Studies on the Inhibition of Cell DNA Oxidative Damage and LDL Oxidation by Bee Pupal Protein and Its Hydrolysates

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ABSTRACT

The bee pupal protein isolated from bee pupa was used as materials in this study, and was hydrolyzed by alcalase and flavourzyme through one- and two-stage processes. The inhibition of cell DNA oxidative damage and LDL oxidation.by the hydrolysates was investigated.

In the aspects of the hydrolysis of bee pupal protein, the degree of hydrolysis (DH) of the hydrolysates by 1.0, 1.5, and 2.0 % alcalase were 8.89, 8.99 and 9.19 %, respectively. The DH of the hydrolysates by 1.0, 1.5, and 2.0 % flavourzyme were 9.57, 8.59, and 9.91 %, respectively. The DH of the hdrolysates by alcalase for 4 hrs and followed by 1.0, 1.5, and 2.0 % flavourzyme for 12 hrs were 9.03, 9.49, and 8.98 %, respectively.

In the aspects of the inhibitory effect of bee pupal protein and its hydrolysates on Fenton reaction induced oxidative damage of DNA molecules, the results showed that the bee pupal protein, one-stage hydrolysates by alcalase or flavourzyme, and two-stage hydrolysates by alcalase and flavourzyme had an inhibitory effect on the oxidative damage of deoxyribose. At a concentration of 1 mg/mL, the bee pupal protein, one-stage hydrolysates (alcalase or flavourzyme), and two-stage hydrolysates exhibited 47.06, 33.70, 24.19, and 43.09 % inhibition, respectively. The bee pupal protein had the highest inhibitory activity. All the samples could reduce the formation of 8-OH-2'-dG. The quanttiy reduced by the samples was in an order of bee pupal protein＜one-stage hydrolysate by flavourzyme＜one stage hydrolysate by alcalase　two-stage hydrolysate. The bee pupal protein and its hydrolysates had no significant pro-oxidant effect on DNA oxidative damage induced by bleomycin-Fe3+.

In the aspects of LDL oxidation induced by Cu2+, the results showed that two-stage hydrolysate exhibited the highest inhibitory acitivity on the TBARS formation, at a concentration of 1 mg/mL. The inhibitory activities of the samples were in an order of two-stage hydrolysate＞one-stage hydrolysate by alcalase＞bee pupal protein＞one-stage hydrolysate by flavourzyme. All the samples could reduce the formation of conjugated dienes. At a concentrations of 1 mg/mL, the lag time of conjugated diene formation for all the samples was around 240 min, 2 times of the control.

Keywords : bee pupal protein、antioxidant activity、Oxidative damage、low density lipoprotein (LDL)

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