



## Ecopharmacognosy: With Special Reference to Indian Himalayan Region

Devesh Tewari

Department of Pharmaceutical Sciences, Faculty of Technology, Kumaun University Bhimtal Campus, Bhimtal, Uttarakhand, India.

\*Corresponding author's E-mail: dtewari3@gmail.com

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### ABSTRACT

Ecopharmacognosy is among one of the latest term introduced in the field of Pharmacognosy. It is the new connectivity between the environmental science and study of natural products. In the generation of melting Himalaya the approach of sustainability of the biodiversity of the medicinally active resources it is necessary to conserve the biodiversity of the Himalayan region. The review is probably the first attempt to emphasize the necessities of ecopharmacognosy in context of Indian Himalayan region.

**Keywords:** Ecopharmacognosy, Himalaya, biodiversity.

### INTRODUCTION

According to Edward O Wilson "Ecology was and remains the discipline that addresses the highest and most complex levels of biological organization. It remains a study of holism and emergence, of properties of life taken from the top down. Even hardnosed laboratory scientists, who were focused on the less complex (and more accessible) levels of cells and molecules, knew in their hearts that in time, biologists must eventually arrive at this subject. It is well said that for understand ecology properly, one would be to understand biology and to be a complete biologist is to be an ecologist"<sup>1</sup>. Ecology is the study of science that elicits the functional interrelationships among the different components of environment on the one hand, and between the organisms and environment on the other. A major ecological principle states that the environment is holocoenotic in nature, which means that environmental factors act as a whole or aggregate in their effect upon organisms and therefore any change in one component is bound to change the states of all other components<sup>2</sup>. The United Nations Convention on Biodiversity of 1992, promoted an ecosystem approach, including humans, to conserving biodiversity rather than the more species-based approaches that predominated previously. An ecosystem consists of all the organisms and the abiotic pools with which they interact. Ecosystem processes are the transfers of energy and materials from one pool to another. Energy enters an ecosystem when light energy drives the reduction of carbon dioxide (CO<sub>2</sub>) to form sugars during photosynthesis. Organic matter and energy are tightly linked as they move through ecosystems. Ecosystems are considered to be at steady state if the balance between inputs and outputs to the system shows no trend with time.<sup>3,4</sup> After an extensive literature review only few proceedings and papers were found explaining the field of ecopharmacognosy which is an emerging trend in the field of pharmaceutical sciences and could become very important for the conservation of biodiversity.

### Pharmacognosy

According to American Society of Pharmacognosy "Pharmacognosy is the study of natural product molecules (typically secondary metabolites) that are useful for their medicinal, ecological, gustatory, or other functional properties. The natural species that are the source of the compounds under study span all biological kingdoms, most notably marine invertebrates, plants, fungi, and bacteria. The field of pharmacognosy is ever-changing and is constantly being refreshed by input from new scientific fields and technologies as they are developed. This is one reason why studying pharmacognosy is a good choice for those who like to work at the interface of many different, but complementary, areas of science that relate to the natural world.<sup>5</sup> In simple words we can define Pharmacognosy as 'the study of crude drugs obtained from natural origin' which is a high potential subject with inclusivity of various disciplines and give opportunity to a researcher to understand the nature closely for the service to mankind and others.

### Ecopharmacognosy

The word ecopharmacognosy was recently introduced by Cordell, 2013 and also stated that "selected, valuable traditional medicines have been, or are being, depleted in their natural environment, without alternative resourcing being developed and defined Ecopharmacognosy, as the "study of sustainable, biologically active natural resources", must become the fundamental basis for all natural product research. Studying plants, or any natural organism, for their use as a global medicine, must take into account the potential long-term sourcing. There are two dominant factors to be considered, the health of the planet and the health of the people. These are not to be separated, as we are all part of one large, fully interacting, biological organism, Earth. The goal must be to maintain the health of that whole organism in a cost-effective manner. Failure to do so will leave a terrible legacy for our descendants. Consideration of all chemical



processes, including those for the synthesis of medicinal agents, and the accessibility of drugs to those in need are critical. Factoring in the anticipated cost to the patient becomes an important consideration as potential drug candidates in any form, synthetic or natural, make the transition from discovery to clinical development. It should be readily apparent that humankind cannot survive another century as destructive of the Earth's resources as the 20th century. Twenty-one years after the Rio Summit of 1992 we are as "irresponsible" as ever with respect to our biodiversity. At the end of the last century one-eighth of all plant species were threatened, 50% of bird species are likely to become extinct by 2050, and affordable oil resources are estimated to last until 2060. Plans for the development of new medicinal plants in any form to fill a market niche must be sustainable. An appropriate balance is needed between intellectual property rights and the burgeoning technology of drug discovery. A balance is also needed between all those who are stake holders for biodiversity and indigenous knowledge and those who have the capacity to potentiate (create value) in that biodiversity for health and economic benefit.<sup>6-9</sup>

