

## **MEDICINAL PLANT TRADE AND CONSERVATION STRATEGIES: AN EXPANDING ROLE IN THE DEVELOPMENT OF SOCIETY**

**Altamash Bashir, Mumtaz Majeed, M. A. Khan, K. N. Qaisar and Gowhar Nabi**

Faculty of Forestry, Sher-i-Kashmir University of Agriculture Science and Technology of Kashmir, Shalimar, Kashmir, J&K

### **ABSTRACT**

Medicinal and Aromatic plants have been used for a long time for their medicinal properties and personal hygiene. Due to the increasing demand for medicinal plants, the survival of some of these species may well be under threat. There is serious concern about the continuing loss of medicinal plants and their natural habitats and the loss of local control over natural resources and their management. It has been observed that a large number of medicinal plants are threatened and depleting day by day, hence it becomes inevitable to save endangered herbs from becoming rare or extinct before it is too late. At present, India has about US\$ 1 billion worth of herbal medicine market. The total turn-over of Ayurvedic/herbal products is approximately Rs. 45 billion. The world market value of pharmaceuticals derived from plants used in traditional medicine exceeds US\$ 20 billion. The medicinal plants have ample scope for strengthening and enlargement for realizing local, national and global benefits. A combined approach should be made to encourage greater responsibility from not only the plant trading companies but also the end user companies and the consumers.

**Key words:** Medicinal plants, conservation, constraints, buyers and traders, phyto-medicine

### **INTRODUCTION**

Medicinal plants have attracted considerable interest in recent years. Commercial enterprises and local dwellers are regularly exploiting natural heritage of these medicinal plants. There is an urgent need of conservation of these valuable medicinal plants through cultivation. The high value of some herbal products and the impatience of the general populace to use even substitutes of them, has led to their diminution and some misconception has arisen overtime. High market demand of some species of medicinal and aromatic plants has led to a severe decline in their natural population and has rendered several important ones to the brink of extinction. Over time, with the gradual (and recently, much more rapid) decline in the natural resources and the simultaneous spurt of the economy, the real herbal products were replaced by comparatively easily available substitutes that took on the trade names of the original species (Chandola, 2005). The rapid rate of extinction of medicinal plants combined with rapid loss of indigenous knowledge system has deep potential consequences for human health; hence this paper is presented to highlight various aspects associated with the use, conservation and market structure of medicinal plants in India and the world.

### Indian Scenario

About 70-75% of Indian population is dependent on herbal medicine for primary health care because of its better cultural acceptability, better compatibility with human body and lesser side effects. Availability and cost effectiveness are the reason for its popularity. India is one of the 12 mega biodiversity centers having 45,000 plant species; its diversity is unmatched due to the 16 different agro-climatic zones, 10 vegetative zones, and 15 biotic provinces. The country has a rich floral diversity (Table 1 and 2).

**Table 1. Floral diversity in India**

| Numbers         | Species          |
|-----------------|------------------|
| 15,000 - 18,000 | Flowering plants |
| 23,000          | Fungi            |
| 25,000          | Algae            |
| 1,600           | Lichen           |
| 1,800           | Bryophytes       |
| 30 million      | Microorganisms   |

(Source: Samy and Gopalakrishnakone, 1998)

India is one of the few countries that are capable of producing most of the important plants used both in modern and traditional system of medicine, due to availability of wide variations of climate, soil, altitude and latitude (Lambert *et al.*, 1997). Most of the plants used by the drug industries, especially from high altitudes are harvested from the wild. This has led to the depletion of the resources and extinction of some the species (Nautiyal and Purohit, 2000). To cash in the scenario, while maintaining the gene-pool, a National Medicinal Plants Board has been established under the ministry of health and family welfare (by notification dated 24<sup>th</sup> November 2000). The objectives of the board are to formulate

strategies for conservation, cultivation, proper harvesting, processing, marketing and Research and Development related to medicinal plants. The board has so far identified 32 medicinal plants for commercial cultivation (Table 3).

