Effects of Functional Proteins on Growth, Feed Utilization and Health of European Sea Bass

Objective:

The aim of this study is to evaluate the nutritional role of two functional animal proteins a) AQUATRAC SOL SD and b) VITAL PEPTIDE in Sea Bass (*Dicentrarchus labrax*) diets. To achieve this goal the effects of dietary incorporation of GePro products on growth, feed utilization and health of juvenile sea bass will be investigated.

Material & methods:

- Location: HCMR (Hellenic Centre for Marine Research), Athens (Greece)
- European Sea Bass (*Dicentrarchus labrax*)
- Fish number: 26 fish/tank (4 diets; 4 replicates)
- Fish initial weight: 15.5 g
- Duration: 16 weeks
- Fish will be fed at libitum two times a day
- Feed will be collected and feed consumed (g) will be recorded daily

Diet 1: Control diet

Diet 2: Control diet + 5% AquaTrac sol SD replacing fishmeal

Diet 3: Control diet + 5% Vital Peptide replacing fishmeal

Diet 4: Control diet + 5% AquaTrac sol SD & 5% Vital Peptide replacing fishmeal

Results & Conclusions

Performance parameter of different functional animal proteins in European Sea Bass (*Dicentrarchus labrax*)

The in vivo growth parameters of the different diets 1-4 for sea bass were shown in ***Table 2*** as well as in the ***Figures 1-4***. The results show that a combination of AquaTrac sol SD and Vital Peptide and the use of AquaTrac sol SD alone, both diets in combination with GEPRO Blood Meal SD, outperformed (statistically significant) the control diet 1 in final body weight, SGR, FCR and PER, substituting 5 to 10 % of fishmeal. Mortality was not affected.

Table 1: *Animal proteins in our diet composition in European Sea Bass (Dicentrarchus labrax)*

Test diets	Diet 1	Diet 2	Diet 3	Diet 4
Fish Meal 67	20	15	15	10
GEPRO Blood Meal	5	5	5	5
Vital Peptide	-	-	5	5
AquaTrac sol SD	-	5	-	5

Table 2: *In vivo growth data of different functional animal protein meals in European Sea Bass (Dicentrarchus labrax)*

Weight	Diet 1	Diet 2	Diet 3	Diet 4
Initial weight (g)	15.81 ±0.22	15.65 ±0.17	15.75 ±0.28	15.79 ±0.10
Final weight (g)	38.51 ±1.47^{a}	44.58 ±1.89^{b}	39.88 ±1.78^{a}	49.61 ±0.75^{c}
Specific Growth Rate (%/day)	0.67 ±0.03^{a}	0.79 ±0.02^{b}	0.70 ±0.03^{a}	0.86 ±0.01^{c}
Daily Feed Intake (% BW/day)	1.18 ±0.02	1.20 ±0.03	1.20 ±0.03	1.16 ±0.01
FCR	1.65 ±0.07^{a}	1.46 ±0.06^{b}	1.59 ±0.08^{a}	1.32 ±0.03^{c}
PER	1.43 ±0.07^{a}	1.68 ±0.07^{b}	1.46 ±0.08^{a}	1.84 ±0.02^{c}
HSI	1.72 ±0.41^{a}	1.65 ±0.33^{ab}	1.42 ±0.34^{b}	1.65 ±0.35^{ab}
VSI	11.02 ±1.99	10.71 ±1.80	10.54 ±1.60	10.02 ±1.38

Figure 1: Feed Utilization of the different functional animal protein meals in European Sea Bass (Dicentrarchus labrax)

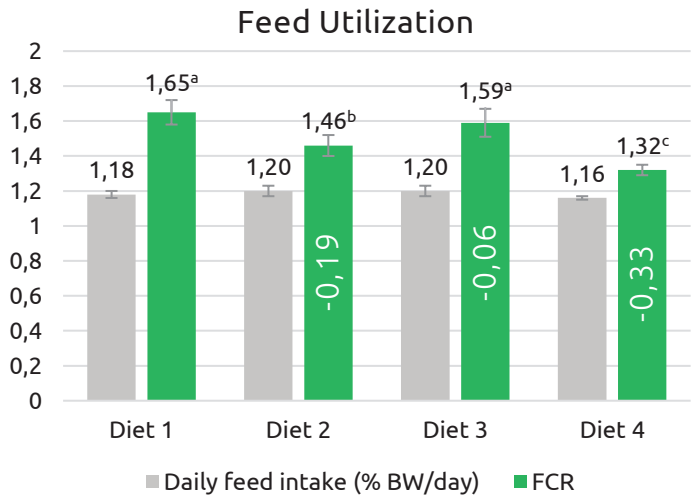


Figure 2: Final individual weight (g) of the different functional animal protein meals in European Sea Bass (Dicentrarchus labrax)

