EUROPE (Ed.): Medicinal plant trade in Europe. Proceedings of the first symposium on the conservation of medicinal plants in trade in Europe, 22-23.6.1998, Kew – pp. 181-182, TRAFFIC Europe, s.loc. <*Harpagophytum procumbens*, *Drosera ramentacea*>

BARNARD, P., ED. (1998): Biological diversity in Namibia. A country study. – 325 pp., Index, Namibian National Biodiversity Task Force, Windhoek.

Price: DM 35 or GBP 11 inclusive of surface postage and handling. For purchase details write or send a fax to Connie Claassen at the National Biodiversity Programme · Ministry of Environment · Private Bag 13306 · Windhoek · Namibia · Fax +264/61/24-0339.

The book is based on input from 46 contributors. It summarizes the current knowledge of Namibia's biological diversity at the habitat, species and genetic levels. This national assessment was funded by UNEP and GEF in order to aid Namibia's process of implementing the CBD which the country has ratified in 1997. Chapters: 1. Biophysical and socioeconomic overview (Namibia is one of the world's driest countries, skirted by the Namib and Kalahari deserts. Annual rainfall is modest and variable.); 2. Terrestrial and freshwater habitats; 3. Marine habitats; 4. Economics of biodiversity conservation (p. 240: summary of *Harpagophytum* use and its socioeconomic importance by M. STROHBACH); 45. Environmental legislation; 6. Future priorities. (schp)

BIANCHI, A., P. IADICICCO & B. LOAZYA (1999): Cat's claw. The healing liana from Amazon forest. Deforestation and the market dynamics of modern panacea. In: TRAFFIC EUROPE (Ed.): Medicinal plant trade in Europe. Proceedings of the first symposium on the conservation of medicinal plants in trade in Europe, 22-23.6.1998, Kew – pp. 183-184, TRAFFIC Europe, s.loc. <*Uncaria tomentosa*>

BLANCO, E., R. MORALES & P.P. PELLIN (1999): Harvesting and trade of *Thymus* in Spain. In: TRAFFIC EUROPE (Ed.): Medicinal plant trade in Europe. Proceedings of the first symposium on the conservation of medicinal plants in trade in Europe, 22-23.6.1998, Kew – pp. 50-54 [+3], TRAFFIC Europe, s.loc.

BLUMENTHAL, M. (1999): Market report. Herb market levels after five years of boom. 1999 sales in mainstream market up only 11% in first half of 1999 after 55% increase in 1998. – Herbalgram 47: 64-65.

BOMBARDELLI, E. & P. MORAZZONI (1997): *Prunus africana* (Hook.f.) Kalkm. – Fitoterapia 68: 205-218.

BOMME, U. (1998): Situation und Zukunftsperspektiven des Feldanbaus von Heil- und Gewürzpflanzen in Deutschland. – Zeitschrift für Arznei- und Gewürzpflanzen 3: 155-161.

BOMME, U. (2000): Anbau und Züchtung von *Arnica montana*. – Zeitschrift für Phytotherapie 21(1): 52.

BRETT, J.A. (1998): Medicinal plants selection criteria. The cultural interpretation of chemical senses. – Angewandte Botanik 3/4: 70-74.

BREVOORT, P. (1998): The booming U.S. botanical market. A new overview. – Herbalgram 44: 33-46.

BREVOORT, P. (1999): Der boomende Heilpflanzenmarkt der USA. Ein neuer Überblick. – Zeitschrift für Phytotherapie 20: 99-108.

BUITRON C., X. (1999): Ecuador. Uso y comercio de plantas medicinales. Situacion actual y aspectos importantes para su conservacion. – xii+101 pp., xviii, TRAFFIC International, Cambridge.

CANIAGO, I. & S.F. SIEBERT (1998): Medicinal plant ecology, knowledge and conservation in Kalimantan, Indonesia. – Economic Botany 52: 229-250.

CASSELS, A.C., C. WALSH, M. BELIN, M. CAMBORNAC, J.R. ROBIN & C. LOBRANO (1999): Establishment of a plantation from micropropagated *Arnica chamissonis*, a pharmaceutical substitute for the endangered *A. montana*. – Plant Cell Tissue and Organ culture 56: 139-144.

CECH, R.A. (1999): Balancing conservation with utilization. Restoring populations of commercially valuable medicinal herbs in forests and agroforests. – Herbalgram 45: 18, 58-60.

CHATTERJEE, S. & S. DEY (1997): A preliminary survey of the status of *Taxus baccata* in Tawang district of Arunachal Pradesh. – Indian Forester 123: 746-754.

CHOUDHARY, D.K., B.L. KAUL & S. KHAN (1998): Cultivation and conservation of *Podophyllum hexandrum*, an overview. – Journal of Medicinal and Aromatic Plant Sciences 20: 1071-1073.

CIELSA, W.M. (1998): Non-wood forest products from conifers. – xiii+124 pp., FAO, Rome (Non-wood Forest Products 12).

DAWSON, I.K. (1997): *Prunus africana*. How agroforestry can help save an endangered medicinal tree. – *Agroforestry Today* 9(2): 15-17.

ERDELEN, W. R., KUSNAKA ADIMIHARDJA, H. MOESDARSONO & SIDIK (1999). Biodiversity, traditional medicine and the sustainable use of indigenous medicinal plants in Indonesia. *Indigenous Knowledge and Development Monitor* 7(3): 3-6.

This paper provides a useful overview of trade in *jamu*, a system of herbal medicine which originated in Java and, assisted by the policy of resettlement of people from densely populated Java, has spread to Bali and many other islands in the Indonesian archipelago. A strong point of this paper is that it emphasizes the dynamic nature of traditional systems of medicine, including *jamu*, which has been and continues to be influenced through cultural exchange of information on species and uses. With the combination of high botanical diversity, large megacities like Djakarta and a high demand for *jamu*, research on this trade is of great interest to the MPSG as it works towards a Medicinal Plants Action Plan. In this paper, the authors draw on their own research and other recent work on medicinal plants conservation in Indonesia, most notably, two papers in Bahasa Indonesia by RIFAI & al. (1992) and SISWOYO & al. (1994). They point out that the majority of rare medicinal plant species are trees, with 25% of the 55 most important *jamu* sources collected from the forests. In addition, herbaceous species such as *Pimpinella pruatjan* (locally known as *purwoiceng*) have "become extremely rare or even locally extinct due to overharvesting of wild populations". In concluding this paper, the authors make seven recommendations which centre around thorough taxonomic inventory of plant species used in *jamu*, research on their geographic distribution and habitat requirements, the need for sustainable use and monitoring based on an adaptive management approach.

RIFAI, M.A. & E.A. WIDJAJA RUGAYAH (1992). Tigah Puluh Tumbuhan Obat Langka Indonesia. [= Thirty of Indonesia's Scarce Medicinal Plants]. *Sisipan Floribunda* 2 : 1-28.

SISWOYO, E.A.M. ZUHUD & D. SITEPU (1994). Perkebangan dan Program Penelitian Tumbuhan Obat di Indonesia [= Research programme on and development of medicinal plants in Indonesia]. pp. 161-300 in : EAM ZUHUD & HAYYANTO (eds.) *Pelestarian Pemanfaatan Keanekaragaman Tumbuhan Obat Hutan Tropika Indonesia*. Bogor, Jurusan Konservasi Sumberdaya Hutan Fakultas Kehutanan IPB & Lambaga Alam Tropika Indonesia (LATIN). (abc)

CRAIB, C. (1999): Zur Ökologie von *Harpagophytum procumbens* ssp. *transvaalense* in der Nord-Provinz Südafrikas. – *Kakteen und andere Sukkulente* 50: 249-253.

CROUCH, N.R., G.F. SMITH, G. NICHOLS, J.A. BURDEN & J.M. GILLMER (1999): A species recovery contribution for *Haworthia limifolia* var. *limifolia*, the umathithibala of the Zulu. – *Aloe* 36: 8-13.

CUNNINGHAM, A.B. (1997): Review of ethnobotanical literature from eastern and southern Africa. – *The African Ethnobotany Network Bulletin* 1: 23-87.

CUNNINGHAM, A.B. (1999): *Prunus africana* (Rosaceae) bark. Trade, conservation and the industrial "footprint" of Europe on a forest tree species in Africa and Madagascar. In: TRAFFIC EUROPE (Ed.): *Medicinal plant trade in Europe. Proceedings of the first symposium on the conservation of medicinal plants in trade in Europe, 22-23.6.1998, Kew* – pp. 78-84, TRAFFIC Europe, s.loc.