There are around 600-700 species of medicinal plants used in our country (India), mainly by the indigenous industries. About 150 species are used commercially. At present, India has about US\$ 1 billion worth herbal medicine market of which a meager US\$ 80 million is earned from export. Even of this small amount of export, 80% comprises crude drugs and not the finished products. It is also interesting to know that 80% of sales of crude drug extract categories which mainly includes 150 plants for various formulations whether classical, ethical, or OTC come only from around 20% of medicinal plants whereas 80% of plants contribute only to 20% of sales. Therefore, there is a need to place more emphasis on high valued plants/extracts by way of taking up their cultivation and processing as a priority.

It is worthwhile to note that the export turn-over is around Rs. 1.1 billion in case of herbal extracts and essentials oils alone, whereas another Rs. 1.45 billion is from the drugs with both totaling around Rs. 2.55 billion. The total turn-over of Ayurvedic/herbal products is approximately Rs. 45 billion (Rawat and Garg, 2005).

The trends in the export are encouraging and growing at a faster rate which leads to a continuous up-gradation in the quality of the drugs and has ensured a state of competitiveness for domestic industry while it is globalizing the business. This is proven

**Table 2. Medicinal plants: species diversity and representative species of different biogeographic zones of India (Ved et al., 2001)**

| Biogeographic region | Estimated no. of medicinal plants | Examples of some typical medicinal species   |
|----------------------|-----------------------------------|--|
| Trans Himalayas      | 700                               | <i>Ephedra geradiana</i> Wall., <i>Hippophae rhamnoides</i> L., <i>Arnebia euchroma</i> (Royle) John   |
| Himalayan            | 2500                              | <i>Aconitum heterophyllum</i> Wall. ex Royle, <i>Ferula jaeshkeana</i> Vatke and <i>Saussurea costus</i> (Balc.) Lipsch., <i>Nardostachys grandiflora</i> D.C. <i>Taxus wallichiana</i> Zucc., <i>Rhododendron anthopogon</i> D.Dun and <i>Panax pseudoginseng</i> Wall. |
| Desert               | 500                               | <i>Convolvulus microphyllus</i> Seib ex Spreng., <i>Tecomella undulata</i> (Sm.) Seem., <i>Citrulus colocynthis</i> (L.), Schrader and <i>Cressa cretica</i> L.  |
| Semi-Arid            | 1000                              | <i>Commiphora wightii</i> (Arn.) Bhandari, <i>Caesalpinia bonduc</i> (L.) Roxb., <i>Balanites aegyptiaca</i> (L.), <i>Delilie</i> and <i>Tribulus rajasthanensis</i> Bhandari & Sharma.  |
| Western Ghats        | 2000                              | <i>Myristica malabarica</i> Lam., <i>Garcinia indica</i> (Thou.) Choisy, <i>Utleria salicifolia</i> Bedd and <i>Vateria indica</i> L.  |
| Deccan Peninsula     | 3000                              | <i>Pterocarpus santalinus</i> L.f., <i>Decalepis hamiltonii</i> Wigh & Arn., <i>Terminalia pallida</i> Brandis and <i>Shorea tumbergaia</i> Roxb.  |
| Gangetic Plain       | 1000                              | <i>Holarrhena pubescens</i> (Buch-Ham.) Wall. ex DC., <i>Mallotus philippensis</i> (Lam.) Muell -Arg., <i>Pluchea lanceolata</i> C.B. Clarke and <i>Peganum harmala</i> L.   |
| North-East India     | 2000                              | <i>Aquilaria malaccensis</i> Lam., <i>Smilax glabra</i> Roxb., <i>Ambroma augusta</i> (L.) L.f. and <i>Hydnocarpus hurzii</i> (King) Warb.   |
| Islands              | 1000                              | <i>Claophyllum inophyllum</i> L., <i>Adnanthera pavonina</i> L., <i>Barringtonia asiatica</i> (L.), Kurz and <i>Aisandra butyracea</i> (Roxb.), Baehni.  |
| Coasts               | 500                               | <i>Rhizophora mucronata</i> Lam., <i>Acanthus ilicifolius</i> L., <i>Avicennia marina</i> Vierth and <i>Sonneratia caseolaris</i> (L.) engl.   |