### Indian Himalaya: Treasure of Biodiversity

India has a rich heritage of species and genetic strains of flora and fauna but increasing population and urbanization are causing decrease of natural habitats resulting in the loss of biological diversity. About 6% of world plant species are found in India and it is estimated that the country is tenth among the plant rich countries and sixth among the centers of diversity and origin of agrodiversity in the world.<sup>10</sup> The Indian Himalayan Region (IHR) having geographical coverage of over 5.3. lakh Km<sup>2</sup> comprises of huge mountain range extending over 2500 km in length between the Indus and the Brahmaputra river systems and raising from low-lying plains to over 8000 m above sea level and is around 300 Km at its widest part with an average width of 80 Km. It is the world's highest mountain chain, so that the Himalaya is characterized by a very complex geologic structure, snowcapped peaks, large valley glaciers, river gorges and rich vegetation.<sup>11</sup>

The Himalaya is the youngest mountain chain present on the earth and is believed to be still changing, and thereby, is less stable geologically and geomorphologically. Due to its extremely active geodynamic condition, small tampering with the geocological balance can initiate environmental changes that may eventually lead to alarming proportion<sup>12-14</sup>. From ancient times biodiversity rich Indian Himalayan region has been utilized by the native people of those area. Now a days the survival of these resources is under threat from rapidly burgeoning human population and concomitant environmental degradation occurring at a fast pace. The major gaps are present in the knowledge of biological resources and the means by which biological diversity is maintained<sup>15</sup>.

### Exploitation of Himalayan Biodiversity

Himalayas are a rich repository of tradition, culture and heritage. They are extremely rich in flora and fauna. Different aspects of ethnobotany in the Himalayas have been studied in depth<sup>16</sup>. As per Ecologists the Earth is undergoing a mass extinction event, in which a large number of species are lost in a short amount of geologic time<sup>17,18</sup>. They observe this massive decline most sharply in areas like the Himalaya that have high biological diversity and a high degree of endemism, that is, a large number of species found only in a particular area. Located at the interface between the temperate Palearctic realm of Eurasia and the tropical Indo- Malayan realm of the Indian subcontinent, the Himalayan region hosts remarkable diversity. The Himalayan watersheds have witnessed unparalleled deforestation over a long period. Deforestation is a commercial activity began during the British time and has continued unabated even after independence. While official estimates say forest cover has increased in the Himalaya which is however doubtful. It is a matter of fact that forests have been diverted for a host of land generally use for commercial activities such as agriculture, human settlements and urbanisation. Large number of infrastructure development such as hydropower construction and road building has taken place. Various Scientific studies indicated that at the current rates of deforestation, the total forest cover in the Indian Himalaya will be reduced from 84.9 per cent (of the value in 1970) in 2000 to not more than 52.8 per cent in 2100. Dense forest areas, on which many forest taxa (groups of species) are critically depend, would decline from 75.4 per cent of the total forest area in 2000 to just 34 per cent in 2100, which is estimated to result in the extinction of 23.6 per cent of taxa restricted to the dense Himalayan forests<sup>19</sup>. Revival of the traditional medicine system in India and abroad has put extra pressure on the forests, especially the medicinal plants. Habitat degradation, unscientific harvesting and over-exploitation to meet the demands of illegal trade in medicinal plants have led to the extinction of more than 150 plant species in the wild<sup>20</sup>. It was observed that in the Uttarakhand Himalaya large number of trees and medicinal plants were demolished in the name of urbanization and development in last decade as compare to the Himachal region and a scientific study is required to estimate the forest depletion. There is a requirement of strict government regulations which are however present and the proper implementation of these regulations.

