Enhancement of gilthead sea bream (*Sparus aurata*) and sea bass (*Dicentrarchus labrax*) larval growth by dietary vitamin E in relation to different levels of essential fatty acids

Eyad Atalah*, Carmen Mari Hernández Cruz, Daniel Montero, Eneko Ganuza, Tibiábin Benítez-Santana, Rachid Ganga, Javier Roo, Hipólito Fernández-Palacios and Marisol Izquierdo.

Grupo de Investigación en Acuicultura (ICCM&IUSA) - P.O. Box 56. 35200 Telde, Canary Island. Spain • eyadatalah@gmail.com

Introduction

Most marine fish larvae require high amounts of n-3 HUFA (highly unsaturated fatty acids) such as eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) (Watanabe, 1982; Izquierdo, 1996). Fish larvae tissue lipids are also very high in n-3 HUFA, what implies a higher risk of peroxidation (Sargent *et al*. 1999) and cellular damage (Kanazawa, 1991), requiring then antioxidants to protect them intra- and extra-cellularly from free radical compounds. Vitamin E (Vit E) functions as a chain breaking antioxidant, reacting with the lipid peroxide radical produced and preventing the further reaction with a new PUFA. Hence their requirements are related with the dietary and tissue PUFA contents. The objective of the present study was to determine the effect of dietary Vit E on gilthead sea bream and sea bass survival, growth and stress, at different n-3 HUFA levels.

Materials and methods

Sea bream (*Sparus aurata*) larvae (18 days old) and sea bass (*Dicentrarchus labrax*) (34 days old) were fed several microdiets with different ratios of DHA, EPA and Vit E as indicated in Table 1 and 2. Survival was calculated by individually counting all the alive at the end of the experiment. Growth (total length, dry body weight) was determined in the beginning, in the middle and at the end. Before the end of the experiment an activity test was conducted by handling 20 larvae/tank out of the water in a scoop net for 1 min then after 24 hours survival were determined. All data were submitted to one-way ANOVA using SPSS software (version 11.0) and means were compared using Duncan's test ($P<0.05$).

Table 1. Sea bream proximate diet composition.

Sea bream dietary DHA/EPA/Vit E	2.5/1.5/ 500	2.5/1.5/ 3000	5/2.5/ 500	5/2.5/ 3000	5/2.5/ 6000
22:6n3	2.34	2.46	5.31	5.26	5.58
20:5n3	1.66	1.68	3.8	3.81	2.32
n-3HUFA	4	4.14	9.11	9.07	7.9

Table 2. Sea bass proximate diet composition.

Sea bass Dietary DHA/vit E	1/1500	1/3000	3/1500	3/3000	5/1500
DHA	0.76	0.85	3.08	3.15	5.87
EPA	2.73	2.74	2.71	2.71	2.44
n-3HUFA	3.49	3.59	5.79	5.86	8.31

Conclusions

For Sea bream, the results of the present study suggest that elevation of dietary vit E up to 3000 mg/kg with DHA/EPA levels of 2.5/1.5 give a better performance in sea bream larvae than increasing DHA/EPA dietary levels to 5/2.5, showing the importance of dietary vit E for larval growth and its interrelation to dietary PUFA levels.
For Sea bass the elevation of DHA negatively affected survival, whereas elevation of vitamin E improves the growth and the stress resistance.

References

Izquierdo, M. S. (1996). Aquac. Nutr., 2, 183–191. Kanazawa, K., 1991. In: Friedman, M. (Ed.), Nutritional and Toxicology Consequences of Food Processing. Plenum, New York, pp. 237–253. Montero, D., Tort, L., Robaina, L., Vergara, J.M., Izquierdo, M.S., 2001. Fish and Shellfish Immunology 11, 473–490. Sargent, J., Bell, G., McEvoy, L., Tocher, D., Estevez, A., 1999. Aquaculture 177, 191– 199. Tocher D.R., Mourente G., Van der Eecken A., Evjemo J.O., Diaz E., Bell J.G., Geurden I., Lavens P. and Olsen Y. 2002. Aquaculture Nutrition 8: 195–207. Watanabe, T. (1982). Comp. Biochem. Physiol., 73, 3-15.

Acknowledgements

This study was partly supported by a grant from Spanish International Cooperation Agency (programme II-A) to Eyad Atalah, and by the Canary Islands Government through the project (Efectos de los ácidos grasos esenciales en el desarrollo de las respuestas endocrina e inmune temprana en larvas de lubina Dicentrarchus labra 2004).

Results and discussion

Gilthead sea bream survival was not affected by the different diets. Increase in dietary DHA significantly reduced sea bass survival, regardless the vitamin E level used. However, regarding stress resistance, increase in vit E significantly improved survival after 24 h of stress test in sea bass, in agreement with studies conducted in bigger fish of other species (Montero et al., 2001). Moreover, in both sea bream and sea bass, elevation of Vit E up to 3000mg/kg significantly improved the growth, particularly at low levels of DHA or EPA in sea bream suggesting a higher protection value when these fatty acids are more limiting. In juveniles of the same species, dietary supplementation with vit E up to 1000 mg/kg increased fish growth (Tocher et al., 2002), particularly when fish were reared at high densities (Montero et al., 2001). Finally, in Sea bream fed (5/2.5, DHA/EPA) diets, the increasing in vit E from 500 to 3000 mg/kg increased the PUFAs content in the larval polar lipids, despite there was the same content in these fatty acids in both diets, again denoting the protective effect of Vit E.

