



SPECIES IN DANGER

**EUROPE'S  
MEDICINAL AND  
AROMATIC PLANTS:**

THEIR USE, TRADE AND  
CONSERVATION

DAGMAR LANGE

A TRAFFIC NETWORK REPORT

**TRAFFIC**  
— EUROPE —

This report was published  
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Cambridge, United Kingdom.

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Suggested citation: Lange, D. (1998).  
*Europe's medicinal and aromatic plants:  
their use, trade and conservation.*  
TRAFFIC International.

ISBN 1 85850 144X

Front cover photograph: Three-leaved,  
or Greek, Sage *Salvia fruticosa*, Sicily

Photograph credit: D. Lange

Printed on recycled paper.

**EUROPE'S MEDICINAL AND AROMATIC PLANTS: THEIR  
USE, TRADE AND CONSERVATION**

by Dagmar Lange

Research for this report was generously funded by the Rufford Foundation; WWF UK; the Bundesamt für Naturschutz, Germany; the Stanley Smith Horticultural Trust; Dogal Hayati Koruma Dernegi; Fauna and Flora International; WWF Netherlands; WWF Belgium; and the European Commission.



Credit: Emilio Blanco Castro

Popular traditional medicine is still alive in Spain, where some people pick wild herbs for their own use. Villagers seen here in Montejo de la Sierra, Spain, have collected Pennyroyal *Mentha pulegium*, for use as a digestive.



**CONTENTS**

<b>Acknowledgements</b>	iv
<b>Executive summary</b>	v
<b>Background</b>	1
<b>Introduction</b>	2
<b>Methods and definitions</b>	3
<b>Characterisation of the areas surveyed</b>	6
<b>Medicinal and aromatic plants in use</b>	10
Species in use	10
Wild or cultivated origin?	13
<b>Trade in medicinal and aromatic plant material in Europe</b>	23
Traded forms of plant material	23
Trade structure	26
Medicinal and aromatic plant material and Customs codification	31
Europe's place in worldwide trade	33
Trade figures for Europe	36
<i>Intra-European trade</i>	39
<b>Legislation relating to the harvest and trade of medicinal and aromatic plants in Europe</b>	40
International level	40
Legislation at European and EU level	40
Legislation at national level	41
<b>Medicinal and aromatic plant species in Europe reported as threatened</b>	49
<b>Conclusions</b>	65
<b>Recommendations</b>	68
<b>Notes</b>	73
<b>References</b>	73
<b>Annex 1</b>	I-XXVI
<b>Annex 2</b>	I-IV

## ACKNOWLEDGEMENTS

This report draws on the results of research made possible with financial contributions from the Rufford Foundation (UK), WWF UK, the German Bundesamt für Naturschutz, the Stanley Smith Horticultural Trust, Dogal Hayati Koruma Dernegi (DHKD), Fauna and Flora International (FFI), WWF Belgium, WWF Netherlands, and the European Commission.

The author would like to express her gratitude to all those who helped to make this study possible by providing assistance and documentation as well as by sharing their knowledge on the subject, above all the consultants and authors of the national reports, namely Adrian Vaso (Albania); Karine Goi (Société Française d'Ethnopharmacologie), Jacques Fleurentin (Société Française d'Ethnopharmacologie, University of Metz) and Martine Todisco (TRAFFIC Europe) (France); Prof. Dr. Jenő Bernáth and Dr. Eva Németh (University of Horticulture and Food Industry, Budapest) (Hungary); Dr Emilio Blanco Castro, John Breaux and Miguel Angel Soto Caba (Spain); Prof. Neriman Özhatay (Istanbul University), Prof. Mehmet Koyuncu (Ankara University), Sema Atay (DHKD) and Andrew Byfield (FFI) (Turkey); and Fiona Dennis (Botanic Gardens Conservation International, UK). Magdalena Mladenova (Bulgaria) and her team of the Agribusiness Centre of the Trade Research and Promotion Institute collected information on trade and legislation in Bulgaria.

The author is also grateful to Dr. Karl Demeyer (Free University of Brussels); Olivier Diana (European Commission, Brussels); Eladio Fernandez-Galiano (Council of Europe, Strasbourg); Bertalan Galambosi (Institute of Resource Management, Finland); Harriet Gillett and Oliver Jarrett (WCMC, Cambridge); Yury Gorbunov (Russian Academy of Science, Main State Botanic Garden); Benoît Hambuckers (European Commission, Brussels); I. Kusahara, (Director, Tariff and Trade Affairs Directorate, World Customs Organization); Anni Luckacs (Environmental Law Centre of IUCN, Bonn); Dr. Guy Leclercq (CERDEPAM, France); Egidius Van Liempd (European Commission, Brussels); Tom De Meulenaer (TRAFFIC Europe); Dr. Barbara Steinhoff (Bundesfachverband der Arzneimittel-Hersteller e.V., Bonn); Dr. Friedrich Pank (Bundesanstalt für Züchtungsforschung an Kulturpflanzen); and Joao Pedro Silva, Portugal.

Fiona Dennis; Alan Hamilton (WWF International); Nina Marshall (TRAFFIC East/Southern Africa); Dr. Noel McGough (Royal Botanic Gardens, Kew); Teresa Mulliken (TRAFFIC International); Sally Nicholson (WWF UK); Chris Robbins (TRAFFIC North America); and Dr. Uwe Schippmann (Bundesamt für Naturschutz, Germany; Chairman, IUCN/SSC Medicinal Plant Specialist Group) have kindly helped to review the text. Julie Gray is thanked for her editorial work. Above all, I would like to thank Anne Vanden Bloock of TRAFFIC Europe for her great support during preparation of this report.

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## EXECUTIVE SUMMARY

The subject of this report is 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.

The report aims to (i) examine the exploitation of native European medicinal and aromatic plants; (ii) investigate the trade of medicinal and aromatic plants in Europe; and (iii) recommend actions to ensure legal and sustainable use of the taxa involved. The findings are based on country-specific surveys which were carried out in Albania, Bulgaria, France, Germany, Hungary, Spain, Turkey and the UK, during 1994-1997. In addition, international trade data from the UNCTAD Comtrade database (United Nations Statistics Division, Geneva) have been analysed.

The countries surveyed are scattered throughout Europe, and are quite diverse; they show 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. These countries, in particular the Mediterranean countries, show rich wild gene pools with regard to medicinal and aromatic plants and are home to many of those cultivated today.

In Europe, at least 2000 medicinal and aromatic plant taxa are used on a commercial basis, of which two-thirds, 1200-1300 species, are native to Europe.

Wild-collection plays still a vital role in the trade in medicinal and aromatic plants in Europe, as, in general, prices for material from wild plants are much lower than for material of cultivated origin. Wild-collection remains particularly prominent in Albania, Turkey, Hungary and Spain. From the 1200-1300 European plant species detected in trade, at least 90% are still wild-collected. In terms of volumes, 30-50% of medicinal and aromatic plant material in trade in Hungary is wild-collected, 50-70% in Germany, 75-80% in Bulgaria, and almost 100% in Albania and Turkey. The overall volume of wild-collected plant material in Europe is estimated to be at least 20 000-30 000t, annually.

Collectors of medicinal and aromatic plant material from the wild are, in the main, rural people, stock-herders, villagers, retired people, or often women and children, for whom it provides in most cases a supplementary income. Collecting is done either with or without prior contractual agreement with a trader. Where prior agreement exists, lists of plants and amounts to be collected are often prepared.

In the European Union (EU), medicinal and aromatic plants are cultivated on an estimated total area of 70 000ha. Important crop species are, for example, lavender *Lavandula* spp., Opium Poppy *Papaver somniferum*, Caraway *Carum carvi*, and Fennel *Foeniculum vulgare*. In all, 130-140 plant species are cultivated. This includes species which may be obtained from both cultivated and wild stock (e.g. Yellow Gentian *Gentiana lutea*), and a few which are invariably from cultivated stock (e.g. Peppermint *Mentha x piperita*). Frequently, cultivation is done under contract to industrial users. Countries covered by this report with many hectares under cultivation are France, Hungary and Spain.

Medicinal and aromatic plant material is traded in most cases in dried form (e.g. Germany: 95%; Albania and Turkey 100%), and to a small extent fresh, or preserved in alcohol. Plant parts may be traded in their whole form or comminuted, e.g. cut, rasped or powdered. In international trade, this plant material is frequently

traded whole, or at most coarsely chopped. However, there is a trend towards trading cut plant material.

The structure of medicinal and aromatic plant trade is complex within Europe, and varies from country to country, depending much on whether the country is a consumer (Germany, France, UK, Spain) or a source (Albania, Bulgaria, Hungary, Turkey).

In most countries, trade is dominated by a few wholesalers, only (Albania 4; Germany 21; Bulgaria 10). In particular, in eastern and south-eastern European countries, several smaller companies also operate, but for several of them it is not their only business. In producer countries, in general, the plant material is purchased from collectors and cultivators through several middlemen, e.g. district traders, local dealers, or village co-operatives. Medicinal and aromatic plant material is delivered to other wholesalers, the pharmaceutical industry, extract producers, packaging companies, the cosmetic, food and colouring agent industries, and different kinds of retail outlets. This trade is increasingly complex, mirroring the diversity of uses for the plants.

The trade in medicinal and aromatic plant material in countries belonging to the former Eastern Bloc, has changed in recent years, largely owing to change from strictly organised and state-controlled trading systems, based mostly on country-wide networks, to free and diversified markets, with an increasing number of competing, private companies.

The number of types of medicinal and aromatic plant parts traded by individual wholesalers, importers, or exporters greatly varies, ranging from a few commodities to 2000 different types of plant material, depending on clientele and on the trader's degree of specialisation.

The international and European trade data in this report are based on the commodity code SITC.3 292.4 "pharmaceutical plants" which equates to HS 1211 "plants and parts of plants (including seeds and fruits), of a kind used primarily in perfumery, in pharmacy or for insecticidal, fungicidal or similar purposes, fresh or dried, whether or not cut, crushed or powdered". The analysis of the trade data revealed that:

Europe's place in world trade in medicinal and aromatic plant material is of global importance. (i) It imports about one-quarter of annual global market imports (440 000t, valued at USD1.3 billion in 1996) each year. (ii) 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.

Europe, as a whole, imported on average 120 000t of medicinal and aromatic plant material, annually, in the period 1992-1996. Imports to Europe came from more than 120 countries, with a share of 60% from non-European countries, mainly from Asia and Africa. Eighty per cent of this 60% was channelled to just five European countries in 1996: Germany, France, Italy, Spain and the UK.

Europe, as a whole, exported, on average, 70 000t of this plant material annually between 1992 and 1996. Of this amount, only 20% was directed to non-European destinations, above all to North America. Sixty per cent of this 20% was exported from just five European countries in 1996: Germany, France, Italy, Spain and the UK.

Germany is by far the leading country of import and of export for medicinal and aromatic plant parts in Europe. Its annual imports are on average over one-third of the total volume and value imported into



Europe. The share of Germany's exports of the total European export is approximately one-fifth in terms of volumes and one-third in terms of value.

In Europe, other consumer countries besides Germany with considerable net imports of medicinal and aromatic plant parts are, France, Italy, UK, Spain, Switzerland and Belgium/Luxembourg.

In Europe, countries exporting more than they import of this commodity (source countries), are Bulgaria, Hungary, Poland, Turkey, Czech Republic, Croatia and Romania.

The intra-European trade in medicinal and aromatic plant parts is very large, about 40%, by volume, of all European imports, and over 80% of all European exports. Germany is the pivotal country in the intra-European trade, acting as a link between the eastern and south-eastern European market and north and west Europe.

Some medicinal and aromatic plants that are in trade in Europe are subject to international, European and national legislation.

On an international level, some of these plants are affected by the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES): all 47 CITES-listed European medicinal and aromatic plant species are in Appendix II, all of them bulbous plants, most of them orchid species used to make salep. Their inclusion in Appendix II requires that specimens of these species in international trade must be accompanied by special permits.

On a European level, the Convention on the Conservation of European Wildlife and Natural Habitats of 1982 (Bern Convention) lists six species of medicinal and aromatic plants included in this report.

At EU level, CITES is implemented by *Council Regulation (EC) No. 338/97* and *Commission Regulation (EC) No. 939/97*, and various amendments. In addition to the 47 CITES-listed medicinal and aromatic plant species listed in this regulation's Annex B, seven others are listed in Annex D, which means that their trade within the EU should be monitored. *Council Directive 92/43 EEC* (EC Habitats, Fauna and Flora Directive) lists 10 medicinal and aromatic plant species; three in Annex II, one in Annex IV(b), and six in Annex V(b). The Directive aims to promote the conservation of natural habitats and of wild fauna and flora within the EU.

Legislation on protection of endangered medicinal and aromatic plant species is present in almost all European countries. Bulgaria has set up a quota system which renders the collection of 23 plant species illegal without prior authorisation: each year quantities to be gathered vary considerably according to species and regions. In all, 341 medicinal and aromatic plant species are affected by the combined national legislation of Bulgaria, France, Germany, Hungary, Spain and Turkey, affording either full or partial protection.

Threats to medicinal and aromatic plants in Europe include over-exploitation, destructive harvesting techniques, habitat loss and alteration (largely as a result of changing agricultural practices during the past 100-200 years), and decrease in genetic diversity. An additional impact in the countries of the former Eastern Bloc has been the deregulation of State-controlled commerce and resulting increases in wild-collection. The question of how many medicinal and aromatic plant species are threatened in Europe as a result of this trade is not answerable at the moment, as information on aspects of their biology, ecology, and use is fragmentary

in many cases. In national reports on which this report is based, about 150 species were reported to be threatened in at least one European country as a result of over-collection from the wild. A number of European medicinal and aromatic plant taxa that are considered to be threatened by collection in Europe owing to their demand in trade have been selected from the national reports in Albania, Hungary, Spain and Turkey for detailed description. They are Pheasant's Eye *Adonis vernalis*, Bearberry *Arctostaphylos uva-ursi*, Mountain Tobacco *Arnica montana*, Iceland Moss *Cetraria islandica*, Round-leaved Sundew *Drosera rotundifolia*, Yellow Gentian *Gentiana lutea*, liquorice *Glycyrrhiza glabra*; *Gypsophila* spp. (*Ankyropetalum gypsophiloides*), Bogbean *Menyanthes trifoliata*, species collected for salep. (Orchidaceae), *Paeonia* spp., *Primula* spp., Butcher's Broom *Ruscus aculeatus*, *Sideritis* spp., and species collected as thyme and oregano (*Thymus* spp., *Origanum* spp., and *Thymbra* spp.). For all these taxa, information on biological and ecological features, trade parameters, as well as conservation status have been reviewed in this study, when available.

Threats facing medicinal and aromatic plant species are similar across the world, and in general, their trade is largely unmonitored and public awareness of this trade and its impacts on the plants involved is slight. It is likely that in Europe, at least, levels of trade are unsustainable in many cases, but lack of information to assess whether or not this is so has so far meant that conservation measures for a species have only begun once it has already become endangered. Despite this, there are several possible measures for avoiding potential danger, or for reversing existing threats, to a species, including *in situ* conservation, trade controls, and cultivation projects. Of paramount importance in the case of medicinal and aromatic plant species, is the conservation of supplies for the future. This requires co-ordinated conservation work at European level, involving experts drawn from conservation, specialised sciences, governments, and all aspects of the trade.

Recommendations made in this report for the conservation of medicinal and aromatic plant species propose action in the spheres of: trade monitoring; adjustments to legislation, (among other things, to list new species as protected in the CITES Appendices and under the EC Habitats, Fauna and Flora Directive); improvement to law enforcement; regulation, in particular, of the trade in orchid bulbs, used for salep; *in situ* and *ex situ* protection; improved management programmes; public awareness initiatives; enhancement of cultivation efforts; future research into trade in wild-harvested plants; and certification of plant material from sustainable sources.

## BACKGROUND

At the basis of our ecosystem, plants have always been used extensively by humans, for countless purposes, including food, fuel, construction, clothing, medicine, decoration, cleaning, perfuming, lubricating and pyrotechnics. Of these multiple uses, medicinal use is of high significance. In Europe, plants and their derivatives have been used for medicinal and aromatic purposes for thousands of years. Özhatay *et al.*, (1997) cite records of such use from the Hittite period of Turkish history (1900-1200 B.C.). Medicinal plant use in Antiquity is recorded by Hippocrates, Pliny, and Dioscorides. Dioscorides (first century A.D.) is famous for recording the medicinal properties of more than 500 plant species and his work remained the most important reference source of the kind in Europe up to the seventeenth century. From the Middle Ages, monasteries played an important role in the use and cultivation of medicinal plants and in the nineteenth century, specialised treatment methods, like homeopathy, founded by Samuel Hahnemann, or Sebastian Kneipp's water treatment, appeared.

Nowadays, roughly one in four of all prescription drugs dispensed by western pharmacists is likely to contain ingredients derived from plants. Just over 100 plant-based drugs prescribed worldwide are derived from just under 100 species, only, in part a reflection of the length of time necessary to research and approve such medicines (Lewington, 1990). By contrast, 28% of the total inventory of the world's plant species are used in folk medicine, which is relied upon by 80% of the world's population. Even in the UK, in 1993, 25% of people surveyed stated that they used herbal remedies regularly (Thomas, 1993, In: Dennis, 1997). In total, according to the World Health Organization, (WHO), 21 000 plant taxa, including synonyms, are reported as being in use globally in medicines (Groombridge, 1992).

Although the capacity to isolate and synthesize plant chemicals known to be useful medicinally led to the development of a branch of medicine focusing on manufactured medicines, whose associations with plants dwindled and were threatened with obscurity, knowledge of the direct use of native plants for medicinal purposes has not been completely lost in Europe, and indeed has an unbroken tradition in parts of several European countries. In Spain, about 600 plant species are used at a "popular level", in a traditional manner (Blanco and Breaux, 1997), and in Bulgaria about 500 plant species are used in folk medicine (Hardalova, 1997). In Turkey, many people still use native plants for medicine, either collecting plants themselves, or purchasing from the nearest *aktar*, or herbalist's shop. In a study of 96 *aktarlar* (herbalists' shops) in 40 towns and cities in Turkey (Başer *et al.*, 1996), 179 taxa were found to be on sale and this may represent only a fraction of the total number of species available in such shops, as Istanbul alone, for example, has 400 *aktarlar*. Within Europe as a whole latterly, herbal medicine has recently attained a heightened profile and status (Akerle, 1991; Principe, 1991). Since 1970, the use of herbal medicines in Germany, for instance, has increased by 13%, or 20% among young people (Allensbach, 1997). In Spain, 20 new companies in Madrid and Barcelona have been created to respond to the new surge in demand for essential oils (Blanco and Breaux, 1997). Fuller (1991) described the western European herb market as being the "most advanced", and stated that "the growth of the western European herb market is evidenced by the doubling of medicinal plant consumption there over the past decade" - a "herbal renaissance".

In international trade, it is usually impossible to separate out plant material destined for the herbal medicine trade from that bound for use in other pharmaceuticals. Indeed, it is impossible even to distinguish plants in trade globally for their medicinal properties, since many plants have multiple uses for which they are traded. For example, the flowers of Chamomile *Matricaria recutita* may be used to make tea or processed in pharmaceutical products such as tinctures or ointments; into cosmetics, such as shampoos or bath additives; or domestic products, such as washing-up liquids. Similarly, liquorice *Glycyrrhiza* spp., well-documented as an

expectorant and anti-inflammatory, has plenty of other, often more familiar, uses, such as in sweets, cigarette papers, even fire extinguishers, while Sweet Basil *Ocimum basilicum* is familiar as a culinary ingredient; less so as a remedy when "bitten by venomous beasts, or stung by a wasp or hornet", as affirmed by Culpepper (Grieve, 1980). Even small portions of the everyday Onion *Allium cepa* are said to be beneficial in lowering cholesterol levels in the blood, while Garlic *Allium sativum*, has been used to prevent and treat all sorts of infections, as well as in cuisine. This multiplicity of uses for many species of plant is reflected in international trade tariff headings. The narrowest focus possible, in terms of Customs category, in attempting to examine international trade in medicinal plants includes plants and plant parts which are in trade for perfumes, pesticides, peppermints, and pizzas, as well as for medicine (see **Methods** and **Annex 2**).

The global importance of plant material in this bracket is enormous, with imports worldwide amounting to 440 000t, valued at USD1.3 billion, in 1996. A major part of these plant resources is still obtained through wild-harvesting, in terms of both species and volumes (Lange and Schippmann, 1997). This is not necessarily detrimental in itself, but increasing demand for medicinal plants in Europe has led to reports that the survival of some plant species could be at risk (Blanco and Breaux, 1997; Dennis, 1997; Masood, 1997; Miller, 1997; Neale, 1997; Özhatay *et al.*, 1997). The urgency of investigating the status of plants used medicinally is the greater since their use by the majority of the population of the world, who rely directly on plants for cures, is likely to increase, as some industrially-produced drugs are considered expensive or inappropriate, and as official recognition of traditional medicine systems is being encouraged around the world (Lewington, 1990). To indicate which species used in medicine are being sustainably harvested, and which are being harvested to the detriment of their natural populations, information on harvest and trade volumes, on cultural and economic parameters, on harvesting techniques, on management regimes, on legislation, and in particular on the conservation status of relevant plant species is necessary. However, in Europe - as across the world - the trade in medicinal plants is so far largely unmonitored in any detail. Ten years after the "Chiang Mai Declaration" in March 1988 called for "health for all by the year 2000" (Akerlele, *et al.*, 1991), it is necessary to take stock of how far international co-operation has advanced the long-term survival of medicinal plants for future generations.

## INTRODUCTION

A preliminary report on the importation of medicinal plants and their extracts into Europe (Lewington, 1993) outlined the global importance of the European market, in particular the German market, for medicinal plants and urged further research to pursue a meaningful assessment of the importation of medicinal plants into Europe. A study undertaken subsequently on behalf of the German Bundesamt für Naturschutz (Federal Agency for the Conservation of Nature) focused on the German market for medicinal (and aromatic) plants (Lange, 1996a). The report reinforced the view that Germany has a pivotal role in Europe with respect to trade in these plants and revealed that India and the eastern and south-eastern European countries, in particular Bulgaria, were Germany's most important suppliers. Both these source countries have been the subject of further trade reviews, Bulgaria on behalf of the German Bundesamt für Naturschutz (Lange, 1996b), and India on behalf of WWF Germany (Lange, 1996c).

Simultaneously, in 1995, TRAFFIC Europe, in co-ordination with the IUCN/SSC Medicinal Plant Specialist Group, started a three-phase project focusing on medicinal and aromatic plant species in Europe (Vanden Bloock, 1997) with the following objectives:

- (1) to examine the exploitation of European medicinal and aromatic plant species appearing in trade in Europe;
- (2) to investigate the trade within Europe in order to develop an understanding of its scope and patterns; and
- (3) to recommend actions to ensure legal and sustainable use of the taxa involved.

Phase 1 of the project consisted of compiling existing information on the European trade in order to identify source countries and end-markets to select for further research. As phase 2 of the project, country-specific surveys were carried out by experts, in Albania, France, Hungary, Spain, Turkey and the UK during 1996 and 1997, to review the exploitation of, and trade in, medicinal and aromatic plants at national level (Vaso, 1997; Goi *et al.*, 1997; Bernáth, 1996 and Németh, 1997; Blanco and Breaux, 1997; Özhatay *et al.*, 1997; and Dennis, 1997, respectively). The studies in Albania, France, Hungary and Spain were conducted on behalf of TRAFFIC Europe, that in the UK on behalf of WWF UK, and that in Turkey on behalf of WWF UK (and carried out by its associate organisation *Dogal Hayati Koruma Dernegi* (DHKD) and Fauna and Flora International (FFI)). During phase 3 of the TRAFFIC Europe project, information contained in the national reports, including those on Bulgaria and Germany (Lange, 1996a and b) was summarised and analysed for inclusion within this European regional report.

This report focuses on the trade in native European flora in Europe, although trade volumes and values in general between Europe and the rest of the world are included in a later chapter, to give some context to the European focus.

As already pointed out (see **Background**), a large number of plant species that are exploited for medicinal purposes are also used for several other applications. It should be clear, therefore, that it is impossible to classify plant species with regard to their subsequent use. Customs tariff headings reflect this and as a result refer, for example, to "plants...of a kind used *primarily* in...pharmacy", etc. For this reason, the subject of this study is not restricted to medicinal plants in trade for medicinal use only, nor even to plants thought of first and foremost as medicinal plants. The question of end-use will naturally be important where any species is found to be over-exploited, but in assessing the degree of threat to a given medicinal species, the affect of all trade, for whatever purpose, will be relevant. The group of plants on which this report concentrates may most succinctly be described as "medicinal and aromatic plants" (for a definition of the term, see **Methods**). Background information on the different countries surveyed, an overview of species harvested, including an evaluation of the amount of wild-harvested *versus* cultivated material produced is provided. Trade structure within each country and trade volumes and values within Europe and in a global setting are examined, as are the various legislative and regulatory controls in place governing trade in medicinal and aromatic plants in Europe. Final chapters include descriptions of a selection of notable threatened medicinal and aromatic plant taxa in Europe and recommendations for the conservation of medicinal and aromatic plant species in Europe.

## **METHODS AND DEFINITIONS**

The information presented in this paper is based mainly on the national studies carried out in Albania, Bulgaria, France, Germany, Hungary, Spain, Turkey, and the UK (Vaso, 1997; Lange, 1996b; Goi *et al.*, 1997; Lange, 1996a; Bernáth, 1996 and Németh, 1997; Blanco and Breaux, 1997; Özhatay *et al.*, 1997; and Dennis, 1997, respectively) and information relating to a given country in this report is attributable to the relevant national studies, unless otherwise stated. Additionally, international trade data from the UNCTAD Comtrade database, compiled and stored by the United Nations Statistics Division, Geneva, and technical literature were consulted, and information gathered from various experts in the field of medicinal and aromatic plants.



The above-mentioned national reports provide profiles of the current market in material from medicinal and aromatic plants in their countries and are based in most cases on information collected through:

- (1) interviews with collectors, traders and/or others knowledgeable about use and trade;
- (2) examination of national Customs statistics;
- (3) examination of relevant legislation;
- (4) review of merchants' catalogues, and brochures of companies involved in the trade; and
- (5) evaluation of technical literature.

In each case, the national reports were compiled by scientists with expertise in at least one of the fields of botany, pharmacy, conservation, and economics, often with a combined knowledge of these.

This overall report, reflecting and combining information given in the individual country reports, provides information relating to medicinal and aromatic plants, mainly vascular plants, although some lichens and fungi are relevant to the subject. The report concentrates on European species, although the focus is widened in the chapter on international trade volumes and values, partly because the data do not distinguish between European and non-European species and partly to give an idea of the trade on a worldwide scale.

The term **medicinal and aromatic plants**, as used in this report, *excludes* many plants associated primarily with food (such as cereals and vegetables); plants traded mainly as ornamentals; for timber; or for fuel. There are areas of overlap, however. Some plants associated (primarily or otherwise) with food or drink, for example, are included, as the dividing line between these and medicinal and aromatic plants is frequently blurred, as has been referred to in **Background**. To give further examples, sage *Salvia* spp., frequently mentioned in this report, is certainly the basis of a tea drunk for medicinal purposes, but also much used in food. Likewise, Hops *Humulus lupulus* are inextricably connected with beer, but no herbal would be complete without their inclusion.

When referring to "medicinal and aromatic plants", this report *includes* within the term those plants which are, collectively, the source for the products traded within the Customs commodity category identified as equating most closely with a category for medicinal plant products in international trade. Indeed, the matter of exactly which species to include within the scope of this study was in part influenced by the character of the definition of the tariff heading in question, namely HS 1211 of the Harmonised Commodity Description and Coding System (HS). The heading covers "Plants and parts of plants (including seeds and fruits), of a kind used primarily in perfumery, in pharmacy or for insecticidal, fungicidal or similar purposes, fresh and dried, whether or not cut, crushed or powdered". (A fuller description may be found in **Annex 2** to this report.) Species outside the categorisation of Customs code HS 1211 may be mentioned in this report in those chapters which do not centre on international trade - for example, medicinal use of seaweed will be mentioned in the report, but not with reference to international trade figures, since tariff heading 1211 excludes it - but where it is a question of comparing trade statistics between countries, or over time, only those species falling under a single tariff heading are referred to, in order to work with comparable data sets.

The term "*Wirkstoffpflanzen*" (from *wirken* - to have an effect + *Stoff* - matter, substance) exists in German to refer to a category of plants which have some special beneficial effect. The category would comprise those here described as "medicinal and aromatic plants". The German word is mentioned here, as it may be helpful as a means to clarify the concept of the group of plants under study in this report. The general nature of the term allows a more succinct way of alluding to the group of plants, where English must paraphrase (as in "Plants....of a kind used primarily in perfumery, in pharmacy or for insecticidal

fungicidal or similar purposes..." etc.), or define a chosen term, in this case "medicinal and aromatic plants", at length.

In order to find a workable term for referring to the raw plant material from medicinal and aromatic plants, such as the flowers, leaves, roots, stems, fruits or seeds, technical literature focusing on the same was consulted. The term "*pflanzliche Droge*" (plant drug) is often used to refer to this category of plant material, but this term was avoided in this report, as the word "drug" refers to medicinal substances in general and, in the minds of most English-speakers at least, the term "plant drug" would encompass processed or manufactured medicines. In common with likely interpretations of the term "plant drug", other possible terms considered referred to end-products made from medicinal and aromatic plants, rather than to the raw plant material. It was therefore decided that no more appropriate term existed to describe the latter than **medicinal and aromatic plant material**.

In this report, **medicinal and aromatic plant material** refers only to whole plants or parts of plants which have either undergone no processing whatsoever, apart from drying, if applicable, or which have undergone no more processing beyond cutting, crushing, grinding, powdering, or impregnation with alcohol.

**Herbs:** The word herb has two common meanings in modern English:

- (1) to refer to any plant with leaves, seeds or flowers used for flavouring, food, medicine, scent, etc.
- (2) to refer to any non-woody, seed-bearing plant, which dies down to the ground after flowering.

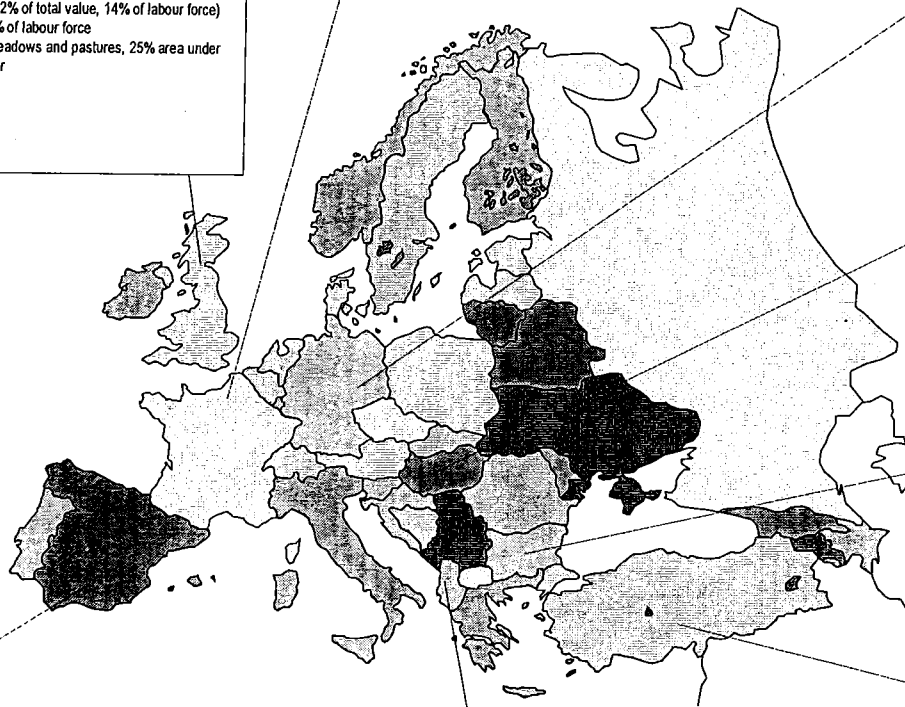
It is on the first of these meanings that the term **herbal medicine** and **herbalism** is based, but further explanation of this term here may be useful. Herbal medicine is used in this report to mean any form of medicinal treatment based on unrefined or little-refined plants or plant parts, which are thought to, or proven to, promote well-being or produce cures. In general, it is separate from mainstream medicinal practice, even espoused in preference to, and rejection of, mainstream medicine. As herbal medicine often involves the ingestion of plant parts, for example, as part of meals, or as drinks, the overlap with food and day-to-day diet is great.

*EEC Directives 65/65, 75/318 and 75/319* define herbal medicines as "medicinal products containing as active ingredients exclusively plant material and/or vegetable drug preparations". A vegetable drug is defined as "plant material used for a medicinal purpose" and "vegetable drug preparations" are "comminuted or powdered vegetable drugs, extracts, tinctures, fatty or essential oils, or expressed juices". Chemically defined, isolated plant constituents or their mixtures are excluded from this definition. These preparations are required to be licensed and, as with all pharmaceuticals, they have to be tested to ensure quality, safety, and therapeutic efficacy, according to the EEC Directives mentioned. Exact criteria to ensure a consistent quality for these products are laid down in *EEC Directive 75/318* and the *Guideline Quality of Herbal Remedies* (Anon., 1989), including the specific botanic identification of the plant material used, the quantity included in a given preparation, description parameters for the method of preparation, and the final control and stability tests. In some countries, and in the cases of selected medicinal plants, therapeutic efficacy may be proved on the basis of traditional use or the results of literature reviews. These herbal medicines can usually be obtained without prescription, although in several countries they are available within the terms of the national health service. Other terms for herbal medicines, as defined by these EEC Directives, are **phytomedicines**, **herbal medicinal products**, or **phytopharmaceuticals**.

<b>Europe</b>	
Area	total 10 498 000km <sup>2</sup>
	Eastern Europe 6 790 360 km <sup>2</sup>
	European Union 3 236 460km <sup>2</sup>
Population	total 682 000 000
	population density 65 persons per km <sup>2</sup>
	Eastern Europe 296 063 000
	population density 44 persons per km <sup>2</sup>
	European Union 373 381 000
	population density 115 persons per km <sup>2</sup>
National parks	244
Protected areas	9 305
Flora	12 500 vascular plant species
Endemics	3 500 (28%)

<b>United Kingdom</b>	
Official name	United Kingdom of Great Britain and Northern Ireland
Form of Government	constitutional monarchy with two legislative houses
Current constitution	since 1066
Political structure	4 countries: England (46 counties), Northern Ireland, Scotland (9 regions), Wales (8 counties)
EU	Member State
Currency	Pound Sterling (GBP); USD1 = GBP0.61 (January 1998)
Area	244 110 km <sup>2</sup>
Capital	London
Chief port	London
Demography	population total 58 784 000
	population density 241 persons per km <sup>2</sup>
	population distribution urban 89.5%, rural 10.5%
Gross domestic product	USD1 069 457 million, USD18 410 per capita
Main economies	(1) finance (26% of total value, 3% of labour force)
	(2) manufacturing (22% of total value, 14% of labour force)
Agriculture	2% of total value, 1% of labour force
Land use	10% forests, 46% meadows and pastures, 25% area under cultivation, 19% other
National parks	10
Protected areas	515
Vascular plant species	1550
Endemics	16 (1%)

<b>France</b>	
Official name	République Française (French Republic)
Form of Government	republic with two legislative houses
Current constitution	since 1958
Political structure	22 regions, 96 departments
EU	Member State
Currency	Franc (FRF); USD1 = FRF6 (January 1998)
Area	543 965km <sup>2</sup>
Capital	Paris
Chief ports	Marseille, Le Havre
Demography	population total 58 392 000
	population density 107.3 persons per km <sup>2</sup>
	population distribution urban 73%, rural 27%
Gross domestic product	USD1 317 950 million, USD22 760 per capita
Main economies	(1) manufacturing (22% of total value, 16% of labour force)
	(2) public administration, defense (19% of total value, 25% of total labour force)
	(3) services (18% of total value, 16% of total labour force)
	(4) trade (14% of total value, 14% of labour force)
Agriculture	3% of total value, 4% of labour force
Land use	27% forests, 19% meadows and pastures, 36% area under cultivation, 18% other
National parks	6 in metropolitan France and 1 in the overseas department Guadeloupe
Protected areas	761
Vascular plant species	4 650
Endemics	133 (c. 3%)



<b>Spain</b>	
Official name	Reino de España (Kingdom of Spain)
Form of Government	constitutional monarchy with two legislative houses
Current constitution	since 1978
Political structure	19 autonomous communities
EU	Member State
Currency	Peseta (ESP); USD1 = ESP163 (January 1998)
Area	505 990km <sup>2</sup>
Capital	Madrid
Chief ports	Barcelona, Seville, Málaga
Demography	population total 39 270 000
	population density 77 persons per km <sup>2</sup>
	population distribution urban 78%, rural 22%
Gross domestic product	USD 525 334 million, USD13 280 per capita
Main economies	(1) trade, finance, services, public administration, defence (59% of total value, 49% of labour force)
	(2) mining, manufacturing (24% of total value, 17% of labour force)
Agriculture	3% of total value, 9% of labour force
Land use	32% forests, 21% meadows and pastures, 40% area under cultivation, 6% other
National parks	6
Protected areas	329
Vascular plant species	5050 (mainland)
Endemics	941 (c. 19%)

<b>Albania</b>	
Official name	Republika e Shqipërisë (Republic of Albania)
Form of Government	unitary multiparty republic with one legislative house
Current constitution	transitional constitution since 1991
Political structure	12 administrative regions subdivided into 36 districts
Currency	Lek (ALL); USD1 = ALL151 (January 1998)
Area	28 748 km <sup>2</sup>
Capital	Tirana
Chief port	Durrës
Demography	population total 3 249 000
	population density 113 persons per km <sup>2</sup>
	population distribution urban 37%, rural 63%, coastal plains c. 50%
Gross domestic product	USD1 229 million (1994), USD360 per capita
Main economies	(1) agriculture, forestry, and fishing (55% of total value, 49% of labour force)
	(2) mining and quarrying (chromium ore, copper ore)
Land use	38% forest, 15% meadows and pastures, 26% areas under cultivation, 21% others
National parks	11, total area 25 8600ha, i.e.0.9% of country's surface
Protected areas	337
Vascular plant species	3 100
Endemics	24 national endemics (0.8%), c. 300 Balkan endemics

**Figure 1**

**Map of Europe depicting the countries surveyed**

<b>Germany</b>	
Official name	Bundesrepublik Deutschland (Federal Republic of Germany)
Form of Government	federal multiparty republic with two legislative houses
Current constitution	since 1949
Political structure	16 Länder
EU	Member State
Currency	Deutsche Mark (DEM); USD1 = DEM1.8 (January 1998)
Area	356 978km <sup>2</sup>
Capital	Berlin
Chief ports	Hamburg, Bremerhaven, Rostock
Demography	population total 81 891 000 population density 229.4 persons per km <sup>2</sup> population distribution urban 85%, rural 15%
Gross domestic product	USD2 075 452 million, USD25 580 per capita
Main economies	(1) manufacturing (23% of total value, 25% of total labour force) (2) services (19% of total value, 23% of total labour force) (3) finance, real estate (13% of total value, 3% of total labour force)
Agriculture	0.9 of total value, 3% of total labour force
Land use	31% forests, 15% pasture, 20% agriculture, 34% other
National parks	11
Protected areas	12 biosphere reserves, 5913 protected areas
Vascular plant species	2700
Endemics	6 (0.2%)

<b>Hungary</b>	
Official name	Magyar Köztársaság (Republic of Hungary)
Form of Government	unitary multiparty republic with one legislative body
Current constitution	transitional constitution since 1989
Political structure	20 counties
Currency	Forint (HOF); USD1 = HOF206 (January 1998)
Area	93 030km <sup>2</sup>
Capital	Budapest
Demography	population total 10 201 000 population density 110 persons per km <sup>2</sup> population distribution urban 63%, rural 37%
Gross domestic product	USD39 009 million, USD3 840 per capita
Main economies	(1) mining, manufacturing (20% of total value, 20% of labour force) (2) services (19% of total value, 24% of labour force) (3) finance, real estate (18% of total value, 9% of labour force)
Agriculture	6% of total value, 7% of labour force
Land use	19% forests, 12% meadows and pastures, 54% area under cultivation, 15% other
National parks	5
Protected areas	194
Vascular plant species	2 200
Endemics	38 (1.7%)

<b>Bulgaria</b>	
Official name	Republika Bulgaria
Form of Government	unitary multiparty republic with one legislative body
Current constitution	since 1991
Political structure	8 administrative regions
Currency	Lev (BGL); USD1 = BGL1 780 (January 1998)
Area	110 994km <sup>2</sup>
Capital	Sofia
Chief ports	Burgas, Varna
Demography	population total 8 366 000 population density 75.4 persons per km <sup>2</sup> population distribution urban 68%, rural 32%
Gross domestic product	USD10 255 million, USD1 217 per capita
Main economies	(1) manufacturing, mining (29% of total value, 27% of total labour force) (2) agriculture (12% of total value, 20% of total labour force)
Land use	35% forests, 19% meadows and pastures, 38% areas under cultivation, 8% others
National parks	11 (250 000ha)
Protected areas	89 nature reserves (77 000ha), 2 272 nature monuments and 99 other protected areas (21 000ha)
Vascular plant species	3 600
Endemics	320 (9%)

<b>Turkey</b>	
Official name	Türkiye Cumhuriyeti (Republic of Turkey)
Form of Government	multiparty republic with one legislative body
Current constitution	since 1982
Administration	76 provinces
Currency	Turkish Lira (TRL); USD1 = TRL216 870 (January 1998)
Area	779 452 km <sup>2</sup>
Capital	Ankara
Chief ports	Istanbul, Izmir
Demography	population total 62 650 000 population density 80.4 persons per km <sup>2</sup> population distribution urban 69%, rural 31%
Gross domestic product	USD149 002 million, USD2 450 per capita
Main economies	(1) manufacturing (21% of total value, 13.5% of total labour force) (2) trade (20% of total value, 12% of labour force) (3) agriculture, forestry, fishing (16% of total value, 41% of labour force)
Land use	26% forests, 16% meadows and pastures, 36% cultivated areas, others 22%
National parks	32 (649 486ha)
Protected areas	32 strict nature reserves (82 023ha), 11 nature parks (46 873 ha), 54 national monuments (74ha), other protected areas (2 248 270ha)
Vascular plant species	8650
Endemics	2675 (31%)

Sources: Anon. 1996; Anon., 1997; Davis *et al.*, 1994; IUCN, 1998; Özhatay *et al.*, 1997; Vaso, 1997.

the University of Sheffield reported purchasing herbal remedies regularly (Thomas, 1993. In: Dennis, 1997). The cost of any private medical treatment in the UK is high, but as a sign of the increasing popularity of herbalism in the country, the first herbal medicine clinic in the UK has recently been set up within a National Health Service hospital. Treatment is not free, but is at the low price of GBP10 (USD16) for 30 minutes treatment (Evers, 1998). Direct use of medicinal and aromatic plants by the population of Spain, e.g. for homeopathy or herbalism, is increasing, but currently only 4% of the population are reported to purchase such remedies, and only 7% of Spaniards report having received homeopathic treatment (Blanco and Breaux, 1997). However, a more traditional base for use of medicinal and aromatic plants is strong in parts of Spain, kept alive by small-scale, informal practice within rural communities. Similar use is reported from Albania, where five per cent of all wild medicinal and aromatic plants collected are said to be for home use (Vaso, 1997).

