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Worldwide Importance of
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Worldwide Importance of Medicinal Plants: Current and Historical Perspectives

Muhammad Shahzad Aslam*, Muhammad Syarhabil Ahmad

School of Bioprocess Engineering, Universiti Malaysia Perlis, Kompleks Pusat Pengajian Jejawi 3, 02600 Arau, Perlis, Malaysia.

*Correspondence: aslammuhammadshahzad@gmail.com

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Abstract

There is no existence of life without plants. Plants are the essential foundation of medicine. Some important drugs that are still in use today are derived from traditional medicinal herbs. The hunt for new medicines has engaged ethnobotany and ethnopharmacology—a new route as an important source of knowledge, which led toward different sources and classes of compounds. Nowadays, studies on structure-activity relationships, and their impact on the design of novel drugs have rendered them one of the utmost valuable and thus significant accomplishments of pharmacology, an advance constituent in the group of pharmaceutical sciences. In this paper, we have discussed the historical importance of medicinal plants, geographical importance throughout the world, some important historical observations of medicinal plants, and leading drugs of plant origin which are still being used to treat various ailments, with or without any structural modifications.

Keywords: Medicinal plants; Historical perspective; Ethnobotany; Traditional medicinal importance; Geographical importance of medicinal plants.

1. INTRODUCTION

It is impossible to imagine the survival of human race if the Earth had no plants on it. The dependence of human beings on plants dates back to the start of the human race. Medicinal plants are common sources of medicine. Solid evidences can be cited in favor of herbs being used for the treatment of diseases and for restoring and fortifying body systems in ancient systems of medicine such as Ayurvedic, Unani, and Chinese traditional medicine. The innately desired purpose of the use of herbs was to obtain a positive interaction with body chemistry [1].

Table 1: Timeline of historical activities.

| Timeline | Activities |
|------------|---|
| 3300 BC | Austrian/Italian "iceman" of the Alps of Otztal (3300 BC) [2] |
| 1500 BC | The oldest known proof of Egyptian medicine system is Ebers Papyrus which dates back to 1500 BC and was recovered in 1873 at archaeological site excavation [3]. |
| 500 BC | Banaras Hindu University was the first school which taught Ayurveda in 500 BC and where the great Samhita (encyclopedia of medicine) was written. Another great encyclopedia was written seven hundred years later, and these two formed the basis of Ayurveda [3]. |
| 460-375 BC | Hippocrates (460-375 BC), a Greek medical doctor, imparted great influence on European medical traditions. He was one of the authors of Corpus Hippocraticum and supposedly the first one of the series [3]. |
| 1 BC | The Greek scholar and physician Pedanius Dioscorides (1 BC) is undoubtedly the father of Western medicine. In his famous book <i>De Materia Medica</i> , he described 600 medicinal plants [3]. |
| AD 130-201 | Claudius Galen (AD 130-201) is one of the most famous Greco-Roman medical doctors who abridged the old Greco-Roman pharmacy and medicine traditions with existing trends. The pharmaceutical term "Galenical" is the reminiscent of his influence on the field of pharmacy [3]. |
| 1991 | Furthermore, half of the best-selling pharmaceuticals in 1991 were either natural products or their derivatives [4]. |
| 1999 | In Pakistan (1999), our import covers US \$31.0 million and export covers US \$6.0 million. Interestingly only 6% have been explored for their biological activities, and only 15% have been explored phytochemically for their constituents [5]. |
| 2050 | In the world, 30% of the pharmaceutical preparations are manufactured from plants. Their global market value is currently US \$60.0 billion; their expected growth would cover US \$5.0 trillion (by the year 2050) [5]. |

Table 2: Some important geographical observations regarding medicinal plants.

