



Plant Conservation and Poverty Alleviation Through Traditional Knowledge in India

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As per the recent estimates nearly 80% of world's population relies on plants as their primary source for food and medicine. The treasure trove of such knowledge still remains untapped in the forests in many parts of the world. There are nearly 700 plant species which are utilized for the development of modern drugs. In the present era of medical engineering, plants play an equally significant role in discovery, designing and development of modern drugs. Over the counter cost of herbal drugs is roughly estimated to be US\$ 500 billion all over the world which is consistently growing @ 10 - 15 % annually and likely to touch US \$ 5 trillion during the next 30 - 40 years.

Indian subcontinent is among the top most nations having richest source of Traditional and Ethnic Knowledge since the time immemorial. India is inhabited by over 550 tribal communities belonging to 227 ethnic groups constituting 8.2% of entire population of the country. About 6,000 plant species are traditionally utilized all over the country for healthcare, food and other day to day material requirements. Hence, it is considered as a heritage of traditional system of medicine dating back to 5000 BC. Traditional Knowledge in our country has survived due to its strength, proven efficacy in the treatment and drug formulations taking care of health requirements of the people. Traditional and ethnic knowledge generated from such leads has played most significant role in the discovery of novel products as well as newer ideas about conservation of natural resources. With the application of modern standard technologies, discovery and designing of new miracle herbal formulations have saved millions of lives in the twentieth century. First successful multi-disciplinary study on ethno-pharmacological problem

was that of an arrow head poison derived from a plant known as 'Nuxvomica' (*Strychnos nux-vomica*). Twenty first century belongs to the herbal pharmaceuticals but the studies in medicinal plants are posed with complex challenges and demand integrated approach towards the development of health care products their sustainable utilization and conservation.

Indigenous plant species comprise as most potential domain for the search of new and novel medicines and commonly considered as the 'Power of Life'. Medicinal plant wealth exhibits enormous and maximum intraspecific variability with chemical polymorphisms among biodiversity rich nations particularly in the tropical and subtropical regions.

Several important and well known mind altering drug plant species in the world reveal documented records of their traditional ancient uses. Some significant examples to cite are: *Papaver somniferum* (Opium Poppy), *Cannabis sativa* (Marijuana), *Erythroxylum coca* (Coca), *Lophophora williamsii* (pey-ote) etc. Widespread distribution and antiquity of the use of these taxa and many other psychoactive drug species is indicative of their relative importance throughout the development of human society through value addition. *Azadirachta indica*, *Cannabis sativa*, *Coptis teeta*, *Gymnema sylvestre*, *Papaver somniferum*, *Picrorrhiza kurrooa*, *Rauvolfia serpentina* and *Withania somnifera* etc. are notable examples from traditional and ethnic leads validating their efficacies based on modern pharmacological evaluations. Presently herbal drug industry in our country has annual turnover of approximately Rs.4000 Crore with a meager export of Rs.400 Crore. It has tremendous scope and potential to expand further and serve the mankind. The hints of pharmaceuticals lie in the



traditional as well as ethnomedicinal claims which possess tremendous scope and potential towards the discovery of new drug formulations and novel lead molecules. Recently it has also been proved through the experimental evidences that a seventeen fold increase in activity of plant extracts pre-selected for medicinal use based on ethnic leads was observed when compared to the screening of plants selected randomly. Traditional and ethnic leads should be handled with great care, positivity and faith in traditionally documented claims. Ethnomedicinal and traditional Knowledge in our country has survived due to its sustained strength, proven efficacy in treatment of diseases and drug formulations taking care of health requirements of the people.