## MEDICINAL AND AROMATIC PLANTS IN USE

### Species in use

It is not possible to ascertain the exact number of species used as medicinal and aromatic plant material, in use in Europe, nor in any given country of Europe. This is because,

- > firstly, some medicinal and aromatic plant material is used in minute amounts and will therefore not be listed in traders' catalogues.
- > Secondly, a medicinal and aromatic plant commodity may come from several species, yet be traded under a trade name which obscures the various specific origins. This is true, for example, for salep, the starchy extract of dried tubers of various orchid species used medicinally and culinarily, especially in the form of a wholesome drink. Salep may be extracted from many orchid species. Thirty-eight are reported in use for this purpose in Turkey, of which 21 are believed to be threatened species in Turkey (Özhatay *et al.*, (1997), and all of these 21 are listed in CITES Appendix II. A similar situation exists in the case of *çöven*, the Turkish trade name for roots sourced from several species of the genus *Gypsophila*, exported from Turkey for at least the past 135 years. *Çöven* is used for whitening halva (a sweet made from sesame seeds and honey). Rose flowers, long in trade for their medicinal and aromatic properties, are similarly obtained from several species.
- > Lastly, many species are only used at local level and their use is not comprehensively documented.

Based on the results of the investigations undertaken in Albania, Bulgaria, France, Germany, Hungary, Spain, Turkey and the UK, it may be estimated that about 2000 taxa are sources of medicinal and aromatic plant material used on a commercial basis in Europe. About two-thirds of these are native to Europe. Some of these, above all those of industrial importance, are used in many countries, in particular in the western European countries with a highly developed pharmaceutical, cosmetic and extract-producing industry. Examples are Mountain Tobacco *Arnica montana*, Deadly Nightshade *Atropa belladonna*, Thorn-apple *Datura stramonium*, Alder Buckthorn *Frangula alnus*, Yellow Gentian *Gentiana lutea*, *Glycyrrhiza glabra*, and Henbane *Hyoscyamus nigra*, all of which are officially recognised medicinal plants in several European countries (Bernáth, 1996). At least 130 plant species reported to be of commercial importance in Spain are known to be in use also in France, the UK, and in Germany (pers. observ.). However, demand for a given species often varies from country to country, owing to, for example, cultural preference. An example of this is the preference for Cascara Buckthorn *Rhamnus purshiana* in the UK as a laxative instead of senna *Cassia*



spp. (Dennis, 1997). Cultural preferences may in turn be originally determined by local availability. In Turkey, herbal teas are brewed from species of about 35 genera, amongst them *Sideritis* and *Salvia*. Native species of these two genera are used to make tea in several European countries, but the actual species used varies, not only with the country, but also the region: Turkey, for example, has 86 species of *Salvia*, 50% of which are endemic taxa (Mabberley, 1997), while Spain has 45 species of *Sideritis*, and most are endemic (Blanco and Breaux, 1997).

In **Albania**, 205 native plant species are used as sources for medicinal and aromatic plant material (Vaso, 1997). Several species are used locally, collected from the wild by individuals for use at home. Among such species in Albania are *Matricaria recutita*, Dog Rose *Rosa canina*, St. John's Wort *Hypericum perforatum*, and Common Nettle *Urtica dioica*. Those species found on sale in pharmacies in the form of dried plant material include, *Matricaria recutita*, *Salvia* spp., *Rosa canina*, Myrtle *Myrtus communis*, mallow *Malva* spp. and lime *Tilia* spp. At open-air markets, "mountain tea" *Sideritis raeseri* was commonly on sale.

In **Bulgaria**, about 750 native plant species, or 21% of the total flora, are used in folk medicine, to flavour food, as teas and in the pharmaceutical industry. Of these, 200 to 300 species are most commonly used (Hardalova, 1997).

A similar high number of medicinal and aromatic plant taxa could be identified in use in **France** (Goi *et al.*, 1997). From the French pharmacopeia and lists of medicines used in allopathic, herbal, homoeopathic, and veterinary practice, some 900 taxa were noted. Almost half, 475, are native to Europe. *Atropa belladonna* and Opium Poppy *Papaver somniferum* each appear in at least 200 proprietary medicines, but this does not indicate that they are among the most heavily used, in terms of quantity.

No fewer than 1500 taxa were identified as sources of medicinal and aromatic plant material in **Germany**, by surveying 22 wholesalers' catalogues; homeopathic companies' catalogues; the homeopathic pharmacopeia; as well as lists of medicinal preparations, including homeopathic remedies and phytomedicines (Lange and Schippmann, 1997). Supply cannot be met, be it from wild or cultivated sources, from Germany itself, and therefore important quantities of all of the 1500 species have to be imported. Six hundred of these taxa are of European origin, many with a distribution in several countries, but more than two-thirds occur in east and south-east Europe. More than half of the 1500 or so species identified as medicinal and aromatic plant sources for the trade in Germany have their natural distribution in temperate Asia. Species of medicinal and aromatic plant imported by Germany from other European countries, in quantities in excess of 1000kg between 1988-1996, include Pheasant's Eye *Adonis vernalis*; Marshmallow *Althaea officinalis*; Iceland Moss *Cetraria islandica*; Common Centaury *Centaureum erythraea*; and *Gentiana lutea*. Cultivated medicinal and aromatic species in Germany include many herbs associated primarily with culinary use, but also hundreds of hectares of *Matricaria recutita* and Milk Thistle *Silybum marianum* and tens of hectares of *Digitalis lanata*, in 1995 (Lange and Schippman, 1997)

According to Németh (1997) some 270 native medicinal and aromatic taxa are used in **Hungary**, 180-200 of which are officially recognised by the Hungarian Pharmacopeia (No. VII) (Bernáth, 1996). The four most frequently used native species in phytomedicines registered by Hungarian authorities are Peppermint *Mentha x piperita* (in 24% of phytomedicines), *Matricaria recutita* (21%), Yarrow *Achillea millefolium* (18%) and *Urtica dioica* (17%) (Bernáth, 1996).

Based on a series of studies of the country's use of medicinal plants, conducted over the past decade, it is estimated that 800 medicinal and aromatic plant species are used in **Spain**. Among them, 600 native species

are used as medicinals "at the popular level", by which Blanco means that these species are used traditionally, collected by individuals, including traditional harvesters (*manzanilleros*, *aniseros* or *comineros*) for such use. This custom persists in the south-east of Spain, especially, but also in the north-west, and involves the artisanal distillation of essences, use of herbal remedies by *curanderos* (local, traditional herbal medicine practitioners), sale by itinerant herb sellers (traditional use does not exclude a commercial element), and the practice of herbalism, in general, on a home or community basis. The species most used among the 600 used at the popular level counted by Blanco are: seven species of thyme *Thymus*; three species of rue *Ruta*; 5 species of *Sideritis* (called *rabogatos* in Spain); 2 species, principally, of *Salvia*; Elder *Sambucus nigra*; Rosemary *Rosmarinus officinalis*; *Malva* spp.; *Tilia platyphyllos*; and *Matricaria recutita*. Breaux adds others, used more especially for medicinal purposes, namely, *Helichrysum stoechas*, *Urtica dioica*, Common Plantain *Plantago major*, *Daphne gnidium*, *Centaurium erythraea*, *Hypericum perforatum*, *Rosa canina*, Common Pellitory *Parietaria officinalis*, Common Ragwort *Senecio jacobaea*, Lemon Verbena or Verveine *Aloysia triphylla*, White Horehound *Marrubium vulgare*, Bay Laurel *Laurus nobilis* and Greater Celandine *Chelidonium majus*, among others. In terms of greatest volumes used in the north-west of Spain, Breaux notes that traditional medicinal species most-collected from the wild are: *Gentiana lutea*, *Origanum vulgare*, *Arnica montana* and *Sideritis hyssopifolia*. He reports that *Gentiana lutea* is used by certain *curanderos* as the base of a tonic prescribed in considerable quantities, of up to 15 litres per patient.

About 450 medicinal and aromatic plant species, either native wild plants, plants cultivated in Spain, or imported plants, are associated with commercial use in Spain. The area of overlap between traditional use and commercial use, as defined by Blanco and Breaux (1997), includes some 150-200 species. Commercial use, as used here, includes use in manufactured pharmaceuticals (20-30% of which contain plant ingredients); essential oils; prepared herbal remedies, such as homeopathic tinctures; simple cut and dried form, for sale in herbalists' shops, open-air markets and by pedlars, as well as in perfumes, cosmetics, household goods, etc. Approximately 2500 establishments referred to as "herbodiabetic" shops in Spain sell simple dried plant material as remedies. In Madrid, a survey of such shops revealed the most frequently stocked dried, cut or crushed material from European plants to include: *Matricaria recutita*; Large-leaved Lime *Tilia platyphyllos*; Hawthorn *Crataegus monogyna*; *Thymus* spp.; horsetail *Equisetum* spp.; Pennyroyal *Mentha pulegium*, and other mints *Mentha* spp. Of the 450 species associated with commercial use, 195 were noted to be the most frequently referenced in traders' catalogues. These 195 species are all native to, or cultivated in, Spain, with the exception of 35 imported species. Among the 20 medicinal and aromatic plant species cited most often in traders' catalogues were, in descending order of importance: *Crataegus laevigata*/C. *monogyna*; *Mentha x piperita*; Field Horsetail *Equisetum arvense*; Lemon Balm *Melissa officinalis*; Anise *Pimpinella anisum*; Common Thyme *Thymus vulgaris*; *Rosmarinus officinalis*; Sage *Salvia officinalis*; and *Foeniculum vulgare*. Among the endemic species considered especially important to trade, are *Thymus* and *Sideritis* species, which are of high commercial value.



Credit: Emilio Blanco Castro

Spain has a long tradition of open-air markets, which are seldom without a stall selling herbs, many of which are wild-collected.

Özhatay *et al.* (1997) list a total of 337 native medicinal and aromatic species that have been commercially traded in Turkey since at least 1990. This number includes 37 endemic plant species. Otherwise, it comprises a notably high number of Lamiaceae, 76 species, mainly collected as culinary herbs and for herbal teas, and the 38 orchid species collected for salep. In the study of 96 *aktarlar* (perhaps the principle source of raw or little-processed medicinal and aromatic plant material for use within Turkey) in 40 towns in Turkey, 179 taxa were found to be on sale. As already suggested, this may represent only a fraction of the total number of species available in such shops, 400 of which are in Istanbul alone (Başer *et al.*, 1996). Some of these species have been in trade since the Ottoman period. Export records from 1856 declared shipments of *Gypsophila* spp.; rose water and attar of roses; liquorice root and syrup; storax from *Liquidambar orientalis*; and Sumac *Rhus coriaria*. These products are still exported from Turkey today, and liquorice is among the principal commodities of medicinal and aromatic plant exported from Turkey nowadays (along with, in order of descending volumes exported, Carob or Locust Bean *Ceratonia siliqua*; capers *Capparis* spp.; *Laurus nobilis*; *Oreganum* and *Thymus* species; Greek Sage *Salvia fruticosa* - used for herbal tea called *Adaçayı* locally; flowers of Silver Lime *Tilia argentea*; *Rhus coriaria*; and *Orchidaceae* for salep). In total, about one-third of the 337 native taxa in commercial trade in Turkey are known to be exported (Özhatay *et al.*, 1997).

Species collected and utilised by local people for traditional, non-commercial, use were not included in the scope of the Turkish study, since the levels of collection are thought to be small.

**UK:** It is relevant to note that Dennis (1997) conducted her survey by obtaining catalogues from traders of herbal medicines whose products were the most common in wholefood shops and other similar retail outlets. Her results are therefore specifically related to plants known to be used for medicinal purposes, and the term "medicinal plants" as opposed to "medicinal and aromatic plants" is consequently used deliberately in the context of the UK report. Further, she focused her report specifically on imported dried medicinal plant material (very little is produced in the UK - see **Wild or cultivated origin?**) and only included in her study those companies dealing in raw plant material. Of these, however, she excluded companies using raw material to manufacture pharmaceutical prescription drugs; oils for aromatherapy and perfumes; fluids and extracts for use in medicinal products or as flavouring; tinctures for homeopathic use; herbal teas; and nutritional supplements.

Twenty-seven traders of medicinal and aromatic plant material (within the parameters described above), including traders of traditional Chinese remedies, provided a catalogue and/or gave interviews. They revealed that there are presently over 3000 different herbal medicines on the UK market, using some 400 different herbs, not including traditional Chinese remedies, which account, exclusively, for a further 290 species. Only 23 species are used both in Chinese and western herbal medicine. Of the 700 or so medicinal plant species in use in the UK for herbal medicines, about 200 of them have a natural distribution in Europe; about 350 in Asia; 89 in North America; 31 in the rest of America; 23 in Africa; and six in Australia.

#### **Wild or cultivated origin?**

Medicinal and aromatic plant material is obtained both from plants growing in the wild and from cultivated stock. Collection from the wild still plays a vital role in the use of, and trade in, medicinal and aromatic plant material in Europe, since cultivation has not proved to be profitable for the majority of taxa in trade. This is because i) many plants are difficult to cultivate; ii) many are required in very small quantities; iii) the quality of some wild-harvested material is supposed superior; and iv) the costs associated with obtaining plant material from the wild are relatively low, (i.e., usually the only cost is that of paying harvesters) (Lange, 1997).

Lange (1996a) estimated that 70-90% of the over 1500 medicinal and aromatic plant species in use in Germany are primarily wild-harvested, and that 50-70% of the volume of medicinal and aromatic plant material on the German market was from wild plants. Such calculations are, however, not easy to make: it is difficult to ascertain the exact share of wild-collected material in trade, partly because the amount of wild *versus* cultivated material used varies greatly between traders. For example, in terms of volume, German traders range from those for whom 100% of plants used are cultivated, to those for whom 90% of plants used are from the wild (Lange, 1996a). These percentages depended much on the area of the market catered for. For example, traders selling organic goods in Germany use a high proportion of material from cultivated plants.

Sometimes the choice of wild or cultivated plants is dependent not upon the market catered for, but upon the species in question. Some species are often obtainable from both cultivated and wild stock. Examples of such species are *Arnica montana*, *Gentiana lutea*, *Glycyrrhiza* spp., *Achillea millefolium*, *Matricaria recutita*, and Purple Coneflower *Echinacea purpurea*. Yet other species may be available only from cultivated supplies, but the situation varies from one country to the next, and even within a country over time. Traders interviewed by Dennis (1997) reported on several occasions that their sources of a species changed as a result of various factors. For example, one trader explained that Sweet Violet *Viola odorata* was traditionally sourced from the wild in Poland, but is now cultivated in Holland. Other traders did not know whether their stock was of wild or cultivated origin. To assess the share of wild-collected *versus* cultivated medicinal and aromatic plant material from Europe in circulation, therefore, the information for each country in this chapter relates largely to **production** of plant material. Where domestic production of medicinal and aromatic plant material is minimal in a country, as in Germany and the UK, (which are net importers of the commodity), any assessment of the degree of wild or cultivated material in use in those countries will necessarily be made in conjunction with an examination of production in supply countries.

Verlet and Leclercq (1997) estimate the total area of cultivated medicinal and aromatic plants to be 70 000ha in the EU and report that European production has ranked as the world leader for crop diversity and for innovative approach during the last decade. The 70 000ha are distributed as follows: France 25 000ha; Spain 19 000ha; Germany 5700ha; Austria 4300ha; Greece 4000ha; the Netherlands 2500ha; Italy 2300ha; UK 2000ha; Finland 1900ha; Ireland 50ha. In all, about 130-140 species are cultivated (Pank, in press).

In **Albania**, most of the medicinal and aromatic plant species in trade are wild-collected (Vaso, 1997). The collectors, in the main, are private individuals, especially villagers in the vicinity of collecting areas, and especially women and children. Lists of plants and amounts to be collected may be prepared by local companies dealing in medicinal and aromatic plant material and distributed to collectors. Wild plant collection is considered an especially useful means of generating income in remote areas of Albania, with poor agricultural land, and which are far from the nearest market. In one such area of the country, Librazhdi, it is reported that collection of medicinal and aromatic plants provides the second-most important means of earning money. In the region of Lushnja, a province bordering the Adriatic Sea, wages from collection of such plants was found to be a component of every rural household's income.

It may be inferred that domestic and traditional use of wild medicinal and aromatic plants is widespread in Albania. About 5% of wild-growing medicinal and aromatic plants collected are for use in the collector's home or family and many more species are collected from the wild for use at commercial level. Until 1992 an Institute of Popular Medicine existed in Tirana, which amassed information on popular use of medicinal plants.

There is no tradition of cultivating medicinal and aromatic plants in Albania. Some 40 species are cultivated, half of which are obtained exclusively from cultivation, for example Pot Marigold *Calendula officinalis*, Flax *Linum usitatissimum*, Ocimum basilicum, Sweet Marjoram *Origanum majorana*, and Parsely *Petroselinum crispum*. Some fields of cultivated plants which date from the era of State-management are now, in many cases, abandoned or have already been built upon or re-planted with agricultural crops.

In **Bulgaria**, not less than 75-80% of the quantity of medicinal and aromatic plant material in trade is obtained from wild stock (Hardalova, 1997), for example from the forests of Bulgaria (Lange and Mladenova, in press). Collecting may be done sporadically and not in accordance with any prior agreement (Lange and Mladenova, in press). As in Albania (and Turkey), collectors are in most cases rural people, unsalaried villagers, retired people, and women and children, who frequently have a traditional knowledge of the plants (Lange and Mladenova, in press).

The remaining 20-25% of medicinal and aromatic plant material in trade, obtained from some 30-40 species, is sourced from cultivation. According to a questionnaire addressed to Bulgarian farmers (Lange, 1996b) 550t of *Silybum marianum* seeds, and 100t of valerian *Valeriana officinalis* roots are obtained through cultivation each year. Besides herbs primarily associated with culinary use, *Atropa belladonna*, *Datura stramonium*, French Marigold *Tagetes patula* (used for severe constipation and colic and for improving digestion (Bown, 1995)) and Gypsophila (also called Baby's Breath) *Gypsophila paniculata* (included in cough remedies) are cultivated in Bulgaria.

According to a (non-exhaustive) list of producers of medicinal and aromatic plant material in **France**, three of 59 of these rely on wild-collected material alone; 27 deal in material from wild and/or cultivated stock; and the remaining 29 use plant material from cultivated stock only. The three producers using wild-harvested material specialise in seaweed, in two cases, and lavender, in the third. At the beginning of the twentieth century, many French were involved in gathering medicinal and aromatic plants. Networks of pickers and traders were established in the areas where the plants were gathered (Verlet and Leclercq, 1997). It is difficult to assess the extent of wild picking now, since this sector includes only a few high-volume species, the major part being composed of a multitude of plants picked in small quantities. Of most significance are Bilberries *Vaccinium myrtillus*, of which 5000-10 000t are collected annually, from which 1000t are destined for the pharmaceutical industry; *Gentiana lutea* (2500t fresh roots annually); Holly *Ilex aquifolium* (150-200t of dried rhizome), *Tilia* spp. (120t dried flower bracts), ash leaves *Fraxinus excelsior*, (100t), and Meadowsweet *Filipendula ulmaria* (50t). The main picking region is the Auvergne (Verlet and Leclercq, 1997).

Cultivation was formerly also well-established: farms with more than 100ha of medicinal and aromatic plants are recorded. Cultivation has since fallen off, but since 1980 various projects have been sponsored by diverse organisations and, at present, total crop production amounts to some 25 000ha, with approximately one hundred different species of medicinal and aromatic plant. The main crops consist of plants that are cultivated by contract with industrial users. Main production areas are the Provence-Alpes-Côte d'Azur region, where, notably, *Lavandula* spp., *Salvia officinalis*, Clary Sage *S. sclarea*, *Thymus* sp., Hyssop *Hyssopus officinalis*, and *Foeniculum vulgare* are grown; Languedoc-Roussillon, specialising in *Petroselinum crispum* and Tarragon *Artemisia dracunculoides*; and the Pays-de-Loire region, specialising in *Matricaria recutita*, *Mentha* spp., *Calendula officinalis* and Cornflower *Centaurea cyanus*. The major crop is Lavandin *Lavandula x intermedia* (= *L. angustifolia* x *L. latifolia*) cultivated on an area of about 14 500ha. Species occupying between 1000 and 5000ha are *Papaver somniferum* (4300ha), *Lavandula angustifolia* (3000ha) and *Salvia sclarea* (no exact data). Further cultivated species include Gingko *Gingko biloba*, Ergot *Claviceps purpurea* (a fungus growing on rye), *Melissa officinalis*, *Aloysia triphylla*, Burdock *Arctium lappa*,



*Viola odorata*, *Althaea officinalis*, and Ginseng *Panax ginseng* (Verlet and Leclercq, 1997), coneflowers *Echinacea*, *Gentiana lutea*, Butcher's Broom *Ruscus aculeatus*, and Wych Hazel *Hamamelis virginiana* (Goi *et al.*, 1997).

### Sage

The medicinal properties of sage have been known since Antiquity. The plant's name derives from the Latin *salvare*, to save. Still today sage species are widely used in Europe. The herb is favoured for its aromatic essential oils, mainly composed of cineol and thujone, which give sage its characteristic smell. Medicinal indications are antiphlogistic for inflammation of the mouth and throat, for stomatitis, for digestive complaints, flatulence, inflammation of the intestinal mucosa, and for diarrhoea (Bisset, 1994). Sage is used for herbal tea and in the form of a gargle. In the phytopharmaceutical trade, either whole plant parts, essential oils or other extracts are components of mouth and throat remedies or of gastro-intestinal remedies, in the form of drops, tinctures, juice, dragees or capsules. Additionally sage has varied uses as an accompaniment to food; in the kitchen as a spice and seasoning, for cooked dishes for example *saltimboca* in Italy, condiments and sauces, and in drinks such as aperitifs and bitters (Simonetti, 1990). The essential oil is used in cosmetics for toiletry products (e.g. soaps, toothpastes) and for scenting lotions mainly together with other essences.

The most important species in use in Europe are Common Sage *Salvia officinalis*, originally distributed from the western Mediterranean region to the western part of the Balkans, and Three-leaved Sage or Greek Sage *Salvia fruticosa*. They grow especially in Mediterranean scrubland together with cistus *Cistus* spp., thyme and asphodel *Asphodelus aestivus*. Both species are much-branched perennial sub-shrubs with woody branches growing up to 60-120cm high. Their flowers are lilac, violet-blue, or, rarely, white, arranged in whorls forming a loose spike. The leaves of *S. fruticosa* show one to two pairs of small lateral segments at their base and are, especially on the upper surface, more pubescent than those of *S. officinalis*. Özhatay *et al.* (1997) report some further species collected for herbal teas in Turkey, for example *Salvia cryptantha*, known as Kara Salba, or *S. verbenaca*, called Yabani Adaçayı in Turkey.

Whilst *Salvia officinalis* is frequently cultivated, *Salvia fruticosa* is mainly sourced from wild stock. Main source countries of sage are Albania, Turkey and Greece. The volumes in trade are large: not less than 250t are exported from Albania to Germany every year (Lange and Schippmann, 1997) and 100-200t a year were collected in Greece in the 1980s and 1990s (Verlet and Leclercq, 1997). In recent years a decrease in abundance of plants has been reported from both main supplier countries, Albania (Vaso, *in litt.*, 18 March, 1998) and Turkey (Özhatay *et al.*, 1997).

**Germany:** Collection of medicinal and aromatic plants from the wild within Germany itself is minimal, although not unheard of. Harvesting of wild plants by private individuals and school classes used to be common practice in the former German Democratic Republic (GDR) and was organised at State-level. Today, a central organisation no longer exists, and collectors of small quantities of medicinal and aromatic plant material are discouraged by the fact that buyers will not accept small amounts of such material, owing to the costs of obligatory quality tests for each consignment (Lange and Schippmann, 1997). The annual amount of medicinal and aromatic plants collected in the wild in Germany nowadays is estimated to be 26t (Verlet and Leclercq, 1997), but could be in the range of 50-100t. Examples of plants collected are berries of *Crataegus* spp. about six tonnes of fresh berries a year; about five tonnes of herb of *Equisetum arvense*; about four tonnes of leaves of birch *Betula* spp.; about three tonnes of herb of *Hypericum perforatum*; two tonnes of herb of *Urtica dioica*; two tonnes of Blackthorn (Sloe) berries *Prunus spinosa*; two tonnes of herb of willow herb *Epilobium* spp.; one tonne of flower bracts of *Tilia* spp.; half a tonne of herb of Mugwort *Artemisia vulgaris*; and half a tonne of the herb of Mistletoe *Viscum album*. Collection of medicinal and aromatic plants from the wild takes place especially in the federal states of Rheinland-Pfalz, Sachsen-Anhalt and Mecklenburg-Vorpommern. The collected species and their amounts vary from one year to another, in

accordance with the different demands of buyers.

Medicinal and aromatic plant cultivation this century in Germany has, at minimum, occupied 500ha, in 1927, and, at maximum, 10 373ha in 1941, as a consequence of the disturbances in world trade during World War Two (Heeger, 1956). From 1945 until 1989/1990, there has been different development in east and west Germany, since East German currency was not freely exchangeable and owing to the resultant permanent lack of foreign hard currencies, this part of Germany was forced to produce as much as possible in its own country. Immediately following the War, cultivation declined, but Government subsidies contributed to the cultivation of medicinal and aromatic plants and the regime forced farmers to found co-operative farms from 1960 onwards, bringing about a change from single farmer-enterprises, to large-scale co-operative farms. Cultivation increased, from 3100ha in 1950, to 6000ha in 1989, by which time only 45 farms were producing medicinal and aromatic plants, and doing so according to contract, with guaranteed prices. The main plants grown were herbs and spices associated primarily with culinary use. Cultivation in West Germany was also characterised by decline, immediately after the War, to 731ha in 1954. It increased only slowly, to 1635ha in 1994: the price of many medicinal and aromatic plants was lower on the world market than from the home market in West Germany, as is still the case (see below).

Approximately 60 medicinal and aromatic plant species are cultivated today commercially in Germany, according to Verlet and Leclercq (1997): Globe Artichoke *Cynara scolymus*, Horse-radish *Armoracia rusticana*, *Petroselinum crispum*, Dill *Anethum graveolens*, Chives *Allium schoenoprasum*, Celery *Apium graveolens* var. *secalinum*, *Sambucus nigra*, Elecampane *Inula helenium*, Sea Buckthorn *Hippophaë rhamnoides*, *Echinacea purpurea*, *Calendula officinalis*, *Urtica dioica*, and *Gentiana lutea*, among others (Lange and Schippmann, 1997; Verlet and Leclercq, 1997). Currently, the area under cultivation for most of the medicinal and aromatic species grown in Germany is extremely small (5652ha), it being much cheaper to cultivate plants in eastern European countries than in Germany. *Petroselinum crispum* was cultivated in 1992 on 600ha, *Thymus* spp. on 130ha, *Valeriana officinalis* on 55ha, and *Sambucus nigra* on 35ha. Twenty-four species grow on 92.5 % of the whole crop area. According to the newest investigations, the organically grown medicinal and aromatic plants occupy 300-350ha, or about 5-6% of total area under cultivation of medicinal and aromatic plants in Germany (Verlet and Leclercq, 1997). Main cultivation areas are the provinces of Thüringen, Bayern, Sachsen-Anhalt and Niedersachsen. Ninety-two percent of the east German plantations are made up of *Matricaria recutita* (680ha), *Origanum majorana* (570ha), Caraway *Carum carvi* (330ha), *Mentha x piperita* (310ha), *Hippophaë rhamnoides* (200ha), Jerusalem Artichoke *Helianthus tuberosus* (150ha), *Thymus* spp. (130ha), *Hypericum perforatum* (107ha), Woad *Isatis tinctoria* (80ha), *Foeniculum vulgare* (73ha), *Digitalis lanata* (50ha) and *Claviceps purpurea* (40ha) (Hoppe, 1997).

**Hungary:** According to Németh (1997), 204 of the 273 medicinal and aromatic plant species authorised for retail trade grow wild in Hungary and are not cultivated there. More than 60% of the 37 most important types of medicinal and aromatic plant material are still in each case wild-harvested. Bernáth (1996) estimates the ratio of medicinal and aromatic plant material derived from wild stock to that of cultivated origin is 1:1, with respect to traditional use, and to 1:2, with regard to plant material used industrially. Overall, Bernáth (1996) estimates 10 000-15 000t of dried biomass is produced from wild Hungarian medicinal and aromatic plants for industrial use, annually, compared to 25 000-30 000t annually from cultivated plants of this category.

Owing to the increasing demand for medicinal and aromatic plant material, cultivation of plants is expanding in Hungary. However, the role of wild indigenous flora is expected to remain important into the twenty-first century. As a result of great demand for the flowers of *Matricaria recutita*, particularly from western European countries, predominantly Germany, the Great Plain of Hungary, where the species occurs naturally,

was developed at the beginning of the twentieth century as an area specialising in its production. The abundance of labour in this region promoted this development: as many as 15 000-20 000 people are employed as collectors during harvest time. To ensure work beyond the short duration of the chamomile harvest, the capacity to exploit and process other species in the region - Juniper *Juniperus communis*, *Achillea* spp., *Gypsophila paniculata*, *Crataegus* spp., and roses *Rosa* spp. - was developed at the same time. Another centre of wild-collection, established at the beginning of the twentieth century lies in the northern mountainous area of Hungary. Main target species are *Rosa* spp., *Sambucus nigra*, *Prunus spinosa*, and *Crataegus* spp. (Bernáth, 1996)

Hungary is a major supplier of material from cultivated medicinal and aromatic plants within Europe, owing to its particular history. The cultivation of such plants has a long tradition in Hungary, dating back for many centuries. The first written records about small-scale cultivation were laid down by monks arriving from France and Italy in the Middle Ages. At that early time the first plant species, in particular members of the family Lamiaceae, were introduced in the Carpathian valley. Hungary was no different from other European countries at this time in growing medicinal and aromatic plants, since plant lore was essential to medicine. However, Hungary took on special prominence as a source of cultivated medicinal and aromatic plants when it became the site for the first research station in the world specialising in these plants, in 1915. The shortage of medicines, teas and spices during the First World War was the rationale for establishing the research station, which focused on controlling medicinal plant production and collection. After the First World War, Hungary became the leading producer in Europe of medicinal and aromatic plant material, as well as of essential oils, from both wild and (limited) cultivated sources. Exports increased accordingly, 2800t of dry medicinal and aromatic plant material being exported, for example, in 1938. From the 1920s until the Second World War, large-scale cultivation of *Mentha x piperita*, *Lavandula x intermedia* and *L. angustifolia*, based on plants of foreign origin, began. Simultaneous with this period, flowers of *Matricaria recutita* from the Hungarian Great Plain and *Ocimum basilicum* from Hungary became valued all over the world and accorded the epithet *Hungaricum*, while rapid development of the pharmaceutical industry stimulated demand for other plants. Production of *Papaver somniferum* (for morphine production), *Digitalis lanata*, and *Claviceps purpurea* (used almost exclusively to promote uterine contraction), was developed. Although production did not necessarily imply cultivation, the demand for certain plants and the success of the Hungarian response to that demand, including high levels of organisation and attention to processing techniques, created the basis for a respected medicinal and aromatic plant industry. Since the late 1940s, this has been administered by: (i) the Ministry of Commerce, responsible for overseeing collection, limited-scale cultivation, processing and retail of medicinal and aromatic plants; (ii) the Ministry of Agriculture, responsible for overseeing large-scale cultivation and processing of medicinal and aromatic plants; and (iii) the Ministry of Industry and Health, responsible for overseeing large-scale production and processing of medicinal and aromatic plants used by industry, (Bernáth, 1996).

Some 110 of the most important plant species in use medicinally in Hungary today are cultivated. Of these, 21 species are reportedly cultivated on a small scale, i.e. on 1-400ha of land each. Examples are Hollyhock *Alcea rosea* f. *nigra* (1-3ha); *Althaea officinalis* (4-10ha); *Hyoscyamus niger* (5-10ha); Blessed Thistle *Cnicus benedictus* (2-4ha); and *Origanum majorana* (= *Majorana hortensis*) (250-400ha). A further 21 species are classed as being planted on a large scale (on areas of between 20 and 20 000ha), and examples of these are Borage *Borago officinalis* (50-200ha); *Carum carvi* (2 000-3 000ha); *Digitalis lanata* (no area data); *Papaver somniferum* (6000-10 000ha); *Salvia sclarea* (250-500ha); and mustard *Sinapis alba* (10 000-20 000ha). Cultivation is mainly based on cultivars registered by Hungarian authorities, in all 54, derived from 31 plant species (Bernáth, 1996).

According to Bernáth (1996), cultivation of the majority of plant species is not restricted to one particular area, but he distinguishes four areas of Hungary which specialise in the cultivation of particular species of medicinal and aromatic plant:

(i) Owing to the Mediterranean character of their climate, the southern slopes of the Tihany peninsula and neighbouring land was selected for the cultivation of *Lavandula angustifolia* and *L. x intermedia*, species of Mediterranean origin.

(ii) The southern part of Hungary along the Danube River is characterised by a warm and sunny climate making it an appropriate area for the cultivation of the Mediterranean and subtropical species *Origanum majorana* and *Ocimum basilicum*. The region is also a good choice in economical terms, since it is the main cultivation area in Hungary for red peppers *Capsicum annum*, which require the same drying and post-harvest processing as marjoram and basil.

(iii) North of Lake Balaton on the south-west slopes of Bakony mountain, *Claviceps purpurea* is produced. The area is a suitable compromise between the ideal ecological conditions necessary for the cultivation of the host plant Rye *Secale cereale* and those for the fungus itself.

(iv) Cultivation of *Papaver somniferum* has a history of several decades in Hungary and is today the second-most widely cultivated medicinal and aromatic plant. Its large-scale cultivation, organised by a Hungarian pharmaceutical company, is divided into two main regions; along the Austrian border, where winters are milder, for the autumn-sown variety, and in the Great Plain for the spring-sown variety.

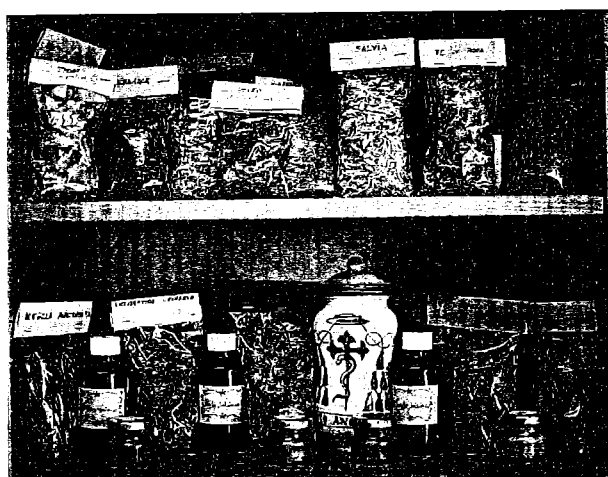
Bernáth (1996) argues that a new strategy must be worked out for the future production of medicinal and aromatic plant material in Hungary, owing to a decrease in wild plant diversity. Although, he maintains, exploiting natural habitats will still be the most economical, (and presumably a sustainable way) to obtain material from many common species, such as *Achillea millefolium*, *Matricaria recutita*, *Crataegus* spp., Field Poppy *Papaver rhoeas*, plantains *Plantago* spp., Dandelion *Taraxacum officinale*, and *Urtica dioica*, expanded cultivation should be explored. Experimental cultivation of some species protected in Hungary, for example, *Adonis vernalis*, has already begun, as it has for species requiring controlled production in order to ensure taxonomical and morphological homogeneity and/or purity of the resultant plant material. Finally, to respond to international demand, new experiments in the initial stages of cultivation of, for example, *Hippophaë rhamnoides* and *Echinacea* spp. have begun.

**Spain:** Wild-collection of medicinal and aromatic plants for use at the "popular level" has an important tradition in Spain, which has diminished markedly over the last 40 years. Although the traditional harvesters of wild herbs, known as *manzanilleros*, *aniseros* or *comineros*, are disappearing, together with the itinerant herb sellers, traditional use of medicinal and aromatic plants persists, especially in the north-west and south-east of Spain, as mentioned in the previous section. Breaux observes that there is hardly a village in the remoter parts of north-west Spain without its resident expert on uses of local plants (usually a woman), going so far as to say that the role of this expert seems almost structurally necessary to the community. Additionally, the role of the informal herbal medicine practitioners known as *curanderos* should be mentioned in this context. The ratio of *curanderos* to patients exceeds that of doctors, per 1000 of the population in Spain, and a *curandero* may often have a significant patient base, spanning anything from three to 200km. Apart from being numerous, *curanderos* often keep warehouses full of plant material and can be shown to have a considerable impact of local plant populations and habitat. Moreover, many of the species associated with healing by *curanderos* are not generally available for sale to the public, and therefore the only possible source is usually from the wild. Even wild-collection for the domestic use of species can cause

conservation problems, especially where the species concerned are also used commercially. *Artemisia granatensis* (occurring only in one location in the Sierra Nevada) and *Micromeria fruticosa* are two species believed to be collected to excess in the wild in Spain, for traditional use.

Wild harvesting of medicinal and aromatic plants species for commercial use (see earlier definition of the term in this context) remains important, albeit with a reduced role relative to 30 or 40 years ago. Collection for *curanderos* and other local practitioners can be on a significant commercial scale: when collection is not carried out direct from the wild by these practitioners, they may buy from a source in a village or town a part of the harvest organised by local buyers. Where collecting is on behalf of commercial traders, lists of plants and amounts to be collected may be prepared. The collectors themselves usually have a precarious economic status and welcome the extra income (ESP40-50 000 (USD261-326) per collection period, each) available from gathering plants. They are typically in the 35-60 age range, not older, as the labour is hard. Villagers acting on behalf of commercial buyers reportedly collected 10.5t of *Gentiana lutea* roots during one extended foray in north-east Spain, and another collection to order produced 80kg-sacks full of *Gentiana lutea* (presumably roots, but the part of the plant is not stated), for sale to *curanderos* and other users. One network of pickers working for a pharmaceutical company in north-west Spain collected an estimated 15-20t of dried *Arnica montana* from the wild (presumably flowers, but part of plant is not stated). Collection of this species is often by Romany and Portuguese communities: collectors receive ESP1500 (USD10)/kg of dried plant material.

Some 15 taxa are widely taken for commercial use from the wild currently, - although with a few exceptions (*Thymus* spp., *Gentiana lutea* and *Arnica montana*) - there are no known significant conservation implications of this harvest. Of the 195 medicinal and aromatic plant species documented as being in frequent use commercially in Spain (see **Species in use**), 102 are wild-sourced in Spain (although 11 species among these are also cultivated in Spain). Those taken from the wild in "significant quantities", are reported to be: *Althaea officinalis*, Bearberry *Arctostaphylos uva-ursi*, Roman Chamomile *Chamaemelum nobile*, *Crataegus laevigata*, *Equisetum arvense*, *Gentiana lutea*, *Mentha pulegium*, *Origanum vulgare*, *Sideritis* spp., *Jasione glutinosa*, *Rosmarinus officinalis*, *Salvia lavandulifolia*, and *Thymus* spp. Based on communication with the Spanish Ethnobotanist Group, relevant scientific literature and personal experience, Blanco (Blanco and Breaux, 1997) has also drawn up a list of 55 medicinal species, which, although not among the 195 species most frequently in commercial use, are of minor commercial interest, are known or assumed to be collected, and indicate existing or potential conservation problems. The list includes *Atropa belladonna*, sundews *Drosera anglica* and Oblong-leaved Sundew *D. intermedia*, *Teucrium* spp., and *Sideritis* spp.



Credit: Emilio Blanco Castro

Medicinal and aromatic plant material on sale in Spain, including "Te de Roca" *Jasione glutinosa*, widely used in rural Spain as a cure for stomach ailments.

In addition to the 102 species of wild-sourced plants, the 195 medicinal and aromatic plant species documented as being in frequent use commercially in Spain comprise 58 that are non-native, but cultivated in Spain, some introduced hundreds of years ago, and 35 that are non-native and plant material from which is imported. In



all, not more than six to eight species are cultivated on a large scale in Spain, some of the most important being *Papaver somniferum*: 4500ha; *Pimpinella anisum*: 5000ha (variable); Saffron *Crocus sativus*: 3800ha; *Lavandula x intermedia*, *L. angustifolia* and Spike Lavender *L. latifolia*: 3000ha; *Salvia officinalis* and *S. lavandulifolia*: 500ha; and *Mentha* spp: 500ha. Other medicinal and aromatic crops, including *Foeniculum vulgare*, *Melissa officinalis*, *Matricaria recutita*, and *Humulus lupulus*, account for the remainder of 1800ha under cultivation (Verlet and Leclercq, 1997). *Digitalis purpurea* is cultivated on a small scale, while another eleven species are in cultivation experimentally, including *Arnica montana*, *Gentiana lutea* and *Thymus* spp. The cultivation of many species - for example, of *Atropa belladonna*, *Datura innoxia*, *Glycyrrhiza glabra* and *Salvia sclarea* - is reported to have been abandoned.

As wild-harvest of medicinal and aromatic plants in Spain has declined, so has cultivated production of these. Spain is clearly different from the other western European countries in this study (France, Germany and the UK), in so far as nearly all medicinal and aromatic plants in use, which are not imported, come from collection in the wild. Apart from the fact that land and labour costs are expensive (in comparison to those in cheaper source countries cultivating medicinal and aromatic plants), coupled with some lack of understanding of optimum conditions for farming medicinal plants, the main reason for the preference for wild-collection in Spain, as summarised by Breaux, is "elasticity". In Spain, most potential and actual cultivators work on a fragile financial basis, and the viability of medicinal and aromatic plant cultivation in Spain is extremely price-sensitive, the explanation for the numerous abandoned cultivation initiatives.