**Table 3. Priority list of medicinal plants identified by National Medicinal Board for commercial cultivation**

| Sr. No. | Species                           | Common name |
|---------|-----------------------------------|-------------|
| 1       | <i>Aconitum heterophyllum</i>     | Atees       |
| 2       | <i>Aconitum ferox</i>             | Vatsnabh    |
| 3       | <i>Aegle maemelos</i>             | Bael        |
| 4       | <i>Andrographis paniculata</i>    | Kalmegh     |
| 5       | <i>Asparagus racemosus</i>        | Shgatavari  |
| 6       | <i>Bacopa monnieri</i>            | Brahmi      |
| 7       | <i>Berberis aristata</i>          | Daruharidra |
| 8       | <i>Cassia angustifolia</i>        | Senna       |
| 9       | <i>Chlorophytum borivillianum</i> | Safed musli |
| 10      | <i>Commiphora wightii</i>         | Guggul      |
| 11      | <i>Coleus barbatus</i>            | Pathurchur  |
| 12      | <i>Emblica officinalis</i>        | Amla        |
| 13      | <i>Saraca asoca</i>               | Ashok       |
| 14      | <i>Withania somnifera</i>         | Ashwagandha |
| 15      | <i>Phyllanthus amar</i>           | Bhumi Amla  |
| 16      | <i>Santalum album</i>             | Chandan     |
| 17      | <i>Swertia chirata</i>            | Chirata     |
| 18      | <i>Tinospora cordifolia</i>       | Giloe       |
| 19      | <i>Gymneme sylvestre</i>          | Gudmar      |
| 20      | <i>Plantago ovate</i>             | Isabgol     |
| 21      | <i>Nardostachys jatamansi</i>     | Jatamanshi  |
| 22      | <i>Gloriosa superb</i>            | Kalihari    |
| 23      | <i>Garcinia indica</i>            | Kokum       |
| 24      | <i>Saussurea costa</i>            | Kuth        |
| 25      | <i>Picrorhiza kurroa</i>          | Kutki       |
| 26      | <i>Solanum nigrum</i>             | Makoy       |
| 27      | <i>Glycyrrhiza glabra</i>         | Mulethi     |
| 28      | <i>Piper longum</i>               | Pippal      |
| 29      | <i>Crocus sativus</i>             | Saffron     |
| 30      | <i>Rowvolfia serpentine</i>       | Sarpagnda   |
| 31      | <i>Ocimum sanctum</i>             | Tulsi       |
| 32      | <i>Embelia ribes</i>              | Vai Vidang  |

by the fact that a lot of scientific work on various aspects of pharmacology, phytochemistry, and clinical experiments are being pursued at the same time. The country has succeeded in exporting parts of plants and in cases, whole plant (Table 4). India's herbal industry has a bright future for exports of medicinal plants and their products. However, to boost exports further, cultivation of the plants of superior quality must be taken up. In addition, it is necessary to educate the farmers and provide superior quality plants to them and their products must also be procured at reasonable prices.

#### **World Scenario**

Botanists believe that from 35,000 to 70,000 plant species are used throughout the world as medicine, most of them growing in tropical forests. And in the U.S. there are at least 120 widely used prescription drugs made from 95 species of plants, 39 of which are originally from the rainforests.

