

HERBAL DRUGS AND PHYTODIVERSITY CONSERVATION

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(Presidential address delivered during National Seminar of Mendelian Society of India at Bodh Gaya)

Key words : *Herbal drugs, Conservation strategies, Herbal industry, Marketing, Export*

Medicinal plants, since times immemorial, have been used in virtually all cultures as a source of medicine. Over 35,000 plants are used in various human cultures around the world, while about 20,000 plants are marketed for medicines. Over half a million tones of dry raw material indiscriminately collected from plants leads to considerable genetic erosion and loss of biodiversity. Conservation of genetic resources of medicinal plants, both *in situ* and *ex situ*, is an important task for botanists. Botanists have to play their part in ensuring a sustainable supply of safe, efficacious and affordable herbal medicines that are compatible with the demands of the urban as well as the rural consumer.

INTRODUCTION

The plant as a source of medicine is as old as humanity. Medicinal plants are an important health and economic component of the floras in developed as well as developing countries. People of India and China are known to have used plants in organized health care regimes for over 5000 years. European herbal medicine blossomed in the Greco-Roman era and remained the mainstream trend until about seven decades ago. Traditional medicine is the sum total of the knowledge, skills and practices based on theories, beliefs and experiences indigenous to different cultures, whether explicable or not, used in the maintenance of health, as well as in the prevention, diagnosis, improvement or treatment of physical and mental illness. Traditional medicines have a long history and have been field tested for centuries by thousands of people; much empirical knowledge has been accumulated in the communities and passed on smoothly by generations of healers.

The end of the world war II ushered in the glamour of medical science with its spectacular discoveries. Chemical "Magic bullets" produced by big pharmaceutical companies and the promise of "a pill for every ill" soon overshadowed herbal medicaments. The renewed interest in traditional and non-orthodox medicine in the west has dramatically increased the level of interest in plants with potential health benefits and fuelled the sharply escalating commercial demand for herbal products in global markets. The reasons for popularity of herbal remedies again is due to various reasons: 1. Allopathic medicines are highly expensive 2. Have unpleasant side effects 3. Allopathy has no cure for chronic diseases and disorder 4. Waiting list for treatment 5. Patients appreciate the more personalized and unhurried treatment by herbal and other therapist 6. Herbal therapies are viewed as "green medicine" and as being more eco-friendly.

HERBAL MEDICINE: INDIAN SCENARIO

India has been known to be rich repository of medicinal plants. The *Rigveda* (5000 BC) mentioned 67 medicinal plants, the *Yajurveda* 81 and the *Atharvaveda* (4,500-2,500 BC) 290 species. Later Charak Samhita (700 BC) and *Sushruta Samhita* (200 BC) described the properties and uses of 1,100 and 1,270 plants respectively, in compounding of drugs and these are

still used in classical formulations in the *Ayurvedic* system of medicine. The most important treatise, *Astanga Hriday Samhita*, unrivalled for principles and practice of medicine, was written by Vagbhata, an *Ayurvedic* practitioner in the seventh century AD. The period between 800 BC and 1000 AD could be considered as the golden age of the Indian system of medicine, particularly because of availability of three treatises which collectively became known as *Vridha Trayi* (senior Triad) of *Ayurveda*. In India, there are four well recognized systems of traditional medicine namely, *Ayurveda*, *Unani*, *Siddha* and *Yoga & Naturopathy*.

India has 16 agro-climatic zones and is immensely rich in medicinal plants occurring in diverse ecosystems. WHO has listed over 21,000 plant species used around the world for medicinal purposes. It has been estimated that India has 47,000 species of plants and is ranked No. 8 in world biodiversity. Out of these, medicinal plants comprise of 8,000 species. Indian system of Medicine (ISM) uses around, 2,500 plant species belonging to more than 1,000 genera. About 800 species are used by industry of which approximately 25% are cultivated. Despite convincing progress in Synthetic chemistry and Biotechnology, plants are the most important sources for preventive and curative medical preparations. WHO has estimated that at least 80% of all the global inhabitants rely on curative medical systems of medicine for their primary health needs and these systems are largely plant based.