DAVIS, D.E. (1999): Medicinal and cultural uses of plants in the southern Appalachians. Past, present and future. – *Ethnopharmacologia* 25: 46-56.

DAWSON, I.K. & W. POWELL (1997): Genetic variation in the African montane tree *Prunus africana*, an endangered medicinal species. – *Molecular Ecology* 8: 151-156.

DENNIS, F. (1999): The trade in medicinal plants in the United Kingdom. In: TRAFFIC EUROPE (Ed.): *Medicinal plant trade in Europe. Proceedings of the first symposium on the conservation of medicinal plants in trade in Europe, 22-23.6.1998, Kew* – pp. 19-32 [+4], TRAFFIC Europe, s.loc.

DUBEY, K.P. (1997): Himalayan yew (*Taxus baccata*) conservation. A vegetative approach. – *Indian Forester* 123: 1150-1154.

DÜRBECK, K. (1999): Demand stimulated sustainable supply for endangered Nepalese medicinal plants. In: TRAFFIC EUROPE (Ed.): *Medicinal plant trade in Europe. Proceedings of the first symposium on the conservation of medicinal plants in trade in Europe, 22-23.6.1998, Kew* – pp. 155-163, TRAFFIC Europe, s.loc.

ELLENBERGER, A. (1999): Assuming responsibility for a protected plant. Weleda's endeavour to secure the firm's supply of *Arnica montana*. In: TRAFFIC EUROPE (Ed.): *Medicinal plant trade in Europe.*

Proceedings of the first symposium on the conservation of medicinal plants in trade in Europe, 22-23.6.1998, Kew – pp. 127-130, TRAFFIC Europe, s.loc.

ETKIN, N.L. (1998): Indigenous patterns of conserving biodiversity. Pharmacological implications. – Journal of Ethnopharmacology 63: 233- 245.

plants in trade in Europe, 22-23.6.1998, Kew – pp. 74-77 [+8], TRAFFIC Europe, s.loc.

FOSTER, S. (1999): Black Cohosh. *Cimicifuga racemosa*. A literature review. – Herbalgram 45: 35-50.

FREI, B., O. STICHER, T. VIESCA & M. HEINRICH (1998): Medicinal and food plants. Isthmus Sierra Zapotec criteria for selection. – Angewandte Botanik

ESKINAZI, D., M. BLUMENTHAL, N. FARNSWORTH & C.W. RIGGINS, Eds. (1999): Botanical medicine. Efficacy, quality assurance, and regulation. – xv+222 pp., Mary Ann Liebert, Larchmont.

Price: Within USA \$82.95, Outside USA \$100.00, available at Mary Ann Liebert, Inc. • 2 Madison Avenue • Larchmont • NY 10538 • USA • Tel.: +1/914/834-3100 • Fax: +1/914/834-3688 • E-mail: info@liebertpub.com.

The book summarizes the results of the 1994 'Symposium on Botanicals. A role in US Health Care?'. Its more than 30 papers by well-known authors have been divided in five parts: What are botanicals and how are they currently used? (4 papers), How can we know that botanicals work? (9), How can we know that these products are safe? (5), How can we ensure that botanical preparations will be of good quality? (6), and how do regulations affect the market place and impact the cost of health care? (7). One important question was, however, not asked: How does wild harvesting of medicinal plants affect their populations? Conservation impacts of phytomedicinal usage of plants are not addressed throughout the book. Three papers of interest have been reviewed below.

BREVOORT, P. (1999): The economics of botanicals. The U.S. experience. – pp. 183-191.

The author describes the US market for phytomedicines, which according to US laws have to be marketed as 'foods' by presenting a series of tables with mostly sales figures: 'Top selling herbs in US commerce', 'US import/export statistics for ginseng and other medicinal plants 1992', 'Herbal sales in natural food retail stores 1991-1994', 'Native North American medicinal herbs in commercial demand (primarily wild-harvested)', 'Top 50 herbs in US health care practices'.

EAVES, M.K. (1999): The economics of botanicals. The European experience. – pp. 175-182.

In western Europe, botanicals or plant-based medicines represent a significant part of usual drug therapy. In Germany, France, Italy, Austria, and Switzerland, plant drugs and phytomedicines are an integral part of conventional medicine. In addition to their extensive over-the-counter (OTC) use, they are also widely prescribed. Germany is the largest phytomedicine market in Europe by a large margin. The report describes the overall market size for phytomedicines and herbal remedies by presenting a number of sales tables. Also, a list of the 145 'most relevant' herbal drugs is presented. The general conclusion of the report is that the European phytomedicines market is considerably larger than indicated by previously available figures.

GRADY, L.T. (1999): Worldwide harmonization of botanical standards. – pp. 147-168.

Worldwide about 35 pharmacopoeias exist with diverging sets of monographed vegetable drugs. The paper discusses the advantages of harmonization of pharmacopoeial standards, above all the need to look for those species that are used and monographed in a variety of countries. Secondly, the need for streamlining quality standards is outlined. A 15-page Appendix lists various botanicals of interest to the United States Pharmacopoeia giving their pharmaceutical names and the plant parts used. (schp)

EVSTATIEVA, L. & R. HARDALOVA (1999): Status of Bulgarian medicinal plants and their conservation. In: TRAFFIC EUROPE (Ed.): Medicinal plant trade in Europe. Proceedings of the first symposium on the conservation of medicinal plants in trade in Europe, 22-23.6.1998, Kew – pp. 196-198, TRAFFIC Europe, s.loc.

FLEURENTIN, J. & M. TODISCO (1999): French regulations concerning the use and commercialization of medicinal plants. In: TRAFFIC EUROPE (Ed.): Medicinal plant trade in Europe. Proceedings of the first symposium on the conservation of medicinal

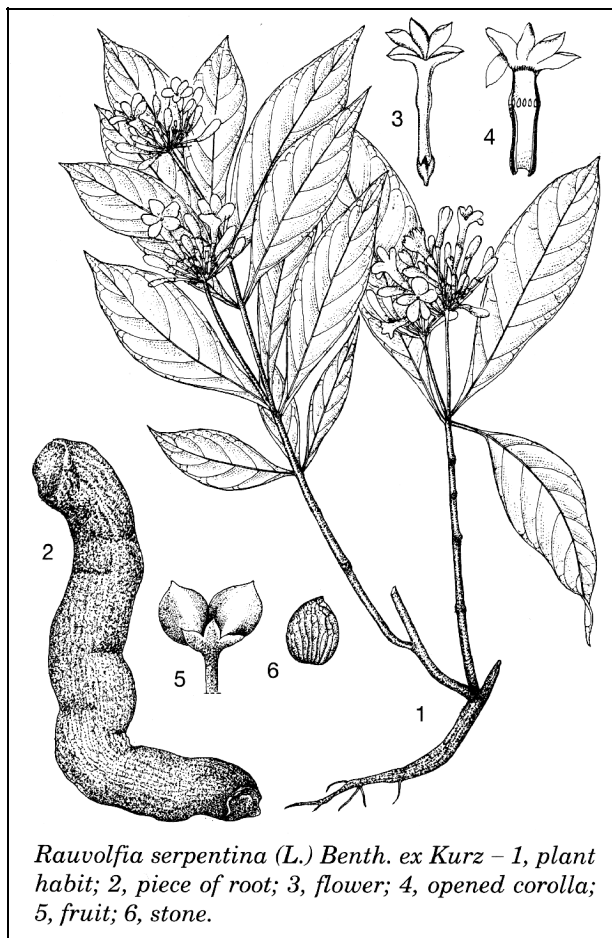
3/4: 82-86.

GEBBERS, D. (1999): Bedeutung der traditionellen Medizin in Afrika und möglicher Beitrag der Heilkundigen zur Erhaltung natürlicher Ressourcen. – Geoid 1: 34-40.

HIRSCH, U. (1999): Certification of sustainably harvested products. In: TRAFFIC EUROPE (Ed.): Medicinal plant trade in Europe. Proceedings of the first symposium on the conservation of medicinal plants in trade in Europe, 22-23.6.1998, Kew – pp. 167-171, TRAFFIC Europe, s.loc.