The trade in herbal medicine is estimated at several billion dollars. The world market value of pharmaceuticals derived from plants used in traditional medicine exceeds US\$ 20 billion. The size of the European Union (EU) herbal market in particular has grown substantially in the past 10 years, fuelled by growing awareness and support from consumers increasingly concerned about the environment and the possible side effects of conventional medicines (Rawat and Garg, 2005). In Germany and France, herbal medicine are sold as prescription drugs and covered by National Health Insurance. Germany has published monographs of 300 medicinal plants. China has generated data for the use of 800

medicinal plants. But, Indian figure is dismal with only few monographs and no organized report (Kamboj, 2000). The estimation of total phyto-medicine sale reported in country wise European Union was about US \$6 billion in 1991, of which almost half were sold in Germany \$3 billion, in France \$1.6 billion and in Italy \$0.6 billion. The present global market (Table 5) is said to be US \$250 billion. Herbal drugs are imported by several countries for their usage of traditional medicinal preparation from various parts of the country (Table 6).

#### **Role of World Health Organization (WHO) in phyto-medicine/herbals medicine**

There is a renewed interest in medicinal plants all over the world. The World Health Organization (WHO) now has a list of 150 plants that its experts consider therapeutic. World Health Organization (WHO) has shown great interest in documenting the use of medicinal plants used by tribal's from different parts of the world. Many developing countries have intensified their efforts in documenting the ethno-medical data on medicinal plants. In 1991, WHO developed guidelines for the assessment of herbal medicine, and the 6th International Conference of Drug Regulatory Authorities held at Ottawa in the same year ratified the same. The salient features of WHO guidelines are:

##### **(1) Quality assessment**

Crude plant materials or plant extract preparation and finished product.

##### **(2) Stability**

Shelf life

**Table 4. Plants exported from India. (Rawat and Gang, 2005)**

| Plant                        | Parts used          |
|------------------------------|---------------------|
| <i>Aconitum spp.</i>         | Root                |
| <i>Acorus calamus</i>        | Rhizome             |
| <i>Adhatoda vasica</i>       | Whole plant         |
| <i>Berberis aristata</i>     | Root                |
| <i>Cassia angustifolia</i>   | Leaf and pod        |
| <i>Colchicum luteum</i>      | Rhizome & seed      |
| <i>Hedychium spicatum</i>    | Rhizome             |
| <i>Heracleum candicans</i>   | Rhizome             |
| <i>Inula racemosa</i>        | Rhizome             |
| <i>Juglans regia</i>         | Bark                |
| <i>Juniperus communis</i>    | Root                |
| <i>Juniperus macropoda</i>   | Fruit               |
| <i>Picrorhiza kurroa</i>     | Root                |
| <i>Plantago ovata</i>        | Seed & husk         |
| <i>Podophyllum hexandrum</i> | Rhizome             |
| <i>Punica granatum</i>       | Flower, Root & Bark |
| <i>Rouwolfia serpentine</i>  | Roots               |
| <i>Rheum emodi</i>           | Rhizome             |
| <i>Saussurea lappa</i>       | Rhizome             |
| <i>Swertia chirata</i>       | Whole plant         |
| <i>Valeriana wallichii</i>   | Rhizome             |
| <i>Zingiber officinalis</i>  | Rhizome             |

**Table 5. Market size of phytomedicine and their sale in US Dollar. (Samay and Gopalakishnakone, 1998)**

| S.No. | Country         | Year | Drugs sale inUS \$ (b) |
|-------|-----------------|------|------------------------|
| 1     | Europe          | 1991 | 6                      |
|       | Germany         |      | 3.0                    |
|       | France          |      | 1.6                    |
|       | Italy           |      | 0.6                    |
|       | Others          |      | 0.8                    |
| 2     | Europe          | 1996 | 10.0                   |
| 3     | USA             | 1996 | 4.0                    |
| 4     | India           | 1996 | 1.0                    |
| 5     | Other Countries | 1996 | 5.0                    |
| 6     | All countries   | 1998 | 30.0-60.0              |

**Table 6. Percentage of herbal drugs imported by various countries for drug preparation (Samay and Gopalakishnakone, 1998)**

| Country     | Percentage of herbal drugs imported |
|-------------|-------------------------------------|
| China       | 45%                                 |
| USA         | 15.6%                               |
| Australia   | 10.5%                               |
| India       | 3.7%                                |
| South Korea | 1.4%                                |
| Taiwa       | 1.7%                                |
| Indonesia   | 8.1%                                |

**(3) Safety assessment**

Documentation of safety based on experience and toxicological studies.