Plant diversity in India

Indian sub-continent has most significant varied ecosystems in world harboring about 17,500 plant species thriving in different bio-geographical regions from Kashmir to Kanyakumari. It is among one of the 12- mega diverse countries in the world. With only 2.5% of land area, it accounts for 7.8% of recorded species globally. Two regions viz.: Western Ghats in Southern region and Eastern Himalaya in North-Eastern parts of India are among mega-diversity areas in the world including 25 micro hotspot centers with endemic taxa. Over 550 tribal communities and ethnic groups belonging to 227 ethnic groups constituting 8.2 % of entire population in India utilize about 6,000 plants for health care, food and other material requirements. This traditional, cultural and ethnic diversity has helped in generating precious knowledge system about the usage of local bio-resources. Nearly 6,000 taxa are used as food and medicines with over 1,75,000 preparations and applications. Only 3,500 species have been scientifically investigated. Our country is rich in traditional and indigenous knowledge, both coded and informal and has several 'Ethnobotanical Hotspots' or 'Traditional Knowledge Hotspots' particularly in North-Eastern region, Western Ghats, Eastern Ghats, A & N Islands as well as the Himalayan regions etc. Indian subcontinent is among the top most nations having richest source of ethnic and traditional Knowledge since the time immemorial. Hence, it is considered as possessing a

heritage of traditional system of medicine dating back to 5000 BC.

Traditional knowledge system (TK)

All over the world the tribals possess a vast emporium of indigenous knowledge system which has been unique to a given culture or a society. Traditional knowledge (TK) is a result of co-evolution and co-existence of indigenous cultures and their traditional resource use. It can also be termed as 'Natural Capitalism' or a 'Green Economy'. Further, TK is a community based functional knowledge developed, preserved and maintained over many generations by local and indigenous people through continuous interactions, observations and experimentations with their surrounding environment.

Traditional Knowledge serves as a powerful tool for bio-prospecting of plant wealth and also for converting into value added products ensuring health security to masses in a most befitting and sustainable manner. Indigenous communities are responsible for discovery of a range of health giving herbal formulations including nutraceuticals, medicinal plants which can generate considerable economic value for our nation and alleviate the poverty as well. But this Traditional Knowledge is being so widely disseminated and commercially over exploited with a small portion of benefits flowing back to the provider communities, raises several questions of ownership. It plays a very important role in the development of the economy at national and global levels. 4.5 Billion people (About 80% of world's population) rely on plants as their primary source of medicine. Plant based drug discovery resulted mainly in development of anti-cancer and anti-infectious agents and continues to contribute to new/better leads under the clinical trials. Besides, the food plants also possess many medicinal efficacies and the potential of less known traditional food crops among the indigenous communities around the world must be judiciously exploited.

Indian scene - traditional system of medicine

India has a documented record of Traditional Systems of Medicine. It is nearly 5000 years old and has been a glorious heritage of our nation. Ayurveda,



the oldest system of medicine in the world, traces its roots to the Vedic period in ancient India. Atreya Samhita is considered as the oldest medicinal book in the world. It is known to be a rich repository of medicinal plants. Mention of medicinal plants is found in our ancient scripts such as Rigveda, Yajurveda & Atharveda. Medicinal Plants were later described in detail for their properties and uses in Charak Samhita and Sushrut Samhita.

There are approximately 30,000 traditional/ethnomedicinal formulations in our country which require immediate attention, documentation and scientific validation as well as IP protection and serious efforts to convert them into green medicines for the benefit of masses. *Rauvolfia serpentina* can be cited as an excellent example which has gone from Traditional Knowledge to the modern drug development in the mid of the 20th century but was dropped because the pure active compound Reserpine had shown several side effects. But later on it was observed that the root powder or the alkaloid as a whole does wonders as anti-depressant and lowering the blood pressure and now being cultivated extensively for use in herbal drug formulations.

Significant examples of plants showing ethno-pharmacological activities from the ethnic leads in India:

- ❑ *Citrullus colocynthis* (Uttar Pradesh)-has several uses including the treatment of testicular enlargement and hernia *Paeonia ovata* (Western Ghats)
- ❑ *Euphorbia acaulis* (Madhya Pradesh) - Found to be very effective against rheumatoid arthritis and inflammation
- ❑ *Adina cordifolia* & *Andrographis paniculata* (Madhya Pradesh)-Has remarkable hepato-protective and immuno-stimulant activities.
- ❑ Compound isolated from *Wedelia calendulacea* showed hepato-protective properties whereas *Kunstleria keralensis* showed anti-fertility activity.

