

Medicinal Plants Studies: History, Challenges and Prospective

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The association of humans and animals with plants obviously originated with the beginning of life on earth, when plants supplied much of the shelter, oxygen, food and medicine needed by higher life forms. Overtime and with the beginning of societies, human learned to recognize and categorize plant materials suited for use in meeting the necessities of life. Of these necessities, the use of herbs and herbal extracts for their healing powers can be traced to earliest of myths, traditions and writings used to codify those plants that can ease pain and treat diseases. The evolution of these plant-based medicine systems, primarily based on plants within a local area, produced the well known traditional medicine systems, the Ayurvedic and Unani of the Indian subcontinent, the Chinese and Tibetan of other parts of Asia, the Native American of North America, the Amazonian of South America and several local systems within Africa.

According to World Health Organization (WHO), about 70 percent of the world's population relies on plants for their primary health care and some 35,000 to 70,000 species has been used as medicaments, a figure corresponding to 14-28% of the 250,000 plants species estimated to occur around the world [1-3], and equivalent to 35-70% of all species used world-wide [3]. In today's global market, more than 50 major drugs originated from tropical plants [4].

From about 250,000 species of higher plants around the world, only 17% have been scholarly investigated for medical potential [5]. The chemical and biological diversity of plants represent a potentially limitless renewable source for the use in the development of new pharmaceuticals.

Flora of China and North America have almost the same numbers of flowering plants around 35,000. However, traditional Chinese medicine use 5000 of them, but Native Americans used 2564 medicinal plant [5,6]

North American herbal medicine represents a rich, yet unexplored source of potential phytopharmaceuticals. According to American ethnobotanist Daniel Moerman, Native Americans used about 9% of all vascular flora for medicinal purposes [7]. Yet, only a few screenings of North American medicinal plants have ever been undertaken, and vast majority of plants still remain unknown.

Objectives of this editorial include evaluation of main criteria of current medicinal plants studies, and recommendations for successful approach of medicinal plants research.

The botanical wisdom accumulated by indigenous people has led to the establishment of the traditional systems of medicine including Chinese, Ayurvedic, Middle Eastern, European, African and American [8,9]. According to American pharmacognosist Norman Farnsworth, 89 plant-derived drugs currently prescribed in the industrial world were discovered by studying traditional herbal use, an ethnobotanical approach [5,10].

In 18th century, British doctor William Withering discovered effectiveness of foxglove (*Digitalis purpurea*) from traditional European herbal medicine, for treatment of dropsy. The retention of fluid also was alleviated by the administration of foxglove. In 20th century, more than 30 cardiac glycosides have been isolated from dried foxglove leaves

including digitoxin and digoxin [10]. Cardiac glycosides are useful because they increase the force of heart contractions, and allow the heart with more time to rest between contractions [11,12]. Each year, over 1500 kilograms of digoxin and 200 kilograms of digitoxin were prescribed to heart patients throughout the world [7,10]. *Rauvolfia serpentina*, the snakeroot plant, traditionally is used for treatment of insomnia in Ayurvedic medicine of India. In 1949, German chemists extracted alkaloid reserpine from *Rauvolfia*, roots used today for high blood pressure treatment [10].

Currently, major biologically active compound in fighting malaria is artemisinin, a sesquiterpene lactone, first isolated in 1972 from wormwood (*Artemisia annua*) by Chinese chemists studying traditional Chinese herbal medicine [13]. Research on traditional medicinal plants in the U.S. has resulted in the discovery of alkaloids from Madagascar periwinkle (*Catharanthus roseus*), used in the chemotherapy of childhood leukemia and for treatment of Hodgkin's disease. The compound taxol with anti-cancer action was discovered in the bark of Pacific yew tree (*Taxus brevifolia*), and approved by FDA in 1992.

Understanding the relationship among medicinal plants used in traditional medicine systems can help identify plant materials with potential constituents applicable to modern medicine. Studies indicate that the traditional medicine of Native Americans used plants from the same family and genus, as the Chinese used in their traditional medicine system. For example, Asian ginseng (*Panax ginseng*) and American ginseng (*Panax quinquefolius*) were used as adaptogenic plants; similarly in Chinese and Native American traditional medicine [6,11]. American licorice (*Glycyrrhiza lepidota*) and Asian licorice (*Glycyrrhiza glabra*) were used in the same way for treatment of bronchial asthma in traditional medicine of China and North America [6,7].

The tropical rainforests are the richest source of medicinal plants [6]. How illiterate traditional healers know every plant in rainforest around them and use them correctly for medicinal purposes? In our opinion, they have used several ways:

- Learning through trial and error.
- Spiritual learning by ritual use of medicinal plants in religious ceremonies, such as "invoking hidden power of the plants" and meditation.
- Observing how apes and other animals utilize those plants.

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- d) Preserving the oral tradition when knowledge about plants is passed by traditional healers from generation to generation.

Currently, investigation of plants used in traditional medicine to determine biological activities is a complicated process that includes several stages:

- a) obtaining reliable ethnobotanical data on use in the traditional system,
- b) collecting specimens from the correct genera and species used in the traditional system,
- c) investigating the activity of crude extracts and active principles, and
- d) analyzing the chemical structure, synthesis, and structural modification.

There are 7 billion people and about 250,000 plants co-existing in this planet. We should never forget that plants lived there for million years before humans, and the main difference between people and plants is that plants can live without people, but people cannot live without plants. People need plants for medicine, in addition to the need of oxygen, food and forage.

For successful research on potential new sources of medicines from plants, we emphasize some important recommendations to consider for every scholar who study medicinal plants:

- 1) Each medicinal plant has hundreds of biologically active chemical compounds that work synergistically together. This is a direct result of natural selection process. The plant as a whole, not only identified main ingredient that might possess medicinal value.
- 2) Each medicinal plant has direct and indirect impact on human body. Direct impact based on pharmacological action of its biologically active compounds. Indirect impact is related to interaction with other plants or drugs taken.
- 3) Search for medicinal plants to cure epidemic diseases should include the plants from the geographical place, where these diseases were originated and most spread around. The disease may be existing there for thousands of years, and local healers-herbalists might cure, or at least control spread of disease with native medicinal plants [14].
- 4) If one plant from one particular genus has significant medical value, all other plants from the same genus may have the same medical value. The only difference is potency; other plants from the genus may have more or less potency.
- 5) When there is an investigation of essential oil plants, one should consider that essential oil content depends on the altitude. Essential oil plants from higher altitudes (as alpine grasslands) have higher content of essential oils.
- 6) Correct identification of medicinal plants by voucher specimen herbarium is very important. Chemotaxonomy and molecular biology are helpful for plant identification. However, identification of chemical compounds and genetic markers alone is not enough, therefore, must be complemented by classical botanical methods and botanical microscopy.
- 7) Evolutionary approach should be taken into consideration; if several generations in the particular ethnicities continuously

used plants from one traditional herbal medicine system (Chinese, African, Indian, Western etc.), and then those plants should remain the first choice for treatment.

As billions of people worldwide rely on medicinal plants for health, sustainability and conservation, it must be our first priority. We should do everything possible to preserve biodiversity of plant ecosystems, especially in tropical rainforests. The recommendations above would help to address scientific approaches to medicinal plants harvest and utilization.

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