



Full length article

The effects of dietary xylooligosaccharide on mucosal parameters, intestinal microbiota and morphology and growth performance of Caspian white fish (*Rutilus frisii kutum*) fry



Seyed Hossein Hoseinifar^{a,*}, Maryam Sharifian^a, Mohammad Javad Vesaghi^a,
Mohsen Khalili^b, M. Ángeles Esteban^c

^a Department of Fisheries, Faculty of Fisheries and Environmental Sciences, Gorgan University of Agricultural Sciences and Natural Resources, Gorgan, Iran

^b Department of Fisheries, Faculty of Agriculture and Natural Resource, Gonbad Kavous University, Gonbad, Iran

^c Fish Innate Immune System Group, Department of Cell Biology and Histology, Faculty of Biology, Regional Campus of International Excellence "Campus Mare Nostrum", University of Murcia, 30100 Murcia, Spain

ARTICLE INFO

Article history:

Received 11 March 2014

Received in revised form

24 April 2014

Accepted 3 May 2014

Available online 16 May 2014

Keywords:

Xylooligosaccharide (XOS)

Prebiotic

Mucosal parameters

Intestinal microbiota

Caspian white fish (*Rutilus rutilus*)

ABSTRACT

The present study investigates the effects of different levels of dietary xylooligosaccharide (XOS) on skin mucus bactericidal activity and protein content, intestinal microbiota and morphology as well as growth performance of Caspian white fish (*Rutilus frisii kutum*) fry. The specimens (1.54 ± 0.03 g) were fed experimental diets supplemented with different levels of XOS [0% (control), 1%, 2% and 3%] for 8 weeks. The results revealed that feeding on XOS significantly increased skin mucus antibacterial activity and protein levels ($P < 0.05$) and the highest levels were observed in 3% XOS treatment. The total autochthonous intestinal heterotrophic bacteria significantly increased following XOS administration in diet ($P < 0.05$). Administration of 2 or 3% XOS in fry diet significantly elevated the autochthonous lactic acid bacteria ($P < 0.05$). However, dietary XOS had no significant effect on intestinal morphology, growth performance and diet utilisation of Caspian white fish fry ($P > 0.05$). These results demonstrate beneficial effects of dietary XOS on different parameters of mucosal immunity (both skin mucus and intestinal microbiota) and encourage further studies regards various aspect of XOS administration in early life stages of fish.

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1. Introduction

The prevention and control of diseases is one of the most important aims in aquaculture, as occurrence of bacterial infection and diseases caused serious problems and substantially affect economic output of fish and shellfish culture [1]. Antimicrobial agents have been routinely administered for control of most bacteria in fish farms [2]. However, as a consequence of increasing concerns about emergence of antibiotic resistance pathogens in fish and human, as well as depression immune system [3,4], there is increasing interests for using eco-friendly alternatives to the therapeutic use of antimicrobials such as administration of functional dietary supplements [5]. Prebiotics are a group of these functional dietary supplements which shows promising results in fish and

shellfish culture. Prebiotic is defined as "a selectively fermented ingredient that allows specific changes, both in the composition and/or activity in the gastrointestinal microflora that confers benefits upon host well-being and health" [6]. Among the beneficial changes, it has been reported that prebiotics can elevate fish resistance to pathogens, improve growth performance, feed utilization, lipid metabolism and stimulate immune response through modulation of intestinal microbiota [7,8].

To date, several studies have been done on administration of fructooligosaccharide, inulin mannanoligosaccharides [5,7,8] and galactooligosaccharide [9–12] as prebiotics in aquaculture and positive results reported on growth performance, feed utilization, immune response and disease resistance of various fish species. Xylooligosaccharides (XOS) are xylose-based oligomers which are non-digestible with prebiotics properties that can promote the growth of beneficial bacteria in animals gut microbita [13]. However, very little scientific information is available on the effects of xylooligosaccharides as prebiotic for fish and shellfish [14,15].

* Corresponding author. Tel.: +98 1714427040; fax: +981712245886.
E-mail address: hoseinifar@gau.ac.ir (S.H. Hoseinifar).