**Turkey:** The national report on medicinal and aromatic plants for Turkey did not consider cultivated plants within its remit and mentions only in passing that some stock is cultivated, for example, *Pimpinella anisum*. However, the 337 native medicinal and aromatic species that have been commercially traded in Turkey since at least 1990 (referred to in the previous section), including the five most-traded species of medicinal and aromatic plant in Turkey (*Glycyrrhiza glabra*; *Ceratonia siliqua*; *Capparis* spp.; *Laurus nobilis*; and *Origanum* and *Thymus* species), are all collected from wild sources in Turkey. Of these, only a few of the thyme and oregano species, known collectively as *kekik* in Turkey, are cultivated on a few hectares. The level of wild-collection is therefore thought to be high: often many people in a particular locality will collect medicinal and aromatic plant species to supplement their own incomes. According to S. Atay, (*in litt.*, 19 February 1998), virtually all plant material obtained from native species traded either internally, or for purposes of export, is wild-collected.

Most of the collection takes place on state-owned land, for example in the hill and mountain country of Anatolia. Collectors are in most cases rural people, unsalaried villagers, retired people, women and children, and sometimes stock-herders, who frequently have a traditional knowledge of the plants. In Turkey, the collectors may remain in the field for some time, as in the absence of good road access, such as in alpine pastures, collecting areas can only be reached on foot or by donkey. Where collection of *kekik* in the wild was observed, it was noted that each village engaged in harvesting had its own well-delimited collecting area.

**UK:** As the report on trade in medicinal plants in the UK concentrates on "the import trade in raw botanical material that is destined to be used for medicinal purposes in both retail outlets and practitioners' dispensaries", collection of plants in the UK, be it from wild or cultivated sources, is largely undocumented by Dennis (1997). Uprooting plants from the wild in the UK is generally illegal. Moreover, it is an offence to pick or uproot the wild plant of any species listed among 168 which receive additional protection under the law (de Klemm, 1997).

As in other countries in Europe, demand for medicinal plants increased during wartime and, during World

War Two, collection of wild-growing *Digitalis* plants, *Hyoscyamus niger*, *Atropa belladonna*, *Rosa* spp. and Horse-chestnut *Aesculus hippocastanum* was organised. The Edward Bach Healing Centre and Trust, in Sotwell, Warwickshire, has a history of collecting wild plants and still collects from many of the same locations from which its founder collected in the 1930s. The Centre manages the meadows and hedgerows from which it gathers the plants.

Two factories in Scotland involved in the extraction of alginate from seaweed still rely on about 4000t of wild-collected Kelp *Laminaria hyperborea* and Knotted Wrack *Ascophyllum nodosum* taken annually from the Western Isles. In the West Country and South Wales, another seaweed, *Porphyra umbilicalis* is reportedly being exploited at greatly increased levels in response to a growing fashion for seaweed dishes.

Finally, an estimated 60t of flowers of *Sambucus nigra* are collected annually in June, almost all for the making of elderflower drinks, which have become very popular in the UK recently. Nowadays, these drinks claim little, if any, health benefits, but the flowers are listed in the Austrian, German, Swiss and UK pharmacopeia and used in medicinal teas and cough and cold cures (Bisset, 1994).

Most wild-harvesting of medicinal plants in the UK tends to be seasonal and paid in cash. The collectors come from a variety of backgrounds, but are often itinerant people, unemployed, and/or local people wanting to supplement income from other sources. The income is minimal: for the collection of *Sambucus nigra* flowers from the wild, the wages are GBP0.70-1 (USD1.1)/kg, and for seaweed GBP1.50(USD2.50)/0.5kg

Although scant, some commercial growing of medicinal and aromatic plants does take place in the UK. The total area devoted to medicinal and aromatic plant production is about 2000ha, according to Verlet and Leclercq (1997). Four well-known companies selling herbal remedies grow small amounts of their own herbs, and one or two nurseries specifically supply the trade in medicinal plant material. One such grows a couple of acres of *Arnica montana*. One pharmaceutical company was found to cultivate medicinal and aromatic plants on a scale exceeding 100ha, cultivating 200ha of *Borago officinalis*, and 400ha of evening primroses *Oenothera* spp.. Besides this there are a lot of small cultivators, often contract-growing, mainly culinary herbs, but also plants for perfume, and numerous (probably hundreds) of very small producers in the UK. Many such can be described as having gardens or small nurseries, and are small family businesses producing mainly culinary herbs and pot herbs.

Rapid expansion of the cultivation of medicinal and aromatic plants is expected in the UK, however. A GBP5 000 000 (USD8 300 000) grant from the EU has been directed towards the cultivation of crops for "drugs, cosmetics and aromatherapy" in Norfolk and Suffolk (counties in eastern England). This project may result in 1200ha of covered by medicinal and aromatic plants of a dozen or so different species. Elsewhere in the east of England, the *Fenland Alternative Crop Technology* group has a funded project to grow medicinal and aromatic crops (Pollitt, 1997, In: Dennis, 1997), including *Taraxacum officinale*, thistle *Cirsium* sp. and the Small Nettle *Urtica urens*. Two other commercial ventures (one in Norfolk, one in Yorkshire) are for the cultivation of snowdrops *Galanthus* spp. for galanthamine and Honesty *Lunaria annua* for the treatment of Alzheimer's disease. Large financial commitments from a foreign investor to establish a forest of *Aesculus hippocastanum* and the willingness of even the smallest growers to invest in pioneering cultivation of *Sambucus nigra* and *Arctium lappa* suggests that cultivation of medicinal and aromatic plants in the UK is set for expansion. One UK trading company advertising a meeting on commercial herb growing was overwhelmed with interest from growers and farmers.

**European Union:** Council Regulation EEC 1765/92 of 1992 establishes a support system and implementing rules for producers of certain arable crops. Together with its updates (334/93, 608/94, 762/94 and 1786/97), it is of importance in the context of this chapter. In order to receive compensation for cultivating cereals, farmers must reduce areas of cultivation by a certain percentage (15% in 1994). It is permissible to farm these areas with annually renewable non-food set-aside, including medicinal plants, and farmers complying with this regulation are compensated by the EU. In general, farmers use this regulation only to grow oil plants, such as Rape *Brassica napus*, and in Germany only 0.006% of arable farmers in 1993 used the set-aside allowance to grow medicinal plants (Lange and Schippmann, 1997). In 1996, 6205ha of arable set-aside land were cultivated in France, of which 6000ha were used for growing *Brassica napus*. On the remaining area, *Foeniculum vulgare*, *Arctium lappa*, Ribbed Melilot *Melilotus officinalis* Garden Angelica *Angelica archangelica*, *Claviceps purpurea*, *Equisetum arvense*, and *Digitalis*, among other crops, were grown. In Germany, 589ha, and in the Netherlands 87ha, were planted with *Digitalis*, *Calendula officinalis*, *Hypericum perforatum*, *Matricaria recutita* and *Echinacea* plants in 1996. According to Van Liempd (pers. comm. to Vanden Bloock, January 1998), there was no medicinal plant cultivation under the terms of the set-aside Regulation in other EU Member States as of 1996, at least.

### **Summary**

Production of the majority of medicinal and aromatic plant material in trade in Albania, Bulgaria, and Spain, and of such material from hundreds of species in Turkey, is obtained from each country's wild native resources. A significant proportion of production of medicinal and aromatic plant material in Hungary is from cultivated stock. In France, wild-collection is still practised for the commercial sector, but its importance relative to harvest from cultivated stock was not made clear in Goi *et al.* (1997). France is the country with the greatest area under cultivation of medicinal and aromatic plants in the EU. In Germany, there is little wild-collection, nor many hectares under cultivation: in Germany, as indeed in France and the UK, the trade in medicinal and aromatic plant material, is largely import-based (see **Trade figures for Europe**).

With respect to Albania and Bulgaria and Hungary, it is likely that land reforms and changes in land tenure from State- to private ownership will continue to affect the collection of wild plants.

## **TRADE IN MEDICINAL AND AROMATIC PLANT MATERIAL IN EUROPE**

### **Traded forms of plant material**

In **Background and Methods**, it was observed that plant species exploited for medicinal purposes often have myriad uses. Whereas the food industry requires only a few types of medicinal and aromatic plant material, but usually in large volumes, for example hips of *Rosa* spp., *Mentha* spp., or Red Sorrel *Hibiscus sabdariffa* in the pharmaceutical and the cosmetic industry a far greater variety of plant types are demanded, but often used in small quantities.

Medicinal or aromatic plant material is traded in different forms depending on its later use. As well as being traded dried or fresh, the material may be preserved in alcohol. Lange and Schippmann (1997) indicated that 95% of medicinal and aromatic plant material in trade in Germany was in dried form. The remaining 5% consisted of fresh plants, or material preserved in alcohol. Examples of plant material with medicinal properties commonly in trade fresh are the herb of *Echinacea purpurea*, Ribwort Plantain *Plantago lanceolata*, Watercress *Nasturtium officinale*, or *Viscum album*. Artichoke leaves used to produce extracts or

pulped juices are also traded fresh. The proportions for Germany of dried, to fresh medicinal and aromatic plant material, to that traded in alcohol, are likely to be similar for all the other European countries. However, in some countries the share of dried material may increase to almost 100%, which is explicitly reported as being the case for Turkey (Özhatay *et al.*, 1997) and Albania (Vaso, 1997).

Active constituents are frequently concentrated in a certain part of a medicinal or aromatic plant, or may be found there exclusively. Therefore, it follows that a particular part of a plant only, several parts, or the whole plant may be harvested and traded. Further, parts of plants may be traded in their whole form (*toto*) or after having been processed mechanically, for example, cut, powdered, squeezed, rasped, rubbed or peeled. In international trade, parts of medicinal and aromatic plants are frequently traded whole, or at most coarsely chopped. Unprocessed medicinal and aromatic plant material is much cheaper than that which has been cut or powdered, etc. However, there is a trend towards trading cut plant material. With regard to Europe, there are three reasons for this (Lange, 1998a). Firstly, more and more source countries for medicinal and aromatic plant material are investing in technical equipment to process the material, thereby increasing its trade value; secondly, transportation costs are paid according to weight and volume and therefore cut plant material is associated with lower shipping costs; thirdly, a great part of the exports from western and central European countries are re-exports and in many cases the raw material is processed before re-export. Coarsely cut medicinal and aromatic plant material is directed to non-food use, including pharmaceutical use, whereas the food industry prefers a fine cut.

### Phytomedicines

The increased utilisation of medicinal and aromatic plant material in Europe is based both on rational grounds (for example, new plant medicines, such as that produced from *Ginkgo biloba*, have no synthetic substitutes), and emotional beliefs (for example, the perception that natural products are less toxic, more appropriate for the human body, time-honoured, etc.). Among the market sectors using medicinal and aromatic plant material - from laboratory use for prescription pharmaceuticals and other manufactured products, to use in its rawest states, for example, in folk medicine - the market for phytomedicines, or phytopharmaceuticals (defined in **Methods**) is a notable growth area. Phytomedicines are the result of up-to-date chemical, bio-chemical, biological and pharmacological achievements, allowing a more sophisticated system of producing preparations made directly from plants, with a certified safety record. The world market is enormous: according to Walluf-Blume (*in litt.*, 19 November 1996) it was estimated to be worth USD11 900 million in 1994. Whereas half of this amount, USD5500 million, was attributable to the European Union (EU), consumption in the remaining European countries was very low, equal to one tenth (USD500 million) of the EU's share. Within the EU, demand is concentrated in two countries: Germany and France, with a 45% and 29% share, respectively, of the EU market. In third place is Italy, with a share of 11% and in fourth place the UK, with a share of 5.5%. These figures equate to an annual *per capita* spending of USD37 on phytomedicine in Germany, of USD28 in France, USD10.5 in Italy, and USD5 in the UK. Each inhabitant of the EU spends on average USD17.4 a year on phytomedicines (Grünwald and Büttel, 1996).

According to Grünwald and Büttel (1997) the European market of phytomedicines is growing at a higher rate than the pharmaceutical market in general. For 1998 and 1999 the growth rate for the phytomedicine market is estimated to be 5-10% (Grünwald, 1997). Country-specific growth rates are available for 1993: 35% in Spain, 15% in Germany, 11% in Italy and 10% in the UK. Grünwald and Büttel explain the high increase in Spain by its rather small market, and in the UK the growth is said to be attributed to several extremely well-selling products. From 1993 to 1995, the German phytomedicinal market grew by 30%, from a value of USD2500 million to one of USD3260 million. According to IMS (Institute of Medicinal Statistics, Frankfurt am Main), the annual turnover of the German phytomedicinal market amounted to 30% of the total German market for non-prescription pharmaceuticals in 1996 (Walluf-Blume, *in litt.*, January 1998).

Phytomedicines in Europe cover a broad range of indications, but most (27%) are sold as cardiovascular remedies, followed by medicines for the respiratory system (15.3%), digestives (14.4%), and tonics, sleeping aids and sedatives (Grünwald and Büttel, 1997). Some 45% of the turnover of USD 3060 in Germany in 1996 was attributable to self-medication. According to Grünwald and Büttel (1996) the single most-used plant in phytomedicines in Europe is *Ginkgo biloba*, and the leading product including it achieves sales of approximately USD200 million a year. Other leading phytomedicines contain ginseng *Panax* spp., Evening Primrose *Oenothera* spp., *Echinacea purpurea* and *Allium sativum* (Grünwald and Büttel, 1997), *Hypericum perforatum* (DEM59 million), myrtle *Myrtus communis* (DEM35 million), *Urtica dioica* (DEM35 million), Saw palmetto *Serenoa repens* (DEM30 million) and *Silybum marianum* (DEM29 million). The taking of garlic supplements was up 16% in 1993 in the UK and approximately seven million Germans take garlic supplements regularly. Where it is a question of herbal monopreparations, *Ginkgo biloba* is again the most used, but the second most-important plant is a European plant species, Horse-chestnut *Aesculus hippocastanum* (sales of DEM114 million a year) for vein treatments, followed by hawthorn *Crataegus* spp. (DEM65 million), used in cardiac preparations, and yeast (DEM59 million) as an antidiarrhetic and used against acne.

Prior to the implementation of the Single Market in the EU, the phytomedicines market was fragmented by differences in marketing authorisation rules and different classification systems across the Member States (DRI Europe, 1997). In practice, this is still the case, as some Member States have not yet altered their national laws to comply with EU requirements. Thus, a product (e.g. *Ginkgo biloba*) may be a licensed phytomedicine in France and Germany, but sold as a food supplement in the UK and in the Netherlands (Grünwald and Büttel, 1996).

In order to advance the scientific status of phytomedicines and to assist with harmonisation of their regulatory status at the European level, ESCOP, the European Scientific Cooperative on Phytotherapy, was founded in 1989. This co-operative is a European umbrella organisation of national associations for phytotherapy. Its members now include associations from the majority of countries within the EU and from a number of non-EU countries (ESCOP, 1996). The Scientific Committee of ESCOP compiles proposals for monographs on medicinal plants and their preparations. Besides providing a definition of a given medicinal plant material, these monographs summarise its constituents, clinical particulars, such as therapeutic indications, dosage, methods of administration, possible contra-indications, etc., and pharmacological properties. In all, 50 monographs have been published to date (Steinhoff, in press), including for Marshmallow roots (*Altheae radix*), St. John's Wort herb (*Hyperici herba*), Golden rod herb (*Solidaginis virgaureae herba*), and nettle root (*Urticae radix*) (ESCOP, 1996). All these monographs are documented on the basis of the same format, in principle on that of the so-called *Summary of Product Characteristics* (SPC), inclusion of which is an integral part of an application for the authorisation to market a medicinal product for human use in all EU Member States (Directive 65/65/EEC).

Other attempts to harmonise use of medicines at European level include continued activities of the Convention on the Elaboration of a European Pharmacopoeia. Two bodies are responsible for the preparation of the pharmacopoeia, (1) the Public Health Committee and (2) the European Pharmacopoeia Commission, both composed of delegations of all parties to the Convention (currently 26, including the EU). According to the European Pharmacopoeia 1997, one of its aims is harmonisation within Europe of policies, standards, monograph specifications, analytical methods and acceptance criteria for officinal remedies included in national pharmacopoeia. Moreover, in 1995, a new system for market authorisation and supervision of medicine came into force in the EU, and a *European Agency for the Evaluation of Medicinal Products* was established. In line with the new market authorisation system, registration of a medicine in one Member State is sufficient grounds for its corresponding registration in fellow Member States, which are required to follow suit within 90 days.

The fact that new systems in place aim to increase the standing of herbal remedies in medical circles, to reduce the time for authorisation of product-release for an officially recognised medicine from several years to less than a year, and to halt the increases in registration fees, may lead in the long run to a rise in launches of phytomedicines.

### Trade structure

The structure of trade in medicinal and aromatic plant material varies from country to country, dependent much on whether the country is a net importer of the commodity or a producer, especially when reliant to a large degree on wild-collection. After collection, plant material may be dried in open or covered areas, for example on roofs or terraces, balconies or gardens (Özhatay *et al.*, 1997; Vaso, 1997; Lange, 1998c), before direct marketing by village co-operatives (mainly in Albania, Bulgaria, Hungary or Turkey) or through middlemen to wholesalers. Dried material is mostly transported by ordinary lorry overland, but in the case of fresh material, cold storage trucks are used. Depending on the plant material, it is possible to transport between 18 and 20t of dried plant material per lorry (Lange, 1996a), destined for the next stage in the production chain, either a processor, wholesaler, or exporter.

Trade in medicinal and aromatic plant material is often dominated by a few wholesalers in each country, for example, 21 importers in Germany (in addition to six specialising in imports of plant material for TEAM and another six specialising in imports for "green" products - see below), four exporters in Albania, and 10 in Bulgaria. Additionally, quite a lot of smaller companies, in particular in Albania, Hungary, and Bulgaria deal in medicinal and aromatic plant material, but for several of them it is not their only business (Lange, 1996c; Németh, 1997; Vaso, 1997).

In common with one another, the trade structures of former Eastern Bloc countries are no longer strictly organised hierarchies, controlled by State-owned companies. These companies have now, in many cases, been dissolved, or are no longer in a position of primacy, as multiple private trading companies have been established.

**Albania:** Prior to 1992, trade structure was hierarchically organised. Rural collectors gathered the bulk of produce, which was collected by local branches, or mobile units, of the District Produce Collector Enterprises. Another body, the District Forestry Enterprise, had responsibility for collecting medicinal and aromatic plant material from cultivated areas and forests. If not for use within the country, from district level, plant material generally came next under control of the Agroexport Enterprise.

Nowadays, the majority of medicinal and aromatic plants, being wild-collected in Albania, are still sold by rural collectors to the local dealer. However, although until 1994 State-controlled trade in medicinal and aromatic plant material was still operational, Vaso (1997) states that this is no longer the case, and that since the passing of the *Company Law* of 1992, the number of private operators in the trade has proliferated. In remote areas, it is most economical to amass a bulk of plant material before it is driven to the nearest town for sale. From the local trader, plant material may pass to a district trader, before release onto the domestic market, or to one of the main companies in Albania involved in international trade in medicinal and aromatic plant material. In general, trade in this commodity is mainly oriented towards export, and 90% of its external trade is dealt with by just four trading companies, three in Durrës, one in Tirana. Occasionally, small quantities of plant material are exported direct to neighbouring countries by local traders, a practice which is reported to be increasing.

One reason for the majority of plant material being traded dry in Albania (see **Forms of material traded**), is the fact that local traders do not necessarily visit collectors frequently, but may wait until the end of the collecting season, or until a surge in demand, before coming to buy.

Prior to the 1990s, Albania exported mainly to the former Yugoslavia and the former German Democratic

Republic, but the recently established private companies are responding nowadays to the increasing demand from western European countries, for whom Albania is a very cheap source of medicinal and aromatic plant material. Main export destinations are now Germany and Italy, and Albania is the chief source of *Salvia* spp. for the European market (Lange, 1996a).

**Bulgaria:** Bulgarcoop, a co-operative enterprise instituted under the Communist regime, is the main dealer nationally in medicinal and aromatic plant material in Bulgaria. It has three warehouses in different regions of Bulgaria, a purchasing centre in almost every large town or village, and a laboratory for chemical analysis of plant material. Otherwise, Bulgarcoop helps growers with plant cultivation, provides seeds and planting material, and guarantees to buy an agreed harvest. It is also a processing company, and produces bath additives, merchandise for the food industry, supplies for pharmaceutical companies and pharmacies, and packaged herbal teas. Around 130 million tea-bags were produced by Bulgarcoop in 1995, mainly destined for the home market.

In addition, 50-60 smaller, private, mostly family-owned companies are involved in the collection, purchase and export of medicinal and aromatic plant material. These companies, established since political changes in the country and the related relaxation of State control, purchase a limited range of plant material, mostly for export. In order better to compete with Bulgarcoop, private companies have established the Private Herb Exchange to provide practical aid to growers, in the way that Bulgarcoop does, and to organise courses for collectors.

Sixty to seventy percent of trade in medicinal and aromatic plant material is directed to export (Lange and Mladenova, in press). Sale is mainly to large wholesalers abroad, whereas direct sales from exporters to retail traders are an exception. The main destination of exported medicinal and aromatic plant material is Germany.

**France:** Twenty-eight international traders of medicinal and aromatic plant material are listed by Goi *et al.*, 1997, as operating in France, but the list is not comprehensive. Among them, 16 are involved in both importing and exporting, 10 in exporting only, one imports only, while the nature of the trade of the remaining company is not stated. Fifteen of these traders are situated in the south-east of France, mainly in Provence and Languedoc, areas significant for cultivation of medicinal and aromatic plants. Four of the traders also grow medicinal and aromatic plants themselves.

Other European countries are by far the most important export destinations for medicinal and aromatic plant material from France, according to Goi *et al.*, 1997, and of other continental export destinations, only North America stands out. France's main sources of imported medicinal and aromatic plant material are non-EU Europe, central, east and south Africa, Asia, and the EU, in that order

**Germany:** The information for this section derives from Lange (1996a), Lange and Schippmann (1997), and Lange (1997).

Germany's domestic and international trade in medicinal and aromatic plant material can be divided into three categories:

- \* *mainstream trade*, which includes use by the food and drink industries; pharmaceutical and other healthcare industries; cosmetics industry; and use in fungicides, insecticides, etc.
- \* *trade in "green" commodities*, which relates to a sector of the trade dealing mainly in material from organically-grown plants
- \* *trade for use in traditional East Asian medicine* (TEAM)

In contrast to the mainstream trade, German trade in TEAM and *green* commodities uses fewer plant species, in comparatively low volumes, and is therefore of only minor trade importance.

*Mainstream trade:* Import, export, and domestic trade is dominated by 21 companies, concentrated, for historical reasons, mainly in north Germany, in particular in and around Hamburg, and in the Lower Franconia region. In some cases, import transactions are undertaken on behalf of these companies by one of seven brokers. During the last fifty years both the number and structure of these companies have changed considerably, many small companies or brokers having been forced to close, merge, or be taken over.

The structure of the mainstream trade within Germany is complex. In general, companies deal in a range of products, and attract a variety of customers with different requirements. Volumes exported are low compared to those imported, as Germany is a net importer of medicinal and aromatic plant material (see **Trade figures for Europe**). Volumes imported by individual trading companies range from approximately 1000t to 30 000t, annually, and may consist of between 80 and 2000 types of medicinal and aromatic plant material. Some companies have considerably reduced their product spectrum by specialising in certain products which they then trade in large quantities. Some possess subsidiary companies abroad, for example in Hungary, France, and Spain, and a few of the larger pharmaceutical and other processing industries import directly a few types of medicinal and aromatic plant material which may be required in large quantities.

Plant material is usually processed before sale by these 21 companies, either directly, or by contracting the work out. Processing involves cleaning, cutting, or grinding the plant to a powder, for example, before delivery to wholesalers, other processors, or manufacturers. Various other stages of processing, manufacture and wholesale trade are necessary, depending on the final product required. About one-third of material imported is re-exported, almost always after some degree of processing.

*Trade for "green" products:* In contrast to the case for mainstream trade, plant material in this trade sector is very often obtained from organically-grown plants. One hundred percent of plant material traded by some companies in this sector is organically-produced. It is mainly purchased from producers within Germany, but also from abroad, especially Austria. Six importers of plant material for "green" products were identified and all were found to be involved in processing the material as well. Between six tonnes and 20t of material is imported by each of the six companies, but leading traders may import as much as 400 tonnes annually. Direct importation of even small quantities of plant material used in "green" commodities seems to be profitable, and it is therefore likely that more companies than those identified also import directly.

A total of between 20 and 90 types of medicinal and aromatic plant material are used by each trader in this category. These consist mainly of spices, tea herbs and aromatic plants like *Matricaria recutita*, *Anethum graveolens*, *Salvia officinalis*, and *Achillea millefolium*. Most of these can also be found in the mainstream trade. Products from this plant material typically sold in retail outlets include simply-packaged dried plant material, mainly for use as teas, or to flavour food; foods; toothpaste and other cleaning products, and are sold mainly from "green" shops, and to a lesser extent in health food shops, other food shops and chemists. The use of these products has increased in recent years in Germany.

*Trade for TEAM:* Most of the plant material used in TEAM is not used in the aforementioned trade sectors. The main consumers are hospitals, doctors and pharmacists, and the plant material is imported on their behalf by pharmacists or traders.

Six importers of medicinal and aromatic plant material in this category were identified, but it is likely that



more may exist. The commodities are obtained either directly from China, or *via* the Netherlands. A further two firms exclusively import processed medicinal products from China. In contrast to the quantities used in mainstream trade, volumes imported by each TEAM trader are small, ranging from 0.5t to 20t annually. Merchandise is usually delivered from the importer directly to the retailer. According to the traders, a maximum of only 5% of the imports are re-exported. Some 190 to 260 types of medicinal and aromatic plant material, corresponding to up to 370 plant species, are used in TEAM in Germany.

**Hungary:** (Németh, 1997) carried out a questionnaire survey of companies registered as processors or marketers of medicinal and aromatic plant material in Hungary. Information below is based on responses to these questionnaires.

The majority of companies responding obtained their material from other wholesalers. In almost equal proportion, the companies which responded were solely processors, dealers, or engaged in both processing and dealing. Some of the companies had a small turnover of 10-20t a year, and larger ones trade about 1000t a year. Frequently, these traders deal in other commodities besides medicinal and aromatic plant material. Some wholesalers specialised in trading one or two types of medicinal and aromatic plant material, while others were reported to trade up to 140 types of material derived from 116-120 medicinal and aromatic plant species (Németh, 1997). One-third of companies engaged in cultivation themselves, frequently under contract, but otherwise obtained material from farmers, wild plants and other traders. Six of the 24 companies dealt particularly in material from wild stock, which accounted for over 70% of the medicinal and aromatic plant material they traded.

As in the other countries of the former Eastern Bloc, changes to the trade structure have taken place, in the case of Hungary, over the past two decades. Bernáth (1996) carried out a questionnaire-based survey of retailers in Hungary, to evaluate the increase in retailers licensed to sell medicinal and aromatic plant material. The results showed that, whereas there were only 20 such merchants in Hungary prior to 1989 (one or two in each of the main towns of the country), the number in 1991 was 258. Inexpertise and lack of quality control at retail level was an inevitable result. Similarly, until the beginning of the 1970s only one wholesale company dealing with medicinal and aromatic plant material, Herbaria, existed in Hungary. It controlled the collection and cultivation of medicinal and aromatic plants within the country and purchased the resultant plant material. (Bernáth, 1996). This extensive system enabled a high degree of quality control: the company's network was country-wide and oversight of production even in the remotest parts of Hungary was possible. Privatisation of rural lands recently and a great increase in the number of companies involved in purchasing from collectors - 70 companies in 1991, although several have closed down since then - has led to a decrease in regulation of the trade. The quality of plant material in trade has become variable, owing not only to an influx of unspecialised labour to the business of collecting, growing or dealing in the commodity, but also to the fact that business may often be over-ridingly motivated primarily by profit, at the expense of quality and of the natural plant resource. The enlarging number of species of plant of high medicinal value placed under legal protection attests the threat to the biodiversity of wild medicinal and aromatic plants in Hungary.

As with production, so with export, and until 1982 only one company, Medimpex, was authorised to export medicinal and aromatic plant material. From this extreme, almost the opposite end of the spectrum has now been reached. Since 1991, any firm with an export licence is eligible to export medicinal and aromatic plant material.

Export is mainly to Germany, but other western European countries occasionally purchase significant amounts of medicinal and aromatic plant material from Hungary (Bernáth, 1996).

**Spain:** As previously noted, most production of medicinal and aromatic plants in Spain is from the wild. In those areas of Spain where traditional, local use of medicinal and aromatic plants is most tenacious, the peculiarities of the trade there give some aspects of it a structure quite different from that in other parts of Spain. In south-east Spain, for example, *curanderos* have shown themselves to be active at all stages of commerce, from collection of plants, to dispensing, despite legislation aimed at their suppression. In these cases, the entire trade structure is inherent in the *curandero*-patient relationship.

Otherwise, wild-collection is organised at the local level, with buyers often requesting collectors to gather plants to order, as already noted in the previous chapter. Buyers usually deal with one or two designated intermediaries in each village, who typically take on the role as an addition to a regular job. These intermediaries are focal in organising transport between villages and the nearby towns. Buyers may be *curanderos* or larger-scale commercial buyers, of which Breaux (Blanco and Breaux, 1997) mentions three in north-west Spain: a group of laboratories, an import-export house in Galicia and a processor in Asturias. Medicinal and aromatic plant material then reaches the public *via* a variety of routes. It may be sold locally at open-air markets, which have a long tradition in Spain, and are seldom without a medicinal plant seller. It is estimated that, in the north-west alone, ESP156 million (USD1 million) *per annum* is earned by medicinal and aromatic plant sellers at weekly markets. Otherwise, the plant material is distributed nationally through a chain of primary processors and distillers; refiners and purifiers; secondary processors, including laboratories; wholesale distributors; and finally retailers. Retail outlets in Spain include 18 000 pharmacies and 2500 shops which Breaux (Blanco and Breaux, 1997) terms "herbodietetic establishments", which sell homeopathic and other herbal remedies, including dieting aids. It is in herbodietetic outlets that the majority of medicinal and aromatic plant material is sold in Spain, usually about 50 different types on sale, in simple packaging. Herbodietetic shops also sell derivatives of such plant material, like extracts and capsules, typically for influenza cures, laxatives, relaxants and for circulatory ailments. Supermarkets and chain stores are increasingly selling products made from medicinal and aromatic plants, however, which were until recently the prerogative of licensed pharmacies. The high growth rate of this sector of the market is at the expense of traditional shops like the herbodietetic shops, and is exposing an increasing percentage of the population to an ever-proliferating array of plant-based products.

The south-east of Spain is the most important region of the country with respect to trade in medicinal and aromatic plants, the majority of companies associated with the trade (wholesalers, distillers and processors) being located here. In the province of Murcia there are estimated to be well in excess of the 28 documented by Rios (1997, In: Blanco and Breaux, 1997), owing to what Rios terms the "hidden" element of this sector of the market.

Altogether, Spain employs some 32 000 people in the medicinal and aromatic plant industry, the majority of these (27 000) at the retail level, and, in turn, the majority (20 000) in herbodietetic shops.

**Turkey:** The trade structure for the market in wild-collected medicinal and aromatic plants in Turkey is largely standardised, irrespective of products, or area of collection. Being based on wild-collection, the trade begins with plant-gathering by villagers, who sell the harvest to village middlemen, representing companies dealing in medicinal and aromatic plant material, or to village co-operatives, which undertake marketing and distribution of plant material to the companies. The village middlemen will hand over to town middlemen, responsible for collecting together material from several villages, and it is they who then deal with the companies, which are based in Izmir and Istanbul and other principal cities. These companies deal both with exports, and distribute to the internal market, including to *aktarlar*, bazaars, herbalists and pharmaceutical companies.

**Spain:** As previously noted, most production of medicinal and aromatic plants in Spain is from the wild. In those areas of Spain where traditional, local use of medicinal and aromatic plants is most tenacious, the peculiarities of the trade there give some aspects of it a structure quite different from that in other parts of Spain. In south-east Spain, for example, *curanderos* have shown themselves to be active at all stages of commerce, from collection of plants, to dispensing, despite legislation aimed at their suppression. In these cases, the entire trade structure is inherent in the *curandero*-patient relationship.

Otherwise, wild-collection is organised at the local level, with buyers often requesting collectors to gather plants to order, as already noted in the previous chapter. Buyers usually deal with one or two designated intermediaries in each village, who typically take on the role as an addition to a regular job. These intermediaries are focal in organising transport between villages and the nearby towns. Buyers may be *curanderos* or larger-scale commercial buyers, of which Breaux (Blanco and Breaux, 1997) mentions three in north-west Spain: a group of laboratories, an import-export house in Galicia and a processor in Asturias. Medicinal and aromatic plant material then reaches the public *via* a variety of routes. It may be sold locally at open-air markets, which have a long tradition in Spain, and are seldom without a medicinal plant seller. It is estimated that, in the north-west alone, ESP156 million (USD1 million) *per annum* is earned by medicinal and aromatic plant sellers at weekly markets. Otherwise, the plant material is distributed nationally through a chain of primary processors and distillers; refiners and purifiers; secondary processors, including laboratories; wholesale distributors; and finally retailers. Retail outlets in Spain include 18 000 pharmacies and 2500 shops which Breaux (Blanco and Breaux, 1997) terms "herbodietetic establishments", which sell homeopathic and other herbal remedies, including dieting aids. It is in herbodietetic outlets that the majority of medicinal and aromatic plant material is sold in Spain, usually about 50 different types on sale, in simple packaging. Herbodietetic shops also sell derivatives of such plant material, like extracts and capsules, typically for influenza cures, laxatives, relaxants and for circulatory ailments. Supermarkets and chain stores are increasingly selling products made from medicinal and aromatic plants, however, which were until recently the prerogative of licensed pharmacies. The high growth rate of this sector of the market is at the expense of traditional shops like the herbodietetic shops, and is exposing an increasing percentage of the population to an ever-proliferating array of plant-based products.

The south-east of Spain is the most important region of the country with respect to trade in medicinal and aromatic plants, the majority of companies associated with the trade (wholesalers, distillers and processors) being located here. In the province of Murcia there are estimated to be well in excess of the 28 documented by Rios (1997, In: Blanco and Breaux, 1997), owing to what Rios terms the "hidden" element of this sector of the market.

Altogether, Spain employs some 32 000 people in the medicinal and aromatic plant industry, the majority of these (27 000) at the retail level, and, in turn, the majority (20 000) in herbodietetic shops.

**Turkey:** The trade structure for the market in wild-collected medicinal and aromatic plants in Turkey is largely standardised, irrespective of products, or area of collection. Being based on wild-collection, the trade begins with plant-gathering by villagers, who sell the harvest to village middlemen, representing companies dealing in medicinal and aromatic plant material, or to village co-operatives, which undertake marketing and distribution of plant material to the companies. The village middlemen will hand over to town middlemen, responsible for collecting together material from several villages, and it is they who then deal with the companies, which are based in Izmir and Istanbul and other principal cities. These companies deal both with exports, and distribute to the internal market, including to *aktarlar*, bazaars, herbalists and pharmaceutical companies.

Turkey's exports of medicinal and aromatic plant material are directed mainly to France, Germany and the UK and Turkey is the most important supplier of *Origanum vulgare* to the European, and in particular the EU, market. Imports are of minor importance.

The report by Özhatay *et al.* (1997) excludes information on the trade structure for cultivated plants and imported plant material.

**UK:** It is worth reiterating here that Dennis (1997) focused her report specifically on imported dried medicinal plant material destined for medicinal use in retail outlets and by practitioners, but excluding companies using raw material to manufacture pharmaceutical prescription drugs; oils for aromatherapy and perfumes; fluids and extracts for use in medicinal products or as flavouring; tinctures for homeopathic use; herbal teas; and nutritional supplements. Therefore the trade reported by Dennis relates exclusively to medicinal plant material for use

in a particular sector of herbal medicine. The characteristic company trading and manufacturing medicinal plant material surveyed by Dennis, is a small, family-run business. Many are long-established, several since the nineteenth century, and as such have strong links in the trade and with each other. Their imported plant material is supplied by bulk traders in the UK, from traders in Europe, or direct from source abroad. The trade today is conducted largely through Germany (Lange, 1996a), not least as a consequence of the break-up of the USSR and the resultant severing of direct links with suppliers in eastern Europe. Of the 700 or so medicinal plant species in use in the area of trade studied by Dennis, material from the majority is imported *via* Germany and any re-export of it is minimal.

As in Germany, there is a largely separate trade in the UK supplying TEAM practitioners. Additionally in the UK, a separate trade supplies practitioners of Ayurvedic medicine. While UK-based trading companies supply medicinal plant material for use in TEAM, no UK-based companies supplying Ayurvedic practice were discovered. In both cases, material is imported direct from source countries; in the case of Ayurvedic herbs it is also imported by practitioners or other individuals, including relatives of a patient who has received a prescription from a practitioner in the UK. Sources for imported TEAM and Ayurvedic medicinal plant material are all outside Europe, in East Asia, Southeast Asia and the Indian subcontinent.

#### **Medicinal and aromatic plant material and Customs codification**

Any attempt to assess the impact of trade on wild medicinal and aromatic plant populations in Europe, should clearly review volumes, values, and, ideally, species, of such plants in international demand. Before any examination of trade statistics, an explanation of the limited capacity of international trade data for tracking movements, volumes and species of medicinal and aromatic plants should be given.

Trade figures for medicinal and aromatic plant material are collected at a national level, at EU level within the EUROSTAT system, and at an international level by the United Nations Statistics Division (Geneva) in



Credit: Professor Mehmet Koyuncu

Ahtar (herbalist's shop) in Turkey

the UNCTAD COMTRADE database. For this purpose medicinal and aromatic plant material is classified in trade according to different Customs codes, which classify and codify merchandise according to commodity groups. Also at the international level, a codifying system commonly accepted by countries complying with the World Trade Organization (WTO) (formerly GATT = General Agreement on Tariffs and Trade), is the Harmonised Commodity Description and Coding System (HS). With the exception of Albania, this code is used by all countries surveyed for this report, and by 90 countries or economic unions worldwide in total (I. Kusahara, *in litt.*, 18 March 1998). As explained in **Methods**, the Customs commodity category which has been chosen as that equating most closely with a category for medicinal plant products in European trade is HS 1211 for "Plants and parts of plants (including seeds and fruits), of a kind used primarily in perfumery, in pharmacy or for insecticidal, fungicidal or similar purposes, fresh and dried, whether or not cut, crushed or powdered" (for a full description, including a list of some commonly traded examples of medicinal and aromatic plant material in this category, see **Annex 2**). This HS code corresponds exactly to tariff heading No. 292.4 of the Standard International Trade Classification Revision 3 Code (SITC.3 Code), items in which are indeed compiled from national HS1211 statistics. SITC.3:292.4 code has been used as the category for comparative calculations in this chapter on international trade, since national trade data according to HS statistics were not available within each of the national reports on which this overview is based. Only ginseng *Panax* spp. and liquorice are separately classified under SITC.3 Code No. 292.4 (Nos 292.42 and 292.41, respectively), the remainder of plant material coming under the broad heading "pharmaceutical plants NES [not elsewhere specified]" (No. 292.49); the equivalent HS category encompasses material from 1500 species in trade *via* Germany.

Material from some medicinal and aromatic plants types of especially high commercial value, like *Mentha* spp., *Tilia* spp., *Verbena officinalis*, *Aloysia triphylla* (syn. *Lippia triphylla*, *L. citrodora*), *Origanum vulgare*, and *Salvia* spp. are monitored separately by countries in the EU, Bulgaria, Hungary and Turkey (Lange and Schippmann, 1997). Yet other medicinal and aromatic plant material may be traded under headings for different categories of commodity (i.e. not primarily for use in perfumery, in pharmacy, etc.). Examples include fruits of *Foeniculum vulgare*; Coriander *Coriandrum sativum*; Cumin *Cuminum cyminum*; Juniper *Juniperus communis*; *Humulus lupulus*; and also saffron *Crocus sativus*; *Laurus nobilis* leaves; capers *Capparis spinosa*; carob pods *Ceratonia siliqua*; *Thymus* spp.; and salep (bulbs of some orchid species). In order that comparable data sets should be used, only figures relating to material traded under SITC.3 Code No. 292.4 are used in the tables in this chapter.

The inadequacies of this method for assessing international trade in medicinal and aromatic plant material, apart from the fact that trade in some will be missed owing to its classification under other tariff headings, are acknowledged to include the following:

- \* only limited information on types of material and on plant species traded is yielded;
- \* the data cannot be guaranteed accurate, as comparison with data from different statistics agencies for the same commodities can show;
- \* trade data may not be comparable between years, as the definitions of commodity groups sometimes change;
- \* the country of export listed in the statistics may not necessarily be the actual country of origin, as trade may not have been direct, from source to destination.

As such, trade data may offer very little, if any, interpretation of the degree of exploitation as a result of international trade of a given plant species. What it can do, is indicate main trade dynamics and trends.

### Europe's place in worldwide trade

In 1996, the overall world importation of medicinal and aromatic plant material in commodity group "SITC.3 292.4, pharmaceutical plants" amounted to more than 440 000t, valued at about USD1.3 billion. Of those 440 000t, Europe was responsible for the importation of about 132 000t, 73 000t of which, valued at USD213 million, were from non-European countries. Thus, about 60% of Europe's imports of medicinal and aromatic plant material came from non-European countries in 1996. Most of this amount came from Asia (32 000t: 45%) and Africa (26 650t: 36%), with far smaller amounts from South America (8300t: 11%), North America (5490t: 7%), and Oceania (1000t: <1%). In all, Europe imported medicinal and aromatic plant material from over 120 countries in 1996, important ones among them, India, the Sudan, Chile, Egypt, Argentina and the USA.

Over 80% of the total imported from outside Europe was channelled to just five European countries in 1996: Germany, France, Italy, Spain and the UK (UNCTAD COMTRADE database). Among European countries, Germany received the largest share of medicinal and aromatic plant material in terms of volume, from each non-European continent in 1996 (see Table 1).