| Continents | Observations |
|--|--|
| Africa, Australia, South America, and Meso-America | Records regarding medicinal plants for regions as Africa, Australia, South America, and Meso-America could not be found. The reasons might be that no such traditions were documented, or they were destroyed by the invaders [3]. |
| Japan, India, and China | The written records of medicinal traditions of Japan, India, and China can be traced in earlier manuscript and books [6, 7]. |
| China | The first document of traditional Chinese system of medicine <i>Shennong Ben Cao Jing</i> (translated as "Drug Treatise of the Divine Countryman") is 2,200 years old which enlisted 365 drugs [7]. |
| South Asia | More than 1,800 different plant species were used by Ayurvedic and other traditional healers in South Asia [8]. |
| China | Over 5,000 medicinal plants have been recorded, and about 1,000 are still used in clinical practice in China [9]. |
| Worldwide | Out of the top-20 best sellers in pharmaceutical field, seven were found to be either natural products or direct derivatives of natural compounds. These drugs earned US\$20 billion revenue per annum [10]. |
| Worldwide | According to conservative estimates, on earth there are about 400,000 secondary plant metabolites, and about 10,000 of them have been chemically isolated [11]. |

2. ISLAMIC IMPORTANCE OF MEDICINAL PLANTS

People having different academic and intellectual backgrounds believe in Islam [12]. Date palm's (*Phoenix dactylifera*) significance is described in this verse of the Holy Quran. "And from the fruits of date-palms and grapes, you drive strong drink and goodly provision" (Surah-an-Nahl, Verse no. 67). Importance of garlic (*Allium sativum*) is given in Verse no.61, Surah Baqarah [13]. The importance of garlic, cucumber, lentils, and onion is described in Verse no. 61, Surah Baqarah [14]. The value of ginger is described in Surah Ad-Dahr Chapter no. 76, Verse no. 17 [13].

In Ahaidth, the significance of many medicinal-plant species has been described by Farooqi in his book *Ahaidth Mein Mazkoor Nabatat, Adwiyah Aur Ghizaen* (translated in English as "Plants, Medicines and Food Mentioned in Ahaidth"). It has citations of about 70 plants and various plant products [15-17].

3. EARLY MODERN AGE

A majority of the population in the developing world is struggling to raise living standards and improve health-care delivery due to increasing poverty and population. According to an estimate, 70-80% of the developing world is dependent on conventional plant-obtained remedies, as pharmaceuticals are high priced [18]. The supposed "Green Wave" activated by rising bionomical consciousness has led to increased involvement in herbal formulations all over the globe. Medicinal plants' consumption has doubled in the west. The number of plant-derived medicaments or health foods has increased slowly to encounter demands [19].

Table 3: Some important historical observations of medicinal plants.

| Medicinal plants | Historical importance |
|--|---|
| Foxglove | Foxglove extract marked the beginning of modern therapeutics which was later on used in the treatment of dropsy [20]. |
| <i>Digitalis</i> | It is well known that its active constituents, digoxin and digitoxin, are secondary metabolites (glycosides) derived from <i>Digitalis</i> species and are still being employed in the management of congestive heart failure. Still today, <i>Digitalis</i> is the primal source of these glycosides [20]. |
| Morphine | Morphine is the first natural compound isolated in pure form from dried leaves of <i>Papaver somniferum</i> . This effort gave impetus to the convergence of attention towards the isolation of pure compounds and likewise the determination of pharmacological properties of compounds and structure determination [1]. |
| Strychnine, cocaine, nicotine, papaverine, and quinine | Strychnine, cocaine, nicotine, papaverine, and quinine represent typical natural compounds which were isolated by man as pure compounds [1]. |

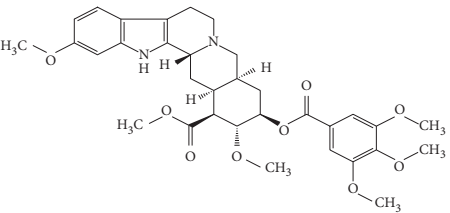
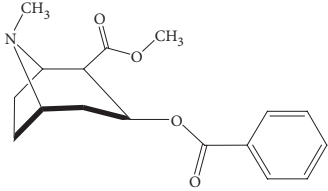
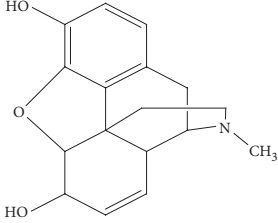
4. CURRENT MODERN AGE

