Newly Emerging Biological Activities for the Pharmaceutical Potential of some Common Lichen Metabolites

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There has been a renewed and growing interest in lichens as a source of novel, pharmacologically active secondary metabolites which contribute to their medicinal utility. More than 1050 unique secondary metabolites mainly belonging to class of polyketides, in particular, depsides, depsidones, diphenylethers and dibenzofurans have been discovered. A number of studies made on their biological activities showed secondary lichen metabolites to be antioxidant, antiviral, antibiotic, antitumor, allergenic, antibacterial, antifungal, anti-inflammatory, anticancer, antigenotoxic, analgesic, anti-pyretic compounds.

Even though numerous activities are reported, most focus on antioxidant and antimicrobial properties with very limited reviews on other newly emerging activities such as α-glucosidase, antiglycation, β-glucuronidase, phosphodiesterase, choline esterases, and urease inhibitory activities and their phytochemical and pharmaceutical applications. In this paper, a number of secondary lichen metabolites with α-glucosidase, antiglycation, β-glucuronidase, phosphodiesterase, choline esterases, and urease inhibitory activities are discussed.

Three potent α-glucosidase inhibitors from lichens, namely zeorin, methyl β-orcinol-carboxylate and methylorsellinate isolated from *Cladonia* sp. showed several fold higher inhibitory activities than those of acarbose, an antidiabetic drug used to manage type II diabetes mellitus and the standard, 1-deoxynojirimycin and have antidiabetic potential. Among other activities found, the depside atranorin showed significant activity as an antiglycation agent, while the depsidone, lobaric acid had remarkably high *β*-glucuronidase inhibitory activity. Lobaric acid and the depside, sekikaic acid showed significant inhibition in the phosphodiesterase enzyme inhibition assay.

At present, acetylcholinesterase (AChE) inhibitors are the first group of drugs to treat mild to moderate Alzheimer's disease (AD). Acetylcholinesterase (AChE) inhibitors are yet the best drugs currently available for the management of Alzheimer's disease. Lobaric acid, Divericatic acid and Sekikaic acid were shown to be good AChE inhibitors. Interestingly, most of the simple aromatic compounds present like orsellinic acid and its derivatives showed very good inhibition against the enzyme urease.

Lichens are therefore an untapped source of biological activities of industrial importance and their potential is yet to be fully explored and utilized. Lichen-derived bioactive compounds hold great promise for biopharmaceutical applications as antimicrobial, antioxidant and cytotoxic agents and in the development of new formulations for human benefit.

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