**(4) Assessment of efficacy**

Documented evidence of traditional use and activity determination (Animals and human).

**Biotechnological Importance**

Biological, diagnostics, and therapeutics, have a growing market reaching US\$ 2,000 million profit for recombinant human growth hormones and US\$ 6,000 million for therapeutics and diagnostics antibodies. Global expenditure on vaccines touches \$10 billion every year, indicating the vast potential for vaccine development initiatives. In this direction creation of vaccine plants by cloning the antigenic genes in edible plants, generating edible vaccines will be potential area for future sustainability. Biotechnology derived products no doubt offer a great potential to the society towards improving health care that too without compromising with the environment. The medicinal plants have ample scope for strengthening and

enlargement for realizing local, national and global benefits (Rawat and Garg, 2005).

**Socio-economic Perspective**

The use of medicinal plants in meeting family's health care and nutritional needs is traditional and embedded in all cultures. Medicinal plants are socially acceptable and provide employment opportunities for women. Traditionally, women have been the mainstays of medicinal plant-based micro enterprises because medicinal plant products easily fit within average daily schedule of women. These typically include medicinal plant raw materials being collected, dried and transported to the market and also trained women employed by Herbal Drug Industry. Many traditional healers have been running medicinal and aromatic plant based health care system as a traditionally continuing family business. Such industries not only strengthen the social fabric, but also preserves the traditional knowledge and offers easily adaptable enterprising opportunities for children who can learn the trade from their parents through which they can earn their livelihood into the future.

### **Employment Perspective**

If proper values can be added to the traditional medical knowledge-based health and subsistence oriented medicinal plant applications, a large number of jobs can be created in the rural areas. Thus, medicinal plants score high in reconciling the need for job-creation with the limited educational opportunities available to the poor people in job starved places. Not only the plants are in increasing demand by major herbal industries as an essential raw materials of their drugs, but also its collection, production, processing, packaging and transportation requires high labour input. Similarly collection from wild and selective harvesting in addition to primary processing is mostly done manually, and even at the secondary and tertiary levels, medicinal plants have substantial labour requirements (Karki, 2003).

### **Environmental Perspective**

Besides economic returns, the cultivation of medicinal plants helps to maintain ecological conditions. This practice may replenish the already dwindling stock of wild plants and help in the conservation of species. In the mountains it has always been a great problem to save the traditional crops like potato, maize, cabbage etc. from the wild animals like Wild boar, Bear, Monkey etc. Medicinal plants have the advantage of being a non-edible item to these animals.

The fragile ecosystem of the mountainous region with unstable nature of the soil makes it prone to landslides if it is disturbed too much for cultivation processes. Medicinal plant cultivation could be done with minimum disturbance to the soil strata

and thereby minimizing the chances of landslides (Chhetri, 2007).

A lot of barren/shifting fallow land has so far remained unutilized, which could be made use for raising plantations of high medicinal value plants, *Picrorhiza kurrooa*, *Podophyllum hexandrum*, *Dactylorhiza hatarirea* etc., which grow well in such lands. Medicinal plants can grow in very poor soils and under low rainfall and moisture conditions thus aiding the natural regeneration.