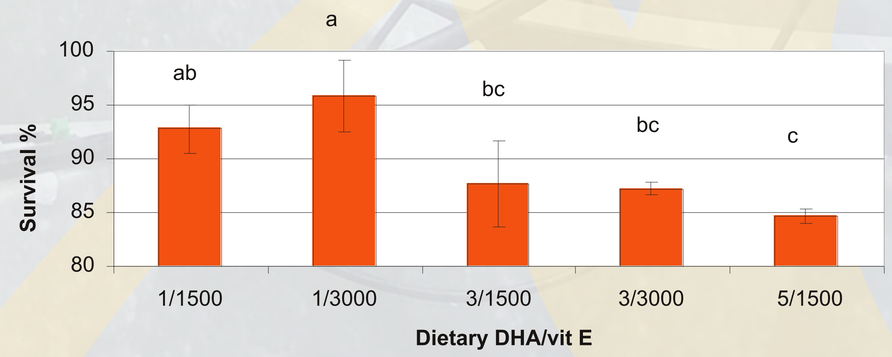

Fig. 1 Sea bass survival.

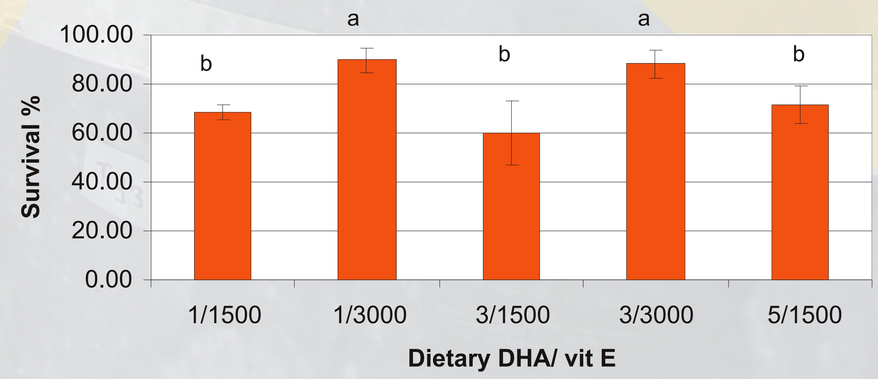

Fig. 2 Sea bass survival after 24h of air activity test.

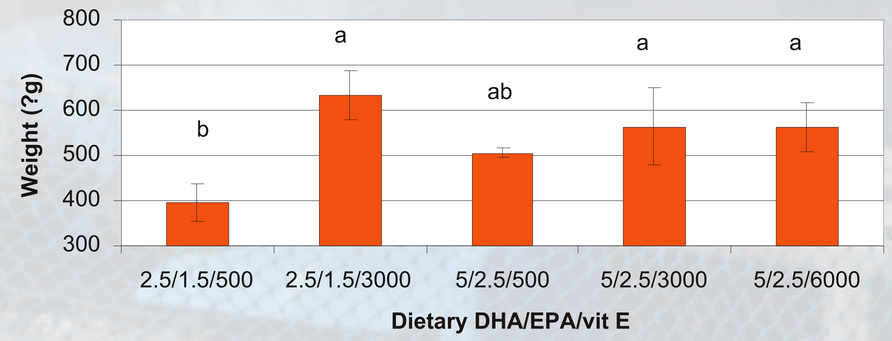

Fig. 3 Sea bream whole body weight.

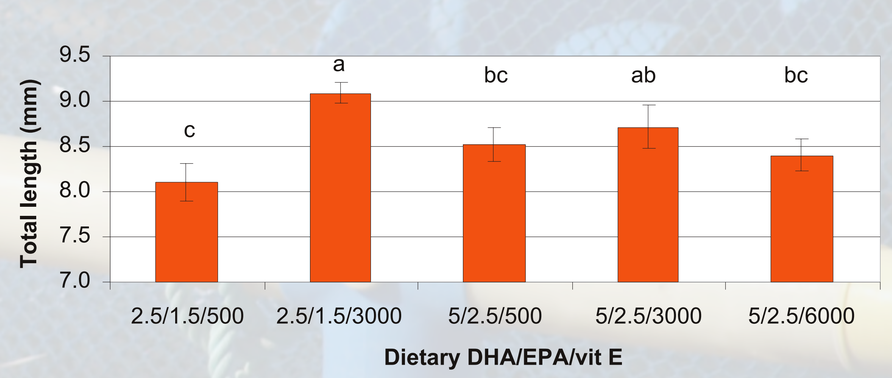

Fig. 4 Sea bream total length.

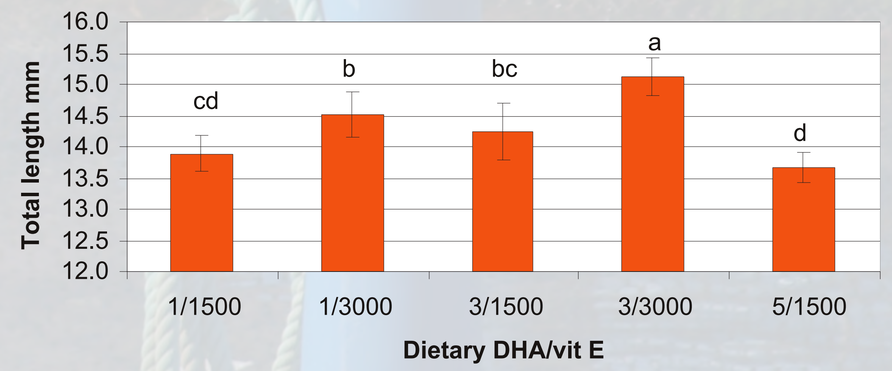

Fig. 5 Sea bass total length.