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Antioxidant, Hypoglycemic and Hypotensive Effects Affected by Various Molecular Weights of Cold Water Extract from Pleurotus Citrinopileatus

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Abstract : Pancreatic α-amylase and intestinal α-glucosidase are the critical enzymes for the breakdown of complex carbohydrates into di- or mono-saccharide, which play an important role in modulating postprandial blood sugars. Angiotensin converting enzyme (ACE) converts inactive angiotensin-I into active angiotensin-II, which subsequently increase blood pressure through triggering vasoconstriction and aldosterone secretion. Thus, inhibition of carbohydrate-digestion enzymes and ACE will help the management of blood glucose and blood pressure, respectively. Studies showed Pleurotus citrinopileatus (PC), an edible mushroom and commonly cultured in oriental countries, exerted anticancer, immune improving, antioxidative, hypoglycemic and hypolipidemic effects. Previous studies also showed various molecular weights (MW) fractioned from extracts may affect biological activities due to varying contents of bioactive components. Thus, the objective of this study is to investigate the in vitro antioxidant, hypoglycemic and hypotenstive effects and distribution of active compounds of various MWs of cold water extract from P. citrinopileatus (CWEPC). CWEPC was fractioned into four various MW fractions, PC-I (□1 kDa), PC-II (1-3.5 kDa), PC-III (3.5-10 kDa), and PC-IV (□10 kDa), using an ultrafiltration system. The physiological activities, including antioxidant activities, the inhibition capabilities of pancreatic α-amylase, intestinal α-glucosidase, and hypertension-linked ACE, and the active components, including polysaccharides, protein, and phenolic contents, of CWEPC and four fractions were determined. The results showed that fractions with lower MW exerted a higher antioxidant activity ($p<0.05$), which was positively correlated to the levels of total phenols. In contrast, the inhibition effects on the activities of α-amylase, α-glucosidase, and ACE of PC-IV fraction were significantly higher than CWEPC and the other three low MW fractions (< 10 kDa), which was more related to protein contents. The inhibition capability of CWEPC and PC-IV on α-amylase activity was 1/13.4 to 1/2.7 relative to that of acarbose (positive control), respectively. However, the inhibitory ability of PC-IV on α-glucosidase (IC50 = 0.5 mg/mL) was significantly higher than acarbose (IC50 = 1.7 mg/mL). Kinetic data revealed that PC-IV fraction followed a non-competitive inhibition on α-glucosidase activity. In conclusion, the distribution of various bioactive components contribute to the functions of different MW fractions on oxidative stress prevention, and blood pressure and glucose modulation.

Keywords : α-Amylase, angiotensin converting enzyme, α-Glucosidase, Pleurotus citrinopileatus
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