Europe as a whole exported about 10 400t of medicinal and aromatic plant material, valued at USD40 million, to other continents of the world in 1996. This represents under 20%, however, of Europe's total exports by volume and value (see Table 2 and **Trade figures for Europe**). North America received the largest share (4640t: 46%) of Europe's exports of this plant material to non-European countries, followed by Asia (2960t: 28%), South America (1600t:15%), Africa (850t: 8%), and Oceania (360t: 3%). In total, Europe exported medicinal and aromatic plant material to over 150 countries worldwide, 1992-96. As can be seen from Table 2, within Europe, Germany dominated export to non-European continents, in terms of volume, in 1996 (Table 2). According to Lange and Schippman (1997), important non-European countries to which Germany exports are Canada, the USA, Australia and Japan, only. In terms of values of exported plant material to non-European continents in 1996, Germany again is pre-eminent within Europe, with one exception, in the case of France's exports to Asia (Table 2).

What emerges from comparison of these trade figures, is that intra-European trade is very important. From Table 3, which shows leading traders of medicinal and aromatic plant material worldwide, it can be seen that Germany's role in the trade is prominent on a global scale. Together with the USA, it stands out as an important trade centre for the commodity, showing high import and export volumes. No fewer than five European countries, all of them EU Member States, are among the 12 leading countries of import, worldwide, while three European countries, Germany, Bulgaria and Poland, are included in the 12 leading countries of export worldwide (Table 3). Of note are the prominent roles of China and Hong Kong, the latter importing, annually, on average, 1992-96, almost two-thirds the volume imported by Europe in 1996 (see above and Table 3).

In terms of genera which include native European species, SITC.3:292.4 statistics reveal information on worldwide trade in *Glycyrrhiza* spp. roots (see Table 4). The statistics also show data for ginseng *Panax* spp. separately. A small amount of ginseng is cultivated in Europe, and it is widely used in Europe, but most is imported (see Table 5).

**Table 1**

**Reported import volumes (t) and values (USD) for 1996 of medicinal and aromatic plant material (SITC.3: 292.4 = HS commodity group 1211) of the five main importing countries of the commodity in Europe, by continent of export**

	N. America		S. America		Africa		Asia		Australia		Total	
	Vol.	Val.	Vol.	Val.	Vol.	Val.	Vol.	Val.	Vol.	Val.	Vol.	Val.
Germany	2610	10 380	5970	22 370	8180	16 550	11 140	22 570	760	3690	28 660	75 560
France	240	1380	490	1820	7240	13 810	7260	12 270	12	75	15 244	29 355
UK	560	5770	60	320	1610	3290	2970	9470	170	470	5364	19 310
Spain	250	1170	510	1490	2970	5370	1560	4210	60	370	5362	12 610
Italy	630	11 340	860	3110	1170	2710	2290	13 130	-	5	4950	30 295
<b>Subtotal</b>	<b>4290</b>	<b>30 040</b>	<b>7890</b>	<b>29 110</b>	<b>21 170</b>	<b>41 730</b>	<b>25 220</b>	<b>61 650</b>	<b>1000</b>	<b>4600</b>	<b>59 570</b>	<b>167 130</b>
Other Euro. countries	1200	10 010	400	4820	5480	9550	6720	22 020	-	30	13 800	46 430
<b>Total imp. to Europe</b>	<b>5490</b>	<b>40 050</b>	<b>8290</b>	<b>33 930</b>	<b>26 650</b>	<b>51 280</b>	<b>31 940</b>	<b>83 670</b>	<b>1000</b>	<b>4630</b>	<b>73 370</b>	<b>213 560</b>

Source: UNCTAD COMTRADE database, United Nations Statistics Division, Geneva, Switzerland.

**Table 2**

**Reported export volumes (t) and values (USD) for 1996 of medicinal and aromatic plant material (SITC.3: 292.4 = HS commodity group 1211) of the five main importing countries of the commodity in Europe, by continent of import**

	N. America		S. America		Africa		Asia		Australia		Total	
	Vol.	Val.	Vol.	Val.	Vol.	Val.	Vol.	Val.	Vol.	Val.	Vol.	Val.
Germany	1750	7800	730	2190	140	810	510	3250	150	1280	3280	15 330
France	370	1550	190	830	120	520	370	4180	70	280	1120	7360
Italy	390	1250	310	1840	30	80	120	440	2	35	852	3645
Spain	240	1210	240	740	15	15	50	390	-	-	545	2355
UK	20	290	2	45	90	450	300	1110	60	1050	472	2945
<b>Subtotal</b>	<b>2770</b>	<b>12 100</b>	<b>1472</b>	<b>5645</b>	<b>395</b>	<b>1875</b>	<b>1350</b>	<b>9370</b>	<b>282</b>	<b>2645</b>	<b>6269</b>	<b>31 635</b>
Other Euro. countries	1870	3450	128	535	455	665	1610	3240	78	575	4141	8465
<b>Total exp. fr. Europe</b>	<b>4640</b>	<b>15 550</b>	<b>1600</b>	<b>6180</b>	<b>850</b>	<b>2540</b>	<b>2960</b>	<b>12 610</b>	<b>360</b>	<b>3220</b>	<b>10 410</b>	<b>40 100</b>

Source: UNCTAD COMTRADE database, United Nations Statistics Division, Geneva, Switzerland.

**Table 3**

**The 12 leading countries of export and import of medicinal and aromatic plant material classified under SITC.3: 292.4 (= HS commodity group 1211). The countries are listed according to descending order of average trade volumes, 1992-1996**

Country of export	Volume [t]	Value [USD]	Country of import	Volume [t]	Value [USD]
China	140 500	325 550 000	Hong Kong	80 550	331 700 000
India	35 700	53 400 000	Japan	57 850	158 300 000
Germany	14 900	72 550 000	USA	51 600	118 400 000
Singapore	12 600	62 750 000	Germany	45 400	107 100 000
Egypt	12 000	13 700 000	Rep. of Korea	34 200	53 350 00
Chile	11 700	26 350 000	France	19 800	46 350 000
USA	11 600	120 200 000	Pakistan	12 550	130 500 000
Pakistan	8500	5 450 000	Italy	10 400	39 100 000
Mexico	8450	9 400 000	China	9250	35 950 000
Bulgaria	7350	11 970 000	Singapore	8500	60 350 000
Morocco	7100	13 750 000	UK	7400	24 450 000
Poland	5500	9 350 00	Spain	7350	24 400 000

Sources: (1) UNCTAD COMTRADE database, United Nations Statistics Division, Geneva, Switzerland; (2) Foreign Trade Statistics of Bulgaria, National Statistic Institute, Sofia, Bulgaria.

**Table 4**

**Import and export of liquorice (SITC.3: 292.41 = commodity group HS 1211.10) in 1996, by continent**

Continent of import/export	Imports		Exports	
	Volume	Value	Volume	Value
Asia	4990	4090	390	280
Africa	-	-	400	230
South America	-	-	20	30
North America	13	1500	560	530
Oceania	-	-	2	20
<b>Subtotal</b>	<b>5003</b>	<b>5590</b>	<b>1372</b>	<b>1090</b>
Europe	927	440	1328	2610
<b>Total</b>	<b>5930</b>	<b>6030</b>	<b>2700</b>	<b>3700</b>

**Table 5**

**Import to Europe, and export from Europe, of ginseng (SITC.3:292.42 = commodity group HS 1211.20) in 1996, by continent**

Continent of import/export	Imports		Exports	
	Volume	Value	Volume	Value
Asia	285	6150	11	260
Africa	-	-	5	130
South America	-	5	4	85
North America	15	445	2	25
Oceania	-	-	-	-
<b>Total</b>	<b>300</b>	<b>6600</b>	<b>22</b>	<b>500</b>

Sources for Tables 4 and 5: UNCTAD COMTRADE database, UN Statistics Division, Geneva.



### Trade figures for Europe

**Import:** The average annual volume of medicinal and aromatic plant material imported to Europe was almost 120 000t for the years 1992-96, valued at more than USD335 million. Nearly 90% of this volume, 100 000t, were destined for EU countries. Germany is by far the leading country of import for medicinal and aromatic plant material in Europe (see Table 6), importing over one-third of the total volume and value imported into Europe. Some of its 30 000t or so of annual net imports of medicinal and aromatic plant material is sold, either processed or unprocessed, on the German domestic market. The rest is exported in various processed forms: Germany has large pharmaceutical, cosmetic, and extract-producing companies. Although the quantities involved are much lower, France (net import: 14 600t); Italy; the UK; and to a lesser extent Spain; Switzerland; Belgium (incl. Luxembourg); and Slovakia all show net imports of medicinal and aromatic plant material, of between 2000t to 7000t annually.

Since 1992, overall importation of medicinal and aromatic plants to Europe has increased by 21%, from 109 000, to 132 000t in 1996. The value of the imported material has fluctuated, but an overall increase of about 15%, or USD51 million, from 1992 to 1996 can be observed.

**Export:** The average annual volume of medicinal and aromatic plant material exported from Europe (1992-96) amounted to 70 000t. In contrast to imports, which are dominated by EU Member States, eastern and south-eastern European countries account for at least 50% of overall exports. Germany is, nonetheless, the leading country of export, but there are notable differences between the values of plant material exported by western European countries and east and south-eastern European countries. In general, the value for merchandise exported from eastern and south-eastern European countries is relatively low. For example, the export price per tonne of Hungarian plant material was on average USD1230, of Bulgarian material USD1630, and of Romanian material USD1800. In contrast, French and German plant material exported was valued on average at USD4800-5500 per tonne. In the case of UK and Switzerland the export price even exceeds USD10 000 per tonne. These figures reflect the fact that whereas eastern and south-eastern European countries export in many cases their own, unprocessed, raw material, German, French, Swiss, Belgian, and UK exports are more often composed of re-exported, partially processed, i.e. cleaned, cut, or powdered plant material. This same factor may explain the increased value per tonne of exports as compared to that for imports in the cases of Germany and of France (from an average value of USD2400/t on import to USD4800-5500/t on export).

The most important European source country for medicinal and aromatic plant material is Bulgaria, with annual average net exports of almost 7000t. Hungary, Poland, Turkey, the Czech Republic, Croatia, and Romania are also important sources of medicinal and aromatic plant material, their net exports ranging from 1000t to 5500t (Table 6).

Albania, which is not a Party to the Harmonised Commodity Description and Coding System, is also a known source of medicinal and aromatic plants. Export data were supplied in Vaso (1997), by the General Directory of Customs, in Albania. Statistics are only available for July-December 1995 and 1996, and therefore give only a limited view, which is nevertheless of interest. For the period July-December 1995, Albania is reported to have exported 3502t of medicinal and aromatic plant material in a category corresponding to HS 1211, and in 1996, 5443t of the same, valued at ALL915 901 636 (USD9 million).

Since 1992, the total volume of plant material exported from Europe has increased by 21%, from 54 000t in 1992, to 71 000t in 1996. If one calculates the percentage increase from 1992 up to 1995, only, in which year

**Table 6**

**Import and export of medicinal and aromatic plant material classified under SITC.3: 292.4 (= HS commodity group 1211) by individual European countries listed in descending order of average net imports for the period 1992-1996.**

Country	Imports (t)	Exports (t)	Net imports (t)	Value of imports (USD x 1000)	Value of exports (USD x 1000)
Germany	45 400	14 910	30 490	107 060	72 550
France	19 800	5180	14 620	46 340	28 208
Italy	10 380	3560	6820	39 100	13 240
UK	7410	660	6750	24 460	6880
Spain	7370	3060	4310	24 420	8480
Switzerland/Liechtenstein	4270	140	4130	17 530	1600
Belgium/Luxembourg	4770	1790	2980	15 370	7510
Slovakia	3040	580	2460	1890	1620
Austria	2590	1820	770	9850	12 010
Slovenia	1220	550	670	2910	1870
Finland	580	10	570	1690	160
Sweden	670	100	570	4 360	3220
Denmark	590	45	545	3450	380
Greece	1180	1000	180	1820	2300
Norway	130	1	129	1250	13
Lithuania	120	12	108	300	50
Latvia	45	9	36	130	30
Iceland	10	1	7	70	60
Netherlands	1510	1630	-120	4020	4670
Moldova	12	180	-168	45	130
Portugal	260	530	-270	2220	560
Romania	40	1010	-970	250	1860
Croatia	430	1510	-1080	1290	4020
Czech Republic	920	2820	-1900	3340	2320
Turkey	170	3550	-3 380	410	10 500
Poland	1770	5470	-3700	4950	11 380
Ireland	2750	6730	-3980	13 490	25 040
Hungary	710	5480	-4770	1990	6720
Bulgaria	420	7350	-6930	850	11 970
<b>Total</b>	<b>118 460</b>	<b>69 670</b>	<b>48 790</b>	<b>334 860</b>	<b>239 460</b>

Source: UNCTAD COMTRADE database, United Nations Statistics Division, Geneva, Switzerland; Foreign Trade Statistics of Bulgaria, National Statistic Institute, Sofia, Bulgaria.

**Table 7**

**Import (t) to the leading European countries of import from selected European countries in 1996**

Exporting countries	Importing countries					
	Germany	France	Italy	Spain	UK	Total
Germany	-	640	1590	1290	1620	5140
France	1650	-	960	1200	330	4140
Italy	300	750	-	100	65	1215
UK	120	180	25	75	-	400
Spain	30	420	50	-	100	600
Other N. or W. European countries	850	520	720	250	170	2510
<b>Subtotal (Europe excl. E. and S.E.)</b>	<b>2950</b>	<b>2510</b>	<b>3345</b>	<b>2915</b>	<b>2285</b>	<b>14 005</b>
Bulgaria	6420	690	620	810	-	8540
Poland	4510	320	250	370	15	5465
Hungary	2620	130	210	160	30	3150
Albania	2280	400	960	20	-	3660
Turkey	1790	840	220	540	-	3390
Other E. and S.E. European countries	2970	1020	800	10	360	5160
<b>Subtotal (south-east Europe)</b>	<b>20 590</b>	<b>3400</b>	<b>3060</b>	<b>1910</b>	<b>452</b>	<b>29 365</b>
<b>Total</b>	<b>23 540</b>	<b>5910</b>	<b>6405</b>	<b>4825</b>	<b>2690</b>	<b>43 370</b>

Source: UNCTAD COMTRADE database, United Nations Statistics Division, Switzerland.

**Table 8**

**Export (t) from the leading European countries of import to selected European countries in 1996**

Importing countries	Exporting countries				
	Germany	France	Italy	Spain	Total
Germany	-	1230	1230	1970	4430
France	820	-	1260	370	2450
Italy	940	1470	-	25	2435
UK	1070	150	320	110	1650
Spain	1230	810	95	-	2135
Austria	1980	25	45	-	2050
Switzerland	2020	410	260	15	2705
Other N. or W. European countries	1680	910	910	180	3680
<b>Subtotal (Europe excl. E. and S.E.)</b>	<b>9740</b>	<b>5005</b>	<b>4 120</b>	<b>2670</b>	<b>21 535</b>
E. and S.E. European countries	2270	150	290	30	2740
<b>Total</b>	<b>12 010</b>	<b>5145</b>	<b>4410</b>	<b>2700</b>	<b>24 275</b>

Source: UNCTAD COMTRADE database, United Nations Statistics Division, Geneva, Switzerland.

87 000t were exported, the rate of increase is even higher, at 60%. The value of this material exported also increased, by 36%, or USD74 million, from 1992 to 1995, but decreased by USD35 million in 1996.

### ***Intra-European trade***

In Europe's place in worldwide trade, it was pointed out that intra-European trade in medicinal and aromatic plant material is very large. The 40% intra-European share of all European imports of this commodity amounted to 45 000t, annually, on average (1992-96), and the 80% intra-European share of all European exports of the same amounted to 61 000t, on average (1992-96). The values of these amounts were USD121 million, and almost USD200 million, respectively.

To analyse the trade channels within Europe a breakdown of import and export volumes for Germany, France, Italy, Spain and the UK (imports only), for 1996, has been undertaken. The results are summarised in Tables 7 and 8.

**Imports:** Table 7 shows that the leading net importing countries in Europe, namely Germany, France, Italy, Spain, and the UK, purchased 2000-3000t of medicinal and aromatic plant material each in 1996 from the other countries besides themselves in that group. Trade between some individual countries was considerable: Germany imported 1600t of material from France; Italy and the UK purchased the same volume each from Germany; and Spain imported about 1200t from Germany and France each.

Germany imported by far the most from south-eastern European countries in 1996. Its total import of over 20 000t of plant material from these countries, was six times more than that of France or Italy, and 10 times more than that of Spain, while the UK share of the total import from east and south-eastern Europe came to 1.4%, only. Bernáth reveals that, with extremely minor exception, Germany was the most significant importer, often by several orders of magnitude, for every category of medicinal and aromatic plant material distinguished by Hungarian export statistics for 1995. He further shows that Germany was the most important importer of the most-exported categories of medicinal and aromatic plant material from Hungary in every year, 1991-95, again usually to a degree far in excess of that of any other importing country.

Bulgaria was the main supplier of medicinal and aromatic plant material to Germany, France, the UK, Spain and Italy in 1996. It exported 6420t to Germany, more than every other country listed in Table 6 exported, on average, in total, annually.

**Exports:** Table 8 indicates that the exports from Germany, France, Italy, and Spain are mainly directed to the north and western European countries, in all 21 530t. Less than one-tenth, 2740t, is sold to south-eastern Europe.

From the trade data presented in this section and preceding sections, it can be seen that Germany is the pivotal country in the European trade in medicinal and aromatic plant material, importing half of all its total imports from European countries and exporting 80% of its total exports within Europe. Of its European imports, 87% come from south-eastern Europe, while 80% of its European exports are to its neighbours in north and western Europe, as indicated in Tables 7 and 8. In other words, Germany acts in particular as a link between the south-eastern European market and northwestern Europe.

Of the five main importers of medicinal and aromatic plant material within Europe, only the UK and France and Spain appear to obtain the majority of this commodity from beyond Europe (compare Tables 6 and 1).

It may also be noted in comparing Tables 7 and 8 that discrepancies between data sets are revealed. Notable is the case of Spain's reported export of about 2000t of plant material to Germany in 1996, in comparison to the reported import to Germany of only 30t from Spain in the same year. This may be explained by wrong classification of merchandise or classification of the source country as "unknown" by Germany. In 1996, imports classed in this category by Germany amounted to 7600t (Federal Agency for Statistics, Wiesbaden).

### **LEGISLATION RELATING TO THE HARVEST OF, AND TRADE IN, MEDICINAL AND AROMATIC PLANTS IN EUROPE**

All species subject to any of the legislation mentioned in this chapter are included in Annex 1 of this report.

#### **International level**

At an international level, trade in wild plants of species that are threatened or might become threatened by trade may be controlled according to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). The ability of any Party to CITES to comply with its provisions, however, is dependent upon the existence of suitable implementing legislation.

As of May 1998, there were 143 Parties to the Convention. Within Europe, Albania, Bosnia-Herzegovina, Croatia, Iceland, the Irish Republic, Lithuania, Macedonia, Moldova, Slovenia, Ukraine, and Yugoslavia are not Parties. Under the terms of the Convention, commercial international trade in an agreed list of endangered species (Appendix I) is banned, while species listed in Appendix II are subject to monitoring and regulation, because they are, or may be, of conservation concern. No European medicinal or aromatic plant species is listed in Appendix I of the Convention, but 47 species, all of them bulbous plants, are included in Appendix II. Species of the orchid family used to make salep are among them, threats to their populations coming from horticultural demand, as well as medicinal and culinary demand.

Other, non-native European medicinal and aromatic plant species listed in CITES Appendices I and II are two species of *Costus* (Kuth) *Saussurea costus* and *Nepenthes khasiana* (App. I), and 82 species in Appendix II.

#### **Legislation at European and EU-level**

The recent *Council Regulation (EC) No.338/97*, adopted on 9 December 1996, *Commission Regulation (EC) No. 938/97*, adopted 26 May 1997, and *(EC) No.2307/97* of November 1997, are the legislative instruments regulating the trade in wild fauna and flora at EU level. These regulations fully implement the provisions of CITES within the Union, indeed include a number of stricter measures than does CITES, and list species subject to regulation in four annexes, A, B, C and D, affording increasing degrees of protection, in that order. Annex D lists 52 non-CITES plant species which require an import notification

when in trade to the EU: not all are necessarily threatened species, but may, for example, be imported in such numbers as to warrant monitoring. Seven medicinal and aromatic plant species are listed in Annex D, namely Bearberry *Arctostaphylos uva-ursi*, *Adonis vernalis*, *Arnica montana*, *Cetraria islandica*, Bogbean *Menyanthes trifoliata*, *Lycopodium clavatum* and *Gentiana lutea*.

The Convention on the Conservation of European Wildlife and Natural Habitats of 1982, known as the Bern Convention, aims at protecting wild flora and fauna and their natural habitats, and paying particular attention to endangered and vulnerable species. Especially for those plant species specified in Appendix I of the Bern Convention there is an obligation on each contracting party to undertake appropriate and necessary legislative and administrative measures for effective conservation of these species and their habitats. For these species, their deliberate picking, collecting or uprooting is strictly forbidden. With the exception of Andorra, Belarus, Bosnia-Herzegovina, Croatia, the Russian Federation, San Marino, Slovenia, Macedonia, Ukraine, and Yugoslavia, all European countries are contracting parties. However, Albania and the Czech Republic, although signatories, have still not ratified their membership. Six medicinal and aromatic plant species are subject to Bern Convention (Appendix I) provisions. They include *Origanum dictamnus*, an Cretean endemic, known for its medicinal value since Theophrastus (third century B.C.), and still widely drunk today as a medicinal tea, and *Artemisia granatensis*, *Atropa baetica*, two orchids *Comperia comperiana* and *Himantoglossum caprinum*, Rhapontic Rhubarb *Rheum rhaponticum* and *Trapa natans*.

*Council Directive 92/43 EEC* of 21 May 1992, the EC Habitats, Fauna and Flora Directive, (amended by *Council Directive 97/62* of 27 October 1997) aims to promote the conservation of natural habitats and of wild fauna and flora within the EU. This directive requires Member States of the EU to designate special areas of conservation for the species listed in its Annex II. Annex IV includes plant species in need of strict protection, the deliberate picking, collecting, cutting, uprooting or destruction of which in their natural range in the wild is prohibited, as is the keeping, transport, sale or exchange, or offering for sale or exchange of specimens of such species. Annex V lists species whose taking in the wild and exploitation may be subject to management measures, but there is no specification in the text of the directive as to the which management measures should apply. Ten medicinal and aromatic plant species are listed in this Directive's annexes: *Artemisia granatensis*, *Atropa baetica*, and *Origanum dictamnus* in Annex II, *Saxifraga vayredana* in Annex IV(b), and *Arnica montana*, *Galanthus nivalis*, *Gentiana lutea*, *Lycopodium annotinum*, *L. clavatum*, and *Ruscus aculeatus* in Annex V(b).

*Council Regulation (EEC) No. 2092/91* of 24 June 1991, amended by *No. 1935/95* of 22 June 1995, regulates organic production of plants at EU level. Accordingly, the collection of wild edible plants and parts thereof, are considered organically produced if (1) growing areas have received no treatments with products other than those listed in the regulation for a period of three years before collection, and (2) collection is sustainable (according to Annex I of regulation (EEC) No. 2092/21, as amended by *Council Regulation No. 2608/93* of 23 September 1993). Guarantees that requirements (1) and (2) have been met are demanded (according to Annex III of *Council Regulation (EEC) No. 2092/91*, as amended by *Council Regulation No. 2608/93*).

#### **Legislation at national level**

Most European countries have legislation to protect endangered medicinal and aromatic plant species, with the exception of Andorra, Cyprus, and Monaco (de Klemm, 1997). In general, protection measures

vary according to the threat facing the species. Such measures may include total prohibition on the taking of certain species, such as uprooting, damage, destroying, and trade in any way whatsoever; or partial prohibition limited to uprooting and removal of the subterranean parts, while the aerial parts are allowed to be collected in given quantities, for example in small bunches; or prohibition only of wild-harvest and trade when for commercial purposes.

In total, 341 medicinal and aromatic plant species are listed in the combined national legislation of Bulgaria, France, Germany, Hungary, Spain and Turkey (see Annex 1).

**Albania:** Owing to the upheaval of recent political changes, the country possesses only a transitional constitution at the moment, and various laws have been adopted on a temporary basis. These include the *Environmental Protection Law* of 1993, intended to be a framework law to be followed by other specific laws (Vaso, 1997). Accordingly, the main strategic elements of this law are the conservation of the national biological diversity, the sustainable management of the natural resources, and the preservation of ecological balance in general. Pursuant to this general law, *Law No. 7722* of 1993 "for the protection of medical, tanning and oil-bearing plants" declares such plants national property. Accordingly, the General Directory of Forestry has responsibility for protecting these plants and local forestry officials have the right, under this law, to grant licences for the collection of plants relevant to the law. The Ministry of Agriculture has the opportunity to revise the list of species prohibited from collection, or subject to collection quotas, each year. The decision is reportedly, however, not based on scientific assessment of the population status of species (Vaso, 1997). The list issued on 20 March 1997 includes 305 plant species, including at least 30 medicinal and aromatic plant species, *inter alia*, *Arctostaphylos uva-ursi*, *Digitalis lanata*, *Capparis spinosa*, *Frangula alnus* and *Sideritis raeseri*. Penalties provided for infractions vary from a fine of ALL250 (USD2.5) to the seizure of plants collected.

A regulation dating from 1993 specifies the techniques to be used for collecting medicinal plants.

**Bulgaria:** Wild-harvesting of, and trade in, medicinal and aromatic plants are governed in Bulgaria by the *Nature Protection Law* of 1967, two ordinances of 1989 and 1995 pursuant to the law, and other legal restrictions and ordinances.

The *Nature Protection Law* of 1967 and the *Ordinance of Species Conservation, No. 718* of 1989, lists species subject to threats from over-exploitation, limited natural distribution, habitat destruction, or as a result of difficult dissemination (Hardalova, 1997). Any cutting, collecting, picking, uprooting, trading, or exporting of any part of these species is forbidden. Three hundred and ninety plant species are listed, amongst them 38 medicinal and aromatic species. Examples are Round-leaved Sundew *Drosera rotundifolia*, *Glycyrrhiza glabra*, *Rheum rhaponticum*, *Sideritis scardica*, and Yew *Taxus baccata*, listed owing to their narrow distribution in Bulgaria. *Gentiana lutea* is listed, as it is classed as over-exploited, and Sweet Flag *Acorus calamus*, *Menyanthes trifoliata*, and different *Orchis* species are listed as they are classed as affected by habitat destruction (Hardalova, 1997).

Since 1991, several legal restrictions and ordinances governing wild-harvest of, and trade in, threatened and non-threatened medicinal and aromatic plant species have also been established in the context of the *Law for the Protection of the Environment* (Lange, 1996b). Fees in return for the issue of import/export certificates for wild-collected species are levied by the Ministry of Environment for the National Fund for Protection of the Environment. According to the degree of protection afforded species, different amounts are charged (Lange and Mladenova, in press). According to these restrictions and ordinances:

(a) Plant species which occur in forests are under the jurisdiction of the Forestry Committee. Their use is subject to forestry laws, which the Forestry Administration is responsible for applying (Hardalova, 1997). In the forests, wild-collecting is seen as a business and thus fees have to be paid for its practice. The rates are species-specific and are paid per kilogramme (*Decree No. 202* of 1994), but charges only apply when resources are exploited commercially. For example, the charge for 1kg of Cowslip *Primula veris* roots is BGL4 (USD0.0022), and for leaves of *Plantago lanceolata* BGL2.50 (USD0.0014)/kg must be paid - see Table 9 (Lange and Mladenova, in press).

(b) Wild-harvest of, trade in, and export of several threatened plant species are subject to restrictions and prohibitions issued by the Ministry of Environment. The ordinances in question aim to protect the species concerned and their natural habitats, to re-establish wild populations, and to encourage cultivation of some species (*Ordinance No. RD-48* of 1995, added to by *No. RD-50* of 1995, revised by *No. RD-76* of 1996, and by *No. RD-97* of 1997). Accordingly, restrictions and prohibitions on collection, purchase, trade and processing of specimens of these species obtained from natural populations for industrial or commercial purposes, are established (Lange and Mladenova, in press):

**Table 9**  
**Examples of medicinal and aromatic plants collected in the forests of Bulgaria and the Government fees charged for their commercial collection**

Common name	Scientific name	Plant part used	Charge [BGL/kg]
Hazel	<i>Coryllus avellana</i>	bark	3.00
Hazel	<i>Coryllus avellana</i>	leaves	1.50
Bilberry	<i>Vaccinium myrtillus</i>	leaves	2.50
Bilberry	<i>Vaccinium myrtillus</i>	fruits	6.00
Wild Strawberry	<i>Fragaria vesca</i>	leaves	2.50
Wild Thyme. serpolet	<i>Thymus serpyllum</i>	herb	1.50
Saint John's Wort	<i>Hypericum perforatum</i>	herb	1.50
Hawthorn	<i>Crataegus monogyna</i>	fruits	3.00
Elder	<i>Sambucus nigra</i>	flowers	1.50
Orange Mullein	<i>Verbascum phlomoides</i>	leaves	1.50
Cowslip	<i>Primula veris</i>	flowers	2.00
Cowslip	<i>Primula veris</i>	roots	4.00
Dog-rose	<i>Rosa canina</i>	fruits	3.00
Large-leaved Lime	<i>Tilia platyphyllos</i>	flowers	2.00
Mistletoe	<i>Viscum album</i>	leaves	1.50
Ribwort Plantain	<i>Plantago lanceolata</i>	leaves	2.50
Dandelion	<i>Taraxacum officinalis</i>	herb	1.50
Dandelion	<i>Taraxacum officinalis</i>	roots	4.00

Note: BGL66-70=USD1 (average rate, May-Dec.1995).

Source: Mladenova (1996). In: Lange, 1996b.



It is totally prohibited to collect 14 medicinal and aromatic plant taxa subject to these ordinances from the wild, and to trade and process them for commercial purposes (see Annex 1). Thus, the species *Althaea officinalis*, Madder *Rubia tinctorum*, *Valeriana officinalis*, *inter alia*, must be cultivated if they are to be exploited commercially. A study of *Adonis vernalis* and *Centaureum erythraea* showed that trading and exporting companies lost interest in herbs subject to the quota-system, because of the small quantities allowed for collection and export, and because of the procedures and expenses involved in securing quotas (Lange, 1998c).

The collection of 23 other plant species from the wild, their processing, and trade are subject to prior authorisation. For this purpose a quota-system has been set up and each spring since 1992, the 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 in the Official Gazette of the Ministry of Environment. Since 1992, the list of plant species affected by this order has been modified slightly, whilst the volumes allowed to be gathered vary considerably from year to year according to species and region (Lange and Mladenova, in press). The list includes an annual ban for a stated period on the exploitation of regional populations of some taxa. The quota system is based on scientific research by specialists of the Ministry of Environment in co-operation with the Institute of Botany of the Bulgarian Academy of Science, and the National Centre of Phytotherapy and Popular Medicine. Table 10 shows examples of quotas for plants allowed to be collected, by region, in 1997.

The Ministry of Environment, the Forestry Committee, and local authorities are responsible for enforcement. Regional Environmental Inspectorates approved by regional Forestry Administrations are responsible for allocation of quantities of wild-harvested species in each district. Applications from herbalists must be submitted by the end of the previous year. For plants affected by these ordinances, harvests must be accompanied by documentation, from source to the end-user. If taxa listed in the ordinances are from cultivation, this much must be supported by documents from the municipality, State Forestries, and regional Environmental Inspectorates. In order to show conformity with legal requirements, purchasers of plant material protected by the ordinances mentioned are obliged (1) to register with the regional Environmental Inspectorates, (2) to ensure complete access for the controlling authorities to their business records, (3) to keep the necessary documentation for all transactions concerning the relevant plant material, and (4) to submit annual reports to the Ministry of Environment on their activities in this field. The export of six sorts of medicinal and aromatic plant material sourced from the wild is strictly prohibited. These include the herb of Summer Snowflake *Leucojum aestivum*, the bark of *Frangula alnus*, and the roots of *Primula veris*.

Analysing the quota tables of 1995-1997, it may be seen that the overall volume of medicinal and aromatic plant material allocated by the ordinances mentioned fluctuated between 73.5t, in 1995, 77t, in 1996, and around 62.4t, in 1997. The share directed to the internal Bulgarian market only, increased from 5% in 1995, to 28% in 1997.

The following examples may serve to better illustrate the quota-system and how flexible and sensitive it can be:

- > In 1995 and 1996 it was totally prohibited to collect the roots of *Atropa belladonna* from the wild, but 2550kg were allowed in 1997.
- > In 1995, it was forbidden to collect any wild plant species in the districts of Pazardgik, Silistra, and Smolian, in the districts of Dobrich, Kardjali, and Jambol in 1996, and in the districts of Lovech, and again Dobrich, Kardjali, Silistra, and Smolian in 1997.

Table 10

Examples of quotas for medicinal and aromatic plant material allowed to be collected, by region, in 1997, in Bulgaria. Volumes are in kilogrammes.

District	<i>Asarum europaeum</i>	<i>Primula veris</i>		<i>Atropa belladonna</i>		<i>Arctostaphylos uva-ursi</i>	<i>Adonis vernalis</i>
Part of plant used	herb	flowers	roots	leaves	roots	leaves	herb
Blagoevgrad	-	800	15	300	-	1 000	-
Varna	-	-	-	-	-	-	700
V. Tirnova	-	500	-	300	-	-	50
Vidin	-	-	-	700	-	-	-
Vratza	-	800	-	200	-	-	-
Gabrovo	50	500	100	500	50	-	50
Kustendil	-	400	-	-	-	-	-
Montana	-	700	-	500	-	-	100
Pazardjik	-	-	-	-	1000	1 500	-
Pernik	-	500	-	-	-	-	600
Pleven	-	300	-	300	-	-	-
Plovdiv	-	-	-	-	-	-	-
Razgrad	-	500	-	-	-	-	500
Ruse	-	500	-	-	-	-	200
Sliven	-	800	200	500	-	-	-
Sofia	-	20	-	20	-	-	-
St. Zagora	-	800	200	1000	1500	-	-
Targoviste	-	250	-	-	-	-	500
Schumen	-	800	-	-	-	-	500
Jambol	-	500	200	-	-	-	-
<b>Total</b>	<b>50</b>	<b>8670</b>	<b>715</b>	<b>4320</b>	<b>2550</b>	<b>2500</b>	<b>3200</b>
Internal market only	50	1000	715	2000	2550	2 00	500

Source: Ordinance No. RD-97 of 28.3.1997.

- > In 1996 and 1997, collection of 500kg of herb of *Adonis vernalis* in Razgrad district was allowed, but it had been forbidden in 1995.
- > In 1995, it was forbidden to collect the leaves of *Arctostaphylos uva-ursi* from natural habitats. In 1996, 800kg were allowed to be collected in Pazardjik district only, and in 1997 the quota was 2500 kg shared between Blagoevgrad district (1000kg), and Pazardjik (1500kg).
- > Wild-collection of a total of 3700kg of *Atropa belladonna* leaves was allowed in 1995, the whole volume to be exported, whereas in 1996 and 1997, 6050kg and 4320kg, respectively, were allowed to be harvested from the wild, but only half of the volumes were destined for export.

**France:** The Rural Code entitled "Nature Protection", prohibits the destruction, cutting, mutilation, uprooting, picking, collecting, transporting, peddling, utilising, selling or purchasing of a number of plant species. Several decrees relate to the Rural Code, including one of 20 January 1982, amended in 1992 and 31 August 1995, according to which, 450 plant species are either fully protected, or may not be taken without a permit (de Klemm, 1997).

Goi *et al.* (1997) list 88 medicinal plant taxa afforded full protection in at least one region of France. *Gentiana lutea*, for example, is fully protected in the Champagne-Ardenne, and *Lycopodium clavatum* within ten regions of metropolitan France. To date, no protective decrees exist for plant species in Aquitaine, Languedoc-Roussillon and Midi-Pyrenees.

A further 13 medicinal and aromatic plant taxa have partial protection throughout metropolitan France, including *Adonis vernalis*, Christmas Rose *Helleborus niger*, *Paeonia officinalis* and *Drosera rotundifolia*. The destruction of specimens of these species is prohibited throughout the national territory, but their collection, utilisation and sale are subject to authorisation from the Ministry of Environment, which takes advice from a Standing Committee of the National Council for Nature Protection.

In addition, a decree of 13 October 1989 (amended 1992) sets out a list of wild plant species which are protected at departmental level in France, complementing the legislation already mentioned. This list covers mainly species which are prized for ornamental or medicinal properties and which are often used for trade. They are subject to permanent or temporary measures limiting their collection, and the provisions of the decree are implemented through prefectural decrees. Twenty of these species are well-known for their medicinal and aromatic properties, ten of which are without any form of protection at national or regional level, otherwise. Prefectural decrees affect the collection of *Arnica montana* in six different French departments.

**Germany:** At federal level, the protection of wild flora is governed by the *Federal Nature Conservation Act* of 1976, amended in 1987. The law confers general protection on the flora by prohibiting the removal of wild plants from their habitats, their destruction, their utilisation, as well as damage of their habitats. In addition, specially protected plant species may not be cut, picked, uprooted, or destroyed. In order to be effective this law must be incorporated into the legislation of the *Länder*. Pursuant to this law, the trade in, and possession of, a number of plant species in Germany is regulated by the *Federal Ordinance of Species Conservation (Bundesartenschutzverordnung, (BArtSchV)* of 1989, last amendment of 1997). It sets out a list of several hundred plant species, both indigenous and exotic. Annex 1 of this law includes non-CITES species of conservation concern, which, in most cases, are not subject to any additional international protection. Importation and export of these species require a permit which, in most cases, will only be granted for cultivated plants, commercial trade in material sourced from wild plants of these species being effectively prohibited. The former Annex 2, which listed species that are also protected under CITES, was annulled when the new *Council Regulation (EC) No.338/97* came into force. The *Federal Ordinance of Species Conservation* especially affects commerce with the eastern and south-eastern European countries (Lange and Schippmann, 1997). In all, 101 medicinal and aromatic plant species are listed in Annex 1 of the *Federal Ordinance of Species Conservation*.

**Hungary:** Bernáth (1996) lists over 150 reserves in Hungary which are particularly important from the point of view of conservation of medicinal and aromatic plants *in situ*. Plants within these areas may not be used, apart from, in some cases, in a limited, controlled, way for scientific research and managed commercial harvest. Otherwise, *in situ* conservation of medicinal and aromatic plants is according to a law of 1982,

supplemented in 1988, and again in 1996 (*decreet 15/1996*). This legislation lists over 557 plant species within Hungary as protected. Forty-six of these, including *Digitalis lanata* and *Paeonia officinalis*, are classed as "especially endangered", permission for collection of which may only be granted by the Ministry of Environment, as opposed to by the Directorate of Nature Conservation, which authorises permission of the other protected species. When applying for permission to collect from a given species, the aim, the time of collection, and the volumes to be collected must be explained. In the case of the "especially endangered" species, collection and transportation may only be for reasons of conservation, or other public interest (Németh, 1997). Destroying any protected species is a contravention of the law, elevated to the level of a "crime", where any of the 46 "especially endangered" species are concerned. Medicinal and aromatic plant species among those classed as protected (but not "especially endangered") in Hungary, and which were used on a large scale prior to their protected status, are: Intermediate Lady's-mantle *Alchemilla xanthochlora*, *Acorus calamus*, *Adonis vernalis*, *Arnica montana*, *Carlina acaulis*, *Dictamnus albus*, *Helichrysum arenarium*, *Helleborus purpurascens*, Kidney Liver-leaf *Hepatica nobilis*, *Hippophaë rhamnoides*, *Inula helenium*, *Primula elatior*, Primrose *P. vulgaris*, Cowberry *Vaccinium vitis-idaea*, and *Valeriana sambucifolia*. Yet others among the list of protected plant species are of medicinal value, if not previously used on a large scale.

Bernáth (1996) points out the inadequacy of *in situ* protection of individual plants as a conservation method for species, their protection, in many cases, being arguably limited to an administrative exercise. Bernáth therefore reasons that additional protective measures should be active for the protection of medicinal and aromatic plant species, advocating monitoring of species populations, so that changes in these can be forecast, as opposed to realised retroactively. In this way, protection could start before endangerment of a species, by which time the chemical, morphological and biological diversity of a species is often lost, leaving little hope for their utilisation as a genetic background for further development of medicinal and aromatic plant resource material. Bernáth advocates the *ex situ* conservation of medicinal and aromatic plant species in the form of a chemotaxonomical garden, in the form of gene banks, in terms of biotechnology, and cultivation, but *in-situ* conservation should always be the priority.

A further law, dating from 1996 and effective from 1997, deals with utilisation of, and trade in, protected plant species, the *Act on Nature Protection*. According to this act, permission is necessary for collection, experiments, transporting or trading of species which are protected in Hungary, or by international agreements, such as CITES. Németh (1997) reports that applications for such permission are rather rare in Hungary.

**Spain:** The *Reales Ordenanzas de Farmacia* of 1860 represents the first legislative edict regulating the sale of medicinal plants and including a list of non-toxic species. In 1928, the National Commission on Medicinal Plants was established to promote cultivation and harvesting practices, followed in 1942 by the establishment of the *Servicio de Plantas Medicinales*. During the early 1940s, harvesting permits were introduced, accompanied by the first lists of protected medicinal and aromatic species. Harvesters, in order to obtain permits, were required to demonstrate that they could distinguish between species to be collected, and to keep records of volumes harvested, locations gathered from, and species used. It was not until the second half of the 1940s that permitting rules considered whether or not a species should be exempt from exploitation on conservation grounds. Although by 1959 lists of regulated species existed, often accompanied by detailed provisos relating to harvest, the legislative protection of medicinal and aromatic plants in Spain declined during the following decade and legislation promulgated during the 1970s and 1980s related to the control of toxicity, fraudulence, preparation, labelling, and sale of species, rather than to conservation.