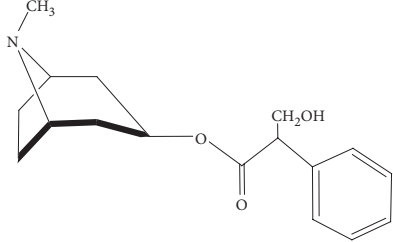
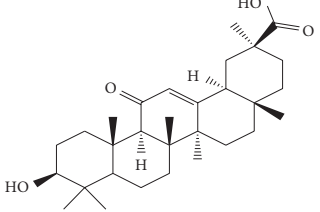
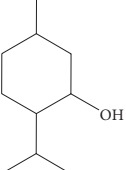
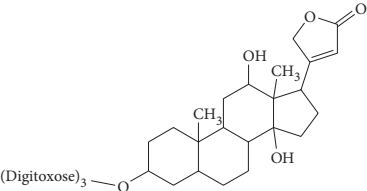
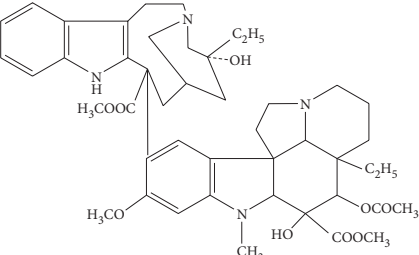
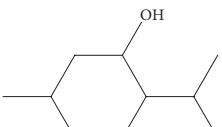
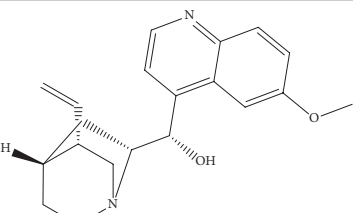
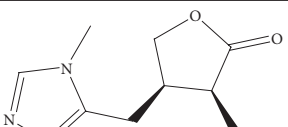
During the past few years, numerous novel compounds have been isolated from marine organisms, and many of these substances have been demonstrated to possess interesting biological activities [21]. Currently, research is focused on the isolation of pharmacologically active compounds from natural sources in the area of those diseases where presently available drugs are not so effective. Also herbal medicines are experiencing greater resurgence as many people are turning their attention from modern drugs toward parallel herbal systems which are also known as alternative medicine [22].

Table 4: Some key observations regarding importance of medicinal plants.

| Percentage | Observations |
|------------|--|
| 20-25% | According to an estimate, 20-25% of all drugs which are mentioned in <i>Pharmacopeia</i> are derived from natural sources, whether being employed in management of diseases without any modification, e.g., vincristine from <i>Catharanthus roseus</i> and silymarin from <i>Silybum marianum</i> , or with slight chemical modifications, e.g., aspirin, a derivative of salicylic acid which in turn is isolated from <i>Salix</i> spp. [23]. |
| 70-80% | According to an estimate, 70-80% of the developing world is dependent on conventional plant-obtained remedies, as pharmaceuticals are high priced [18]. |
| 50% | In the United States of America, the prescription-based statistics from 1993 to 2000 elucidated that more than 50% of the drugs prescribed were purely natural products, or they were derived from natural compounds [24]. |
| 80% | World Health Organization reported that 80% of world's total population sought out herbal medicines for the management of their primary health-care problems [25]. |
| 75% | More than 100 drugs that are widely used in many countries are of plant origin. Of these, 75% are directly derived from plants that are extensively used in traditional systems [26]. |
| 39% | Food & Drug Agency statistics showed that during the period 1983-1994, 39% of 520 drugs registered were either from natural sources or their structurally modified derivatives [26]. |
| 77% | Scientists have reported that at least 119 compounds derived from 90 plant species are currently used in clinical practice, with 77% of these being derived from plants used in traditional medicines [25]. |
| 25% | About 25% of the prescriptions worldwide are filled with drugs which are obtained or extracted from plant sources [27]. |

Table 5: Leading drugs of plant origin which are still being used to treat various ailments without any structural modifications [30].

