

Plant metabolomics - A novel method in phytochemical analysis

For centuries, man has used traditional medicines to treat ailments. In spite of the advancement in field of pharmaceutical sciences, traditional medicines have always been a boon for the society. Using the traditional and herbal therapies as a background, a new method was developed that has resulted in the development of methods for isolation of active compound from the herbs and other natural resources. These advances in phytochemistry and phytopharmacology have provided a wealth of new potential drug targets for the treatment of various diseases. In addition, the development of new methods such as Nuclear Magnetic Resonance (NMR) has become the single most reliable form of spectroscopy in identification and structural elucidation of isolated phytochemicals.^[1]

Recent developments in NMR screening technologies are contributing to its increasing importance in industrial drug research. NMR methods have been used to solve a great variety of problems including: studying chemical structures, SAR of combinatorial libraries, metabolomics, determination of complex molecules and biochemical mechanistic investigations, etc. To reduce the research timeline in the discovery stage has been a key priority for pharmaceutical companies worldwide. Many such institutes are trying to achieve this goal through metabolomics. Plants produce a wide range of secondary metabolites and these plant specific compounds represent very important quality traits of plants. Metabolomics is the branch of basic medical sciences that deals with all cellular metabolites and has been recently recognized as an important sector of post-genome science. The general idea of 'metabolomics' or the 'metabolome' was first defined several years ago in the field of microbiology,^[1] and its importance in plant science was pointed out soon after.^[2] Today, metabolomics is also a powerful tool in drug discovery and development; for instance, in

the identification of drug metabolites or biomarkers for organ-specific toxicities.^[3]

Metabolomics is one of the powerful emerging technology, whereby the total metabolite composition of plant material is analyzed. In the post-genome era, Metabolomic studies will be essential for the exploitation of genomics, in order to understand, at the molecular level, the ultimate consequences of effects at the levels of genes and proteins in important medicinal plants. By characterizing the plant metabolome at different stages of development, or following exposure to different conditions, global shifts in metabolism can be followed. The plant metabolomic approach complements studies in which changes in the transcriptome or proteome are monitored. The combination of global metabolomic analysis with complementary transcriptomic and proteomic studies offers the opportunity to gain a holistic view of the complex relationships between genes and metabolites. New metabolomic technologies will lead to a greater understanding of metabolism in medicinal plants. Plant Metabolomics also offers opportunities to characterize genes of unknown function by using metabolic changes to infer the identity of genes following manipulation of their expression.

Medicinal plant research is mainly aimed at the isolation and identification of naturally occurring substances. The complex and diverse chemistry involved in plant primary and secondary metabolism produces a very wide range of phyto-compounds, many of which have essential health-promoting roles or provide opportunities for wealth creation. Development of Metabolomics not only will help to determining the quality, nutritional value, safety and efficacy of phytotherapeutic drugs, but will also provide a way to identify opportunities for the exploitation of novel metabolic products from plants.

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