Investigating Bioactive Metabolites of Some Macrofungi from Sri Lanka and Analysis of the Nutritional Composition of Edible Forms

A thesis submitted for the
Degree of Doctor of Philosophy

Niranjan W. Gunasekara

Faculty of Science
University of Colombo
June 2018

Abstract

Sri Lankan wild mushrooms are almost unexplored for their bioactive properties and wild edible mushrooms are rarely consumed by locals due to the lack of awareness of their nutritional values. Thus, seven indigenous macrofungi were investigated for their nutritional quality and 66 macrofungi species from the dry zone were studied for their antimicrobial activities. Nutritional properties were investigated using AOAC and chromatographic analysis methods. Antimicrobial activity was tested according to the disc diffusion method and poisoned food technique. Bioassays guided separation was performed for the isolation of natural compounds. Structure elucidation of the isolated compounds was carried out using the mass spectroscopic data and one and two-dimensional NMR data.

Indigenous edible mushrooms showed distinct proximate nutritional profiles. They were rich in essential amino acids and unsaturated fatty acids. Linoleic acid (PUFA), oleic acid (MUFA) and palmitic acid (SFA) were present as major fatty acids while glutamic acid, arginine and glycine were detected as major amino acids in studied mushrooms. Sri Lankan indigenous mushrooms, *Termitomyces eurrhizus*, *Termitomyces heimii* and *Termitomyces microcarpus* can be potentially used to enrich the nutritional quality of food consumed by Sri Lankan rural communities, due to their superior nutritional values including high protein and low carbohydrate contents. Investigation of antimicrobial properties revealed that *Serpula* sp., *Anthracophyllum lateritium*, *Fomes* sp., *Coriolopsis byrsina* (isolate from Dambulla) and *Hymenochaete rubiginosa* (isolate from Minneriya and Kawudulla) possess antibacterial activity (against Gram-positive bacteria) while *Flavodon flavus*, *Coriolopsis aspera*, *Coriolopsis caperata*, *Trichaptum byssogenum* and *Xylaria polymorpha* possess antifungal activity. Bioassay-guided fractionation of a mycelium culture of *P. tricoloma* resulted in two known ergostane type compounds 3β,5α-dihydroxy-(22E,24R)-ergosta-7,22-dien-6-one and 3β,5α,9α-trihydroxy-(22E,24R)-ergosta-7,22-dien-6-one. Further, three novel metabolites serpulanine A to C were isolated from an extract of a *Serpula* sp from Bibila area. Serpulanine A has shown total class I/II HDAC enzyme inhibitory activity in A9 murine metastasis cells with IC_{50} at 7μM. Serpulanine B hasn't shown considerable inhibition of HDAC6 and HDAC9 enzymes under *in-vitro* conditions compared to positive control TSA. The presence of an oxime group at the alpha position with respect to a terminal hydroxamic acid moiety as in serpulanine A hasn't been reported in natural products earlier. Hence, further studies are permitted to study the therapeutic potential of serpulanine A as potential metal ion chelating agents and as zinc-binding groups for the of inhibition of matrix metalloproteinases.