### Ecopharmacognosy for Himalayas

There is a requirement to develop the ecopharmacognostic approach using better techniques for cultivation, evaluation and standardization of the natural resources and by using them in a minimum quantity, serve the nature by using methods of development for generation of its own creations with minimum loss and maximum benefits to the



environment. When we talk about Himalaya it is essential to conserve not only the plant and animal biodiversity but it is also very crucial to conserve the information and folklore knowledge of these regions by using ethnopharmacological and ethnobotanical studies.

## CONCLUSION

For the improvement of sustainable development of biologically active natural resources in the Indian Himalayan region it is good to focus in the area of Ecopharmacognosy and apart from only the exploitations of the natural resources one should go for the conservation and sustainable development too. An environment friendly tool can become an important tool in the field of medicinal research with the help of ecopharmacognosy.

## REFERENCES

- Odam EP, and Barret GW, Fundamentals of Ecology, fifth edition, Thomson books, 2005 1-5.
- Singh JS. Sustainable development of the Indian Himalayan region: Linking ecological and economic concerns, Current Science, 90(6), 2006, 784-788.
- Chapin FS, Matson AP, Mooney HA, Principles of Terrestrial Ecosystem Ecology. Springer Verlag New York, Inc 2002, 4-10.
- Bormann FH, and Likens GE, Pattern and Process in a Forested Ecosystem. Springer-Verlag, New York, 1979.
- [www.pharmacognosy.us/what-is-pharmacognosy/](http://www.pharmacognosy.us/what-is-pharmacognosy/)
- Cordell GA. The Convention on Biological Diversity and its impact on natural product research. In: "Natural Product Chemistry for Drug Discovery". A.D. Buss and M.S. Butler, eds. Royal Society of Chemistry Publishing, Cambridge, England, 2010, 81-139.
- Cordell GA "Ecopharmacognosy and the Globalization of Traditional Medicine", in "Proceedings of the 7th International Symposium of the International Society for the Development of Natural Products", Noida, Delhi, India, ed. P. Pushpangadan and V. George, 2013, In press.
- Geoffrey A, Cordell. Ecopharmacognosy: exploring the chemical and biological potential of nature for human health, Journal of Biology medicine and natural product chemistry. 4(1), 2014, 1-21
- Reid WV, Sittenfeld A, Laird SA, Janzen DH, Meyer CA, Gollin MA, Gámez R, and Juma C, Biodiversity Prospecting. World Resources Institute, Baltimore, Maryland, 1993, 341.
- Nandi SN, Dhyani PP, Samal PK. Resource information database of the Indian Himalaya ENVIS monograph, 3.
- National mission for sustaining the Himalayan eco-system under national action plan on climate change, Department of Science and Technology Government of India. 2010.
- Valdiya KS, Environmental status assessment – The Himalaya. In, Environmental problems and prospects in India (ed. M. Balakrishnan), Oxford & IBM Publishing Co. Pvt. Ltd., New Delhi, 1993.
- Valdiya KS, Developing a paradise in peril. Pt. G.B. Pant memorial lecture : VII, GBPIHED, Kosi-Katarmal, Almora, 1997.
- Gaur VK, Mitigating disasters in the Himalaya – A basic agenda for development. Pt. G.B. Pant memorial lecture : VIII, GBPIHED, Kosi-Katarmal, Almora, 1998..
- Heywood, VH. Global biodiversity assessment, University Press, Cambridge, 1995.
- Tewari D, Pandey HK, Sah AN, Meena HS, Manchanda A, Patni P, Pharmacognostical, biochemical and elemental investigation of *Ocimum basilicum* plants available In western Himalayas. International Journal of Research in Pharmaceutical and Biomedical Sciences. 3(2), (2012), 840-845.
- Barnosky, Anthony D., Has the Earth's sixth mass extinction already arrived? *Nature*, 471 (7336), 2011, 51–57.
- Pereira, Henrique M., et al, Scenarios for global biodiversity in the 21st century. *Science*, 330 (6010), 2010, 1496–1501.
- [www.thehindu.com/opinion/op-ed/nature-avenges-its-exploitation/article4834480.ece](http://www.thehindu.com/opinion/op-ed/nature-avenges-its-exploitation/article4834480.ece)
- Uniyal SK, Awasthi A, Rawat GS. Current status and distribution of commercially exploited medicinal and aromatic plants in upper Gori valley, Kumaon Himalaya, Uttaranchal current Science, 82 (10), 2002, 1246-1252.

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