



Full length article

Effects of dietary soybean lecithin on growth performance, blood chemistry and immunity in juvenile stellate sturgeon (*Acipenser stellatus*)Fatemeh Jafari^a, Naser Agh^{a,*}, Farzaneh Noori^a, Amir Tokmachi^b, Enric Gisbert^c^a Artemia and Aquaculture Research Institute, Urmia University, Urmia, Iran^b Faculty of Veterinary, Urmia University, Urmia, Iran^c Institut de Recerca i Tecnologia Agroalimentàries (IRTA), Centre de Sant Carles de la Ràpita, Unitat de Cultius Aquícoles, Crta. Poble Nou km 5.5, 43540, Sant Carles de la Ràpita, Spain

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ABSTRACT

An eleven weeks feeding trial was conducted to determine the effects of different levels of dietary soybean lecithin (SBL) on growth performance, blood chemistry and immunity in juvenile stellate sturgeon (*Acipenser stellatus*). Fish were fed seven isoproteic (44% crude protein) and isolipidic (17% crude fat) diets containing graded levels of SBL: 0 (control), 1, 2, 4, 6, 8 and 10%. Results showed that dietary SBL supplementation significantly improved the final body weight (BW) and weight gain (WG). Fish fed 6% SBL showed the highest BW and WG values in comparison to fish fed the control diet ($P < 0.05$), whereas increasing SBL levels above 6% had little practical benefit in terms of somatic growth performance. The inclusion of SBL in diets significantly improved the immune response as data from lysozyme, total Ig levels, alternative complement, phagocytic and bactericidal activities indicated ($P < 0.05$). The broken-line regression analysis of immunological variable revealed that depending on the parameter considered, the optimal SBL levels in diets for stellate sturgeon juveniles varied. In particular, dietary SBL levels requirements in stellate sturgeon when considering the phagocytic activity rate were determined at 3.3%, whereas 4.1–4.2% were recommended when considering data from lysozyme, alternative complement and bactericidal activities. In contrast, the highest minimum dietary SBL content was estimated at 6.9% when data from total Ig levels were considered. These results indicated that dietary PLs are required for boosting innate immunity in stellate sturgeon, although their minimal level changed depending on the immunological parameter considered. Therefore, we assume that SBL levels comprised between 3.3 and 6.9% may be used as a prophylactic measure to improve the health status in stellate sturgeon. Red blood cell count, hemoglobin and hematocrit levels increased with increasing dietary SBL levels, especially in those sturgeons fed the diet with 6% SBL ($P < 0.05$). In addition, white blood cell counts significantly increased as dietary SBL levels increased from 4 to 8% in comparison to the control group. Blood biochemistry was also affected by different dietary SBL levels. In particular, significantly higher levels of glucose, cholesterol, HDL and triglycerides were detected in fish fed > 6%, > 4%, > 2% and 2% SBL, respectively ($P < 0.05$). Based on somatic growth parameters, blood chemistry and systemic immunity parameters, diets containing ca. 6% SBL are recommended for juvenile stellate sturgeon.

1. Introduction

It has been reported that lipids play an important role in the immune system [1,2]. Among lipid components, phospholipids (PL) are important components for maintaining the structure and function of cellular membranes, emulsifying lipids in the gut and improving intestinal absorption of long chain fatty acids [3]. Phospholipids are a source of fatty acids for the synthesis of eicosanoids, a wide range of bioactive compounds with multiple functions. It has been reported that the composition of dietary fatty acids influenced the non-specific

immunity (e.g. phagocytosis, respiratory burst and serum lysozyme) [4–6] and specific immunity (e.g. antibody production and resistance to pathogens) [7–10] and eicosanoid production [9,11]. The optimal level of dietary phospholipid supplementation depends on the species, developmental stage, culture conditions, and PL source. In this regard, soybean lecithin (SBL) due to its market availability and relatively stable composition has been commercially used as a convenient source of PL in aquafeeds, although some studies dealing with larvae have used marine phospholipid sources [3].

Among the fish species living in the Caspian Sea, sturgeons are of

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