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Physiological properties of protein hydrolysate from tuna cooking drip

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Tuna is one of the largest commercially canned fishery products in the world. Annually, more than 4 million metric tons of tuna are harvested worldwide, and approximately 3 million tons of canned tuna are produced. Steam cooking is an important method for processing canned tuna, during which a large amount of condensed water, called cooking drip, is obtained as a by-product[1]. Cooking drip is a rich source of nutritionally valuable proteins, but it is being wasted. It has been reported that various peptides or hydrolysates derived from seafood proteins possess better health benefits in comparison with crude protein[2]. Gamma irradiation has been used to decontaminate the food and agricultural products, but hydrolysis process with irradiation had several advantages including simple processing with a short hydrolysis time, simultaneous sterilization, and no additive catalysts. Therefore, in this study, radiation process was used to hydrolyze the protein from tuna cooking drip.

The cooking drip of *Thunnus thynnus* (protein content determined by the bicinchoninic acid method, 2.1 g/L) was obtained from DongWon Fisheries Co. (Seoul, Republic of Korea). The cooking drip was filtered, and then precipitated with trichloroacetic acid. The freeze-dried protein sample was resuspended in distilled water to constitute the original concentration, and then gamma irradiated.

We observed that the main proteins with high molecular weights of 200 kDa, 100 kDa, and 65 kDa were degraded by the gamma irradiation. The degradation of proteins was dependent on the absorbed dose of gamma rays. When the dose was increased, the high molecular weight proteins were degraded more severely. The degree of hydrolysis (DH) was measured after irradiation. When the absorbed doses were 10 kGy, 30 kGy, and 50 kGy, the DH were 5.1%, 9.7%, and 10.5%, respectively.

To investigate the change of antioxidant activity by radiation hydrolysis, 2,2-diphenyl-1-picrylhydrazyl (DPPH) assay has been used. The DPPH radical scavenging activity of the cooking drip was 39.4%. However, the DPPH radical scavenging activities of the hydrolysates were increased to 53.2%, 61.7%, and 71.3% at the doses of 10 kGy, 30 kGy and 50 kGy, respectively. The inhibition of ACE activity is a major target for anti-hypertension. The angiotensin-I-converting enzyme (ACE) inhibitory activity of tuna cooking drip was about 62.7% and that of the hydrolysate irradiated at a dose of 10 kGy was increased to 73.9%. The ACE inhibitory activities of the hydrolysate increased depending on the irradiation dose, being 83.6% and 84.8% at the doses of 30 kGy and 50 kGy, respectively. Tyrosinase inhibitors have recently become increasingly important in medicinal and cosmetic products in relation to hyperpigmentation. The tyrosinase inhibitory activity of tuna cooking drip was 31%, but the activities increased in accordance with the absorbed dose. When the doses were 10 kGy, 30 kGy, and 50 kGy, the tyrosinase inhibitory activities of hydrolysate were increased to 38.5%, 62.1%, and 63.2%, respectively. These results suggest that radiation hydrolysis is a promising method for food and environmental industries.

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