

## Natural Products as Lead Bases for Drug Discovery and Development

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### Abstract

Medicinal plants from time immemorial have been used not only for food but also for their inherent natural products exhibiting medicinal properties. Natural products from medicinal plants are endowed with tremendous secondary metabolites (phytochemicals) including alkaloids, flavonoids, tannins and Saponins. They form the basis for both traditional and modern systems of medicine. These natural products from medicinal plant serve as major pointers in drug development as these bio-resources can be isolated and used as potential lead compounds in the drug discovery process as new medicine or as prototypes for the development of new drugs.

**Keywords:** Medicinal plants; Natural products; Secondary metabolites; Phytochemicals

### Introduction

Natural products are products from natural sources not synthesized in the laboratory. These sources apart from plants include microorganisms like mould and bacteria, venoms from snakes and bees. The common denominator in all of them is the presence of the bioactive secondary metabolites including alkaloids, flavonoids, tannins and saponins.

Natural products from medicinal plants play a great role in the discovery and development. They are the oldest known source for the development of new medicines. Some of the biologically active compounds in plant have been applied as components of drugs, some have been used as prototype for the synthesis of new drugs while some have been isolated or the whole plant used as therapeutic agents. A survey of current pharmaceutical use revealed that 25% of the total prescription drugs dispensed are plants [1].

Medicinal plants are the richest bioresource of drugs of traditional systems of medicine, modern medicines, nutraceuticals, food supplements, folk medicines, pharmaceutical intermediates and chemical entities for synthetic drugs. Their relevance in these areas arises from the ability of cells to synthesize a tremendous number of so-called secondary metabolites from biogenic materials. These secondary metabolites are phytochemicals with varied potentials to prevent and treat diseases.

Phytochemicals are used for long and short term specific health problems by releasing their medicinal action without serving as nutrients in diets. Unlike the primary metabolic metabolites carbohydrate, protein, lipids, and nucleic acids that are involved in metabolic processes, the secondary metabolites play defensive roles against attacks from predators by exerting neurotoxicity against them [2]. This activity has been applied on the central nervous system as antidepressants, sedatives, muscle relaxants and anesthesia. Another defensive role is their cytotoxicity against pathogens including

microorganisms which is directly utilized by man as an antimicrobial source.

Natural plant products are usually released by plants in their attempts to resist biotic and abiotic factors including availability of minerals and changes in weather, temperature, conditions of growth like water status, light level, and UV exposure. These conditions including age of plants and level of stress the plant is subjected to also determine the concentration of biologically active compounds found in plants. It is, therefore, not uncommon to find the same species of plants from different locations having varied compositions, isomers and/or concentrations of phytochemicals.

Also, during natural selection in evolution, species - species and plant -plant competition and attraction of pollinators and symbionts, biological active compounds are also produced and released which not only also impact on the contents of biological active compounds but serve ecological functions in plants. They can act as plant growth regulators/modulators of gene expression and act as signal transduction. These actions mimic endogenous metabolites, ligands, hormones, signal transduction molecules and neurotransmitters. Man takes advantage of these functions and abilities and taps their medicinal values.

### Some Natural Products and Their Applications

Natural products like ginseng (genus: Panax) act on hypothalamic-pituitary-adrenal areas. Artemisinin from the plant *Artemisia annua* has been isolated and very effective against malaria parasites. The crude extract of *Vermonia amygdalina* have been reported by Atangwho, et al. [1] to have antidiabetic property by a concurrent inhibitor of gluconeogenesis and potentiating of glucose oxidation via pentose phosphate pathway while Ebong et al. [3] reported same plant as having polyherbal therapeutic tendencies towards diabetics and also possess hypoglycemic activity [3]. All the biochemical activities are attributed to the non-nutritive pharmacologically active components-phytochemicals [4].

Some pharmaceuticals used in modern medicine discovered with bases from natural products include morphines from alkaloids,

ephedrine, reserpine, quinine. To obtain these secondary metabolites some ethnopharmacological approach are used. The first step involves the release of the secondary metabolites from biogenic materials from the matrix by means of extraction. A logical next step is the isolation process is to separate the target compounds from the crude extract. This step is to concentrate the desired components and make the sample amendable to the final purification steps. The third step in the isolation process involves some type of high-resolution method to separate the compounds of interest from the other compounds still remaining in the extract. As the undesired components of the mixture are likely to have some resemblance to the target compounds, this stage usually involves optimization of the separation method to achieve sufficient resolution in the final preparative isolation. Often, the final isolation step involves some kind of chromatography or a combination of techniques. Recently, the development of series of bioassay methodologies and utilization of bioassay-guided isolation techniques have also contributed significantly to the progress of medicinal plant research.

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