Protection of traditional knowledge

Local communities possess a vast knowledge

about their plant resources, habitat and seasonal behaviour but lack in the means to safeguard this most valuable property under the prevailing conditions. Traditional communities are not given due credit for their information system of innovation. They are grass root innovators and have generated extremely rich pool of ethnic knowledge. This knowledge is highly vulnerable due to globalization process for the commercial profits of few developed societies. There is urgent need to focus on such knowledge and community innovations which can only be protected and preserved through national policies and international understanding and political will link to IPR for the benefit to its stake holders. Present IPR systems encourage appropriation of Traditional Knowledge (TK) for commercial use and that too without fair sharing of benefits to the holders of their knowledge. This violates indigenous cultural precepts by encouraging the comodification of such knowledge. This issue needs to be looked at from two perspectives: The 'Protection' may be granted by third parties on the protected information. On one hand protection also means to preserve (TK) from use that may erode it or negatively affect life or culture of ethnic communities who have developed it and applied. Traditional knowledge about the natural dyes/paintings also requires focused attention and research inputs for value addition and conservation of such dye yielding plant species. The interest of indigenous communities involved in such traditional arts must be safeguarded.

National level protection for ethno-medicinal & traditional knowledge in India

Indian government has passed three parliamentary acts in an attempt to protect nation's Biological Diversity and the interests of researchers, plant breeders and farmers.

This three pronged strategy involves:

- ❑ Protection of Plant Varieties and Farmers' Rights Act-2001
- ❑ National Biodiversity Act 2002
- ❑ Geographical Indication of Goods (Registration)
- ❑ India's interpretation of CBD is reflected in the India's Biodiversity Act-2002.



- ❑ It also recommends for the establishment of a National Biodiversity Authority (NBA) with extensive powers to protect biological resources (Anonymous, 2007) which has already been established at Chennai (TN).

Convention of Biological Diversity (CBD)

Throughout the history, Biodiversity has been the commons of local communities with both resources and knowledge being freely exchanged. It is the capital asset of a nation and forms the foundation upon which the human civilizations are built. Convention of Biological Diversity (CBD) has developed and changed the attitude towards the use of Biodiversity

TK prior art databases

In order to protect and conserve the Indian Traditional Knowledge a collaborative project on Traditional Knowledge Digital Library (TKDL) has been in progress at National Institute of Science Communication and Information Resources (NISCAIR), New Delhi, Department of AYUSH and Department of Industrial Policy & Promotions and being implemented at NISCAIR. This project is integrating the huge amount of generated knowledge based information on Ayurveda, Unani and Siddha into a unified code to protect this valuable knowledge from biopiracy, use in discoveries of new drugs and equitable sharing of benefits.

This searchable database of documented information on TK will remain available to the Patent Examiners in India and elsewhere during the patent examinations. Such databases will be useful to improve the efficiency of prior art searches and digitization of Traditional Knowledge and will be certainly helpful in stopping notorious patents like Turmeric, Neem and Basmati cases from being granted in the other countries. During 2000 Indian Council of Medical Research, New Delhi has also initiated the publication of series of volumes on Indian medicinal plants incorporating the multidisciplinary studies.

Need for collaborative research & combination products

As far as R&D activities based on traditional and ethnomedicinal evidences are concerned, days of individualistic researches are gone. Multidisciplinary team work involving numerous personnel from diverse fields is most vital and imperative for achieving major breakthroughs in new drug discovery programmes. R & D with broader goals should be encouraged and supported in the present times. Herbal ingredients used in combination should also be taken into consideration during the course of drug development. Discovery of a new drug from plants has been a highly complex and costly affair despite of significant advances in pharmacological fields. Their assessment may be undertaken according to specific guidelines and strict criteria using full application procedures as per standard norms.

Conclusion

Side effects of modern allopathic medicines have now been realized well all over the world. As a result more attention is being focused on the alternative sources of medicine such as TK within the reach of a common man for affordable health care. Usage of herbal drugs has increased exponentially during the past few years in developing and developed nations. Demand for the raw material of plants in pharmaceutical industry for manufacturing drugs, nutraceuticals as well as cosmeceuticals has increased manifold during last 10-15 years requiring development of agro-technologies and commercial cultivation of such taxa. Success rate is approximately 90% from traditional and ethnic leads in new drug discovery programmes as compared to the random sampling.

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