

MEDICINAL PLANTS AND DRUG DISCOVERY: THE JOURNEY FROM ETHNOBOTANY TO PHARMACOLOGY

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Abstract- Plants are used as medicine from prehistoric times. Ancient and Traditional system of medicine are dependent on medicinal properties of plants in many of their preparations. Taking cue from traditional system modern medicine also has a great relationship with plant kingdom. Many plants like *Cinchona*, *Opium*, *Salix* are milestones in development of different categories of drug. In the era of sustainable development plant based drugs provides a real solution to pharmacologists. Present study discuss journey of some plants from tradition to modern medicinal system.

Key words - Plants, Traditional medicine, Modern medicine, Ethnobotany, *Cinchona*, *Opium*, *Salix*, Turmeric.

Medicinal plants are significant source of medicine. Any plant part viz root, stem, leaves, flower, fruit and seeds can be source of medicine. They are in use since the ancient times. The study of medicinal plants was included under herbalism.

Herbalism- The word Herb has been derived from Latin word "*herba*" mean grass or green. Herbal medicine (or "herbalism") is the study and use of medicinal properties of plants which has a rich history of 5000 years. It is estimated that 80% of world population rely

on traditional herbal medicine for primary health care.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3847409/>

According to WHO, around 21,000 plant species have the potential for being used as medicinal plants.

About 8,000 herbal remedies have been codified in AYUSH systems in INDIA. Ayurveda, Unani, Siddha and Folk (tribal) medicines are the major systems of indigenous medicines. (Seth and Singh, 2004). Presently herbs are much in use as dietary supplements which act as enhancers of immunity, help in fighting with diseases.

Medicinal plants in Ayurveda. India is a home for many alternative medicinal system. Vedas mention treatment with plants, which are abundant in the country. Ancient Indian system of medicine, Ayurveda is practiced from around 3000 years and has a long history of managing disease. Ayurveda has a holistic approach of treatment. It is based on three basic principles called as *doshas* (*vata*, *pitta*, and *kapha*) which are derived from five elements (*akash*, *agni*, *vayu*, *jal*, *prithvi*) of Indian philosophy. Three *doshas* are regulatory control factors for basic metabolic processes. Disorders in any of the three major



doshas are treated in different modes, medicines are one of them. Approximately 90% of ayurvedic medicinal preparations are plant based. *Sushruta* in the 6th century BC describes 700 medicinal plants in *Sushrut Samhita*. (Mishra, B.1995, Dwivedi, G.S. 2007-). Ayurveda emphasized on polyherbalism (mix of two or more herbs) for systematic treatment. The traditional Ayurvedic text *Sarangdhar Samhita*, which dates from 1300 AD, highlights the concept of polyherbalism (Sastri, 2002).

Other traditional medicinal systems like Chinese, Unani, Sidha, Tibetan and homeopathy also make use of medicinal plants to a great extent in various forms. All of these systems are practised in India in some or other extent.

Plants in Modern Medicine. At the beginning of the nineteenth century, the era of “modern” drugs began. First pharmacologically active compound morphine was isolated in 1805 from the opium plant (Krishnamurti and Rao, 2016). Since then, countless active compounds have been separated from natural products. Selected groups of these active compounds are successful in treating diseases like cancer, hypertension, and migraine. Interestingly, ethnobotanical information laid the foundation the use of plant as medicine in many cases. Milestone drug discoveries like quinine, aspirin have their roots in indigenous use of plants by locals (especially tribals) to treat various ailments. Several naturalists explored these tribal societies and collected botanicals which have played important roles in the development of new drugs for many centuries. (Heinrich, M., 2003). This resulted in focusing on a systematic evaluation of indigenous pharmacopoeias which is now included in official agenda of national and international organizations.

Present study is aimed to discuss such journey of some important drugs from ethnobotany to pharmacology.

Some great players in the field of Ethnobotany to Pharmacology.

The Anti- Malarial Wonders: Curious case of Discovery of quinine from *Cinchona*

***officinalis*.** Malaria as a disease have been a foremost cause and is responsible for a significant mortality rate all over the world.. Even in present times the disease is prevalent in many countries and claims more than 600,000 lives every year as per WHO reports. (World Malaria Report, 2014)

Discovery of anti-malarial drug quinine is most significant milestone in the history of treatment of malaria. The drug is extracted from the bark of tree of quinine tree (*Cinchona officinalis*), a native plant of western South America. *Cinchona* is an evergreen tree which grows on the eastern slopes of the Andes mountains.. The indigenous people used to take the preparations of the bark to combat the fever. In later years the anti-malarial properties of bark of tree (quina-quina in local language) were found by missionaries in PERU. They were credited with introducing cinchona bark into medical use in Europe around 1640 which was accepted as remedy by 1681. Various forms of quinine remained main medicine of malaria treatment until the 1920s with chloroquine as most effective. In later years resistance with chloroquine developed, still quinine continues to play a significant role in the management of malaria. (Ranslo, A.R., 2013)

Artemisinin: The Second Generation Anti-Malarial Drugs.