The laws so far mentioned were enacted primarily for health reasons, albeit with conservation benefits at times. From an environmental perspective, legislation to protect plants in Spain may be considered to have come into being with the *Clasificación General de los Montes Públicos* of 1859. Later editions of this law (*Ley de Montes*, 8-VI-1957 and *Reglamento* of 1962), specify that any exploitation involving public forests is subject to specified conditions. These laws are still in force, but rarely observed. *Ley 4/1989, Conservation of Natural Areas and Wild Flora and Fauna* is of note, as it specifies protection for species listed as "vulnerable" (Annex III), and of "of special interest" (Annex IV), in which cases it is prohibited to destroy, damage, pick or trade plants in question, species "in danger of extinction" (Annex I), and species "sensitive to changes in their habitat" (Annex II), which are more strictly protected, in so far as their possession, transport, sale, import or export is not allowed without a permit. Further, it is prohibited to collect their pollen or spores. This law also establishes the provision for regional catalogues of threatened species. What this has meant in practice, is that conservation at regional level has become more coherent, and whereas only Asturias and Cataluña had a concerted regional approach prior to *Ley 4/1989*, after this law, seven other regions developed improved legislation. This regional legislation (Andalucía (*Decret 104/94*), Asturias (*Decret 65/95*), Aragón (*Decret 49/1995*), Balearics (*Decret 24/1992*), Cataluña (*Decret 328/1992*), Madrid (*Decret 18/92*), Murcia (*Order* of 17 February 1989), Valencia (*Order* of 20 December 1985) is very variable: in the Balearics, harvesting of medicinal plants is regulated only if it is for large-scale commercial use; in Aragón, recuperation programmes for species in decline are in place. Regional regulations may be quite detailed: on 2 June 1997, an order to regulate the collection of 45 plant species on private forest grounds and protected zones in Andalucía was passed, whereby a collector must submit a request of authorisation to the Provincial Delegation of the Regional Ministry of the Environment precisely defining the area and time of collection, the species, the plant parts, the volumes, and the methods of exploitation and tools to be used. Moreover, the applicant must estimate the size of the total population of each species in kilogrammes and number of plants, the share to be collected, and the methods used to obtain these figures. The permit - if exploitation is authorised - will establish quotas, time frames for harvesting, which will not last longer than two months, and methods to ensure the conservation of the species and its habitat. Once the collection has come to an end a detailed report has to be submitted to the Regional Ministry of Environment. This order affects important medicinal and aromatic plant species, including *Arctostaphylos uva-ursi*, *Rosmarinus officinalis*, and several *Sideritis* and *Thymus* species.

**Turkey:** A considerable proportion of Turkey's unenclosed forests and open habitat is owned by the State and managed by the Ministry of Forestry, and it is in these areas that much collection of medicinal and aromatic plants for commercial use takes place. *Forest Law No. 6831, Items 37 and 40* apply and empower the General Directorate of Forestry Production (Non-timber Forest Products) to regulate and control the wild collection of native plant species. Regulation is by licence, issued on payment of a fee. In only a few cases, is it well-conducted, as in the example of *kekik* collection in the Isparta region of south-west Turkey. Here, the date for the start of collection is precisely determined and announced annually and the permitted quantities very tightly regulated. Collectors must sign a *Kekik Collection Agreement*, accepting all conditions for its collection, and detailing their time and place of collection.

Another law, *Regulations for collection, production and export of natural flower bulbs*, 1989, amended in 1995, pertains to medicinal and aromatic plants in Turkey. It controls the export of flower bulbs from Turkey, including all Orchidaceae (which may be used for *salep* production), Squill *Urginea maritima*, *Leucojum aestivum*, and *Gentiana lutea*. The regulation works by reverse-listing, that is, all species not listed are banned from export. For those species listed, an annually-determined export quota is set by the Ministry of Agriculture and Rural Affairs, advised by a Technical Advisory Committee, comprising scientific, conservation and trade interests.

In all, some 44 taxa, at least, collected as medicinal plants (horticultural bulbous plants included, since they have medicinal value) are afforded some protection in Turkey *via* national or international regulation.

**UK:** The protection of wild plant species is governed in Great Britain by the *Wildlife and Countryside Act* of 1981, and in Northern Ireland by a statutory instrument of 1985 (de Klemm, 1997). According to the first law mentioned, the uprooting of any wild plant is prohibited. Moreover, a list of 168 plant species which are prohibited from sale, offer or exposure for sale, possession or transportation, for commercial purposes is in force (de Klemm, 1997). In Northern Ireland, 55 protected plants are listed.

## **MEDICINAL AND AROMATIC PLANT SPECIES IN EUROPE REPORTED AS THREATENED**

### **Introduction**

The ideal of a study such as this is to identify those European medicinal and aromatic plant species that are considered to be most threatened by collection owing to their demand in trade. For such an assessment to be made, information on knowledge of plant part used; level of demand; trade volumes; trade routes; source countries; collection practices and harvesting techniques, as well as biological parameters, such as life-form; population sizes; plant community considerations; habitat requirements; distribution; growth rates; and reproductive biology have to be evaluated, correlated and weighted. Gathering all this information for all the approximately 2000 medicinal and aromatic plant species discovered to be in trade as a result of research for this report is an enormous project and at the moment information for the majority of these species is only fragmentary. Although, in general, knowledge of the 1200-1300 native European species implicated is much easier for researchers based in Europe to collect than it is for the remainder of the species - they are more familiar in many cases - there is nonetheless a sore lack of information for these species on trade data and biological parameters. Because of the absence or fragmentary nature of this kind of information, a susceptibility assessment of the species in this report, based on comparable, objective data is not currently possible.

The authors of the national reports which contributed to this overview faced these same difficulties of threat assessment. They used different approaches to select the threatened plant species in their reports. Whereas the approach of Németh (1997) is mainly based on taxonomic and biological parameters, Özhatay *et al.* (1997) followed the methodology drafted by Cunningham (1996) for identifying the top 50 most threatened medicinal and aromatic plant taxa in Turkey. The selection undertaken by Blanco (Blanco and Breaux, 1997) is based on his long and profound knowledge on the trade in medicinal and aromatic plants and the species involved, and on various ethnobotanical studies in Spain.

Özhatay *et al.* (1997) use, according to Cunningham (1996), five steps to narrow down to the most threatened species: 1) identification of major sales sites; 2) identification of medicinal and aromatic plants in trade; 3) preparation of a short-list of species in trade which are slow-growing, destructively harvested, expensive and/or popular and/or sold in great quantity, and considered to be increasing in scarcity by traders and/or collectors; 4) preparation of a further short-list on the basis of commonness or rarity and on the basis of habitat requirements, geographic distribution and local population sizes; 5) the setting of priorities within the short list resulting after completion of step 4, based on phylogenetic distinctness. This approach resulted in a list of 50 native Turkish plant species, including 21 orchid species used for salep, several *Gypsophila* species collected for çöven, *Paeonia mascula* and *P. peregrina*, *Primula veris* and *Ruscus aculeatus*.

Blanco (Blanco and Breaux, 1997) list, in all, 29 plant taxa native to Spain which are of commercial interest in the medicinal and aromatic plants trade and which are associated with conservation problems. This list

includes the widely exploited genera *Thymus* and *Sideritis*, but also *Arnica montana*, *Gentiana lutea*, *Menyanthes trifoliata*, *Drosera rotundifolia* and *Arctostaphylos uva-ursi*. Blanco reports the most threatened medicinal plant in Spain is "manzanilla real" *Artemisia granatensis*. This species is an endemic of the Sierra Nevada and is locally used. Since the size of the population is estimated only at some 1000 individuals present above 2500m in the Sierra Nevada Nature Park, the species is almost threatened to extinction.

Németh (1997) lists 45 native Hungarian plant species which are threatened in Hungary. They are selected according to a classification system of 10 different parameters; for example, degree of phylogenetic isolation; size of the distribution; size and extent of the plant population; habitat tolerance; and threat category, at both a national and international level. Species included in that list are Mountain Everlasting or Cat's Foot *Antennaria dioica*, *Carlina acaulis*, *Inula helenium* and Goldenrod *Solidago virgaurea*. Out of these 45 species Németh (1997) selected 26 species which are characterized (1) either by only few plant populations in Hungary or are threatened in Hungary, (2) which are listed in the Hungarian "Red Book of endangered species" (published in 1989) or (3) which are used in large quantities or often. Species included in this list include *Arnica montana*, *Glycyrrhiza glabra*, *Menyanthes trifoliata*, *Primula elatior*, *P. vulgaris*, and Heath Speedwell *Veronica officinalis*.

For Albania, Vaso (1997) lists 32 medicinal and aromatic plant species which are reported to be threatened and therefore included in the National Red Data Book (Vangjeli *et al.*, 1995). Two species, *Aesculus hippocastanum* and Common Barberry *Berberis vulgaris* are categorised as probably Extinct<sup>1</sup>; 24 species as Endangered, including *Orchis morio*, *O. mascula* and *Gentiana lutea*; five species which are probably Endangered, for example *Origanum vulgare* and *Salvia officinalis*; and one Vulnerable species, the Maidenhair Fern *Adiantum capillus-veneris*. It remains unclear whether the threat facing these species is a result of over-exploitation or habitat-loss or their limited area of distribution.

All the threatened medicinal and aromatic plant species mentioned in the national reports are included in Annex 1. From these plant taxa, 15 have been selected for detailed description. The criteria for their selection have been (1) the occurrence of the species in international trade, (2) high trade volumes, (3) the availability of sufficient information, including information regarding degree of threat, and (4) evidence that the species or group of species is highly exploited in several countries. Not all criteria (apart from (1)) were met in each of the 15 cases set out below, but all the species mentioned below are threatened in at least one country owing to their exploitation. Further, it is important to mention, that these species may be, but will not be necessarily be, the most threatened medicinal and aromatic plant species in Europe. Further research could reveal other such species which are equally or more threatened.

The species described below are arranged in alphabetical order.

### 1. *Adonis vernalis* L.

Ranunculaceae

**Synonyms:** *Adonis apennina* L., *Adonis davurica* Reichenb.

**Vernacular names:** Pheasant's Eye (En), Adonis printanière (Fr), Eliboro falso (Fr), Frühlings-Adonisröschen (Ge), Adonide gialla (It), Mitek wiosenny (Pl), Goricwiet vesinnij (Ru)

**Pharmaceutical and trade names:** Adonidis herba, Herba Adonidis (Latin), Herb of Spring Adonis (En), Herb d' Adonide (Fr), Yerba de Adonis (Sp), Frühlings-Adonisröschenkraut (Ge)



Credit: Éva Németh

Pheasant's Eye *Adonis vernalis*

*Adonis vernalis* is a herbaceous perennial extending from south-east Sweden to south Europe and eastwards to western Siberia. As a typical steppe plant, its growth places in central and south Europe are restricted to isolated growth places, but in more easterly Europe, populations are increasing. The species has a scattered distribution in the Ukraine, the Russian Federation, and in the north Caucasus. Owing to habitat destruction and over-collection for ornamental and medicinal purposes, *A. vernalis* has become scarce in central and south Europe. According to IUCN threat categories, it is Extinct in Italy and the Netherlands, Vulnerable in Slovakia, Germany, Sweden and Switzerland, and Rare in Hungary (Walter and Gillett, 1998). In Romania, there are three Red Lists: Oltean *et al.* (1994) and Boscaiu *et al.* (1994) do not include *A. vernalis* in theirs, but Dihoru and Dihoru (1994) categorise this species as Vulnerable, according to the IUCN system of threat categorisation.

The plant yields heart glycosides, and is used in remedies for chronic cardiac problems and as a tranquilizer. The aerial parts of *Adonis vernalis* plants are used, and collected from initial blossoming until the fruits fall (Lange, 1998c), but the best quality of material is obtained during full bloom. As there is no established cultivation of the species, all material is gained from wild stock. Collecting the plant by pulling out the flowering stem may destroy the plant, whereas a cut about 5-10cm above ground may be sustainable (Lange, 1998c).

Plant material in trade is above all of Romanian, Russian, and Ukrainian, and sometimes Bulgarian origin (Lange, 1998c; Gorbunov, *in litt.* to TRAFFIC Europe, 21 January, 1998). Today, no trade is known in the Ukraine (Melnik, *in litt.*, 10 April 1998). Until 1990, export from Bulgaria amounted to 5-10t a year, but decreased to zero when collection of the species became subject to restrictions (see chapter on legislation). The quotas allowed have been too small to make collection profitable. Lange (1998c) reports only exports of 900kg in both 1996 and 1997, from Bulgaria to France. Until 1990, about 20t were exported from Romania annually to Germany, but since the species's listing in Annex 1 of the *Federal Ordinance on the Conservation of Species* in 1989, export from Romania to Germany decreased to zero, whereas Romania's export to France has recently been increasing and reached 10t in 1997 (Lange, 1998c). Since 1996, collection of *A. vernalis* has been subject to a permit in Romania (Lange, 1998c). Wild-collecting in that country may also affect *A. wolgensis* and *A. transylvanica*, both considered to be vulnerable in Romania, which resemble *A. vernalis* (Oltean *et al.*, 1994). In Hungary, the species was exploited for commercial purposes until the 1980s, until the enormous decrease of its population sizes led to the prohibition of wild-collection.

*A. vernalis* is widely exploited in Russia (Gorbunov, *in litt.* to TRAFFIC Europe, 21 January, 1998). Under optimal conditions on typical chernozem soils, the species yields 600-800kg of raw plant material per ha, decreasing to 45-110 kg/ha on soggy soils. Gorbunov, *in litt.* to TRAFFIC Europe, 21 January, 1998, estimates an annual demand of 180t per year in Russia. The annual harvest of dry, raw material is estimated to be 100t, or equivalent to one-fifth to one-tenth of the total potential amount of raw material harvestable in Russia each year. Owing to unsustainable use, resources of *A. vernalis* are rapidly declining in Russia (Gorbunov, *in litt.* to TRAFFIC Europe, 21 January, 1998).

In Spain, *A. vernalis* is a rare species restricted to the central-north with some isolated localities in the central-south. Blanco and Breaux, (1997) report that the species is much used in central Europe and that it is not known if it is collected from the wild in Spain, but that if it is, it should not be.

*A. vernalis* is subject to specific protection in France, Hungary, and under EU law (Annex V(b) of the EC Habitats, Fauna and Flora Directive and according to *Council Regulation (EC) No. 338/97* (see legislation chapter).



**2. *Arctostaphylos uva-ursi* (L.) Sprengel**

Ericaceae

**Synonyms:** *Arbutus uva-ursi* L.**Vernacular names:** Bearberry, Bearsgrape, Mountain box (En); Bousserole officinale, Raisin d'ours (Fr); Uva de oso, Gayuba (Sp); Echte Bärentraubē (Ge); Uva ursina (It); Toloknianka (Ru)**Pharmaceutical and trade names:** Uvae ursi folium, Folia Uvae ursi (Latin), Bearberry leaves (En), Feuille de busserolle (Fr), Hojas de gayuba (Sp), Bärentraubenblätter (Ge), Uva orsina (It), List'ja toloknjanki (Rus).

Credit: Emilio Blanco Castro

Bearberry *Arctostaphylos uva-ursi*

*Arctostaphylos uva-ursi*, a subshrub, shows a circumpolar distribution - in Europe, southwards to southern Europe, (and in North America southwards to Virginia, Illinois, New Mexico and California). The leaves, which are traded dry, either whole or cut, contain arbutin and are used to treat inflammatory disorders of the lower urinary tract. This plant material is of high commercial value (Blanco and Breaux, 1997), and almost 200 medical preparations could be identified on the German market in 1995 as containing it (pers. observ.). There are no figures for the total annual demand of the leaves, which are traded dry, either whole, or cut (Lange, 1998a).

To date, no cultivation of this plant exists, only a project to cultivate plants organically in the Lerdian Pyrenees (Blanco and Breaux, 1997), which means that plant material in trade is almost certainly derived from wild stock. Main source countries are Russia, China, Romania, Bulgaria, and in general the Balkans, Spain and Finland (pers. comms). Whereas it is a common species in most northern countries, distribution in the south is relictic and limited to mountainous areas. Consequently, the impact of any exploitation of this species in the southern part of the species's area may be serious. Indeed, it is reported to be threatened in many central and (south-)eastern European countries, including in important source countries. It is classed by IUCN as Rare in Bulgaria, the Czech Republic and Romania; Vulnerable in the Netherlands, Slovakia and Bulgaria; and Endangered in Albania (Walter and Gillett, 1998).

Imports into Germany from all countries with the exception of Spain and the Scandinavian countries are prohibited according to the *Federal Ordinance on the Conservation of Species*. Exports from Spain to Germany have increased recently (pers. comm.). According to Blanco and Breaux (1997), the species is widely gathered in Spain, by uprooting plants entirely, which disturbs any other plants in the immediate vicinity. Monitoring of the harvest only exists in the areas of Burgos and Soria, where the local authorities auction the harvesting rights, and sites are exploited every four to five years, and in the region of Valencia, where wild-harvesting is also subject to permits. According to Blanco and Breaux (1997), the species is threatened only in south-east Spain. The new regulation relating to the collection of plant species on private forest grounds in Andalucia (see legislation chapter) may help to control exploitation of the species in that area. Wild-harvest of this species in general in Spain is forbidden without permits, according to the *Ley de Montes, 8-VI-1957*, but as has already been noted, this regulation is seldom complied with (Blanco and Breaux, 1997). Most material from Spain is exported to Germany, either as dried leaf or in a more processed form (Lange, 1996b).

In 1996, as noted in the chapter on legislation, Bulgarian regulations allowed the collection of 2500kg of *Arctostaphylos uva-ursi*, but export was prohibited (Lange, 1996). In France, the species is fully protected

in two regions: Poitou-Charentes and the Auvergne. To monitor trade in *Arctostaphylos uva-ursi*, it has been placed on Annex D of *Council Regulation (EC) No. 338/97*. In Albania, the species is listed under the *Order*, dated 20 May 1997, in accordance with *Law No. 7722* of 1993 (see legislation chapter).

### 3. *Arnica montana* L.

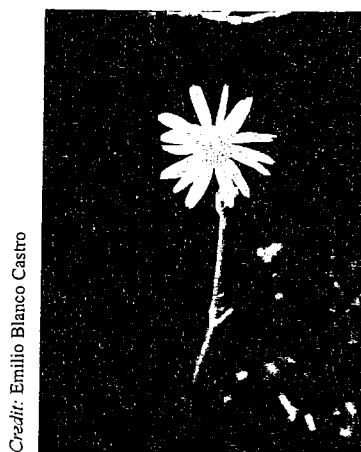
Asteraceae

**Synonyms:** *Doronicum arnica* Desf.

**Vernacular names:** Mountain Tobacco, Mountain Arnica (En); Arnica, Arnique (Fr); Árnica, Flor de Tabaco (Sp); Arnika, Bergwohlverleih (Ge); Arnica (It)

**Pharmaceutical and trade names for the dried flowers:** Arnicae flos, Flores Arnicae (Latin); Arnica flowers (En); Fleur d'Arnica (Fr); Flor de árnica (Sp), Arnikablüten (Ge), Fiore de arnica (It).

**Pharmaceutical and trade names for the dried roots:** Arnicae radix, Radix Arnicae (Latin); Arnica root (En); Racine d'Arnique (Fr); Raiz de árnica (Sp); Arnikawurzel (Ge); whole fresh plant: Arnica e planta tota



Credit: Emilio Blanco Castro

Mountain Tobacco *Arnica montana*

*Arnica montana*, a herbaceous perennial, is distributed from south Norway and Latvia southwards to south Portugal, the north Appennines and south Carpathians. Subsp. *montana* is widely distributed, occurs in mountainous areas and prefers poor meadows on acid soils, whereas subsp. *atlantica* (Bolós) is restricted to an area ranging from south-west France to south Portugal. In many countries, populations are decreasing in size and number owing to habitat loss, but also through exploitation for medical purposes. This has led to listing of the species in several national Red Data Books, as Indeterminate in Kaliningrad, Ukraine; Rare in the Czech Republic; Vulnerable in Bosnia-Herzegovina, Lithuania, the Netherlands, Portugal, and Romania; and Endangered in Germany and Hungary.

Several parts of plants are used, such as dried flowers, dried roots, and the whole fresh plant. The last-mentioned form is only used in homeopathy, and thus is of minor importance in trade. Of most importance are the dried flowers, their annual demand in Europe, estimated to be 50t (Lange, 1998c). To obtain one kilogramme of dried flowers, it is necessary to harvest five to six kilogrammes of fresh material. In addition, some hundreds of kilogrammes of roots are traded per year. The value of both flowers and roots is high: in retail trade one kilogramme of flowers costs the equivalent of USD56 in Germany and one kilogramme of the roots may even cost the equivalent of USD110. Whereas the latter may be derived from cultivation (in Germany), *Arnica* flowers are still wild-harvested (Lange, 1998c). Cultivation of *Arnica montana* is indeed in progress experimentally or on a small scale in Hungary, France, Germany, Spain and the UK, however, with respect to the flowers produced, not profitable to date (Bernáth, 1996; Blanco, 1997; Dennis, 1997; Goi *et al.*, 1997; Lange, 1998c). With respect to the roots, profit made from cultivated stock is much better, however, and today roots are often derived from cultivated plants, in particular in Germany (Lange, 1998c).

Main source countries of *Arnica montana* flowers in Europe are Romania and Spain (Lange, 1998c). According to the German *Federal Ordinance on the Conservation of Species*, import to Germany of *Arnica montana* sourced from wild plants, from all countries apart from Spain, has been prohibited since 1989. Nonetheless, 1000-3000kg of material from the species was exported to Germany from Romania during the 1990s (Lange, 1998c), while exports from Romania to other European countries have been two to three times as great. Since 1996, a permit for collecting *Arnica montana* flowers has been necessary in Romania. In Spain, about 10t of dried flowers of *Arnica montana* were reported as traded through one wholesaler alone

in Galicia, who reported the existence of a large harvesting network in that province. The species may also be harvested in Asturias and the Pyrenean region. (Blanco and Breaux, 1997). According to the harvesters, the size of *A. montana* populations are decreasing and Blanco and Breaux (1997) report the species as having potential conservation problems. Collection is made often by Portuguese and Romany communities in Spain, and pickers receive ESP1500 (USD10)/kg dried plant material. In Hungary, *Arnica montana* is a rare species which is reported not to be collected nowadays (Lange, 1998c).

Whereas collection of the plant is not subject to any restrictions in Spain, the species receives protection in law in Hungary (1982.III.15.KTM decree and its amendments) and in France is fully protected in the central region of the country and in Bourgogne, while collection in seven departments, at least, requires a permit. To monitor the trade in *Arnica montana* flowers and roots, they have been listed in Annex D of *Council Regulation (EC) No. 338/97* and the species is listed in Annex V(b) of the EC Habitats, Fauna and Flora Directive.

#### 4. *Cetraria islandica*

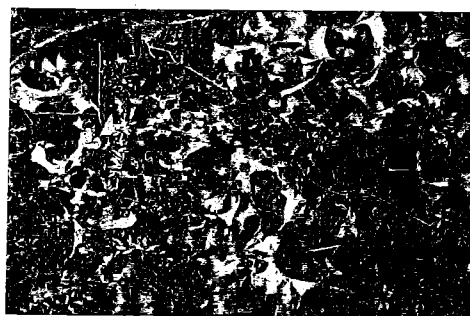
Parmeliaceae (lichens)

**Synonyms:** *Lichen islandicus* L.

**Vernacular, pharmaceutical and trade names:**

Lichen islandicus, Cetrariae lichen (Latin); Iceland moss (En); Lichen d'Islande (Fr); Líquén de Islandia (Sp), Isländisches Moos (Ge); Erba rissa, Lichene islandico (It)

Credit: D. Lange



Iceland Moss *Cetraria islandica*

*Cetraria islandica* is a thallose lichen which is widely distributed from the arctic to central Europe, with some extension to south Europe, the western part of North America, and south Chile (Patagonia). The whole body is traded and valued as a cough remedy. No fewer than 100 medicinal preparations were found on sale in Germany in 1995. There is no cultivation, thus all material in trade is derived from wild stock. Whereas the species is abundant in the north, it becomes rare in its southern area. Source countries are Iceland, Norway, Romania, Bulgaria, Czech Republic, Russia, Canada, but also Spain (Hänsel *et al.*, pers. comm.).

Only few trade data are available: Iceland's exports amount to one to three tonnes a year, above all to Germany (Gislason, *in litt.*, 11 March 1996). In Romania about 2.5t may be collected in the Rodna Mountains annually (Bartók *in litt.* to Schmitz-Kretschmer, 19 March 1997). According to Blanco and Breaux, (1997) *Cetraria islandica* is rare in Spain, occurring mainly in the Pyrenees and the Cantabrian mountains. Nevertheless, the species is collected from wild stock and considered to be potentially at risk, in conservation terms.

Collection of *Cetraria islandica* in Bulgaria was not allowed in 1995, nor in 1996 (see legislation chapter). Imports into Germany are only allowed on presentation of a permit stating that harvest was sustainable, according to the *Federal Ordinance on the Conservation of Species*, and the species is also protected according to Annex D of *Council Regulation (EC) No. 338/97*.

5. *Drosera rotundifolia* L. (*D. anglica* Hayne, *D. intermedia* Hudson)

Droseraceae

**Vernacular names:** Sundew (En); Rorella, Drosera (Es); Rossolis (Fr); Rosolida (It); Sonnentau (Ge); (*Drosera* spp.), Common Sundew

**Pharmaceutical and trade names:** Droserae herba, Herba Droserae (Latin); Sundew herb (En); Herbe de la rosée (Fr); Yerba de drosera (Sp); Sonnentaukraut (Ge).

Credit: Saxifraga Foundation/CNC



Round-leaved Sundew *Drosera rotundifolia*

The genus *Drosera* is widely distributed in Europe and also in north Asia, Japan, and North America, and southwards to Lebanon and the Caucasus. In Europe, three species occur: *Drosera rotundifolia*, Great Sundew and *D. anglica*, which are both widely distributed in Europe, and *D. intermedia*, which is confined to Europe and the Atlantic side of North America. The whole plants of *Drosera rotundifolia*, *D. intermedia*, and *D. anglica* are valued against disorders of the respiratory organs, especially bronchitis, asthma and pertussis. About 100 different medical preparations including homeopathic remedies, were found on sale in Germany in 1995. All three species are very small, with basal leaves and flowering stems rarely exceeding 10cm. Owing above all to habitat destruction, these *Drosera* species occur in fragile biotopes, such as mires, peats, and bogs and there is an overall decline in the size and number of their populations in many European countries, where they are listed as Endangered, Vulnerable or Rare, according to IUCN threat categories (see Annex 1).

Cultivation is difficult as the species requires specific bog conditions, but experimental cultivation exists (Galambosi, *in litt.*, 30 January 1996). All material in trade is therefore derived from wild stock. Collection and trade is recorded for Spain (Blanco and Breaux, 1997). *Drosera rotundifolia* and *D. intermedia* are collected from marshy locations in Galicia and León and tonnes of dry plant material are reported to be gathered. Taking into consideration that 2500-16 000 plants have to be collected to amass one kilogramme of raw material, a tremendously high number of individual plants will be collected annually. The plant material is of high commercial value, as the price in wholesale trade in 1996 was ESP3600/kg (USD23). No regulatory legislation especially for the species exists in Spain.

In Finland, fluctuating quantities of *D. rotundifolia* are collected: 750kg in 1990, in contrast to 2100kg in 1994, but 800kg in 1995. The species is harvested in the north, mainly around Oulu, and is subject to regulation (Galambosi, *in litt.*, 30 January 1996). The material is exported to Switzerland.

Active constituents are not as potent in non-European *Drosera* species, yet these are exploited. In particular, *Drosera madagascariensis* (referred to in trade as “*Drosera longifoliae* herba”) is widely exploited and 2-20t are exported from Madagascar annually (N. Marshall, *in litt.*, February 1998), which equates to 20-120 million individual plants.

All three European *Drosera* species are prohibited from collection in Bulgaria and protected in Hungary. In France, collection of *Drosera intermedia* and *D. rotundifolia* needs a permit, and the species may only be imported into Germany with a permit proving sustainable harvest in the source country, as they are covered by the *Federal Ordinance of Species Conservation*.

6. *Gentiana lutea* L.

Gentianaceae

**Vernacular names:** Yellow Gentian, Bitterwort (En); Gentiane jaune (Fr); Genciana (Sp); Gelber Enzian (Ge); Genziana maggiore (It)

**Pharmaceutical and trade names:** Gentianae radix, Radix Gentianae (Latin); Gentian root (En); Racine de gentian (Fr); Enzianwurzel (Ge); Radice di Genziana (It); Raiz de genciana (Sp)

*Gentiana lutea* is a herbaceous perennial and grows in mountainous regions, on meadows and open slopes from the Pyrenees to the Carpathian mountains, and to north and west Anatolia. Subspecies *lutea* is distributed throughout the range of the species, subspecies *symphyandra* (Murb.) Hayek occurs from south-eastern Alps to the

Balkan peninsula and Anatolia. In many countries a general decline in population size owing to commercial exploitation has led to Red Data Book listings: in Bosnia-Herzegovina (V), Romania (V), Portugal (E), Bulgaria (V), Albania (E), Germany (En), Czech Republic (R), Ukraine (I), and Poland (R)<sup>1</sup>.

The dried roots and the rhizome of the gentian yield bitter substances which stimulate the digestive system and are used in a great variety of phytomedicines and other herbal preparations. In Germany about 300 of such products are listed as containing roots of *Gentiana lutea*. The roots are further the basis of various bitters, the most famous being the Enzian schnapps.

Although cultivation takes place, the plant is only grown on an area of about 150ha in total, above all in France, but also in Bavaria, Austria and Italy (Franz, *in litt*; Verlet and Leclercq, 1997). In Spain cultivation is limited to a few experimental plots in Navarra and Galicia (Blanco and Breaux, 1997). Subsequently, most of the demand, estimated to be more than 1500t of dried roots (equal to 6000t of fresh root) annually (Franz, *in litt*) is derived from wild stock, from populations in France, Spain, Turkey, Germany (Bavaria), Albania, Romania and to a lesser extent in Italy and Switzerland. In France alone, 2500t of fresh roots are collected annually, the equivalent of FF10 million (USD1 691 000) Verlet and Leclercq, 1997. The roots are collected from spring to autumn, often before flowering, and their collection destroys the whole plant. In many countries, local use of the roots can be observed, such as in Albania and Austria, but large-scale processing takes place in France, Germany, Italy, and Japan.

In Spain, most wild-harvest takes place throughout the north, both legally and illegally, mainly in the mountains near León and in the Pyrenees. Around León, some 88t are collected legally each year. Further uncontrolled and illegal collection, often accompanied by the existence of harvesting networks and illegal warehouses, is assumed to augment this figure considerably (Blanco and Breaux, 1997). Numerous permits have been sought since 1996 for the exploitation of the species in the Ancares Natural Preserve, where the endemic subspecies *aurantiaca* co-exists. Another endemic, *Gentiana montserratii* Vivant, is also collected, and is confined to the central pre-Pyrenees and considered to be Rare (Walter and Gillett, 1998). The merchandise collected in Spain is mainly directed to Germany and Switzerland (Blanco and Breaux, 1997). Wild-harvesting of *Gentiana lutea* in Spain is subject to largely ignored legislation from the 1940s, at the national level (Blanco and Breaux, 1997). Blanco and Breaux (1997) report that harvesting of the species in Spain should be strictly regulated, and that although various populations are abundant, commercial trends suggest future intensification of pressure.

Credit: D. Lange

Yellow Gentian *Gentiana lutea*

In Albania, the gentian has a scattered distribution at high mountain level in the northern and eastern part of the country. The roots are used for home production of Enzian schnapps, but also collected for export. According to harvesters in Albania, the sizes of the populations are declining (Baltisberger *in litt.*, to Schippmann, 3 September 1993). From 1994 onwards, collecting in Albania and export has been prohibited (Dinga, *in litt.* to Schmitz-Kretschmer, 17 August 1995). In Albania, the species is listed under the *Order* dated 20 May 1997, in accordance with *Law No. 7722* of 1993 (see legislation chapter).

In Turkey, the species is known from fewer than 10 isolated localities. Owing to intensive over-exploitation, some populations are almost destroyed, others show declines (Özhatay *et al.*, 1997). As this species is subject to the "bulbous plant regulation" (see chapter on legislation), collection and export from Turkey is banned. However, according to Özhatay *et al.* (1997) the roots are still collected, therefore the gentian is regarded as seriously threatened.

In addition to legislation mentioned above, *Gentiana lutea* is subject to control under the *Federal Ordinance of Species Conservation* in Germany, thus imports of wild-collected material are subject to permitting regulations, in an attempt to ensure sustainable harvest in the source country. Imports from Spain and France are excluded from this regulation, however. In France this species is fully protected in the region Champagne-Ardenne (Goi *et al.*, 1997). At European level, as previously stated, it is listed on Annex V(b) of the "Habitats Directive", and on Annex D of *Council Regulation (EC) No. 338/97*.

#### 7. *Glycyrrhiza glabra*.

Fabaceae

**Vernacular names:** Liquorice (En); Réglisse, Bois doux (Fr); Süßholz (Ge); Legno dolce (It); Regalizia (Sp)

**Pharmaceutical and trade names:** Liquiritiae radix, Radix Liquiritiae (Latin); Licorice root (En); Racine de réglisse (Fr); Süßholzwurzel (Ge); Regaliz (Sp)

The genus *Glycyrrhiza* is widely distributed in Eurasia, extending to Australia, North America, and the temperate regions of South America. In Eurasia around 20 species occur, among them five confined to Europe. The roots of many species are sources of liquorice, though often only of local importance. Liquorice is used in confectionery, cough mixtures, lozenges, medical remedies, plug tobacco and in brewing stout. In trade, several kinds of liquorice are distinguished with regard to their geographical origin: Spanish, Russian, Persian, and Mongolian liquorice, but not to plant species from which the roots are derived. Moreover, trade name and plant source may not be coincident. A widely used species is *G. glabra*, a herbaceous perennial native to the Mediterranean region, the Near East, central Asia, as well as western Siberia. Other highly exploited species are *G. uralensis*, that extends from western to eastern Siberia, as well as across central Asia to Mongolia; *G. echinata* with an area extending from the Balkans across Asia Minor to south-eastern Russia and western Siberia; and *G. pallidiflora* native to the Far East and China. In many cases, the plant is cultivated, for example in Italy, southern France and Spain, but also in central Asia, Australia, and Brazil (Mansfeld, 1986), but liquorice plants growing in the wild also continue to be exploited to a large extent (*pers comm.*).

Credit: Emilio Blanco Castro



Liquorice *Glycyrrhiza glabra*

Liquorice is in high demand and therefore is listed in a separate Customs category, as has been mentioned. European countries in all imported 6000t of roots in 1996, almost all from Asia (Table 4). Main source

countries were Azerbaijan, Turkmenistan, Afghanistan, Iran and Pakistan. The exports amounted to only some 2700t, more or less evenly directed to North America, and African and Asian countries (Table 4).

While France dominates the import trade in Europe, Turkey is the biggest exporter of liquorice, shipping some 3040t in 1991, 1684t in 1992, 1350t in 1993, 1140t in 1994, 1560t in 1995, and 1730t in 1996, according to the UNCTAD COMTRADE database. The figures of the State Statistical Institute in Turkey correspond very closely with these figures, except for the year 1996, in which Turkey is reported to have exported only 985t (Atay, *in litt.* 19 February 1998). These figures do not include the material which is needed in Turkey to produce extracts, which are also exported. Main destination countries have been the USA, Egypt, Italy, France, and Israel. According to Özhatay *et al.* (1997) the export of processed products from Turkey is slightly increasing. As there is almost no importation of liquorice roots into Turkey, and no cultivation takes place (Özhatay *et al.*, 1997), all plant material is derived from wild stock. *G. glabra* occurs across Turkey with the exception of in the north-east by the Black Sea, and the roots are collected above all in south-east Anatolia (Özhatay *et al.*, 1997). The drastic decline in exports from Turkey, from 20 000t 50 years ago, to 1500t today may be a result of unsustainable overuse of the natural resource (Özhatay *et al.*, 1997). The species is becoming scarce, at least locally, and is categorised as Rare in Turkey by Ekim *et al.*, 1989.

Spain also exports liquorice, however the quantities involved are much less. Liquorice is obtained either from wild stock or from cultivation, although less so now than previously. According to Blanco (Blanco and Breaux, 1997) the species is not threatened in Spain. In Bulgaria, liquorice is regarded as being Rare (WCMC, 1988). Németh (1997) reports this species as being threatened in Hungary owing to its exploitation for its medicinal and aromatic value.

No law exists to protect this species, or to regulate trade, either nationally, or internationally.

#### 8. *Gypsophila* spp., *Ankyropetalum gypsophylloides*

Fenzl

Caryophyllaceae

**Vernacular name:** Gypsophila (En); Gypsophile (Fr); Gipskraut (Ge); Radice saponaria (It)

**Pharmaceutical and trade names:** Saponariae alba radix, Radix Saponariae alba, Gypsophilae radix, Radix Lanariae (Latin); White Soapwort root, Italian Soapwort root (En); Racine de Saponaire blanche (Fr); Weiße Seifenwurz (Ge); Raiz de Saponaria blanca (Sp); çöven (Tu)



Credit: Prof. Mehmet Koyuncu

*Gypsophila Gypsophila* sp. collection, Van area, S.E. Anatolia, Turkey

The genus *Gypsophila* shows a Eurasic distribution with its centre of diversity in South Russia and Asia Minor. The roots of several *Gypsophila* species, including European species, for example *G. paniculata*, *G. arrostii*, *G. fastigiata*, and *G. perfoliata* contain saponine and are known in trade as Saponariae albae radix or White Soapwort Root (Hänsel *et al.*, 1993). Medicinally they are used for the preparation of remedies against coughs and ailments of the upper respiratory system. In addition the roots are used for the production of a variety of other products: cleaning chemicals, film emulsion, in the confectionary as a stabilizer of froth and as an ingredient in fire extinguishers. Saponin is also used as a whitener in the production of halva. The roots are sourced either from cultivated plants or from wild stock. Conservation problems are so far known only for Turkey where the plants are widely exploited from the wild (Özhatay *et al.*, 1997).

The roots of *Ankyropetalum gypsophylloides* and of five species of *Gypsophila* (*G. arrostii*, *G. bicolor*, *G. eriocalyx*, *G. perfoliata*, *G. venusta*) are collected in Turkey. All the species collected are herbaceous perennials growing in dry open habitats. *G. eriocalyx*, *G. arrostii* var. *nebulosa* and *G. perfoliata* var. *anatolica* are endemic to Anatolia. According to Özhatay *et al.* (1997), the roots have been collected for commercial purposes since 1900, when they were exported by camel caravans from Diyarbakir. Collecting of the roots take place between March and June before fruiting. The roots go to 1-1.5m deep, and are uprooted by digging holes 50-80 cm deep. After cleaning and drying, the plant material is packed in sacks, and sold through two or three middlemen to export firms in Istanbul, Izmir and Denizli. The annual trade is estimated to involve 500t-1000t of roots a year, but precise data on the volumes in trade are not available (Özhatay *et al.*, 1997). The roots are widely used in the domestic market, but also exported to the USA, to European countries *inter alia*, Germany, Belgium, and Switzerland, and to countries of the Near and Middle East. Average export volume between 1989 and 1996 was 140t (Özhatay *et al.*, 1997). The harvest of these slow-growing species with a narrow range is of a destructive nature, and they are considered to be endangered in Turkey (Özhatay *et al.*, 1997).

#### 9. *Menyanthes trifoliata* L.

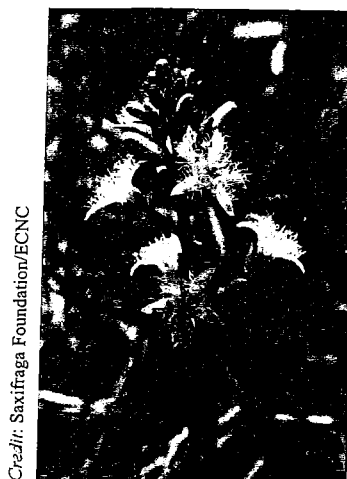
Menyanthaceae

**Vernacular names:** Bogbean, Buckbean, Marsh trefoil (En); Trèfle d'eau (Fr); Trebol de agua (Sp); Fieberklee, Bitterklee (Ge); Trifoglio fibrino (It)

**Pharmaceutical and trade names:** Menyanthidis folium, Trifolii fibrini folium, Folia Trifolii fibrini (Latin); Bogbean leaf (En); Feuilles de Ményanthe (Fr); Fieberkleeblätter (Ge); Foglia di trifoglio fibrino (It); Hojas de trebol de agua (Sp)

*Menyanthes trifoliata* is widely distributed throughout the temperate and arctic zones of the northern hemisphere. It grows in fragile habitats, marshes and shallow wetlands, declining in many parts of Europe. Thus it not surprising that the species is recognized to be Vulnerable or Endangered (WCMC, 1988) in nine central and south European countries (see Annex 1). Its leaves are favoured for their bitter substances which stimulate the appetite and the secretion of gastric juice. Further, Blanco (Blanco and Breaux, 1997) reports their use as a basis of antimigraine preparations. About 50 different remedies with *Menyanthes trifoliata* were detected in Germany's pharmacies in 1995 (pers. observ.).

As cultivation exists only on an experimental scale, the leaves are entirely collected from the wild. Main source countries are Russia, Poland, and the Balkans (Wichtl, 1997; pers. comm.). Exact figures on volumes and trade channels are not yet available. However inclusion in national Red Data Books and the fact that collection is prohibited or restricted in Bulgaria (Lange, 1996b), in Hungary (Bernáth, 1996), and in six regions in France (Goi *et al.*, 1997), according to the *Federal Ordinance of Species Conservation* (and thus imports of material of wild-collected origin are prohibited), and in Annex D of *Council Regulation (EC) No. 338/97*, is an indication of the threatened status of the species.



Credit: Saxifraga Foundation/ECNC

Bogbean *Menyanthes trifoliata*



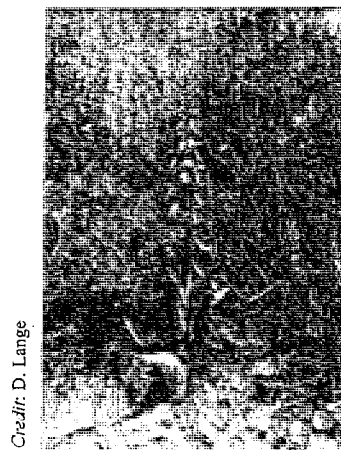
## 10. Species of Orchidaceae

Orchidaceae

**Vernacular names:** Orchids (En); Orchidées (Fr); Orchideen (Ge)

**Pharmaceutical and trade names:** Salep tuber, Tubera Salep (Latin); Salep (div.)

The tubers of *Orchis morio* were formerly officinal, and used for the preparation of medical treatments against diarrhoea of children and as a vehicle for acrid remedies (List and Hörhammer, 1977). In addition, tubers of various other orchid species of several genera, for example *Anacamptis*, *Barlia*, *Himantoglossum*, *Orchis* and *Ophrys*, may be used to obtain salep (the extract of dried tubers of various orchid species used culinarily and medicinally, in the form of drinks and ice cream). In Germany, salep was included in the national pharmacopeia until the 6th edition. Owing to habitat loss, there has been a decline in the number of a lot of orchid populations throughout Europe. Today, orchids are protected in most European countries and the family Orchidaceae is listed in Appendix II of CITES.