### **Conservation Strategies for Medicinal Plants**

It has been observed that a large number of medicinal plants are threatened and depleting day by day, hence it becomes inevitable to save endangered herbs from becoming rare or extinct before it is too late. Conservation of these precious medicinal herbs not only provide genuine raw drugs for the pharmaceutical industries, efficacious drugs for ailing humanity but it may also fetch foreign exchange on some of them, besides improving ecosystem at large.

Conservation measures for medicinal plants fall under two basic strategies besides other measures i.e.

- (1) **In-situ conservation** in their natural or original habitat and
- (2) **Ex-situ conservation** in gene banks as seeds, by tissue culture, or in plantations or in herbal farms etc. and
- (3) **Other measures.**

### **In-situ Conservation**

In-situ conservation is always preferred. It can be done in two ways i.e.



- (a) Conservation involving several species of endangered medicinal plants which happen to grow in a few square kilometers covering large areas, such areas can be conserved as Biosphere Reserves.
- (b) Conservation involving solitary species or group of threatened species growing in almost pure population together with other medicinal plants – such areas can be conserved as Gene sanctuaries.

#### Ex-situ Conservation

Ex-situ conservation means are usually taken up when it is not possible to conserve species by *In situ* conservation methods. This conservation involves in

- (a) Herbal farms or Botanic gardens,
- (b) Seed banks and
- (c) *In vitro* cultures or tissue cultures.

#### Other Measures

- (a) Sacred grooves:  
The sacred grooves provide an effective means of conservation.
- (b) Check against weeds:  
As a conservation measure spread of weeds like *Lantana*, *Xanthium* etc. in the forests should be effectively checked. These weeds not only destroy the ground flora and trees but also effect the floristic composition.
- (c) Awareness among rural folk:  
Adequate awareness about medicinal herbs and their cultivation among rural people may also help in the conservation of the herbs (Billore, 2000).
- (d) Develop national, regional and local biodiversity planning, and implement

programs for inventory and threat assessment of medicinal plants.

- (e) Sign agreements with botanical gardens and appropriate international agencies to regulate transfer of germplasm previously taken from developing countries for commercial use.
- (f) Develop community-based conservation strategies for increasing self-reliance of rural communities in primary health care by building upon cultural traditions and practices.
- (g) Develop new models of multi-dimensional ethno-botanical studies driven by community needs rather than by national or global priorities.
- (h) Strengthen global, national and regional networking activities related to conservation and sustainable utilization of medicinal plants (Anonymous, 1998).  
In addition to conservation of valuable plants resources systematic concerted effort should be undertaken of the yield and quality improvement through modern biological tools.

#### Constraints in Conservation and Development

According to a UNIDO study, the following constraints are associated with the use of traditional medicine sector in developing countries including India (Rawat and Garg, 2005).

1. Poor agricultural practices.
2. Poor harvesting.
3. Lack of research on development of high yielding varieties.
4. Poor propagation methods.
5. Inefficient processing techniques leading to low yields and poor

- quality products.
6. Poor quality control procedures.
7. High energy losses during processing.
8. Lack of current good manufacturing practices.
9. Difficulties in marketing.
10. Lack of local market for primary processed products.
11. Lack of facilities to fabricate equipment locally.
12. Lack of access to latest technological and market information.

#### **Channels of Supply (Market and Marketing)**

There are different forms of trade that exist and the various channels through which medicinal plants pass, Cunningham (1996) describes three trading sectors for medicinal plants:

1. On the first level, there is the national trade in medicinal plants which can involve hundreds of species. This trade would be undertaken at regional medicinal plant markets where hundreds of plant species are traded.
2. The second level again is informal and consists of trade across national borders but within the same continent. This trade tends to consist of fewer numbers of species, although many of these species are threatened. In Asia, *Nardostachys grandiflora* and *Valeriana jatamansi* are examples of species which are threatened, but both are still traded from Nepal to India.