Traditional medicine is apparently perceived as efficient, safe, cost effective and affordable; moreover, it is accessible, especially for the poor and for those living in remote areas, who tend to depend more on traditional and herbal medicines than people living in urban areas. In recent years, the Indian Ministry of Health has adopted a policy for the modernization of traditional medicines, while retaining its identity. This modernization encompasses several aspects, such as diagnosis through the use of modern techniques while providing treatment by traditional methods as well as modernization of the production processes and quality control of traditional medicines. The modernization policy also includes efforts to encourage scientific research, including clinical trials, to document the effectiveness and safety of traditional medicines. Many efforts have been made but still more need to be planned

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and well executed with the support, not only from India but also other countries for the benefit of humankind. The knowledge and experience of many tribes in India still need to be documented, even rediscovered, and thoroughly researched. The objectives should include finding ways not only to explore and to exploit, but also to preserve the availability and sustainability of the medicinal plants for the benefits of mankind.

HERBAL MEDICINE INDUSTRY

Current trends all over the world have shown that for one or the other reason, people are willing to try natural medicine and traditional remedies. As a result there is a global resurgence in the trade of herbal medicine; international market of medicinal plants is reported to be over US Dollar 60 billions per year. India's contribution to this large pool is only few hundred crores, which is expected to be raised to Rs. 8000 crores in 2020. There is thus an enormous scope for India to emerge as a major player in the global herbal market. But unfortunately various lacunae pertaining to quality of herbal drugs became major hindrances to come up to the expected level of trade of these traditional medicines both within and outside the country. This requires a national strategic plan to augment the availability of quality raw materials and standardized finished products. In this context, it seems important to find out ways and means of increasing availability of raw materials and to invest in Research and Development, to ensure quality formulation. To reach the goal of the development of National Traditional Medicines Industry, some initiatives should be planned and integrated. These orchestrated initiatives will involve many institutions and organizations from many sectors. Generally speaking, the ultimate result should be an integrated herbal medicines industry, which is export oriented, highly competitive, yields good profit sufficient for distributions and which satisfies the farmers.

HERBAL MEDICINE: PROMOTION AND MARKETING

This can be done and executed in the following manner:

- (i) Encouragement for cultivation of selected priority medicinal plants like *Amaltas*, *Ashwagandha*, *Brahmi*, *Gudmar*, *Guggal*, Indian Mustard, *Kala Zeera*, *Neem*, *Sanai*, *Atis*, *Karela*, etc., which are in great demand both in domestic and international market.
- (ii) Registration of farmers/cultivars and traders of raw drugs.
- (iii) Human resources should be trained enough to handle the queries on cultivation, postharvest management, storage, marketing, standardization, quality maintenance and drug usage.
- (iv) Demonstrations should be conducted to emphasize the benefits of traditional medicines as well as the indigenous knowledge.
- (v) Periodic exhibition for the domestic and export market are usually effective to introduce and increase the

popularity of herbal medicines to the domestic and international customers.

- (vi) Strategic alliance with partners from all over the world are to be encouraged to gain access to international market, and to boost product image.

INDIA EXPORTS

The export of medicinal plants from India is in four forms: (i) As dried plants or plant parts, e.g., liquorice roots, *Senna* leaves, *Catharanthus roseus* herb (ii) As extracts, e.g., Sap of opium poppy (iii) As isolated and purified active ingredients, e.g., *Gymnema* powder, Atropine sulphate, Menthol crystals, Calcium sennoside (iv) As formulations, e.g., Proprietary formulations.

Among herbs and plants, Ginseng roots, *Isabgul* husk and *Senna* leaves and pods dominate. USA, Germany, UK, France, Switzerland, Japan, Italy and the Netherlands account for majority of the Indian exports followed by Asian and African countries. It is also clear that India is exporting very less number of "Value added Products" and the main focus is on the export of dried plants or plant parts, powders.