- HÖFT, R. & M. HÖFT (1997): A profile of ethnobotany in Africa. – The African Ethnobotany Network Bulletin 1: 5-22.
- IVANCHEVA, S. & B. STANTCHEVA (2000): Ethnobotanical inventory of medicinal plants in Bulgaria. – Journal of Ethnopharmacology 69: 165-172.
- JATEM-LASSER, A., M.S. RICARDI & G. ADAMO (1998): Herbal traditional medicine of Venezuelan Andes. An ethnopharmacological study. In: CAPASSO, F., F. BASSO, R. DE PASQUALE, F.J. EVANS & N. MASCOLO (Eds.): Proceedings of the 2nd International Symposium on Natural Drugs, Maretea, Italy, 28.9.-1.10.1997. pp. 53-59, (Phytotherapy Research 12, Suppl. 1).
- JOHNSTON, B.A. & D. MALONE (1999): States pass legislation curtailing harvest of wild *Echinacea*. – Herbalgram 46: 67.
- JOSHI, D.N. & G.S. RAWAT (1997): Need for conservation and propagation of alpine and sub-alpine medicinal plants of north-west Himalayas. – Indian Forester 123: 811-814.
- KAN TAE-SUK (1999): TRAFFIC and its medicinal plant work. In: TRAFFIC EAST ASIA (Ed.): Proceedings of the workshop on the conservation of medicinal plants, Seoul, 25.11.1998 – pp. 23-33, TRAFFIC East Asia. Unpublished report, Hong Kong.
- KASPAREK, M. & U. GRIMM (1999): European trade in Turkish salep with special reference to Germany. – Economic Botany 53: 396-406.
- KELLER, K. (1997): Aktuelle rechtliche Position und Zukunft des pflanzlichen Arzneimittels in Deutschland und in der europäischen Union. – Herba Polonica 43: 466-488.
- KEPLINGER, K., G. LAUS, M. WURM, M.P. DIETRICH & H. TEPPNER (1999): *Uncaria tomentosa* (Willd.) DC. Ethnomedicinal use and new pharmacological, toxicological and botanical results. – Journal of Ethnopharmacology 64: 23-34.
- KING, S.R., E.N. MEZA, T.J.S. CARLSON, J.A. CHINNOCK, K. MORAN & J.R. BORGES (1999): Issues in the commercialization of medicinal plants. – Herbalgram 47: 46-51.
- KISGECI, J. (1999): Anbau von Arzneipflanzen im ehemaligen Jugoslawien. – Zeitschrift für Arznei- und Gewürzpflanzen 4: 97-98.
- KÖHLER, I. (1999): Traditionelle Medizin in Ghana. – Zeitschrift für Phytotherapie 20: 22-28.
- KOERPER, H. & A.L. KOLLS (1999): The Silphium motif adorning ancient Lybian coinage. Marketing a medicinal plant. – Economic Botany 53: 133-143.
- KRISHNAN, R.M., H. RAMMOHAN & B.R. RAMESH (1997): Ecological database of some south Indian medicinal plants. – Journal of Economic and Taxonomic Botany 21: 625-637.
- The paper outlines the method used to establish a database to primarily explain the ecology and distribution patterns. Herbaria, literature and field work data for some 300 selected medicinal plants are stored. The major use of the database is to aid in habitat conservation. (schp)
- LANGE, D. (1998): Europe's medicinal and aromatic plants. Their use, trade and conservation. – viii+77 pp., xxvi+iv, TRAFFIC International, Cambridge.
- LANGE, D. (1999): Identification training for medicinal and aromatic plants covered by CITES and EU Regulation 2307/97. Lecture script. Version 2-En. 25.5.99. – 98 pp., Annexes, Bundesamt für Naturschutz, Bonn (BfN-Skripten 11).
- LANGE, D. & U. SCHIPPMMANN, Eds. (1999): Checklist of medicinal and aromatic plants and their trade names covered by CITES and EU Regulation 2307/97. Version 3.0. – 48 pp., Federal Agency for Nature Conservation, Bonn (BfN-Skripten 8).
- LANGE, D. (1999): Status and trends of medicinal and aromatic plant trade in Europe. An overview. In: TRAFFIC EUROPE (Ed.): Medicinal plant trade in Europe. Proceedings of the first symposium on the conservation of medicinal plants in trade in Europe, 22-23.6.1998, Kew – pp. 1-4 [+5], TRAFFIC Europe, s.loc.
- LEE, S.K.H. (1998): Attitudes of Hong Kong Chinese towards wildlife conservation and the use of wildlife as medicine and food. – v+65 pp., TRAFFIC East Asia, Hong Kong.
- LEE YOUNG-JONG (1999): The importance of conserving medicinal plants. In: TRAFFIC EAST ASIA (Ed.): Proceedings of the workshop on the conservation of medicinal plants, Seoul, 25.11.1998 – pp. 13-22, TRAFFIC East Asia. Unpublished report, Hong Kong.
- LEITH, J. (13.1.2000): Devil's claw. Sustainable harvesting of and fair trade in medicinal plants. – <<http://www.positivehealth.com/permit/articles/herb>

al/claw36.htm> (viewed 14.1.2000) <*Harpagophytum procumbens*>



Rauwolfia serpentina (L.) Benth. ex Kurz – 1, plant habit; 2, piece of root; 3, flower; 4, opened corolla; 5, fruit; 6, stone.

Figure 1. *Rauwolfia serpentina* (after: PADUA, L.S. DE & al.1999, see box page 37.)

LIEBMANN, R. & al. (1998): Industry and organizations form partnership for goldenseal conservation. – *Herbalgram* 44: 58-59. <*Hydrastis canadensis*>

LUTOMSKI, J. & P. GORECKI (1999): Drogenkunde und Phytotherapie in Polen. – *Zeitschrift für Phytotherapie* 20: 209-214.

MAHTO, L.B. (1999): *Vanda*. Famous for its ornamental and medicinal value. – *MFP News* 9(1): 8-9.

MANDER, M. (1998): Marketing of indigenous medicinal plants in South Africa. A case study in Kwazulu-Natal. – x+1 51 pp., FAO, Rome.

MCGUFFIN, M. (1999): AHPA goldenseal survey measures increased agricultural production. – *Herbalgram* 46: 66-67. <*Hydrastis canadensis*>

MCKEOWN, K.A. (1999): *Echinacea* gives the United States an opportunity to put conservation policies into practice. – *Diversity* 15(3): 17-19.

MEZA, E.N., Ed. (1999): *Desarrollando nuestra diversidad biocultural. 'Sangre de Grado' y el reto de su producción sustentable en el Perú.* – 259 pp., Universidad Nacional Mayor de San Marcos, Lima. <*Croton lechleri*>

MLADENOVA, M. (1999): The management system of harvesting of medicinal plants in Bulgaria. In: *TRAFFIC EUROPE* (Ed.): *Medicinal plant trade in Europe. Proceedings of the first symposium on the conservation of medicinal plants in trade in Europe, 22-23.6.1998, Kew* – pp. 85-98, *TRAFFIC Europe*, s.loc.

MOLUR, S. & S. WALKER, Eds. (1998): *Conservation Assessment and Management Plan (C.A.M.P.) workshop report. Selected Medicinal Plants of Northern, Northeastern and Central India.* Lucknow 21-25 January, 1997.

This report is the outcome of a workshop, which was held in Lucknow, India from 21-25 January, 1997. It gives the results of the status conservation assessment of 75 selected medicinal plants taxa carried out at the Biodiversity Conservation Prioritisation Project (BCPP) Conservation Assessment and Management Plan (CAMP) workshops. Nowadays, medicinal plants are receiving an enormous amount of attention. The resurgence is due to their enormous demand and by the indigenous pharmaceutical industries which are estimated to be 9000 within the country. There are some important ones, which are not only catering the needs of the country but also exporting the indigenous medicines and the extracts in form of botanicals and pharmaceuticals. Due to overexploitation of medicinal and aromatic plants these are dwindling in nature. The report has enlisted 75 medicinal and aromatic plants after assessment - 38 of these are from north western India, 19 from north eastern India and 18 from central India.

A taxon data sheet of each species is given, which describes the taxonomic status, habit, habitat, global distribution, elevation, range (in km²), number of locations, population trends (in % of decline), number of mature individuals, global population status, recent field studies, threats, trade, CITES listings, recommendations such as research management, cultivation, and finally the sources from where the information has been received and the compilers. The only shortcoming of this report is that a number of plants which have never been used as medicine or in medicinal preparations have been included in this report such as *Costus lacerus*, *Craterostigma plantagineum*, *Drymeia indica*, *Ilex khasiana*, *Nepenthes khasiana*, *Przewalskia tangutica*, *Saussurea gossypiphora*, and *Saussurea simpsoniana*.

