

*Full Length Research Paper*

# Conservation and sustainable wild-collection of medicinal and aromatic plants in Köprülü Kanyon National Park, Turkey

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**This research was carried out to determine trends in the conservation and sustainable wild-collection of medicinal and aromatic plants (MAPs) in Köprülü Kanyon National Park located in Turkey. Within this context, various types of MAPs harvested from the wild for commercial and non-commercial purposes were investigated. In addition; marketing mechanisms of the species in trade were investigated. The research comprised surveys, interviews various stakeholder, investigations of market trends, and collection of field data on the selected MAPs. The results of the research indicate that 20 MAPs are commonly collected from the wild for commercial (e.g. generation of income) and non-commercial (e.g. food and drinks) reasons in the national park. The results of the marketing mechanism show that the marketing structure includes two chains (middlemen and trade companies) between collectors and consumers. Considering the volume of harvest and average prices of MAPs at collection levels, it was estimated that 471.80 tonnes of MAPs was harvested, and US\$ 263,930 cash income was generated in the national park in 2005.**

**Key words:** Medicinal and aromatic plants, wild-collection, conservation, sustainable use, Turkey.

## INTRODUCTION

Medicinal and aromatic plants (MAPs) have provided significant goods and services (e.g. food, traditional medicine, and soil stabilization) for human well-being from prehistoric times up to the present. For example, the World Health Organization (WHO) (2002) points out that the majority of the world's population, particularly in developing countries, still depends on traditional medicine systems for the primary healthcare needs based on MAPs. Thus, MAPs have been important particularly for landless poor people and/or fragile groups such as children and women to generate cash income to lift their lives out of poverty; for example, the findings of Larsen and Smith (2004); Bussmann and Sharon (2009); Olsen (1998); Helle and Carsten (2007) show that MAPs are the major source of income generation for many local poor communities in Nepal, Peru and the Central Himalayas.

Within this context, Köprülü Kanyon National Park from Turkey can serve as an instructive case study.

According to the national forest law No. 6831, Köprülü Kanyon was designated as a national park on 12<sup>th</sup> December, 1973 due to its outstanding natural and geomorphologic features as well as cultural assets (Antalya Orman Bölge Müdürlüğü, 1993). The national park comprises the whole range of vegetation zones from thermo-Mediterranean to alpine environment, and the flora therefore is very rich (900 - 1000 species) (Ayaşlıgil, 1987), including about 76 MAPs species (Özçelik et al., 2006). Because of these merits, the area was selected as one of the sites for the "Biodiversity and Natural Resource Management Project" financed by the Global Environmental Facility (GEF) (Arandlı, 2002). Local people from eleven villages in Köprülü Kanyon, particularly with the least land and vulnerable groups such as children and women, collect MAPs from the wild for their subsistence and primary healthcare needs, as well as to generate cash income. This present situation supports

**Abbreviation:** MAPs, Medicinal and aromatic plants.

the findings of several scholars (Olsen and Bhattarai, 2005; Hamilton, 2003; Larsen, 2002). However, numerous factors have put at risk the conservation and sustainable wild-collection of the species in the national park. Major factors include limited employment opportunities and insufficient farmland, lack of the management plan and marketing mechanism for the species in trade, conflicts in access rights to MAPs, and insufficient institutional regulation. These are the major constraints that motivated me to conduct this study in Köprülü Kanyon National Park.

The purpose of this study is to determine trends in the conservation and sustainable wild-collection of MAPs in Köprülü Kanyon National Park in Turkey. Objectives of the study include: identification of MAPs harvested from the wild for a variety of purposes and determination of the marketing structure for the species in trade.

It is expected that the results of the study will be useful for decision-makers and those who are responsible for the management of MAPs to promote a better understanding under which conditions the sustainable use of these plants can be achieved in the national park.

## MATERIALS AND METHODS

### Study site

Köprülü Kanyon is located in the western part of the Taurus Mountains between the elevations of 110 and 2500 m on a very heterogeneous geomorphologic structure. It encompasses 37,000 ha and lies 90 km north-east of the city of Antalya (Orman Bakanlığı, 1971). The national park comprises the whole range of vegetation zones from thermo-Mediterranean to alpine environment (Ayaşlıgil, 1987).