Credit: D. Lange

*Barlia robertiana*

Özhatay *et al.* (1997) report salep to be obtained from 38 different orchid species belonging to ten different genera, collected from five regions in Turkey. After collection, the tubers are washed, gently scrubbed, put into boiling water for 10-15 minutes, and dried in the sun. On average, to obtain one kilogramme of dried tubers 2600 tubers have to be collected, but the range is anything from 1000 to 4350 tubers. The commercial value of the tubers is high: a collector earns about USD5.6/kg. In 1996, in retail trade in Germany, 100g cost about USD17. According to Özhatay *et al.* (1997), the demand of the domestic market in Turkey, where the tubers are favoured for preparing ice cream and beverages, is impossible to estimate. However, according to Kasperek, cited in Özhatay *et al.* (1997), 3750-7500kg of dried salep powder are produced in Turkey, representing 10-20 million tubers a year.

Collection of the tubers is not regulated in Turkey, but since 1989 export has been forbidden (according to the "bulbous plant regulation"). Despite this regulation, exports were still taking place in 1997 (Özhatay *et al.*, 1997). Continuous and uncontrolled collection has caused a critical decrease in numbers for some species, in particular for *Barlia robertiana* and some species, for example, *Ophrys phrygia*, are endemic.

Vaso (1997) reports collection of orchid tubers in Albania, but trade data were not available for this report. Lange (1996) reported a probable export of about 700kg of salep in 1992, from Albania to Germany, and in 1996, of 1100kg (Federal Agency for Statistics, Germany). In Albania, *Orchis morio* and *O. mascula* are classified as endangered (Vaso, *in litt.*, 18 March 1998).

Despite the listing of the family Orchidaceae in Appendix II of CITES and Annex B of Regulation (EC) 338/97, which requires import and export permits to accompany shipments, no trade data are available for salep.

**11. *Paeonia* spp.**

Paeoniaceae

**Vernacular names:** Paeony (En); Pivoine (Fr); Pfingstrose (Ge); Peonia (It)

**Pharmaceutical and trade names of the flowers:** Paeonia flos, Flores Paeoniae (Latin); Peony flowers (En); Fleurs de Pivoine (Fr); Pfingstrosenblüten (Ge)

**Pharmaceutical and trade names of the roots:** Paeoniae radix, Radix Paeoniae (Latin); Peony roots (En); Racine de Pivoine (Fr); Pfingstrosenwurzeln (Ge); Raiz de Peonia (Sp)

Credit: D. Lange



*Paeonia mascula*

The flowers and roots of several *Paeonia* species are used within Europe. Although traded as *P. officinalis*, plant material is often derived from other paeony species such as *P. peregrina* and *P. mascula*. *P. officinalis* is a western and south-western European species ranging eastwards to Albania; *P. mascula* ranges from central France to north Africa, and eastwards to the Caucasus, Iraq and Iran; *P. peregrina* is limited to the eastern Mediterranean region, the Balkans and Asia Minor. Özhatay *et al.* (1997) report wild-collection of roots and flowers of *P. mascula* and *P. peregrina* in several regions of Turkey. Between 500 and 1000kg of plant material from paeonies, largely made up of roots, are destined for export annually from Turkey, above all to Germany. Although collecting of flowers is *per se* more of a sustainable type of harvest than root collection, the flowers are of such high commercial value that over-exploitation may be occurring. Özhatay *et al.* report declines in population sizes, as a result of over-collection of roots. Both *P. mascula* and *P. peregrina* are rare in Turkey, according to Özhatay *et al.* (1997), who class *Paeonia* spp. as among the 10 most-threatened medicinal species or genera in trade in Turkey.

In 1995, 1500kg of *P. peregrina* roots were authorised for collection from Bulgaria, but in 1996 only 1000kg were authorised. The quotas for flowers were 6300kg and 7 550kg for the same years, respectively. Most of the flowers were for export, the roots only for domestic consumption within Bulgaria. Németh (1997) lists *P. officinalis* among some 40 particularly threatened medicinal and aromatic plant species in Hungary and (Bernáth, 1996) reports it to be vulnerable to collection, which is subject to permission. In France, collection and trade of any parts of *P. officinalis* is subject to authorisation (Goi *et al.*, 1997). In Romania, *P. mascula* is considered to be endangered, and both *P. officinalis* and *P. peregrina* are classified as Vulnerable (WCMC, 1998). In Albania, *Paeonia* is listed in the *Order* dated 20 May 1997, in accordance with *Law No. 7722* of 1993 (see legislation chapter).

**12. *Primula* spp.**

Primulaceae

**Vernacular name:** Primulas (Cowslip, Oxlip, Primrose) (En); Primevère (Fr); Primel, Schlüsselblume (Ge);

Primula, Primavera (It)

**Pharmaceutical and trade names of the flowers:** Primulae flos, Flores Primulae (Latin); Primrose flowers (En); Fleurs de Primevère (Fr); Schlüsselblumenblüten (Ge)

**Pharmaceutical and trade names of the roots:** Primulae radix, Radix Primulae (Latin); Primrose roots (En); Racine de Primevère (Fr); Primelwurzeln (Ge); Raiz de Primavera (It)

Credit: É. Németh



Cowslip *Primula veris*

Roots and flowers of *Primula veris* L. and Oxlip *P. elatior* (L.) Hill are used in herbal preparations and phytomedicines against coughs, bronchitis and colds. Although both species are widely distributed in Europe, Asia Minor and Siberia, trade effects mainly the eastern European and Russian populations. It is therefore alarming that *P. veris* and *P. elatior* are protected in Hungary, and listed by Németh (1997) among the most threatened medicinal and aromatic plant species in that country. In Bulgaria, volumes of the flowers authorised for collection are high (in 1995, 6300kg; in 1996, 12 000kg), but only 1060 kg and 600kg of the roots were authorised for the same years, respectively. Özhatay *et al.* (1997) list *P. veris* among the 45 most-threatened medicinal plants in Turkey.

### 13. *Ruscus aculeatus* L.

Liliaceae

**Vernacular names:** Butcher's Broom (En); Petit houx, Fragon (Fr); Rusco (Sp); Stechender Mäusedorn (Ge) Pungitopo (It)

**Pharmaceutical and trade names:** Rusci aculeati rhizoma, Rhizoma Rusci (Latin); Rhizome de Petit-houx (Fr); Mäusedornwurzel (Ge)

*Ruscus aculeatus*, a semishrub, is native to west and south Europe, and ranges from the Mediterranean area to the Black Sea. In Turkey, the species is confined to the north and west. The rhizome of the species (*Rusci aculeati rhizoma*) is used in remedies for venous insufficiency and haemorrhoids. The shoots of this species are also used for ornamental purposes, above all in dried bunches of flowers. Since only little cultivation is known, in France (Goi *et al.*), most plant material is obtained from wild stock. Wild collection is known in Turkey (Özhatay *et al.*, 1997), where the roots are gathered for example in Samsun, Bafra, and Izmir, with the occasional labour of 200-300 local families. After collection the roots are cleaned and dried over a period of 10-12 days. The harvest is estimated to amount to 2000t of fresh roots per year, which equates to 400t of dried material, predominantly destined for export. No fewer than five export companies in Izmir are involved in this trade, and have been so for at least for the last 15 years. According to Özhatay *et al.* (1997), the species has become locally extinct, especially in Samsun (around Terme), owing to over-collection. Currently, Turkey seems to be the most important supplier: certainly it is the major supplier to Spain (Blanco and Breaux, 1997) and France (Goi *et al.*, 1997). There is no precise information available on collection, volumes involved, and status in European countries other than Turkey. However, the fact that collection of the species is subject to restrictions in no fewer than nine departments in France (Goi *et al.*, 1997), in Bulgaria (Lange, 1996b), in Hungary (Bernáth, 1996), and in Spain (in Andalucía and Valencia) indicates that threats face the species in these countries. It is listed among the 10 most-threatened medicinal species or genera in trade in Turkey (Özhatay *et al.*, 1997). As has been mentioned, *Ruscus aculeatus* is listed in Annex V(b) of the EC Habitats, Fauna and Flora Directive.



Dried roots of Butcher's Broom *Ruscus aculeatus*, Izmir, Turkey

### 14. *Sideritis* spp.

Lamiaceae

**Vernacular names:** Mountain tea; in Spain *rabogatos*, *zahareñas* and *garranchuelos*; *crapaudine* (Fr); *Gliedkraut* (Ge)

**Pharmaceutical and trade names:** *Sideritis herba* (Latin); Mountain tea (En); Griechischer Bergtee (Ge)



"Mountain tea", *Sideritis* sp., Alanya, Turkey

The genus *Sideritis* is distributed in southern Europe and Asia Minor. About 100 different species can be distinguished. This genus includes annuals, herbaceous perennials and shrubs. *Sideritis* shows two centres of diversity. (1) In Spain, at least 45 native species grow (Obon de Castro y Riviera, 1995. In: Blanco and Breaux, 1997). The majority of them are endemics concentrated in the Iberian south-east. Among them, 14 species are considered as endangered and 19 as vulnerable (Blanco and Breaux, 1997). (2) In Turkey, no fewer than 43 species occur: 75% or 33 species are endemic, often with limited distribution.

In Spain, Turkey and other south-eastern European countries, the herb of a lot of perennial *Sideritis* species is favoured as tea. Although widely used in Spain, there is a particular traditional use in Andalucia, where the herb has the status of panacea. According to Blanco (Blanco and Breaux, 1997) some 17-18 taxa are used in Spain, of which 12 are potentially threatened or even threatened, and three of which may be considered endangered: *S. glacialis*, *S. lasiantha* and *S. marminorensis*. These species are used only locally, but the herb of *S. hyssopifolia* is used as a digestive tea on a commercial scale in the European Alps region. This species is abundant with numerous subspecies ranging from the Swiss Jura to France, to Spain and Portugal. It is mainly confined to mountainous areas. According to Blanco (Blanco and Breaux, 1997), it can be considered threatened to a certain extent.

In Turkey, the herb of most *Sideritis* species, including 24 endemics (and two endemic subspecies) were found to be collected at least locally (Özhatay *et al.*, 1997). No fewer than 20 of them are considered to be in the IUCN category Rare, according to Walter and Gillett (1998). On the Balkan peninsula, only five species occur, including one endemic on mountain rocks of the Peloponnese. "Mountain tea", is widely sold on domestic markets. Vaso (1997) reports wild-collection of a total of 67t in 1995 and 1996 in southern Albania (Saranda and Delvina districts), of which 57t were exported to Greece. In Albania, *S. raeseri* is considered to be Endangered and has been listed under the Order dated 20 May 1997, in accordance with Law No. 7722 of 1993 (see legislation chapter). In Bulgaria, *S. scardica* is categorised as Threatened (WCMC, 1998).

Mountain tea has become very fashionable in Germany recently, and is to be found in a wide variety of shops. The herb is sometimes advertised as "a special tea prepared according to the traditions of the herdsman in the southern mountains of Greece". The herb is sold cut, or sometimes even whole, the latter making identification much easier: *S. scardica* and *S. syriaca* were detected in German retail trade (pers. observ.). Recently, a further species was found, *S. dichotoma*, a north-west and north Anatolian endemic.

Whereas in Turkey and in Spain the plant material is only known to be sourced from the wild, in Greece *Sideritis* species are either derived from cultivation or wild-collected. Verlet and Leclercq (1997) report that recently 183t of cultivated material and 74t of wild-harvested plant material was produced annually in Greece.

**15. *Thymus* spp., *Origanum* spp., and *Thymbra* spp., and *Coridothymus capitatus* (L.) Reichenbach.fil.**

**Lamiaceae**

**Vernacular names, pharmaceutical and trade names:** **Thymus:** Thymi herba, Herba Thymi (Latin); Thyme (En); Thym (Fr); Thymian (Ge); Timo (It); Tomillo (Sp); Kekik (Tu). **Origanum:** Origan herba, Herba Origani (Latin); Wild Marjoram (En); Origan (Fr); Dost, Oregano (Ge); Origano (It)

The family of Lamiaceae is well-known for its value in flavouring cookery. Many species are also used in the production of essential

Credit: Prof. Neriman Özhatay



Collection of Wild Marjoram *Origanum vulgare*, Turkey

oils and medical preparations. For all species involved the herb or the leaves are the parts used. The quantities traded annually are enormous. Lange and Schippmann (1997) report Germany as importing about 1100t of *Origanum vulgare* in 1994. The imports of 1995 and 1996 are less, amounting to 730t (1995) and 830t (1996). The predominant source country for this merchandise is Turkey, exporting 500-800t annually to Germany, according to the Federal Agency for Statistics, Germany. The volumes of *Thymus* spp. imported annually into Germany are similarly high, 550t (1994), 770t (1995), and 820t (1996). The main supplier is Spain. As no distinction is made in trade between plant material derived from *Origanum*, *Thymus* and *Thymbra* in Turkey, the species included in these genera are discussed together.

The genus *Thymus* is widespread in the temperate regions of Eurasia. In total about 350 species are known, of which more than sixty are native to Europe. They are widely used and many species of European origin are of great commercial importance. Today, *Thymus vulgaris*, Lemon Thyme *T. x citriodorus*, and the species group of Serpolet *Thymus serpyllum* are the most famous ones. Centres of biodiversity are in Spain, with some 37 species and 24 endemics, and in Turkey, with 58 taxa, of which 30 are endemic (Atay, *in litt.*, 19 February 1998). *Thymus* is cultivated on a large scale in Poland, France and Hungary, but huge quantities are still obtained from wild stock. Main supply countries are Spain and Turkey.

The genus *Origanum* consists of 36 species which are widely distributed in Eurasia and the Mediterranean region. Many are used and collection for local use is very common. Two of the best-known species are *O. vulgare* (the oregano much used in pizza) and *O. dictamnus*, endemic to Crete and well-known as a medicinal tea for centuries. Whereas species of *Origanum* are cultivated (in Poland and Chile) on a large scale, most of the plant material exported from the Balkan region (including Turkey) is sourced from wild plants. Thirteen species are native to Europe (excluding Turkey), most of them confined to the Mediterranean region. In Turkey, 21 species, or 24 taxa occur, of which thirteen are endemic to Turkey (Atay, *in litt.*, 19 February 1998).

In commerce, two groups of thyme are distinguished. The first is Wild Thyme or Serpolet, *Thymus serpyllum*-group, which represents a group of closely related taxa, today mainly considered as species (Jalas, 1972; Podlech, 1975). Widely distributed species are *Thymus serpyllum* s.str., *T. pulegioides* and *Thymus praecox*. The second is the commodity group known as "thyme", which includes *Thymus vulgaris*, Conehead Thyme *Coridothymus capitatus*, *Thymus satureioides*, and *T. x citriodorus*. However, these distinctions may sometimes be theoretical only, as it is often difficult to distinguish species.

Almost all *Thymus* species occurring in Spain are used at popular level (Blanco and Breaux, 1997). Since there is only cultivation on a minor scale, including some organic cultivation of endemic species in Murcia and Almeria, almost 100% of Spanish production is from wild plants. The south-east of Spain is predominantly involved in the exploitation of thyme, where most companies dealing in the commodity are situated. The herb is harvested March to June by uprooting the whole plants, which are loaded onto vans and sold, packed into large bales, to intermediaries. This has been the practice for many years, and in spite of the tonnes of material removed, the plants in the wild are abundant (Blanco and Breaux, 1997). However, only long-term field investigations could show whether there are prejudicial effects on the plant populations. Taking into consideration that this kind of harvest takes place in an area characterised by erosion and increasing desertification, any up-rooting and consequent topsoil disturbance could result in tremendous damage to the eco-system. With respect to the species involved, Blanco reports *T. moroderi*, endemic to Alicante and Murcia as threatened, and lists six species to be in decline, including *T. zygis* subspecies *gracilis* and *T. baeticus* (Blanco and Breaux, 1997). Collection and trade of several *Thymus* species are subject to authorisation in Andalusia and Valencia (see legislation chapter).

In all, it is assumed that about 75 million plants are uprooted annually in Spain. About 90% of these are directed to export, mainly to the USA, but also to France, Germany, Canada, Japan and Australia. Blanco and Breaux, (1997) reports exports of 1634t in 1992 and of 1547t in 1993. However, all these figures do not take account of essential oil trade: a considerable distilling industry is situated in the south-east of Spain. A by-product of distilling, dried dross, is highly demanded in Japan and used as an antioxidant in the food industry.

In Turkey, at least 15 species of Lamiaceae, including *Origanum onites*, *O. vulgare*, *Calamintha nepeta*, *Coridothymus capitatus*, *Thymbra spicata* and *Thymus praecox* are in trade under the name *kekik* (Özhatay *et al.*, 1997). *Kekik* is mainly collected in north-west, west and south Anatolia, only sometimes in a fashion well-regulated by the Directorate of Forestry, for example, in the Isparta region in south-west Turkey (Özhatay *et al.*, 1997). The material is then processed, mainly powdered, thus making identification of plant sources impossible. *Kekik* is one of the chief exports of medicinal and aromatic plant material from Turkey, with increasing quantities exported: on average 3000-4000t per year are exported (Özhatay *et al.*, 1997). The trade is dominated by two wholesalers. The huge amounts of plant material collected each year have massive impacts on the populations; collectors, middlemen and exporters report decreasing volumes owing to over-collection. Endemics, which are collected together with widely distributed species, may be especially impacted by harvest. This is explicitly reported as being the case for *Origanum minutiflorum*, a mat-forming herbaceous perennial endemic to montane habitats of the Taurus mountains. The volumes traded of this species are estimated to be 600-800t annually.

## CONCLUSIONS

Medicinal and aromatic plants play an important role in everyday life in Europe; Europeans are consuming phytomedicines, herbal teas, plant-based shampoos and ointments - the range of products is enormous, as described in **Background** and **Methods**. Moreover, the livelihood of many people in Europe is based on medicinal and aromatic plants, on their collection, cultivation, manufacturing, and trade in raw material, processed products, and at retail level.

Certainly many products used for medicinal and aromatic purposes are based on Europe's rich heritage of plant species; about 1200-1300 plant taxa have been identified as sources of medicinal and aromatic plant material used on a commercial basis in Europe. This is equal to one-tenth of the total European flora of 12 500 vascular plant species. However, since only eight countries are covered by this study, the figure for commercially used taxa in Europe is assumed to be even higher. Additional medicinal and aromatic plant taxa are used on a traditional basis, often for direct, local use. Of medicinal and aromatic plant species in trade in Europe, it can be estimated that 50-70% of the volume and 70-90% of the number of species are collected from the wild (about 900-1200 plant species). Related volumes of medicinal and aromatic plant species in international trade, calculated on the basis of figures in **Trade figures for Europe**, are estimated to be 20 000 - 30 000t, annually, to which must be added domestic trade figures, in order to arrive at a total tonnage figure.

Europe plays a remarkable role in international trade of medicinal and aromatic plant species. No less than a quarter of the global import market being attributable to European countries, with an average (1992-1996) of 120 000t, valued at more than USD330 million, imported. Among the world's leading 12 countries of import there are no fewer than five European countries: Germany, France, Italy, the UK and Spain. Bulgaria, Poland, and Germany are among the world's leading exporters. Europe has a large intra-continental trade, as about 40% of imports are from other European countries, and 80% of European exports are to other European countries. In this trade Germany is the pivotal country in Europe, acting as a dealer between the eastern and

south-eastern European countries and directing the medicinal and aromatic plant material to EU Member States, namely France, Italy, Spain, Austria, and the UK. The overall importation of medicinal and aromatic plant material into European countries increased between 1992 and 1996 by 21%, or almost 23 000t. The net import of all European countries increased from 55 000t to 71 000t (i.e., by 40%), and in particular, the consumption in Germany was in 1996 (36 000t) almost 30% higher than in 1992 (28 000t). The increased utilisation of medicinal and aromatic plant material in Europe is in line with the growth of the so-called „green-movement“ or „back to nature-movement“ (Lange and Schippmann, 1997) and its demand for plant-based products.

The question of how many medicinal and aromatic plant species are threatened in Europe as a result of this trade is not answerable at the moment, as information on aspects of their biology, ecology, and trade is fragmentary in many cases. In national reports on which this report is based, about 150 species were reported to be threatened in at least one European country as a result of over-collection from the wild (Blanco and Breaux, 1997; Németh, 1997; Özhatay *et al.*, 1997; Vaso, 1997). In addition, many medicinal and aromatic plant species are included in national Red Data Books and Lists, as the selection of species in **Annex 1** shows, and 24 species are threatened on a global scale (Walter and Gillett, 1998). Examples are *Artemisia granatensis* which is reported to be Endangered, *Dictamnus hispanicus* which is Rare, and *Ophrys phrygia* which is Endangered, according to IUCN categories of threat (see **Annex 1**).

Harvesting techniques may often exacerbate the threat to medicinal and aromatic plant species, by causing unnecessary levels of damage, as in the cases of *Arctostaphylos uva-ursi* or *Thymus* species, where uprooting of the whole plant to use only aerial parts of the plant causes unnecessary depletion of population levels of the species, as well as damage to the top-soil (Blanco and Breaux, 1997). Regulations providing precise instructions on the techniques allowed to collect wild plant material are almost non-existent, at European level, and at national level in Europe.

Habitat changes across most parts of Europe have also eroded species' population levels. During the last 100-200 hundred years, there has been a steady degradation of the relatively rich, pre-industrial countryside to a monotonous, large-scale, fully mechanised agro-industrial landscape. Drainage has spared only remnants of wetland, bogs, mires and marsh forests, grassland has been replaced in the last 50 years by agro-prairies consisting of only a few grass-species, and only fragments of old forest survive. As a result much of Europe's natural heritage has been devastated (Davis *et al.*, 1994; McNeely *et al.*, 1994) and the impact on plant life has been, and is still, huge. Medicinal and aromatic species affected by eutrophication, drainage, frequent mowing and/or afforestation of meadows include *Arnica montana*, *Adonis vernalis*, *Menyanthes trifoliata*, *Acorus calamus* and *Drosera rotundifolia*. Habitat conservation is therefore a valuable tool in protecting the survival of medicinal and aromatic plant species. In the main source countries of wild-collected medicinal and aromatic plant material, the percentages of protected areas are poor: in Hungary about 6% of the country, in Bulgaria 2.4%, in Albania 3.7%, and in Turkey only 0.6%. This implies an urgent need for designating more protected areas in these countries, in particular in those areas with a high biodiversity of medicinal and aromatic plants and in those where threatened species occur. To identify which areas would be appropriate could be done within the framework of the project of identification of Important Plant Areas (IPAs) (see **Recommendations**). Protection of an area need not imply a ban on collection of plants, as long as collection is well-organised.

There is an additional impact on medicinal and aromatic plants in European countries formerly belonging to the Eastern Bloc. Owing to the political changes in these countries, the trade has altered from a strictly state-organised and controlled commerce, to one of privatised competition and associated uncontrolled collection.

Harvest from the wild has in many cases increased as a result of a general decrease in cultivation of medicinal and aromatic plant cultivation.

Protection of individual medicinal and aromatic plant species is necessary in the case of highly threatened species, such as the 15 taxa highlighted in the preceding chapter. Not only may the survival of a species be threatened by over-exploitation, but any collection which causes a clear reduction in population results in a decline in genetic diversity. This may cause enormous problems when attempts are made to cultivate these species, or to optimise their production, or when searching for new chemotaxa. In this context, it is alarming that wild relatives of numerous medicinal and aromatic plant species which are widely cultivated today, such as *Digitalis lanata* in Hungary, are reported as threatened. National legislation aimed at protecting individual threatened medicinal and aromatic plant species *in situ* is reported to be inadequately enforced in some source countries (Bernáth, 1996; Blanco and Breaux, 1997) and Bulgaria is the only country in Europe which has a national system of quotas in place to manage collection of medicinal and aromatic plants from the wild. A good way of conserving wild medicinal and aromatic plants may be to ensure that the commercial value of these provides an economic incentive to the harvesters (communities and individuals) to conserve the areas in which the plants grow. The example of managed harvest of *Matricaria recutita* from the wild in Hungary is a case in point.

Cultivation of medicinal and aromatic plant species is a very effective means, if not the most promising one, to satisfy the market's expanding demand in future, while reducing or eliminating pressure on their wild populations (WHO, IUCN and WWF, 1993). In the case of plant species that are critically endangered through over-exploitation this is certainly the only method to stop their decline and to secure their long term survival, if there is no substitute plant material (Lange and Schippmann, 1997). However, the cultivation of medicinal and aromatic plant species will not be possible or economically feasible in every case and it may take up to 20 years to introduce a species into cultivation. Promotion of cultivation should be done carefully, as this may lead to loss of income to those people involved in collecting this material from wild stock, and may lead to the degradation or destruction of natural or semi-natural vegetation where there is no longer any economic benefit from its conservation (see preceding paragraph). Thus, it is very difficult to find a balance between wild-collection, provided it is sustainable, and cultivation, and almost impossible without regulation from government authorities. During the last few decades, many species of medicinal and aromatic plant have been introduced into cultivation, and currently there are several examples of experimental growing of medicinal and aromatic plants in Europe, as have been mentioned in the report.

CITES and the primary EU wildlife trade legislation, *Regulation (EC) No. 338/97* and its amendments, offer a means of conserving medicinal and aromatic plant species in international trade. However, compliance with these is complicated by the fact that only the parts and derivatives of the plants - roots, leaves, flowers, fruits - appear in trade, making species identification difficult. No identification manual exists for parts and derivatives originating from CITES plant species used for medicinal purposes, but a training package on CITES-listed plant species used for medicinal purposes (Lange, 1998a) has recently been developed on behalf of the German Bundesamt für Naturschutz. Similarly, the EC Habitats, Fauna and Flora Directive requires that certain medicinal and aromatic plant species in Annex (b) be subject to management measures, but there is no text in the Directive specifying which sort of management measures should apply to these species, and no obligation for Member States to report on protective measures taken. As a case in point, there have been no measures taken to prevent the wild-harvesting of *Arnica montana* in Spain (Blanco and Breaux, 1997), which is listed according to the Directive. The importance of this Directive and its significance for the trade in medicinal and aromatic plants taken from the wild will increase when more and more eastern and south-eastern European countries, which are important suppliers of such plant material, join the EU. In the



long run, and in general, it will be more significant with respect to intra-European trade in plant material obtained from the wild, from endangered species, than CITES.

*Ex-situ* conservation includes the cultivation of medicinal and aromatic plants in botanical gardens, as well as in seed and in gene banks. In the case of those plants whose natural habitats have been destroyed, or cannot be preserved, or the case of very rare or locally extinct taxa, *ex-situ* protection should be a priority. Different cultivars or chemotypes may be stored in gene-banks or in special chemotaxonomical gardens, to meet changes in demand for plant chemotypes. As an example, a sudden demand for pyrrolizidine-free populations of some species of the Asteraceae, such as *Petasites* spp., was experienced. In Hungary there are two chemotaxonomical gardens, in Budapest and in Budakalász, both associated with research institutes for medicinal plants, where more than 2000 specimens of Hungarian medicinal and aromatic plant species, including many chemotaxa, are gathered (Bernáth, 1996).

Threats facing medicinal and aromatic plant species are similar in Europe to those across the world: increasing demand, over-exploitation, destructive harvesting techniques, habitat loss, and decrease in genetic diversity (Lange and Schippman, 1997). To summarize, it can be stated that the trade in medicinal and aromatic plant species is huge, largely unmonitored, and that wild-harvesting predominates. Public awareness of the trade in medicinal and aromatic plant species and the impact on wild-populations of plant species is slight. It is highly likely that many uses are unsustainable and hence threatening taxa. Lack of data for assessment of the conservation status of species is resulting in delayed protection measures: conservation action has usually only begun once it is known that a species is already threatened.

Nonetheless, there are several different possibilities, at national and international level, for avoiding potential danger, or for reversing existing threats to medicinal and aromatic plant species, including *in situ* species conservation measures, trade controls, use of substitutes, and cultivation projects. In the case of medicinal and aromatic plant species conservation, it is especially important to ensure future supplies of plant material. All efforts to conserve European medicinal and aromatic plant species and to operate sustainable harvesting programmes, to ensure future supply should be undertaken on the basis of co-ordinated international work at European level. This will call for a panel of experts composed of scientists, conservationists, government representatives, members of the European Commission, traders, members of the processing industry, and consumers. Such an idea was already part of the Chiang Mai Declaration with its slogan "health for all by the year 2000", but unfortunately co-ordinated international work on medicinal and aromatic plant conservation has only just begun.

## **RECOMMENDATIONS**

The recommendations given below are based on the results of research by Bernáth (1996), Blanco and Breaux (1997), Dennis (1997), Goi *et al.* (1997), Lange (1996a and b), Németh (1997), Özhatay *et al.* (1997) and Vaso (1997), evaluation of technical literature, as well as written or personal communications to the author.

### **Trade monitoring**

- > Many species of medicinal and aromatic plant have had a notable feature in common, namely, that conservation efforts to protect them have begun only after they were already threatened by over-exploitation. A European medicinal and aromatic plants monitoring task force of TRAFFIC, WWF and the IUCN/SSC Medicinal Plant Specialist Group should be established for the collection of

available information on medicinal and aromatic plant species harvested in Europe, relating to their collection, and their legal, trade and conservation status. This task force should undertake analysis of data collected and formulate recommendations on a regular basis to European governments for the conservation and sustainable use of European species in trade in Europe. Further, this task force should develop and promote pilot projects for the sustainable use of medicinal and aromatic plants and encourage the exchange of information, including research, trade and conservation data, to promote discussions amongst specialists. An electronic database should be set up to store information on species in trade and to facilitate exchange of data.

- > European countries should facilitate the work of the European medicinal and aromatic plants monitoring task force, and provide information on a regular basis to the task force, including national Customs statistics, national legislation with regard to trade in, and conservation of, medicinal and aromatic plants, as well as the contact details of government agencies and departments that are, in Europe, responsible for management, protection, and trade in wild medicinal and aromatic plants.
- > European countries that comply with the WTO and use the Harmonized Commodity Description and Coding System (HS) for reporting trade statistics should propose and promote the listing of some medicinal and aromatic plant species which are traded in considerable volumes as a separate commodity under the heading 1211.90 of the System. In particular, the roots of different *Gentian* species and the roots of several species traded as *Saponariae albae radix*, such as *Ankyropetalum gypsophylloides* and several *Gypsophila* species should be separately listed.

#### **CITES-listing**

- > European countries that form part of the distribution area of *Adonis vernalis* and that are also Parties to CITES should consider if this species meets the criteria for listing in CITES Appendix II and, if so, prepare a listing proposal for submission at the next meeting of the Conference of the Parties to CITES.

#### **Legislation and law enforcement**

- > European countries that are Parties to CITES should ensure that their enforcement staff and Customs are properly trained to control the international trade in medicinal and aromatic plant parts that are covered by CITES and should make use of the CITES medicinal plants training package to that purpose. This package has recently been developed on behalf of the Bundesamt für Naturschutz (Lange, 1998a) and includes a lecture script; a collection of commodities of CITES-listed medicinal and aromatic plant species; and exercises for practical training. In addition, a checklist of the CITES-listed medicinal and aromatic plant species will be published soon (Lange and Schippmann, in prep.).
- > European countries that are not yet Parties to CITES should be encouraged to accede, namely Albania, Andorra, Bosnia-Herzegovina, Croatia, Iceland, the Irish Republic, Lithuania, Macedonia, Moldova, San Marino, Slovenia, Ukraine and Yugoslavia.
- > Member States of the EU should make all efforts to ensure that EC Regulation No. 338/97 is effectively implemented with regard to the medicinal and aromatic plant species listed in Annex D of the Regulation, and should specifically make traders aware of their obligations when importing Annex D-species into the EU, and train Customs officers to identify the material in trade. The CITES medicinal plants training package could be used in this respect.

- > The European Commission should carry out a survey to assess the level of implementation of import controls on medicinal and aromatic plant species listed in Annex D of EC Regulation 338/97 and take remedial measures for its improvement if necessary.
- > European countries which once belonged to the Eastern Bloc, which are now evolving in a free market context, and where the former legal structures no longer apply, leading to unregulated exploitation of the plants concerned, should develop clear legislative frameworks to regulate their trade in medicinal and aromatic plants and, if these are already in place, ensure that they are properly enforced.
- > With respect to species that are included in Annex V(b) of *EC Directive 92/43/EEC* (EC Habitats, Fauna and Flora Directive) on the conservation of natural habitats and of wild fauna and flora, Member States of the EU should:

(1) modify the wording of its Article 14 in order to make obligatory the measures that the Member States need to take to ensure that the taking in the wild of specimens of species of wild flora listed in Annex V(b) as well as their exploitation, is compatible with their being maintained at a favourable conservation status; (2) with reference to item (1), provide a specific definition with measurable criteria of what a "favourable conservation status" is; and (3) specify in Article 17, para. 1, of the Directive that the report on the implementation of the measures that Member States need to forward to the Commission, and make accessible to the public, in line with the Directive, will specifically include the description of the measures that were taken under (1). It is of particular importance for Member States of the EU to bear in mind that an increasing number of eastern European countries, which are important suppliers of wild-harvested medicinal and aromatic plant parts, will join the EU. The integration into the Union of Hungary, the Czech Republic, Poland, Estonia, and Slovakia will begin as soon as 1999. This will make it even more crucial that the recommendations related to EU legislation, and in particular the ones concerning the EC Habitats, Fauna and Flora Directive, are followed to ensure that European indigenous wild plant species are managed in a sustainable way.

- > Member states of the EU should make full use of the provisions of Article 14 of the EC "Habitats, Directive" and take measures to ensure that the taking in the wild and the exploitation of medicinal and aromatic plants is sustainable, especially in the case of Spain with regard to *Arnica montana*.
- > Member States of the EU should include *Arctostaphylos uva-ursi*, *Cetraria islandica*, and all European species of *Drosera* in Annex V(b) of the EC EC Habitats, Fauna and Flora Directive.
- > European countries that are not yet party to the Convention on the Conservation of European Wildlife and Natural Habitats should be encouraged to accede, namely Albania (signed, but not ratified), Andorra, Belarus, Bosnia-Herzegovina, Croatia, Czech Republic (signed, but not ratified), Macedonia, Monaco, Russian Federation, San Marino, Slovenia, Ukraine and Yugoslavia.
- > Turkey should fully implement its "bulbous plant regulation" with regard to *Gentiana lutea*, to ensure that there is no illegal export of this species.

### ***In-situ* and *ex-situ* protection**

- > European countries should establish nature refuges of medicinal and aromatic plants to maintain their populations in the wild and prevent genetic erosion. This should be done, in order of priority, (1) in the species-rich countries of Spain, Bulgaria, and Turkey, and (2) for threatened medicinal and aromatic plant species (see Annex 1), in particular for *Adonis vernalis* in Romania and in Russia and for *Gentiana lutea* in Turkey. These nature refuges should receive full protection through designation as formally protected areas, for example, as nature reserves or national parks.
- > Each European country should identify their own national Important Plant Areas (IPAs), particularly for medicinal and aromatic plant species, and establish protected areas for such species. The Important Plant Areas project is one of the 30 Priority Projects of IUCN's "Parks for Life" action plans on protected areas in Europe, and was one of the main recommendations of the *Planta Europa* conference on the conservation of wild plants in Europe, (Hyères, France, September 1995).
- > European countries should provide additional protection to threatened medicinal and aromatic plant species, in particular to *Adonis vernalis*, and not only ensure their conservation in natural habitats, but also *ex-situ*. This includes storing seeds in European gene-banks, as well as preserving populations of these species of different origins in botanical gardens to maintain their genetic diversity.

### **Management programmes**

In addition to the establishment of nature refuges and the creation of gene banks and cultivation of species within botanical gardens, (species-) specific management programmes should be developed in order to avoid potential endangerment to a species, or to reverse an existing threat to medicinal and aromatic plant species. Specifically,:

- > European countries should develop general guidelines for the sustainable collection of indigenous medicinal and aromatic plant species and promote their implementation. In a preliminary phase model, projects should be identified and initiated where medicinal and aromatic plants are harvested in a sustainable manner. In the case of species already threatened, in particular *Adonis vernalis*, *Arctostaphylos uva-ursi*, *Arnica montana*, *Drosera rotundifolia*, *D. anglica*, *D. intermedia*, *Gentiana lutea*, *Gypsophila* spp., *Thymus* spp., and *Origanum* spp., guidelines specific to a particular habitat and country should be developed and annual quotas of plant parts which may be taken should be established. This should be done in collaboration with consumer and source countries.

### **Salep trade**

- > The Government of Turkey should develop and enforce legislation regulating the collection of orchid bulbs used for salep, as well as to the trade in salep, to ensure that the exploitation of these plants is sustainable.
- > European countries that are parties to CITES should ensure full implementation of CITES with regard to species of Orchidaceae used for, and traded as, salep.
- > The Government of Turkey should modify its legislation and no longer require that Turkish ice-cream include salep (orchid bulbs) as an essential ingredient.

#### Public awareness activities

- > The Government of Turkey should develop campaigns to raise public awareness of the conservation problems facing orchid species used for salep production.
- > Public awareness and educational material should be developed to inform government authorities, traders, phytopharmaceutical companies, scientists, cultivators, collectors and consumers on threats facing specific medicinal and aromatic plant species in trade and on the legal status of the plants in use.

#### Enhancement of cultivation efforts

- > European countries should promote cultivation of medicinal and aromatic plant species, owing to the increasing demand for products of these. This should be done especially in the case of threatened medicinal and aromatic plant species, since cultivation is a very effective means of reducing or eliminating pressure on their wild populations. Where cultivation is taking place in those places where harvesting from the wild is traditional, it is important to ensure that the benefits of the activity will be directed to village communities involved in collecting, and that the natural habitats of the species will be preserved.
- > The cultivation of *Thymus* spp. and *Origanum* spp. should be promoted, in particular in Spain and Turkey. In the case of *Arnica montana*, Germany, as a main importer of this species, and Spain and Romania, as important source countries of the species, should pay special attention to its cultivation. Further, the cultivation of *Glycyrrhiza glabra* and *Gentiana lutea* should be supported, above all in source countries.

#### Future research

- > Each European country, if it has not already done so, should study its trade in European and non-European wild-harvested medicinal and aromatic plant species, with regard to trade structure, volumes, species involved, and origins, in order to determine the impact of exploitation on the conservation status of the plant species concerned, in the wild.
- > European countries should regularly update research on trade in, and conservation of, medicinal and aromatic plant species.
- > The European trade in essential oils, which is not specifically discussed in detail in this report, should be investigated, in order to determine its impact on the conservation of European plant species in the wild.
- > Further research should be carried out on European medicinal and aromatic species exploited, in order to improve knowledge of trade volumes and structures, source countries, and the impact on their wild populations. In particular, surveys should be undertaken on specific plant taxa threatened through trade, in order to determine and promote the necessary remedial measures to be implemented to ensure their exploitation is compatible with their being maintained at a favourable conservation status. Such taxa include, in particular, *Arctostaphylos uva-ursi*, *Cetraria islandica*, *Gentiana lutea*, *Drosera* spp., *Menyanthes* spp., *Paeonia* spp., *Primula* spp., *Ruscus aculeatus*, *Sideritis* spp. and *Glycyrrhiza glabra*.

Özhatay *et al.* (1997) recommend further research on plant species traded as salep (Orchidaceae), *Gypsophila* spp., and *kakik* (*Origanum* spp. and *Thymus* spp.). In addition, long-term field surveys on threatened plant species in selected source countries, for example, *Adonis vernalis* in Romania and Russia, should be undertaken.

### General

- > It should be recommended, in addition, that those involved in the wild plant trade be encouraged to finance research and conservation activities and that the costs of sustainable utilisation should be built into their marketing calculations.
- > Schemes, such as the Non-timber Forest Products Certification Scheme of the *Forst Stewardship Council*, should be developed and promoted for the certification of products processed from medicinal and aromatic plants from a sustainable source, be they from cultivated or wild source. Consumers should be encouraged to purchase such certified products. The increase in profit from sale of these products should be linked to added value at source, i.e. to collectors or cultivators.

### NOTES

- 1 IUCN Red List and Red Book threat categorisation was revised in 1994. From that time, the categories have included: Ex = Extinct; EN = Endangered (when a taxon is less than Critically Endangered, but is facing a very high risk of extinction in the wild in the immediate future, as defined by IUCN criteria; VU = Vulnerable (when a taxon is not Critically Endangered or Endangered, but is facing a high risk of extinction in the wild in the medium-term future, as defined by IUCN criteria (Anon., 1994). Prior to the revision, categories included Ex = Extinct; E = Endangered (when a taxon is in danger of extinction and its survival is unlikely if the causal factors continue operating; V = Vulnerable (when a taxon is believed likely to move into the Endangered category in the near future if the causal factors continue operating); R = Rare (when a taxon has a small world population, but which is not at present Endangered or Vulnerable, but is at risk); I = Indeterminate (when a taxon is *known* to be Endangered, Vulnerable or Rare, but where there is not enough information to say which of the three categories is appropriate) (Anon., 1990).

