

FIRST INTERNATIONAL SYMPOSIUM ON THE CONSERVATION OF MEDICINAL PLANTS IN TRADE IN EUROPE

22-23 JUNE 1998

ROYAL BOTANIC GARDENS, KEW

UNITED KINGDOM



Pheasant's Eye *Adonis vernalis*
Credit : Éva Németh

organised by TRAFFIC Europe
in collaboration with World Wide Fund for Nature,
the IUCN/SSC Medicinal Plant Specialist Group
and the Royal Botanic Gardens, Kew.

TRAFFIC
EUROPE



Funding for the symposium has been kindly donated by the Rufford Foundation, the UK Department of Environment, Transport and the Regions and the Bundesamt für Naturschutz



Bundesamt für Naturschutz

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SUMMARY

FIRST INTERNATIONAL SYMPOSIUM ON THE CONSERVATION OF MEDICINAL PLANTS IN TRADE IN EUROPE

JUNE 22 - 23, 1998

ROYAL BOTANIC GARDENS, KEW, UNITED KINGDOM

More than 120 plant specialists, government and industry representatives and conservationists attended the First International Symposium on the Conservation of Medicinal Plants in Trade in Europe that was held on 22 and 23 June 1998 in the Royal Botanic Gardens, Kew, in the United Kingdom. The event, organised by TRAFFIC Europe in collaboration with the IUCN/SSC Medicinal Plant Specialist Group, World Wide Fund for Nature UK office and the Conventions and Policy Section of Kew Gardens, provided a platform for discussions and presentations of facts related to the conservation of plant species, whether native to Europe or not, that are traded for medicinal and aromatic purposes in Europe. Funding for the symposium was kindly donated by the Rufford Foundation, the UK Department of Environment, Transport and the Regions and the German Federal Agency for Nature Conservation.

The symposium was divided up into 5 sections : an introductory overview of the medicinal and aromatic plant trade in Europe and 4 themes related to the exploitation of medicinal plants in different European countries of origin (theme 1); to the management regimes regulating the exploitation of these plants in specific countries of origin as well as the access to the market of plant based pharmaceutical products (theme 2); to the Conventions and International Agreements applicable to the exploitation of and trade in medicinal plants (theme 3); and to workable conservation solutions ensuring the sustainable use of this group of plants (theme 4). Dr Uwe Schippmann, chairman of the IUCN Medicinal Plant Specialist Group, closed the meeting by sharing some summary remarks and conclusions with the participants.

Overview of the medicinal and aromatic plant trade in Europe

The different presentations at the symposium shed light on certain characteristics and trends of the European market for medicinal and aromatic plants. The importance of this market in terms of species (at least 2,000 taxa are used on a commercial basis in Europe), volumes (annual European imports averages 120,000 tons¹) and values (European imports are valued at more than USD 335 million² annually) was highlighted. European imports of this plant material represent about one-quarter of the global market volumes and values. Germany is predominant in Europe. It shows high import and export volumes, and acts as a link between European suppliers (mainly eastern and south-eastern countries) and consumers (mainly west and central countries). According to the results of a recent study undertaken by the European Commission on the production of aromatic and medicinal plants in different countries of the European Union (EU), the European market for this type of products was described as "restrictive, competitive, often secretive and, for an individual producer, practically impenetrable".

Different speakers described Europe's herbal renaissance in recent years, with an increase in consumption of natural remedies as well as plant-based cosmetics and household products. This increased use of plant-based medicinal products in Europe is demonstrated by an increase of 20 % of trade in medicinal and aromatic plant material in Europe between 1992 and 1996 (last year for which figures were available). The same phenomenon is occurring in the USA where the size and value of the herbal market is growing at a rate of 15-20 % per year.

The fact that the European population is ageing is also likely to lead to an increase of the demand for medicinal and health care products in the future. Systems recently established at EU level to ease and harmonise marketing authorisation for phytomedicines may also contribute in the long run to their increased use on the EU pharmaceutical market.

¹ Import volumes of medicinal and aromatic plant material included in tariff heading N°292.4 of the Standard International Trade Classification Revision 3 Code.

² Import values of medicinal and aromatic plant material included in tariff heading N°292.4 of the Standard International Trade Classification Revisions 3 Code.

According to trade surveys undertaken in eight different European countries, and summarised in a recent TRAFFIC publication "Europe's Medicinal and Aromatic Plants: Their Use, Trade and Conservation", at least 150 medicinal and aromatic plant species are threatened as a result of overcollection, destructive harvesting techniques as well as habitat loss and habitat changes in one or several European countries of their area of distribution. The species that are described in detail in the report are the following : *Adonis vernalis*, *Arctostaphylos uva-ursi*, *Arnica montana*, *Cetraria islandica*, *Drosera rotundifolia*, *Gentiana lutea*, *Glycyrrhiza glabra*, *Gypsophila* spp., *Ankyropetalum gypsophylloides*, *Menyanthes trifollata*, species of Orchidaceae that are used in the production of salep, *Paeonia* spp., *Primula* spp., *Ruscus aculeatus* and *Sideritis* spp. Two of these taxa, namely *Arnica montana* and *Drosera* spp. were the subject of specific talks at the symposium.

In addition to European species, many other medicinal and aromatic plants are imported in large quantities into Europe from all over the world. Some are unsustainably harvested in countries of origin to meet the demand of the European industry. This was illustrated at the symposium by presentations on the exploitation and trade of two African species, *Prunus africana* and *Harpagophytum procumbens*, and of one Asian species, *Taxus wallichiana*. Speakers stressed that exports of both *Prunus africana* and *Harpagophytum procumbens* to Europe had increased in recent years, resulting in further overexploitation and depletion of remaining wild stocks in certain parts of their range.

From different talks it was clear that no or little information exists on the population status of a great number of medicinal and aromatic plant species that are traded in Europe. Further research is needed in order to obtain this information. Species specifically mentioned in this regard included native Turkish medicinal and aromatic plants and Spanish thyme species. Statistics on imports and exports of individual medicinal and aromatic plant species into or from Europe were reportedly difficult to obtain because Customs trade categories usually lump together a large number of species.

Changes in the market of medicinal and aromatic plants in Eastern European countries since the fall of Communism

From the different talks and discussions at the symposium it was made clear that the wild harvesting of medicinal and aromatic plants provides significant incomes to rural communities in Eastern European countries. The collapse of the Communist rule at the beginning of the 1990s has deeply modified the management and controls of the production, processing and trade in medicinal and aromatic plants in these countries. These activities used to be organised by a small number of state-controlled enterprises but are now undertaken by a great number of private companies. In Georgia and Albania, it was clear that cultivation of medicinal and aromatic plants as organised before the fall of Communism through collective farms, was now in decline. Most collective farms in Georgia have now become private property and are growing fruits and vegetables. In Albania, lands that were dedicated to cultivation of medicinal and aromatic plants are either abandoned, dedicated to other crops or developed as real estate. One of the speakers also underlined the fact that the medicinal and aromatic plant production in Eastern European countries is now depending nearly entirely on the demand of Western European countries.

Conventions and International Agreements applicable to the exploitation of and trade in medicinal and aromatic plants

Legal tools that are available to ensure the sustainable exploitation and trade of medicinal plants were discussed.

The Convention on Biological Diversity of 1993 provides a framework for the fair and equitable sharing of the benefits that arise from the use of genetic resources, including medicinal and aromatic plants. There is a growing number of countries that has already introduced national laws, policy measures or administrative procedures to regulate the way people may acquire their genetic resources. Some of these countries have provisions in their laws that ensure that a part of the benefits arising from access to genetic resources goes towards conservation. To conserve the genetic resources in the future, some kind of incentive is necessary. In that regard, the need for the provider to enter in partnership with the user and get an added value to its genetic resource was stressed as of particular importance.

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) regulates since 1975 the international trade in wild species of fauna and flora that are or may be threatened with extinction, including certain medicinal and aromatic plant species. CITES is one of the most successful international conservation treaties to date with a membership of over 140 countries in the world. It prohibits the trade in wild species threatened with extinction that are listed in Appendix I and regulates the trade of species listed in Appendix II through the issuance of an export permit by the exporting country. Prior to the issuance of the export permit, two conditions are to be complied within the exporting country : legal acquisition and non detrimental findings. For the latter condition, the CITES Scientific Authority of the export country has to decide, on the basis of the population status of the species in the country, whether the export is not detrimental to the survival of the species. Few plant species are listed on the CITES Appendices because of international trade for medicinal and aromatic purposes, but more can be listed in the future. Parties to CITES should make full use of the criterion of non-detrimental findings for Appendix II medicinal and aromatic plants in order to ensure that the species is sustainably exploited in countries of origin. Mechanisms that will help exporting countries to implement this provision will probably be adopted at the next meeting of the Conference of the Parties to CITES to be held in the year 2000. Medicinal and aromatic plant species listed on CITES Appendix II include *Prunus africana*, *Taxus wallichiana*, *Panax quinquefolius*, *Hydrastis canadensis* and *Pterocarpus santalinus*. One of the speakers informed the participants that a co-operative arrangement between dealers, states, national governments and NGOs was planned in the USA to monitor the harvest, processing and trade of CITES and non-CITES medicinal plant species and to identify species of potential concern for domestic action, thereby avoiding the need for CITES protection.

The recent European Union CITES Regulation of 1997 implements CITES in the EU but also contains a number of measures that are stricter than CITES, including strict import conditions for all species included in Annex B (similar to CITES Appendix II) and the monitoring of imports into the EU of non CITES species (including seven European medicinal plant species) that are included in Annex D. The EU CITES Regulation provides for a quick procedure to amend Annexes B to D so as to adapt to conservation needs. The EU CITES Regulation is a powerful and flexible tool that can be used to ensure the sustainable exploitation of wild medicinal and aromatic plant specimens that are imported into the EU which is, as mentioned earlier, a main market for this type of products.

The European Union Directive on the conservation of natural habitats and wild fauna and flora of 1992 makes provisions for the sustainable management of a number of animal and plant species that are listed in its Annex V (including 6 medicinal and aromatic plants). Member States of the EU have no obligations whatsoever to take management measures concerning these species, nor must they report on them to the European Commission.

One of the speakers reported that a working group with representatives of the government, scientific institutions, pharmaceutical sector, biological farming associations and nature conservation organisations had recently been established in Georgia to prepare legislation for the certification of wild plants that are sustainably harvested in the country and destined for export.

Workable conservation solutions ensuring the sustainable use of medicinal and aromatic plants

Solutions to ensure the sustainable exploitation of medicinal and aromatic plants in trade in Europe were discussed at length. The importance of using non-detrimental harvesting techniques was discussed, in particular for *Arnica montana*, *Harpagophytum procumbens* and European species of *Drosera*. In Finland, educational programmes on sustainable harvesting techniques are set up for wild collectors of *Drosera* plants.

Cultivation of threatened species, when possible, should be promoted to alleviate pressure from wild populations. This should be conducted at an early stage, before the species becomes endangered in the wild. Cultivation is indeed an expensive and slow process that may take years before it can be applied successfully, if at all, at commercial level. Examples of threatened medicinal plants that are being cultivated that were given at the symposium include *Prunus africana*, *Drosera rotundifolia* and *Drosera intermedia*, *Arnica montana*, *Harpagophytum procumbens* and *Taxus wallichiana*. For *Prunus africana*, cultivation schemes have come too late to supplement decline in wild populations. This is unfortunate because the depletion of wild stocks could have been foreseen a long time ago given the understanding of the species biology and the parts that were harvested. It is regretful that the industry didn't react earlier. One

speaker also stressed the fact that "domestication" of wild collected native plants of commercial importance in supplier countries (in particular Nepal) was necessary to secure regular sources of herbal raw material and therefore stabilise the production.

Cultivation should always be undertaken together with mechanisms setting up harvesting quotas for natural populations based on good scientific data. A management system for harvesting, processing and trading in threatened medicinal and aromatic plants was, for example, established in 1991 in Bulgaria. This country is the main supplier to Europe of wild raw medicinal and aromatic plant material. In the framework of this system, species, quantities and parts of plants allowed to be collected from which districts as well as the share allowed for the internal versus external market have been published every year since 1992 in the Official Gazette by the Ministry of Environment. The quota system is based on information provided by experts from government and scientific institutions on the population status of the various species.

Different speakers advocated that the industry get directly involved in the sustainable production of medicinal and aromatic plant material. In addition to safety, efficacy and quality, the industry should also take into account the responsible sourcing of its plant-based products. Private companies can contribute to the sustainable use of plants and have to internalise the related costs. If these companies do not get more involved, the supply of raw material on the market will be at risk of diminishing and even disappearing altogether. Some specific examples were presented at the symposium to illustrate the different kinds of involvement of private companies in projects of controlled cultivation of endangered medicinal plants (Sertürner on cultivation of *Harpagophytum* in Namibia; Weleda on cultivation of *Arnica montana* in Germany, Switzerland and France; Dabur Ltd on cultivation of *Taxus* specimens in Nepal). The investment of the pharmaceutical sector in Nepal, for example, was said to be key in helping to establish successful long-term sustainable production that can help secure economic and social stability.

One speaker talked about the possible involvement of private companies in controlled management of protected habitats which may be a more effective tool for conservation than total restriction.

Better access to information and technology by private enterprises in supplier countries is also required. This would enable local companies to process the raw plant material produced in the country and therefore add a value to it. An example of processing of raw plant material that was given at the symposium was the production of essential oils in Nepal. Market access was also determined as key to the commercial success of local companies in supplier countries.

Local communities that live next to the resource have to benefit from its exploitation by external companies. This would be an incentive for them to conserve the resource instead of overexploiting it.

Finally, the need for collaboration between the private sector, NGOs and rural farming communities was reiterated on several occasions. All have to work together to ensure that future medicinal and aromatic product supplies come from a sustainable source. One speaker pleaded specifically for more exchanges of experiences and improved co-operation among the pharmaceutical industry, nature conservation organisations, research institutions and government agencies for the sustainable exploitation and future supply of wild medicinal and aromatic plants. This collaboration would include the establishment of common objectives and decisions, the elaboration of national programmes and the setting up of study groups.

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PROGRAMME AND TIMETABLE

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Royal Botanic Gardens, Kew

22 - 23 June 1998

FINAL PROGRAMME

Introduction - Steven Broad, TRAFFIC International

Welcome speakers :

Prof. Sir Ghillian Prance, Royal Botanic Gardens, Kew, UK

Prof. Dr Martin Uppenbrink, Bundesamt für Naturschutz, Bonn, Germany

STATUS AND TRENDS OF MEDICINAL AND AROMATIC PLANT TRADE IN EUROPE : AN OVERVIEW

Dr Dagmar Lange, IUCN Medicinal Plant Specialist Group, Germany

THEME 1 - FROM COLLECTORS TO USERS

Introduction - Tom De Meulenaer, TRAFFIC Europe, Belgium

The wild medicinal and aromatic plant trade in Turkey - Prof. Neriman Özhatay, University of Istanbul, Turkey

The trade in medicinal plants in the United Kingdom - Fiona Dennis, Botanic Gardens Conservation International, UK.

Organisation of harvesting in Albania - Andrian Vaso, Aquarius, Albania

Harvesting of Thymus in Spain - Dr Emilio Blanco Castro, Spain

Changes in the market of medicinal plants since the fall of communism in Hungary - Prof. Dr Jenő Bernath, University of Horticulture and Food Industry, Hungary

THEME 2 - MANAGEMENT REGIMES AND REGULATIONS

Introduction - Sara Oldfield, World Conservation Monitoring Centre, United Kingdom

ESCOP and WHO monographs - a potential scientific basis for a rational assessment in Europe under specific aspects of the regulatory situation - Dr Barbara Steinhoff, German Medicines Manufacturers Association, Germany

Regulations concerning the use and trade of medicinal plants in France - Jacques Fleurentin, Société Française d'Ethnopharmacologie and University of Metz, France

Trade in Prunus africana - Dr Tony Cunningham, WWF/UNESCO/Kew "People and Plants Initiative", Australia

Management system of harvesting in Bulgaria - Magdalena Mladenova, Agribusiness Centre, Bulgaria

Management of medicinal plant species in USA - Chris Robbins, TRAFFIC USA, USA

THEME 3 - CONVENTIONS AND INTERNATIONAL AGREEMENTS

Introduction - Rob Hepworth, Chairman CITES Standing Committee, United Kingdom

The Biodiversity Convention and its medicinal plant implications - Kerry ten Kate, Conventions and Policy Section, Royal Botanic Gardens, Kew, UK

The role of CITES Convention in medicinal plant monitoring and conservation - Dr Ger Van Vliet, CITES Secretariat, Switzerland

Medicinal plants: The EU CITES Regulation and the Fauna, Flora and Habitats EU Directive - Geert Raeymaekers, Ecosystems Ltd, Belgium

THEME 4 - WORKABLE SOLUTIONS

Introduction - Danna Leaman, IUCN Medicinal Plant Specialist Group, Switzerland

The production of aromatic and medicinal plants in Europe: An economic database for a development strategy - Guy Leclercq, CERDEPPAM, France

Assuming responsibility for a protected plant: Weleda's endeavour to secure a company's provision with Arnica montana - Andreas Ellenberger, Weleda, Switzerland

Can we replace collection of Drosera by cultivation? - Dr Bertalan Galambosi, Mikkeli, Finland

Improvement of pharmaceutical drug quality: A cultivation project for Harpagophytum procumbens in Namibia - Dr Matthias Schmidt, Sertürner Arzneimittel, Germany

Sustainable cultivation of Taxus - Denzil Phillips, Denzil Phillips International Ltd, UK

Demand stimulated sustainable supply for endangered Nepalese medicinal plants - Klaus Dürbeck, Klaus Dürbeck Consulting, Raubling, Germany.

With one another or against each other - Preservation of endangered species and pharmaceutical use of medicinal plants - Alfred Zink, Martin Bauer GmbH, Germany

Certification of sustainably harvested products - Udo Hirsch, CUNA Georgica, Georgia.

CONCLUSIONS - Dr U. Schippmann, German Federal Agency for Nature Conservation, IUCN Med. Plant Specialist Group

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22 - 23 June 1998

FINAL TIMETABLE

MONDAY 22

- 08h30 - 10h00 Registration of participants
10h00 - 10h10 Introduction (Steven Broad, TRAFFIC International)

Welcome speakers :

- 10h10 - 10h20 Prof. Sir Ghillian Prance, Royal Botanic Gardens, Kew, UK
10h20 - 10h30 Prof. Dr Martin Uppenbrink, Bundesamt für Naturschutz, Bonn, Germany

- 10h30 - 11h15 **STATUS AND TRENDS OF MEDICINAL AND AROMATIC PLANT TRADE IN EUROPE : AN OVERVIEW** - Dr Dagmar Lange, IUCN Medicinal Plant Specialist Group, Germany

- 11h15 - 11h35 Coffee Break

THEME 1 - FROM COLLECTORS TO USERS

- 11h35 - 11h40 *Introduction* - Tom De Meulenaer, TRAFFIC Europe, Belgium
11h40 - 12h10 *The wild medicinal and aromatic plant trade in Turkey* - Prof. Neriman Ozhatay, University of Istanbul, Turkey
12h10 - 12h35 *Organisation of harvesting in Albania* - Andrian Vaso, Aquarius, Albania
12h35 - 13h00 *Harvesting of Thymus in Spain* - Dr Emilio Blanco Castro, Spain
13h00 - 14h20 Lunch

- 14h20 - 14h45 *Changes in the market of medicinal plants since the fall of communism in Hungary* - Prof. Dr Jeno Bernath, University of Horticulture and Food Industry, Hungary

THEME 2 - MANAGEMENT REGIMES AND REGULATIONS

- 14h45 - 14h50 *Introduction* - Sara Oldfield, World Conservation Monitoring Centre, United Kingdom
14h50 - 15h15 *ESCAP and WHO monographs - a potential scientific basis for a rational assessment in Europe under specific aspects of the regulatory situation* - Dr Barbara Steinhoff, German Medicines Manufacturers Association, Germany
15h15 - 15h40 *Regulations concerning the use and trade of medicinal plants in France* - Jacques Fleurentin, Société Française d'Ethnopharmacologie and University of Metz, France
15h40 - 16h05 *Trade in Prunus africana* - Dr Tony Cunningham, WWF/UNESCO/Kew "People and Plants Initiative", Australia
16h05 - 16h25 Coffee Break
16h25 - 16h50 *Management system of harvesting in Bulgaria* - Magdalena Mladenova, Agribusiness Centre, Bulgaria

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16h50 - 17h15 *Management of medicinal plant species in USA* - Chris Robbins, TRAFFIC USA, USA

THEME 3 - CONVENTIONS AND INTERNATIONAL AGREEMENTS

17h15 - 17h20 *Introduction* - Rob Hepworth, Chairman CITES Standing Committee, United Kingdom

17h20 - 17h45 *The Biodiversity Convention and its medicinal plant implications* - Kerry ten Kate, Conventions and Policy Section, Royal Botanic Gardens, Kew, UK

17h45 - 19h15 **Cocktail**

TUESDAY 23

09h00 - 09h25 *The role of CITES Convention in medicinal plant monitoring and conservation* - Ger Van Vliet, CITES Secretariat, Switzerland

09h25 - 09h50 *Medicinal plants : the EU CITES Regulation and the Fauna, Flora and Habitats EU Directive* - Geert Raeymaekers, Ecosystems Ltd, Belgium

09h50 - 10h15 *The trade in medicinal plants in the United Kingdom* - Fiona Dennis, Botanic Gardens Conservation International, UK

10h15 - 10h55 **Coffee Break (Poster session)**

THEME 4 - WORKABLE SOLUTIONS: OPTIONS FROM THE FIELD

10h55 - 11h00 *Introduction* - Danna Leaman, IUCN Medicinal Plant Specialist Group, Switzerland

11h00 - 11h25 *The production of aromatic and medicinal plants in Europe : An economic database for a development strategy* - Guy Leclercq, CERDEPPAM, France

11h25 - 11h50 *Assuming Responsibility for a protected plant: Weleda's endeavour to secure a company's provision with *Arnica montana** - Andreas Ellenberger, Weleda, Switzerland

11h50 - 12h15 *Can we replace collection of *Drosera* by cultivation?* - Dr Bertalan Galambosi, Mikkeli, Finland

12h15 - 13h45 **Lunch**

13h45 - 14h10 *Improvement of pharmaceutical drug quality: A cultivation project for *Harpagophytum procumbens* in Namibia* - Dr Mathias Schmidt, Sertürner Arzneimittel, Germany

14h10 - 14h35 *Sustainable cultivation of *Taxus** - Denzil Phillips, Denzil Phillips International Ltd, UK

14h35 - 15h00 *Demand stimulated sustainable supply for endangered Nepalese medicinal plants* - Klaus Dürbeck, Klaus Dürbeck Consulting, Germany

15h00 - 15h25 *With one another or against each other - Preservation of endangered species and pharmaceutical use of medicinal plants* - Alfred Zink, Martin Bauer GmbH, Germany

15h25 - 15h50 *Certification of sustainably harvested products* - Udo Hirsch, CUNA Georgica, Georgia.