| Plant | Uses | Drug | Structure |
|-----------------------------|--|-----------|---|
| <i>Rauwolfia serpentina</i> | Antihypertensive, tranquilizer | Reserpine |  |
| <i>Erythroxylum coca</i> | Local anesthetics, cerebral stimulant (Narcotic use) | Cocaine |  |
| <i>Papaver somniferum</i> | Narcotic analgesic | Morphine |  |

| | | | |
|-------------------------------|---|-------------------|---|
| <i>Atropa belladonna</i> | Mydriatic, anhydrotic, anti spasmodic | Atropine |  |
| <i>Glycyrrhiza glabra</i> | Anti-inflammatory, peptic ulcer treatment | Glycyrrhetic acid |  |
| <i>Mentha piperita</i> | Antipruritic, counterirritant, stimulant | Menthol |  |
| <i>Digitalis lanata</i> | Cardiotonic | Digoxin |  |
| <i>Catharanthus roseus</i> | Hodgkin's lymphoma, choriocarcinoma | Vinblastine |  |
| <i>Mentha arvensis</i> | Local anesthetic, counterirritant | Menthol |  |
| <i>Cinchona officinalis</i> , | Analgesic, antipyretic, antimalarial | Quinine |  |
| <i>Pilocarpus jaborandi</i> | Treatment of glaucoma | Pilocarpine |  |

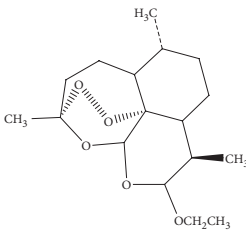
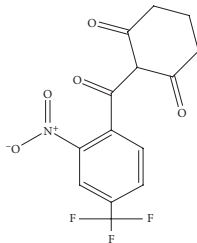
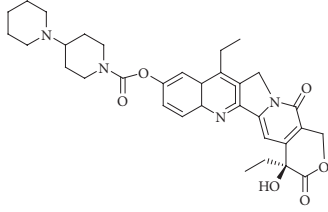
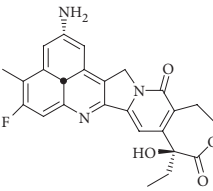
5. LEADING DRUGS FROM PLANT ORIGIN

The plant kingdom offers a high range of structural diversity in the use of a variety of biochemicals. Phytochemical studies on medicinal plants have led to the isolation of a number of new pharmacophores. Pharmacophores have played a priceless role in drug discovery [28, 29].

Table 6: List of medicinally important plant-derived drugs.

| Sr.No. | Drug | Botanical source | Therapeutic uses |
|--------|-----------------------------|---|------------------------|
| 1. | Artemisinin | <i>Artemisia annua</i> L. | Antimalarial drug |
| 2. | Galantamine | <i>Galanthus woronowii</i> Losinsk | Anti-Alzheimer's drug |
| 3. | Taxol | <i>Taxus brevifolia</i> | Anticancer drug |
| 5. | Opium alkaloids | <i>Papaver somniferum</i> | Analgesic, antitussive |
| 6. | Vinca alkaloids | <i>Catharanthus roseus</i> | Anticancer |
| 7. | Reserpine | <i>Rauvolfia serpentina</i> | Antihypertensive |
| 9. | Quinine, Quinidine | <i>Cinchona spp.</i> | Antimalarial |
| 10. | <i>Digitalis glycosides</i> | <i>Digitalis purpurea, Digitalis Lanata</i> | Cardiotonic glycosides |
| 11. | Sennosides A and B | <i>Cassia angustifolia</i> | Laxative |
| 12. | Pervilleine A | <i>Erythroxylum pervillei</i> | Anticancer |
| 13. | Silvestrol | <i>Aglaia foveolata</i> | Cytotoxic |
| 14. | Resveratrol | <i>Cassia quinquangulata</i> | COX-1 enzyme inhibitor |

Table 7: Plant-derived semisynthetic drugs.

| | Plant name | Chemical structure | Semisynthetic drug | Uses |
|----|------------------------------|--------------------|--|--------------|
| 1. | <i>Artemisia annua</i> | Arteether |  | Antimalarial |
| 2. | <i>Callistemon citrinus</i> | Nitisinone |  | Tyrosinemia |
| 3. | <i>Camptotheca acuminata</i> | Irinotecan |  | Anticancer |
| 4. | <i>Camptotheca acuminata</i> | Exatecan |  | Anticancer |

All plants have primary and secondary metabolites. The therapeutic effects of medicinal plants are due to the combination of "secondary metabolites" [11].

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