3. The third level comprises formal export trade. In Africa, Cunningham, 1996 found that at this level only a limited number of species were traded in significant volumes. Cunningham, 1996 cites Cameroon which exports four species to Europe including *Prunus africana* (a bark extract of which is used in the treatment of benign prostatic hypertrophy), all of which is exported to France; and *Pausinystalia johimbe*, 65% of which is exported to Holland, 18% to Germany and the rest to Belgium, Luxembourg and France.

However, based on the imports of plant material into Germany, a significant number of species are indeed traded internationally, i.e. at this third level and several hundred species in significant volumes.

#### **Role of Traders and Buyers**

From the source of collection, plant material passes through a network of buyers including collective organizations and state run organizations and agents or subsidiaries of the plant traders.

The major part of material is sold to plant trading companies. These plant traders hold enormous stocks and also have the facilities to undertake the quality controls required for raw material used in the production of drugs. They play an enormously powerful role in the medicinal plant trade partly because of the large quantities they purchase which enables them to more or less dictate the price. In addition, their ability to reliably undertake the quality control analysis also helps to protect their position of power.

The situation in Germany illustrates the critical role of the traders, where 'drug' imports of medicinal plants is undertaken almost entirely by 20 drug trading companies (Lange, 1996). Another critical point which helps safeguard the position of the traders is the guarantee that they will supply material of a specified standard of quality at a fixed price. This price and quality guarantee is a major incentive to the end user, for whom cost, quality, reliability and flexibility are said to be the key requirements for purchasing pharmaceutical raw materials (Lapinskas, 1993).

Other traders have been emerging, referred to as the 'ecological trade' by Lange (1996); they source botanical material for use generally by the smaller herbal medicine/health product companies and alternative practitioners. They often establish their own contacts in the source countries and have shorter sales routes involving fewer parties, partly as they purchase only raw material not extracts.

#### **International Policy and Regulation**

There are a number of reasons as to why the trade in wild harvested material has been left to reach such a critical point:

- Firstly, the legislation that exists to control harvesting and trade of medicinal plants is inadequate and ineffective in its current form; new policies and easier mechanisms to control the trade are needed.
- Secondly, the lack of awareness among many of the end users, as to the extent to which wild harvested materials are used; indeed, it is only during the last five to ten years that

wild harvesting has become a subject of concern.

- Thirdly, in an attempt to control the market, the traders will give virtually no information on the extent of wild-harvesting.
- Finally, as already mentioned, the low price of wild harvested material has made the procurements of alternative sources of raw material (via cultivation) financially unattractive.

Despite the seriousness of the problem, there exist a limited number of measures for controlling international trade in medicinal plants. Currently the main form of regulation is through CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora). However, this agreement is not specifically concerned with medicinal plants and, in fact, has only a limited number of medicinal plants listed in the Appendices. The CITES treaty was signed in Washington in 1973, and has signatories from 99 countries.

New policy is needed and an easier mechanism to control the trade of plants. Apart from the recent (and continuing) involvement of The World Bank, most of the current conservation efforts seem to be led by non-governmental organizations and privately funded international agencies, notably World Conservation Monitoring Centre (WCMC), the Worldwide Fund for Nature (WWF), the Nature Conservancy (of USA), the World Conservation Union (IUCN), several botanic gardens, mainly Kew, Edinburgh, Missouri and New York.

The problem lies in the fact that there is little or no legislation restricting the use of wild-harvested materials in finished

products, or for assuring the sustainable utilization of medicinal plants. There is need for greater awareness of the issues particularly among government officials, farmers and scientists. It is also very obvious that there needs to be greater awareness amongst the end users, e.g. the pharmaceutical, phyto-pharmaceutical and health products companies, as to the consequences of their trade on the future availability of medicinal plant resources (Srivastava *et al.*, 1995).