15h50 - 16h10 **Coffee Break**

CONCLUSIONS

16h10 - 16h30 Dr Uwe Schippmann, Federal Agency for Nature Conservation, IUCN Medicinal Plant Specialist Group, Bonn, Germany

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ABSTRACTS OF PRESENTATIONS

MEDICINAL PLANT TRADE IN EUROPE: CONSERVATION AND SUPPLY
ROYAL BOTANICAL GARDENS, KEW

22-23 JUNE 1998

WELCOME SPEAKERS

PROFESSOR SIR GHILLEAN PRANCE, F.R.S., M.A., D.Phil., F.L.S.

Ghilleen Tolmie Prance has been Director of the Royal Botanic Gardens, Kew since 1988. Born in Suffolk, England on 13th July 1937, he was educated at Malvern College, Worcestershire and Keble College, Oxford where he obtained a B.A. in Botany (1960) and a D.Phil. in 1963 for his "Taxonomic Study of Chrysobalanaceae".

He began his career with The New York Botanical Garden in 1963 as a research assistant, subsequently becoming B.A. Krukoff Curator of Amazonian Botany, Director and then Vice-President of Research, and finally Senior Vice President for Science in 1981. He also set up the Garden's Institute of Economic Botany of which he was the first Director from 1981-1988.

Sir Ghilleen was trained as a plant taxonomist and has spent over eight years on field work and botanical exploration in Amazonian Brazil. He has a world-wide interest in the sustainable development of rainforest ecosystems and conservation generally; as well as being the author of fourteen books and editor of a further eleven, he has published over 320 papers of both scientific and general interest on plant systematics, plant ecology, ethnobotany and conservation.

In addition to his various duties at The New York Botanical Garden, Sir Ghilleen was the founder Director of graduate studies at the Instituto Nacional de Pesquisas da Amazonia (INPA) in Manaus, Brazil where he set up programmes in botany, ecology, entomology and ichthyology. He is an adjunct Professor of the City University at New York and a Visiting Professor at the University of Reading; from 1983-88, he was Visiting Professor in Tropical Studies at the School of Forestry and Environmental Studies of Yale University. He is a Fellow of the Linnean Society of London and President 1997-2000, Fellow of The Royal Geographical Society, the Explorers Club and the American Association for the Advancement of Science, and has been President of the Association of Tropical Biology (1979-80), the American Association of Plant Taxonomists (1984-85) and the Systematics Association (1989-1991).

Sir Ghilleen holds Honorary Doctorates from the Universities of Kent, Portsmouth, Kingston-upon-Thames, St Andrews, University of Bergen in Norway, Göteborg University in Sweden, Florida International University and the University of Sheffield for his work on Amazonian conservation. He is a foreign member of the Academy of Sciences of Brazil, Denmark and Sweden; his honours include the Diploma Honora ao Mérito from INPA, Brazil (1978), the Distinguished Service Award of the New York Botanical Garden (1986), the Henry Shaw Medal of the Missouri Botanical Garden (1988), the Linnean Medal for Botany (1990), the Patron's Medal of the Royal Geographical Society (1994), the International Award of Excellence of the Botanical Research Institute of Texas (1998), Corresponding Member of the Botanical Society of America (1994) and Ordem Nacional do Mérito Científico:- Grã-Cruz (Brazil) 1995. In 1993, he was elected a Fellow of the Royal Society and was awarded the International Cosmos Prize for his environmental work in Amazonia. He was knighted in July 1995.

Sir Ghilleen is married and has two daughters; both are married and one is living in Recife, Brazil and the other is a doctor.

MEDICINAL PLANT TRADE IN EUROPE: CONSERVATION AND SUPPLY
ROYAL BOTANICAL GARDENS, KEW

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WELCOME SPEAKERS

PROFESSOR DR MARTIN UPPENBRINK

Professor Uppenbrink has been Chief Administrator of the Federal Agency for Nature Conservation, Bonn since 1994. He was born in Bielefeld in the Federal Republic of Germany on 5 October 1934. After passing the First and Second Legal State Examinations he was educated in economics at the Universities of Heidelberg (Germany), Besançon and Rennes (France), and gained a Doctorate in Law at Heidelberg in 1964.

His professional career started with legal and administrative employment until he came to the German Federal Ministry of the Interior in 1968, where he began in the Department of Personnel, Management and Finance, after three years changing to the Department of the Environment. Being Head of the Environmental Policy Section he was responsible for the First Federal Environment Programme, the establishment of the Federal Environmental Protection Agency and the First Federal Environmental Research and Development Plan.

In 1974, Professor Uppenbrink became Director of the Federal Environmental Agency and Head of its Environmental Planning and Ecology Department, supervising 150 professional staff and cooperating with environmental institutions in more than 45 countries. His main responsibilities were the environmental impact assessment for Federal Projects, the assessment of environmental chemicals and pesticides under the Federal Chemicals Act and the Federal Pesticides Act, as well as economic, social and legal aspects of environmental policy. During this period there were a number of papers and positions which required elaboration for presentation by Germany to international bodies such as UNEP, ECE and EEC, for example the OECD Chemical Programme and the 6th amendment of the EEC Directive 1967 on Chemicals. From 1979 until 1982 he was Chairman of the OECD Expert Group AInternational Glossary of Key Terms in Environmental Chemicals Law@, besides his membership of the EEC Committee for Environmental Information (CIDST-Environment).

After fifteen years he moved to Geneva to work as the Director of the Regional Office for Europe of the United Nations Environment Programme (UNEP) until 1993.

Professor Uppenbrink has been Senior Lecturer on environmental law at the Free University of Berlin and the Technical University of Berlin since 1976 as well as Vice-President of the German Society for Environmental Law. From 1982 until 1988 he was President of the Board of Trustees of the International Research Institute for Environment and Society at the Science Centre in Berlin. Since 1983 he has been Professor of environmental law at the Technical University of Berlin and since 1997 Vice-Chairman of the ASubsidiary Body on Scientific, Technical and Technological Advice (SBSTTA)@ of the Convention on Biological Diversity.

Professor Uppenbrink is married and has three children.

STATUS AND TRENDS OF MEDICINAL AND AROMATIC PLANT TRADE IN EUROPE: AN OVERVIEW

Dr. Dagmar Lange, Jahnstr. 16, D-71642 Ludwigsburg
Tel/Fax ++ 49/7144/92804, email dagmarlange@t-online.de

Keywords: Medicinal and aromatic plants, use, trade, conservation

The report Europe's Medicinal and Aromatic Plants: Their Use, Trade and Conservation aims to

- examine the exploitation of native European medicinal and aromatic plants
- investigate the trade of medicinal and aromatic plants in Europe; and
- recommend actions to ensure legal and sustainable use of the species involved

The findings of this report are based on several country-specific surveys on the trade in medicinal and aromatic plants which have been carried out since 1994, in Albania, Bulgaria, France, Germany, Hungary, Spain, Turkey and the UK. In addition, international trade data from the UNCTAD Comtrade database (United Nations Statistics Division, Geneva) have been analysed.

The countries surveyed are a representative selection of European states in the frame of medicinal and aromatic plant trade, and include the major players with respect to trade, consumption and supply. The countries surveyed are quite diverse, showing a considerable range of political structures and economies, landscape and climate, flora and vegetation, medical practice and cultural preferences in the use of medicinal and aromatic plants.

The subject of the report are European medicinal and aromatic plants and their parts which are used medicinally, for cosmetics, as herbal teas, as spices, in liqueurs and bitters, as insecticides and fungicides, and in domestic cleaning products. Plants associated primarily with food (cereals, vegetables), ornamental use, timber or fuel have been excluded.

In Europe, at least 2,000 medicinal and aromatic plant taxa are used on a commercial basis, of which two-thirds, equal to 1,200-1,300 species, are native to Europe. In addition, a lot of more plant species are reported to be in use at local level, collected for home uses or sold on local markets only.

About 130-140 plant species are cultivated in Europe, most of them are indigenous to the region. Countries covered by this report with many hectares under cultivation are France, Hungary and Spain. In the EU, medicinal and aromatic plants are cultivated on an estimated total area of 70,000 ha. Consequently wild collection plays still a vital role. Presuming that on average 70% of the plant material is still wild-collected, the overall volume of wild-collected plant material in Europe may be estimated to be at least 20,000-30,000 tonnes annually.

Medicinal and aromatic plant material is traded in most cases in dried form, and to a small extent fresh or preserved in alcohol. Plant parts may be traded in their whole form or comminuted. In international trade, the plant material is frequently trade whole, however a trend towards trading cut material can be observed.

The structure of the trade in medicinal and aromatic plant material in Europe is very complex and varies from country to country, depending much on whether the country is a consumer (Germany, France, UK, Spain) or a source country (Albania, Bulgaria, Hungary, Turkey). (1) In most countries trade is dominated by a few big wholesalers only: Albania 4, Germany 21, Bulgaria 10. (2) In producer countries, in general, material is purchased from collectors or cultivators through several middlemen to exporters; these middlemen may be district traders, local dealers, or village co-operatives. (3) Collectors of medicinal and aromatic plant material from the wild are, in most cases, rural people, retired people, or often women and children. Collecting provides in most cases a supplementary income and is done either with or without prior contractual agreement with a trader or a producer. (4) In consumer countries the imported merchandise is delivered either to other wholesalers, or to different kind of industries, such as the pharmaceutical, cosmetic or food industry, extract producers, packaging companies, second level retail suppliers, and different kind of outlets. (5) The trade in medicinal and aromatic plant material in countries belonging to the former Eastern bloc has changed in recent years, largely owing to changes from strictly organised, state-controlled

trading systems, based mostly on country-wide networks before the fall of communism to free and diversified markets, with an increasing number of competing, private companies. (6) In Germany, besides the mainstream trade two small trades can be observed: trade in *green* commodities, and trade for use in traditional East Asian or Chinese medicine.

The analysis of trade figures is done on data collected by the United Nation Statistic Division, Geneva which are based on the Standard international Trade Classification Revision 3 (SITC.3 Code). Import and export figures of the commodity group *pharmaceutical plants* of all available European countries have been analysed. (1) Europe's place in world trade in medicinal and aromatic plant material is of global importance. It imports about one-quarter of annual global market imports (440000t, valued at USD 1.3 billion in 1996). Five European countries show up among the 12 leading countries of import, all of them European Union Member States: Germany, France, Italy, Spain and the UK; among the 12 leading countries of export, Germany, Bulgaria and Poland are listed. (2) The average annual volume of medicinal and aromatic plant material imported to Europe was almost 120 000t for the years 1992-1996. Nearly 90% of this volume, around 100,000 tonnes were destined for EU countries. Imports to Europe came from more than 120 countries, with a share of 60% from non-European countries, mainly from Asia and Africa. (3) the average annual volume of medicinal and aromatic plant material exported from Europe in 1992-1996 amounted to almost 70 000t. Since 1992, the exports have been destined to more than 150 countries all over the world. Only a share of 20% of the total export is exported to non-European countries, mainly to North America. Within Europe the exports are dominated by eastern and south-eastern European countries which account for at least 50% of overall exports, above all Bulgaria. (4) Germany's role in the trade is prominent on global and European scale. Together with the USA, it stands out as an important trade centre for the commodity, showing high import and export volumes. Further Germany imports over one-third of the total volume imported into Europe and the share of its exports is approximately one-fifth in terms of volumes. Its net imports are on average 30 000t per year. The country is acting as a link between the eastern and south-eastern European market and west and central Europe. (5) Since 1992, the export and import of medicinal and aromatic plant material from and into Europe has increased. The import increased by 18%, from 109 000t to 132 000t in 1996, the export by 21% from around 54 000t to 71 000t in 1996.

Medicinal and aromatic plant species that are in trade in Europe may be subject to international, European and/or national legislation, affecting in all, 341 species. On international level species may be protected by the Convention on International Trade in Endangered Species of Wild Fauna and Flora. On European level, there is the Convention on the Conservation of European Wildlife and Natural Habitats of 1982 (Bern Convention). At EU level, CITES is implemented by Council Regulation (EC) No. 338/97 and amendments and the Council Directive 92/43 EEC (EC Habitats, Fauna and Flora Directive). Legislation on protection of endangered medicinal and aromatic plant species is present in almost all European countries.

Threats facing medicinal and aromatic plant species in Europe are – very similar across the world – a largely unmonitored trade, over-exploitation, destructive harvesting techniques, as well as habitat loss and habitat changes, resulting in decreasing population sizes, decrease in genetic diversity and finally to the extinction of the species. An additional impact in the countries of the former Eastern Bloc has been the deregulation of state-controlled commerce resulting in the increase of wild collection.

The question of how many medicinal and aromatic plants are threatened in Europe as a result of trade for plant-based medicinal, cosmetic, or domestic cleaning products is not answerable at the moment, as information on aspects of the biology, ecology and use of many of the 1,200 – 1,300 native European species is still fragmentary. In the national reports, about 150 species are reported to be threatened in at least one European country as a result of over-collection from the wild. Examples are Pheasant's Eye (*Adonis vernalis*), Arnica (*Arnica montana*), Yellow Gentian (*Gentiana lutea*) and species sold as Mountain Tea obtained from several *Sideritis* spp. For Pheasant's Eye it is recommended to consider if this species meets the criteria for listing in CITES Appendix II.

THE TRADE IN WILD MEDICINAL PLANTS IN TURKEY

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Key words: Trade, wild medicinal plants, threatened species, Turkey

1. This study aims to identify the levels of collection of medicinal plants from wild sources, and to assess the threats that such collection poses to the survival of the traded species at a local and national level.
2. The study has been undertaken during the period August 1996 to September 1997, and the result based on facts gathered by interviewing collectors, middlemen and export traders; governmental and customs officials; scientists; and literature sources. For the purposes of this study, wild medicinal plants are taken to be native vascular plants used in the pharmaceutical trade, culinary herb and spice trade (plus other consumption), dye plants, and plants for cosmetic use. Trade in essential oils, gums, resins and non flowering plants (excluding ferns) have not been studied.

Wild collected medicinal plants fall into two basic categories: taxa collected (i) for local/traditional use (typically not for profit), and (ii) species commercially traded both internally and through export. The latter category is thought to pose the greater threat to wild populations, and so only this aspect of medicinal plant collection has been dealt with here.

3. Whilst it is difficult to generalise, the medicinal plants are collected by local villagers, mainly from forest and mountain habitats across Turkey. Basic drying and sorting takes place within the village, before the materials are collected together by village middlemen, prior to sale to town middlemen who in turn sells the material to the wholesale trader (export and internal traders).

For material exported from Turkey, consignments are accompanied by two certificates: a quality control certificate, detailing purity of product (eg relating to pesticide residues etc.) and a phytosanitary certificate.

The income generated from the wild collection of medicinal plants is of considerable importance to village populations, particularly since many individuals involved in collection do not have any full time employment. Remarkably, the income generated from non-timber forest products, including medicinal plants, in most years is equal to, or more, in value than timber products from the forest.

4. Two national and three international statutes regulate the collection and, for some species, export of wild medicinal plants, as follows:

**Forest Law No 6831* allows the General Directorate of Forestry Production to regulate and control collection of native wild plant species from state lands through a system of licensing.

**The Regulations for the collection, production and export of natural flower bulbs* (1989), regulates the collection of wild bulbous species for the purposes of export. The export of permitted species is regulated through the setting of an annual quota; the export of unlisted species is by default banned. In addition to bulbous plants of ornamental value, a number of other species subject to trade for medicinal and other purposes are included on the list of banned species: all members of the *Orchidaceae*, and *Gentiana lutea* are banned from export through this mechanism.

**The Bern Convention* protects one medicinal plant species in Turkey – the orchid *Comperia comperiana* – and places an obligation on member states to take reasonable and necessary measures to protect the species and its habitats.

*The EU Habitats Directive regulates the trade between Member States. Five listed medicinal plant species occur within Turkey, but it remains unclear as to whether it regulates the importation of the five taxa from non-member states (such as Turkey) into Member Countries.

*CITES controls the international trade of 44 medicinal plant taxa from Turkey (mainly members of the *Orchidaceae*).

In Turkey, there are no specific regulations to govern the overall trade in native plants (including medicinal plant species).

5. In recent years (approximately equating to the post-1990 period) some 346 taxa of wild native plant have been reported in commercial trade. The trade is divided up into two categories :

*internal trade

*external trade

6. INTERNAL TRADE: The principle markets for medicinal plants within Turkey are bazaars and market stalls, herbalists and to the pharmaceutical industry. The two principle uses of medicinal plants used within Turkey are thought to be as (i) herbal teas (particularly from the genera within the family Labiatae such as *Salvia*, *Sideritis* and *Stachys*; and (ii) a raw material in the production of Helva, utilising the roots of perennial species of *Ankyropetalum* and *Gypsophila* (both Caryophyllaceae). Due to the wide ranging nature of collection and marketing (there are over 400 herbalist shops in Istanbul alone), it is virtually impossible to accurately quantify the quantities of each species in trade.
7. EXTERNAL TRADE: Turkey exports approximately 28,000 tonnes of medicinal and aromatic plants per annum, generating nearly 50 million dollars foreign currency from the trade per annum. Turkey accordingly earns 20 times more income from trade in medicinal and aromatic plants than bulbous plants marketed for horticultural purposes. Using data from Lange & Schippmann (1997) this indicates that Turkey is the third largest exporter of medicinal plants of wild origin of any country on earth after China and India.
8. The five principle species in export trade (accounting for nearly 84% of all exported material by weight are:

SPECIES	1992-1995: annual average quantity collected (kg)	1992-1995: annual average foreign income (USD)	Percentage of overall quantity	Parts used
<i>Ceratonia siliqua</i> 'Carob'	9.694.788	3.634.509	34	fruit
<i>Origanum</i> spp./ Others 'Oregano'	5.559.465	13.462.160	20	vegetative parts
<i>Capparis spinosa</i> 'Caper'	4.207.314	11.452.733	15	flower buds
<i>Laurus nobilis</i> 'Bay Laurel'	2.795.224	5.872.018	10	leaves
Miscellaneous	2.678.050	7.268.909	9	-
<i>Glycyrrhiza glabra</i> 'Licorice'	1.433.711	1.067.836	5	roots

The figures above are based on those supplied by the State Statistics Institute. The Institute records export data according to customs commodity standard reference numbers: these are internationally accepted species or group commodity categories which at one end of the scale comprise an individual product from one species (eg oil of *Laurus nobilis*), whilst at the other end of the spectrum, include broad group categories comprising many species (eg 'flower bulbs' or 'miscellaneous medicinal plants').

In addition to the five species or groups of species listed above, the fifth largest export category under which materials is exported is the 'Miscellaneous' category, which accounts for 2,678 tonnes of material annually during the years 1992-1995 (during the wider period 1989-1996, the 'Miscellaneous' category was the fourth largest). It is within this category that material of all non-categorised species are exported. Thus one exporter in Turkey traded 15 taxa, including such vulnerable/localised species such as *Althaea officinalis* (Marsh Mallow) and *Paeonia officinalis* (paeony root: the species listed is clearly wrong since it does not occur in Turkey).

9. The conservation threats to individual species have been based on categories devised by Tony Cunningham in conjunction with the IUCN Medicinal Plants Specialist Group (MPSG), and take into account such factors as the parts of the plant used (eg seeds, leaves, roots), the plant life cycle and reproductive capacity, a species distribution and population status in the wild, and level of collection, and other threats such as land reclamation for agriculture.
10. The most threatened 10 plant species have been determined from the listing of the Top 50 most endangered taxa, viz.

Turkish commodity name	Species	Suggested IUCN threat category	Parts used & uses
Egir	<i>Acorus calamus</i>	E	Rhizomes
Çöven	<i>Ankyropetalum gypsophylloides</i>	E	Roots, as a whitener in the production of helva
Salba	<i>Ballota saxatilis</i> ssp. <i>brachyodonta</i>	R	Vegetative parts, for herbal teas
Salep	<i>Barlia robertiana</i>	E	Tuber, one of nearly 40 species of orchids used in the production of ice cream and winter drink
Censiyan	<i>Gentiana lutea</i>	E	Roots
Çöven	<i>Gypsophila arrostii</i> var. <i>nebulosa</i>	R	Roots, as a whitener in the production of helva
Kibrit otu	<i>Lycopodium annotinum</i>	R	Vegetative parts and spores
Yayla Kekigi	<i>Origanum minutiflorum</i>	R	Vegetative parts, for use as culinary herb and other uses
Tibbi sakayik	<i>Paeonia mascula</i>	V	Roots
Diken kökü	<i>Ruscus aculeatus</i>	V	Roots

11. Local examples introduced to encourage the sustainable use of medicinal plants include;

- Since 1990, education courses promoting the artificial propagation and cultivation of medicinal plants have been undertaken by the Ministry of Agriculture and Rural Affairs, in conjunction with the Aegean Agricultural Research Institute. Targeted species include *Origanum onites*, *Capparis spinosa* and *Melissa officinalis*.
- The wild collection of Oregano is strictly regulate by the regional Forestry Directorate in the Sütüler (Isparta) region. This directorate identifies places for annual collection, lays down precise collecting dates, and prepares relevant contracts and other paperwork. A co-operative operates within this area.