Those who are interested in this report may write to Zoo Outreach Organization · Box 1683 · Peelamedu, Coimbatore - 641 004 · India. (Shah)

PADUA, L.S. DE, N. BUNYAPRAPHATSARA & R.H.M.J. LEMMENS, Eds. (1999): Medicinal and poisonous plants 1. – 711 pp., b/w illustrations, map, Backhuys Publishers, Leiden (Plants Resources of South-East Asia 12,1).

Price: Dfl 350 (app. US\$ 180), available at Backhuys Publishers · PO Box 321 · 2300 AH Leiden · Netherlands. A paperback edition at a price of Dfl 140 will be available in 2001. For developing countries a paperback edition is already available at US\$ 25 from the PROSEA Network office · PO Box 332 · Bogor 16122 · Indonesia.

This wonderful and hefty volume of the PROSEA series relies on contributions of >100 authors. The introduction gives a comprehensive 8-page summary of the role of medicinal plants in Indonesia, Peninsular Malaysia, Borneo, New Guinea, The Philippines, Thailand, and Vietnam and brief info on conservation and trade issues. The main section has alphabetically arranged descriptions on 102 genera and species covering a.o.: original taxonomic publication, family, chromosome numbers, list of species, vernacular names, distribution, uses, production, international trade, properties, adulterations, substitutes, description, ecology, propagation, diseases, harvesting yield, and literature. Conservation information, if any, is summarized under 'genetic resources and breeding'. The only CITES protected species covered in the volume is *Rauvolfia serpentina*. The literature section contains 1660 bibliographic citations. Besides a glossary, indices on compounds, pharmaceutical terms, scientific plant names and vernacular plant names are given. Specific mention has to be made to the precise b/w plant drawings (fig. 1) which have been taken from various sources and redrawn and adapted by A.S. NURHAMAN, I. SYAMSUDIN, P. VERHEIJ-HAYES, and P.H. YAP (*Jasminum*). A map in the back with designation of islands, states, regions and provinces outlines the area covered by the PROSEA project. (schp)

OLSEN, C.S. (1998): The trade in medicinal and aromatic plants from central Nepal to northern India. – Economic Botany 52: 279-292.

ORAN, S.A. & D.M. ALI-EISAWI (1998): Checklist of medicinal plants of Jordan. – Dirasat. Medical and Biological Sciences 25: 84-112.

ÖZGÜVEN, M. & S. TANSI (1998): In-situ conservation of aromatic plants in southeastern Turkey. B. Wild *Origanum* species. In: ZENCIRCI, N., Z. KAYA, Y. ANIKSTER & W.T. ADAMS (Ed.): Proceedings of International Symposium on In-situ Conservation of Plant Genetic Diversity, Antalya, Turkey, 4.-8.11.1996 – pp. 177-183, Central Research Institute for Field Crops, Ankara.

ÖZHATAY, N., M. KOYUNCU, S. ATAY & A. BYFIELD (1999): The trade in wild medicinal plants in Turkey. In: TRAFFIC EUROPE (Ed.): Medicinal plant trade in Europe. Proceedings of the first symposium on the conservation of medicinal plants in trade in Europe, 22-23.6.1998, Kew – pp. 5-18 [+2], TRAFFIC Europe, s.loc.

PANDEY, A.K. & A.K. BISARIA (1998): Rational utilization of important medicinal plants. A tool for conservation. – Indian Forester 124: 197-206.

PANK, F. (1998): Der Arznei- und Gewürzpflanzenmarkt in der EU. – Zeitschrift für Arznei- und Gewürzpflanzen 3: 77-81.

PHILLIPS, L.D. & D.B. DWYER (1999): Sustainable harvesting of Himalayan yews. In: TRAFFIC EUROPE (Ed.): Medicinal plant trade in Europe. Proceedings of the first symposium on the conservation of medicinal plants in trade in Europe, 22-23.6.1998, Kew – pp. 147-154, TRAFFIC Europe, s.loc.

PORDIÉ, L. (1998): Survey on medicinal plants used for treatment of malaria and fever amongst ethnic minorities. Mondolkiri province. Kingdom of Cambodia. – Ethnopharmacologia 23: 14-25.

PRENDERGAST, H.D.V., N.L. ETKIN, D.R. HARRIS & P.J. HOUGHTON, Eds. (1998): Plants for food and medicine. Proceedings of the joint conference of the

MONTSERRAT, R. & H. BORGTFT PEDERSEN (1996): Bibliografía sobre botánica económica, etnobotánica y manejo sustentable en el Ecuador. – Funbotanica Boletín 3: 8-43.

NADEEM, M., L.M.S. PALNI, A.N. PUROHIT, H. PANDEY & S.K. NANDI (2000): Propagation and conservation of *Podophyllum hexandrum* Royle, an important medicinal herb. – Biological Conservation 92: 121-129.

ODENTHAL, K.P. (1998): *Vitex agnus-castus* L. Traditional drug and actual indications. In: CAPASSO, F., F. BASSO, R. DE PASQUALE, F.J. EVANS & N. MASCOLO (Eds.): Proceedings of the 2nd International Symposium on Natural Drugs, Maretea, Italy, 28.9.-1.10.1997. pp. 160-161 (Phytotherapy Research 12, Suppl. 1).

Society for Economic Botany and the International society for Ethnopharmacology, London, 1.-6.6.1996. – ix+438 pp., Royal Botanic Gardens Kew, Richmond.

RAISON, J. VON (2000): Neues zur Taxonomie und Systematik der Gattung *Arnica*. – Zeitschrift für Phytotherapie 21(1): 40-41.

RASOOL, G. (1998): Saving the plants that save us. Medicinal plants of the northern areas of Pakistan. – xi+92 pp., BASDO, Gilgit.

REINHARD, K.H. (1997): *Uncaria tomentosa* (Willd.) DC. Cat's Claw, Uña de Gato, or Savéntaro. – Journal of Alternative and Complimentary Medicine 5(2): 143-151.

ROBBINS, C.S. (1998): Medicinal plant conservation. A priority at TRAFFIC. – Herbalgram 44: 52-54.

ROBBINS, C.S. (1999): A comparative analysis of management regimes and trade monitoring mechanisms for two native North American medicinal plants. American ginseng (*Panax quinquefolius*) and goldenseal (*Hydrastis canadensis*). In: TRAFFIC EUROPE (Ed.): Medicinal plant trade in Europe. Proceedings of the first symposium on the conservation of medicinal plants in trade in Europe, 22-23.6.1998, Kew – pp. 99-110, TRAFFIC Europe, s.loc.

ROSS, I.A. (1999): Medicinal Plants of the World: chemical constituents, traditional and modern medicinal uses. 415 pp. Humana Press, Totowa.

The author, a research scientist with the US Food and Drug Administration, has selected 26 plant species widely used as foods or in food supplements and traditional remedies. The focus of this volume is to digest the known chemical constituents, pharmacological activities, and results of clinical trials. The author has also included general information concerning origin, distribution, and in relevant cases a hint at conservation concerns (e.g., the invasiveness of *Lantana camara*). The following species are included: *Abrus precatorius*, *Allium sativum*, *Aloe vera*, *Annona muricata*, *Carica papaya*, *Cassia alata*, *Catharanthus roseus*, *Cymbopogon citratus*, *Cyperus rotundus*, *Curcuma longa*, *Hibiscus rosa-sinensis*, *Hibiscus sabdariffa*, *Jatropha curcas*, *Lantana camara*, *Macuna pruriens*, *Mangifera indica*, *Manihot esculenta*, *Momordica charantia*, *Moringa pterygosperma*, *Persea americana*, *Phyllanthus niruri*, *Portulaca oleracea*, *Psidium guajava*, *Punica granatum*, *Syzygium cumini*, *Tamarindus indica*. (Leaman)

SAN MARTIN, R. & R. BRIONES (1999): Industrial uses and sustainable supply of *Quillaja saponaria* (Rosaceae) saponins. – Economic Botany 53: 302-311.

SAPIO, O.A. DI, S.J. GATTUSO & M.A. GATTUSO (1997): Morphoanatomical characters of *Taxus baccata* bark and leaves. – Fitoterapia 68: 252-260.

SCHMIDT, M., J. EICH, J. KREIMEYER & G. BETTI (1999): Improvement of pharmaceutical drug quality. A cultivation project for *Harpagophytum procumbens* in Namibia. In: TRAFFIC EUROPE (Ed.): Medicinal plant trade in Europe. Proceedings of the first symposium on the conservation of medicinal plants in trade in Europe, 22-23.6.1998, Kew – pp. 140-146 [+2], TRAFFIC Europe, s.loc.