### Methods

The method of the study includes a series of stages that are explained below. The relevant data were collected through fieldwork conducted in July 2006. The collected data were analyzed between 2006 and 2007.

#### Selection of pilot sites

Six villages (Eskibeydilli, Çaltepe, Balıbuca, Çukurca, Karabük and Altinkaya) were selected as pilot sites in cooperation with the National park authority to conduct the study. The criteria for the selection of these villages were their proximity to the natural habitats of MAPs, their potential for traditional use of MAPs and their geographical remoteness.

#### Design of survey forms

Two kinds of survey forms were prepared to record data obtained from the heads of the villages and collectors.

#### Interviews with the representatives of the villages

Significant data on MAPs harvested, harvest volume, market prices for the target species at source level and marketing mechanism were obtained from the representatives of the villages. In addition,

the collectors to be interviewed were determined with them, as they are involved in the marketing mechanism of MAPs in the villages.

#### Interviews with collectors

A number of group meetings with the collectors (both male and female), instead of individual interviews, were conducted. The main reason was that group meetings were more effective than one-on-one interviews, as individuals proved more likely, when in a group environment, to discuss on the species collected, modes of use, harvest volume, marketing structure and market prices for the target species at source level.

#### Interpretation of surveys

The data obtained from the surveys were evaluated by combining with observations of group meetings and literature review (Medicinal Plant Specialist Group, 2007; Schippmann et al., 2006).

#### Identification of species

Species samples were collected and identified by using the national park's flora inventory list (Özçelik et al., 2006).

#### Investigation of market trends in MAPs

The market prices of the species at consumer and export levels were obtained from herbalist shops (in the cities of Antalya and Istanbul), trade companies (in the city of Antalya), trade unions (in the cities of Istanbul and İzmir), and Turkey General Export data.

#### Estimation of the economic value of MAPs

The data on the harvest volumes and market prices for the target species at source level were assessed, and thereby the total economic value of MAPs was estimated. In addition, the data on the market prices of the target species at source, export and consumer level were assessed in order to reveal the price differentials between source and consumer level.

## RESULTS AND DISCUSSION

### Diversity and use of MAPs

The results of the surveys conducted in 6 villages show that 20 species of MAPs are generally collected for both commercial and non-commercial purposes in the national park (Table 1). The first 17 species in Table 1 are those harvested for private and commercial reasons. The last 3 species listed under "others" were not mentioned by the collectors, but the data for these species were obtained from the Directorship of Forestry. According to this data (Taşağıl Orman İşletme Müdürlüğü, 2006), a volume of 70,400 kg of rockrose (*Cistus* spp.) species was harvested in the national park in spring 2006 to generate income. Only a number of collectors harvest these species due to the limited amount of demand from a few companies in the city of Antalya. The results of interviews show that the local people generally collect the species from the wild particularly toward the market demand. In addition, these collectors usually move to the lower parts of the national park or to the city of Antalya in winter

**Table 1.** MAPs used for a variety of purposes in Köprülü Kanyon National Park.

Botanical name	Local name of plants	Parts of plants used	Processing	Type of use	Species used locally (L) and/or marketed (M)	Conservation status (IUCN category)
<i>*Origanum minutiflorum</i> O. Schwarz et. P.H. Davis	Yayla kekiği					LR (nt)
<i>Origanum onites</i> L.	Bilyalı kekik Eşek kekiği			Herbal tea, food flavouring and extraction of oil		
<i>Satureja cuneifolia</i> Ten.	Sivri kekik,					-
<i>Satureja thymbra</i> L.	Aş kekiği, Çorba kekiği					
<i>Salvia tomentosa</i> Miller	Şalba, Ballı, Kabak tıkaçı					
<i>Sideritis condensata</i> Boiss. Heldr. apud Benth	Kedi kuyruğu Kelleli çay, Havaotu	Leaves and branches	Drying	Herbal tea for stomach disorders and heart problems Herbal tea	L, M	LR (cd)
<i>Sideritis stricta</i> Boiss. and Heldr.	Kedi kuyruğu					
<i>Sideritis libanotica</i> Labill. subsp. linearis (Benth) Bornm.	Eşek otu Ada çayı					LR (lc)
<i>Teucrium polium</i> L.	Oğul otu			Herbal tea to reduce stomach ache	L	-
<i>Thymbra spicata</i> L.	Kekik			Food flavouring	L, M	LR (cd)
<i>Laurus nobilis</i> L.	Defne, Tehnel	Leaves	-	Extraction of oil	M	
<i>Ceratonia siliqua</i> L.	Keçi boynuzu, Boynuz, Harnup	Fruits	Crushing and then soaking in water	Traditional Turkish food Pekmez	L, M	
<i>Tilia platyphyllos</i> Scop.	İhlamur	Flowers and leaves		Herbal tea to prevent colds and chest ache	L, M	
<i>Urtica dioica</i> L.	Isırgan			Traditional Turkish food Börek	L	-
<i>Myrtus communis</i> L. subsp. communis	Mersin, Murt, Sazak	Leaves	Drying	Herbal tea	M	
<i>Hypericum scabrum</i> L./ <i>H. perforatum</i> L.	No local name was recorded.	Leaves and branches		Herbal tea to prevent cold and headache	L	
<i>Vitex agnus-castus</i> L.	Hayıt	Leaves		Wetted leaves are put on stomach to reduce stomach ache	L	