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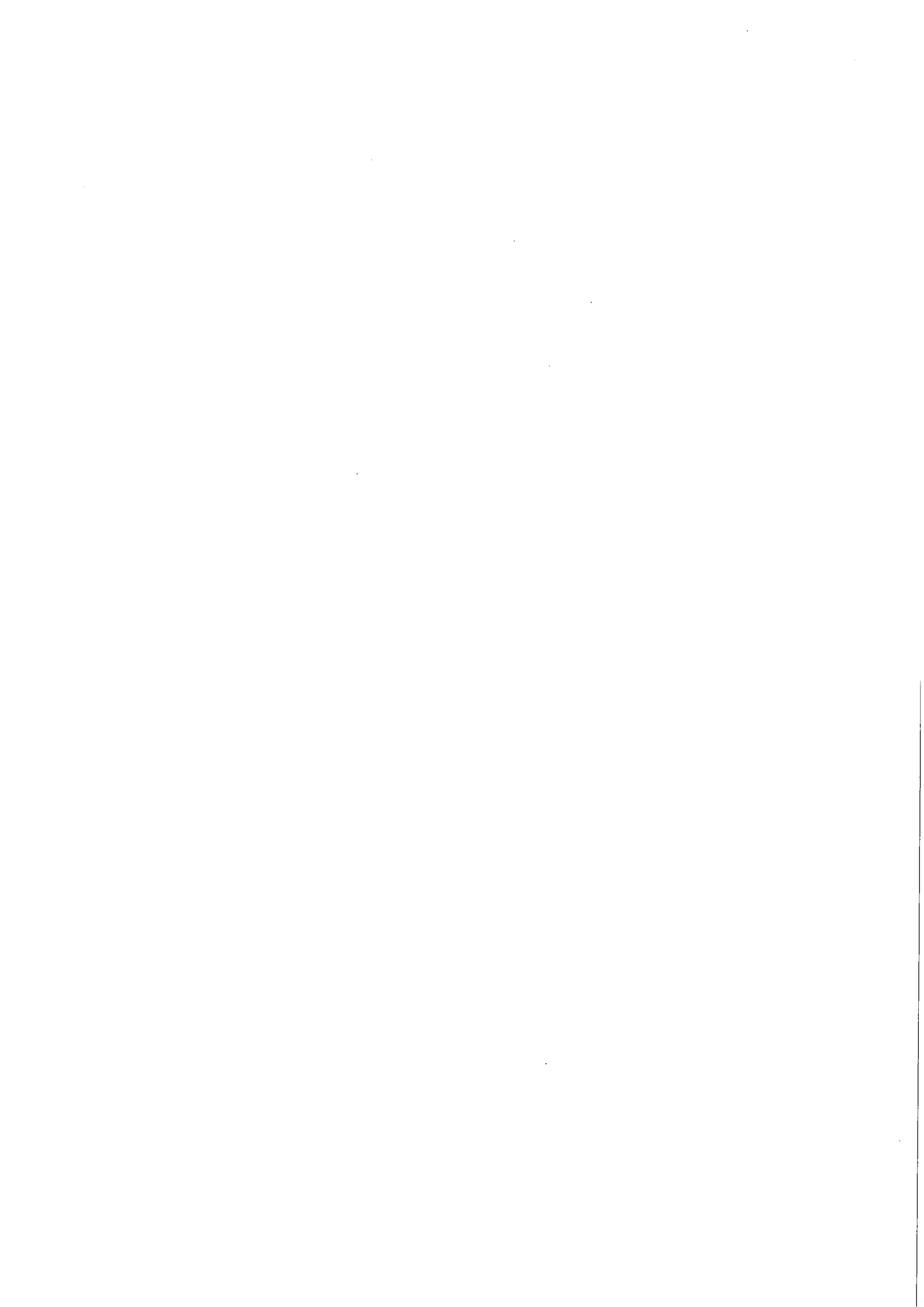
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Annex 1

Medicinal and aromatic plant species subject either to international, European and/or national legislation in Bulgaria, France, Germany, Hungary, Spain, and Turkey and/or reported as threatened by Blanco and Breaux (1997), Lange (1998c), Németh (1997), Özhatay *et al.* (1997), Vaso (1997).

Plant species	Origin	Family	Life form	Plant part used	CITES	EU	Bern	FFH	DE	FR	ES	BG	HU	TR	IUCN	Degree of threat according to countries	Remarks
<i>Abies alba</i>	+	Pinaceae	tree	buds, resin											-	RO: E; CZ: R	TOP 24-listing in Spain
<i>Aceras anthropophorum</i>	+	Orchidaceae	herb. perenn.	tuber	II B								+	+	-	BA, NL: E; CH, DE: V	TOP 50-listing in Turkey, collection for salep
<i>Achillea crithmifolia</i>	+	Asteraceae	herb. perenn.	herb, flowers									+		-	HU: R	
<i>Achillea ptarmica</i>	+	Asteraceae	herb. perenn.	herb, flowers									+		-	BA, RO, SK: V; HU: R	
<i>Acinos alpinus</i>	+	Lamiaceae	herb. perenn.	herb							A97				-		Spain: much collected, not yet threatened
<i>Aconitum lycoctonum</i> subsp. <i>vulparia</i>	+	Ranunculaceae	herb. perenn.	herb				I					+		-		
<i>Aconitum napellus</i>	+	Ranunculaceae	herb. perenn.	tuber				I	P						-	SE: E; Corsica: R	
<i>Acorus calamus</i>	+	Araceae	herb. perenn.	rhizome								+			-	BA, CH: V	TOP 10-listing in Turkey, overcollection, habitat loss
<i>Actaea spicata</i>	+	Ranunculaceae	herb. perenn.	rhizome, herb						P					-	NL: V	
<i>Adiantum capillus-veneris</i>	+	Adiantaceae	herb. perenn.	herb						P		+			-	AL, BA, SI: V; BG, CH: R	
<i>Adonis vernalis</i>	+	Ranunculaceae	herb. perenn.	herb					I	R	C3	R	+		-	IT, NL: Ex; BA: E; CH, DE, SE, SK: V; HU: R	TOP 45-listing in Hungary, Russia: over-collection
<i>Alchemilla acutiloba</i>	+	Rosaceae	herb. perenn.	herb									+		-	GB, HU: R	TOP 26-listing in Hungary
<i>Alchemilla crinita</i>	+	Rosaceae	herb. perenn.	herb									+		-	HU: R	
<i>Alchemilla mollis</i>	+	Rosaceae	herb. perenn.	herb											-	BG: V	
<i>Alchemilla vulgaris</i> s.l.	+	Rosaceae	herb. perenn.	herb								+			-		
<i>Alchemilla xanthochlora</i>	+	Rosaceae	herb. perenn.	herb							C3	R			-	NL: R	Spain: rare
											C3		+		-	NL: E; HU, SE: R	TOP 26-listing in Hungary

Plant species	Origin	Family	Life form	Plant part used	CITES	EU	Bern	FFH	DE	FR	ES	BG	HU	TR	IUCN	Degree of threat according to countries	Remarks
<i>Alkanna tinctoria</i>	+	Boraginaceae	herb. perenn.	roots								+			-	Sardinia: V; SK: I; BA: K	TOP 45-listing in Hungary, Spain: increasingly rare, overcollection
<i>Allium ursinum</i>	+	Liliaceae	herb. perenn.	herb, seeds								R			-	LT: V; FI, LV: R	TOP 26-listing in Hungary
<i>Aloe arborescens</i>	-	Aloaceae	shrub	leaves	II	B									-		
<i>Aloe ferox</i>	-	Aloaceae	tree	leaves	II	B									-		
<i>Aloe perryi</i>	-	Aloaceae	shrub	leaves	II	B									-		
<i>Althaea officinalis</i>	+	Malvaceae	herb. perenn.	roots, leaves					I	P	As2	P			-	LI: V	
<i>Amanita caesarea</i>	+	Amanitaceae	gill fungus	whole plant					I						-		
<i>Anacamptis pyramidalis</i>	+	Orchidaceae	herb. perenn.	tuber	II	B						+	+	+	-	PL: Ex; GI, NL: E; BA, CH, EE, SK, TR: V; Corsica, CZ, DK, HU, RO, Sardinia, SE: R; AM, MD, UA: I	TOP 50-listing in Turkey
<i>Angelica archangelica</i>	+	Apiaceae	herb. perenn.	roots, leaves, fruits						P		+			-	BG: Ex; RO: V; HU: R; CZ, SK: I	TOP 26-listing in Hungary
<i>Angelica panicii</i> (=A. sylvestris)	+	Apiaceae	herb. perenn.	roots								R			-	SI: R	
<i>Ankyropetalum gypsophylloides</i>	+	Caryophyllaceae	herb. perenn.	roots											-		TOP 50-listing in Turkey, overcoll.
<i>Antennaria dioica</i>	+	Asteraceae	herb. perenn.	flowers					I	P/L					-	NL: V	TOP 45-listing in Hungary
<i>Apium graveolens</i>	+	Apiaceae	herb. perenn.	roots, herb, seeds						P					-	SE: Ex; FI: E; NL: V; DK: R	
<i>Aquilaria malaccensis</i>	-	Thymelaeaceae	tree	fungi-infested heartwood	II	B									-		
<i>Aquilegia nigricans</i>	+	Ranunculaceae	herb. perenn.	herb								+			-	RO: V	
<i>Aquilegia vulgaris</i>	+	Ranunculaceae	herb. perenn.	herb					I	P					-	NL: E; BG, DK, HU: R; SK: I	
<i>Arbutus unedo</i>	+	Ericaceae	tree	roots, leaves						P					-	CY: E; SI: V	
<i>Arctium lappa</i>	+	Asteraceae	herb. perenn.	roots											-		TOP 24-listing in Spain

Plant species	Origin	Family	Life form	Plant part used	CITES	EU	Bern	FFH	DE	FR	ES	BG	HU	TR	IUCN	Degree of threat according to countries	Remarks
<i>Arctostaphylos uva-ursi</i>	+	Ericaceae	shrub	leaves		D			I	P	A97,V3	R			-	AL: E; NL,SK: V; BG,CZ,RO: R; LV: K	TOP 24-listing in Spain
<i>Armoracia macrocarpa</i>	+	Chenopodiaceae	herb. perenn.	roots									+		-	RO: E; HU: R; SK: I	
<i>Arnica montana</i>	+	Asteraceae	herb. perenn.	flowers, roots	D		V(b)		I	P/L			+		-	DE, HU: E; BA,LT,NL,PT, RO: V; CZ: R	TOP 26-listing in Hungary, TOP 9-listing in Spain, overcollection, habitat changes
<i>Artemisia alba</i>	+	Asteraceae	herb. perenn.	herb											-	RU: Kal., UA: I	
<i>Artemisia campestris</i>	+	Asteraceae	herb. perenn.	herb, leaves											-	CZ: E; RO: R	
<i>Artemisia granatensis</i>	s	Asteraceae	herb. perenn.	herb						P					-	GB: E	
<i>Artemisia maritima</i>	+	Asteraceae	herb. perenn.	herb		I	II		I		NI, AI				-	ES: E	Spain: most threatened species, limited area
<i>Artemisia santonicum</i>	+	Asteraceae	herb. perenn.	herb						P					-	NL, NO: V; EE: R	
<i>Artemisia umbelliformis</i>	+	Asteraceae	semishrub	?								+			-	SK: V	
<i>Asarum europaeum</i>	+	Asteraceae	herb. perenn.	herb								P			-	ES: Ex/E	
<i>Asparagus officinalis</i> ssp. <i>prostratus</i>	+	Aristolochiaceae	herb. perenn.	roots, herb				I							-	LI: Ex; FI: V	
<i>Asplenium scolopendrium</i>	+	Liliaceae	herb. perenn.	rhizome, roots						P/L					-	GB, NL: V	
<i>Asplenium scolopendrium</i>	+	Aspleniaceae	herb. perenn.	herb				I				P			-	MT: Ex; DK: E; SE: V; LI, NO: R; CH: K; SK: I	
<i>Asplenium trichomanes</i>	+	Aspleniaceae	herb. perenn.	herb											-	MT: Ex; LV, LT: E; NL: V; DK, IS: R	TOP 50-listing in Turkey
<i>Aster amellus</i>	+	Asteraceae	herb. perenn.	roots											-	CZ: V; HU: R; SK: I	
<i>Astragalus glycyphyllos</i>	+	Fabaceae	herb. perenn.	herb				I	P						-	NL: V	
<i>Atropa baetica</i>	+	Solanaceae	herb. perenn.	roots, leaves						P					-	ES, PT: E	Spain: rare, collected as <i>A. belladonna</i>
<i>Atropa belladonna</i>	+	Solanaceae	herb. perenn.	roots, leaves		I	II		I		NI, AI				-	AL, NL: E; BG: R; AM, AZ, GE, RU, UA: I	Spain: rare
<i>Ballota cristata</i>	t	Lamiaceae	herb	herb										R	TR: R		TOP 50-listing in Turkey, limited range

Plant species	Origin	Family	Life form	Plant part used	CITES	EU	Bern	FFH	DE	FR	ES	BG	HU	TR	IUCN	Degree of threat according to countries	Remarks
<i>Balota saxatilis</i> subsp. <i>brachyodontha</i>	t	Lamiaceae	?	herb											R	TR: R	TOP 10-listing in Turkey, limited range
<i>Barlia robertiana</i>	+	Orchidaceae	herb. perenn.	tuber	II B	B								+		MT, TR: E; Corsica: R	TOP 10-listing in Turkey, overcollection for sale
<i>Berberis vulgaris</i>	+	Berberidaceae	shrub	roots, fruits						P		E / R			-	AL: Ex/E	
<i>Betula pendula</i>	+	Betulaceae	tree	leaves						P	M4				-	AL: E	TOP 24-listing in Spain
<i>Betula pubescens</i>	+	Betulaceae	tree	leaves									+		-	BA: V	TOP 24-listing in Spain
<i>Bietilla striata</i>	-	Orchidaceae	herb. perenn.	tuber	II B	B									-		
<i>Botrychium lunaria</i>	+	Botrychiaceae	herb. perenn.	herb						P					-	CZ, NL, ES: V AL, HU, SJ: R	
<i>Brassica oleracea</i>	+	Brassicaceae	biennial/ herb. perenn.	leaves						P					-	FR: V	
<i>Buxus sempervirens</i>	+	Buxaceae	shrub	leaves					1	P/L	A97, A2, V3				-	GB: R	
<i>Calluna vulgaris</i>	+	Ericaceae	shrub	herb								+			-	BG: R	TOP 26-listing in Hungary
<i>Carlina acanthifolia</i>	+	Asteraceae	herb. perenn.	roots								R			-	PL: V; RO: R	
<i>Carlina acaulis</i>	+	Asteraceae	herb. perenn.	roots					1	P/L			+		-	HU: I	TOP 45-listing in Hungary
<i>Carlina vulgaris</i> ssp. <i>longifolia</i>	+	Asteraceae	biennial/ herb. perenn.	roots						P					-	FI: V	
<i>Centaureum erythraea</i>	+	Gentianaceae	biennial	herb					1						-	CZ, NL: V; SE: R	
<i>Centaureum uliginosum</i>	+	Gentianaceae	herb. perenn.	herb					1						-	CZ: E	TOP 45-listing in Hungary
<i>Ceratonja siliqua</i>	+	Leguminosae	tree	fruits, seeds						R					-		
<i>Cetraria ericetorum</i>	+	Parmeliaceae	foliose lichen	whole plant body					1								
<i>Cetraria islandica</i>	+	Parmeliaceae	foliose lichen	whole plant body		D			1			R					TOP 9-listing in Spain
<i>Chamaemelum nobile</i>	+	Asteraceae	herb. perenn.	flowers											-		TOP 24-listing in Spain
<i>Chimaphila umbellata</i>	+	Pyrolaceae	herb. perenn.	herb					1	P			+		-	CH: Ex; AT, CZ, DE, SK: E; HU, NO, SI: V; DK, RO: R; LV: K	

Plant species	Origin	Family	Life form	Plant part used	CITES	EU	Bern	FFH	DE	FR	ES	BG	HU	TR	IUCN	Degree of threat according to countries	Remarks
<i>Chrysosplenium alternifolium</i>	+	Saxifragaceae	herb. perenn.	herb						P					-	NL: V	
<i>Cibotium barometz</i>	-	Dicksoniaceae	tree fern	rhizome	II B										-	BA, CH, SI: E; HU, SK: V; BG, RU-North: R; CZ: I	
<i>Cicuta virosa</i>	+	Apiaceae	herb. perenn.	roots, herb, fruits						P					-		
<i>Cladonia rangiferina</i>	+	Cladoniaceae	fruticose lichen	whole plant body					I						-		
<i>Cnicus benedictus</i>	+	Asteraceae	herb. perenn.	herb								P			-	EE: Ex	
<i>Cochlearia officinalis</i>	+	Brassicaceae	biennial	herb, roots					I	P					-	CZ, RO: E; HU: R; YU: K, SK: I	
<i>Colchicum arenarium</i>	+	Liliaceae	herb. perenn.	tuber											-	AL, IE, PT: E; NL, RU: V; LT: R	
<i>Colchicum autumnale</i>	+	Liliaceae	herb. perenn.	tuber						P					-		
<i>Colchicum cilicicum</i>	+	Liliaceae	herb. perenn.	tuber											+		
<i>Colchicum speciosum</i>	+	Liliaceae	herb. perenn.	tuber	II B										+		
<i>Comperia comperiana</i>	+	Orchidaceae	herb. perenn.	tuber			I								-	GR, UA-Crimea, TR: E	
<i>Convallaria majalis</i>	+	Liliaceae	herb. perenn.	leaves						L	C3	P			-	AL: E; BA: V; SK: I	
<i>Coridothymus capitatus</i>	+	Lamiaceae	shrub	herb							A97				-		Spain: in regression due to collection
<i>Crataegus monogyna</i>	+	Rosaceae	shrub	young shoots, fruits							Mu2, A97				-		TOP 24-listing in Spain
<i>Crataegus oxyacantha</i>	+	Rosaceae	shrub	young shoots, fruit											-		
<i>Crithmum maritimum</i>	+	Apiaceae	herb. perenn.	herb						L					-	EG, NL: E; BG: R	
<i>Cyclamen hederifolium</i>	+	Primulaceae	herb. perenn.	tuber	II B										+	TR: V	
<i>Cyclamen purpurascens</i>	+	Primulaceae	herb. perenn.	tuber	II B					P/L					-	BA: V; HU: R	
<i>Cypripedium parviflorum</i>	-	Orchidaceae	herb. perenn.	roots	II B										-		
<i>Cyrtopodium punctatum</i>	-	Orchidaceae	herb. perenn.	herb	II B										-		
<i>Cystoseira barbata</i>	+	Cystoseiraceae	?	whole plant body											-		
<i>Dactylorhiza iberica</i>	+	Orchidaceae	herb. perenn.	tuber	II B										+	SU-Eur.: V	
<i>Dactylorhiza osmanica</i>	+	Orchidaceae	herb. perenn.	tuber	II B										+	TR: R	TOP 50-listing in Turkey
<i>Dactylorhiza romana</i>	+	Orchidaceae	herb. perenn.	tuber	II B										+		



Plant species	Origin	Family	Life form	Plant part used	CITES	EU	Bern	FFH	DE	FR	ES	BG	HU	TR	IUCN	Degree of threat according to countries	Remarks
<i>Daphne laureola</i>	+	Thymeleaceae	shrub	roots, herb						P					-	RO: V; BA, BG, HU: R	
<i>Daphne mezereum</i>	+	Thymeleaceae	shrub	bark					I	P/L		+			-	NL: E; CZ: V; RU-North: R	
<i>Delphinium staphysagria</i>	+	Ranunculaceae	herb. perenn.	seeds						R					-	Corsica: E	Spain: not abundant, recently fashioned
<i>Dendrobium candidum</i>	-	Orchidaceae	herb. perenn.	herb	II B										-		
<i>Dendrobium chrysanthum</i>	-	Orchidaceae	herb. perenn.	herb	II B										-		
<i>Dendrobium fimbriatum</i>	-	Orchidaceae	herb. perenn.	herb	II B										-		
<i>Dendrobium loddigesii</i>	-	Orchidaceae	herb. perenn.	herb	II B										-		
<i>Dendrobium nobile</i>	-	Orchidaceae	herb. perenn.	herb	II B										-		
<i>Dianthus chinensis</i>	-	Caryophyllaceae	biennial	herb					I						-		
<i>Dianthus superbus</i>	+	Caryophyllaceae	herb. perenn.	herb					I						-		
<i>Dictamnus albus</i>	+	Rutaceae	herb. perenn.	roots, herb					I			+			-	NL: Ex; DE, LV, LT, SK: E; HU, PL, SE: V; BA, CZ, DK: R; CH: K	
<i>Dictamnus hispanicus</i>	s	Rutaceae	herb. perenn.	?											-	AL, PL: E; CH, RO: V; CZ: R; SK: I	TOP 26-listing in Hungary
<i>Digitalis lutea</i>	+	Scrophulariaceae	herb. perenn.	leaves							V3				-	ES: R	Spain: rare, threatened
<i>Digitalis lanata</i>	+	Scrophulariaceae	biennial/ herb. perenn.	leaves					I	P					-		
<i>Digitalis purpurea</i>	+	Scrophulariaceae	herb. perenn.	leaves								+			-	AL, HU: E; BA: V; MD: I	TOP 26-listing in Hungary
<i>Dionaea muscipula</i>	-	Droseraceae	herb. perenn.	whole plant	II B							+			-	NL: V; CH: R	TOP 24-listing in Spain
<i>Dioscorea deltoidea</i>	-	Dioscoreaceae	herb. perenn.	roots	II B										-		
<i>Drosera anglica</i>	+	Droseraceae	herb. perenn.	herb							As2, C3				-	HU: Ex; CZ, RO: E; CH, IT, LI, PL, SI: V; DK: R; SK: I	Spain: possible collected with <i>D. rotundifolia</i>
<i>Drosera intermedia</i>	+	Droseraceae	herb. perenn.	herb					I	R					-	LI: Ex; CH, CZ, LT, RO, SI: E; IT, LV, PL: V	Spain: possible collected with <i>D. rotundifolia</i>
<i>Drosera rotundifolia</i>	+	Droseraceae	herb. perenn.	herb					I	R	C3	+			-	Corsica, PT: E; BA, CH, HU, SI, SK: V; BG, CZ, PL: R	TOP 9-listing in Spain, overcollection

Plant species	Origin	Family	Life form	Plant part used	CITES	EU	Bern	FFH	DE	FR	ES	BG	HU	TR	IUCN	Degree of threat according to countries	Remarks
<i>Ephedra distachya</i>	+	Ephedraceae	shrub	herb								+			-	AL: E; IT: Sicily; V; RO: R; SK: I; TR: K	TOP 45-listing in Hungary, Spain: rare
<i>Ephedra fragilis</i>	+	Ephedraceae	shrub	herb							Mu2				-	MT: Ex; PT: E	Spain: rare
<i>Ephedra major</i> (=E. nebrodensis)	+	Ephedraceae	shrub	herb							C3, Mu2				-	BA: R	Spain: rare
<i>Equisetum arvense</i>	+	Equisetaceae	herb. perenn.	herb							A97				-	Balearic Is.: Ex; PT-Azores: R	
<i>Equisetum hyemale</i>	+	Equisetaceae	herb. perenn.	herb						P	C3		+		-	HU, LI, RU-North: R	
<i>Equisetum telmateja</i>	+	Equisetaceae	herb. perenn.	herb											-	LV, SE: E; LT, NL: R; PL: I	Spain: very rare
<i>Equisetum variegatum</i>	+	Equisetaceae	herb. perenn.	herb						P	C3				-	DK, HU, NL, SK: V	
<i>Erica cinerea</i>	+	Ericaceae	herb. perenn.	flowers						P					-		
<i>Erodium petraeum</i> (=E. cheilanthifolium)	+	Geraniaceae	herb. perenn.	herb?											-		Spain: possibly threatened in future
<i>Eruca vesicaria</i> ssp. <i>sativa</i>	+	Brassicaceae	annual	whole plant, seeds						P					-		
<i>Eryngium maritimum</i>	+	Apiaceae	biennial	?					I	P/L		+			-	SI: Ex; LV, LT, RO: E; EE, MT, NL, NO: V; BG, SE: R; GI: I	
<i>Eryngium planum</i>	+	Apiaceae	herb. perenn.	herb, leaves											-	SK: V; CZ: R	TOP 45-listing in Hungary
<i>Euphorbia resinifera</i>	-	Euphorbiaceae	shrub	gum	II	B									-		
<i>Fagus sylvatica</i>	+	Fagaceae	tree	wood, fruits						P					-		
<i>Filipendula vulgaris</i>	+	Rosaceae	herb. perenn.	roots, herb, flowers											-	NL: Ex; IE: R	TOP 24-listing in Spain
<i>Fritillaria cirrhosa</i>	-	Liliaceae	herb. perenn.	bulb					I						-		
<i>Fritillaria delavayi</i>	-	Liliaceae	herb. perenn.	bulb					I						-		
<i>Fritillaria przewalskii</i>	-	Liliaceae	herb. perenn.	bulb					I						-		
<i>Fritillaria umbroactea</i>	-	Liliaceae	herb. perenn.	bulb					I						-		
<i>Fritillaria verticillata</i>	-	Liliaceae	herb. perenn.	bulb					I						-		
<i>Galanthus nivalis</i>	+	Liliaceae	herb. perenn.	roots, herb	II	B		V(b)	I	L	C3	+			-	CZ: Ex/E; BA, BG, SU: V; SK, TR: I; CH: K	

Plant species	Origin	Family	Life form	Plant part used	CITES	EU	Bern	FFH	DE	FR	ES	BG	HU	TR	IUCN	Degree of threat according to countries	Remarks
<i>Ephedra distachya</i>	+	Ephedraceae	shrub	herb								+			-	AL: E; IT, Sicily: V; RO: R; SK: I; TR: K	TOP 45-listing in Hungary, Spain: rare
<i>Ephedra fragilis</i>	+	Ephedraceae	shrub	herb							Mu2				-	MT: Ex; PT: E	Spain: rare
<i>Ephedra major</i> (=E. nebrodensis)	+	Ephedraceae	shrub	herb							C3, Mu2				-	BA: R	Spain: rare
<i>Equisetum arvense</i>	+	Equisetaceae	herb. perenn.	herb							A97				-	Balearic Is.: Ex; PT-Azores: R	
<i>Equisetum hyemale</i>	+	Equisetaceae	herb. perenn.	herb						P	C3		+		-	HU, LI, RU-North: R	
<i>Equisetum telmateja</i>	+	Equisetaceae	herb. perenn.	herb											-	LV, SE: E; LT, NL: R, PL: I	Spain: very rare
<i>Equisetum variegatum</i>	+	Equisetaceae	herb. perenn.	herb						P	C3				-	DK, HU, NL, SK: V	
<i>Erica cinerea</i>	+	Ericaceae	herb. perenn.	flowers						P					-		Spain: possibly threatened in future
<i>Erodium petraeum</i> (=E. cheilanthifolium)	+	Geraniaceae	herb. perenn.	herb?											-		
<i>Eruca vesicaria</i> ssp. <i>sativa</i>	+	Brassicaceae	annual	whole plant, seeds						P					-		
<i>Eryngium maritimum</i>	+	Apiaceae	biennial	?					1	P/L		+			-	SI: Ex; LV, LT, RO: E; EE, MT, NL, NO: V; BG, SE: R; GI: I	
<i>Eryngium planum</i>	+	Apiaceae	herb. perenn.	herb, leaves											-	SK: V; CZ: R	TOP 45-listing in Hungary
<i>Euphorbia resinifera</i>	-	Euphorbiaceae	shrub	gum	II	B									-		
<i>Fagus sylvatica</i>	+	Fagaceae	tree	wood, fruits						P					-	NL: Ex; IE: R	TOP 24-listing in Spain
<i>Filipendula vulgaris</i>	+	Rosaceae	herb. perenn.	roots, herb, flowers											-		
<i>Fritillaria cirrhosa</i>	-	Liliaceae	herb. perenn.	bulb					1						-		
<i>Fritillaria delavayi</i>	-	Liliaceae	herb. perenn.	bulb					1						-		
<i>Fritillaria przewalskii</i>	-	Liliaceae	herb. perenn.	bulb					1						-		
<i>Fritillaria unibracteata</i>	-	Liliaceae	herb. perenn.	bulb					1						-		
<i>Fritillaria verticillata</i>	-	Liliaceae	herb. perenn.	bulb					1						-		
<i>Galanthus nivalis</i>	+	Liliaceae	herb. perenn.	roots, herb	II	B		V(b)	1	L	C3	+			-	CZ: Ex/E; BA, BG, SU: V; SK, TR: I; CH: K	



Plant species	Origin	Family	Life form	Plant part used	CITES	EU	Bern	FFH	DE	FR	ES	BG	HU	TR	IUCN	Degree of threat according to countries	Remarks
<i>Gratiola officinalis</i>	+	Scrophulariaceae	herb. perenn.	herb, roots					I	R					-	CZ, LT, NL: E; CH, LV, SK: V	
<i>Guajacum officinale</i>	-	Zygophyllaceae	tree	wood, resin	II B	B				P					-		
<i>Guajacum sanctum</i>	-	Zygophyllaceae	tree	wood, resin	II B										-		
<i>Gymnadenia orchidis</i>	-	Orchidaceae	herb. perenn.	tuber	II B										-		
<i>Gypsophila arrostii</i> var. <i>nebulosa</i>	t	Caryophyllaceae	herb. perenn.	roots											-		TOP 10-listing in Turkey, overcoll.
<i>Gypsophila bicolor</i>	+	Caryophyllaceae	herb. perenn.	roots											-		TOP 50-listing in Turkey, overcoll.
<i>Gypsophila eriocalyx</i>	t	Caryophyllaceae	herb. perenn.	roots											-		TOP 50-listing in Turkey, overcoll.
<i>Gypsophila perfoliata</i>	+	Caryophyllaceae	herb. perenn.	roots											-		TOP 50-listing in Turkey, overcoll.
<i>Harrisia pomanensis</i>	-	Cactaceae	shrub	stems, flowers	II B										-		
<i>Helichrysum arenarium</i>	+	Asteraceae	shrub	flowers					I	R		P	+		-	NL: Ex; CZ: R	TOP 45-listing in Hungary
<i>Helleborus foetidus</i>	+	Ranunculaceae	herb. perenn.	roots					I						-		
<i>Helleborus niger</i>	+	Ranunculaceae	herb. perenn.	rhizome					I	R					-		
<i>Helleborus purpurascens</i>	+	Ranunculaceae	herb. perenn.	rhizome									+		-	SU-Eur.: V; PL: R; SK: I	
<i>Helleborus viridis</i>	+	Ranunculaceae	herb. perenn.	rhizome					I	P					-	NL: E; CH: K	
<i>Hepatica nobilis</i>	+	Ranunculaceae	herb. perenn.	herb, leaves					I	P			+		-	ES: E; BA: V	TOP 45-listing in Hungary
<i>Himantoglossum affine</i>	+	Orchidaceae	herb. perenn.	tuber	II B	B								+	-	TR, UA-Crimea: E; RU-North Cauc., SK: I	TOP 50-listing in Turkey
<i>Himantoglossum caprinum</i>	+	Orchidaceae	herb. perenn.	tuber	II B	I								+	-	HU, SI: E; BG: V; LI: R	TOP 26-listing in Hungary
<i>Hippophae rhamnoides</i>	+	Eleagnaceae	shrub	fruits											-		
<i>Huperzia selago</i>	+	Lycopodiaceae	herb. perenn.	herb					I				+		-	BE, LX: E; DK, HU, LT: V; Corsica: R; LV: K	
<i>Hydrastis canadensis</i>	-	Ranunculaceae	herb. perenn.	rhizome, herb	II B										-		
<i>Hypericum elegans</i>	+	Hypericaceae	herb. perenn.	herb, flowers					I				+		-		
<i>Hypericum maculatum</i>	+	Hypericaceae	herb. perenn.	herb, flowers									+		-	CZ, PL, SK: V	
<i>Hyssopus officinalis</i>	+	Lamiaceae	herb. perenn.	herb						P					-	HU: I	
											R				-	SI: R	TOP 24-listing in Spain

Plant species	Origin	Family	Life form	Plant part used	CITES	EU	Bern	FFH	DE	FR	ES	BG	HU	TR	IUCN	Degree of threat according to countries	Remarks
<i>Ilex aquifolium</i>	+	Aquifoliaceae	tree	leaves, fruits					I	L	A2, A4, A5, M2, V1	+			-	ES, PT, SE: E; BA: V; Balearic Is., BG, TR: R; RO, YU: I	
<i>Inula helentium</i>	+	Asteraceae	herb. perenn.	roots, rhizome								P	+		-	HU: I; TR: R	TOP 45-listing in Hungary
<i>Iris aphylla</i>	+	Iridaceae	herb. perenn.	rhizome					I	R					-	PL, RO: E; FR: V; CZ: R; HU: I	
<i>Iris chamaeiris</i>	+	Iridaceae	herb. perenn.	rhizome					I	L					-		
<i>Iris germanica</i>	+	Iridaceae	herb. perenn.	rhizome					I						-		
<i>Iris lutescens</i>	+	Iridaceae	herb. perenn.	rhizome					I	P					-		
<i>Iris pallida</i>	+	Iridaceae	herb. perenn.	rhizome					I						-		
<i>Iris pseudacorus</i>	+	Iridaceae	herb. perenn.	rhizome					I						-	LI: V; CH: K	
<i>Iris pumila</i>	+	Iridaceae	herb. perenn.	rhizome					I				+		-	SK, RU: V; CZ: R	
<i>Iris sibirica</i>	+	Iridaceae	herb. perenn.	rhizome					I	P					-	CH, FR, LI, LT, PL, SK: V; CZ, HU, LV, RO: R	
<i>Iris sisyrynchium</i>	+	Iridaceae	herb. perenn.	rhizome					I	P					-		
<i>Iris spuria</i>	+	Iridaceae	herb. perenn.	rhizome					I	P					-	CZ: Ex/E; AT, DE, SK: E; DK, HU, RO, SE: V	
<i>Iris tenax</i>	+	Iridaceae	herb. perenn.	rhizome					I						-		
<i>Iris versicolor</i>	+	Iridaceae	herb. perenn.	rhizome					I						-		
<i>Iris xiphium</i>	+	Iridaceae	herb. perenn.	rhizome					I	P					-	FR: E	
<i>Isatis tinctoria</i>	+	Brassicaceae	biennial/ herb. perenn.	roots, leaves, fruits									+		-	GB: V; DK: R	
<i>Jasonia glutinosa</i>	+	Asteraceae	herb. perenn.	herb							V3				-		TOP 9-listing in Spain
<i>Juniperus communis</i>	+	Cupressaceae	shrub	fruits						P	Mu2				-	AL: E; NL: V	
<i>Juniperus oxycedrus</i>	+	Cupressaceae	shrub/tree	shrub								R			-	AL: E; SI: R	
<i>Juniperus sabina</i>	+	Cupressaceae	shrub	shrub/tree								+			-	PL: V; BA, BG, RO, SI: R SK: I	
<i>Juniperus thurifera</i>	+	Cupressaceae	shrub	wood							M2, Mu1, V2				-	Corsica: V; FR, IT: R	Spain: produced into extracts, of scientific interest

Plant species	Origin	Family	Life form	Plant part used	CITES	EU	Bern	FFH	DE	FR	ES	BG	HU	TR	IUCN	Degree of threat according to countries	Remarks
<i>Lamium album</i>	+	Lamiaceae	herb. perenn.	herb													TOP 24-listing in Spain
<i>Laurus nobilis</i>		Lauraceae	tree	leaves							A2, V2					AL: E; CH, MT, SI: R	
<i>Lavandula angustifolia</i> subsp. <i>pyrenaica</i>	+	Lamiaceae	semishrub	flowers													TOP 24-listing in Spain
<i>Ledum palustre</i>	+	Ericaceae	shrub	herb					I							CZ: V; DK: R	
<i>Leontopodium alpinum</i>	+	Asteraceae	herb. perenn.	herb					I	L						AL: Ex/E; BA, IT, RO, SK: V; BG: R; UA: I	
<i>Leonurus cardiaca</i>	+	Lamiaceae	herb. perenn.	herb												NL, SI: E; CH: V	
<i>Lepidium cartilagineum</i>	+	Brassicaceae	herb. perenn.	herb						P							TOP 26-listing in Hungary
<i>Leucojum aestivum</i>	+	Liliaceae	herb. perenn.	bulb, leaves					I			E / R	+			CH, CZ: E; BG, NL, RO, SK, TR: V; HU, RU- North Cauc.: R; GB, MD, UA- Crimea: I	TOP 50-listing in Turkey, also for ornamental purpose
<i>Leuzea rhapontica</i>	+	Asteraceae	herb. perenn.	roots					I							LI, SI: R	
<i>Lilium brownii</i>	-	Liliaceae	herb. perenn.	bulb					I								
<i>Lilium candidum</i>	-	Liliaceae	herb. perenn.	whole plant					I								
<i>Lilium lancifolium</i>	-	Liliaceae	herb. perenn.	bulb, whole plant					I								
<i>Lilium martagon</i>	+	Liliaceae	herb. perenn.	?					I		C3, M2		+			PT: E; BA, CZ, RU: V; SK: I; CH: K	
<i>Lilium pumilum</i>	-	Liliaceae	herb. perenn.	bulb					I								
<i>Lobaria pulmonaria</i>	+	Strictaceae	foliose lichen	whole plant					I								
<i>Lophophora williamsii</i>	-	Cactaceae	succulent	rhizome													
<i>Lycopodium annotinum</i>	+	Lycopodiaceae	herb. perenn.	herb. spores					I				+			ES, HU: V; NL: R; CZ, LV, SK: I	TOP 10-listing in Turkey, limited area, Spain: rare
<i>Lycopodium clavatum</i>	+	Lycopodiaceae	herb. perenn.	herb. spores		D			I	P/L			+			PT: Ex; NL: V; ES: R; SK: I	TOP 26-listing in Hungary, Spain: rare, TOP 50-listing in Turkey, collection effects other, rare species

Plant species	Origin	Family	Life form	Plant part used	CITES	EU	Bern	FFH	DE	FR	ES	BG	HU	TR	IUCN	Degree of threat according to countries	Remarks
<i>Malus silvestris</i> subsp. <i>orientalis</i>	+	Rosaceae	tree	fruits											-		TOP 50-listing in Turkey
<i>Marrubium vulgare</i>	+	Boraginaceae	herb. perenn.	herb											-	CH, NL, SE: E; SK: V	TOP 26-listing in Hungary
<i>Matteuccia struthiopteris</i>	+	Dryopteridaceae	herb. perenn.	rhizome					I				+		-	FR: E; BA, CZ, DE, DK, HU, SK: V; CH: R	
<i>Melissa officinalis</i>	+	Lamiaceae	herb. perenn.	herb											-	CH: R	TOP 26-listing in Hungary
<i>Mentha pulegium</i>	+	Lamiaceae	herb. perenn.	herb						P					-	CH, NL: E; GB, IE: V; CZ: R	TOP 50-listing in Turkey
<i>Menyanthes trifoliata</i>	+	Menyanthaceae	herb. perenn.	leaves		D			I	P	M3	+	+		-	Corsica, CZ, PT: E; BA, BG, HU, LI, SK: V	TOP 26-listing in Hungary, TOP 9-listing in Spain
<i>Micromeria fruticosa</i>	+	Lamiaceae	shrub	herb							V3					IT: E; TR: V	Spain: at least in regression, local commercialisation
<i>Morchella esculenta</i>	+	Morchellaceae	morel fungus	whole body					I								
<i>Mucuna pruriens</i>	-	Leguminosae	annual	fruits						P							
<i>Myrtillocactus geometrizans</i>	-	Cactaceae	succulent	fresh shoots		II B											
<i>Myrtus communis</i>	-	Myrtaceae	shrub	leaves, fruits							A97, V3					MT, SI: V	Spain: in regression in the southeast
<i>Narcissus poeticus</i>	+	Liliaceae	herb. perenn.	bulb					I							CH: R	
<i>Nardostachys grandiflora</i>	-	Valerianaceae	herb. perenn.	roots		II B											
<i>Neotinea maculata</i>	+	Orchidaceae	herb. perenn.	tuber		II B								+		MT: Ex; GB: R	TOP 50-listing in Turkey
<i>Nepenthes distillatoria</i>	-	Nepenthaceae	shrub, climber	whole plant		II B									R	LK: R	
<i>Nepenthes khasiana</i>	-	Nepenthaceae	shrub, climber	roots, leaves		I A									I	IN: I	
<i>Nerium oleander</i>	+	Apocynaceae	shrub	leaves						R						Corsica, FR: V	
<i>Nuphar lutea</i>	+	Nymphaeaceae	herb. perenn.	rhizome					I	P		+				AL, BA, BG, SK: V	
<i>Nymphaea alba</i>	+	Nymphaeaceae	herb. perenn.	flowers, roots					I	P		+				IL: Ex; LI: E; AL, BG, CZ, LT, SI, SK: V; CH, LV: K	
<i>Oenanthe aquatica</i>	+	Apiaceae	biennial	fruits						P						CH, NO: E; FI: R	



Plant species	Origin	Family	Life form	Plant part used	CITES	EU	Bern	FFH	DE	FR	ES	BG	HU	TR	IUCN	Degree of threat according to countries	Remarks
<i>Oenanthe crocata</i>	+	Apiaceae	herb. perenn.	herb						P					-		
<i>Ophrys bombyliflora</i>	+	Orchidaceae	herb. perenn.	tuber	II	B								+	-		TOP 50-listing in Turkey, uncontrolled collection
<i>Ophrys ferrum-equinum</i>	+	Orchidaceae	herb. perenn.	tuber	II	B								+	-		TOP 50-listing in Turkey, uncontrolled collection
<i>Ophrys fusca</i>	+	Orchidaceae	herb. perenn.	tuber	II	B								+	-		TOP 50-listing in Turkey, uncontrolled collection
<i>Ophrys holoserica</i>	+	Orchidaceae	herb. perenn.	tuber	II	B								+	-		TOP 50-listing in Turkey, uncontrolled collection
<i>Ophrys lutea</i>	+	Orchidaceae	herb. perenn.	tuber	II	B								+	-		TOP 50-listing in Turkey, uncontrolled collection
<i>Ophrys mammosa</i>	+	Orchidaceae	herb. perenn.	tuber	II	B								+	-		TOP 50-listing in Turkey, uncontrolled collection
<i>Ophrys oestrifera</i>	+	Orchidaceae	herb. perenn.	tuber	II	B								+	-		TOP 50-listing in Turkey, uncontrolled collection
<i>Ophrys phrygia</i>	+	Orchidaceae	herb. perenn.	tuber	II	B								+	-		TOP 50-listing in Turkey, uncontrolled collection
<i>Ophrys reinholdii</i>	+	Orchidaceae	herb. perenn.	tuber	II	B								+	-		TOP 50-listing in Turkey, uncontrolled collection
<i>Ophrys speculum</i>	+	Orchidaceae	herb. perenn.	tuber	II	B								+	-		TOP 50-listing in Turkey, uncontrolled collection
<i>Ophrys tenthredinifera</i>	+	Orchidaceae	herb. perenn.	tuber	II	B								+	-		TOP 50-listing in Turkey, uncontrolled collection
<i>Ophrys umbilicata</i>	+	Orchidaceae	herb. perenn.	tuber	II	B								+	-		TOP 50-listing in Turkey, uncontrolled collection
<i>Opuntia ficus-indica</i>	-	Cactaceae	shrub	flowers	II	B									-		
<i>Opuntia humifusa</i>	-	Cactaceae	succulent	stems, flowers	II	B									-		
<i>Opuntia monacantha</i>	-	Cactaceae	succulent	stems, flowers	II	B									-		