SCHMITZ-KRETSCHMER, H.J. & U. SCHIPPMANN (1998): Artenschutz bei Heilpflanzen. Aktivitäten des Bundesamts für Naturschutz. – Zeitschrift für Arznei- und Gewürzpflanzen 3: 49-50.

SCHNEIDER, E. (1998): Kultur am Wildstandort. Eine Möglichkeit zum Schutz wildwachsender Arzneipflanzen. – Drogenreport 11 (20): 20-22.

SCHNEIDER, M. & B. BUETER (1999): Domestication projects for various endangered medicinal plant species by VitaPlant Ltd. In: TRAFFIC EUROPE (Ed.): Medicinal plant trade in Europe. Proceedings of the first symposium on the conservation of medicinal plants in trade in Europe, 22-23.6.1998, Kew – pp. 200-201, TRAFFIC Europe, s.loc.

SCOTT-SHAW, R., C. HILTON-TAYLOR, B. KASSEEPURSA & B. CHURCH (1998): The conservation status of Pepper Bark Tree. – Sabonet News 3(2): 73-75. <*Warburgia salutaris*>

SHARMA, R. (1999): Vulnerable and threatened plants of economic value. *Taxus baccata*. – MFP News 9(1): 17-18.

SHARMA, R. (1999): Vulnerable and threatened plants of economic value. *Gentiana kurroo*. – MFP News 9(4): 14.

SHIVA, A. (1999): Medicinal plants. First-aid remedies. Their sources and methods of use. – ii+58 pp., Surya International Publications, Dehra Dun.

SIDDIQI, M.M.H., S.H. AFAQ & M.M.R.K. AFRIDI (1991): *Boswellia serrata*, an underexploited plant of medicinal importance, can be put to better use. – Hamdard Medicus 34(1): 73-84.

SMALL, E. & P.M. CATLING (1999): Canadian medicinal crops. x+240 pp. NRC Research Press, Ottawa. [Monograph Publishing Program, NRC Research Press, National Research Council of Canada, Ottawa, Ontario K1A 0R6, Canada]

Canada has approximately 3200 native plant species, of which nearly 1000 have medicinal uses. This volume provides excellent and detailed summaries of ecological, ethnobotanical, and pharmacological information for 25 species with current or potential commercial value as crops: *Achillea millefolium*, *Acorus calamus*, *Arctostaphylos uva-ursi*, *Arnica* species, *Caulophyllum* species, *Cimicifuga racemosa*, *Echinacea* species, *Epilobium angustifolium*, *Hamamelis virginiana*, *Hierochloë odorata*, *Humulus lupulus*, *Hydrastis canadensis*, *Laminariales* species, *Oenothera biennis*, *Oplopanax horridus*, *Panax quinquefolius*, *Podophyllum peltatum*, *Polygala senega*, *Rhamnus purshianus*, *Rhodiola rosea*, *Sanguinaria canadensis*, *Taraxacum* species, *Taxus brevifolia*, *Vaccinium macrocarpon*, *Vaccinium myrtillus*. For each of these taxa, conservation considerations are included within a discussion of the agricultural and commercial aspects of their development as crops. The volume also includes extensive reference lists, including relevant web sites, as well as a thorough treatment of the regulatory and commercial environment for medicinal plant production in Canada. (Leaman)

SMITH, G.F. & N.R. CROUCH (1999): Mesembs in the muthi-market. *Lithops lesliei* as an ethnomedicinal plant. – *British Cacti and Succulent Journal* 17(3): 133-137.

22-23.6.1998, Kew – pp. 67-73, TRAFFIC Europe, s.loc.

SUNDERLAND, T. & J. NKEFOR (1997): Conservation through cultivation. A case study. The propagation of *Pygeum*, *Prunus africana*. – *Tropical Agriculture Association Newsletter* December: 5-13.

SUNG NAK-SOOL (1999): Prospect and agricultural background of medicinal plants. In: TRAFFIC EAST ASIA (Ed.): Proceedings of the workshop on the conservation of medicinal plants, Seoul, 25.11.1998 – pp. 35-46, TRAFFIC East Asia. Unpublished report, Hong Kong.

SWANSON, T.M., Ed. (1998): Intellectual property rights and biodiversity conservation. An interdisciplinary analysis of the values of medicinal plants. – xiii+271 pp., Cambridge University Press, Cambridge.

TEN KATE, K. (1999): The Convention on Biological Diversity and its medicinal plant implications. In: TRAFFIC EUROPE (Ed.): Medicinal plant trade in Europe. Proceedings of the first symposium on the

SUNDERLAND, C.H., L.E. CLARK & P. VANTOMME, Eds. (1999): Non-wood forest products in central Africa. Current research issues and prospects for conservation and development. – viii+288 pp., FAO, Rome.

This book has recently been published by FAO and contains 29 papers in four sections: *Introduction* (1 paper), *Ecological issues* (8), *Socio-political issues* (8), *Market-economic issues* (10), and *Networks and information exchange* (2). The papers which directly or indirectly relate to medicinal plants, (over-)utilization and conservation are selected below.

CUNNINGHAM, A.B. (1999): The management of non-wood forest products in protected areas. Lessons from a case study of multiple-use in Bwindi Impenetrable National Park, Uganda. – pp. 143-159.

LAIRD, S. (1999): The management of forests for timber and non-wood forest products in central Africa. – pp. 51-60.

SUNDERLAND, T.C.H. (1999): The ecology and sustainability of *Pausinystalia johimbe*. An over-exploited medicinal plant of the forests of central Africa. – pp. 67-77.

SUNDERLAND, T.C.H. & C. OBAMA (1999): A preliminary market survey of the non-wood forest products of Equatorial-Guinea. – pp. 211-220.

TCHOUNDJEU, Z., B. DUGUMA, M.L. TIENCHEU & M.L. NGO-MPECK (1999): The domestication of indigenous agroforestry trees. ICRAF's strategy in the humid tropics of west and central Africa. – pp. 161-169. <*Prunus africana*, *Pausinystalia johimbe*>

WILKIE, D. (1999): CARPE and non-wood forest products. – pp. 3-16. <*Pausinystalia johimbe*, *Prunus africana*, *Voacanga africana*, *Bailonella toxiparva*>

STEINHOFF, B. (1999): ESCOP and WHO monographs. A potential scientific basis for a rational assessment of herbal medicinal products in Europe under specific aspects of the regulatory situation. In: TRAFFIC EUROPE (Ed.): Medicinal plant trade in Europe. Proceedings of the first symposium on the conservation of medicinal plants in trade in Europe,

conservation of medicinal plants in trade in Europe, 22-23.6.1998, Kew – pp. 111-113, TRAFFIC Europe, s.loc.

THOMSON-DELANEY, J. (1999): Wild ginseng. A Canadian perspective. – TRAFFIC North America 2: 4-6. <*Panax quinquefolius*>

THORMANN, I, D.I. JARVIS, J.A. DEARING & T. HODGKIN (1999): Internationally available infor-

mation sources for the development of in situ conservation strategies for wild species useful for food and agriculture. – Plant Genetic Resources Newsletter 118: 38-50.

VASO, A. (1999): Organisation of harvesting in Albania. In: TRAFFIC EUROPE (Ed.): Medicinal plant trade in Europe. Proceedings of the first symposium on the conservation of medicinal plants in

TEN KATE, K. & S.A. LAIRD (1999): The commercial use of biodiversity. Access to genetic resources and benefit-sharing. – xiv+398 pp., Earthscan, London. 1 85383 334 7.

Price: 50.00 GBP + postage and mailing: 2.50 GBP inside UK/3.60 GBP rest of the world. Purchase: The book can be obtained at Nim Moorthy · Assistant Marketing Manager · Earthscan Publication Ltd. · 120 Pentonville Road · London N1 9JN · Tel.: +44/171/278-0433 · Fax: +44/171/278-1142 · E-mail: earthinfo@earthscan.co.uk
When ordering please quote: ESCB36.