12. The findings of this study suggest that the wild collection of a relatively large group of species must be regarded as sustainable, and therefore of no concern to nature conservationists. However, perhaps the majority of species fall into two categories;

- **VULNERABLE TAXA:** Where a clear threat to continued local or national survival of a particular species exists due to the threats posed by collection for medicinal purposes.
- **DATA DEFICIENT TAXA:** Where collection may be damaging, at least at the local level, but data is currently insufficient for experts to assess the possible threats posed by collection.

Accordingly, the authors of this report see further action as a necessary corollary to this report. For convenience sake, the various suggested activities are split into five "themes": (i) **FURTHER RESEARCH;** (ii) **REGULATORY POLICIES, LEGISLATION AND MONITORING;** (iii) **IDENTIFICATION AND DESIGNATION OF PROTECTED AREAS;** (iv) **ARTIFICIAL PROPAGATION AND CULTIVATION;** and (v) **EDUCATION AND PUBLIC AWARENESS.**

In each theme of activity, long-term goals have been identified, as well as short-term actions which may represent the most appropriate future actions for The Society for the Protection of Nature, Turkey / Fauna & Flora International to undertake. Thus a long-term goal in the education category may be increased understanding amongst all medicinal plant collectors, whilst a short-term action might be to undertake specific education activities amongst the collectors of one species, to ensure that they cut, not uproot through ripping, a particular species.

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Collection of medicinal plants in Albania

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The first private companies in Albania were established after the approval of the Company Law in 1992. During the period 1992 - 1994 the state enterprises collecting products (including medicinal plants) were still in operation. Today, the number of trade companies who deal with the medicinal plants is high, but only few of them have occupation all over the year on this business. During 1995 - 1996 the market demand increased and other companies were involved. These last two years the export increased directly from the district traders.

Usually, companies in the districts, either big or small, collect medicinal plants from individuals, mostly peasants from the surrounding settlements. It might be that individuals from villages do the first collections in their settlements and then bring them to the nearest town, where they deal with the local companies. Often this kind of people are those who have cars or trucks. In these districts which share boundaries with the neighbouring countries, especially close to Greece, some local traders manage to export small quantities of medicinal plants directly to the neighbour traders.

However, the highest amount of the collected material goes to the internal market and towards the big Albanian companies which either collect from all over the country and export the merchandise, or first produce drugs (extracts) before exportation. The big companies instruct the district traders towards the amounts and type of plants that should be collected. For that purpose, they prepare lists of plants. About the same situation exists all over the country.

Alb Ducros is one of the biggest trade companies in the country. It has established Albania's biggest plant for the distillation of drugs in Durrësi (the largest harbour in Albania) and has huge storage places for the collection of commodities from all around the country.

It is clear that the big trade companies use the harbour of Durrësi as the main infrastructure for the transportation of the commodities abroad. This is done mainly by ship (usually ferries) that carry the trucks to Italy, Slovenia, and Europe. Transport to Greece is done overland via the cross border points.

Contacts revealed that the major foreign markets include those of Germany, France, Italy, Greece and Slovenia.

Most of the collectors are from rural areas. Often, children and women of families are directly involved during the collection period from spring to autumn. The type of plants they collect depend on the season and the region. Since the economical situation was not satisfactory for most of the population, they were obliged to use other local natural resources for getting better incomes. One of the most attractive activities became the collection of medicinal plants.

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Almost 100 % of the medicinal plants collected by the rural population (collectors) is collected dry by the local traders. This is not only because of the type of plant they collect, but also because trade does not operate all the time. Local traders come to collect the merchandise at the end of the collecting season or when there are demands by the big traders.

Cultivation of medicinal plants does not occur on extended areas. There is no tradition for that type of activity in the country. Only in a few cases, like in Shkodra and Laci, we have seen land fields cultivated with Rosmarine, but even in these instances the fields were planted before the political changes during the period of co-operatives. In other areas, cultivation took place on territories managed by the forestry enterprises which had annual plans and workers to cultivate and harvest some medicinal plants. Today these territories are either abandoned (collapse of the state enterprises) or have been given back to the previous land owners. Most of these land owners have changed the destination of these territories towards building or agriculture.

HARVESTING AND TRADE OF Thymus IN SPAIN

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Keywords: Thymus, "tonillo", Spain, harvesting

Thirty-seven species of the genus *Thymus* occur in Spain, amongst which are twenty-four that are endemic to Spain and three that are iberoafricans (MORALES, 1986). The majority of these endemic species are restricted to south-east of Peninsular Spain. The general Spanish term that is used to designate this group of species is "tomillos".

Most of the species are used in significant quantities at popular, domestic level (ethnobotanical) as well as for the trade. They are considered excellent aromatic and medicinal plants and condiments. Their main use in medicine is as antiseptics, antispasmodics, expectorants and eupeptics.

The entire plant is used, and not only the leave (either whole or after being crushed or powdered). The essential oil that is produced through distillation of the plant is rich in terpen, especially timol and cavacrol.

Nearly all species that are used and commercialised originate from the wild. The main species that are collected at significant levels are the following:

⇒ Within the group of "tomillos serpoles" or "serpoles": *Thymus pulegioides*, *Th. praecox*.

⇒ Within the group of "tomillos": *Th. mastichina*, *Th. zygis* subsp. *zygis*, *Th. zygis* subsp. *gracilis*, *Th. vulgaris*, *Th. hyemalis*, *Th. baeticus*, *Th. orospedanus*, *Th. serpilloides* subsp. *gadorenensis* and *Thymra capitata* (= *Thymus capitatus*).

All these species have common and trade names which may be different from one species to another and from one region to another, leading to great confusion in nomenclature.

Many tonnes of dried, uprooted thyme plants are exported from Spain every year. According to official statistics, 1.600 tonnes of non crushed, non powdered leaves of thyme were exported during 1992 and 1993 (MERINO, 1996). This figure does not take into account the thyme that is used for the production of essential oils which also amounts to an important number of tonnes. The rate of production of an essential oil from a given quantity of thyme is only of 1 to 3 percent.

Ninety percent of the thyme collected in Spain is destined for export. The main countries of import of the thyme that is produced in Spain are the United States, Germany, the United Kingdom and France. Spanish thyme is also exported to Japan which also buys the dry leaves that are the by-products of distillation.

Conservation

There have been increasing concerns at national and international level about the massive wild collection of thyme in Spain in recent years. A full assessment of the impact of the exploitation

on the species and their ecosystem as well as of the sustainability of the resource should be carried out:

- a) At a species level. In spite of the large quantity of thyme that is harvested, it was not possible to demonstrate that any of the species of thyme in concern was threatened, although that some species demonstrated a slight regression in the size of their populations. These species are the following: *T. moroderi*, *T. serpiloides* subsp. *gadorenensis*, *T. orospedanus*, *T. baeticus* and *T. zygis* subsp. *gracilis* (BLANCO, 1997).
- b) At ecosystem level. The scientific community and the experts consider the collection of thyme in the wild as detrimental to the arid ecosystems of south-east Spain where these species occur. Uprooting plants is indeed a factor that accelerates soil erosion. Reaping instead of uprooting of plants is therefore recommended as a more sustainable harvesting technique for the species and for its ecosystem. This opinion is not shared by the collectors and the rural communities which believe that uprooting plants favours the dissemination of the species and does not reduce the size of the populations.

The monospecific populations of thyme that exist in the south of Spain in areas called "tomillares" are the only type of vegetation that can thrive in such dry climates and poor soils. In-depth studies should be carried out to clarify once and for all the impact on the species and its ecosystem of the massive uprooting of thyme plants that has been taking place every year since many decades. It is also necessary to assess which method of collection (uprooting or cutting) should be recommended as the most sustainable for the conservation of the species.

CHANGES IN THE MEDICINAL PLANT SECTION OF HUNGARY SINCE THE FALL OF COMMUNISM

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Medicinal and aromatic plants, especially for self consumption are produced in the territory of Hungary since many centuries. However, large scale production started in the first half of 20th century only. Hungary became one of the "leading" medicinal plant production country of Europe in a short time period. In spite of the administrative, political and economical contradictions that existed in the former "socialist" system, the medicinal and aromatic plant section in Hungary did not loose its importance till the end of the 90'. Some of the products were acknowledged as of Hungarian origin ("Hungaricum"), valued respectfully in the world market.

According to estimates the cultivation area of medicinal and aromatic plants is of about 40 000 ha, the total drug mass is of 35000 – 40 000 tonnes from both natural and agrarian systems.

In July 1991, the last Soviet Military Forces left Hungary and the country went free again. The medicinal and aromatic plant business came across a new situation at the time of these last political and economical changes.

- The conditions for the production of medicinal and aromatic plants were modified. The natural plant supply, because of the re-evaluation of the national bio-potential, decreased. This is demonstrated by the increasing number of protected and endangered species. The production ration shifted to cultivation and farms, which were established recently, should play an important role in it. From political point of view the privatisation (privatisation of forests, meadows etc.) may limit the area used for wild collection.
 - The wholesale system showed dramatic change also. After the collapse of the government monopoly many new purchasing and wholesale companies were established, generating both promotion and adverse effect on the activity of the section.
 - The number of the retail dealers specialised for medicinal and aromatic plant drugs and their products increased a lot since the changes of the political situation. However, the increase in the number of shops was not controlled by proper regulations.
 - As a result of the political-economical changes, many new firms were licensed to export-import of medicinal and aromatic plants. The liberalisation of the export-import activity had advantages and adverse effects on the productivity of the section as well.
 - The Hungarian medicinal and aromatic plant section showed increasing international character. Many western producers came to manage production or to establish joint ventures specialised for medicinal and aromatic plants (e.g. Müggenburg, Fink – Germany etc.).
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THE TRADE IN MEDICINAL PLANTS IN THE UNITED KINGDOM

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In 1996, WWF UK commissioned a report as part of a European wide study to ascertain the extent of the herbal medicine trade and to attempt a constructive analysis of the status of the species in the light of the growing popularity of herbal medicine in Western Europe.

The UK is amongst the top 12 importers of medicinal and aromatic plants on a global scale and one quarter of the people questioned in a 1993 survey, said they purchase herbal remedies regularly, one third had tried them on at least one occasion.

Collection of wild plants for the trade is not really an issue in the UK - most of the material is imported and Germany is an important entrepot. There is a growing interest in cultivation of medicinal plants as an alternative crop on a commercial scale, including a large EU grant for the growing of crops for drugs, cosmetics and aromatherapy in Norfolk and Suffolk - eastern counties of England.

The study concentrated on imported medicinal plant material destined for medicinal use in retail outlets and by practitioners therefore excluding other possible uses such as herbal teas, aromatherapy oils, flavourings and homeopathic uses. The characteristic company trading and manufacturing medicinal plant material surveyed is a small family run business, many long established.

Around 3000 herbal remedies were found on the market in the UK - using some 400 different plants, not including traditional Chinese remedies. Of the 700 or so medicinal plant species in use in the UK, about 200 have a natural distribution in Europe.

ESCOPE MONOGRAPHS – A POTENTIAL SCIENTIFIC BASIS FOR A RATIONAL ASSESSMENT OF HERBAL MEDICINAL PRODUCTS IN EUROPE UNDER SPECIFIC ASPECTS OF THE REGULATORY SITUATION

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The European Union has developed a comprehensive legislative network in order to facilitate the free movement of goods, capital, services and persons in the community. According to the Directives 65/65/EEC and 75/318/EEC, pharmaceutical products require pre-marketing approval before gaining access to the market. Requirements for the documentation of quality, safety, and efficacy, the dossier and the expert reports are laid down in Directive 91/507/EEC. Article 39 para 2 of Directive 75/319/EEC obliged the European Member States to check all products in the market within a deadline of 12 years whether they met the requirements of the European directives. Different countries have made different approaches to review herbal medicinal products in the market in order to fulfil the requirements of these European directives.

For achievement of a free movement of medicines within the common market of the European Union, besides a centralised system of marketing authorisation e.g. for new chemical entities on one side and the possibility for an application on a national level only on the other side, a system of mutual recognition of marketing authorisation decisions has been installed, the so-called "decentralised procedure". It provides as a general rule that the assessment by one national authority should be sufficient for subsequent registration in other Member States. Within this decentralised procedure, the so-called "Summary of Product Characteristics (SPC)" approached by the first authority must be taken into account. If differences in evaluation occur between national authorities, a decision will be reached by a specific arbitration procedure. In accordance with the new legislation, this decision is binding and may have – in case of a negative result – a negative "rebound effect" on the first registration in a Member State. That means that under this decentralised system of application, the first registration in a Member State might be lost unless the applicant does not withdraw his application for recognition of the dossier. As uniform criteria on a European level regarding assessment of safety and efficacy do not exist at present, only a guideline for quality of herbal remedies, the harmonisation of scientific assessment is regarded to be a precondition for adjustment of different marketing authorisation decisions, particularly in the field of herbal medicinal products for which different national viewpoints and traditions are existing in different Member States of the European Union.

In order to provide scientifically based assistance for a harmonised assessment of herbal medicinal products, ESCOP, the European Scientific Cooperative on Phytotherapy, had been founded in 1989. The main objectives are to establish harmonised criteria for the assessment of herbal medicinal products, to give support to scientific research and to contribute to the acceptance of phytotherapy on a European level. In October 1990, the first five monographs were presented at a symposium in Brussels and were officially handed over to representatives of the European Community. After a thorough assessment, the Committee on Proprietary Medicinal Products (CPMP) adopted four monographs on anthraquinone laxatives in May 1994, whilst no decision was made in case of *Matricariae flos* and *Valerianae radix*. Although this was disappointing for ESCOP, it was decided to continue preparing harmonised SPC proposals in order to fulfil an obligation to the European Union of 50 monographs by end of December 1996. To be in line with the requirements laid down in European guidelines, the drafts which are planned to be submitted to the CPMP have the format of a Summary of Product Characteristics (SPC). An SPC describing a medicinal plant and its preparations refers to a Pharmacopoeia monograph with respect to quality, and the most important constituents are listed that

are possibly able to contribute to the claimed effect. The most important parts of an SPC are the therapeutic indications, the dosage and the pharmacological properties. The latter paragraph gives as many details as possible on pharmacodynamic properties, pharmacokinetic properties and preclinical safety data, each statement supported by references. The SPC text is followed by a detailed reference list including all the papers that have been used for the evaluation of safety and efficacy of the respective medicinal plant and its preparations.

ESCOP hopes that the Ad Hoc Working Group on Herbal Medicinal Products founded by the European Agency for the Evaluation of Medicines (EMA) at the beginning of 1997 will perform an assessment of further draft in the near future. Parallel to submission to the Working Group and European authorities, 50 monographs have been published as a loose-leaf binder in 1996 and 1997. They can be ordered at the ESCOP Secretariat in Exeter, United Kingdom.

Based on the "Guidelines for the Assessment of Herbal Medicines" which define basic criteria for the evaluation of quality, safety and efficacy of herbal medicines, the World Health Organisation (WHO) with its Traditional Medicine Programme (TRM) had decided to prepare a technical document entitled "Model Monographs of Widely used Medicinal Plants" for primary health care. These monographs include summaries of the botanical characteristics, quality control and major active chemical constituents as well as clinical applications, pharmacology, posology, contraindications and adverse reactions. A WHO consultation on these model monographs took place in Munich in July 1996. 28 model monographs were adopted during a WHO consultation in Munich in July 1996 and were presented at the 8th meeting of the International Conference of Drug Regulatory Authorities in Bahrain, November 1996.

Keywords :

European marketing authorisation system; herbal medicinal products; ESCOP monographs; WHO monographs; Summary of Product Characteristics; harmonised criteria; efficacy and safety assessments.

FRENCH REGULATIONS CONCERNING THE USE AND COMMERCIALIZATION OF MEDICINAL PLANTS

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Key words: medicinal plants, regulation, trade, conservation

Abstract

The domestic market for medicinal plants in France is supplied through importation, collection from the wild and cultivation of indigenous plants. Importation however accounts for the essential part of the demand (58%), while collecting and cultivation account only for 42%. Two distinct types of regulation control the utilisation and commercialisation of medicinal plants and their therapeutic derivatives. The Health Ministry is responsible for the first which relates to strictly medicinal plants as commercialised by the pharmaceutical monopoly. The Economics Ministry is also involved in regulating dietary supplements which use medicinal plants. At present it concerns 594 species (cultivated, imported and collected from the wild). The Environment Ministry is responsible for the second, which aims at preserving biological diversity by protecting susceptible species. Legal measures such as full protection on national or regional levels and the creation of a collecting permit along the regulation it implies are therefore needed. The lack of any connection between the two is highly regrettable.

1. The main trends for trade in medicinal plants in France: consumption, production, import and export of medicinal plants

Since 1970, France has witnessed an important progression in the use of medicinal plants going from 12 500t in 1970 to 37 500t in 1996. Medicinal plant imports represented 9 000t in 1970, 28 000t in 1988 and 1996. Since 1990, the trend in consumption and trade has decreased and then increased again. Exports increased from 1 500t in 1970 to 11 800t in 1988, reaching 10 500t in 1996.

Trade of Glycyrrhiza glabra will be discussed.

French production of medicinal plants, both cultivated and wild species, represented 5000t in 1970 and 20 000t in 1996. Botanicals collected from wild stocks concerns about 200 plant species, providing about 40 to 50% of the production in 1986. Some species are only wild harvested like Filipendula ulmaria (80 tonnes in 1996), others are both cultivated and wild harvested like Gentiana lutea (2 500t). Homeopathic industries used to need about 797 species in little quantities whether allopathic pharmaceutical industries usually need higher quantities.

2. Legislation on the medicinal plant sales in France

The utilisation and commercialisation of medicinal plants are under the control of two administrations :
The pharmaceutical monopoly and medicinal plants used in pharmaceutics

The medicinal plants are listed in the French Pharmacopoeia: 521 species from list A and 73 species from list B are used in allopathy and homeopathy with a negative benefit/risk ratio. Medicinal plants defined as medicines by the Public Health Code, belong to a pharmaceutical monopoly and, as such, should only be sold in pharmacies. Only 34 plants, whose usage is commonplace, are authorised for free sale in their crude state. All medicine including crude plants or plant extracts must apply for an authorisation for release on the market (AMM) delivered by the Health Ministry. Besides the standard AMM which requires chemical, toxicological, pharmacological and clinical studies, the Health Ministry has set up a "plant AMM" so called "light AMM" in which pharmacological and clinical evaluation are not necessary in order to obtain the authorisation for release on the market OTC (over the counter) phytodrugs. A list of 174 plants has been published.

Dietary supplements

The advent of dietary supplements made with foodstuffs, said to offer elements beneficial to the health, are beginning to pose problems in France and in Europe too, because some are prepared with medicinal plants or "borderline" plants that are both medicinal and foodstuff or spice.

For authorisation to release onto the market dietary supplements, which are not traditionally part of the human diet, industries apply to the General Direction of Competition, Consumption and Repression of Fraud (Economic Ministry).

The problem arises when plants thus listed also appear in the French Pharmacopoeia, like Peumus boldo, Valeriana officinalis or Fucus vesiculosus, and have to be sold in pharmacies according to the Public Health Code.

3. Existing measures for the conservation of medicinal plants

Plants that are sources of botanicals are subject to protection in order to avoid overexploitation of species and to preserve the biological heritage of plant species indigenous to France. Legislative measures relating to wild flora are grouped under the Rural Code entitled "Nature Protection". The regulation is situated at different levels: national, regional and local.

Plant species protected through French territory at national or regional levels

The destruction, cutting, mutilation, uprooting, picking or collecting, transportation, peddling, utilisation, sale or purchase of plant species are prohibited. These plant species are fully protected on the whole territory (including overseas territories) or at least in one specific region. In total, eighty-nine medicinal plant genera or species are fully protected throughout French territory. Some other plant species are concerned by a partial protection on the whole territory. The destruction is also prohibited but cutting and commercial use are allowed with a special permit delivered by the Ministry of Environment. Thirteen genera and/or species with medicinal properties are concerned.

Regulation at local level

In addition, a ministerial decree lists the medicinal plant species which are subject to permanent or temporary measures limiting collection in the wild. This regulation is implemented through prefectoral decrees. Twenty-three species are concerned.

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Paper Prepared for the symposium on Medicinal Plants in Trade in Europe
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**PRUNUS AFRICANA (ROSACEAE) BARK: TRADE, CONSERVATION AND
THE INDUSTRIAL "FOOTPRINT" OF EUROPE ON A FOREST TREE SPECIES
IN AFRICA AND MADAGASCAR**

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ABSTRACT

This paper takes Prunus africana bark trade as a case-study to describe the path towards workable solutions in medicinal plants conservation - a path involving multiple interest groups, different agendas and a single, unifying factor : if Prunus africana stocks are overexploited, then all user groups lose out. Although this case-study only deals Prunus africana, several issues raised here also characterise other medicinal species in trade. These are the complexity of the medicinal plants trade from harvesters to final product, the wide range of products sold, the secrecy of industry and that sustainable yields from wild populations are often underestimated, local tenure systems are often weak and prices to harvesters low. These factors complicate monitoring and resource management - but the path towards workable solutions is more one of politics and people management than natural resource management.

While cultivation for slower growing species such as Prunus africana can be a viable proposition, industry is often understandably reluctant to commit resources to cultivation on a significant scale when wild stocks are still available, even if this means "resource mining" rather than resource management. Despite this, rapid progress can be made. In this case, despite over 20 years of trade, we have progressed from a situation of little information available to the international conservation community to one where the species is CITES listed, where we have a good knowledge of volumes and products traded, of the economics of tree production and genotypic variation within the species. Industry has been involved viewing well established (40 - 50 yr old) and younger (12 yr old) plantations and in contributing to the setting of future agroforestry research priorities. Two changes are a key to future progress in encouraging a shift from cases where unsustainable wild harvest take place to agroforestry or plantation scale production. First, the application of "non-detriment" finding by CITES authorities with regard to export and import permits. Secondly, wider awareness amongst the European and North American public and the herbal products industry of the need for, and benefits of certified, sustainable sourcing.

