
ABSTRACT

Mushrooms have been valued throughout the world as both food and medicine for thousands of years. *Pleurotus sajor-caju* has become attractive as functional food and a source of physiologically beneficial substances. These functional characteristics are mainly due to their chemical composition thus the chemical compositions of *P. sajor-caju* were investigated in this study. Twenty-seven compounds have been separated and identified from the EAE and BE extracts of *P. sajor-caju*. EAE comprised of three methyl esters namely, methyl palmitate, methyl stearate and methyl linoleate, five hydrocarbon fatty acids namely, pentadecanoic acid, palmitic acid, oleic acid, myristic acid and linoleic acid, a phenolic compound identified as 2,4-ditertbutylphenol, six ethyl esters, namely ethyl myristate, ethyl palmitate, ethyl linolenate, ethyl stearate, ethyl linoleate and ethyl oleate and eight sterol compounds namely, lichesterol, 5,6-dihydroergosterol, neoergosterol, ergosta-5,8-dien-3-ol, 7-ergostenol, ergosta-5,18(14)-dien-2-ol, ergosta-5-en-3-ol and ergosterol. Cinnamic acid, nicotinamide, benzeneacetamide and 4-hydroxybenzaldehyde were identified in BE extract using GC-MS and NMR analysis. These fractions were then subjected to various antioxidant assays namely β -carotene bleaching, ferric reducing capability, ABTS radical scavenging ability, inhibition of lipid peroxidation and total phenolic content. The AE and BE extracts exhibited the highest antioxidant activities and corresponds to the total phenolic content meanwhile the sub-fractions from the EAE extract (EP2, EP3, EP4 and EP5), showed moderate antioxidant activity. Hence, *P. sajor-caju* extracts can be considered as potential dietary antioxidants. Polysaccharide (GE) was isolated and purified using hot-water extraction method. The efficacy of GE on lipid metabolism and glucose homeostasis was evaluated using the *in-vitro* and *in-vivo* models.

In the *in-vitro* study using 3T3-L1 cell line, GE stimulated lipogenesis (lower concentrations) and lipolysis by up-regulating the expression of HSL, ATGL and leptin genes. Furthermore, GE also up-regulated the expression of adiponectin and GLUT-4 genes, indicates GE is able to enhance the glucose uptake efficiently. Finally, GE attenuated oxidative indices (protein and lipid damages) which may occur during glucose oxidation in 3T3-L1 cells. In the *in-vivo* study using C57BL/6J (*ob/ob*) mice fed a high-fat diet, GE treated groups significantly reduced the body weight and this is could be due to the up-regulation of HSL and ATGL genes in the adipose tissue which may have stimulated lipolysis while down-regulation of PPAR- γ , SREBP-1c and LPL genes may have decreased the differentiation of adipose tissue. Additionally, GE also improved the glucose tolerance, hyperglycemia and hyperinsulinemia in the mice by up-regulating the expression of adiponectin and GLUT-4 genes. GE also attenuated the DNA, protein and lipid damages along with uric acid levels by increasing the enzymic antioxidants (SOD, CAT and GPx) content in the mice. Finally, GE down-regulated the expression of inflammatory markers (IL-6, TNF- α , SAA2, CRP and MCP-1) by inactivating the nuclear transcription factors (NF- κ B) hence, the mice in GE treated groups were not insulin resistance and did not develop diabetes. Regular consumption of *P. sajor-caju* as a part of our diet may render nutritional benefits for preventing obesity and diabetes.