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The potential of metabolomics for natural product drug discovery as incorporated into broader "omic" data sets

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The ability to sequence whole plant and human genomes has taught us that our knowledge with respect to gene function is rather limited. Functional genomics analyses include investigations at the level of gene expression (transcriptomics), protein translation (proteomics) and more recently the metabolite network (metabolomics). Metabolomics is the study of global metabolite profiles in a system (cell, tissue, or organism) under a given set of conditions. The analysis of the metabolome is particularly challenging due to the diverse chemical nature of metabolites in a cell. This presentation provides an overview of metabolomics and discusses its complementary role within system biology. It highlights how metabolome analyses are being conducted using different spectroscopic techniques NMR and MS, and how the highly complex data generated are analyzed. Specific examples will then be presented to illustrate how metabolomics can lead to valuable information relative to natural products biosynthesis, herbal medicines quality control analysis and agricultural biotechnology.

Biography

Specializing in plant metabolomics, Mohamed A. Farag completed his Ph.D. at Texas Tech University, USA, in 2003 and later worked as a postdoctoral fellow at The Samuel Noble Foundation, and the James Graham Brown Cancer Center, USA. Since 2009, Dr. Farag has been working as a visiting Professor at the Technical University of Munich, Germany, and in 2009–2010 he held Alexander von Humboldt fellowship. For his highly cited publications, he was recently elected to serve as an associate editor for Journal of Advanced Research. In 2011, he was selected as a top researcher in the field of plant biology in Africa by the American society of plant biology. He has published close to 40 in reputed journals with a total H-index of 15.

Identification of phytoconstituents as novel aldose reductase inhibitors and antiglycating agents: Evaluation against diabetic complications

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Diabetes can lead to various long-term complications. Although, strict glycemic control is expected to prevent diabetic complications, perfect glycemic control is not always possible. Further, persistence progression of hyperglycemia-induced complications during subsequent period of normal glucose homeostasis due to metabolic memory suggest that exclusive management of glucose might no longer be sufficient for the control of long term complications such as retinopathy, nephropathy, neuropathy and cataract. Multiple biochemical pathways have been implicated in the pathogenesis of secondary complications. These mainly include enhanced polyol pathway, formation of advanced glycation end-products (AGE), activation of protein kinase C, etc. Hence, agents that can act on these molecular targets, irrespective of glycemic control, need critical evaluation in the management of secondary complications. Dietary agents, spices and traditional foods form the mainstay in Indian system of medicine for the management of diabetes. Thus, we have tested a large number of natural sources for their potential to prevent the activation of polyol pathway and prevent AGE formation using *in vitro*, ex vivo and *in vivo* (animal) models. Based on these studies, we have isolated and characterized a few novel and promising inhibitors of protein glycation and polyol pathway from these functional foods. However, many of these phytochemicals are under-utilized due to their poor peroral bioavailability. Hence, we have also studied the efficacy phytonutrient loaded nanoparticles and demonstrated that encapsulation of curcumin in biodegradable nanoparticles improves oral bioavailability and enhanced ability in attenuating diabetic cataract in rats. Together these results provide a basis for the prospects to alleviate diabetic complications.