The international trade in wild collected plant material to supply a thriving trade in dietary supplements and herbal products has grown rapidly over the past two decades. With this growth has come the widespread realisation within industry of the need to produce quality products that are safe and effective. Public and industry awareness of quality also needs to extend to the fact that quality sourcing has to mean ecologically sustainable sourcing. Leading companies in North America and Europe in particular must develop a system of "environmental accounting" so that quality of herbal products and dietary supplements also includes sustainable harvest and production. At present, this awareness is not sufficiently developed. Far too many importers, despite their good intentions, are content to leave issues of environmental responsible sourcing to local exporters and harvesters and are unaware of the

destructive effects that their trade is having on some wild plant populations and habitats. Continuation of this practice is not healthy - either for industry, which progressively loses its supply source, the environment, where habitat is damaged or is selectively depleted of species or local people who see their local self-sufficiency eroded through overexploitation of popular, effective plant species they use to treat themselves.

THE MANAGEMENT SYSTEM OF HARVESTING OF MEDICINAL PLANTS IN BULGARIA

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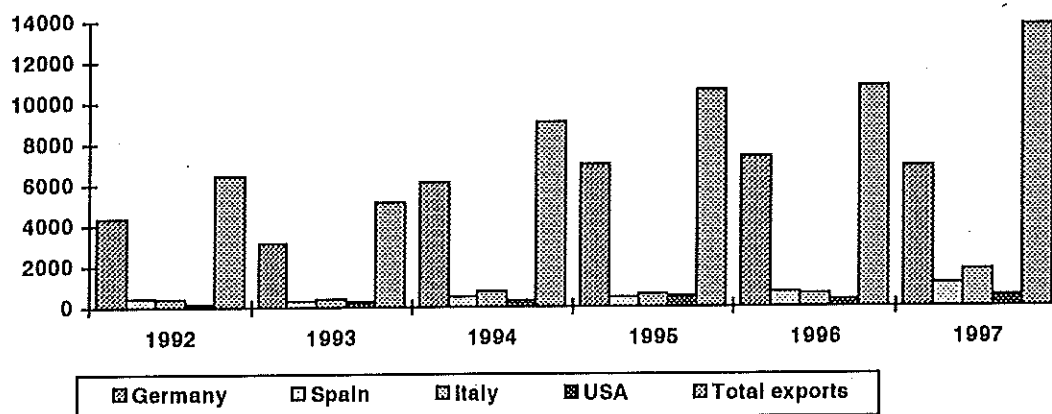
Keywords: Bulgaria, medicinal plants, trade, regulations, quotas

Medicinal plants gathering in Bulgaria has long traditions. Bulgarian medicinal plants are of the highest quality because of the specific soil and climatic conditions in the country. They are famous for the high content of medicinal properties. Annually about 60-70 % of all 14 to 17 thousand tonnes of gathered, purchased and processed medicinal plants are exported. About 30-40% remain in the country as raw materials for the cosmetic and pharmaceutical industries, for providing the general and specialised herb pharmacies, as well as for production of medicinal and herb table teas and spices. More than 200 species are gathered and processed in the country.

About 70% of Bulgarian export of medicinal plants consists of wild medicinal plants (such are possible to be found in everywhere in the country and their population is not threatened) and 30 % - of cultivated ones.

In 1997 the export of medicinal plants from Bulgaria almost doubled compared to 1992 and reached 13 778 tonnes with a value of 17.7 million dollars. Bulgaria became the biggest exporter in Europe. In the period 1992-1997 medicinal plants from Bulgaria were exported to more than 20 countries. The main export market however is Germany, to which Bulgaria exported annually about 6-7 thousand tonnes in the last 4 years. Other important markets are France, Italy, Spain, USA.

Bulgarian export of medicinal plants (in thousand tonnes)



According to the import/export regime the export from Bulgaria of medicinal plants, including cultivated ones is subject to licensing.

Under the territory of Bulgaria 389 species (about 40 of which - medicinal plants) are announced protected. Cutting, picking, gathering, trading and export abroad of the protected plants is prohibited.

In 1991 the Ministry of Environment issued an Ordinance regulating the gathering, trade and export of some medicinal plants with limited resources. It was based on research made by experts from the Ministry of Environment and the Institute of

Botany. In February 1992 for the first time were published annual quotas for gathering some species of medicinal plants in different regions. Every year in February-March a table is published in "Official Gazette" (or other newspapers) giving the medicinal plants allowed to be gathered by regions. The list of the medicinal plants which are subject of restrictions has not changed (except in a few cases) in these years. The quotas represent the highest permissible for gathering quantities of medicinal plants from the natural populations of these species.

Bulgarian export of medicinal plants and in-quota export

	/in tonnes of dried med. plants/						
	1992	1993	1994	1995	1996	1997	1998
Total quota	69.000	82.750	44.560	33.805	76.955	62.365	64.110
- internal market only	4.000	18.350	7.470	3.960	13.245	17.215	16.500
- for export	65.000	64.400	37.090	29.845	63.710	45.150	47.610
Total export	6440	5139	9052	10601	10792	13778	
Share of in-quota export in total export (%)	0.01	0.01	0.004	0.003	0.006	0.003	

In 1992-1997 the total export of medicinal plants from Bulgaria has increased while export of medicinal plants under control decreased. The share of in-quota export in the total Bulgarian export of medicinal plants is very small. Those under restriction are strictly controlled and their collecting and export in bigger quantities is impossible.

Since 1992 *Adonis vernalis* is in the list of medicinal plants under control. Every year gathering quotas are fixed by regions. In the period 1992-1998 the quantities allowed for gathering constantly have decreased.

Quotas for gathered *Adonis vernalis*

	/in kg of dried med. plants/						
	1992	1993	1994	1995	1996	1997	1998
Total quota	5000	4500	2700	3500	2750	3200	1720
- internal market only	0	500	0	0	500	500	220
- for export	5000	4000	2700	3500	2250	2700	1500

In a complete inquiry of some of the major exporters of medicinal plants was found that after *Adonis vernalis* have been put under control in 1992, the interest of processors and exporters in this plant sharply decreased because of the small quantities allocated in different regions of the country. One of the reasons is the small profitability of this activity. Another one is the lack of inquiries from foreign companies for such small quantities. As a result the processing and exporting companies show no interest in medicinal plants under control.

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MEDICINAL PLANT MANAGEMENT IN THE UNITED STATES

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An estimated 175 native North American plant species are harvested from the wild for use in medicinals sold in the United States and overseas. Two such species, American ginseng (Panax quinquefolius) and goldenseal (Hydrastis canadensis), are protected under CITES. The U.S. Government has established a monitoring program for P. quinquefolius with states and a cooperative arrangement for H. canadensis with industry in order to obtain the scientific and legal knowledge it needs to implement the Appendix II listings of these two species. However, the implementation of P. quinquefolius and H. canadensis listings follow disparate approaches. Each approach offers different experiences and opportunities from which lessons might be drawn and used to improve the implementation of CITES listings or applied to the management of other high-value, heavily exploited medicinal plants in the United States and abroad. Monitoring and management programs established between public and private entities to help implement CITES listings may eventually replace the need for CITES regulation.

Key words: Panax quinquefolius, Hydrastis canadensis, CITES, Trade, and Management.

INTRODUCTION

There may be as many as 1400 species of medicinal plant traded regularly within the United States and up to 25 percent are harvested from U.S. and Canadian eastern hardwood forests. Two of the most heavily commercially traded North American medicinal plants are American ginseng (Panax quinquefolius) and goldenseal (Hydrastis canadensis). Both taxa are herbaceous perennials found in the understory of eastern U.S. and Canadian deciduous forests and both, due to substantial legal harvest for international trade, have been listed on CITES. In order to help it meet CITES requirements, the USFWS requests from states and industry information on harvest amounts, location, intensity, confirmation of legal acquisition. The federal agency then uses this information to determine whether the exportation of P. quinquefolius or H. canadensis from the United States should be approved.

AMERICAN GINSENG (Panax quinquefolius)

This species is sought for its high-value gnarled roots, most of which is exported to East Asia -- the oldest and largest ginseng market. The United States is the chief supplier of wild American ginseng to overseas markets, exporting annually an average 60 metric tons of wild root, 90 percent of which goes to Hong Kong.

Commercial trade in P. quinquefolius has been regulated since 1975 when its CITES Appendix II listing went into effect. The USFWS has established a joint ginseng management program with states to monitor wild ginseng populations and regulate ginseng harvest and commerce. Twenty-four states, in cooperation with the federal government, regulate the harvest and/or sale of P. quinquefolius; 19 states are authorized by USFWS to export wild and cultivated roots and five are authorized to export cultivated roots only. The national ginseng program has bolstered state

ginseng monitoring, regulation, and management, and its the only governmental mechanism for systematically gathering important information on ginseng biology and harvest. Despite the ginseng program's benefits, TRAFFIC has identified aspects of the program that are deficient or onerous and, in a new report, makes recommendations to improve the effectiveness of the species' management, harvest and ecological monitoring, and trade controls.

GOLDENSEAL (Hydrastis canadensis)

Historically, goldenseal (Hydrastis canadensis) has been utilized by Native Americans as a yellow dye and to treat a litany of medical conditions ranging from cancer to arrow wounds. Today, the roots of H. canadensis are primarily collected from the wild for use in ubiquitous herbal products, including cold remedies. Commercial cultivation is limited but increasing in North America. As an immediate measure to control potential unsustainable trade, the species was listed on Appendix II of CITES in June 1997.

The implementation of H. canadensis in the United States is still in its early stages. In implementing H. canadensis, however, the USFWS is planning to rely more heavily and directly on the assistance of industry and less on state governments for information needed to help make its scientific and legal findings and determinations for export approval. Major U.S. traders have agreed to submit voluntary information on harvest to the USFWS, which in turn plans to use the data to monitor H. canadensis trade and to approve export. Participating traders will also help the USFWS obtain baseline information on location, intensity, frequency, and amount of H. canadensis harvest by distributing questionnaires to diggers.

CONCLUSIONS

The USFWS is implementing the listing of H. canadensis differently than P. quinquefolius in order to avoid some of the problems encountered with the ginseng management program. Recognizing the financial, administrative, and practical limitations of the federal/state ginseng management program, as expressed by states, the USFWS is using a different, yet promising approach by working with industry to collect information on H. canadensis harvest and trade. The USFWS's alliance with traders is an innovative effort that could improve the quality of information collected on H. canadensis harvest. This partnership could evolve into a system whereby the harvest of non-CITES medicinal plants is quantified, evaluated and used to develop domestic conservation strategies for priority taxa, thus averting the need for CITES protection.

THE CONVENTION ON BIOLOGICAL: IMPLICATIONS FOR ACCESS, USE AND CONSERVATION OF MEDICINAL PLANTS

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Key words: Convention on Biological Diversity, access to genetic resources, benefit-sharing, industry survey.

Medicinal plants continue to make an important contribution to phytomedicines and to pharmaceuticals, despite the role of other genetic resources, such as microbial and human materials, and approaches to drug development other than natural products, such as synthetic and combinatorial chemistry. The Convention on Biological Diversity (CBD) has major implications for all those who continue to collect, study and conserve medicinal plants, as well as for those engaged in the discovery, development, and manufacture of products derived from them.

The CBD, now ratified by 171 countries and the European Union, is relevant not only to the conservation and sustainable use of medicinal plants, but is central to core business issues for the pharmaceutical and phytomedicine sectors. Provisions of the Convention and national laws that implement them require any company or individual seeking to collect wild, and, in some circumstances, cultivated, medicinal plants, whether for scientific research or as the starting point for commercial development, to obtain the 'prior informed consent' of government authorities authorised to determine access.

Laws and policy measures aimed at securing fair business and research partnerships have been introduced or are under development by the governments of Australia (at the Commonwealth and state levels), Bolivia, Brazil, Cameroon, Colombia, Costa Rica, Ecuador, Eritrea, Ethiopia, Fiji, The Gambia, Ghana, India, Indonesia, Kenya, Lesotho, Malawi, Malaysia, Mexico, Mozambique, Nigeria, Peru, Philippines, Seychelles, South Africa, South Korea, Tanzania, United States of America, Venezuela, and Zimbabwe. Others are likely to follow suit in the coming years.

Countries are increasingly prioritising certain forms of benefit-sharing in return for access to their genetic resources.

Typically, such benefits include participation by their scientists in research on the medicinal plants, access to the results of this research, technology transfer, and training and capacity building for source-country institutions. Some partnerships offer help in kind, such as medical assistance and investment in local infrastructure. Others support conservation projects in the field.

This paper will address the demand by industry and research institutions for access to plant genetic resources for pharmaceuticals and phytomedicines, and best practice in 'benefit-sharing' partnerships between companies and institutions supplying them with genetic resources and value-added derivatives. It will conclude with some recommendations for those regulating access to medicinal plants, and to the individual scientists and companies wishing to use them.

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CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES OF WILD FAUNA AND FLORA



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CITES AND MEDICINAL PLANTS.

CITES, the Convention on International Trade in Endangered Species of Wild Flora and Fauna, has as a mission to avoid that international trade in specifically mentioned species may create a risk for the survival of the wild populations. But, most importantly, the Convention contains special mechanisms that permits and promote sustainable utilization of natural resources.

The species subject to the provisions of this Convention are included in three Appendices:

Appendix I: Fully protected species. Commercial trade in wild specimens is prohibited.

Appendix II: Trade in wild specimens is permitted when certain conditions are met. Inclusion of species in this Appendix does not mean the prohibition of trade. Inclusion in this Appendix is actually a protection against over-exploitation, at the same time providing a mechanism for a long term sustainable utilization of natural resources.

The inclusion of species in Appendix I and II is a two-third majority decision by the Parties present at the bi-annual meetings of the Conference of the Parties. Currently 144 Nations are a Party to CITES.

Appendix III is an Appendix in which individual Parties can include a species that they want to provide special attention to and for which they seek the assistance from other Parties to the Convention.

The trade is regulated through a system of permits, issued by a CITES Management Authority in each Party State, subject to specific regulations included in the text of the Convention. The fact that the regulatory mechanism for the trade is included in detail in the text of the Convention, and that each Party is obliged to implement these once it joins the Convention, makes CITES probably on the strongest environmental Convention.

In principle the trade in medicinal plants and its derivatives can be divided into three commodities:

- the plants or parts of the plants itself;
- trade in half-products, such as oils, extracts, powders etc; and
- trade in the final product, the medicines.

If Parties wish to use the CITES mechanism to regulate trade in any plant species used for medicinal purposes, they should carefully consider which of the above mentioned three groups is in international trade, and whether regulation of that international trade would assist in protecting the natural populations.

Similarly is should be consider whether the proportion of international trade, in comparison to national trade, would contribute to the protection of the national populations.

It should not be ignored that, although basically the trade is regulated through a permit system, the main controls are carried out at the international borders, by customs. It should be possible for customs to recognize and identify the products in trade in order to be able to regulate it.

THE PRODUCTION OF AROMATIC AND MEDICINAL PLANTS IN THE EUROPE UNION : AN ECONOMIC DATABASE FOR A DEVELOPMENT STRATEGY

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There are only very few data available on operations in Europe relating to the medicinal, aromatic and perfumery plant sector. The existing databases are not very relevant to these specialised crops. Production is not included in agricultural statistics. On the basis of a network consisting of partners from nine European countries, it was necessary to compile a database dealing with its economic aspects and with research in order to provide a new methodological approach for its management and to establish a research methodology.

This paper reports on economical aspects of the sector, as compiled in the European Concerted Action AIR 3-CT-94-2076.

1 Austria

Cultivation of spices and medicinal herbs has a long tradition in Austria. Production is concentrated in small farms, with an average acreage between 15 - 30 ha, where herb cultivation makes up probably just one percent of the farm's activity: 0.5 - 2.0 ha. Farmers are organised either in co-operatives or in marketing associations. These assure selling by contracts with traders and industry.

2 Finland

Finland, mainly due to the northern climatic conditions, has not been a traditional herb producer in the past, however, with the increased demand in the consumption of these plants, there has been a considerable development in this sector. In addition, the surplus of the traditional agricultural products and pressure for organic cultivation resulted in governmental subsidies for alternative crop production. The cultivation area has increased from 100 ha in 1984 to 1924 ha in 1994. About 26 different herbs are cultivated and about 56 species of wild medicinal plants are picked.

3 France

At the beginning of the century, France had well established cultivation and collection of aromatic and medicinal plants, with some farms producing on 100 ha. In 1970 and 1980, cultivation dropped drastically, because the farms were not able to make sufficient profit margins and development was hindered by various difficulties: choice of correct species, lack of mechanisation, market instability. About 80% of the domestic needs in this sector were supplied by import. Since 1980, various projects have been sponsored by diverse organisations and a new approach was outlined for the development projects. At present, total crop production amounts to some 25,000 ha with approx. one hundred different species.

4 Germany

Medicinal and aromatic plant production has had a long tradition in Germany for centuries, reaching a peak in 1941 of 10,373 ha. After a decline in production in 1990-1993, there is again a trend for increased cultivation, not only for the spices and herbs in their traditional sense, but also as the renewable raw material and source for various extracts. High manual labour costs and high energy expenses (e.g. drying, distillation) are the main obstacles for competitiveness with low world-market prices. Overproduction can happen very quickly and the cultivation is carried out exclusively on the basis of contracts between the producer and the trader or processor.

5 Greece

Aromatic and medicinal plants in Greece have a very long tradition of collection, cultivation and uses. Over the last 20 years, there has been an expansion in the cultivation of aromatic plants, especially in the underprivileged areas. The programme was initiated in 1982, with the support of the government and commercial bank. When funding came to an end in 1996, the programme nearly collapsed and various indirect compensatory allowance schemes were implemented to support cultivation and collection of herb species.

6 Ireland

In the last 10-15 years a few specialist herb growers have established enterprises and supply the catering and retail trade with fresh herbs. Recent statistics show that there are about 44 ha of herbs under cultivation, usually grown on 3-5 ha plots, by vegetable or fruit producers, both open-air and covered. They usually supply local markets, together with potted herbs, fresh and dried flowers. One producer only is growing lemon balm for oil distillation (6 ha).

7 Italy

Medicinal and aromatic plant cultivation and collection in Italy reached its peak in 1929-1945, and similarly to other countries, more or less collapsed after the World War II. At present, about 20% of these plants satisfy the internal market, while the rest is being imported. Approximately 2,272 ha are cultivated in different regions, either on the individual farms or in the co-operatives. The cultivated areas are usually about 2-3 ha, some of them using organic farming methods, and some of them have a high degree of mechanisation and well established cropping system.

8 The Netherlands

The production of aromatic and medicinal plants is a relatively new sector in the Netherlands. Large-scale production was established after World War II, initiated by the Department of Agriculture and organised by regional co-operatives. About 140 farmers grow 400-500 ha of approx. 20 different species. About 80% of the production is exported. Farmers are usually growing improved genotypes on 2-5 ha fields, with adapted mechanisation and aiming for intensive culture and high yield. Centralised organisation allows to produce large quantities with stable quality and a reliable market outlet.

9 United Kingdom

Aromatic and medicinal plants were traditionally produced and collected in the UK, however, after the war these industries declined and there has only been a revival of these crops over the last 10-20 years. Total area is estimated at 2,000 ha, however, since there are no statistics available on the production, it is very difficult to give a correct estimation. Most growers operate in isolation and undertake their own market research and formulate their own production systems for a particular market. It is estimated that the markets for aromatic and medicinal plants are increasing by about 10% per annum and those for complementary healthcare by about 30%.

To conclude the survey, the authors suggest a better organisation of the production, trade promotion and more applied research programs to meet the needs of the growing markets.

ASSUMING RESPONSIBILITY FOR A PROTECTED PLANT: WELEDA'S ENDEAVOUR TO SECURE THE FIRM'S SUPPLY OF ARNICA MONTANA

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For WELEDA as an important manufacturer of anthroposophical and homeopathic remedies and natural body care products, *Arnica montana* is an essential and "irreplaceable" medicinal plant.

The firm's annual needs (in fresh and dried flowers) are rather modest, nevertheless WELEDA has to face – and is willing to accept – the fact that *Arnica* is protected in most countries (and in most cantons of Switzerland !).

The paper will outline and discuss the firm's various efforts made on different levels:

- cultivation (wild cultivars at original sites and natural hybrids at appropriate continental and alpine sites);
- research (four-year study by the Botanical Institute of the University of Berne on the long run impact of collecting *Arnica* in a rich ecosystem);
- ecological management (long-term contracts with land-owners) to achieve the following aims :

protecting the areas from the use of fertilisers, pesticides and other potentially harmful treatments;

cleaning and mowing of abandoned pastures to reduce *Arnica*'s competitors for light and moisture;

implementing an *Arnica*-compatible grazing and pasturing system

- contact with rural management and wildlife protection authorities (changing protection protocols in the case of *Arnica montana*)

Despite considerable costs, the project is considered by the firm as a necessary contribution to a sustainable use of an endangered species.

CAN WE REPLACE COLLECTION OF *DROSERA* BY CULTIVATION?B. Galambosi¹ - N. Takkunen² - M. Repcak³¹ Ecological Production, Resource Management, Agricultural Research Centre of Finland.FIN-50600, Mikkeli, Finland² The Finnish 4H Federation, Oulu district, FIN-90120, Oulu, Finland³ University of P.J.Safarik, Dept. of Experimental Botany & Genetics. 04167 Kosice, Slovakia

Raw material from some *Drosera* species is used in different medicinal products for the treatment of asthma and bronchitis. The marketed quantities of the different species on the European market is estimated to range from some hundred kg (*D. intermedia*, *D. peltata*) to 10-18 tons/year (*Drosera madagascarensis*) (Kirsch, 1995).

