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Opinion

Pharmacology and Indian Drug Plants

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I consider it a great honour and privilege to write this editorial to the Journal of Acta Scientific – Pharmacology (AS Pharmacology). Generally we know that pharmacology is in the branch of pharmaceutical sciences, to be specific under the umbrella of life sciences, chemical sciences and medical sciences, dealing with the study of the selection of drug plants and also its ingredients to know the compounds produced chemically for having medical benefit. The compound obtained can be defined as drug which can be used to get its effect on living organisms.

India inherits a rich herbal heritage. It has vast natural resources including herbs and other plants having curative properties. The history of medicine in India can be traced back to the oldest repository of human knowledge – The Rigveda (4500 B.C. – 1600 B.C.) where mention has been made of 67 medicinal plants. But in the Atharvaveda (2000 B.C. - 1500 B.C.) there are about 290 plants used as charms for curing the diseases. Lord Dhanvantari, one of the disciples of emergence Lord Asvini is the originator of Ayurveda (2500 B.C. – 900 B.C.) who established the real foundation of earliest medical science where the properties of various drugs have been given in details. Of the eight divisions of Ayurveda, two Samhitas (Charak – 1000 B.C.) and Sushruta (800 B.C.) which exclusively deal with medicine and surgery respectively, are probably the parts of Agnivesa Samhita. About 700 plant species have been mentioned here as medicinal plants. In Charak Samhita the materia medica, administration of purgatives, emetics and other drugs resemble almost with that of present day system. In Sushruta samhita, earlier that Lord Buddha (c.550 B.C. - 470 B.C.) and Hippocrates (460 B.C.), the application of the anesthesia was not uncommon, before the surgical operation. But anesthetic as Sammohini, i.e., inhalation of medicaments for the purpose, was probably introduced during Buddhist period by Jivaka – the Physician of Lord Buddha. Sushruta possessed armamentarium of 20 types of sharp and 101 types of blunt surgical instruments along with the dressing material and other equipments.

The most enduring legacy of the science of the classical era is the Indian system of medicine, namely Ayurveda, which is in daily use even today. The two greatest theses of the Ayurveda, the Charaka and Susruta Samhitas, were composed during this time. There are more than 600 medicines of plant, animal or mineral origin prescribed in the Charaka and Susruta Samhitas. Extensive methods of medicinal preparations, therapeutic processes and disease diagnostics are mentioned. Herbal products are being used as drug from time immemorial in all parts of the world. But with the advancement of chemical sciences the active ingredients were isolated and characterized. Ultimately these drugs were naturalized in modern medicine e.g., atropine, quinine, morphine, reserpine, digitoxin, etc. In view of the latest development the science of chemistry, pharmacology, physiology, molecular biology, etc. progressed with tremendous speed and was applied to establish the importance of Herbal Medicine.

Plants are companion of man since his appearance on the earth. Glancing through the history of civilization one finds that forests were closely related to human being in one way or the other in meeting some of the basic needs. The forest constitutes an important natural heritage for the people, more so to the tribal communities

who live amidst the forests. Besides serving as a complimentary source of food, fodder, medicine, religious rite and other material requirement to tribal communities, forests are in culture of these people and make this system more than a mere physical entity and register its indispensability for the maintenance of equilibrium of ecology and economy. Forests are characterised by pure stand of "Sal" or forests of mixed and miscellaneous types. Besides Sal (*Shorea robusta*), other major tree components of forests are Trop (*Buchanania lanzan*), Murga (*Pterocarpus marsupium*), Bhilawa (*Semecarpus anacardium*), Asan (*Terminalia alata*), Kumbhi (*Careya arborea*) and species of *Bauhinia, Bridelia, Butea, Diospyrus* and *Ziziphus.* Beneath these tree covers are found different types of herbs, shrubs and climbers which are characteristics of particular locality.

India with her 55,000 plant species and 550 tribal communities belonging to 160 linguistic groups inhabited in varied geographic and climatic zones with diversified plant species, varied culture, rich traditional knowledge system and wisdom possess an Ethno botanical emporia. Living close to the nature, the tribal communities are custodian of unique traditional knowledge system and wisdom about ambient flora and fauna and rich heritage of Phyto medicine-Ethno medicine. Therefore, Professor R.E. Schultes of the Harvard University, USA, opined that "India with her many living groups of people, having diversified ethnic culture, history of rituals and performance, who are more or less isolated from modern world and are closely associated with their ambient vegetation is the emporia of ethno botanical research".

