

The effects of short- and long-term diet supplementation with Iranian propolis on the growth and immunity in rainbow trout (*Oncorhynchus mykiss*)

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Summary

Propolis, a resinous substance collected by *Apis mellifera* bees from various plant sources is transformed in the presence of bee enzymes. Short- and long-term effects of diet supplementation with ethanol extract of Iranian propolis (EEIP) was investigated on growth and immunity in juvenile rainbow trout. The fish (mean body weight 30 ± 3.2 g) were fed a commercial diet supplemented with 0 (control), 1, 2 and 5 g/kg EEIP for 96 h and 0, 0.5, 1 and 2 g/kg EEIP for a 45-days. Rainbow trout growth performance significantly ($P < 0.05$) increased by the dietary supplementation of Iranian propolis. Our results showed that significant increase in serum lysozyme activity, complement activity and total immunoglobulin were seen in all treatment groups during short- and long-term feeding trial when compared to the control group. On the basis of our findings, propolis improved rainbow trout growth performance and some immune parameters.

Key words: Rainbow trout, Iranian propolis, Growth performance, Immunity

Introduction

The usefulness of immunostimulants has been demonstrated in aquaculture (Nagai *et al.*, 2001), and fish farmers use a wide range of immunostimulants which may or may not need to be purified (vitamins, chitin, glucans, etc.) (microorganisms, animal and plant extracts, sub products of other industries, etc.). The second category of immunostimulants have recently received more attention since they are cheaper, easy to incorporate into the diet and have low impact on the environment. Besides, they have many additional effects on fish physiology because they act as a “cocktail” containing many nutrients, micronutrients as well as immunostimulant substances (Ji *et al.*, 2007).

Propolis (bee glue) is a complex resinous mixture collected by bees from bud and plants secretions, which is transformed in the presence of bee enzymes. Its color varies from green, red to dark brown. Propolis is adhesive and has a characteristic smell and reacts strongly with skin lipid and proteins. Due to its numerous pharmacological properties, it has been used in folk medicine since ancient times. In general, propolis is composed of 30% wax, 50% resin and vegetable balsam, 10% essential and aromatic oils, 5% pollen, and other substances (Burdock, 1998).

Propolis is a non-toxic natural product with multiple

pharmacological effects and complex chemical composition (Burdock, 1998). Nowadays, propolis is used extensively in poultry and fish as a growth promoter (Meurer *et al.*, 2009; Beyraghdar Kashkooli *et al.*, 2011), as adjuvant for mammals and poultry or as immunostimulant for fish (Cuesta *et al.*, 2005; Chu, 2006; Abd-el-Rhman, 2009; Talas and Gulhan, 2009; Zhang *et al.*, 2009).

Because of the importance of rainbow trout (*Oncorhynchus mykiss*) as the most important aquacultured fresh water fish in Iran (Akhlaghí and Sharifi Yazdi, 2008) and the proven immunostimulatory effects of propolis in mammals, and recent finding on effects of Iranian propolis against some fish pathogens (Tukmechi *et al.*, 2010), we decided to examine the impact of short- and long-term dietary supplementation of ethanol extracted propolis on growth, innate immune response and disease resistance of this fish. Further, the goal was to assay the safety of Iranian propolis (as a natural product) for application in aquatic animals as growth and immune stimulator.

Materials and Methods

Preparation of propolis

Crude propolis samples were collected from the honey bee, *Apis mellifera carnica*, apiaries of a local bee