During 1981-1994, the quantity of *Drosera rotundifolia* collected from natural swamps has increased from 100 kg to 2100 kg in Finland and most of it was exported to Switzerland. The average fresh yield of the 19 m² observation plots located in different wild swamps was 6.7 g/m². As one kilogram of fresh sundew consists of about 5000-10000 flowering plants, the question has arisen: can we cultivate sundew to replace its collection from the nature?

Cultivation experiments on *D. rotundifolia* and *D. anglica* were carried out during 1992-1997 in South Finland in order to determine their agrobiological features, to elaborate their growing methods and to obtain data on their biomass potential both in the nature and in cultivation. According to our results, both *Drosera* species were successfully cultivated indoors in plastic houses and outdoors on natural peat beds. The plants were propagated from seeds, with natural winter stratification and developed flower stems after the second and third growing years.

Due to the warmer conditions and the higher plant density, the yields of *Drosera* species in plastic houses were higher than outdoors. The average fresh yield in the plastic house ranged between 1.1-1.4 kg/m² and 0.6-0.9 kg/m² in the second and third growing year, respectively.

The fresh yield during the third and fourth year on the outdoor peat beds of an area of 24 m² ranged between 0.3 and 0.9 kg/m².

Plant growth was accelerated by regular artificial fertilisation using protein-containing preparations. The 7-methyljuglone contents of the plants was not affected significantly either by agricultural methods (sowing, transplantation, indoor conditions) or artificial fertilisers preparations.

On the basis of these experiments, it seems to be possible to produce raw material of *Drosera rotundifolia* and *D. anglica* under cultivation conditions. Additional research is necessary to test these experimental results in a larger- scale pilot production system with economic calculation.

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IMPROVEMENT OF PHARMACEUTICAL DRUG QUALITY: A CULTIVATION PROJECT FOR *Harpagophytum procumbens* DC IN NAMIBIA

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Summary

Increasing demands and an uncontrolled, destructive collection are leading to a rarification of *Harpagophytum procumbens* on its natural sites. Already, increasing quantities of adulterations with the roots of *Harpagophytum zeyheri* can be detected in commercial drug lots and herbal medicines. Although a controlled cultivation of *Harpagophytum procumbens* was considered as impossible, an ample project aiming on the cultivation of *Harpagophytum procumbens* and the selection and multiplication of a high quality Devil's claw chemotype was started in Namibia, which led to excellent results. Thus, all the demand of root slices for the production of the German herbal medicine Rheuma-Sern[®] ¹ is already covered by a biocertified and controlled collection.

Keywords:

Harpagophytum procumbens, *Harpagophytum zeyheri*, adulterations, drug quality, controlled cultivation

Introduction

The rational application of herbal remedies does not only require the proof of efficacy and tolerability, but also a reproducible extract quality and composition. Seemingly insignificant parameters, such as rainfall, constitution of the soil, cattle breeding, or harvesting method, strongly influence the content of active ingredients in medicinal plants (1), and thus the therapeutical efficacy of herbal drugs. In the case of uncontrolled collections, problems with the drug purity may also arise from adulterations in the harvested plant material. The most effective solution to maintain a defined drug quality is the implementation of a controlled cultivation. Until very recently, such a cultivation was considered to be impossible in the case of the Namibian medicinal plant „Devil's claw“, *Harpagophytum procumbens* DC (2,3).

Harpagophytum procumbens DC (Pedaliaceae) is a well-established medicinal plant for the treatment of chronic rheumatic disorders. Its roots contain appreciable amounts of iridoid glycosides, mainly harpagoside. The drug material is generally obtained by a destructive and uncontrolled collection of naturally occurring plants. The increasing demands of the world market are leading to a rarification of *Harpagophytum*, which is reflected by detectable amounts of roots of *Harpagophytum zeyheri* DECNE in commercial preparations (4-7). Descriptions of adulterations in commercial drug lots of *Harpagophytum procumbens* were already published as early as 1964 (8-10).

¹ Rheuma-Sern[®] : 1 capsule contains 400 mg of a powdered aqueous dry extract of the secondary roots of *Harpagophytum procumbens* (drug-extract ratio: 2:1), corresponding to 800 mg of dry plant material.

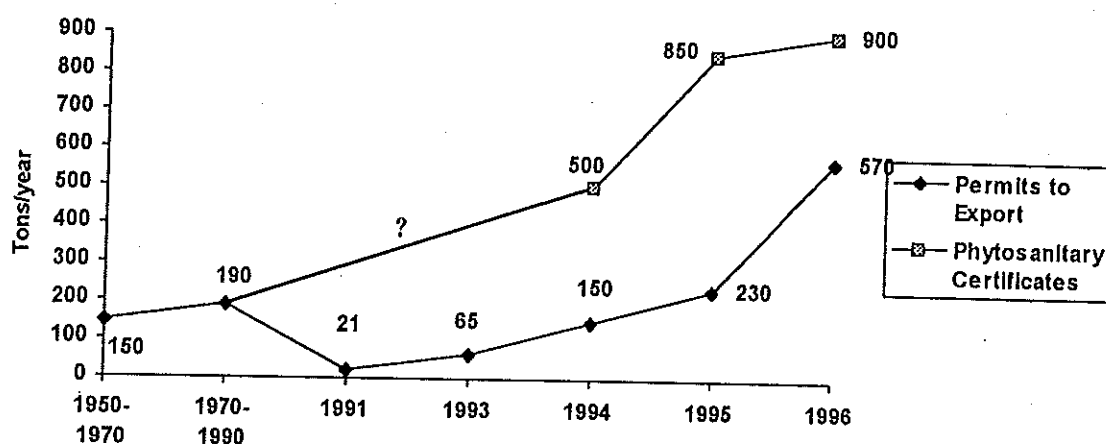


Fig. 1: Since 1991, increasing amounts of the roots of Devil's claw were exported. The true quantities are not exactly reflected by the „permits to export“ granted by the ministry of environment and tourism (11): as compared to 570 tons in 1996, phytosanitary certifications for 900 tons were issued by the ministry of agriculture, water and rural development at the same time (12).

Results and discussion

In 1997, Schneider (13) described a semi-cultivation of wild plants. The disadvantage of this method is a 50% reduction of the plant population with each collection cycle. In addition, no efforts were made towards the selection of high-quality plant material. In contrast, G. Betti already established a controlled cultivation and a collection method, which guarantees the complete survival of the plants in 1995 (14). In addition, the pharmaceutical quality of the regenerated roots is under constant surveillance with HPLC methods. Meanwhile, Betti's cultivation method was officially granted the label „biocertified“ (15). Since 1997, the German company Sertürner Arzneimittel is able to cover the complete demands of Devil's claw root slices from this biocertified cultivation.

The implementation of a controlled cultivation can only be regarded as a first, however paramount step in the optimisation process of pharmaceutical drug quality. The selection of high performance plant material with a high content of pharmaceutical relevant active ingredients, and a high biomass crop yield are of equal importance.

As no chemotaxonomical comparisons of wild populations of *Harpagophytum procumbens* were published, we analysed the roots of taxonomically strictly identified samples of *H. procumbens* and *H. zeyheri* from 30 geographically/geologically differing locations using a HPLC technique devised for the quantification of harpagoside and other iridoid components (5,6). Depending on their origin, samples of *H. procumbens* show a broad range of iridoid contents, with values between 1.0 and 3.5% for harpagoside. Furthermore, measuring the content of 8-p-coumaroyl-harpagide provides a tool for the analytical differentiation between the two *Harpagophytum* species (4), and allows the detection of adulterations in pharmaceutical drug material (5,6).

Table 1: Samples of *Harpagophytum procumbens* and *Harpagophytum zeyheri*, collected on different locations in Namibia, RSA and Angola, show distinct variations in their contents and composition of the iridoid glycosides (HS = Harpagoside, PCHG = 8-p-Coumaroyl-harpagide). These findings can be interpreted as a hint for the existence of chemotypes (5,6).

Sample No.	% HS	% PCHG	Sample No.	% HS	% PCHG
<i>Harpagophytum procumbens</i>					
1	1,16	0,06	12	2,80	0,06
2	1,33	0,08	13	1,65	0,13
3	1,63	0,08	14	1,56	0,11
4	1,26	0,02	15	1,63	0,10
5	1,26	0,03	16	1,84	0,16
6	3,01	0,11	17	1,98	0,15
7	2,51	0,07	18	1,93	0,18
8	1,76	0,09	19	2,52	0,13
9	1,08	0,03	20	1,04	0,05
10	1,50	0,03	21	1,58	0,05
11	1,73	0,04			
<i>Harpagophytum zeyheri</i>					
22	0,87	1,36	27	1,00	1,59
23	1,45	0,93	28	0,94	0,87
24	1,47	1,84	29	1,16	0,84
25	0,99	1,24	30	0,70	0,94
26	1,56	0,97	31	1,70	0,76

As a result of our screening project, an appropriate „chemotype“ of *H. procumbens* was selected for vegetative multiplication. At the same time, the ideal growth characteristics were tested (i.e. irrigation, shading, soil conditions). Within 50 days, the layers formed a well-developed matting of secondary roots with multiple tuberised segments.

Conclusions

The analysis of commercial extracts and of plant material from naturally occurring populations of *Harpagophytum procumbens* underlines the importance of activities towards the conservation of the species. Such measures are unavoidable to provide a suitable pharmaceutical drug quality. Although the cultivation of the Devil's claw was considered to be impossible, a joint venture of the companies Sertürmer Arzneimittel and Lichtwer Pharma under the scientific guidance of G. Betti, aimed on the controlled cultivation of Devil's claw, was successful. Already, the total demand of *Harpagophyti radix* for the production of the drug Rheuma-Sern® is covered by biocertified culture. This cultivation contributes to the protection of an endangered species, and at the same time leads to an optimisation of the pharmaceutical drug quality.

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SUSTAINABLE CULTIVATION OF TAXUS

L.D. Phillips, Denzil Phillips International and
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The discovery of the anti cancer agent Taxol in the bark of the pacific Yew (*Taxus brevifolia*) more than a decade ago gave rise to destructive harvesting of this material in the North West USA. Environmental pressures brought this activity abruptly to a halt and the industry turned to the needles mainly from *Taxus baccata* as the main source of Taxol and other related derivatives.

Although systematic screening and harvesting activities of *Taxus baccata* and underway in both North America (Bristol Myers Squibb /Weyhauser) and Europe (Rhone Poulenc Rorer /Indena) its is to the Taxus forests of the Himalayas that pharmaceutical companies have increasingly turned to obtain the hundreds of tonnes of needles required to satisfy the ever growing demand for this drug.

The increasing, sometimes haphazard wild harvesting of Himalayan Taxus has itself come under increasing criticism and control.

A major effort is hence underway in Nepal to develop sustainable plantations of taxus trees. (Dabur/New Crops Seeds and Products)

A purpose built environmentally controlled greenhouse facility has been constructed outside Kathmandu which will shortly supply around 2 million Taxus seedlings a year to social forestry projects, agro-entreprises and small farmers throughout the region. The trees will be grown and harvested with a buy-back arrangement and supplied to Nepal's only commercial Taxol extraction plant thereby ensuring maximum value addition to the region.

New cropping systems will be developed for Taxus including intercropping of the trees with food crops and other medicinal herbs. Honey bees will also be introduced to provide short term income while the slow growing taxus trees mature. Initial trials show yields of needles and levels of taxol which in almost all cases exceed those prevailing in Europe and the United States. Based on present day local prices of wild harvested needles Taxus plantations look a profitable new cash crop for Nepali farmers with sizeable economic, environmental and social benefits.

DEMAND STIMULATED SUSTAINABLE SUPPLY FOR ENDANGERED NEPALESE MEDICINAL PLANTS

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Keywords: medicinal plants, private sector, extracts, sustainable production

The kingdom of Nepal is a landlocked country in the Himalayas covering an area of 141.000 km² and including a population of 21,9 million people (mid 1995).

Because of different climatic conditions alpine meadows in the North as well as sub-tropic forests in the south provided Nepal with a many-faceted biodiversity.

One can find wild medicinal and essential oil plants, which are collected and exported and form a source of income for the local population. According to estimations about 80 of these plant species with a volume of 1.000 tons are exported annually and form 2% of the foreign exchange of the kingdom of Nepal.

The collection of wild aromatic plants has a long tradition. It is a matter of fact that in Nepal all economically important sources for wild aromatic and essential oil plants are dependent on the forests. Only recently raw material of selected plants has been acquired from cultivation. The basis for any industrial activity concerning medicinal, aromatic and essential oil plants, however, forms a reliable raw material supply from controlled wild collection and/or cultivation in agroforestry.

In the years between 1980 and 1990 the government of Nepal has executed an intensive programme for the registration of natural medicinal and aromatic plants of the country by the Royal Drug Research Laboratory (RDRL), Department of Medicinal Plants. Detailed botanical and commercial inventories („Economic Mapping“) were carried out.

The UNDP/UNIDO-project „Processing of Medicinal and Aromatic Plants Cultivated and Collected in Nepal“ documented in 1987 a comprehensive inventory concerning the development potential of some selected areas in Nepal. In the study „Prospects of extension for agro-forestry and cultivation of indigenous and exotic medicinal and aromatic plants to raise income for the rural population“, basic ecological data had been validated for the compilation of ecological plant profiles. During six expeditions in selected areas in the Kingdom of Nepal, basic of the ecological habitat of indigenous medicinal and aromatic plants have been collected.

The activities of Protrade/GTZ in Nepal between 1988 and 1993 “Product and Marketing Advisory Services and Trade Promotion for Medicinal and Aromatic Plant Products and Essential Oils” primarily focused on opening an alternative to the prevailing predominant export of only dried plant raw material to India and Europe. The trade with locally produced intermediate and/or finished products from plant raw material, e.g. essential oils and plant extracts, encouraged the producers and traders to explore ways and means to leave the uncertain raw material supply from wild collection.

Between 1991 and 1995 GTZ has executed a project for the cultivation of three selected medicinal and aromatic plants under the control of Protrade experts as a back-up measure for its project activities. The objective was the domestication of at least 3 economically important

species of local medicinal plants on land which is not planned for the traditional farming of conventional agricultural crops.

Protrade has given financial assistance to the preparation of plant monographs in Thailand, also including important plants from Nepal (e.g. *Zingiber officinalis* and *Centella asiatica*).

The work of Protrade/GTZ as a pioneer in international marketing of the medicinal plant extracts and essential oils from Nepal has been carried on since 1993 within the framework of "Integrated Consultancy Service for Private Industries in Counterpart Countries" by DEG/Nepal-German Chamber of Commerce and industry. All-day entrepreneur-seminars at Kathmandu and Pokhara and individual consultant discussions formed the preliminaries in April 1993.

As a result of the GTZ project in 1997 commercial business contacts had been established for the following plant species:

Rauwolfia serpentina
Swertia chirata
Nardostachys jatamansi
Rhododendron anthopogon

An European pharmaceutical company has started the development activities with the Nepalese partners to produce the raw material from 11 plants for the production of traditional medicines in Europe.

Certification of sustainably harvested products

Udo Hirsch, CUNA Georgica, Georgia

In Georgia we are aiming at certification of wild plants for the following reasons:

- a) The result of this certification will be beneficial for the valuation of sustainably harvested products and will also improve the economic situation of collectors as well as of vendors.
- b) It will enable effective controls of sustainable harvesting of wild plants and will encourage the biological cultivation of particular plants.

Currently medicinal plants are still harvested in the traditional manner for local use. There is no legal control over the methods of collection. So far, this proved satisfactory and will remain successful as long as the environmental conditions do not change. The need for certification does therefore not seem urgent. We do feel however, that legal regulations have to be put into practice at the earliest possible time for the certification of those plants which are harvested for export. At present, a proportion of medicinal plants have been cultivated but the majority of plants are still harvested from the wild without any control.

To protect these natural resources, there must be a co-operation between Georgian and foreign business partners towards the control and legal certification of sustainable harvesting of wild plants and the cultivation of medicinal plants in Georgia. Collectors and vendors of medicinal plants are equally highly interested in a legal certification for economic reasons.

Most requirements for legal certification already exist.

A data bank on the present status of about 350 medicinal plants is available and being presently updated. Sustainable utilisation of wild plants can be controlled and guaranteed by regional experts from the Ministry of Environment, by the "Green Police", and by privately organised parties of professionals in the field of medicinal plants.

In Georgia there is at present a wide range of information available on the sustainable utilisation and the biological cultivation of many medicinal plants.

CUNA Georgica has formed a temporary working group consisting of members of the Parliamentary Commission for Natural Resources, the Ministry of Environment, the Academy of Science, the "Green Pharmacies" and an association for biological farming (ELKANA). The committee members are working on proposals for the legal certification of wild plants. We are anticipating that the final proposal for regulations will be submitted to the Georgian parliament by the end of 1999.

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**FIRST INTERNATIONAL SYMPOSIUM ON THE
CONSERVATION OF MEDICINAL PLANTS IN TRADE
IN EUROPE**

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Status of Bulgarian Medicinal Plants and their Conservation.

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THE CULTIVATION OF MEDICINAL PLANTS: A NECESSITY FOR SUPPLYING THE PHARMACEUTICAL INDUSTRY WITH DRUG RAW MATERIAL

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Actual situation

As a consequence of the steadily increasing popularity of medicinal plants, the pharmaceutical industry displays a growing interest in the producers of drug raw material. This pressure is the origin of the scarcity of a large number of wild species, from which the active ingredients were often isolated in the course of ethnopharmacologic investigations.

The requirements of the western countries for medicinal plant derived drug raw material are increasing so rapidly, that they can in no way be met on short, middle or long term. On the other hand, disproportionate and uncontrolled collections of wild plants will inevitably lead a large number of species to the edge of extermination. For several of these species the situation is already alarming. Indeed, the natural resources of medicinal plants are steadily decreasing on a planetwide scale.

This situation may be explained by to major facts:

- 80% of the world's population has access to traditional therapies based on medicinal plants.
- The high popularity of „mild therapeutic options“ in the industrial countries is leading the western pharmaceutical industry to develop plant derived drugs.

With the requirements faster growing than the biomass, the natural reserves are irreversibly affected.

In most cases, ancient collection methods, exclusively designed to satisfy local demands, gradually changed into real industrial collections. More or less organised within commercial structures often created by the consumers themselves, mostly no strategy whatsoever to guarantee the perennation of the plants, or their replacement by replantation is foreseen. Such collections rarely consider quality concepts, and even less the idea of chemotypes, both of which however are fundamental for the development of a reproducible quality concept in the pharmaceutical industry.

Consequences of the evolution of the requirements

The evolution of the requirements of medicinal plant material leads to numerous and severe problems, concerning the countries of origin as well as the local or industrial consumers in the western countries. It implements a strong pressure on the collectors, which are tempted to include other, sympatric species to the collection of a defined pharmaceutical raw material. With the inclusion of allopatric species, the concept of intentional adulterations is introduced. Thus, the pharmaceutical companies dispose of a raw material, which is devaluated in proportion to the percentage of foreign material, which may sometimes even include highly toxic matters, which cannot always be detected by routine analytical HPLC controls.

To the impossibility of obtaining a defined quality, the difficulties of insuring a reliable supply are added, thus leading to fluctuating prices for medicinal plant derived raw material.

In the end, the destruction of the plant – an inheritance of the country where it took millenia to develop – is unavoidable.

Solutions for the future

Whenever possible, strategies for the industrial cultivation of medicinal plants must urgently be developed. Even difficult cases must form the object of research programs, such as realised by the German group Sertürner Arzneimittel/Lichtwer Pharma for *Harpagophytum procumbens* in Namibia. By improving the local employment situation, such cultivations contribute to the development of the countries in question, bringing with them a valorisation and stability in regions most often placed at an economical disadvantage.

When implementing industrial cultivations, it is evident that the use of chemotypes with high quantities of active ingredients will be preferred, corresponding to the requirements of a pharmaceutical company. The highest possible profitableness and quality level will put the company in the place of the market leader, at the same time insuring the marketing development by excluding a major factor of uncertainty.

Some examples

A high pharmaceutical quality can be obtained in multiple cases:

- *Harpagophytum procumbens*: Control of adulterations with the species *Harpagophytum zeyheri*, and cultivation of chemotypes with high quantities of harpagoside and glucoiridoids.
- *Agathosma betulina* and *A. crenulata*: Guaranty of purity and reproducibility of an analytical standard, without adulterations by the dozens of neighboring species, which are all locally known by the name of „buchu“, but display a totally different phytochemical composition.
- *Strophantus gratus*: Except for energetical efforts, this liana of the primeval forests of Central Africa is endangered to dissapear in short term, thus leaving the companies producing drugs against insufficiency of the heart without their supply of K-strophantine. Actually, the small amounts of seeds available from wild collections consist of a mixture of several undefined apocynaceae.
- *Drosera ramentacea*: This species from Madagascar is massively collected as a replacement for circumpolar *Drosera* species. The populations of *Drosera ramentacea* are becomming increasingly scarce in spite of the low quantities of plumbagine compared to the species admitted by our pharmacopeia, whereas the cultivations of those is perfectly possible on peat soil in the course of regeneration.
- *Commiphora mukul*: Like all species of the familiy of the burseraceae, whose mostly ancient populations are rapidly decreasing, *Commiphora mukul* is becoming severely rarified due to the harvesting method of making incisions to the trunk in order to extract the resin (most often mixed with several species of *Commiphora* and *Bosphelia*).
- The enumeration of species could be continued for dozens of pages to follow.

Conclusions

Hoping that the pharmaceutical industry might listen to reason in the form of a systematic supply of their industrial requirements through cultivation might be considered as somewhat irrational. Furthermore, when a plant is put into danger by excessive collection methods, it would be quite fruitless to call to an international organisation for fast measures. The modern civilisations have to stop to act like predators, quietly causing within a few decennia the vanishing of an uncountable number of species, thus depriving future generations of something their ancestors were able to preserve for millenia. The implementation of industrial cultivations allows to interfere.

CAT'S CLAW: THE HEALING LIANA FROM AMAZON FOREST. DEFORESTATION AND THE MARKET DYNAMICS OF MODERN PANACEA

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Keywords: *Uncaria tomentosa*, Peruvian forest, sustainable harvest.