Plant species	Origin	Family	Life form	Plant part used	CITES	EU	Bern	FFH	DE	FR	ES	BG	HU	TR	IUCN	Degree of threat according to countries	Remarks
<i>Orchis anatolica</i>	+	Orchidaceae	herb. perenn.	tuber	II	B								+	-		Turkey: collected for salep
<i>Orchis coriophora</i>	+	Orchidaceae	herb. perenn.	tuber	II	B						P	+	+	-	CZ, EE: Ex; CH, PL: E; RU: V; BG, SK: I	Turkey: collected for salep
<i>Orchis italica</i>	+	Orchidaceae	herb. perenn.	tuber	II	B								+	-	MT, TR: E	Turkey: collected for salep
<i>Orchis laxiflora</i>	+	Orchidaceae	herb. perenn.	tuber	II	B						P	+	+	-	CH: E; HU: I	Turkey: collected for salep
<i>Orchis mascula</i>	+	Orchidaceae	herb. perenn.	tuber	II	B						P	+	+	-	NL: E; EE, LT, PL: V; CZ, FI, RU: R; HU, NO: I; CH, LV: K	Turkey: collected for salep
<i>Orchis militaris</i>	+	Orchidaceae	herb. perenn.	tuber	II	B						P			-	DK, LT, NL: E; GB, PL, SK: V; BG, CZ, HU, LV: R; AM, AZ, GE, parts of RU, UA, UA-Crimea: I; CH, EE: K	
<i>Orchis morio</i>	+	Orchidaceae	herb. perenn.	tuber	II	B						P	+	+	-	MT: Ex; LV: E; DK, EE, IE, LT, NL, PL, SK, TR: V; CZ, HU, NO, RO: R; parts of RU, UA: I; CH: K	TOP 45-listing in Hungary; Turkey: collected for salep
<i>Orchis pallens</i>	+	Orchidaceae	herb. perenn.	tuber	II	B						P	+	+	-	Corsica, RU: E; HU, PL, SK: V; CH, CZ, LI, RO: E	TOP 50-listing in Turkey, uncontrolled collection
<i>Orchis palustris</i>	+	Orchidaceae	herb. perenn.	tuber	II	B								+	-	SE: R	TOP 50-listing in Turkey, uncontrolled collection
<i>Orchis papilionacea</i>	+	Orchidaceae	herb. perenn.	tuber	II	B					B2	P		+	-	SI: E; Balearic Is., RO: V; BG: R	Turkey: collected for salep



Plant species	Origin	Family	Life form	Plant part used	CITES	EU	Bern	FFH	DE	FR	ES	BG	HU	TR	IUCN	Degree of threat according to countries	Remarks
<i>Osmunda regalis</i>	+	Osmundaceae	herb. perenn.	whole plant					1		C3		+	-	-	CZ, RO: Ex; AL, BG, CH, DE, DK, HU, NO, PL: V; Sicily: R; AM: I	
<i>Paeonia mascula</i>	+	Paeoniaceae	herb. perenn.	flowers, roots												RO: E; BG, Corsica, Sardinia, SI: V; AL: R	TOP 10-listing in Turkey, overcoll.
<i>Paeonia officinalis</i>	+	Paeoniaceae	herb. perenn.	flowers, roots					1	R			+	-	-	BA, CH: E	TOP 26-listing in Hungary
<i>Paeonia peregrina</i>	+	Paeoniaceae	herb. perenn.	flowers, roots					1			E / R		-	-	RO: V; IT: R; MD: I	TOP 50-listing in Turkey, overcollection
<i>Panax quinquefolius</i>	-	Araliaceae	herb. perenn.	roots	II	B								-	-		
<i>Paris quadrifolia</i>	+	Liliaceae	herb. perenn.							P	M3			-	-	NL: R	
<i>Parmelia</i> ssp.	+	Parmeliaceae	foliose lichen	whole plant				1						-	-		
<i>Parnassia palustris</i>	+	Saxifragaceae	herb. perenn.	herb				1	P				+	-	-	CZ, HU, NL, SK: V	
<i>Petasites albus</i>	+	Asteraceae	herb. perenn.	roots, leaves									+	-	-	NO: R	
<i>Petasites hybridus</i>	+	Asteraceae	herb. perenn.	roots, leaves									+	-	-		TOP 9-listing in Spain
<i>Peucedanum officinale</i>	+	Apiaceae	herb. perenn.	roots									+	-	-	CZ: Ex/E; GB: R	Spain: scarce
<i>Phlomis crinita</i>	s	Lamiaceae	shrub	herb							V3			-	-		
<i>Physalis alkekengi</i>	+	Solanaceae	herb. perenn.	fruit										-	-		
<i>Picrothiza kurroa</i>	-	Scrophulariaceae	herb. perenn.	rhizome, roots	II	B											TOP 50-listing in Turkey
<i>Pinguicula vulgaris</i>	+	Lentibulariaceae	herb. perenn.	herb					1				+			HU, NL, PL, PT; E; BA, LT, SK: V; CZ, LV, RO: R	
<i>Pinus mugo</i>	+	Pinaceae	tree	leaves, gemmae						P				-	-	FR: R; SK: I	
<i>Plantago major</i>	+	Plantaginaceae	herb. perenn.	leaves							A97			-	-		
<i>Plantago maxima</i>	+	Plantaginaceae	herb. perenn.										+	-	-	HU: R; RO: I	
<i>Platanthera bifolia</i>	+	Orchidaceae	herb. perenn.	tuber	II	B					M3			-	-	CZ, NL: V; BA: R; CH, LV: K	
<i>Platanthera chlorantha</i>	+	Orchidaceae	herb. perenn.	tuber	II	B								-	-	CZ, LT, NL, SK: V; BA: R; CH, LV: K	
<i>Podocarpus neriifolius</i>	-	Podocarpaceae	tree	leaves	II	C								-	-		
<i>Podophyllum hexandrum</i>	-	Berberidaceae	herb. perenn.	rhizome, resin	II	B								-	-		

Plant species	Origin	Family	Life form	Plant part used	CITES	EU	Bern	FFH	DE	FR	ES	BG	HU	TR	IUCN	Degree of threat according to countries	Remarks
<i>Polygala amara</i>	+	Polygalaceae	herb. perenn.	roots, herb											-	CH: R	TOP 45-listing in Hungary
<i>Polygala antillensis</i>	-	Polygalaceae	?	?						P					Ex/E	MQ: Ex/E	
<i>Polygala calcaria</i>	+	Polygalaceae	herb. perenn.	radix, herba						P							
<i>Polygala major</i>	+	Polygalaceae	semishrub	radix, herba													
<i>Polygala vulgaris</i>	+	Polygalaceae	herb. perenn.	radix, herb									+		-	CZ: V; HU: R; PL: I	TOP 45-listing in Hungary
<i>Polygonatum odoratum</i>	+	Liliaceae	herb. perenn.	rhizome											-	NL: V; Balearic Is.: R	TOP 45-listing in Hungary
<i>Polygonum bistorta</i>	+	Polygonaceae	herb. perenn.	rhizome									+		-	NL: R	Spain: rare, threatened at least in the Levante
<i>Polypodium vulgare</i>	+	Polypodiaceae	herb. perenn.	rhizome											-	LI: Ex; FI: V; HU, PT: R	
<i>Polytrichum commune</i>	+	Polytrichaceae	foliose moss	whole plant											-		TOP 26-listing in Hungary
<i>Primula elatior</i>	+	Primulaceae	herb. perenn.	roots, flowers				I							-		
<i>Primula farinosa</i>	+	Primulaceae	herb. perenn.	?											-	CZ: V; HU, SE: R; SK: I	TOP 26-listing in Hungary
<i>Primula veris</i>	+	Primulaceae	herb. perenn.	roots, flowers											-	CZ: Ex; BA, PL, RO: E; DK, LT, SK: V; LV: R; HU: I; FI: K	
<i>Prunus africana</i>	-	Rosaceae	tree	bark	II B										-	CZ, NL: V	TOP 26-listing in Hungary. TOP 50-listing in Turkey
<i>Prunus padus</i>	+	Rosaceae	tree	bark											-		
<i>Pterocarpus santalinus</i>	-	Leguminosae	tree	heartwood	II B					P					-	BA: V	
<i>Pulsatilla chinensis</i>	-	Ranunculaceae	herb. perenn.	roots											E	IN: E	
<i>Pulsatilla halleri</i>	+	Ranunculaceae	herb. perenn.	herb											-		
<i>Pulsatilla pratensis</i>	+	Ranunculaceae	herb. perenn.	herb												AL: Ex/E; SK, PL: V; CH, RO: R	
																HU, NO, RO: V; BG, LT: R; parts of RU, UA: I; EE, LV: K	

Plant species	Origin	Family	Life form	Plant part used	CITES	EU	Bern	FFH	DE	FR	ES	BG	HU	TR	IUCN	Degree of threat according to countries	Remarks
<i>Pulsatilla vernalis</i>	+	Ranunculaceae	herb. perenn.	herb					I			+			-	CZ, SK: E; DK, PL: V; BG, LI: R; RU-North: I	
<i>Pulsatilla vulgaris</i>	+	Ranunculaceae	herb. perenn.	herb					I	P/L						NL, PL: Ex; CH, RU: E; GB, SE: R	
<i>Quercus farnetto</i>	+	Fagaceae	tree	galls									+		-	HU: R	
<i>Ranunculus sceleratus</i>	+	Ranunculaceae	annual	herb						P					-	LI: E; CH: V	
<i>Rauvolfia serpentina</i>	-	Apocynaceae	shrub	roots	II	B									-		
<i>Raymonda myconi</i>	s	Gesneriaceae	herb. perenn.	?							Ar2						Spain: possibly commercialisation in future, tertiary endemic, taxonomical isolated position
<i>Rhamnus frangula</i> (=Frangula alnus)	+	Rhamnaceae	tree	bark							A2	E / R			-	IE: R	TOP 24-listing in Spain; Romania: overcollection (Lange, 1998c)
<i>Rheum rhaponticum</i>	+	Polygonaceae	herb. perenn.	rhizome		I			I			+			R	BG: R; NO: R	
<i>Rhodiola rosea</i>	+	Crassulaceae	herb. perenn.	herb								+			-	BA, CZ: E; SK: V	
<i>Rhododendron ferrugineum</i>	+	Ericaceae	shrub	leaves					I						-		
<i>Rhododendron hirsutum</i>	+	Ericaceae	shrub	leaves					I						-	BA, FR: V; YU: I	
<i>Ribes nigrum</i>	+	Grossulariaceae	shrub	leaves								+	+		-	HU, NO: E; BG, RO, SI, TR: R	TOP 26-listing in Hungary
<i>Ribes pendulina</i>	+	Grossulariaceae	shrub	leaves									+		-		
<i>Rosa agrestis</i>	+	Rosaceae	shrub	fruits											-	DK: Ex; SE: E; GB: R; TR: K	TOP 45-listing in Hungary
<i>Rosa gallica</i>	+	Rosaceae	shrub	fruits						R					-	CH: E; CZ, PL: V	
<i>Rosa jundzilli</i>	+	Rosaceae	shrub	fruits						P					-	SE: Ex; CH, IT, TR: R	
<i>Rosa pisiformis</i>	t	Rosaceae	shrub	fruits											-		TOP 50-listing in Turkey
<i>Rosa rubiginosa</i>	+	Rosaceae	shrub	fruits											-	LI: R	TOP 45-listing in Hungary
<i>Rosa stylosa</i>	+	Rosaceae	shrub	fruits					P						-	CH, HU, RO: R	TOP 45-listing in Hungary
<i>Rosa tomentosa</i>	+	Rosaceae	shrub	fruits											-	DK: E; TR: R	TOP 45-listing in Hungary

Plant species	Origin	Family	Life form	Plant part used	CITES	EU	Bern	FFH	DE	FR	ES	BG	HU	TR	IUCN	Degree of threat according to countries	Remarks
<i>Rosa villosa</i>	+	Rosaceae	shrub	fruits						P						HU,NL, SE: V; LI, RO: R	
<i>Rosmarinus officinalis</i>	+	Lamiaceae	shrub	herb, leaves							A97					CH, MT: R	
<i>Rubia tinctoria</i>	+	Rubiaceae	shrub, climber	roots								P				NL: E	TOP 26-listing in Hungary
<i>Rumex alpinus</i>	+	Polygonaceae	herb. perenn.	roots, rhizome, leaves													TOP 24-listing in Spain
<i>Ruscus aculeatus</i>	+	Liliaceae	shrub	roots				V(b)	L		A97, V2	P	+			BA: V; RO: R; CH: K	TOP 9-listing in Spain, TOP 10-listing in Turkey
<i>Ruscus hypoglossum</i>	+	Liliaceae	shrub	roots									+			BA: E; AL, HU; RO: R; UA- Crimea: I	
<i>Ruta graveolens</i>	+	Rutaceae	herb. perenn. /semishrub	herb												CH: E	
<i>Salvia cryptantha</i>	t	Lamiaceae	shrub	leaves													TOP 50-listing in Turkey
<i>Salvia tomentosa</i>	+	Lamiaceae	shrub	shrub								P				MT: E	
<i>Sanguisorba officinalis</i>	+	Rosaceae	herb. perenn.	herb					P							IE, LV: V; DK: R	
<i>Santolina oblongifolia</i>	s	Asteraceae	shrub	inflorescence													Spain: much collected for local use
<i>Sarracenia purpurea</i>	-	Sarraceniaceae	herb. perenn.	herb	II	B											
<i>Satureja montana</i>	+	Lamiaceae	herb. perenn.	herb, leaves							A97					AL: E	
<i>Satureja obovata</i>	+	Lamiaceae	semishrub	herb, leaves							A97						
<i>Saussurea costus</i>	-	Asteraceae	herb. perenn.	roots	I	A										IN: E; PK: E	
<i>Saxifraga granulata</i>	+	Saxifragaceae	herb. perenn.	herb					I	P						IE: E; NL: V; HU: R; SK: I	
<i>Saxifraga stolonifera</i>	+	Saxifragaceae	herb. perenn.	?					I								
<i>Saxifraga vayredana</i>	s	Saxifragaceae	herb. perenn.	?				IV(b)	I								Spain: possibly commercialised in future, potentially endangered
<i>Scopolia carniolica</i>	+	Solanaceae	herb. perenn.	roots, leaves									+			HU: R; SK: I	
<i>Scilla bifolia</i>	+	Liliaceae	herb. perenn.	bulb, seeds					I	P						LI: V; PL: E; CZ: R	
<i>Sedum acre</i>	+	Crassulaceae	herb. perenn.	herb													
<i>Selenicereus grandiflorus</i>	-	Cactaceae	shrub	whole plant, flowers	II	B											

Plant species	Origin	Family	Life form	Plant part used	CITES	EU	Bern	FFH	DE	FR	ES	BG	HU	TR	IUCN	Degree of threat according to countries	Remarks
<i>Sempervivum marmoratum</i>	+	Crassulaceae	herb. perenn.	whole plant?					1						-	SK: V; HU: R	
<i>Sempervivum tectorum</i>	+	Crassulaceae	herb. perenn.	herb					1	P	A97	+			-	HU: R	TOP 26-listing in Hungary
<i>Serapias vomeracea</i>	+	Orchidaceae	herb. perenn.	tuber	II	B								+	-	CH, MT, E; TR: V; BG, FR, RU: R	TOP 50-listing in Turkey
<i>Serratula tinctoria</i> ssp. <i>seoanei</i> (=S. <i>seoanei</i> )	+	Asteraceae	herb. perenn.	whole plant						P					-		
<i>Sideritis arborescens</i>	+	Lamiaceae	shrub	herb							A97				-		Spain: possibly threatened, locally commercialised
<i>Sideritis borgiae</i>	s	Lamiaceae	semi-shrub shrub	herb											-		Spain: threatened, locally commercialised
<i>Sideritis carbonellii</i>	s	Lamiaceae	semi-shrub shrub	herb											-		Spain: possibly threatened, locally commercialised
<i>Sideritis glacialis</i>	s	Lamiaceae	herb. perenn.	herb							A97				-		Spain: endangered, locally commercialised
<i>Sideritis hyssopifolia</i>	+	Lamiaceae	herb. perenn.	herb							V3, A97				-		Spain: threatened, regional commercialised
<i>Sideritis lasiantha</i>	s	Lamiaceae	herb. perenn.	herb							A97				-		Spain: endangered, locally commercialised
<i>Sideritis endressii</i> subsp. <i>laxosolicata</i>	s	Lamiaceae	herb. perenn.	herb											R	ES: R	Spain: possibly threatened, locally commercialised
<i>Sideritis leucantha</i>	s	Lamiaceae	herb. perenn.	herb							A97				-		Spain: threatened, locally commercialised
<i>Sideritis luteola</i> (=S. <i>arborescens</i> subsp. <i>luteola</i> )	s	Lamiaceae	shrub	herb							A97				-		Spain: threatened, locally commercialised
<i>Sideritis mammiformis</i>	s	Lamiaceae	semi-shrub shrub	herb											-		Spain: endangered, locally commercialised
<i>Sideritis murgetana</i>	s	Lamiaceae	semi-shrub shrub	herb											-		Spain: threatened, locally commercialised
<i>Sideritis osteoxylla</i>	s	Lamiaceae	semi-shrub shrub	herb											R	ES: R	Spain: possibly threatened, locally commercialised



Plant species	Origin	Family	Life form	Plant part used	CITES	EU	Bern	FFH	DE	FR	ES	BG	HU	TR	IUCN	Degree of threat according to countries	Remarks
<i>Sideritis pusilla</i>	s	Lamiaceae	herb. perenn.	herb							A97				-		Spain: threatened, locally commercialised
<i>Sideritis raeseri</i>	+	Lamiaceae	herb. perenn.	herb											-	AL: E	
<i>Sideritis reverchonii</i>	s	Lamiaceae	herb. perenn.	herb							A97				R	ES: R	Spain: threatened, locally commercialised
<i>Sideritis scardica</i>	+	Lamiaceae	herb. perenn.	herb								+			-	BG: R	
<i>Sideritis spylea</i>	t	Lamiaceae	?	herb											-		TOP 50-listing in Turkey
<i>Sideritis syriaca</i>	+	Lamiaceae	herb. perenn. / semishrub	herb								+			-		
<i>Sideritis tmolea</i>	t	Lamiaceae	?	herb											R	TR: R	TOP 50-listing in Turkey
<i>Sideritis trojana</i>	t	Lamiaceae	?	herb											R	TR: R	TOP 50-listing in Turkey
<i>Sideritis</i> spp.	+	Lamiaceae	-	herb							A97, V3				-		
<i>Smilax aspera</i>	+	Liliaceae	shrub, climber	roots							A97				-		
<i>Solidago virgaurea</i>	+	Asteraceae	herb. perenn.	herb											-	NL: V	TOP 45-listing in Hungary
<i>Stachys officinalis</i>	+	Lamiaceae	herb. perenn.	herb								E			-	DK: Ex; NL, SE: E; FR, IE: V	TOP 45-listing in Hungary
<i>Stachys palustris</i>	+	Lamiaceae	herb. perenn.	herb						P					-		
<i>Stachys recta</i>	+	Lamiaceae	herb. perenn.	herb											-		
<i>Sternbergia lutea</i>	+	Amaryllidaceae	herb. perenn.	?		II B									-	LT: R	TOP 50-listing in Turkey
<i>Tamus communis</i>	+	Dioscoreaceae	herb. perenn, climber	rhizome						L					-	SI: Ex; BA: V; SU: R	
<i>Taxus baccata</i>	+	Taxaceae	tree	tops, needles				I		L	A1, As4, B2, Ma2, V2	+			-	LT: Ex; AL: Ex/E; PT: E; BG, EE, LV: V; BA, Balearic Is., DK, ES, FI, HU, RO: R; AM, AZ, GE, YU, parts of RU, UA: I	Spain: scarce, formerly harvested
<i>Taxus wallichiana</i>	-	Taxaceae	tree	bark, leaves		II B									-		
<i>Tetralinis articulata</i>	+	Cupressaceae	tree	gum							Mu1				-		
<i>Teucrium botrys</i>	+	Lamiaceae	herb. perenn.	herb						P					-	BG: Ex; NL: E; GB, RO: V; PL: R	

Plant species	Origin	Family	Life form	Plant part used	CITES	EU	Bern	FFH	DE	FR	ES	BG	HU	TR	IUCN	Degree of threat according to countries	Remarks
<i>Teucrium elemanii</i> (= <i>T. charidemi</i> )	s	Lamiaceae	semishrub	herb, leaves							A97				R	ES: R	Spain: overcollection for local use
<i>Teucrium leonis</i>	?	Lamiaceae	?	herb, leaves											-		Spain: overcollection for local use
<i>Teucrium polium</i> ssp. <i>pupurascens</i>	+	Lamiaceae	semishrub	herb, leaves					P						R	FR: V; ES- Balearic Is.: R	
<i>Teucrium scordium</i>	+	Lamiaceae	herb. perenn.	herb, leaves					P						-	Channel Is.: Ex/E; CH, LT, NL: E; DK, GB: V; LV: R; SK: I	
<i>Teucrium</i> spp.	+	Lamiaceae	-	herb, leaves							A97, V3				-		
<i>Thymus baeticus</i>	+	Lamiaceae	semishrub	herb, leaves							A97				-		Spain: in regression due to collection
<i>Thymus hyemalis</i>	+	Lamiaceae	semishrub	herb, leaves							A97, V3				-		Spain: in regression due to collection
<i>Thymus mastichina</i>	+	Lamiaceae	semishrub	herb, leaves							A97, V3				-		
<i>Thymus moroderi</i>	s	Lamiaceae	semishrub	herb, leaves							A97, V3				-	ES: R	
<i>Thymus orospedanus</i>	s	Lamiaceae	semishrub	herb, leaves											-	ES: R	Spain: threatened, collection for liquor and tea
<i>Thymus serpylloides</i> subsp. <i>gadorensis</i>	+	Lamiaceae	semishrub	herb, leaves							A97				-		Spain: in regression due to collection
<i>Thymus vulgaris</i>	+	Lamiaceae	semishrub	herb, leaves							A97, V3				-		Spain: in regression due to collection
<i>Thymus zygis</i>	+	Lamiaceae	semishrub	herb, leaves							A97, V3				-		Spain: in regression due to collection
<i>Tilia cordata</i>	+	Tiliaceae	tree	flower bracts											-		Spain: in regression due to collection
<i>Tilia platyphyllos</i>	+	Tiliaceae	tree	flower bracts											-	AL, SE: E; DK: R	TOP 24-listing in Spain
															-		TOP 24-listing in Spain

Plant species	Origin	Family	Life form	Plant part used	CITES	EU	Bern	FFH	DE	FR	ES	BG	HU	TR	IUCN	Degree of threat according to countries	Remarks
<i>Trapa natans</i>	+	Trapaceae	annual	fruits			I		I				+		-	Balearic Is., BE, CH, LT, SE: Ex; CZ, LV, PL: E; AL, AT, BA, DE, ES, GR, IT, RO, SI, SK, YU: V; BG, HU, TR: R; AZ, GE, KZ, UA, parts of RU: I	
<i>Traunsteineria globosa</i>	+	Orchidaceae	herb. perenn.	bulb	II B							P			-	BA: V; BG: R; CH: K	
<i>Trifolium alpinum</i>	+	Leguminosae	herb. perenn.	?											-	SE: E; EE, LV: V; DK: R	Spain: much collected, potentially threatened
<i>Urginea maritima</i>	+	Liliaceae	herb. perenn.	bulb											-	Corsica: R	
<i>Urtica kioviensis</i>	+	Urticaceae	herb. perenn.	roots, herb									+		-	HU: V; CZ, RO: R; SK: I	
<i>Usnea barbata</i>	+	Usneaceae	beard lichen	whole plant					I								
<i>Vaccinium myrtillos</i>	+	Ericaceae	shrub	leaves, fruits						P	M4				-	PT: V	Spain: scarce, in regression TOP 26-listing in Hungary
<i>Vaccinium vitis-idea</i>	+	Ericaceae	shrub	herb, leaves, fruits						P			+		-	AL: E; HU, TR: R	
<i>Valeriana officinalis</i>	+	Valerianaceae	herb. perenn.	roots						P					-	AL: E; PT: R	TOP 9-listing in Spain
<i>Valeriana sambucifolia</i> (= <i>V. officinalis</i> subsp. <i>sambucifolia</i> )	+	Valerianaceae	herb. perenn.	roots								P	+		-		

Plant species	Origin	Family	Life form	Plant part used	CITES	EU	Bern	FFH	DE	FR	ES	BG	HU	TR	IUCN	Degree of threat according to countries	Remarks
<i>Vanilla planifolia</i>	-	Orchidaceae	shrub, climber	fruits	II	B							+		-		
<i>Veratrum album</i>	+	Liliaceae	herb. perenn.	rhizomes						P	M4		+		-	FI: E; CZ, SK: V	TOP 26-listing in Hungary
<i>Veronica officinalis</i>	+	Scrophulariaceae	herb. perenn.	herb											-		TOP 26-listing in Hungary
<i>Veronica teucrium</i>	+	Scrophulariaceae	herb. perenn.	herb?						P					-		
<i>Vinca minor</i>	+	Vincaceae	semishrub	herb											-		
<i>Viola canina</i>	+	Violaceae	herb. perenn.	roots						P		R			-		
<i>Viscum album</i>	+	Loranthaceae	shrub	herb, leaves						L					-	Balearic Is.: Ex; AL: E; NO: V; NL: R; CZ: I	
<i>Vitex agnus-castus</i>	+	Verbenaceae	shrub	fruits, seeds						R					-	Corsica, FR: V; MT, SI: R	
<i>Vitis sylvestris</i>	+	Vitaceae	shrub, climber	leaves					I	P			+		-	HU, SK, SU-Eur., SU-Asia: V; CZ, SK: I	

**Abbreviations used in the columns:**

- Origin** + = native to Europe (including Turkey); g = endemic to Greece; s = endemic to Spain; t = endemic to Turkey
- Life form** herb perenn. = herbaceous perennial
- Plant part** The list is not exhaustive.
- CITES** I, II, or III denote a CITES appendix and a species's listing in the same.
- EU** A, B, C, or D in this column denotes an annex of *Regulation (EC) No. 338/97* of 9 December 1996, and a species's listing within it.
- Bern** An entry in this column denotes a species's listing in Annex I of the *Convention on the Conservation of European Wildlife and Natural Habitats*, 1982.
- FFH** An entry in this column denotes the annex of *Council Directive 92/43/EEC* of 21 May 1992, (Habitats, Fauna and Flora Directive) in which a species's is listed;
- DE** An entry in this column denotes listing in Annex 1 of the German *Federal Ordinance on the Conservation of Species* (Bundesartenschutzverordnung), (BartSchV) 1989, (as of last amendment of 1997).
- FR** P = full protection in one or more regions of France; R = partially protected, collection is restricted everywhere in France; L = protection at department level.
- ES** A = protected in Andalusia, according to *Decret 104/94*; A97 = protected in Andalusia, according to *Order of 2 June 1997*; As = protected in Asturias, according to *Decret 65/95*; Ar = protected in Aragón, according to *Decret 49/1995*; B = Balearics, *Decret 24/1992*; C = protected in Cataluña, according to *Decret 328/1992*; M = protected according to *Decret 18/92*; Mu = protected in Murcia, according to *Order of 17 February 1989*; N = protected according to national law 4/89; V = protected in Valencia, according to *Order of 20 December 1985*. The number following the letter indicates the number of the relevant annex (1-4).

- BG** P = total prohibition of collection, trade, and processing of wild plants, for commercial purposes; R = restrictions on collecting, trade, and processing of wild plants, for commercial purposes (quota system); E = prohibition of export; + = protected according to *Nature Protection Law* of 1967 and the *Ordinance of Species Conservation, No. 718* of 1989 and its amendments;
- HU** A + indicates protection according to the species protection law in Hungary, (1982. III.15.), amended in 1988 and in 1996 (15/1996, VII.26., *KTM decree*); ++ = afforded the highest degree of protection according to the law;
- TR** A + indicates that a species's is subject to regulations for collection, production and export of natural flower bulbs, issued in 1989 (*Official Gazette No. 20059*), and its amendments;
- IUCN** A letter in this column denotes the IUCN category of threat for a species, according to Walter and Gillett (1998).
- Deg. of threat** Codes in this column are ISO codes for countries, coupled with IUCN threat category codes. The codes denote those countries which list the species in question in their national Red Data Book or Red List. The codes used show the degree of threat for the species in the Red Data Book/Red List of the countries preceding it. Many of the IUCN codes given here correspond to old IUCN threat categories. *Source:* (WCRC, 1998).
- Remarks** Information, if not otherwise stated is sourced for Hungary from Németh (1997); for Spain from (Blanco and Breaux, 1997) and for Turkey from Özhatay *et al.* (1997).

## Annex 2

### Excerpt from the Harmonised Commodity Description and Coding System (HS), tariff heading 12.11.

Section II  
12.09/11,

- (g) Seeds and fruit which are themselves of a kind used primarily in perfumery, in pharmacy, or for insecticidal, fungicidal or similar purposes (heading 12.11).
- (h) Locust beans (heading 12.12).

#### 12.10 - HOP CONES, FRESH OR DRIED, WHETHER OR NOT GROUND, POWDERED OR IN THE FORM OF PELLETS; LUPULIN.

1210.10 - Hop cones, neither ground nor powdered nor in the form of pellets

1210.20 - Hop cones, ground, powdered or in the form of pellets; lupulin

**Hop cones** are the scaly cone-like catkins or flowers of the hop plant (*Humulus lupulus*). They are used mainly in the brewing industry to give flavour to the beer, but they are also used for medicinal purposes. The cones fall in this heading whether fresh or dried and whether or not ground or powdered or in the form of pellets (i.e., agglomerated either directly by compression or by the addition of a binder in a proportion not exceeding 3 % by weight).

**Lupulin** is a yellow resinous powder which covers the hop cones and contains the bitter, aromatic principle which gives hops their characteristic properties. It is used in brewing as a partial substitute for hops and in medicine. It may be separated from the hops mechanically after drying.

The heading excludes :

- (a) Extract of hops (heading 13.02).
- (b) Spent hops (heading 23.03).
- (c) The essential oil of hops (heading 33.01).

#### 12.11 - PLANTS AND PARTS OF PLANTS (INCLUDING SEEDS AND FRUITS), OF A KIND USED PRIMARILY IN PERFUMERY, IN PHARMACY OR FOR INSECTICIDAL, FUNGICIDAL OR SIMILAR PURPOSES, FRESH OR DRIED, WHETHER OR NOT CUT, CRUSHED OR POWDERED.

1211.10 - Licorice roots

1211.20 - Ginseng roots

1211.90 - Other

This heading covers vegetable products of a kind used primarily in perfumery, in pharmacy or medicine, or for insecticidal, fungicidal, parasiticidal or similar purposes. They may be in the form of whole plants, mosses or lichens, or of parts (such as wood, bark, roots, stems, leaves, flowers, petals, fruits and seeds (other than oleaginous fruits and oil seeds classified in headings 12.01 to 12.07)), or in the form of waste resulting, in the main, from mechanical treatment. They remain in the heading whether fresh or dried, whole, cut, crushed, ground or powdered or (where appropriate) grated or hulled. Products of this heading impregnated with alcohol remain classified here.

Plants and parts (including seeds and fruits) of trees, bushes, shrubs or other plants are classified here if of a kind used directly for the purposes specified above or if used for the production of extracts, alkaloids or essential oils suitable for those purposes. On the other hand, the heading excludes seeds and fruits of a kind used for the extraction of fixed oils; these fall in headings 12.01 to 12.07 even if the oils are to be used for the purposes mentioned in this heading.

It should also be noted that vegetable products more specifically described in other headings of the Nomenclature are excluded from this heading, even if they are suitable for use in perfumery, pharmacy, etc., e.g. : citrus fruit peel (heading 08.14); vanilla, cloves, aniseed, badian and other products of Chapter 9; hop cones (heading 12.10); chicory roots of heading 12.12; natural gums, resins, gum-resins and oleoresins (heading 13.01).

Live chicory plants and roots and other live seedling plants, bulbs, rhizomes, etc., clearly intended for planting, and flowers, foliage, etc., for ornamental purposes, fall in Chapter 6.

It should be noted that woods of a kind used primarily in perfumery, in pharmacy or for insecticidal, fungicidal or similar purposes are classified in this heading only if in chips, in shavings or in crushed, ground or powdered form. In other forms, such wood is excluded (Chapter 44).

Certain plants or parts of plants (including seeds or fruits) of this heading may be put up (e.g., in sachets) for making herbal infusions or herbal "teas". Such products consisting of plants or parts of plants (including seeds or fruits) of a single species (e.g., peppermint "tea") remain classified in this heading.

However, the heading excludes such products consisting of plants or parts of plants (including seeds or fruits) of different species (whether or not incorporating plants or plant parts of other headings) or consisting of plants or parts of plants of a single or of different species mixed with other substances, such as one or more plant extracts (heading 21.06).

It should also be noted that the following products fall in headings 30.03, 30.04, 33.03 to 33.07 or 38.08, as the case may be:

- (a) Products of this heading, unmixed, but put up in measured doses or in forms or packings for retail sale, whether for therapeutic or prophylactic purposes, or put up for retail sale as perfumery products or as insecticidal, fungicidal or similar products.
- (b) Products which have been mixed for use for the purposes described in (a) above.

However, the classification of vegetable products in this heading, by virtue of their being used primarily in pharmacy, does not necessarily imply that they may be regarded as medicaments of heading 30.03 or 30.04 when they are mixed, or unmixed but put up in measured doses or in forms or packings for retail sale. While the term "medicaments" within the meaning of heading 30.03 or 30.04 refers only to products which have therapeutic or prophylactic uses, the broader term "pharmacy" has reference both to medicaments and to products having no therapeutic or prophylactic uses (e.g., tonic beverages, fortified foods, blood-grouping reagents).

The heading also excludes the following products of a kind used either directly for flavouring beverages or for preparing extracts for the manufacture of beverages:

- (a) mixtures consisting of different species of plants or parts of plants of this heading (heading 21.06);
- (b) mixtures of plants or parts of plants of this heading with vegetable products falling in other Chapters (e.g., Chapters 7, 9, 11) (Chapter 9 or heading 21.06).

The following products are included in the heading:

- Aconite (*Aconitum napellus*): roots and leaves.
- Ambrette (musk) (*Hibiscus abelmoschus*): seeds.
- Angelica (*Archangelica officinalis*): roots and seeds.
- Angostura (*Galipea officinalis*): bark.
- Araroba (*Andira araroba*): powder.
- Arnica (*Arnica montana*): roots, stems, leaves and flowers.
- Basil (*Ocimum basilicum*): flowers and leaves.
- Bearberry (*Uva ursi*): leaves.
- Belladonna (*Atropa belladonna*): herbs, roots, berries, leaves and flowers.
- Boldo (*Peumus boldus*): leaves.
- Borage (*Borago officinalis*): stems and flowers.
- Bryony (*Bryonia dioica*): roots.
- Buchu (*Barosma betulina*, *Barosma serratifolia* and *Barosma crenulata*): leaves.
- Buckbean (*Menyanthes trifoliata*): leaves.
- Burdock (*Arctium lappa*): Seeds and dried roots.
- Calabar (*Physostigma venenosum*): beans.
- Calamus (*Acorus calamus*): roots.
- Calumba (*Jateorhiza palmata*): roots.
- Cannabis (*Cannabis sativa*): herbs.
- Cascara sagrada (*Rhamnus purshiana*): bark.
- Cascarilla (*Croton eluteria*): bark.
- Cassia (*Cassia fistula*): pods and unpurified pulp. (Purified cassia pulp (aqueous extract) is classified in heading 13.02.)
- Centauria (*Erythraea centaurium*): herbs.
- Cevadilla (Sabadilla) (*Schoenocaulon officinale*): seeds.
- Chamomile (*Matricaria chamomilla*, *Anthemis nobilis*): flowers.



*Chenopodium* : seeds.  
Cherry : stalks.  
Cherry laurel (*Prunus laurocerasus*) : berries.  
Cinchona : bark.  
Clove (*Caryophyllus aromaticus*) : bark and leaves.  
Coca (*Erythroxylon coca* and *Erythroxylon truxillense*) : leaves.  
Cocculus indicus (Indian berry) (*Anamirta paniculata*) : fruit.  
Cocillana (*Guarea rusbyi*) : bark.  
Colchicum (*Colchicum autumnale*) : corms and seeds.  
Colocynth (*Citrullus colocynthis*) : fruit.  
Comfrey (*Symphytum officinale*) : roots.  
Condurango (*Marsdenia condurango*) : bark.  
Couchgrass (*Triticum*) (*Agropyrum repens*) : roots.  
Cubé (barbasco or timbo) (*Lonchocarpus nicou*) : bark and roots.  
Cubeb (*Cubeba officinalis* Miquel or *Piper cubeba*) : powder.  
Damiana (*Turnera diffusa*) : leaves.  
Dandelion (*Taraxacum officinale*) : roots.  
Datura metel : leaves and seeds.  
Derris (or tuba) (*Derris elliptica* and *Derris trifoliata*) : roots.  
Digitalis (*Digitalis purpurea*) : leaves and seeds.  
Elder (*Sambucus nigra*) : flowers and bark.  
Ephedra (Mahuang) : stems and branches.  
Ergot of rye.  
Eucalyptus (*Eucalyptus globulus*) : leaves.  
Frangula : bark.  
Fumitory (*Fumaria officinalis*) : leaves and flowers.  
Galangal (*Alpinia officinarum*) : rhizomes.  
Gentian (*Gentiana lutea*) : roots.  
Ginseng (*Panax quinquefolium* and *Panax ginseng*) : roots.  
Golden seal (*Hydrastis*) (*Hydrastis canadensis*) : roots.  
Guaiaicum (*Guaiaicum officinale* and *Guaiaicum sanctum*) : wood.  
Hamamelis (witch hazel) (*Hamamelis virginiana*) : bark and leaves.  
Hellebore (*Veratrum album* and *Veratrum viride*) : roots.  
Henbane (*Hyoscyamus*) (*Hyoscyamus niger*) : roots, seeds and leaves.  
Horehound (*Marrubium vulgare*) : herbs and stems.  
Hyssop (*Hyssopus officinalis*) : flowers and leaves.  
Ipecacuanha (*Cephaelis ipecacuanha*) : roots.  
Ipomoea (*Ipomoea orizabensis*) : roots.  
Jaborandi (*Pilocarpus jaborandi* and *Pilocarpus microphyllus*) : leaves.  
Jalap (*Ipomoea purga*) : roots.  
Lavender (*Lavandula vera*) : flowers and herbs.  
Leptandra (*Veronica virginica*) : roots.  
Linaloe (*Bursera delpechiana*) : wood.  
Linden (*Tilia europaea*) : flowers and leaves.  
Liquorice (*Glycyrrhiza glabra*) : roots.  
Lobelia (*Lobelia inflata*) : herbs and flowers.  
Long pepper (*Piper longum*) : roots and underground stems.  
Male fern (*Dryopteris filix-mas*) : root.  
Mallow (*Malva silvestris* and *Malva rotundifolia*) : leaves and flowers.  
Mandrake : roots or rhizomes.  
Marjoram (see " Wild marjoram " below).  
Marshmallow (*Althaea officinalis*) : flowers, leaves and roots.  
Melissa (*Melissa officinalis*) : leaves, flowers and tops.  
Mint (all species).



A variety of products made from medicinal and aromatic plants on sale in a German pharmacy

Credit: D. Lange

## Section II

### 12.11<sub>4</sub>

- Mousse de chêne (oak moss) (*Evernia furfuracea*) (a lichen).  
Mugwort (*Artemisia vulgaris*) : roots.  
Nux vomica (*Strychnos nux-vomica*) : seeds.  
Orange tree (*Citrus aurantium*) : leaves and flowers.  
Orris (*Iris germanica*, *Iris pallida* and *Iris florentina*) : roots.  
Pansy : flowers.  
Patchouli (*Pogostemon patchouli*) : leaves.  
Peppermint (see mint).  
Pine : buds.  
Plantago psyllium : herbs and seeds.  
Podophyllum (*Podophyllum peltatum*) : roots or rhizomes.  
Poppy (*Papaver somniferum*) : heads (unripe, dried).  
Pulsatilla (*Anemone pulsatilla*) : herbs.  
Pyrethrum (*Chrysanthemum cinerariaefolium*) : leaves, stems and flowers.  
Pyrethrum (*Anacyclus pyrethrum*) : roots.  
Quassia (*Quassia amara* and *Picraena excelsa*) : wood and bark.  
Quince : seeds.  
Rhatany (*Krameria triandra*) : roots.  
Rhubarb (*Rheum officinale*) : roots.  
Rose : flowers.  
Rosemary (*Rosmarinus officinalis*) : herbs, flowers and leaves.  
Rue (*Ruta graveolens*) : leaves.  
Sage (*Salvia officinalis*) : leaves and flowers.  
St. Ignatius beans (*Strychnos ignatii*).  
Sandalwood : chips (white and yellow).  
Sarsaparilla (*Smilax*) : roots.  
Sassafras (*Sassafras officinalis*) : bark, roots and wood.  
Scammony (*Convolvulus scammonia*) : roots.  
Senega (*Polygala senega*) : roots.  
Senna (*Cassia acutifolia* and *Cassia angustifolia*) : pods and leaves.  
Slippery elm (*Ulmus fulva*) : bark.  
Solanum nigrum.  
Squill (*Urginea maritima*, *Urginea scilla*) : bulbs.  
Stramonium (*Datura stramonium*) : leaves and tops.  
Strophanthus (*Strophanthus kombe*) : seeds.  
Tansy (*Tanacetum vulgare*) : roots, leaves and seeds.  
Tonka (tonquin) (*Dipterix odorata*) : beans.  
Valerian (*Valeriana officinalis*) : roots.  
Verbascum (mullein) (*Verbascum thapsus* and *Verbascum phlomoides*) : leaves and flowers.  
Verbena : leaves and tops.  
Veronica (*Veronica officinalis*) : leaves.  
Viburnum (*Viburnum prunifolium*) : root bark.  
Violets (*Viola odorata*) : roots and dried flowers.  
Walnut : leaves.  
Wild marjoram (*Origanum vulgare*); sweet marjoram (*Majorana hortensis* or *Origanum majorana*) is excluded (Chapter 7).  
Woodruff (*Asperula odorata*) : herbs.  
Wormseed (*Artemisia cina*) : flowers.  
Wormwood (*Artemisia absinthium*) : leaves and flowers.  
Yohimba (*Corynanthe johimbe*) : bark.

The botanical names in the list above (which is **not exhaustive**) are given to assist in the identification of the plants. Mention of the botanical name of a particular species does not necessarily indicate that other species of the same plant family are not classified in the heading.

Certain products of this heading, which are regarded as narcotic drugs under international instruments, are indicated in the list which appears at the end of Chapter 29.

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