Pyropia yezoensis Protein Extract: Exercise-Mimetic Effects Through Byproduct Valorization and Health Functionality Integration

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Abstract

Gim (Pyropia yezoensis), a widely consumed seaweed, has gained global popularity as a nutritious snack. However, the production of Gim snacks generates significant amounts of byproducts, which are often discarded without further processing, posing challenges in waste management. To explore sustainable solutions, this study examines the potential exercise-mimetic effects of Gim byproducts. Gim is distinguished among seaweeds for its high protein content and its efficacy in preventing muscle atrophy. These properties suggest that Gim consumption may extend beyond basic nutritional benefits, offering the potential to partially replicate the physiological effects of exercise.In this study, we evaluated the exercise-mimicking effects of protein extracts derived from Pyropia yezoensis (PY) using in vitro and in vivo experimental models. Dried PY was pulverized, enzymatically hydrolyzed, and subjected to ethanol precipitation to isolate protein extracts, followed by analysis of polysaccharide and protein content. Nitric oxide production and muscle-strengthening effects were assessed using EA.hy 926 endothelial cells and C2C12 myoblasts, respectively. Behavioral experiments using zebrafish with induced circulatory impairment were conducted to investigate the relationship between blood circulation and memory enhancement. Furthermore, an exercise-restricted mouse model was employed to evaluate muscle function decline and memory loss. Treatment with PY protein extracts resulted in significant improvements in body weight, muscle strength, bone density, body composition, memory function, and vascular thickness.This study demonstrates the exercise-mimicking effects of PY protein extracts and suggests their potential for developing health supplements or advancing related food industries in the future.

Keywords: Pyropia yezoensis, Exercise Mimetic Effects

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