The term "Cat's Claw" is used on the European and American markets to refer to products derived from a tropical forest liana, *Uncaria tomentosa*. Used for thousands of years as an anti-inflammatory by the native tribes and mestizo populations in Peruvian Amazonia, it has met with growing interest on international markets as an immunostimulant. Its immunostimulant action seems to be partially ascribable to the alkaloid fraction. The part of the plant traditionally used is the bark of the trunk, which is prepared in the form of an infusion, alcoholic extract or dry extract, and put on to the market in the form of capsules, pastilles or liquid preparations. The bark of the root is often used, due to a presumed higher concentration of the active ingredients, although no study had ever confirmed this. Mention must also be made of the fact that *Uncaria guianensis* is often used as an equivalent although adequate studies have not yet been carried out on this species from the photochemical and pharmacological point of view. The market of the immunostimulants is without doubt one of the largest in the field of phytotherapeutics, with leader product such as *Echinacea* (which currently corresponds to 11.93% of the American market and is the largest selling product based on medicinal plants on the U.S. market) and it corresponds to 26% of the European and North American market. On this highly competitive market, the sales of products based on "Cat's Claw" have gone from negligible position in 1995, to 2.1 % in 1996 (14th position) to 3.49% in 1997 (8th position of the best selling plants on the American market). Until 1995, all the *Uncaria tomentosa* present on the international markets came from Peruvian Amazonia. From 1996 onwards, following the product's commercial success, extraction at an intense rate also began in the forests of Ecuador and Colombia, but no data is available for these countries. Peru's export show a sharp upturn from 200 Kg/year in 1993 to 722.975 kg/year in 1995. Ninety per cent of the *Uncaria* extracted comes from five areas of the Peruvian selva (Ucayali, Humico, Pasco, San Martin, and Junin), thus limiting the area subjected to exploitation. At the same time, the number of importing countries has significantly increased from 8 in 1994 (two Europe - Spain and Bulgaria, one in Asia - Japan, and five in Latin America) to 24 in 1995-1996 (11 in Europe - Austria, Belgium, Bulgaria, Finland, France, Germany, Italy, Netherlands, Poland, Spain and Switzerland - two in Asia - Japan and Singapore - as well as Australia, Canada, New Zealand and the USA and seven Latin American countries). In 1996, there was in fact a drop in the exports, especially in the USA (with imports dropping from 608.507 Kg/year in 1995 to 105.399 in 1996 and imports to European countries dropping from 20.000 Kg/year in 1995 to 6.600 Kg in 1996), only partially compensated by the increase in exports to Latin American countries (in particular Chile which between 1995 and 1996 went from 10 Kg to 77.000). However, this data must be duly interpreted and explained in the light of two factors:

- the creation in other Amazonian countries of "alternative" markets for Europeans and North American companies
- the increased demand and export of products processed and packaged in Peru and bordering countries (Chile in particular) which has often supplanted the demand for bark. The previous data, supplied by INRENA, the Peruvian authority in charge of natural resource management, refers solely to trade in the raw plant and not its derivatives. The interest in more sophisticated products explains the

massive increase in exports to Chilean traditionally having advanced technology and consolidated commercial relations with several European countries.

Moreover, the rise on the American market (there is shortage of reliable data for the European market) of products derived from *Uncaria tomentosa* (14th position in 1996 and 8th position today in the classification of the best selling plants) confirms an increase in sales which has no corresponding elements in the INRENA s-data. It is therefor credible that the extraction of *Uncaria* has not decreased as shown in the data on the exportation of the raw product but is prevalently marketed today as a partially or wholly processed product.

From an ecological point of view, the pressure of the forest population of *Uncaria tomentosa* has anything but diminished. With a yield estimated at between 60 and 306 Kg/ha of dry bark, on the basis of INRENA, between 3360 and 17160 hectares of forest have been deforested over the past four years, only for the quantities of bark exported as such. In fact, the figure is certainly underestimated. It does not take into account domestic consumption in Peru, the quantity processed and exported in an extract form or as other derivatives, or what is not used and abandoned in loco. Often, due to the very low price of the raw material in the forest and the very high cost of transport, the same quantity of bark is purchased in different places and then effectively transported only on the basis of the costs of the journey. We can therefor reliably state that the number of hectares deforested due to the extraction of *Uncaria tomentosa* is significantly superior to that shown in the official versions and probably for this reason the Peruvian authorities have included the plant amongst the species considered Vulnerable.

On the basis of the considerations and in view of an increasingly greater presence of *Uncaria tomentosa* extracts on European and North American markets, it has become urgent too devise strategies of sustainable extraction. The Organizacion Indigena de la region de Atalaya, with the support of the COE, an Italian NGO, has thus started a project for a comparative assessment of the different types of sustainable extraction. In the territories of 20 native communities in the region of Atalaya, a comparison has been made between extraction based on the selective removal of bark, (in strips up to a maximum of 60% of the trunk's surface), on cutting the liana at the height of one meter above the ground (in order to offer the plant an opportunity for further growth) and extraction associated with reforestation with young plants in the "balcony" undergrowth. Only this last method, after four years, has shown a significant regeneration of the population of the species under examination, even if in terms of work-hours, it is without doubt the most costly method.

Some indication of the genetic diversity of common herb species *Rosmarinus officinalis* and *Mentha spicata*

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Introduction

Rosemary, *Rosmarinus officinalis* is a perennial shrub common in the Mediterranean region grown as a culinary herb, as a garden plant, and as a medicinal herb. There are many cultivars of Rosemary, some with very different aroma profiles, which can supply these very different market niches but it is important for growers to select the appropriate cultivar. Spearmint, *Mentha spicata* is an other commonly grown culinary and medicinal herb that grows well in the UK.

This paper describes a study undertaken, at the National Herb Centre, to examine the volatile components from 26 named Rosemary, part of the Royal Horticultural Society's 'Rosemary Collection' and grown at Yorkstock Nurseries and 16 spearmint clones, supplied by the British Herb Trade Association.

Method

Leaf material (100g) was steam-distilled in a Neo-Clevenger essential oils determination apparatus. The oil was dried over anhydrous sodium sulphate and stored under nitrogen below 30C before analysis. A 0.1(1 sample was split (100:1) injected onto a 30m. 0.25mm ID 0.25(Supelcowax 10 column in a Perkin Elmer 8320 Capillary FID gas chromatograph. The injector and detector temperature were 2000C and 2500C respectively and the carrier gas H₂. The initial column temperature was 350C for 3 min, then programmed @ 40Cmin⁻¹ to 2000C, which was held for 5 min.

A leaf sample (1g) was placed in a sample vial (20 ml) and gently crushed to release the volatile oils. The vial was placed in a water bath at 300C for 5 min before a poly(dimethylsilane) SPME fibre (Supelco) was introduced into the vial for a further 10 min. The headspace volatiles were desorbed from the fibre, for 1 min., onto a capillary GC column by the heated injection port (2000C). The whole sample was desorbed directly onto the capillary column and analyzed as before.

The aroma profiles analyzed by Solid Phase Micro Extraction (SPME) were compared and grouped by multivariate cluster analysis (Minitab), using complete linkage and squared Euclidean distance.

Results and Discussion

Rosemary Analysis shows a wide variation in the major volatile constituent from the 26 rosemary cultivars, which is only to be expected as many of these cultivars have been selected for flower colour, and habit and to a far lesser extent by the volatile components. It is important from this data to select those cultivars with the appropriate profile to meet market requirements. This may be fairly simple in the case of essential oils for aromatherapy or as a food additive, which the percentage of the volatile constituent may be known. (-pinene 20 - 30 %, 1,8- cineole 20 - 30 % and camphor <4 %.

Mint Analysis shows a wide variation in the major volatile constituent from the 16 spearmint clones. For culinary purposes and essential oil a good spearmint should have a high concentration of carvone, with lesser amounts of limonene, pinene, and 1,8-cineole.

However herb oils have been shown to have antibacterial and antifungal activity but the important components of the oil remain unidentified. It is also well known that herbs contain many non volatile components responsible for antioxidant properties and anti cancer properties. Again the variation of these components throughout the range of rosemary cultivars and spearmint clones is unknown, making selection of appropriate cultivars difficult and uncertain. The wide variation in the volatile components indicates the genetic variability of the genus, which may be utilized for the development of cultivars and clones, which satisfy Market requirements whether these are for aroma, medicinal properties or appearance.

Acknowledgements I am grateful to Peter Turner, Lighthorne Herbs Associates for providing the facilities to undertake this study.

Further work will continue in 1998 on *Lactuca virosa* accessions obtained from The Vegetable Gene Bank, Horticulture Research International, Wellesbourne

The Use of Plants in Folkloric Medicine and Phytotherapeutics in Turkey

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The treatment with herbal folk medicine still takes place today as it did since 4,000 years. People get their herbal material mostly from the herbalists.

Today, the variety of Turkish herbal crude drugs at the herbalist is rather limited, yet it is possible to find about 100 kinds of drugs at herbalists in Istanbul (List 1).

On the other hand, the majority of plants that are used in medicine are given below in List 2. This list was prepared according to the crude drug content of the phytotherapeutics that are produced in Turkey.

In this study, the governing regulations for the sale of herbal drugs and the name of herbal drugs which are forbidden to be sold by herbalists are also given.

Habitats' Protection and Preservation of Aromatic and Medicinal resources.

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Protection of habitats is one of the basic conditions for the preservation and protection of medicinal and aromatic plants. From regulatory point of view, habitat conservation will gradually be achieved at European level through the implementation of European Directive No 92/43 CEE of 21 May 1992, so-called "NATURA 2000". On a global scale, the Biodiversity Convention that was concluded at the Rio Conference of June 1992 provides a guaranty for habitat preservation when all countries adhere to it.

The habitats constitute an irreplaceable genetic reservoir for the plants that naturally occur there, and it has often been shown that a plant produced more active constituents when it grows in its own habitat. In situ conservation must therefore be as much encouraged as possible.

The authors give two examples:

- protection of hedgerows and woodland borders
 - protection of crop-weeds
-

Ex Situ Conservation: Cultivation of Woodland Medicinal Plants

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The Silphion Project was founded in 1993 to research and develop the cultivation of northern temperate medicinal plants. The aim is to decrease wild collection and thus assist in preservation of the genetic diversity, and thus robustness and evolutionary potential, of the remaining wild populations.

A botanical reference collection of North American medicinal plants is being established at Brackenhurst Agricultural College, Southwell, Nottinghamshire. This includes about fifty herbaceous perennials, shrubs and trees. Some are very uncommon in cultivation in the UK and the collection is a unique educational resource. This includes both the official species and closely related species and other taxa that have been used as medicines. North American herbs have been prescribed as medicines by herbal practitioners in the UK since 1840 and many are in daily use by Members of the National Institute of Medical Herbalists which was founded in 1864.

A database has been established on northern temperate medicinal plants which includes taxonomy, conservation status, demography, population biology and horticultural requirements. A detailed study has been made of the relevant domestic and international conservation legislation.

The cultivation trials are focussed on rhizomatous natives of the Eastern Deciduous Woodlands. Most woodland understorey plants are slow growing and some have specific habitat requirements. It is essential to maximise and maintain the genetic diversity of our stock; the efficacy of medicinal plants has been shown to depend on many constituents and we need to retain the genetic and phenotypic variations within our populations. Findings of propagation trials for *Caulophyllum thalictroides* Mich., *Echinacea* spp, *Hydrastis canadensis* L. and *Rhus aromatica* Ait. are presented. The findings emphasise the value of practical experience in one's own locality rather than attempting to recreate the original habitat.

STATUS OF BULGARIAN MEDICINAL PLANTS AND THEIR CONSERVATION

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Keywords: medicinal plants, status, trade, conservation, management

Status of Bulgarian medicinal plants

Medicinal plants used in Bulgarian traditional medicine are about 750 from 3560 species of vascular plants native in the country. The total amount of the herbs exported is between 7000 - 10000 tons during the last 10 years as the tendency for increasing every year.

Increasing exploitation provoke the depletion, loss of natural populations of some medicinal plants and reducing options for the future. Now 36 endangered and rare medicinal plants are protected by the Nature Protection Law, and their collection and trade are prohibit; about 40 medicinal species, to be in danger of depletion, are under a restrict usage regime. For them normative documents in the last 10 years are published for regulation and control the commercial collection. The system of require permissions (quote for 23 species) or prohibit the collection and trade of 14 species for a short period of time is provided for them. 31 of these 77 threatened medicinal plants are included in the "Red Data Book of Bulgaria" (1994) under different categories of threatened species.

The others, widely spread medicinal plants used for trade are controlled.. Rotation system and cultivation is recommended for them. The export is regulated too.

Management of medicinal plants in Bulgaria

Many activities have been carried for the conservation and regulation of trade of medicinal species, so their population continue to grow and develop.

National Resources Conservation Strategy of medicinal plants is prepared and published with funding from the Biodiversity Support Program in 1993 year. It includes a characteristics of the wild medicinal resources in Bulgaria and recommendations for their steady long term development (Hardalova et al.,1993).

The Government, the Research institutions and some Non-government Organizations develop and coordinate scientific research, monitoring the resources and trade of plants. They include:

- * The study of traditional knowledge of the use of plants in health care. "Encyclopedia of Bulgarian Traditional Medicine" is written by Minchev (in press).

- *Exact identification of the medicinal species in "Flora Bulgaricae" 1-10 vol.(1963-95).

- *Assessment and mapping the distribution of medicinal plants is published in "Chorological Atlas of medicinal plants in Bulgaria" (1995). This book includes distribution, ecology, biological peculiarities, resources and conservation of 196 native medicinal plants.

- *Research programs for biological and chemical investigations are predominantly connected with the threatened plants. There are mapped, monitored and are showing the state of populations of 10 protected species. The resource characteristics of 9 species under a restricted regime of utilization have elaborated and determining standards for their industrial use. The profound researches into the ecological and biological characteristics of these plants have shown the problems in their reproduction and adaptation., that secure their long-term survival.

The regularity, established in their breeding allowed their propagation in experimental conditions and the usage of the material for re-introduction and cultivation. Specific cultivation techniques are prepared, including *in vitro* propagation.

The content and the dynamics of the accumulation of biologically active compounds in more than 40 medicinal plants is determined. The genetic material of valuable chemo- and ecotypes with high content of compounds and yield has been used for a further cultivation.

We realize now the conservation by cultivation with possibilities for trade of the protected and rare plant as *Alchemilla mollis*, *Ruta graveolens*, *Sideritis scardica* (endemic) and *S. syriaca*, *Inula helenium*, *Rubia tinctorum*, *Valeriana officinalis*, *Althaea officinalis*, *Leucojum aestivum* etc.

*About 70 cultivars from 34 valuable medicinal plants over exploited, some of them without further endangering their survival, are selected in Bulgaria and are breded.

*We applied new methods of breeding for biological agriculture which include the using of ecologically pure products for trade.

*Conserving about 150 species (34 of them threatened) medicinal plants *ex situ* in seed bank and Field genbank used for propagation, improvement, research and education purposes.

*Society training and information by education campaigns like " A day of the herbalist", lectures, courses, etc.

The trends of trade and conservation policy for 21 Century

* The trade of medicinal plants will increase by growing the export list of species, enlarge the part of cultivated medicinal plants till 60% of all export and double the number of the private trade organizations. Over-exploitation will decrease critically their resources in nature.

*It is necessary to accept as soon as possible a special Law for medicinal plants which will create a number of rules for control of the collection, trade and cultivation of plants.

*The monitory system, the research and the education programs will extend with the assistance of International Organizations. The information system will include a centralized data basis of research, trade and conservation.

*New threatened and valuable species for trade medicinal plants will be cultivated.

*The public support connected with the foundation program and finances will increase as well as the collaboration with the International Organizations for the up to-date information, education and scientific experience.

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“EDUCATION FOR SUSTAINABLE MEDICINE”

KEYWORDS; BOTANIC GARDEN; CONSUMER; EDUCATION; LABELLING;
KNOWLEDGE GAP.

150 million people visit botanic gardens worldwide every which makes them a vital shopfront for conservation messages about plants of all types. Many visitor surveys, certainly in Europe, have shown that the majority of visitors are A/B profile (opinion formers/decision makers) and are likely to include many “green consumers”. However, Botanic gardens, especially those in urban areas, frequently report visitors’ lack of understanding of how many plants are involved in products used in our daily lives, from foods to pharmaceuticals, fibres to colourants. There is a need to reconnect people to the reality of what sustains them - by the sensory appeal of seeing, touching and experiencing plants.

Most people do not know where their medicines come from. They assume that pharmaceuticals are manufactured in laboratories and the statistic that half of the world’s top 25 best selling pharmaceuticals are derived from the natural world amazes them¹. Likewise, the “green consumer” who would never consider buying a mahogany toilet seat because of publicity about timber conservation, *does not know* that over 70% of herbal products are taken from the wild, often unsustainably². Botanic gardens are well-placed to plug this knowledge gap. The educated consumer can then exert pressure on suppliers to certify their products as sustainably sourced, which could reinforce conservation initiatives in primary producing countries, perhaps through an international labelling scheme.

Examples will be given of public education initiatives at the Chelsea Physic Garden. They include an ethnomedical Garden of World Medicine, proposals for a Pharmaceutical Garden, a thematic trail entitled “Rare plants, endangered peoples, lost knowledge” and the use of “discovery carts” to use medicine packaging to reconnect people to the plants involved in their production.

Of the 750 botanic gardens in the world, about 400 are involved with medicinal plants in terms of their collections or research. 120 of these are in Europe, 44 in China and 32 in India³ - a worldwide resource for public education about the issues involved in sustainable medicine.

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66 Royal Hospital Road, London, SW3 4HS

Bibliography:

¹ Source: Glaxo Wellcome.

² Source: Dagmar Lange/ V.Schippmann “ Trade Survey of Medicinal Plants in Germany ‘Bonn-Bad Godesberg 1997.

³ Source: Botanic Gardens Conservation International “Directory of Botanic Gardens Medicinal Plant Collections”.

DOMESTICATION PROJECTS FOR VARIOUS ENDANGERED MEDICINAL PLANT SPECIES BY VITAPLANT LTD.

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Keywords: Domestication, *Centauraea* sp., *Alchemilla* sp., *Primula* sp.

A. General informations concerning VitaPlant Ltd.

VitaPlant Ltd. presents a spin-off company of the University of Basel (Institute for Pharmaceutical Biology). The major activities of VitaPlant Ltd. are:

1. Identification of active principles in plant extracts via bioassays
2. Development of systems for the field cultivation of medicinal plants under controlled conditions
3. Breeding of varieties with improved pharmacological and agronomical attitudes (using conventional and biotechnology methods)
4. Implementation of quality control measures (biochemical analyses, audits, monitoring)
5. Consulting in areas 1.-4.
6. Supply of ecologically safe raw drugs and extracts to the phytopharmaceutical industry

B. Domestication projects

Three species are currently under investigation:

B.1. *Centaureum erythraea* (Common Centaury)

Common Centaury belongs to the *Gentianaceae* family and is either an annual, winter-annual or biannual species with a small, fragile and yellow root. Stems are square, erect (ca. 50 cm) and branched in the upper part. The leaves usually form a rosette in the first year and are lanceolar or long ovated. The pink or slightly blue-violet flowers are forming a cyme. Blossom lasts from July to October. The natural areas of distribution are Europe (except the very North), Caucasus, Persian and North Africa. Centaurium drug, i.e. the herbal part of the plant, mainly originates from East European countries (e.g. Bulgaria, Albania, Romania), France, Morocco and Algeria. In some countries, e.g. Germany, common Centaury is almost extinct. With a very few exceptions raw drugs on the market derive from wild crafting. The main compounds are bitter substances (e.g. swerosid, centapicrin, gentiopicrin). In Phytomedicine, the plant is used as digestive; a high demand also comes from the liquor industry.

Only few experiments have been carried out in the past aiming at the domestication of this species. Our activities deal with optimising germinability, sowing date and planting distances. A selection of ca. 10 accessions is tested for agronomic characters such as growth height, flowering-period, yield etc.

B.2. *Primula veris*, *P. elatior* (Cowslips, Oxlip)

The two species belong to the *Primulaceae* family and are perennial. Leaves are abruptly narrowed at base. Flowers vary from pale to bright yellow. Growth height is ca. 20 cm and the plants are hairy at stems and leaves. Hybrids between the both species exist. Flowering occurs from April to May in a nodding one-sided cluster. Both, flowers and roots are used in the pharmaceutical- and cosmetic industry. The natural habitat is grassland, open scrubs and woods at different altitudes. Both species are originated in Central- and Near Asia as well as in Europe. Raw drugs are imported from Bulgaria, Romania, Albania, former Yugoslavia and GUS countries. The compounds of interest are saponins and flavanoids (gossypetin),

carotinoids and essential oils. Preparations with *Primula* are mainly used for the treatment of cough.

Our focus is a comparison of 20 accessions with regard to flowering date, number of flowers per plant, yield and other agronomic aspects.

B.3. *Alchemilla vulgaris*, *A. alpina* (Common Lady's Mantle, Alpine Lady's Mantle)

Both are perennial species in the Rosaceae family. *A. vulgaris* usually is rather densely hairy, green, with palmately lobed leaves. *A. alpina* has more hairs and is smaller, the colour varies from pale green to silvery grey with 5-7 narrow lobes. *A. vulgaris* is flowering from May to September and *A. alpina* from June to August. The species are spread in Europe, North America and Asia. The crude drug is imported from Poland, Czech Republic, Slovakia, Bulgaria and Hungary.

Major compounds are tanning agents (e.g. gallotannine, ellagitannine, alchemillin). Preparation with *Alchemilla* are used as astringent against bleeding and diarrhoea.

Almost no information is available on the cultivation of this species. Therefore, in a first step VitaPlant is interested in basic aspects of cultivation like germination, planting time and density, harvest time and harvest technology. In these preliminary studies, like in the species described above, variations between different accessions will be of particular interest.

Besides these three species, VitaPlant Ltd. has started domestication efforts in further species such as *Cnicus benedictus*, *Iberis amara*, *Cimicifuga racemosa*, *Vitex agnus castus*, *Petasitis hybridus*, reflecting VitaPlant's commitment to the supply of ecologically safe raw materials for the phytopharmaceutical industry.