Table 1. Contd

Others (The species that were not mentioned by the collectors)					
<i>Hedera helix</i> L.	Sarmaşık	Leaves			
<i>Cistus creticus</i> L.	Karahana, Laden	Leaves and	-	M	-
<i>Cistus salviifolius</i> L.		branches			

According to the National Red Data Book (Ekim et al 2000); Endemic species and their conservation status:

LR: Under "Lower Risk"; cd: "Conservation Dependant"; nt: "Near Threatened"; - : Species are not evaluated by the red list.

\* Most threatened species at national level (Özhatay et al 1997).

season.

Conservation status of MAPs was reviewed to assess the sustainability of the species (see Table 1). Within this context, the following national and international regulations (ratified and/or adopted into the national conservation strategies) were reviewed:

- The National Red Data Book (Ekim et al., 2000) prepared according to the IUCN threat categories;
- The National Regulations for the collection, production and export of natural flower bulbs (1989) (Official Gazette: 24 January, 1989 No. 2059);
- The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES, 2006);
- European Council Directive 92/43/EEC (EC Habitats, Fauna and Flora Directive);
- The Convention on the Conservation of European Wildlife and Natural Habitats (The Bern Convention, 2006).

The results of the assessment show that most of MAPs targeted are not listed in the threat categories of these regulations and conventions. Omission of some of MAPs species (e.g. oregano/kekik) may indicated lack of information and/or assessment. However, some of species such as oregano/kekik need conservation action.

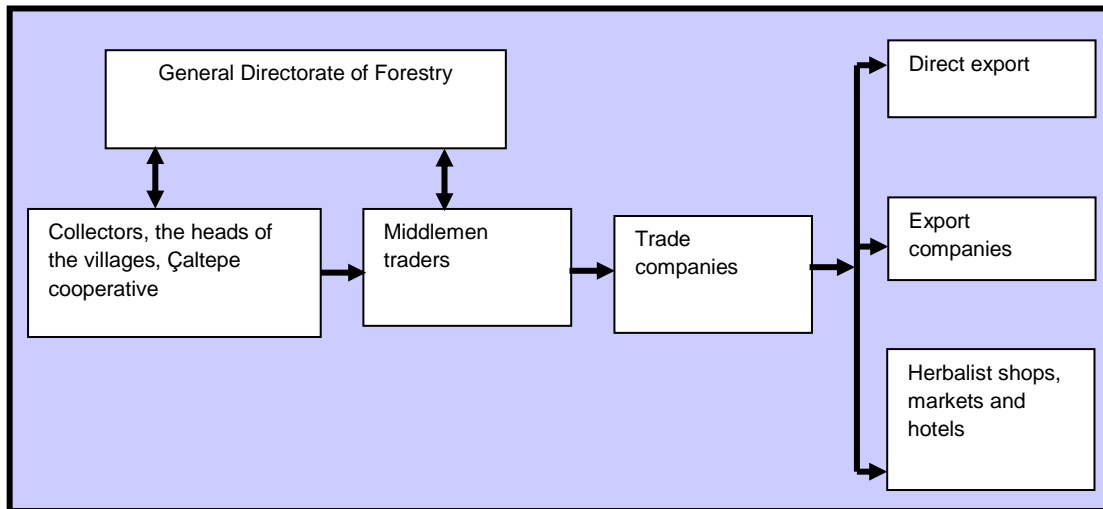
For example, the data on the harvest volumes show that 249 tonnes of oregano/kekik was harvested in the 6 villages in 2005. In addition, Lange (2002) emphasizes that huge amounts of plant material collected each year have massive impacts on the populations of *Origanum minutiflorum* O. Schwarz and P.H. Davis. Therefore, there is a need to determine "collection intensity and regeneration level of the target species" (Criterion 1.3 of the Principle 1 of the International Standard for sustainable Wild Collection of MAPs: ISSC-MAP) and to identify "sensitive taxa and habitats" (Criterion 2.1 of the Principle 1 of the ISSC-MAP). Afterwards, appropriate conservation measures such as annual harvest quotas can be fixed and implemented to regulate the wild-collection of MAPs.

