

THE POWER OF MEDICINAL PLANTS

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This article may be cited as: Shuja N: The Power of Medicinal Plants. Pak Med & Allied, 2025; 01(4): 1-2.

Received: 10-04-2025

Revised: 15-06-2025

Accepted: 15-07-2025

Published: 30-07-2025

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Man has depended on nature since time immemorial to heal, to eat, and to survive. Medicinal plants were an essential part of the medical tradition of civilizations long before modern pharmacology, and the historical examples of these systems are Ayurvedic (and Unani) systems, Chinese herbal, and indigenous ethnomedicine ¹. Medicinal plants are an important part of the world health in spite of wonderful achievements in the development of synthetic drugs and biotechnology. Indeed, the world health organization is found to estimate that about 80 percent of the people in the developing nations, use herbal medicine as primary healthcare. With the further development of scientific knowledge, the world nowadays faces a revival of the studies on plant-based therapeutics. This comeback is not just a nostalgic one, but a motivated one, responding to the pressing demands in the world: antimicrobial resistance, the burden of chronic illnesses, an increase in drug prices, and a new interest in long-term health practices².

Medicinal plants are not cultural artifacts, but rather biochemical power plants. Even the invention of modern pharmacology can be traced back to plant compounds, aspirin of willow bark, morphine of opium poppy, quinine of cinchona, digoxin of foxglove, vincristine of periwinkle. Such discoveries led to thousand life-saving treatments. However, as of today, nature has provided an unparalleled diversity of molecules even with the current laboratories and the complex synthetic pathways ³. Estimated to be over 25 percent of modern drugs are of direct or indirect plant origin and thousands of species of medicines have not been scientifically studied. Here every leaf, root and bark are home to compounds, the products of millions of years of evolution- rich, intricate, adaptive chemical structures, which synthetic chemistry has been unable in many cases to duplicate ⁴.

The modern issues strengthen the acceleration of studying plant-based pharmacology. Antimicrobial resistance (AMR), which is among the biggest threats of modern medicine, requires new therapeutic agents.

Antimicrobial compounds are the natural defense of plants; most of them demonstrate potential effect against drug-resistant pathogens ⁵. Equally chronic illnesses, diabetes, cancer, cardiovascular disorders, autoimmune diseases are increasing in the world, especially in the low and middle-income countries. Phytochemicals and medicinal plants have preventive and curative potential in the manipulation of immune responses, reduction of inflammation, and metabolic pathways. Resveratrol, catechins, curcumin, and berberine are common examples. Incorporation of such bio-active compounds into contemporary treatment measures may simulate a paradigm shift in the treatment of chronic diseases ⁶.

Nevertheless, nothing can be scientifically proved as being right. Despite the abundance and evaluability of traditional knowledge, it ought to be augmented with the systematic laboratory and clinical studies. There must be safety, efficacy, standardization of dosage and quality control. However, most of the herbal products available in the market are not regulated, and hence there is the concern of adulteration, changing potency and, contamination ⁷. To enhance the levels of public safety and clinical reliability, standardization of the herbal preparations, the usage of evidence-based protocols, and pharmacovigilance in the sphere of herbal medicine are essential. It is scientifically responsible, as well as morally obligatory to bridge traditional wisdom with modern research frameworks ⁸.

The other very important dimension is sustainability. Medical plants are natural resources and increase in demand in the world endangers biodiversity. Endangered species are at risk due to overharvesting, destruction of habitat and climate change. Medicinal plant research and policy consideration should thus be incorporated with conservation biology, cultivation programmers and sustainable harvest practices ⁹. Innovative avenues have been developed through technology, such as plant tissue culture, metabolic engineering and synthetic biology can add to the manufacture of medicinal products with an

ecologically innocuous solution. Along with pharmaceutical development, botanists, pharmacologists, and agronomists, with policymakers should collaborate to conserve biodiversity¹⁰.

It is a huge opportunity to regions such as South Asia, Africa, and Latin America, which are home to biodiversity and have long-standing systems of healing. Other countries like Pakistan, India, and China have years-old herbal medical traditions but are under-represented in the world phytopharmacology research publications^{1,3}. To a great extent, academic institutions, government ministries and pharmaceutical industries in these areas need to invest in the establishment of well-organized medicinal plant research programs. Discovery can be expedited through national herbal repositories, collaborative botanical gardens, ethnobotanical survey, molecular research, and innovation hubs. In addition, the existence of the tribal and rural members as the guardians of traditional knowledge means that their intellectual property is respected, and they gain without causing inequity in the establishment of benefits^{2,8}.

Gone are the days of independent scientific fields. The contemporary pharmaceutical research is becoming more interdisciplinary, and medicinal plants research cannot be left out. There is artificial intelligence and computational means that allow in-silico screening of phytochemicals, molecular targets prediction, as well as optimization of the structure of compounds. The state of the art of metabolomics, genomics and high-performance analytical technologies enables scientists to unravel the puzzle of plant chemistry as never before^{4,7}. The recent innovations combined with phytopharmaceuticals and clinical research will form the future of phytopharmaceuticals- putting the chemistry of nature on the center stage of future therapeutics.

Medical journals can have the final escape. Scientific credibility, collaboration and innovation are situations enhanced by releasing quality, peer-reviewed articles on medicinal plants. The editorial boards need to place their focus on research rigor, encourage ethical reporting modes, and encourage the discouragement of anecdotal or unverified assertions. Phytomedicine as a scientific discipline should be promoted among young researchers with grants, mentorship and support structures provided to carry out the research^{2,9}. More importantly, the medical education programs must also introduce the evidence-based herbal pharmacology, which will equip future doctors to responsibly counsel the patients. The natural

remedies are on the upswing among the people- clinicians should be furnished with such scientific information instead of indignation skepticism or blind-belief.

There is the balance required in the road ahead. The medicinal plants in the past must not be either romanticized as medicine or dismissed as primitive. They have to be honored, studied, and properly incorporated into the contemporary healthcare. This is not to substitute the synthetic drugs but to broaden the therapeutic choices, find new molecules, and provide better care to patients in a holistically scientific study^{5,7}. The world has got the most advanced laboratory, which is nature. It will be an injustice to affect medical science, the worldwide health and to future generations to overlook its potential.

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