Sustainable Exploitation of *Prunus africana* on Mt. Cameroon.

Paper to be presented at the Symposium On The Conservation Of Medicinal Plants In Trade In Europe. Royal Botanic Gardens Kew, London. 22 - 23 June 1998.

James Acworth, Forest Management Adviser, Mount Cameroon Project

Bruno Njombe Ewusi, Senior Forestry Officer, Mount Cameroon Project.

Ngatoum Donalt, Divisional Delegate for the Environment and Forestry, Fako, South West Province.

Abstract

In addition to its use as traditional medicine by indigenous people, *Prunus africana* has been exploited commercially on Mount Cameroon for over 20 years. Although Plantecam, a medicinal plant company, has the sole commercial exploitation licence for the area, agreements have been reached which permit villagers to harvest for commercial purposes under Plantecam's licence.

In order to guarantee sustainability, a 1% management inventory was carried out in 1996. The results of the inventory were supposed to serve as the basis for allocating future exploitation quotas.

Preliminary estimates of the standing stock of *Prunus africana* (27,000 live trees) and sustainable yields for the next 3 years (approximately 200 tonnes of fresh bark per annum) have been calculated on the basis of this inventory. This yield is less than the quantity previously exploited from Mt. Cameroon (500 - 1300 tonnes per annum) falling short of exploiters requirements. This yield will surely increase when other trees become available for exploitation (30 cm dbh, or once they recover after recent over-exploitation). However the present low yield implies that unless the exploitation is carefully managed the resource will be at risk of being further depleted.

All interested parties (Plantecam, the Ministry of Environment and Forestry - MINEF, the Mt. Cameroon Project, and the local community) have recognised the need for sustainable management and work is ongoing to establish a system of exploitation based on realistic estimates of sustained yield. The partners are also investigating the institutional and managerial structures required to ensure that sustained quotas are respected. Available information suggests that current exploitation levels are not sustainable and it is hoped that an early agreement is reached amongst all parties as a result of the ongoing work.

Responsible management of *Prunus africana* represents a real opportunity for an International Company to demonstrate the will and commitment to pursue its commercial objectives without compromising either this threatened species on which it relies, or the essential need of Cameroon at national and local level, to sustain an income from its natural resources, indefinitely.

Until recently exploitation was done without any detailed inventory to serve as the basis for allocating quotas.

**FIRST INTERNATIONAL SYMPOSIUM ON THE
CONSERVATION OF MEDICINAL PLANTS IN TRADE
IN EUROPE**

22 – 23 JUNE 1998

ROYAL BOTANIC GARDENS, KEW

UNITED KINGDOM

PAPERS SUBMITTED AS CONFERENCE DOCUMENTS

The Situation of *Prunus africana* in Madagascar

(published in the Newsletter of the Medicinal Plant Specialist Group of the IUCN Species Survival Commission „Medicinal Plant Conservation“, Volume 3, 1997:14-15)

Prunus africana is an internationally traded medicinal plant of high commercial value. Its bark is used to extract active substances to treat benign prostatic hyperplasia. One country of origin is Madagascar, where *Prunus africana* is probably the most valuable medicinal plant for exportation. Nevertheless, little is known about the socio-economic and ecological consequences of its exploitation in the mountain forests of the Malagasy High Plateau.

In 1994/95 a study was carried out to evaluate the „Sustainability of Non-Timber Forest Products Utilisation in the Peripheral Zone of the Nature Reserve of Zahamena“, a project run by Conservation International. Whereas a variety of plants play an important role for local health care in this region, only one medicinal plant in the surroundings of the Nature Reserve is exploited commercially: *Prunus africana*.

The commercial exploitation of *Prunus africana* in Madagascar began in 1979 in the north-eastern part of the High Plateau and reached Zahamena in 1988. The intensive collection of *Prunus africana* in- and outside the Reserve has lead to an extinction of exploitable trees and consequently to an expansion of the extraction area southwards. As a result of this, the amount of exploited bark has enormously increased in 1995: Between January and March 1995 more bark was extracted as in whole 1994 (100 t). The total quantity of bark extracted in 1995 were estimated to reach 600 t.

Trade in *Prunus africana* in Madagascar is under control of one Malagasy ex- and one Italian importer each. The exploitation is organised by middle-men who are the official permit holders. They establish local markets in the exploitation area, buy up bark and transport it to the exporter where it is transformed. The extraction of bark is exclusively done by local farmers. They remove the bark inside the forest after having cut the tree and sell it to the middle-men. Timber and other parts of the tree are not used.

Even if the quantity of bark exploited in Madagascar seems to be negligible in comparison to the world largest *Prunus africana* exporter Cameroon (about 2000 t/yr), concern has to be expressed regarding the consequences of this exploitation in Madagascar.

Ecologically, the exploitation has lead to an over-exploitation of the natural stock. Governmental concessions are not yet adapted to the ecological situation. Besides, they are neither controlled by the Forest Department nor followed by the middle-men nor known by the farmers.

Socio-economically, the monetary value of bark or extract represents an important income resource on the national and regional (commune) level as well as for every participant of trade. Even for the farmers, who receive less than 2% of the export value, the collection of bark is an important additional income generating activity.

Radical changes are necessary to transform the way of extraction into an ecologically and socially sustainable one. First of all, more basic information has to be collected regarding the ecological situation of *Prunus africana* in Madagascar (e.g. regeneration, geographical distribution). Besides, research is requested to assess the ecological and economical feasibility of bark-stripping and other sustainable extraction methods as well as ways of artificial cultivation (e.g. integration into agroforestry systems). Secondly, property-rights must be guaranteed to the gatherers to secure a long-term exploitation. They have to be allocated on the community level and not the individual one and combined with regulations of extraction.

At the moment, the Forest Department seems to get aware of the seriousness of the situation but has not yet undertaken concrete activities. The industry concerned does not realise any need for action. Especially the Italian importer negates any responsibility for the Malagasy forest. But only a co-operation of official authorities, industry and science may contribute to an improvement of the current situation in Madagascar.

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SUSTAINABLE EXPLOITATION OF *Prunus africana* ON MT. CAMEROON

Paper to be distributed at the Symposium On The Conservation Of Medicinal Plants In Trade In Europe. Royal Botanic Gardens Kew, London. 22 - 23 June 1998.

James Acworth¹, Bruno Njombe Ewusi², Ngatoum Donali³.

Key words: *Prunus africana*, Pygeum, sustainable, quota, medicinal, Cameroon

Abstract

Prunus africana has been exploited commercially on Mount Cameroon for over 20 years by Plantecam, a medicinal plant company. Their exploitation quota of 1,500 tonnes per annum was not scientifically founded. Annual harvests have risen from an average of 448 tonnes in the 1980s to almost 1,400 tonnes per annum by 1995. Recently a small proportion (<30%) was harvested by villagers for unlicensed contractors.

A 1% management inventory was carried out in 1996 to calculate sustainable exploitation quotas. Of the *P. africana* stems inventoried, 20% were dead. Of the living trees of exploitable size (>30cm diameter), 40% had been excessively stripped and will not produce again for at least another 10 years, if ever. The standing stock was estimated at 37,000 live trees of which 25% displayed signs of severe stress.

Using this population data and actual yields per tree, sustained yield for the 5 year period 1996-2001 was estimated at approximately 300 tonnes of fresh bark per annum. By 1998, 1,600 tonnes has already been exploited, so recommended quotas have been further reduced to 200 tonnes per annum for the next 3 years.

The estimated sustained yield is much less than the quantity previously exploited from Mt. Cameroon, and falls short of Plantecam's requirements. Calculations show that if trees had not been over-exploited, sustained yield would have been more than three times greater, at 614 tonnes per annum.

Plantecam now dispute the validity of the inventory and sustained yield estimates. A more detailed inventory (≥5%) will therefore commence in November 1998. Statistical analysis by Mt. Cameroon Project (MCP) of the 1996 inventory data demonstrates that the *P. africana* population is most unlikely to be more than +/- 50% different from the 1% sample mean.

Recommended quotas will surely increase again if the natural population is allowed to recover from recent over-exploitation. However, renewal of Plantecam's licence in April 1998 with a quota of 1,500 tonnes per annum makes this unlikely.

In 1997, MCP brokered a pilot agreement which permits villages to harvest for commercial purposes under Plantecam's licence. This has minimised villagers' desire to benefit from illegal exploitation which is poorly paid and destructive. A village level participatory monitoring and evaluation system has been established.

It now remains for all interested parties (Plantecam, the Ministry of Environment and Forestry, the Mt. Cameroon Project, and the local community) to further develop the institutional and managerial structures required to ensure that sustained quotas are agreed and respected. Failure by any party to co-operate in implementing the proposed strategy must clearly imply that such a party is not committed to the long term sustained management of *P. africana*.

Responsible management of *P. africana* represents a real opportunity for an International Company such as Plantecam to demonstrate the commitment to pursue its commercial objectives without compromising either this threatened species on which it relies, or the essential need of Cameroon at national and local level, to sustain an income from its natural resources, indefinitely.

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The Mount Cameroon Project is a multilateral project between the Government of Cameroon, UK Department for International Development, German GTZ, and the Global Environment Facility.

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Introduction

Prunus africana, otherwise known as Pygeum, is a widespread pan-african montane tree found throughout the remaining highland forest of Cameroon. Mt. Cameroon supports the most important population of *P. africana* in Cameroon and probably in West Africa.

P. africana bark is used locally, and is one of the most important traditional medicines (Jeanrenaud 1991). It is also the raw material for the pharmaceutical industry. If the bark is partially stripped according to prescribed norms (two quarter panels) it will regenerate and can be repeatedly exploited over 5 to 7 year intervals, without killing the tree.

All parties recognise the importance of the *P. africana* resource as an opportunity for sustained forest use which provides benefits to the Government, local communities, and exploitation companies alike as well as supplying an important international demand for a medicinal product.

In recent years, *P. africana* has been subject to severe and poorly controlled exploitation for its bark by both licenced and illegal exploiters, putting increasing pressure on this species (Cunningham & Mbenkum 1993), which is listed on CITES Appendix 2, in recognition of the threat posed by over-exploitation.

If adequate management measures are taken, then there is no reason why *P. africana* should not continue to be exploited and traded indefinitely. Presently, this objective is still not being achieved fully and the resource remains threatened.

Trade of *Prunus africana* bark

Exports from Cameroon of *P. africana* bark by Plantecam, an internationally owned pharmaceutical company, have steadily risen over the last 20 years. Data from the Cameroon's Ministry of Forestry and Plantecam's own weigh-bridge show that Plantecam alone processed and exported the produce from an average of 1,923 tonnes of raw bark per year during the period 1986 to 1991.

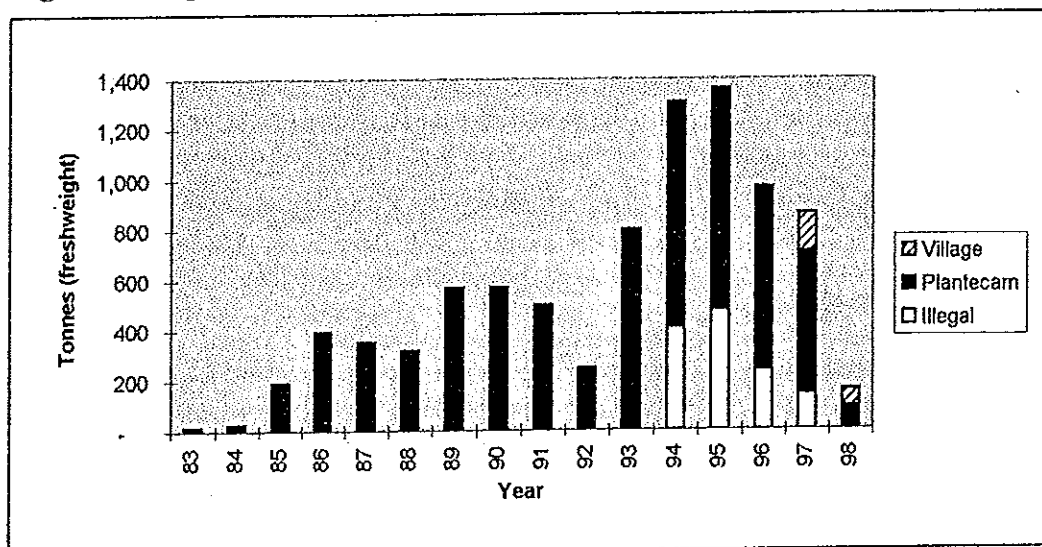
The global market value of the final product is estimated to have now reached US\$220 million per year (Cunningham *et al.* 1997).

Exploitation of *Prunus africana* bark on Mt. Cameroon

The sole licence for the Mt. Cameroon area is held by Plantecam, and until recently harvesting was done only by its own employees. From Plantecam's records, as presented to the Ministry of Environment and Forestry (MINEF), a total of 4,478 tonnes were exploited over the period 1st July 1985 to 31st June 1995, equivalent to 448 tonnes per annum (Ewusi *et al.* 1996).

Benefits to local communities were very small. In 1994, there was an outbreak of illegal exploitation. Unauthorised buyers encouraged villagers to harvest, giving the latter much greater rewards than they had previously been offered by Plantecam.

From January 1994, MINEF records show an increase in Plantecam's annual harvest to approximately 926 tonnes per annum. During the same period estimates of the illegal exploitation correspond to an additional annual harvest of 590 tonnes. Thus extraction increased to an unprecedented 1,500 tonnes per annum.

Figure 1. Exploitation of *Prunus africana* from Mt. Cameroon from 1983 to April 1998.

Source: Divisional Delegation of Forestry, Fako Division (Ministry for the Environment & Forestry).

This was more than three times higher than the exploitation levels sustained over the previous 10 years and was considered to be unsustainable by June 1994. Exploitation has dropped significantly again since 1996. This is in part due to the reduction of legal and illegal exploitation, but may also be because remaining stocks are becoming increasingly inaccessible.

Mt. Cameroon Project and its partners

In June 1994, the Mount Cameroon Project (MCP) was established. It is a multi-lateral Biodiversity Conservation Project, working directly within the Ministry of Environment & Forestry (MINEF) and the Ministry of Public Investment and Territorial Administration. The purpose of this project is to "increase the capacity of forest users and other stakeholders to implement a participatory strategy for sustainable use and conservation of forest resources in the Mt. Cameroon region".

With this objective, MCP has focused much attention and considerable resources on the sustainable management of *P. africana*. It works closely with MINEF, Plantecam, and villages to explore sustainable ways to manage this resource which both guarantee its continued supply and ensure benefits to the local community.

In Mapanja and Bokwaongo villages, the Project has successfully facilitated an arrangement between Plantecam, MINEF and the villagers, whereby the latter now exploit bark themselves, selling directly to Plantecam at the official market price (much higher than the "black market" price). A significant share of the revenue is reinvested in a village development fund. Villagers now appreciate the value of managing the resource sustainably: correct harvesting methods are observed and illegal exploiters are no longer welcome. This model has been monitored closely by all parties and is now ready to be extended to other villages (Brocklesby *et al.* 1997).

The importance of respecting sustained yield

To ensure the continued existence of *P. africana* on Mt. Cameroon, and its sustained productive potential, it is critical that exploitation quotas are set which are both **realistic** and **respected** by all parties.

In 1995 Plantecam's previous 5 year licence expired. Up until this time, the quota allocated to Plantecam in their licence to harvest *P. africana* bark has not been based on any objective scientific data. Before Plantecam's licence could be renewed, they were required by the Forestry Law to complete an inventory of existing stocks to determine the **sustainable** harvest levels of bark. This was intended to form the basis of a quota, which would be duly shared between Plantecam's own harvesting team and villages with whom recognised agreements have been reached.

Management Inventory of Mt. Cameroon

In 1996, Plantecam commissioned a management inventory (1% sample) of the *P. africana* stock on Mt. Cameroon to establish the status and extent of the population. This inventory was undertaken by the Office National de Développement des Forêts (ONADEF) who are the Government Parastatal responsible for forest inventories. The survey was part funded (approx. 40%) by the Global Environment Facility which supports MINEF to carry out biological surveys in preparation for management plans. It was closely monitored by joint teams of Plantecam, MINEF, ONADEF and MCP staff who independently cross-checked a 10% sample of the field work and confirmed the results to be sufficiently accurate. Careful measures were made of the degree of debarking and the crown health of the tree.

Table 1 Summary of results of ONADEF Management Inventory of Mt. Cameroon (June 1996)

Block	Zone	Area (hectares)	Total number of trees >30cm (live and dead)	Dead (%)	Total No. of live trees >30cm	Live stems/ hectare >30cm	Live but over-exploited*
Block A	Bokwango to Ekonjo	6,083	6,533	24%	2,591	0.82	43%
Block B	Buea to Ekona Lelu	5,509	8,814	62%	1,160	0.61	33%
Block C	Bavenga/Ikata to Munyenge	9,984	8,448	7%	2,261	0.90	57%
Block D*	Bomboko Forest Reserve	20,091	5,504	23%	4,220	0.21	8%
Block E	Etinde to Bomana	8,182	13,040	0%	12,912	1.59	18%
TOTAL		48,609	47,005	22%	36,823	0.76	33%

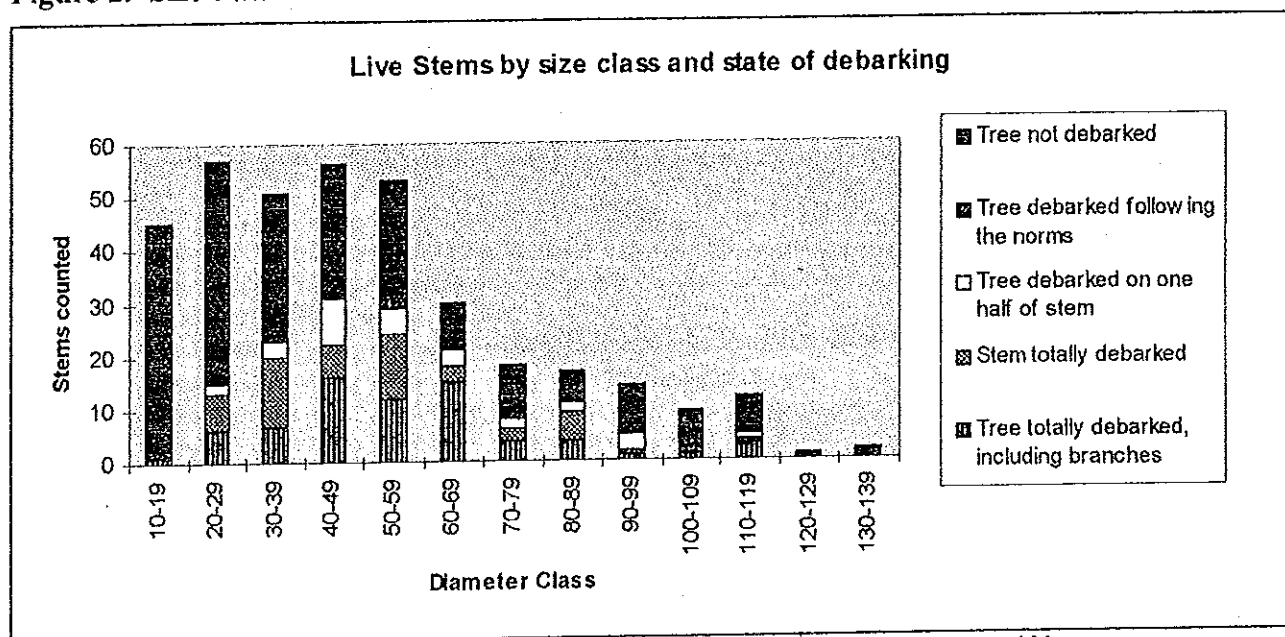
*Over-exploited trees includes those that have been stripped of all bark from their branches and/or their entire stem.

The ONADEF inventory report (ONADEF, 1997) indicates that there are a total of almost 37,000 trees on the Mountain which are still alive and above the minimum exploitable size (diameter ≥ 30 cm).

These trees are unevenly distributed on the mountain; the population is most dense at higher altitude and on the western flank of the Mountain. Whether this is a result of geo-climatic influences or the fact that this area is remote and has never been previously exploited is not clear.

Distribution is also uneven between size classes, more trees occurring in the smaller diameter classes, which is normal for any tree population.

Of all the stems inventoried, 20% were already dead at the time of the inventory, 90% of these due to over-exploitation or felling. 25% of the remaining live trees displayed signs of severe stress, with more than 40% of their branches dead.

Figure 2. Size class distribution and condition of *Prunus africana* (1996)

Source: ONADEF (1996) Management Inventory of Mt. Cameroon with emphasis on *Prunus Africana*.

Of the living trees of exploitable size, 40% have been excessively stripped (all of the stem or the entire tree had been debarked), and another 16% had been normally stripped. The over-exploited trees will certainly not be productive for at least 10 years, and most will probably not survive at all. The impact of over-exploitation during the last 5 years is clear, the productive population of *P. africana* has been reduced dramatically. Only about 22,000 trees are exploitable in the next 5 years.

Comparing the ONADEF results with previous surveys (e.g. Ewusi et al. (1992), also suggests that there has been a significant decrease in the overall *P. africana* population over the last 5 years.

By applying statistical tests, MCP has shown that the estimated total population of *P. africana* is accurate to within $\pm 50\%$ at the 95% confidence level. While this is a wide range, for forest management purposes, it is already clear that it is highly unlikely that the population of *P. africana* is more than 50% greater than estimated. In such circumstances, normal forestry practice is to plan exploitation on the side of caution, until more accurate estimates are available.