### Marketing of MAPs

The wild-collection of non-timber forest products in the State lands is regulated through licensing according to the Forest Law No. 6831 (items 37 and 40) in Turkey (Özhatay et al., 1997). Thus, the wild-collection of MAPs is conducted entirely legal in the national park. The collectors pay a fee to the General Directorate of Forestry for licensing the plant material harvested. The marketing structure of MAPs in the national park was determined

through interviews with the target groups (National Park Authority, collectors, representatives of the villages and trade companies in the city of Antalya). The results of the survey revealed that the marketing structure contains two chains (middlemen and trade companies) between collector and consumer levels (Figure 1). The representatives of the villages have significant role in the marketing structure through obtaining permission for harvesting from the National Park Authority, negotiating with middlemen traders (from nearby regions) on the market prices, and marketing the plant material of their villages. The cooperative of Çaltepe conducts this role in the village of Çaltepe. Afterwards, middlemen traders pay a fee (about US\$ 0.42 per kg) to the General Directorate of Forestry for transporting the plant material outside of the national park and a fee (about US\$ 0.33 per kg) to the representatives of the villages for their mediatory role with the collectors.

This fee is usually used for the needs of the villages. The middlemen traders generally sell the plant material to other trade companies located in the city of Antalya where the plant material is operated on three ways: directly exported; traded to another export company, processed and sold as herbal products (e.g. spices and essential oils). The assessment of the marketing structure revealed that market prices are often decided by



**Figure 1.** The marketing structure of MAPs in Köprülü Kanyon National Park.

**Table 2.** Average prices of MAPs at source, export and consumer levels.

Botanical name of plant	Average prices of MAPs at collector, export, and consumer levels (US\$/kg)			Harvest volume (Tonnes)	Value of trade (US\$)
	Collector	*Export	Consumer		
<i>Oreganum</i> (Kekik) species	0.66	1.30	10	249	164,340
<i>Ceratonia siliqua</i> L.	0.50	4.47	2	90	45,000
** <i>Myrtus communis</i> L.	0.30	-	12	100	30,000
<i>Salvia spp.</i> species	0.69	2.83	9	21	14,490
<i>Sideritis spp.</i> species				8	5,520
<i>Tilia platyphyllos</i> Scop.	4.00	7.15	28	0.8	3,200
<i>Laurus nobilis</i> L.	0.46	2.56	10	3	1,380
Total				471.80	263,930

\*Average prices of export are based on the data from the trade unions [İstanbul İhracatçıları Birliği (2005), Ege İhracatçıları Birliği (2006), and Türkiye İhracatçıları Birliği (2004 and 2005)].

\*\* Export data for *Myrtus communis* L. could not be found.