Few botanical issues have captured the attention of professionals, politicians and the public as much as the policy and practice of commercial use of plant and animal genetic resources and "biodiversity prospecting". The recent publication of this book by KERRY TEN KATE, who heads the Convention on Biodiversity Unit at RBG, Kew, and SARAH LAIRD, an independent consultant, is an extremely timely one, for equally few issues have become so rapidly confused by a smokescreen of biopolitics. Clearly written, skillfully combining case-studies and "boxed" examples with a good glossary, comprehensive bibliography, index and list of useful contacts and sources of information, this book will provide an essential reference for policymakers, entrepreneurs and professionals working in conservation and rural development. Published together with the Commission of the European Communities, this book provides a comprehensive explanation of access and benefit-sharing in relation to the Convention on Biodiversity (CBD) and the national legislation and contracts related to this. In addition to sections most relevant to the MPSG dealing with botanical medicines and pharmaceuticals, with an excellent case study on kava (*Piper methysticum*), the book also analyses the ethical and legal issues related to crop development, crop protection, horticulture, biotechnology, and personal care and cosmetics products. My only negative comment relates not to the content of the book, but its price (GBP 50), putting it out of reach of most individuals and many institutions in developing countries where this book would be most topical. This is no fault of the authors, but is an issue which the publishers should take into account and ideally rectify through publication of a lower cost softback edition. I have no doubt that there is sufficient demand to justify a second edition. (abc)

Additional comment by Uwe Schippmann:

On page 110 in chapter 4.10 on "Practices in benefit-sharing", the authors write "...the German company Sertürner has established a partnership in Namibia to develop cultivated sources of devil's claw... Value is added locally through extraction facilities, which are intended to build domestic capacity to process products. Stable jobs are created, and efforts are made to provide farm jobs to wild harvesters of plant material."

It seems that the authors paint an overly optimistic picture of this venture. Stakeholders in the region point out: (1) No value adding takes place in the region to date. Devil's Claw (*Harpagophytum*) is only dried and cut and then shipped to mostly European destinations where the processing takes place. (2) About 1,500 local harvesters in Namibia, mostly San and Damara, have their only income in harvesting Devil's Claw on their communal land. Self-sufficiency of industry through cultivated stocks will deprive these people of this income source. (3) Compared to the large group of harvesters, only few jobs have been or will be eventually created in the cultivation fields. (4) Also, these few jobs will not be in the remote places where the harvesters live but on the land of commercial farmers. If this is an example of "practices in benefit-sharing" it seems not to be a positive one. What is needed in terms of *Harpagophytum* conservation is the promotion of high quality and sustainable wild harvesting in the traditional Kalahari sand areas. This will give the people an incentive to act as custodians of their resource.

TOIT, J. DU, E. JOUBERT & T.J. BRITZ (1998): Honeybush tea. A rediscovered indigenous South African herbal tea. – Journal of Sustainable Agriculture 12: 67-84. <*Cyclopia*>

TRAFFIC EUROPE, Ed. (1999): Medicinal plant trade in Europe. Proceedings of the first symposium on the conservation of medicinal plants in trade in Europe, 22-23.6.1998, Kew. – vi+214 pp., Appendix, TRAFFIC Europe, s.loc.

trade in Europe, 22-23.6.1998, Kew – pp. 33-49, TRAFFIC Europe, s.loc.

VED, D.K. & V. TANDON, Eds. (1998): Conservation assessment and management plan workshop for high altitude medicinal plants of Jammu-Kashmir and Himachal Pradesh, Kullu, Himachal Pradesh, 16-18 April 1998. – 75 pp., Maps, FRLHT, Bangalore.

The report of the Kullu CAMP workshop presents a detailed assessment study of 42 high altitude medicinal plants of two states in the NW Himalayas/India. The species are assigned to an IUCN threat category and detailed species data sheets are provided. Among the investigated species, only *Saussurea costus* is listed in CITES Appendix I, while *Dactylorhiza hatagirea*, *Nardostachys grandiflora*, *Picrorhiza kurrooa*, and *Podophyllum hexandrum* are in Appendix II. A trade survey revealed that all 42 species are in trade with more than 2/3 of the species being traded for their roots, rhizomes or bulbs. Management recommendations for selected species as well as a bibliography are given. General information on CAMP workshops and the IUCN threat categories are provided. (roh)

VERLET, N. & G. LECLERCQ (1999): The production of aromatic and medicinal plants in the European Union. An economic database for a development strategy. In: TRAFFIC EUROPE (Ed.): Medicinal plant trade in Europe. Proceedings of the first symposium on the conservation of medicinal plants in trade in Europe, 22-23.6.1998, Kew – pp. 121-126, TRAFFIC Europe, s.loc.

VOGEL, H., U. DOLL, M. MUNOZ, I. RAZMILIC, J. SAN MARTIN & G. VIZCARRA (1998): Boldo (*Peumus boldus* Mol.). Vermehrungsversuche und ökophysiologische Untersuchungen am natürlichen Standort

in Chile. – Drogenreport 11 (19): 14-17.

WALTER, S. (1998): The utilization of non-timber forest products in the rainforests of Madagascar. A case study. – Plant Research and Development 47/48: 121-144.

WU, J. & R. CHANG (1999): TRAFFIC creates more links with TCM community. – TRAFFIC Dispatches January: 9.

YANG, LI-XIN, XU JIAN-CHU & LI LIAN-FANG (1999): [The distribution and the present situation of utilization of *Taxus* L. resources in Yunnan province and its protection and sustainable utilization. In Chinese with English summary.] – Journal of Plant Resources and Environment 8: 39-43.

The producing and mailing of this issue was made possible through the generous support of the German Ministry of Environment and the Federal Agency for Nature Conservation.

List of Members

The following list of members is as of 1 June 2000. Please look through it and advise the editor on all errors and missing information (e.g. e-mail addresses).

Prof. Dr. Bill AALBERSBERG
c/o Chemistry Department • University of the South Pacific • Suva • Fiji
Tel: 00679/313-900 x 2416
Fax: 00679/302548, 301305
E-Mail: Aalbersberg@usp.ac.fj

Dr. Mohammed AHMEDULLAH
Indian Subcontinent Plant Specialist Group • SSC/IUCN • C-89, Brij Vihar, P.O. Chander Nagar (near Vivek Vihar, E.Delhi) • Ghaziabad - U.P. 201 011 • India
E-Mail: dr_ahmed@hotmail.com

Prof. Dr. Laurent AKE-ASSI
Centre National de Floristique de l'Université • 22 BP 582 • Abidjan 22 • Ivory Coast
Tel: 00225/448614

Fax: 00225/416728; 444688

Dr. Janis B. ALCORN
Biodiversity Support Programme • c/o WWF US • 1250 24th Street, NW • Washington DC 20037 • USA
Tel: 001/202/778-9697
Fax: 001/202/293-9341
E-Mail: janis.alcorn@wwfus.org

Dr. Edward F. ANDERSON
Desert Botanical Garden • 1201 N. Galvin Parkway • Phoenix, AZ 85008 • USA
Tel: 001/602/754-8105
Fax: 001/602/481-8124
E-Mail: adefa@imap1.asu.edu

Prof. John Thor ARNASON
Department of Biology • University of Ottawa • Faculty of Science • 30 Marie Curie St., P.O.Box 450, Stn. A • Ottawa • Ontario K1N 6N5 • Canada
Tel: 001/613/562-5262
Fax: 001/613/562-5765
E-Mail: jarnason@science.uottawa.ca

Sema ATAY
Dogal Hayati Koruma Dernegi (DHKD) • PK 971 Sirkeci • 34436 Istanbul • Turkey
Tel: 0090/212/528-2030

Fax: 0090/212/528-2040
E-Mail: kelaynak@dhkd.org

Manjul BAJAJ
D-II/2532 • Vasant Kunj • New Delhi - 110 070 • India
Tel: 0091/11/6891695
Fax: 0091/11/6121181
E-Mail: manjul@nde.vsnl.net.in

Dr. Michael J. BALICK
Institute of Economic Botany and Philecology • The New York Botanical Garden • Southern Blvd. & 200 Street • Bronx, New York 10458 • USA
Tel: 001/718/817-8763
Fax: 001/718/220-1029
E-Mail: mbalick@nybg.org

Dr. Nirmal Kumar BHATTARAI
419, Ghattekulo • Dillibazar, Kathmandu • Nepal
Tel: 00977/1/436356
Fax: 00977/1/473020
E-Mail: mansa@cctl.com.np

Dr. Emilio BLANCO CASTRO
c/Titulcia 17-1° • 28039 Madrid • Spain
Tel: 0034/991/5526637
Fax: 0034/991/5526637

Ximena BUITRON CISNEROS
TRAFFIC South America - Regional
Office • c/o IUCN Regional Office for
South America • Av. Atahualpa 955 y
República • Edificio Digicom, 4to piso
• P.O. Box 17-17-62 • Quito • Ecuador
Tel: 00593/2/466-622, -623
Fax: 00593/2/466-624
E-Mail:
ximena.buitron@traffic.sur.iucn.org