From the study of Tribal Medicine (Ethno medicine)/folk medicine, it can be said now that about 1600 species are newly identified as drug yielding plants and are well known for their use about 4000 drug industries of various Indian systems of medicine like Ayurveda, Unani, Siddha (South Indian System) and Homoeopathy. It is about 12% of present Indian flora. About 80% of the raw materials of medicinal plants are still now collected mainly from 75 million hectares of forest coverage. Some forest species like Mamira (*Coptis teeta*), Sarpagandha (*Rauvolfia serpentina*), Brahamakamal (*Saussurea lappa*), etc. are endangered or threatened species. A good number of plant species and their plant products such as *Plantago, Acacia, Asparagus, Senna, Myrobalan*, etc. are of export value. Plants are utilized in preparation of herbal drugs used in traditional systems of medicine such as Ayurveda, Unani, Siddha and Tantra therapy. Many of these plant species like *Asparagus racemosus, Bacopa monnieri, Emblica officinalis, Phyllanthus amarus, Strychnos nux-vomica, Rauvolfia serpentina*, etc. are also used in modern Allopathic and Homeopathic systems of medicine. For economical viability, the cultivation of herbals may be the source of supplement income to the rural women and tribal communities.

Plants have influenced the development of the cultural and spiritual life in India from the very ancient times. They are being used as writing material, as beauty aid, as incense and perfumes and in religious rituals and social ceremonies. Certain trees like peepul (*Ficus religiosa*), banyan (*Ficus benghalensis*), tulsi (*Ocimum sanctum*), plantain (*Musa sapientum*), bel (*Aegle marmelos*), etc. find prominent place in the religious festivals. In certain places both Hindus and Muslims offer the same flowers and fruits in temples as well as in Mosques.

Emperor Akbar used to go to temples with betel and areca nuts. The plants of plantains and mango leaves are indispensable in the cultural and religious life in Bengal, both in West and in Bangladesh. This is an interaction between environment and culture, being quite independent of the religion. In Hindu religion distinct plants are attributed to appease different Gods, e.g. Lotus (*Nelumbium speciosum*) for Goddess Durga, Jaba (*Hibiscus rosa-sinensis*) for Goddess Kali, Palas (*Butea monosperma*) for Goddess Saraswati, Dhutura (*Datura metel*) and Akanda (*Calotropis procera*) for Lord Shiva and so on. In North India Dhutura is offered to Lord Vishnu.

At present, a large number of Indian plants are endangered due to either over-exploitation or due to technological or agricultural pollution and extension of human settlement. Medicinal plants like different species of *Lycopodium, Rauvolfia, Podophyllum, Dioscorea, Colchicum, Gloriosa* are over-exploited for their medicinal value. *Santalum album, Pterocarpus santalinus* are over-exploited for their scented and coloured timber. Some of them are over exploited as they are botanical curios as *Nepenthes khasiana, Helwingia himalaica,* etc. some for their beautiful flowers as Primulas, Orchids, etc. A large number of plants are endangered due to agricultural pollution as *Drosera, Utricularia* (aquatic insectivores) and due to agricultural extension as *Nypa fruticans* in the Sunderbans. These are irreplaceable resources which we have inherited through generations.

The drugs so far developed have been arrived at from chemical processing of 35,000 plants and screening of bioactivity of 25,000 extracts. A serious problem has emerged out due to over exploitation of medicinal herbs. An example can be cited for the plant *Taxus brevifolia,* for the marketed drug taxol used for refractory ovarian cancer, isolated from this plant. The trees can be grown for the production of active components but there are certain practical difficulties. The big trees are slow growing and such harvesting cannot be sustained indefinitely. The other way to obtain extracts for the preparation of medicines from plants is to obtain it through micro propagation and culture of plant cell, tissue organ. These alternative sources will definitely offer a number of benefits including uniformity of products, freedom from climatic factors, seasonal variations, disease and other restraints. Nowadays, the biotechnological procedures involving genetic engineering are also being developed for production of the useful plant drugs to avoid over-exploitation of bio reserve.

In view of the so many destructive forces working together on the biosphere, it will be our prime duty to save our floristic heritage at any cost. The present editorial is an attempt to provide an idea of the genesis of India's floristic inheritance with reference to drug plants for the use as medicines for the benefit of our society.