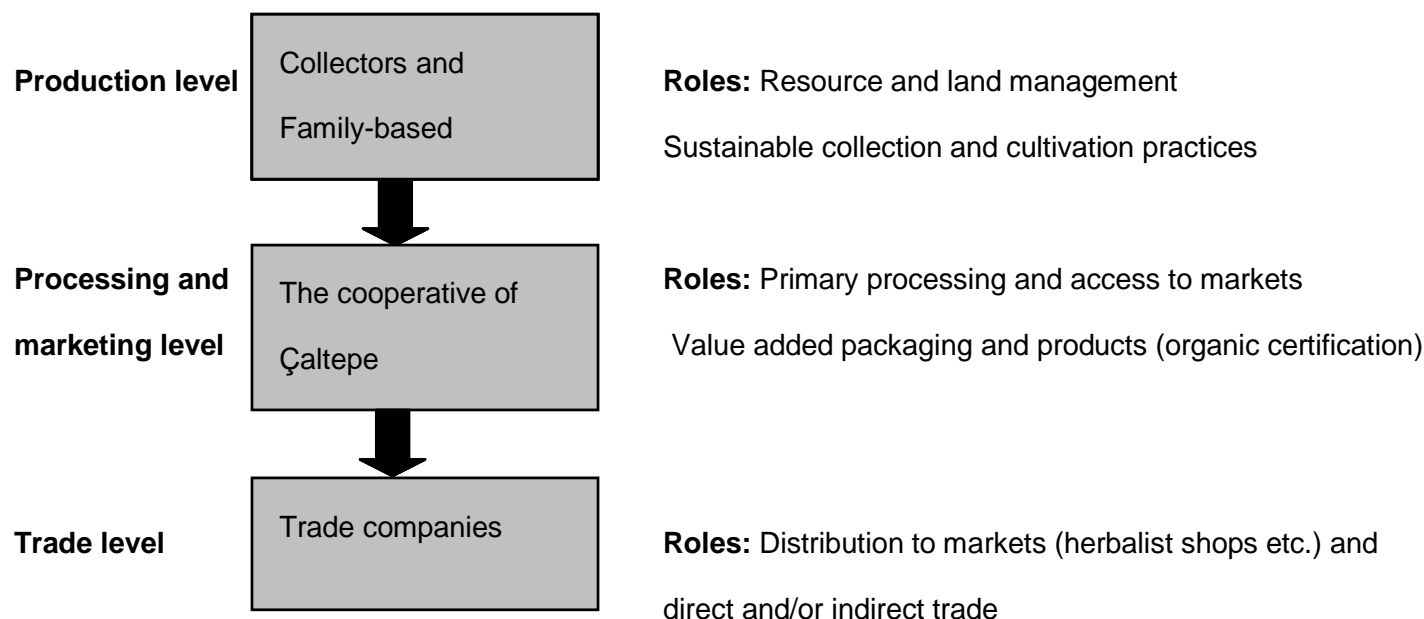
the middlemen traders as the representatives of the villages and collectors have inadequate information about the real market prices of the species. This situation has led to monopolization of the marketing of MAPs by a few local middlemen traders. This opinion supports the finding of Helle and Carsten (2007).

Considering the volume of harvest and the average prices of MAPs obtained from the collectors, it was estimated that a volume of 471.80 tonnes of MAPs was harvested from the wild and US\$ 263,930 cash income was generated in the target villages in 2005. In addition, the domestic and export prices of MAPs were collected in three major cities (Antalya, İzmir, and İstanbul) and the average economic value of the species (US\$/kg) at collector, export, and consumer levels was determined (Table 2). It was difficult to obtain precise information from the export companies as they usually hesitated to

share the information. Therefore, the lack of market transparency emerges as a factor that adversely affects the market prices at the collector level.

The price differentials between the collector and consumer levels show that middlemen, trade, and export companies generate a significant amount of income from the marketing of MAPs. The price differential is a failure that may derive from the absence of marketing mechanism and management plan for the target species. Therefore, an appropriate marketing mechanism is needed to enhance rural livelihoods and conserve the target species. This can be realized through putting the middlemen out of the mechanism (Figure 2).

Each part of the trade chain has its merits. However, the present marketing mechanism is ineffective to improve the marketing skills and bargaining power of the collectors and also to provide viable and sustainable



**Figure 2.** The model of marketing mechanism proposed for trading MAPs.

income generation to the local communities. For that reason, it is considered that the community-based cooperative of Çaltepe can take an important role in the marketing of MAPs. The cooperative was established recently to process, package and market the target species. The leading role of the cooperative can contribute to adding value to products, providing market transparency and stability, setting up a regulatory mechanism for the wild-collection of MAPs and improving the local livelihoods in the national park.

