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## **A Short Note on Designing Curriculum for Medicinal Phytochemistry**

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### **Introduction:**

Phytochemistry is defined as study of chemical composition of medicinal plants or phyto-drugs. Phytochemistry is significant subject of Pharmacognosy curriculum. Today we can witness explosive growth of herbal drug industry. Standardized herbal extracts and phytochemicals are in high demand for applied research as well as commercial use. The phytochemistry course taught in pharmacy schools deals with process of isolation, purification and pre-clinical studies of herbal extracts and phytochemicals.

Before the availability of synthetic drugs, phyto-drugs or herbal drugs were mainstay of treatment. Several factors including lack of emergency medicine, surgery, research and standardization lead to decline of phyto-medicine. With discovery of the opium alkaloid morphine, chemists started targeting herbal drugs for bioactive compounds (referred to as phytochemicals). Phytochemicals may affect health, but are not essential nutrients. Most of the phytochemical in modern pharmaceutical industry are secondary metabolites. Emerging factors like drug-resistance, cost-effectiveness and side-effects of synthetic drugs have led to resurgence of phyto-drugs.

World Health Organization has identified the growing popularity of phytomedicine. Several articles and documents have been published highlighting future of phyto-medicine. Pre-clinical or non-pharmacological studies published in index journals have demonstrated utility of standardized herbal extracts and phytochemicals. Clinical-studies done on phyto-drugs like garlic, St. John's wort, purple cone-flower, ginseng, black-cohosh and Ginkgo have proved ancient claims. More so, these phyto-drugs have been documented in reputed medical text-books.

Herbal drug industry is in transition stage. Time is ripe for initiating more research activities in this unexplored field. Non-standardized herbal preparations like infusions, decoctions, tinctures and powders have been largely replaced by standardized herbal preparations like extracts. Extracts are standardized to marker-compounds or active-constituents. Marker-compounds are used in identification of plant material. It is more of industrial importance. Active-constituents are responsible for pharmacological or medicinal activity of the extract.

### Classification of phytochemistry

In our view, phytochemistry can be divided into two classes:

1. Conventional or traditional phytochemistry
2. Medicinal or applied phytochemistry

Conventional phytochemistry adopts procedures for isolation and purification of active constituents of medicinal plants. Study of this discipline is of more relevance to the pharmaceutical industry. Detailed discussion of conventional phytochemical techniques is beyond the scope of the present communication. Medicinal Phytochemistry is emerging as new subject keeping in mind recent trends in phytotherapy. This subject is of interest to medical or herbal professionals. Recently some institutes have introduced chapters or modules on herbal medicine or phytotherapy in regular medical syllabus.

### Scope of medicinal phytochemistry

Medicinal Phytochemistry seems to be an interdisciplinary subject. For well-trained medicinal phytochemist, knowledge of subjects like medicinal or pharmaceutical botany, anatomy, physiology, pathology, pharmacognosy, ethno pharmacology, chemical ecology, conventional phytochemistry, toxicology, traditional systems of medicine, clinical research and biostatistics is a prerequisite. Several complementary and alternative systems of medicine are in practice but Traditional Chinese System (TCM) has made tremendous progress as far as application of phytochemistry in medicine is concerned.

A typical Medicinal Phytochemistry course will be postgraduate and of two-year duration. In case of Ayurvedic curriculum, medicinal phytochemistry can combine well with Dravyaguna. Dravyaguna is defined as study of Ayurvedic perspective of medicinal plants. A comparative curriculum blending ancient and modern concepts of ancient therapy will be helpful for students of Ayurveda. Curriculum of herbal medicine taught in Australia, Europe

and United States have glimpses of Medicinal Phytochemistry but it needs significant expansion.

### **Career prospects**

A well-trained medicinal phytochemist can join academic institutes conducting research on natural medicinal products or as expert in herbal drug industry. There is cut-throat competition in herbal drug industry and well-trained medicinal phytochemists are in high demand.

### **Challenges in the future**

Herbal medicine is rapidly expanding its wings. We need to create specialties subjects in already existing curriculum of herbal medicine. Many allopathic practitioners are interested in understanding mechanism of actions of phyto-drugs. Most of the CAM practitioners have little interest towards integrating the modern and traditional systems of medicine. However some of the CAM practitioners have started understanding the importance of integrative approach. In order to sustain medicinal phytochemistry in near future, we need more funds for research and development. The course is must for creating specialty subjects like phytopharmacology and phytopharmacotherapy.