



Effect of different dietary oil on growth performance, water quality, and vitality of European Sea bass (*Dicentrarchus Labrax*) in A Recirculating Aquaculture system

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ABSTRACT

In our study, we examined the effects of different dietary oil sources (fish oil, corn oil, sunflower oil, and linseed oil) on the growth and vitality of European sea bass (*Dicentrarchus Labrax*). We conducted four treatments using these oils, each repeated three times in twelve 30 x 40 x 100 cm glass aquaria. The aquaria were equipped with a ventilation system in closed water systems, and each tank housed 12 fish. The study lasted for ten weeks, during which the initial body weight of the fish was 15.19 g per fish, and they were fed twice daily at a satiate rate. Our results showed that sunflower oil (SFO) was the most effective oil source for promoting growth in the sea bass. Fish fed with SFO exhibited better feed utilization compared to those fed with other oil sources. While the different oil sources did not significantly affect the moisture content of the sea bass, they did have a significant impact on the protein and fat content. Our findings indicated that sunflower oil led to an increase in significant weight and improved feed efficiency at a probability of 0.05. Therefore, sunflower oil can be considered the optimal oil source for achieving the highest growth rate in sea bass.

INTRODUCTION

Aquaculture is a rapidly expanding method of food production and is currently the fastest-growing sector globally. It supplies nearly half of the globe's food fish consumption and is expected to meet 60-70% of the world's fish needs by 2030 (Subasinghe *et al.*, 2009). The demand for farmed fish and aquaculture has significantly increased over the past few decades, with global aquaculture production reaching 83.6 million metric tons (FAO, 2018). As aquaculture production grows, the demand for aqua feeds also increases. Feeds, vital fish growth, survival, and health, account for a substantial portion of operational costs in aquaculture systems. In 2018, the global aquaculture feed production reached 40.1 million metric tons, representing a growth of around 4% from the previous year. Fishmeal and fish oil are essential protein and lipid sources for aquaculture feeds, with approximately 12% of the total fish production being reduced to fishmeal and fish oil in 2016 (FAO, 2018).

Several species, including Atlantic salmon (Brandsen *et al.*, 2003), sea bream (Montero *et al.*, 2008), sea bass (Mourete *et al.*, 2005), and rainbow trout (Turchini and Francis, 2009), have been studied to replace fish oil with plant oil in fish diets. Sunflower oil (SFO) is extensively used due to its high availability and low production cost (Brandsen *et al.*, 2003; Wilkinson *et al.*, 2006; Yildiz and ŞENER, 2004).

The successful replacement of oil relies on the fish's capacity to transform fatty acids of polyunsaturated found in vegetable oils, which have low unsaturation, into long-chain highly unsaturated fatty acids required for the fish's development and growth (Vagner and Santigosa, 2011). The fish's ability to produce these long-chain fatty acids relies on

the enzyme $\Delta 6$ -desaturase, which controls the initial step in the pathway for the production of arachidonic acid (AA), docosahexaenoic acid (DHA), and eicosapentaenoic acid (EPA). This enzyme converts linolenic acid (LNA) and linoleic acid (LA) from food into 18:4n-3 and 18:3n-6, accordingly. Additionally, (Sprecher, 2000) reported that $\Delta 6$ -desaturase synthesizes DHA through a process known as Sprecher's shunt.

The research conducted by (Bertucci *et al.*, 2018) revealed the presence of a gene similar to $\Delta 6$ -desaturase in the mRNA of pejerrey. Furthermore, a study on the fatty acid examined of wild pejerrey larvae by (Kopprio *et al.*, 2015), as well as a study on larvae from a related species, the Mexican silverside (*Chirostoma estor*) by (Palacios *et al.*, 2007), suggests that both species are capable of converting PUFAs in their diet to long-chain PUFAs through both $\Delta 6$ and $\Delta 4$ desaturation pathways (Fonseca-Madriral *et al.*, 2014).

Oil is a crucial component of an animal's diet, according to (Yadav *et al.*, 2019). Incorporating oil into fish feed is crucial for the development and longevity of the aquaculture industry. Oils are important sources of critical fatty acids like omega-3 and omega-6. The utilization of oil in the production of fish feed can impact coastal areas. To support sustainable growth in aquaculture, it is important to use the appropriate amount of oil that fulfills the nutritional requirements of the fish. The choice of oil should be based on the specific species' needs and availability. Some experts have proposed that oil exhibits antimicrobial, antioxidant, and growth-enhancing properties while enhancing feed

تأثير مصادر الزيت المختلفة على أداء النمو وجودة المياه وحيوية أسماك القاروص الأوروبي في أنظمة المياه المغلقة

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في هذه الدراسة قمنا بفحص تأثير مصادر الزيوت الغذائية المختلفة (زيت السمك وزيت الذرة وزيت عباد الشمس وزيت بذر الكتان) على نمو وحيوية سمك القاروص الأوروبي. أجرينا أربع معاملات باستخدام هذه الزيوت، كررت كل منها ثلاث مرات في اثني عشر حوضًا زجاجيًا بحجم ٣٠ x ٤٠ x ١٠٠ سم. تم تجهيز الأحواض بنظام تهوية في أنظمة مياه مغلقة، وكان كل حوض يضم ١٢ سمكة. استمرت الدراسة لمدة عشرة أسابيع، وخلالها كان الوزن الأولي للأسماك ١٥,١٩ جرامًا لكل سمكة، وتم إطعامها مرتين يوميًا بمعدل تشبع. أظهرت نتائجنا أن زيت عباد الشمس كان مصدر الزيت الأكثر فعالية لتعزيز نمو سمك القاروص. أظهرت الأسماك التي تتغذى على زيت عباد الشمس استخدامًا أفضل للعلف مقارنة بتلك التي تتغذى على مصادر زيت أخرى. في حين أن مصادر الزيت المختلفة لم تؤثر بشكل كبير على محتوى الرطوبة في سمك القاروص، إلا أنها كان لها تأثير كبير على محتوى البروتين والدهون. أشارت نتائجنا إلى أن زيت عباد الشمس أدى إلى زيادة كبيرة في الوزن وتحسين كفاءة التغذية باحتمالية ٠,٠٥. وبالتالي، يمكن اعتبار زيت عباد الشمس المصدر الأمثل للزيت لتحقيق أعلى معدل نمو في أسماك القاروص الأوروبي.