## Conclusion

There is a growing demand for MAPs at the global level (Hamilton, 2003; Schippmann et al., 2006). Therefore, conservation and sustainable use of these species are necessary to meet the needs of present and future generations. Within this context; various development and research actions have been attempted by the governmental agencies, national and international conservation as well as development organizations to find solutions so that these species can be harvested and used in a sustainable manner (Karki et al., 2003). For example; the Medicinal Plant Specialist Group (2007) developed an international regulations and standards for conservation and sustainable use of MAPs. Adoption of this regulation into national conservation strategies in Turkey can be a challenge for strengthening institutional frameworks for the conservation and sustainable wild-collection of MAPs at the national level. In addition; establishment of an advisory committee and development of a legal regula-

tion at the national level should be supported to contribute to establishing a legal framework, strengthening *in situ* and *ex situ* conservation, and giving more authority to peripheries.

Responsible marketing practices such as certification should be designed and implemented to minimize the price differentials between the collector and consumer levels. This opinion supports the findings of Bussmann and Sharon (2009). Within this context; Schippmann et al (2006) point out that sustainable harvesting of MAPs from the wild is difficult to achieve; therefore, certification standards can play a role to assure that a product meets certain standards of sustainability.

A management plan for the target species in trade should be designed and implemented to limit the harvest of the species to a sustainable level. The International Standards developed by Medicinal Plant Specialist Group (2007) can be an effective tool in terms of helping the National Park Authority to design and implement the management plan for the species targeted. In addition; the indicated standards can be helpful for developing a comprehensive monitoring mechanism in the framework of the management plan. Thus, periodic data on the populations of the target species and their habitats can be collected. Such data would be a feedback into the management plan to fix annual harvest quotas and thereby measuring whether the wild-collection is sustainable. On the other hand, traditional knowledge on the species identified should be recognized and respected in the management plan to regulate the wild-collection of MAPs. This idea supports the findings of Cetinkaya (2009).

