



Effect of dietary supplementation of *Ulva rigida* C. Agardh extract on biochemical response and digestive enzyme activities of grey mullet, *Mugil cephalus* (Linnaeus)

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Abstract

This study was aimed to assess the effect methanol extract from *Ulva rigida* C. Agardh on biochemical response and digestive enzyme activities in grey mullet, *Mugil cephalus* (Linnaeus). A control diet without and three other experimental diets were prepared with supplementation of *U. rigida* extract (UE diet) at the inclusion levels of 5, 10 and 15 g kg⁻¹ diet, respectively. One hundred twenty grey mullet with an initial mean weight of 14.95 g were randomly distributed into twelve tanks and fed twice a day (09:00 and 17:00) for 60 days. After 60 days of the feeding trial, serum total protein and globulin levels of the fish fed diets containing UE showed an increasing trend of better performance except to those fed UE5 better. The highest amylase, lipase and protease activities was observed in fish fed diet containing UE10. Significantly different was observed in survival rate, glucose and triglyceride levels between control and UE supplemented groups ($P < 0.05$). There was significant decline ($P < 0.05$) in glucose and triglyceride levels in those fish which received UE diet over the control. The present study elucidates the suitability of *U. rigida* extract as a novel dietary supplement in grey mullet diet for improving metabolism of carbohydrate and enhancing digestive enzyme activities in grey mullet.

Keywords: *Ulva rigida*, *Mugil cephalus*, Biochemical response, Digestive enzymes, Dietary supplement

Introduction

Mugil cephalus (Linnaeus) known as grey mullet is an important aquaculture candidate species owing to its high demand and fast growth has been successfully cultivated in brackish water, marine environments and fresh water throughout the Mediterranean region [1]. Mullet have been recognized as very desirable species for pond culture in Iran, China, Egypt, Hawaii, Italy, Japan, Philippines, Taiwan and other parts of the world, where they are mainly grown in polyculture with shrimp, carps, tilapia and milkfish [2]. To improve the quality of fish, feed consumption and sufficient

nutrients to the fish are important factors. Antibiotics and synthetic drugs such as hormones and vitamins have been tested for various activities, such as immunostimulant, growth promotion and appetizing in aquaculture [3]. Even though some synthetic products promote production of fishes and shrimps [4], they are not much preferred in commercial aquaculture operations because of their costs, tendency to form residues and undesirable side effects. Consumer awareness and concern over food safety has led to the search for alternative appetizers of natural origin. Natural plant products such as microalgae [5], seaweeds [6] and herbal extract [7] serve as growth promoters, immunostimulants and appetizers. They are highly promising in the aquaculture industry to increase feed consumption and improve digestion [8].

Many studies related to dietary seaweeds such as *Porphyra purpurea* (Roth) in thick-lipped grey mullet, *Chelon labrosus* (A. Risso), [9], *Hizikia fusiformis* (Harvey) in olive flounder, *Paralichthys olivaceus* [10], *Pyropia yezoensis* in olive flounder [11] and *Sargassum ilicifolium* (Turner) in rainbow trout, *Oncorhynchus mykiss* (Walbaum), (Zamannejad *et al.*, 2016) diets were beneficial for fish growth and immunity. Interestingly, the effect of supplementation of dietary seaweed also variably depends on dietary seaweed's species and its concentrations [6,12]. Also, Choi *et al* [11] reported that total protein and glucose levels increased and decreased respectively when the inclusion level of dietary *P. yezoensis* extract was high. Although reports are available about beneficial effect of seaweed on growth, immunity and biochemical responses as a dietary supplementation in aquaculture species, no information is available to support the dietary role of *U. rigida* extract on biochemical responses and digestive enzyme activities in grey mullet.

The main objective the present research was to evaluate the effect of dietary inclusion *U. rigida*