In 1960s a second-generation antimalarial drug, Artemisinin, came in picture. Interestingly this drug also comes from thousand-year-old herbal remedy from China. It is extracted from the *Qinghao* or wormwood plant, a native of temperate Asia. It is recognized as a powerful anti-malarial drug and has partly replaced quinine. It has the merit of high efficiency, quick effect, and low toxicity. It effectively treats different forms of malaria which are otherwise resistant to chloroquine. (Efferth, T., 2009)

***Papaver somniferum*: Opium, The Ultimate Pain killer. (Analgesic)**

The plant is an annual herb originally from Eastern Europe and Western Asia and provide

most potential painkillers used in treating different categories of pain. The dried latex from the fruit (capsule) is the source of medicine. Genus *Papaver somniferum* L. (Papaveraceae) also known as "opium poppy" or "sleep-bringing poppy" is a native of Turkey. The plant was cultivated in the ancient civilizations of Egypt, Mesopotamia and Persia. It may have been in use by human being over 30,000 year ago as suggested by fossilized evidences. Written evidence was found in Sumerian text as old as 4000 B.C. Traditional systems of medicine like Chinese and Tibetan used air dried latex or extract of un-ripened capsule seeds were used to prepare opium in treating disorders like dysentery and cholera. (Lukman, 2014). Many ancient medicinal texts mentioned use of opium. Ancient Indian medical work like 'Bhavaprakasha' treatises 'The ShodalGadanigrah' and 'SharangdharSamahita' describe the use of opium for diarrhoea and sexual debility. The *Dhanvantri Nighantu* also describes the medical properties of opium. Use of raw opium was widespread in many Asian countries.. It was taken orally as pills

(<http://cbn.nic.in/html/opiumhistory1.html>).

In modern system of medicine opium came into wide use as a painkiller in the 18th

century. Morphine was first isolated from opium about 1805. Dried extract from capsule is source of many opiates like morphine, codeine, papaverine and thebaine which are extensively used in treating spasms, pain, insomnia and anxiety. (Lukman, 2014).

Salix willows - Source for first pain killer Aspirin. Willow (genus *Salix*) is deciduous tree from Salicaceae family. The origin centre of tree is China but its travelled throughout the northern hemisphere.

Willow tree (genus *Salix*) have abundant watery bark sap which has been used as a traditional medicine for more than 3500 years in the ancient Egyptian and Greek civilisations. They used the bark of willow tree to reduce the pain and to break the fever. They were not knowing the sap is a great source of salicylic acid which is an integral part of human metabolism. Later the chemical composition of sap was studied in lab and *Salicin* was found to be the main active ingredient which would later form the basis of the discovery of aspirin. Chemist Felix Hoffmann, a German chemist convert it acetylsalicylic acid which is the present form of aspirin. This is the first Non-Steroidal Anti Inflammatory Drug (NSAID). (Sneader, W., 2000). Aspirin also inhibits production of hormones responsible for the formation of clots that leads to heart attacks and strokes. (Vane, J.R, 2000)

Name	B.N.	Origin	Active Principle	Drug Action
Quinine	<i>Cinchona officinalis</i>	Latin America	Quinine	Anti -Malarial
Wormwood	<i>Artemisia annua</i>	Temperate Asia	Artemisinin	Anti -Malarial
Opium	<i>Papaver somniferum</i>	Turkey	Morphine and others	Analgesic (Pain Killer)
Willow	<i>Salix spp.</i>	Northern China	Salicin (Aspirin commercial name)	Analgesic
Turmeric	<i>Curcuma spp.</i>	India	Curcumin	Anti - Inflammatory, Antiseptic

Table: Quinine, Opium, Willow and Turmeric: Journey from ethnobotany to pharmacology



Journeys in pipeline. Turmeric: Yellow gold from India. Turmeric is a classic example which has travelled from ancient to modern medicine is turmeric. it is cited as analgesic and anti-inflammatory in Ayurveda and India won a war to get its patent back from U.S.A. known as II war of *Haldighati*. Turmeric, termed as vulnerary herb, can effectively treat a fresh cut and wound. (Kumar, S. 1997). Various research trials are under process to study the effect of phytochemicals found in turmeric on diseases such as cancer, arthritis, diabetes under various research trials.. In a research study curcumin is being studied for its effectiveness in chemotherapy in patients with advanced bowel cancer. (Ishita and Khaushik, 2004). Other plants under trial are *Capsicum* for pain killing and Aloe for skin protection.

Conclusion

It is clear from above study that medicinal plants have unique biodiversity and remained most important source for drug development. Medicinal plants will always be in use to meet the increasing need to develop effective drugs. They will be the main player in the journey of discovery of drugs for treating human diseases, especially critical diseases. (Cragg and Newman,2013).

India, being a mega-biodiversity centre is a rich treasure of medicinal plants. Indian forests are a rich biodiversity centre inhabiting large number of medicinal and aromatic plants which provide the basic raw material for commercial production of drugs. Moreover, Indian ayurvedic system provides a great database to work upon medicinal plants. Modernization and integration of Ayurveda and other traditional medicinal system with modern medicine seems a promising solution in creating new plants based medical formulations.

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