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COMPARISON OF LIPOPROTEIN LIPASE ACTIVITY IN TISSUES OF RAINBOW TROUT (*Oncorhynchus mykiss*) AND GILTHEAD SEA BREAM (*Sparus aurata*)

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Abstract
Enzymes assays demonstrated lower lipoprotein lipase (LPL) activities in white muscle (10.9 ± 2.9 mIU/g), whereas higher in red muscle (148.4 ± 19.3 mIU/g) and specially in adipose tissue (247.4 ± 80.6 mIU/g) of rainbow trout, in comparison with those in gilthead sea bream (27.3 ± 9.8; 34.6 ± 16.9; and 111.9 ± 19.1 mIU/g, respectively). However, higher LPL activities were found in livers of gilthead sea bream than in rainbow trout (54.1 ± 19.3 *vs.* 21.9 ± 5.8 mIU/g). A close correspondence between the LPL activity observed in tissues and the lipid depot pattern in rainbow trout and gilthead sea bream, respectively, was suggested in this study.
Keywords: lipoprotein lipase, lipid, uptake, fish.

Introduction
BLACK et al. (1983b) described LPL activity on fresh homogenates of extrahepatic tissues such as red and white muscle, heart, brain and liver of rainbow trout (*Oncorhynchus mykiss*) indicating different abilities of these tissues to take up triacylglycerols from circulating lipoproteins. However, fish are known to distribute fat depots heterogenously (ACKMAN, 1995). Therefore, regarded the evidence of different distributions of lipid depots among fish, correspondingly, a different distribution of LPL activity could also be expected in their tissues.

Objective
Thus, the objective of the present study was to determine and compare LPL activity in different tissues of rainbow trout (*Oncorhynchus mykiss*) and gilthead sea bream (*Sparus aurata*).

Materials and methods
Rainbow trout (81-94 g) and gilthead sea bream (164.9-253.2 g), maintained on standard commercial diets (42P: 22L and 46P: 22L, respectively), were starved for 24 h, killed and white and red muscle, liver and white adipose tissue excissed out for the determination of LPL activity using the procedure described by BENGTSSON-OLIVECRONA & OLIVECRONA (1991). Several physical parameters were also measured and the viscerosomatic index (VSI) and condition factor (CF) calculated (Table I).

Results and discussion
In rainbow trout, LPL activity was significantly higher in adipose tissue (247.42 ± 80.59 mIU/ g) compared to white and red muscle, activity was more than 20-fold and almost two fold higher, respectively (Figurel), indicating a relatively higher lipid uptake by adipose tissue compared to the rest of tissues, and corresponding well with those obtained by other authors (BLACK et al., 1983a; BLACK & SKINNER, 1986; LINDBERG & OLIVECRONA, 1995). Rainbow trout also showed a relatively higher VSI than gilthead sea bream, meaning that a visceral weight proportionally higher than the body weight would help this species to accumulate relatively more lipids in viscerae than in gilthead sea bream (Table I). LPL activity was higher in red than in white muscle, although with significant difference only in trout, coinciding with findings of LPL activity associated with vital organs, such as heart in mammals (TAN et al. 1977). Red muscle shows a higher lipid content than white muscle in fish (7 to 20% for red and 2 to 10% in white muscle), so a correlation between muscle lipid content and LPL activity might be also expected. CORRAZE & KAUSHIK (1999) showed that increasing dietary lipid level from 8-18% increased lipid contents in muscle and specially in viscera of rainbow trout, whereas liver lipid contents remained constant, while in sea bass, another marine fish species, lipid levels increased specially in liver and to a lesser extent in muscle whereas those in viscerae remained constant. Higher LPL activities found in gilthead sea bream livers corresponded also well with those reported by BLACK et al. (1983a), who observed higher LPL activities in livers of cod rather than of rainbow trout.

In general, results showed a close relationship between LPL activity in a tissue and its role as a lipid depot site in a fish.

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CRECIMIENTO DE JUVENILES DE TILAPIA (*Oreochromis niloticus*) CON PIENSOS DE DIFERENTES NIVELES PROTEICO Y LIPÍDICO

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Resumen

El objetivo de este trabajo es determinar los óptimos niveles dietarios de proteína y grasa para el crecimiento de juveniles de tilapia (*Oreochromis niloticus*). Asimismo también se estudia la influencia de la alimentación en la composición y en los índices corporales. Para ello se utilizaron 6 piensos experimentales con 2 niveles de proteína y 3 niveles de grasa (35/10, 35/15, 35/20, 40/10, 40/15, 40/20, % PB, % EE) y con diferentes contenidos en carbohidratos, fabricados mediante cocción-extrusión. Y además un pienso comercial de Dibaq-España (50/20).

Los mejores resultados, en cuanto al incremento de la biomasa, tasa de crecimiento instantáneo e índice de conversión, se obtuvieron con los piensos (40/10, 40/15). El efecto de los lípidos no fue significativo. En cuanto de proteína, el nivel de 40 % dio mejor resultados de TCI.