Yield studies per Tree

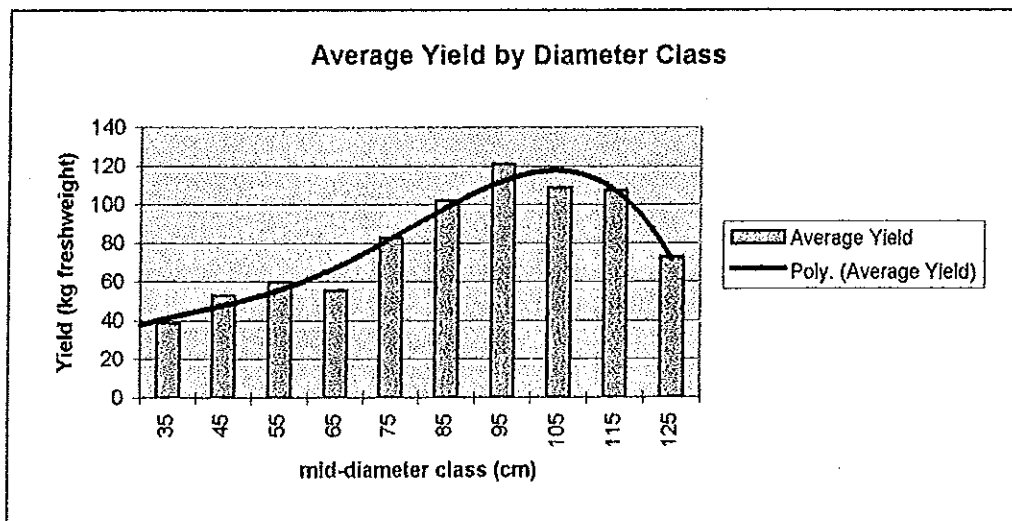
Average yields per tree are based on data available from replicated field studies carried out jointly by Plantecam and MCP. Yields were recorded from more than 150 trees of different sizes. Dimensions and bark thickness were recorded for a further 200 trees.

Using current exploitation methods approximately 68kg bark can be harvested per tree, when exploitation norms are respected. This is the weighted average by size class; note that there are many more small trees which have a much smaller average yield (see Figure 2 and Figure 3).

It was noted that the potential yield of the largest trees is not being realised, due to difficulties of climbing and stripping old, large diameter trees which tend to be either covered in thick climbers or so gnarled that they are impossible to peel.

This estimate is consistent with a Forestry Department study of 7,717 trees harvested in Bui Division, North West Province which recorded an average yield of 55kg per tree. MCP is ready to carry out joint field surveys with Plantecam and MINEF to collect all the necessary additional data to improve on this calculation, but it is not expected to change significantly. Even if the largest trees were exploited, it would not increase yields significantly, because the large trees (over 100cm dbh) only account for about 6 percent of all exploitable trees.

Figure 3 Average yield by size class, from all yield study data



Source: Dibobe, Tako & Acworth 1996-1997.

Assumptions used in calculating the sustained yield.

For planning the inventory and interpreting the results, a joint committee of representatives from Plantecam, MINEF, and MCP worked to calculate the sustained yield of bark to set appropriate exploitation quotas for the Mt. Cameroon region.

At the beginning of this process a number of key assumptions were agreed:

1. Inventory Data
 - The inventory data provided by ONADEF is acceptable as a valid first estimate of the population at the time of the inventory. However, it was not completed in some key areas (<10% of total area), and is still to be checked.
2. Exploitable area
 - The total population of *P. africana* on Mt. Cameroon is restricted to the area which was inventoried and no more.
3. Unproductive Trees (dead or over-exploited)
 - For the purposes of calculating the sustained yields available over the next 5 years, all dead or completely stripped trees, could not be expected to produce again during this 5 year period.
 - Given that the tree is stripped from alternate sides every 5 years, the bark actually takes 10 years to regenerate. If a completely stripped tree is to recover at all, then it will need at least 10 years to do so. Such trees should not be counted in the estimate of 5 yearly quotas. Only when evidence is available that totally stripped trees have recovered will they be included in future estimates of sustained yield.
4. Tree health
 - Many trees were recorded which show more than 40% canopy mortality. While these were clearly showing signs of stress, the yield has not been reduced accordingly. This is because it is quite likely that they are the same trees that have been over-exploited and have already been excluded from the yield estimate.
5. Frequency of Exploitation
 - The norm of harvesting every 5 years should be used in the calculation, although this should be subject to further monitoring and adjusted accordingly when better information on bark regeneration rates is available.
6. Yield per tree
 - Plantecam's data from 20 years' worth of experience in the field suggests that the

average yield is approximately 100 kg per tree. However, monitoring of their exploitation area shows that trees are often over-exploited; in addition, their harvesters have favoured medium sized to larger trees in the past.

- MCP and Plantecam collected yield data from the field to estimate the average yield by size class of tree. The available data suggests that an average yield is closer to 68kg per tree for all size classes (weighted by size class distribution).
7. Yield per Block
- Due to the large variation in number of trees and degree of previous exploitation in each block, yields will be calculated per block and quotas given accordingly.
8. Estimates of exploitation this year
- All exploitation, by Plantecam and illegal exploiters, carried out since the inventory was completed (July 1996), will be considered as coming from the sustained yield quota calculated for the block concerned, for the total 5 year period (1996-2001).

Calculating the sustained yield

On the basis of the ONADEF inventory results and all the assumptions listed above, sustained yields have been estimated for each of the 5 inventory blocks (Table 2).

For the entire Mountain, sustained yield was estimated at 1,488 tonnes over a 5 year period or 298 tonnes per annum at the time of the inventory (July 1996).

Table 2 Summary of Exploitation from July 1996 to April 1998

Block	Source of Exploited Bark (Tonnes fresh weight)			Exploitation Block	Estimated Sustained Yield 1996-2001	Sustained yield Tonnes per annum
	Illegal exploitation*	Plantecam Exploitation ^A	Village Harvester's Unions [#]			
A	190	-	141	331	186	37
B	135	-	-	135	83	17
C	-	593	-	593	162	32
D	-	338	-	338	303	61
E	-	137	68	205	753	151
Grand Total	326	1068	209	1,602	1,488	298

*Illegal exploitation has been estimated from confirmed reports of trucks leaving villages with illegally exploited bark.

^APlantecam exploitation figures are obtained from way-bills presented to MINEF, adjusted to freshweight.

[#]Mapanja, Bokwango and Likoko Membea Harvester's Unions are operating under the Plantecam Licence.

Since then more than 1,600 tonnes have been exploited. In some areas exploitation has seriously exceeded estimated sustained yields whereas in others, exploitation has only just begun (see Table 2). This suggests that trees in some blocks have been further over-exploited and therefore future sustained yields will again suffer.

Table 3 Estimates of quotas of bark remaining at June 1998 after adjusting for actual quantities of *P. africana* bark harvested from Mt. Cameroon since July 1996.

Tonnes of Bark fresh weight	Estimated Yield quotas for period July '96-June 2001	Bark exploited: July '96 to Apr '98	Adjusted yield quota for period Jan 1998-June 2001	
			Total	Annual
Block	Total			
Block A	186	331	0	0
Block B	83	135	0	0
Block C	162	593	0	0
Block D*	303	338	?	?
Block E	753	205	548	183
TOTAL	1,417	1,602	548	183 + ?

*Inventory data not complete

On the basis of these reported harvested quantities, the sustained yield has been adjusted for the remainder of the 5 year exploitation period (see Table 3).

The conclusion of the study is that all the available quota for blocks A, B and C has already been harvested. The only remaining bark which can be sustainably exploited during the next 3 years is in Blocks D (Bomboko Forest Reserve) where inventory data is not complete, and E (between Mt. Etinde and Bomboko Forest Reserve) which has large stocks of exploitable bark.

Maximum potential yield, assuming no over-exploitation

To assess the impact of recent exploitation on the sustained yield, the same inventory data was reprocessed, assuming that all trees were live and productive. The same yields per tree were used. Sustained yield for Mt. Cameroon was then calculated to be 614 tonnes per annum. This test clearly demonstrates that unsustainable and destructive exploitation has reduced the annual sustained yield to less than a third of its potential of a few years ago. It is unlikely to recover to this original potential for many years, due to the fact that many over-exploited trees have already or are still likely to die. Further over-exploitation will continue to reduce sustained yields.

Plantecam's reaction to the sustained yield estimates

Plantecam have expressed concern that their factory (at the foot of Mt. Cameroon) requires a minimum supply of 1,500 tonnes per annum, to be met from its own concession and by buying from contractors in other areas, and that they were relying on Mt. Cameroon to supply an allowable annual off-take of up to half of this (700 tonnes). The estimated sustained yield from Mt. Cameroon clearly does not meet their current demands, and many other legal exploiters (and illegal) are exporting directly to the world market even though they do not have official export licences.

As a result Plantecam have consistently disputed the sustained yield estimates prepared by MINEF and Mt. Cameroon Project on the basis that the ONADEF 1% inventory is insufficiently intensive, inaccurate, and was not completed in some areas and that average yields per tree are higher than those recorded during joint MCP / MINEF / Plantecam field studies.

Renewal of Plantecam's licence and quota

In preparation for renewal of Plantecam's licence and quota, the sustained yield estimates calculated above had been made available to all concerned in early 1998. However, in April 1998 the Ministry renewed Plantecam's licence for another year with an exploitation quota of 1,500 tonnes. Clearly sustained yield estimates were not taken into account.

After further consultation between local MINEF and Project partners, MINEF organised a meeting in June 1998 at which Plantecam and MCP were present. Agreement on a sustained yield was not reached, and all parties accepted that a more intensive (minimum 5%) exploitation inventory in Blocks D and E should be carried out by an independent professional forestry body to provide supplementary information for the detailed management of these areas over the next 3 years. The inventory will be jointly funded by Plantecam and MCP and will start from November 1998. On the basis of these inventory results, MINEF will set binding quotas to reflect the availability of *P. africana* in the field, and to guarantee sustainability.

Ongoing exploitation of *Prunus africana* on Mt. Cameroon.

In the meantime exploitation continues with the condition that prescribed harvesting norms are respected, no tree is revisited before complete bark recovery (minimum 5 years) and regular monitoring is carried out by a joint MINEF, Plantecam and MCP team.

Plantecam state that they expect to have harvested over 400 tonnes in this harvest year (1997/1998). This is considerably more than available objective estimates of sustained yield calculated by MCP of around 200 tonnes based on existing inventory and production data. MCP does not expect further inventory data to change this analysis by more than a maximum of +/-50%.

MINEF are committed to adjusting Plantecam's future production even if the remaining quota does not satisfy the current demands of the Plantecam factory. Given that Plantecam have all the facts, the possibility that their own current exploitation may be jeopardising their future supplies is a risk they have consciously chosen to take.

Clearly there is an urgent need to finalise the inventory and determine a realistic sustainable yield, but in the meantime, any exploitation should err on the side of caution.

Other elements to the *Prunus africana* conservation strategy

It is important that all parties agree to respect future quotas and together seek for solutions to any problems that may arise in its implementation.

Monitoring must be regular and follow clear guidelines. Incorrect or excessive harvesting should be strictly controlled. Long term monitoring data is required to validate the current bark stripping methods and harvest interval.

Benefits to the local communities must continue to increase so that illegal exploitation will be eliminated from the Mt. Cameroon region.

It is equally important for MINEF to spare no efforts in the control of illegal exportation of *P. africana* from Cameroon, to guarantee Plantecam enough raw material to allow their factory to operate economically.

Replanting efforts on Mt. Cameroon are being supported by both Plantecam and the Limbe Botanic Garden. While these initiatives should be applauded, they will not yield any bark, or income, for at least 15 years, and in no way diminish the importance of conserving the existing in-situ population and augmenting supplies from the natural resource base.

Conclusion

Mt. Cameroon Project actively urges Plantecam to adopt a cautious approach to exploitation rates, until such time as the first estimate of sustained yield is confirmed. On the basis of statistical analysis of existing data, this is not expected to be far from that described in this paper.

The pilot measures being taken, as described in this paper, are considered to be the most effective means of ensuring its sustained management and ultimate survival. Adoption of a conservative and participatory exploitation strategy is recommended

not only in the interests of the long term survival of *P. africana* as a viable species on Mt. Cameroon, but because if sustainably managed as a renewable resource, this species has the potential to continue providing important benefits to all concerned.

All parties have a clear interest in ensuring that *P. africana* is kept free of restrictive trade bans. By following a responsible and scientific strategy, Plantecam, in partnership with MINEF, villagers and the Mt. Cameroon Project can achieve this.

Open dialogue and ongoing collaboration amongst all stakeholders are a necessity, if partners are committed to the objective of conserving *Prunus africana* for the benefit of all.

Failure by any party to co-operate in implementing the proposed strategy must clearly imply that such a party is not committed to the long term sustained management of *Prunus africana*.

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UNITED KINGDOM

CONCLUSIONS

Medicinal Plants Trade in Europe: Conservation and Supply

Royal Botanic Gardens Kew, 22-23 June 1998

Summarizing Remarks and Conclusions

drafted by Uwe Schippmann

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The Issue of Land and Resource Tenure

If general interests of stakeholders in medicinal plants are compared they seem to be partly congruent and overlapping (see Annex): There is a shared interest to conserve biodiversity resources. Of course they come from differing backgrounds: Trade and industry have a supply background, governments of biodiversity rich countries have an obligation and a commitment to maintain their biodiversity heritage, etc. The chart also shows a second shared interest: Health care needs and concerns which show up several times.

What makes it so difficult to translate the common interest in biodiversity conservation in concerted action for sustainable management?

- There is competition among users to control markets and / or to increase profit.
- Environmental costs are disregarded. The resource is cheap because no investment in sustainability has to be made.
- The resource is often a common resource with mostly open access. This means that collector A has no incentive to take less but all of the resource because collector B may come later and spoil his efforts to harvest sustainably.

Under historic conditions, many open access schemes were sustainable because pressure on the resources was low. In times of increasing population, low income, high unemployment, and increasing trade demand, open access is disastrous and must be regulated by common resource management.

Conclusion: Ownership and land tenure are primary factors which greatly influence the way a resource is depleted or not. In many cases, the path towards workable solutions is more one of politics and people management than natural resource management.

Action Fields for Medicinal Plant Conservation

Land ownership issues are a core issue in conservation. Being based in long historical processes and cultural traditions, changing unfavorable land tenure system is in most cases beyond the reach of our efforts as traders, conservationists, etc.

What can be done is to take the underlying socio-economic conditions into account and to identify favorable land-tenure conditions. In fact, many long-lived, successful common property management systems are in place. They need to be identified and supported.

Medicinal plant conservation has to provide the following:

(1) Better understanding of the resources and their biology: Setting priorities for research and conservation

As was shown in Dagmar Lange's overview paper, we have before us a shortlist of taxa for immediate action. However, the majority of species in use is still poorly understood in terms of response to collection and use.

Knowledge about the resource is very poor among many stakeholders. Far too many importers, despite their good intentions, are content to leave issues of environmental responsible sourcing to local exporters and harvesters and are unaware of the destructive effects that their trade is having on some wild plant populations and habitats. The resource is often utilized and over-harvested without understanding the biology.

More research is needed on distribution, growth rates, habitat specificity, population status, and sustained yield of utilized medicinal plant species, especially if they are under commercial exploitation.

Initiatives in this respect have been increasingly started over the last few years. More R&D projects to investigate the resources and for priority-setting have to be initiated through...

- Governments of source countries and importing countries
- Corporate users
- Bilateral technical cooperation and development projects
- Non-governmental organizations

A process to identify the threatened taxa among the many hundreds of taxa in trade is underway. The IUCN *Medicinal Plant Specialist Group* (MPSG) has initiated a process to assess the susceptibility of taxa which are in international trade. This process aims at boiling down the vast number of hundreds, maybe thousands of species in significant utilization and at identifying the ones which are affected by this use. This can be done by assessing a limited set of mostly biological characteristics. To illustrate this: It is of course of higher conservation concern if a habitat specific, slow growing perennial is harvested for its roots than it would be for a widespread tree used for its leaves. More research is needed to this end.

(2) Continued and improved monitoring of trade volumes

Monitoring tools are different for protected and non-protected species.

For species covered by international legislation:

- CITES Appendix II is the main tool for this.

Annual reports are obligatory but often reporting is poor. Governments need to better control and monitor the CITES trade. Also training of officers is required. The German Bundesamt fuer Naturschutz has developed a training unit for the identification of protected medicinal plants. Significant Trade Studies are carried out on behalf of the CITES Plants Committee.

- The Annex D of the EU-CITES-Regulation was created as a monitoring index.

For species in trade, but not covered by legislation:

- National customs data are in most cases not species-specific.
There is a need to amend customs tariff codes and single out certain species.
- TRAFFIC studies on plant trade.

(3) Legal measurements to regulate "open access" schemes

Legal measurements can have a national or international focus.

- Countries can install **national quota and licensing systems** for the harvest of certain species.
It is clear that these must be based on inventories and yield studies and have to be backed up by continuous monitoring of regeneration and impact.
- The **Convention of Biological Diversity (CBD)** in its Article 15 gives sovereignty to countries of origin to restrict the access to genetic resources. Biodiversity rich countries are increasingly using this tool.
- **CITES** has a mandat to control international trade in endangered species. For all Appendix II species, it is the sole responsibility of the country of export to issue or deny export permits.
- The **EU-CITES-Regulation** implements CITES in the EU. As a stricter measure it requires import permits for Annex B species (which includes all Appendix II taxa). Imports can be denied if sustainable use cannot be proven.
- **EU Habitats Directive**: For the taxa listed in Annex V (some of which have medicinal qualities: *Arnica montana*, *Gentiana lutea*, *Lycopodium* spp.) member states have to ensure that their exploitation is sustainable.
- In the **pre-marketing approval process** of a newly developed drug, applicants need to prove its safety, efficacy and quality. The term "quality" needs to be defined to also include the requirement of "sustainable sourcing".

(4) Continued research in cultivation, especially targetting threatened and susceptible species

Industry is often understandably reluctant to commit resources to cultivation on a significant scale when wild stocks are still available, even if this means "resource mining" rather than resource management.

What are the limitations for cultivation? Cultivation is only feasible if the following conditions are met:

- fast growing species
- easy growing conditions
- high price per produced unit
- large units per cultivation area

Why is wild collection so often preferred?

- It is cheaper and does not require infrastructure and investment.
- If quantities needed are not large enough, cultivation is not economically viable.
- For some plants successful cultivation techniques have not yet been achieved.
- It is often believed that wild plants are more powerful.

Two different approaches are needed: (i) A high-tech approach which aims at selecting fast-growing

cultivars with high active ingredient level, and (ii) on-farm research with small-scale commercial farmers. There is also an important role of botanic gardens and universities to take the initiative here.

(5) Search for alternative sources

Search for alternative sources means shift to other resources which

- ☐ are more common, or
- ☐ are easier to cultivate, or
- ☐ can be synthesized.

Caveat 1: Options (4) and (5) may take pressure off wild populations by gaining independence from the non-cultivated or wild resource. However, this may also lead to loss of incentive to conserve the habitat. Populations in the wild are needed in the long run for identifying new leads or new activity against resistancy effects.

Caveat 2: A more abundant alternative resource may again run into overharvesting and supply problems.

(6) Support of sustainable harvest from non-cultivated sources

The major conclusion is: We need to support the sustainable harvest from non-cultivated sources. Only if there is a benefit for harvesters and people living close to the resource there will be an interest to maintain the populations and habitats. The aim is to avoid the "tragedy of the commons" through installation of common property resource management. As said earlier, this is only possible under favorable ownership and land tenure conditions.

Any intended use of a species requires an effective management system and legal framework based on sound scientific information. The management plans have to address various questions:

- ☐ Assessment of threat according to experts/literature (global, regional)
- ☐ Field research: collection of population data
- ☐ Investigation of data on the biology of the taxon: growth rates, life form, plant community, breeding system, etc.
- ☐ Revision of national regulations for the utilization in source country
- ☐ Extent of wild harvesting versus cultivation
- ☐ Revision of volumes that have been harvested / traded in the past
- ☐ Establishing a management scheme: annual harvesting quotas, seasonal restrictions, regional restrictions, restrictions to certain plant parts or size classes; cultivation projects
- ☐ Installation of continuing monitoring and reevaluation

(7) Improved communication among stakeholders

There are many projects, programmes, groups, initiatives, institutions, authorities which work on the issue in many ways. They all need to be networked. This means open, honest, factual communication. The pharmaceutical industry and the trade are particularly secretive. If we are to work together to resolve issues which we have identified as being of common interest we have to find a way to get around this.

The Clearing House Mechanism of the CBD needs to take up this challenge. Here is also a role for the Medicinal Plant Specialist Group (e.g. through its regular newsletter *Medicinal Plant Conservation* and the *Directory for Medicinal Plant Conservation*). The most recent development is the creation of a "Network of Networks" which was an outcome of the February 1998 Bangalore conference "Medicinal Plants for Survival".

(8) Increased awareness of consumers by means of certification or ecolabelling

Many companies involved in trade and production wish to trade from "politically correct" sources and perhaps wish to invest in conservation research. These efforts have to be translated to the consumers, especially in Europe and North America, as being responsible strategies which merit higher prices. There is a role for a certification scheme here, a sustainability label. By this, the costs for sustainable harvesting could be built in the cost calculations for the plant based product. There are, however, some problems with labelling:

- Sustainable production has to be defined by a sound set of characters. IUCN has tried that for a long time and no product has yet been achieved.
- The consumer may not respond to a sustainability-label if his/her health is concerned.
- For prescriptive drugs there is no choice for consumers, this would instead have to be addressed to the physicians or pharmacists.

Final Remarks

For many of the actions fields (1) to (8) mentioned above, there is a role for a yet-to-create foundation which could function as a *Medicinal Plant Resources Secretariat*. Financial support for this could come from government authorities in supply and demand countries. But more so this should be provided by corporate stakeholders.

In general, conservation measures can be imposed on the market either externally: this can be in the framework of CITES listings or of the CBD; or the measures may come from within the market by corporate strategies to invest in conservation research and measures.

Continuation of current harvesting practices and resource mining is not healthy - either for industry, which progressively loses its supply source, the environment where habitat is damaged or is selectively depleted of species, or local people who see their local self-sufficiency eroded through overexploitation of popular, effective plant species they use to treat themselves.

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