Prof. Dr. Robert A. BYE
Jardín Botánico • Instituto de Biología
• Universidad Nacional Autónoma de
México • Apdo. Post. 70-614 • 11860
Mexico • D.F. • Mexico
Tel: 0052/5/616-1297, 622-9057
Fax: 0052/5/616-2326, 622-9046
E-Mail:
rbye@ibunam.ibiologia.unam.mx

Dr. Michel CAMBORNAC
Equipe Yves Rocher pour la Nature •
Laboratoires Yves Rocher • La Croix
des archers • 56200 La Gacilly •
France
Tel: 0033/2/9908-2838
Fax: 0033/2/9908-2893
E-Mail:
michel_cambornac@yrm.com

Prof. Dr. CHAUDHARY MAHEN-
DRA KUMAR
Departamento de Agricultura del
Desierto • Universidad Arturo Prat •
Av. 11 Septiembre, 2120 • 121 Iquique
• Chile
Tel: 0056/57/445190
Fax: 0056/57/445190
E-Mail:
mahendrakumar@hotmail.com

Prof. Dr. Rachid CHEMLI
Association Tunisienne Plantes
Médicinales • Faculté de Pharmacie de
Monastir • Monastir 5000 • Tunisia
Tel: 00216/3/461000
Fax: 00216/3/461830

Dr. Tony CUNNINGHAM
WWF/UNESCO/Kew People and
Plants Initiative • 84 Watkins St •
White Gum Valley • Fremantle, 6162 •
Australia
Tel: 0061/8/93366783
Fax: 0061/8/93366783
E-Mail: peopleplants@bigpond.com

Dr. Ermias DAGNE
Chemistry Department • University of
Addis Ababa • Miazia 27 Square •
P.O. Box 30270 • Addis Ababa •
Ethiopia
Tel: 00251/1/126276; 114854

Fax: 00251/1/551244
E-Mail: eda@telecom.net.et

Prof. Dr. Tuley DE SILVA
International Centre for Science and
High Technology (ICS-UNIDO) •
451/75, Thimbirigasyaya Road •
Colombo 5 • Sri Lanka
Tel: 0094/1/584436
Fax: 0094/1/584436
E-Mail: tdesilva@cga.slt.lk

Fiona Ruth DENNIS
Botanic Gardens Conservation Inter-
national (BGCI) • Descanso House •
199, Kew Road • Richmond • Surrey,
TW9 3AB • United Kingdom
Tel: 0044/20/8332-5953/-4/-5
Fax: 0044/20/8332-5956
E-Mail: frd@bgci.rbgekew.org.uk

Prof. Dr. DEVADAS WINFRED
THOMAS
Dept of Botany • The American
College • Thallakulam • Madurai - 625
002 Tamil Nadu • India
Tel: 0091/452/530967 x 315
Fax: 0091/452/532125
E-Mail: jj@md3.vsnl.net.in (attn.
Winfred Thomas)

Prof. Dr. Elaine ELISABETSKY
Federal University of Rio Grande do
Sul, Brazil • C.P. 5072 • 90041-970
Porto Alegre RS • Brazil
Tel: 0055/51/316-3121; -3183
Fax: 0055/51/316-3121
E-Mail: elisasky@vortex.ufrgs.br

Dr. Doug O. FULLER
Department of Geography • The
George Washington University • 619
21st Street, NW • Washington DC
20052 • USA
Tel: 001/202/994-8073
Fax: 001/202/994-2484
E-Mail: dfuller@gwu.edu

Dr. GANESAN BALACHANDER
Biodiversity Conservation Network
(BCN) • c/o WWF • 1250, 24th Street,
N.W. • Washington DC 20037 • USA
Tel: 001/202/861-8348
Fax: 001/202/861-8324
E-Mail: gballa@mozcom.com

Dr. Nigel P. GERICKE
African Natural Health C.C. • P.O.
Box 937 • Sun Valley 7985 • Cape
Town • South Africa
Tel: 0027/21/7891249
Fax: 0027/21/7891249
E-Mail: ngericke@mweb.co.za

Dr. Shahina Agha GHAZANAFAR
Department of Biology • Sultan
Qaboos University • College of Science
• P.O. Box 36 • Al-Khod 123 • Muscat
• Sultanate of Oman
Tel: 00968/513263
Fax: 00968/513263 (Home)
E-Mail: mirage@gto.net.om

Prof. Dr. Stephan R.P. HALLOY
Crop and Food Research • Invermay
Agricultural Research Centre • Private
Bag 50034 • Mosgiel • New Zealand
Tel: 0064/3/489-3809
Fax: 0064/3/489-3739
E-Mail: halloys@crop.cri.nz

Dr. Alan HAMILTON
WWF International • Panda House,
Weyside Park • Catteshall Lane •
Godalming • Surrey GU7 1XR •
United Kingdom
Tel: 0044/1483/412550
Fax: 0044/1483/426409
E-Mail: ahamilton@wwfnet.org

Dr. Paul HERSCH-MARTINEZ
Instituto Nacional de Antropología e
Historia (INAH) • Matamoros No. 14,
Col. Acapantzingo • CP 62440 •
Cuernavaca, Morelos • Mexico
Tel: 0052/73/144046
Fax: 0052/73/123108
E-Mail: leon@dunsun.cti.uaem.mx

Dr. Steven KING
Shaman Pharmaceuticals • 213 East
Grand Avenue • South San Francisco •
CA 94080-4812 • USA
Tel: 001/650/952-7070
Fax: 001/650/952-8367
E-Mail: sking@shaman.com

Dr. Sonia LAGOS-WITTE
Programa TRAMIL-Centroamerica •
Apartado Postal 64 • Managua •
Nicaragua
Tel: 00505/2/658311
Fax: 00505/2/657283
E-Mail: planmed@ibw.com.ni

Sarah LAIRD
317 West 95th Street # 7E • New
York, NY 10025 • USA
E-Mail: sarahlaird@aol.com

Dr. John D.H. LAMBERT
The World Bank • AFTR2, Room
J6-171 • 1818 H Street, N.W. •
Washington DC, 20433 • USA
Tel: 001/473/473-3913
Fax: 001/202/473-5147
E-Mail: jlambert@worldbank.org

Dr. Dagmar LANGE
Jahnstraße 16 • 71642 Ludwigsburg •
Germany
Tel: 06341/280-188
Fax: 06341/280-143
E-Mail: dagmarlange@t-online.de

Dr. Danna LEAMAN
Executive Secretary • Medicinal Plant
Specialist Group of the IUCN-SSC •
Canadian Museum of Nature • P.O.
Box 3443 • Station D. • Ottawa,
Ontario K1P 6P4 • Canada
Tel: +1/613/364-4140
Fax: +1/613/364-4022
Email: dleaman@mus-nature.ca

Christine LEON
Royal Botanic Gardens Kew • Chinese
Medicinal Plant Authentication Centre
• Kew, Richmond • Surrey, TW9 3AB
• United Kingdom
Tel: 0044/20/8332-5702
Fax: 0044/20/8332-5197
E-Mail: c.leon@rbgkew.org.uk

Dr. Richard LIEBMANN
United Plant Savers • P.O. Box
437258 • Kamuela, HI 96743 • USA
E-Mail: liebmann@ilhawaii.net

Edelmira LINARES MAZARI
Jardin Botánico del Instituto de
Biología UNAM • Ciudad Univer-
sitaria • Apdo. Post. 70-614 • 04510
México, D.F. • Mexico
Tel: 0052/5/622-9047; 50
Fax: 0052/5/622-9046
E-Mail: mazari@mail.ibiologia.unam.mx

Dr. Samar Bahadur MALLA
Department of Plant Resources •
22/348 Ganabhal • Kathmandu,
Ganabhal, Khichhapokhari • Nepal
Tel: 00977/1/220262
Fax: 00977/1/242516

Dr. Narayan Prasad MANANDHAR
Nepalese Resource Centre for
Indigenous Knowledge • Ka 3-16,
Nayan Baneshwar • P.O. Box 3389 •
Kathmandu • Nepal
Tel: 00977/1/479436
Fax: 00977/1/225145; 479436
E-Mail: sanjay@freak_st.mos.com.np

Nina MARSHALL
TRAFFIC East/Southern Africa -
Kenya Office • P.O. Box 68200 •
Nairobi • Kenya
Tel: 00254/2/577943
Fax: 00254/2/577943
E-Mail: traffic@iconnect.co.ke

Dr Victor Ivanovich MELNIK
Central Republic Botanical Garden •
Ukrainian Academy of Sciences •
Timiryazevska Str., 1 • 252014 Kiev •
Ukraine
Tel: 00380/44/295-0480
Fax: 00380/44/295-2649
E-Mail: melnik@botanical-garden.kiev.ua