Lange (1996) suggests a combined approach where an attempt is made to encourage greater responsibility from not only the plant trading companies but also the end user companies and the consumers. Collective consumer pressure is a powerful tool in bringing about change in commercial practices. As such, consumers should be made aware of the problems with the medicinal plant trade and encouraged to only purchase products made from plants cultivated or collected on a sustainable basis. Perhaps an international logo similar to those used for recycled goods or for organically farmed foods can be used.

Although the problem of wild harvesting is of international concern, perhaps the developed world should first try to reduce the demand for such material.

#### CONCLUSIONS

An effort has been made to present various aspects associated with medicinal plants. It is earnestly appealed to save the endangered herbs from becoming rare or extinct. Conservation of these medicinal plants will not only provide genuine raw drugs for the pharmaceutical industries, but

may also fetch foreign exchange, besides improving ecosystem at large. These resources need to be augmented and properly managed following national and international guidelines for standards and quality to ensure their marketing and commensurate benefits to the local people.

#### ACKNOWLEDGEMENTS

Authors are grateful to Library staff of SKUAST-K Shalimar, Srinagar for providing necessary material.

#### REFERENCES

- Anonymous. 1998. Declaration of the International Conference on Medicinal Plants held at Bangalore, India. 3(1): 1-5.
- Bellore, K.V. 2000. Depleting state of medicinal plants in Rajasthan (India) and their conservation. *Indian Forester*, 4:419-426.
- Chandola, S. 2005. Some rare and imperfectly known medicinal plants species of Uttaranchal. *Indian Forester*, 3:341-345.
- Chhetri, D.R. 2007. Medicinal plants scenario in Darjeeling Himalayas: conservation and cultivation as alternative crop. *Indian Forester*, 5: 665-678.
- Cunningham, A.B. 1996. Medicinal plant trade, conservation and the MPSG (Medicinal Plant Specialist Group) *Medicinal Plant Conservation*, 2: 2-3.
- Kamboj, V.P. 2000. Herbal medicine. *Cur. Sci.*, 78(1): 35-39.
- Karki, M. 2003. Organic conversion and certification: A strategy for improved value – addition and marketing of medicinal plants products in the

- Himalayas. *Indian Forester*, 1:130-142.
- Lambert, J., Srivastava, J., Vietmeyer. 1997. World Bank technical paper no. 355. The World Bank, Washington DC.
- Lange, D. 1996. *Untersuchungen zum Heilpflanzenhandel in Deutschland*. (Research on the market of medicinal plants in the Germany) Bonn, Germany; Bundesamt für Naturschutz. <http://www.fao.org/docrep/w7261e/W7261e08.htm>
- Lapinskas, P. 1993. Factors affecting the commercial success of a novel crop. *Acta Horticulturae*, 333: 73-79.
- Nautiyal, M.C. and A.N. Purohit. 2000. Cultivation of Himalayan aconites under polyhouse conditions. *Current Science*, 81 (5): 1062-1063.
- Rawat, R.B.S. and Garg, G.P. 2005. Medicinal plants: trade and commerce opportunities with India. *Indian Forester*, 3: 275-287.
- Samy, R.P. and Gopalakrishnakone, P. 1998. Current status of herbal and their future perspectives. *Nature Preceding. Venom and Toxin Research Programme. Department of Anatomy Yong Loo Lin School of Medicine, National University of Singapore. Singapore 117597.*
- Srivastava, J., Lambert, J. & Vietmeyer, N. 1995. *Medicinal Plants: A Growing Role in Development*. Washington, D.C., USA; Agricultural and Natural Resources Department, The World Bank. UN Statistical Division. 1992.
- Ved, D.K, Prathima, C.L, Morton, N. and Dharsan, Shnakar. 2001. Conservation of India's medicinal plant diversity through a novel approach of establishing a network of in situ gene banks. p. 183-195. In: R. Uma Shaankar, K.N. Ganeshaiah and Kamaljit S. Bawa, (eds.) *Forest Genetic Resources: Status, Threats and Conservation Strategies*. Oxford and IBH Publishing Co. New Delhi, India.