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## REFERENCES

- Antalya Orman Bölge Müdürlüğü (1993). Amenajman Plan of Köprülü Kanyon National Park (1984-93). Antalya: Unpublished report. (In Turkish).
- Arancli S (2002). Biodiversity and natural resource management in Turkey. In: the international conference on the environmental connectivity: Protected areas the Mediterranean Context. 26-28 September, Malaga.
- Ayaşlıgil Y (1987). Der Köprülü Kanyon Nationalpark-Seine Vegetation und ihre Beeinflussung durch den Menschen. Techn. Universität München-Weihenstephan [PhD Dissertation]. (in German).
- Bussmann RW, Sharon D (2009). Markets, healers, vendors, collectors: The sustainability of medicinal plant use in Northern Peru. *Mountain Res. Dev.*, 29(2): 128-134.
- Cetinkaya G (2009). Challenges for the maintenance of traditional knowledge in the satoyama ecosystems, Noto Peninsula, Japan. *The J. Hum. Ecol. Rev.*, 16(1): 27-40.
- Convention on the Conservation of European Wildlife and Natural Habitats (The Bern Convention) (2006). URL: <http://europa.eu/scadplus/leg/en/lvb/l28050.htm>. Cited 12 Sep
- Convention on International Trade in Endangered Species of wild Fauna and Flora (CITES) (2006). Cited 6 Oct.
- Ege İhracatçılar Birliği (2006). Herbal export report of the Ege Export Company of Forest and Herbal Products., (Statistical data on herbal products). İzmir: (in Turkish).
- Ekim T, Koyuncu M, Vural M, Duman H, Aytaç Z, Adıgüzel N (2000). Red data book of Turkey (Pteridophyta and Spermatophyta). Turkish Association for the Conservation of Nature. Ankara: (in Turkish)
- European Council Directive 92/43/EEC (EC Habitats, Fauna and Flora Directive) (2007). [http://ec.europa.eu/environment/nature/nature\\_conservation/eu\\_nature\\_legislation/habitats\\_directive/index\\_en.htm](http://ec.europa.eu/environment/nature/nature_conservation/eu_nature_legislation/habitats_directive/index_en.htm). Cited 10 Jan.
- Hamilton A (2003). Medicinal plants and conservation: issues and approaches. WWF-UK. URL: <http://www.wwf.org.uk/filelibrary/pdf/medplantsandcons.pdf>. Cited 18 Jan 2009.
- Helle L, Carsten O (2007). Unsustainable collection and unfair trade? Uncovering and assessing assumptions regarding Central Himalayan medicinal plant conservation. *Biodiversity Conserv.*, 16(3): 1679-1697.
- İstanbul İhracatçılar Birliği (2005). Statistical report of export in 2005 (Export data in 2005). İstanbul (in Turkish)
- Karki M, Tiwari B, Badoni A, Bhattarai (2003). Creating livelihoods enhancing medicinal and aromatic plants based biodiversity-rich production systems: Preliminary lessons from South Asia. Presented at the 3th World Congress on Medicinal and Aromatic Plants for Human Welfare (WOCMAP III), 3-7 February 2003, Chiang Mai, Thailand.
- Larsen HO (2002). Commercial medicinal plant extraction in the hills of Nepal: local management system and ecological sustainability. *Environ. Manage.*, 29(1): 88-101
- Larsen HO, Smith PD (2004). Stakeholder perspectives on commercial medicinal plant collection in Nepal. *Mountain Res. Dev.*, 24(2): 141-148
- Lange D (2002). The role of east and southeast Europe in the medicinal and aromatic plant's trade. Newsletter of Medicinal Plant Conservation (IUCN). Volume 8. Available via IUCN. [http://www.iucn.org/themes/ssc/ssg/mpsg/news\\_download/mpc8.pdf](http://www.iucn.org/themes/ssc/ssg/mpsg/news_download/mpc8.pdf).
- Medicinal Plant Specialist Group (2007). International standard for sustainable wild collection of medicinal and aromatic plants (ISSC-MAP). Version 1.0. Bundesamt für Naturschutz (BfN), MSPG/SSC/IUCN, WWF Germany, and TRAFFIC, Bonn, Gland, Frankfurt, and Cambridge (BfN-Skripten 195).. [http://www.floraweb.de/proxy/floraweb/MAP-pro/Standard\\_Version1\\_0.pdf](http://www.floraweb.de/proxy/floraweb/MAP-pro/Standard_Version1_0.pdf).
- Official Gazette (2004). Law on the collection, production and export of natural flower bulbs. 24 August No.25563.
- Olsen CS (1998). The trade in medicinal and aromatic plants from central Nepal to northern India. *Econ. Bot.*, 52(3): 279-292.
- Olsen CS, Bhattarai N (2005). A typology of economic agents in the Himalayan plant trade. *Mountain Res. Dev.*, 25(1): 37-43.
- Orman Bakanlığı (1971). The long-term development plan of Köprülü Kanyon National Park. Ankara (in Turkish).
- Özçelik H, Deligöz A, Fakir H, Tanrıverdi F (2006). The study of inventory flora of Koprulu Canyon National Park (Antalya-Isparta). GEF- II Project final report.
- Özhatay N, Koyuncu M, Atay S, Byfield A (1997). The wild medicinal plant trade in Turkey. Doğal Hayatı Koruma Derneği (DHKD); İstanbul, Turkey.
- Schippmann U, Leaman D and Cunningham AB (2006). "A comparison of cultivation and wild collection of medicinal and aromatic plants under sustainability aspects". J. Springer 2006. [http://library.wur.nl/frontis/medicinal\\_aromatic\\_plants/06\\_schippmann.pdf](http://library.wur.nl/frontis/medicinal_aromatic_plants/06_schippmann.pdf)
- Taşagül Orman İşletme Müdürlüğü (2006). The 2006 statistic data of the General Directorate of Forestry; Antalya (in Turkish).
- Türkiye İhracatçılar Birliği (2004). General export data of Turkey in; Ankara (in Turkish).
- Türkiye İhracatçılar Birliği (2005). General export data of Turkey in 2004; Ankara (in Turkish)
- World Health Organization (WHO) (2002). WHO Traditional Medicine Strategy 2002-2005. Geneva. URL: WHO. [http://whqlibdoc.who.int/hq/2002/WHO\\_EDM\\_TRM\\_2002.1.pdf](http://whqlibdoc.who.int/hq/2002/WHO_EDM_TRM_2002.1.pdf).