PROBLEMS AND CHALLENGES

The National Herbal Industry is facing many problems and complexities to improve performance today. The problems range from plant's cultivation, production processes, technology and product development including research and development, and marketing. Variants in quality of raw materials from different sources were also adding problems toward complexities in development of the industry. Unavailability of scientific reports supporting the safety and efficacy of the traditional medicines has been the biggest concern for a wider acceptance by the medical professionals. The marketing efforts of traditional medicines are constrained by the fact of usually non-standardized products, lack of scientific information to support the products and insufficient financial resource in most small and medium companies, insufficient market information, less innovative and inappropriate choice especially concerning the international information, less innovative and inappropriate choice especially concerning the international markets. To cope up with the aforementioned problems, an integrated approach for the development of National Medicines Industry needs to be designed and planned. In the long run, all the constraining factors should be appropriately addressed and minimized so as to yield positive outcomes for the welfare of the people. To meet the challenges following recommendations need immediate address:

- (i) An inventory should be carried out of commercially important medicinal plants and a comprehensive survey of the scale of supply and use of medicinal plants.
- (ii) Studies on new medicinal plants that can serve as substitutes for other plants with high demand and also for threatened plants.

Int. J. Mendel, Vol. 33(1-2), 75-78, 2016

- (iii) Development of an effective network of dissemination of information, training and technology transfer and post harvest transfer.
- (iv) Development of industries near farming areas to give impetus to production of value added product and reduce the stronghold of middlemen.
- (v) Development of consortium for collection of raw materials, processing, marketing and export.
- (vi) Cultivation of medicinal plants should be encouraged.
- (vii) Standardization of quality parameters for medicinal plants both for domestic and export markets.
- (viii) Protection of Intellectual Property Rights at global scale.

SOME COMMERCIAL MEDICINAL PLANTS

Indian System of Medicine uses around 2,500 plant species belonging to more than 1,000 genera. About 800 species are used by industry of which approximately 25% are cultivated. Some selected plants of commercial value are given below:

Ammi majus : The seeds of *Ammi majus* contain a coumarin viz., xanthotoxin used in the treatment of leucoderma. A method for production of xanthotoxin from seeds has also been developed.

Aloe vera : It acts as a source of nourishment for HIV patients, stimulate immune response against cancer. The gel and powder from *Aloe vera* has great international demand.

Artemisia annua : The active principle in this plant (called Quinghao) is artemisinin. It is used in treatment of fever, malaria and cerebral malaria.

Withania somnifera : *Ashwagandha* is used for treatment of rheumatism, gout, hypertension, cancer and as tonic and sex stimulant.

Bacopa monnieri : This plant improves learning ability, retention and enhances results. Drug **Memory Plus** is developed by CDRI, Lucknow.

Belladonna : The leaves and roots of *Atropa acuminata* are important crude drugs due to their anticholinergic, antispasmodic and mydriatic properties.

Catharanthus roseus : Yield many alkaloids, out of these Vincristine and Vinblastine are used to treat leukemia.

Centella asiatica: It has the ability to rebuild energy reserves. It increases the mental and physical power, it combats stress and improves reflexes.

Dioscoria composite: The rhizome of the plant constitutes important source of diosgenin. Diosgenin is used for the synthesis of a number of steroidal drugs.

Opium: *Papaver somniferum* : Cultivated for isolation of 25 alkaloids specially codeine.

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Pyrethrum : The flower of *Chrysanthemum cinerarifolium* are the source of pyrethrines, the safest insecticide.

Rauwolfia serpentina : Sarpagandha is used to treat insanity as well as physical illness such as fevers and snakebites. The thick dry roots yield alkaloids like reserpine.

Solanum khasianum : Berries are rich source of splasodine used for commercial production of steroidal drugs.

Taxus baccata : Commonly known as Himalayam Yew. Taxol alkaloids isolated from bark are active against different cancers.

THREATS TO MEDICINAL PLANTS

Habitat destruction and anthropogenic extinction of species are the order of day. The bio-depletion is due to exponential growth of human population and exploitation of natural resources in an unsustainable way. Natural habitat has been destroyed for the cause of landscape development, building construction, harvesting timber and plantation forestry. Besides, unrestricted grazing and widespread pilferage from the wild have led to serious decline of medicinal plant species in particular and the entire ecosystem as a whole.

It is an undeniable fact that more than 95% of the medicinal plant material being used by pharmaceutical industry has been acquired from the wild by illegal means. Local *ayurvedic* doctors collect the herbal species very unscientifically, due to which further germination does not take place in the same natural habitat. In addition to this, putting fires repeatedly causes loss of regeneration potential of wild species leading to the degradation and destruction of natural habitat. The other factors, such as micro-climatic changes, economic conditions of rural people, high market demand of medicinal plants and illegal trade practices also possess threat to the loss of valuable biodiversity from this region.

