aquaculture europe

EFFECT OF DIETARY FREE FATTY ACID CONTENT ON GROWTH AND HEPATIC MORPHOLOGY IN SOLE (*Solea senegalensis*) JUVENILES

E. Salas-Leiton[1], E. Asensio[1], A. Rodriguez-Rúa[1], I. Hachero[2], R. Zerolo[3] , C. Fernández-Díaz[1], J.P. Cañavate[1]

[1] IFAPA, Centro *El Toruño*. Junta de Andalucía. Cádiz. Spain
[2] IFAPA, *Centro Agua del Pino.* Junta de Andalucía. Huelva. Spain
[3] Pesquerías Isla Mayor, S.A. San Juan de Aznalfarache, Sevilla. Spain

IFAPA

ABSTRACT

Utilization in aquaculture of unusual meals with unbalanced lipid content or inadequate previous treatment may result in harmful state for fish. This research studied the effects caused by different dietary free fatty acid (FFA) content on growth performance and hepatic morphology in liver in sole juveniles. Results revealed an inverse relationship between dietary FFA content and ability of fish to grow. Moreover, hepatic morphology analysis indicated an overall healthier status in hepatocytes of fish fed with low dietary FFA content. Dietary fatty acids must be esterified to glycerols seem an absolutely necessary requisite in sole, allowing a proper energy storing and its latter mobilisation to gain biomass.

INTRODUCTION

Searching protein and lipid alternative sources is nowadays a high interest issue in aquaculture. Utilization of unusual sources with unbalanced lipid content or inadequate previous treatment may result in subsequent harmful state for fish. Present study analyzes the effects caused by different dietary free fatty acid (FFA) content on growth performance and hepatic morphology in liver in sole juveniles.

MATERIAL AND METHODS

S. senegalensis juveniles (60 g) were reared in closed systems (60 days). Three diets (1 % fish biomass as daily feeding ration) with a different content of FFA were assayed: low (13.87 % of FFA respecting total lipids, TL), medium (21.67 %) and high (54.34 %) named as diet 1, 2 and 3 respectively. Every diet was thus characterized (Table I) by extracting TL as same as separating and quantifying respective lipid classes.

Specific growth rates (SGR) and feed conversion efficiencies (FCE) were calculated at days 30 and 60. Significant differences were identified (P<0.05). For histological study, sections of liver were fixed in 4% buffered formaldehyde and embedded in paraffin blocks. Transverse 5 µm thick sections were finally stained.

Table I: Lipid classes (%TL) of assayed diets

	Diet 1	Diet 2	Diet 3
TLP	7.18	11.90	9.50
DAG	3.13	3.32	0.00
ST	8.81	9.54	9.64
FFA	17.87	21.67	54.34
TAG	56.58	36.26	6.26
Others	10.43	17.31	19.92

TLP: Total phospholipids; DAG: diacylglicerols; ST: sterols; FFA: free fatty acids; TAG: triacylglicerols

RESULTS

- ***Productive parameters***

↑ **FFA content** ⟶ ↓ **SGR FCE**

Table II: SGR (% day^{-1}) and FCE values for every assayed condition and sampling day.

	Diet 1 (13.87 % FFA)		**Diet 2** (21.67 % FFA)		**Diet 3** (54.34 % FFA)	
	SGR	*FCE*	*SGR*	*FCE*	*SGR*	*FCE*
day 30	$0.49^{a}\pm0.08$	$0.62^{a}\pm0.11$	$0.28^{b}\pm0.04$	$0.35^{b}\pm0.05$	$0.28^{ab}\pm0.04$	$0.35^{ab}\pm0.05$
day 60	$0.47^{a}\pm0.03$	$0.60^{a}\pm0.04$	$0.31^{b}\pm0.06$	$0.40^{b}\pm0.06$	$0.31^{b}\pm0.06$	$0.40^{b}\pm0.06$

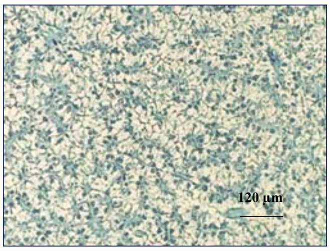
- ***Hepatic morphology analysis***

Low and medium FFA content (Diets 1 and 2)

Polygonal shape hepatocytes with intracellular vacuoles and peripheral nuclei (Figure 1. Left).

High FFA content (Diet 3)

Regular shape hepatocytes. Very few cytoplasmic lipidic inclusions and dilatation of blood sinusoids. Pycnotic nuclei were even visible (Figure 1. Right)



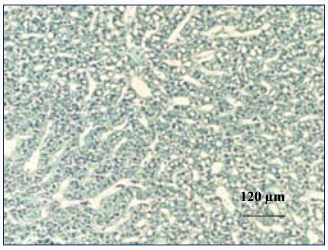


Figure 1: Morphological structure in livers of fish fed with dietary FFA contents of 21.67 % TL (diet 2. Left) and 54.34 % TL (diet 3. Right) respectively. Haematoxylin-VOF

CONCLUSIONS

⟶ **Inverse relationship between dietary FFA content and growth.**

⟶ **Hepatic morphology analysis indicated a worst overall health status and lower amount of lipidic inclusions caused by the high dietary FFA content**

DIETARY FATTY ACIDS MUST BE ESTERIFIED TO GLYCEROLS SEEMS A NECESSARY REQUISITE IN SOLE, ALLOWING A PROPER ENERGY STORING AND ITS LATTER MOBILISATION TO GAIN BIOMASS

JUNTA DE ANDALUCIA

Instituto de Investigación y Formación Agraria y Pesquera
CONSEJERÍA DE AGRICULTURA Y PESCA

Vela La Palma PARQUE NATURAL

Unión Europea
Fondo Europeo de Desarrollo Regional
Invertimos en su futuro

COOPERACIÓN TRANSFRONTERIZA ESPAÑA - PORTUGAL

ecoaqua