Susan MINTER
Chelsea Physic Garden • 66 Royal
Hospital Road • London SW3 4HS •
United Kingdom
Tel: 0044/20/7352-5646 x 2
Fax: 0044/20/7376-3910
E-Mail: sue@cpgarden.demon.co.uk

Magdalena MLADENOVA
Trade Research & Promotion Institute
with the Ministry of Trade and
Tourism • N3-A, 165 Str., Complex
"Izrev" • 1797 Sofia • Bulgaria
Tel: 00359/2/734046; 705154
Fax: 00359/2/705154
E-Mail: agribiz@aster.net; instrade@
aster.net

Prof. Dr. Daniel E. MOERMAN
Dept. of Behavioral Sciences •
University of Michigan-Dearborn •
4901 Evergreen Rd. • Dearborn, MI
48128 • USA
Tel: 001/313/593-5016
Fax: 001/313/593-5016
E-Mail: dmoerman@umich.edu

Prof. V.P.K. NAMBIAR
IDRC Medicinal Plant Conservation
Project • Arya Vaidya Sala • Kottakkal
- 676 503 • Malappuram District,
Kerala • India
Tel: 0091/493-74-2220
Fax: 0091/493-74-2572

Rafael Angel OCAMPO SANCHEZ
Bougainvillea S. A. (Jardin Agroeco-
lógico) • Apartado Postal 8146-1000 •
San José • Costa Rica
Tel: 00506/2363775
Fax: 00506/2363775

Sara OLDFIELD
The Old Plough • 2 Caxton Road •
Great Gransden, Nr. Sandy • Beds.
SG19 3BE • United Kingdom
Tel: 0044/1223/571000
Fax: 0044/1223/461481
E-Mail: sara ffi@aol.com

Prof. Dr. PEISHENGJI
Dept. of Ethnobotany • The Kunming
Institute of Botany, CAS • Kunming
650204 • China

Tel: 0086/871/5150-660
Fax: 0086/871/5150-227
E-Mail: peisj@990.net

Dr. Nat QUANSAH
Chez NINAH • Ankisirasira Sud (2
km) • Morondava 619 • Madagascar
Tel: 00261/209552525
E-Mail: quansah@bow.dts.mg

Ajay RASTOGI
Eastern Himalaya Programme •
Bungalow no. 2, Bhujipani • Bag-
dogra - 734 422 • Dist. Darjeeling,
West Bengal • India
Tel: 00977/1/525312; 525313
Fax: 00977/1/524509; 536747
E-Mail: atree@dte.vsnl.net.in

Dr. Gopal Singh RAWAT
Wildlife Institute of India (WII) •
Faculty of Wildlife Biology • P.O. 18,
Chandrabani • Dehra Dun - 248 001,
Uttar Pradesh • India
Tel: 0091/135/64011/-2,3,4,5
Fax: 0091/135/64011-7
E-Mail: rawatg@wii.gov.in

Dr. Marileen REINDERS
Department of Cultural Anthropology •
Utrecht University • P.O. Box 80.140 •
3508 TC Utrecht • The Netherlands
Tel: 0031/30/253-1903, -2111
Fax: 0031/30/253-4666
E-Mail: m.reinders@fss.uu.nl

Prof. Moh REJDALI
Institut Agronomique et Vétérinaire
Hassan II • Dpt. d'Ecologie Végétale •
B.P. 6202 Rabat Instituts • Rabat •
Morocco
Tel: 00212/7/774093
Fax: 00212/7/774093
E-Mail: rejdali@iav.refer.org.ma

Christopher S. ROBBINS
TRAFFIC North America/WWF-US •
1250, 24th Street NW • Washington
DC 20037 • USA
Tel: 001/202/778-9678
Fax: 001/202/775-8287
E-Mail: christopher.robbs@wwfus.org

Dr. SANAGAVARAPU VEDAVA-
THY
S.V. Arts College, Tirupati • B-23,
Vaikunatapuram, M.R. Palli • Tirupati
- 517 502, Andhra Pradesh • India
Tel: 0091/8574/29605
Fax: 0091/8574/27606
E-Mail: cybernet@cyberservices.com

Dr. Anca SARBU
Botany Department • Faculty of Bio-
logy • University of Bucharest • Aleea
Portocalelor 1-3 • 77206 Bucharest •
Romania
Tel: 0040/1/6387175
Fax: 0040/1/9614090
E-Mail: asarbu@bio.bio.unibuc.ro

Dr Y. K. SARIN
101/8 Chandralok Colony • Rajpur
Road • Dehra Dun - 248 001, Uttar
Pradesh • India
Tel: 0091/135/748184
Fax: 0091/135/749560

Dr. Niranjan Chandra SHAH
MS-78, Sector 'D' • Aliganj, Lucknow -
226 024 U.P. • India
Tel: 0091/522/326489
Fax: 0091/522/326489
E-Mail: ncshah@hotmail.com

Patricia SHANLEY
The Durrell Institute of Conservation
Biology • 17 South Church Street •
Honeoye Falls, New York 14472 •
USA
Tel: 001/716/624-9608
E-Mail: trishanley@aol.com

Dr. Ernest SMALL
Eastern Cereal and Oilseed Research
Centre • Agriculture and Agri-Food
Canada (ECORC) • Central Experi-
mental Farm • Room 212, Saunders
Building • Ottawa, ON K1A 0C6 •
Canada

Tel: 001/613/759-1370
Fax: 001/613/759-1599
E-Mail: smalle@em.agr.ca

Dr. Carsten SMITH OLSEN
The Royal Veterinary and Agricultural
University • Department of Economics
and Natural Resources • Unit of
Forestry • Rolighedsvej 23 • 1958
Frederiksberg C • Copenhagen •
Denmark
Tel: 0045/3528-2292
Fax: 0045/3528-2671
E-Mail: olsen.carsten@hotmail.com

Bhishma P. SUBEDI
Asia Network for Small Scale Biore-
sources (ANSAB) • P.O. Box 3635 •
Kathmandu • Nepal
Tel: 00977/1/497547, 473974
Fax: 00977/1/487916
E-Mail: ansab@mos.com.np

Vinay TANDON
TALLAND • Shimla - 171 001 • India
E-Mail: tandon1@nde.vsnl.net.in

Paul VANTOMME
FAO • Wood and Non-Wood
Utilization Branch • FOPW, Forest
Products Division, Forestry Depart-
ment • Via Terme di Caracalla • 00100
Roma • Italy
Tel: 0039/06/570-54064
Fax: 0039/06/570-55618
E-Mail: paul.vantomme@fao.org

Devendra Kumar VED
Foundation for the Revitalization of
Local Health Traditions (FRLHT) • 50
M.S.H. Layout • Anand Nagar,
Bangalore - 560 024 • India
Tel: 0091/80/333-0348
Fax: 0091/80/333-4167
E-Mail: root@flht.ernet.in

Vivienne WILLIAMS
Department of Botany • University of
the Witwatersrand • Private Bag 3 •
P.O. Wits 2050 • Johannesburg • South
Africa
Tel: 0027/11/716-2182
Fax: 0027/11/403-1429
E-Mail:
vivienne@gecko.bi.ol.wits.ac.za

Dr. Eva ZAMBORI-NEMETH
University of Horticulture and Food
Industry • Department of Medicinal
Plant Production • Villányi ut 29/31 •
P.O. Box 53 • 1518 Budapest •
Hungary
Tel: 0036/1/1664998
Fax: 0036/1/1664998
E-Mail: drog@hoya.kee.hu

Asst. Prof. Dr. ZHAO DE-XIU
Institute of Botany • Academia Sinica •
20 Nanxincun • Xiangshan, Haidian
District • Beijing 100093 • China
Tel: 0086/010/62591431 ext.6201
Fax: 0086/010/62590833
E-Mail: zhaodx@bj.col.com.cn

Medicinal Plant Conservation is edited and produced by:

Bundesamt für Naturschutz • Uwe Schippmann • Chair of the Medicinal
Plant Specialist Group • Bundesamt für Naturschutz • Konstantinstraße
110 • 53179 Bonn • Germany • Tel.: +49/228/8491-136 • Fax: +49/228/
8491-119 • E-mail: schippmu@bfm.de. Any article that is not signed by
an author's name is in the responsibility of the chair.

Contributions for the next issue of *Medicinal Plant Conservation* are most
welcome and should be sent to Natalie Hofbauer (e-mail: hofbaun@
bfm.de) as word processing files. Files in ASCII or Word Perfect for
Windows are equally welcome.