CONSERVATION STRATEGIES

Medicinal plants are renewable natural resources and conservation of threatened medicinal herbs is, therefore, considered to be the most important responsibility of biodiversity rich nation like India. Both *in situ* and *ex situ* conservational strategies can be adopted for protection of threatened medicinal herbs as cited below:

1. To recognize and support the conservational strategies adopted by tribal and rural people by the term of faith, myths, taboos, tradition, religious aspects, sacred grooves etc.
2. Protection of the area in their natural condition by the participation of local inhabitants.
3. Establishment of Biosphere Reserves, Botanical Gardens, etc., and bulking up of such plants in the garden and re-introducing them is essential to restore their population.

4. Agricultural cultivation is an important step towards the conservation of threatened medicinal herbs. Cultivation has also economic advantage and can ultimately contribute to the sustainability of this fragile ecosystem.
5. In addition to *in situ* and *ex situ* conservation, long term storage of seeds in gene banks. NBPGR, Delhi has already developed cold storage modules. Seed banks, *in vitro* bank, cryo-banks, and DNA banks could play a constructive role for conservation.
6. To create widespread public awareness on the importance and need for medicinal plant conservation.
7. Ban on exploitation, trade and marketing of threatened medicinal herbs by means of legislation formulated by the government.
8. Patenting strategies should be enhanced.

CONCLUSION

Traditional medicine is apparently perceived as efficient, safe, cost effective and affordable; moreover, it is accessible, especially for the poor and for those living in remote areas, who tend to depend more on traditional herbal medicine than people living in urban area. Commercial use of medicinal plants in India is growing, but the value is still small compared with the global market. Since majority of the medicinal plants are collected from the wild by the unskilled people, problems of inconsistent quality, adulteration, destructive method of collection leading to extinction or endangered status of a number of plants, are severe. On the other hand, the demand for herbal medicines is increasing day by day as more and more people become aware of the dangers of side effects of Allopathic medicines. In order to bridge the gap between these two scenarios, it is necessary to undertake a detailed study to shortlist a few medicinal plants for extensive cultivation and then to concentrate on standardizing the cultivation practices, post-harvest technologies related to these plants by adhering to Good Agricultural Practices (GAP) and Good Manufacturing Practices (GMP).

Another need of the hour is to develop value added production of herbals and of phytochemicals at the community level and the economic potentials of Indian medicinal plants can be captured to the extent of maximum.

References

- Dwivedi, S.N., Dwivedi, S. and Patel, P.C. 2007. Status and conservation of threatened medicinal herbs. In Book: Indian folk medicine (Editor P.C. Trivedi), Pointer publisher, Jaipur, pp. 151-198.
- Sharma, G.R.K. 2006. Commercial use of medicinal plants and traditional knowledge in India. In Book : Medicinal Plants, Traditional knowledge (Editor P.C. Trivedi), I.K. International Publishing House, New Delhi, pp. 118-137.
- Trivedi, P.C. 2004. Medicinal Plants: Utilisation and Conservation. Aavishkar Publishers, Distributors Jaipur pp. 431.
- Trivedi, P.C. 2004. Herbal Drugs and Biotechnology. Pointer Publishers, Jaipur pp. 366.
- Trivedi, P.C. 2006. Herbal Medicine Traditional Practices, Aavishkar Publishers, Distributors Jaipur pp. 322.
- Trivedi, P.C. 2006. Medicinal Plants: Ethnobotanical Approach. Agrobios (India), Jodhpur pp 410.
- Trivedi, P.C. 2007. Indian folk medicine, Pointer Publishers, Jaipur, pp. 344.
- Trivedi, P.C. 2007. Ethnomedicinal Plants of India, Aavishkar Publishers, Distributors, Jaipur.
- Trivedi, P.C. 2009. Indian Medicinal Plants. Pointer Publisher, Distributors, Jaipur.
- Trivedi, P.C. 2010. Ethnic tribes and medicinal plants, Pointer publisher, Jaipur.
- Trivedi, P.C. 2015. Medicinal Plants and Traditional Practices. Pointer Publisher, Jaipur.
- Trivedi, P.C. 2015. Ethnomedicinal Uses of Plants, Aavishkar Publisher and Distributor, Jaipur.