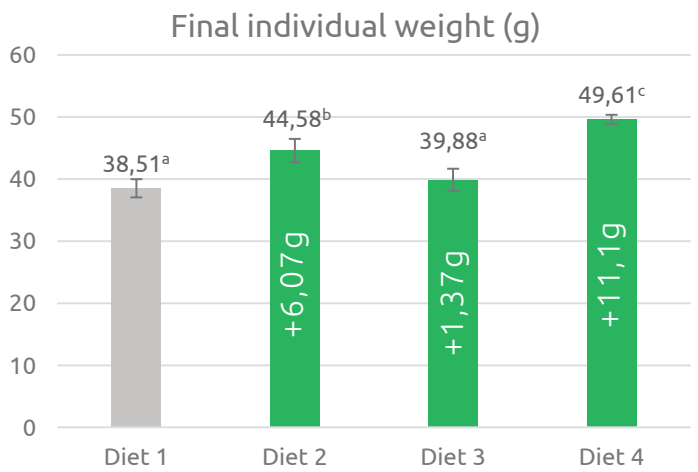
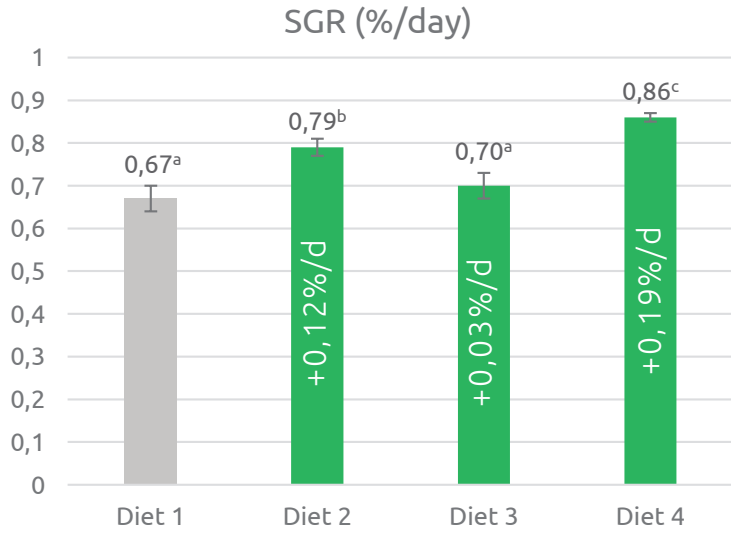


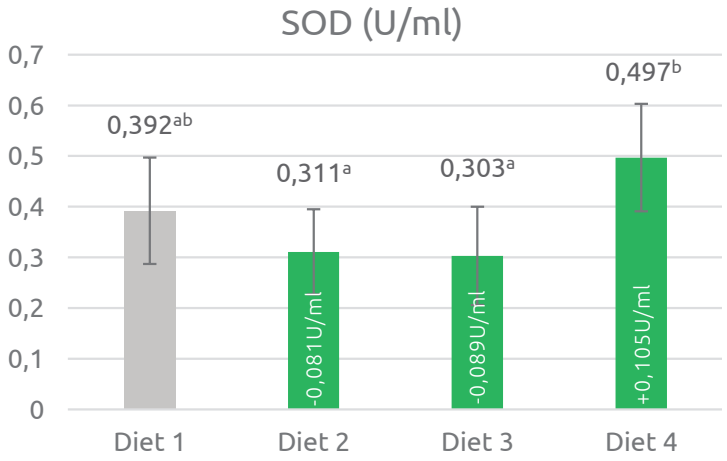
Figure 3: Specific Growth Rate (%/day) of the different functional animal protein meals in European Sea Bass (Dicentrarchus labrax)



Anti-oxidative enzymes

Liver anti-oxidative enzymes such as catalase (CAT) and superoxide dismutase (SOD) are involved in combating oxidative stress in the intestines. In diets 2 and 4, the CAT values support a tendency of improved antioxidant ability and in diet 4 SOD showed statistically higher antioxidant ability (***Figure 5***) of sea bass to protect against production of reactive oxygen species (ROS).

Figure 5: Superoxide Dismutase (U/ml) of the different functional animal protein meals in European Sea Bass (Dicentrarchus labrax)



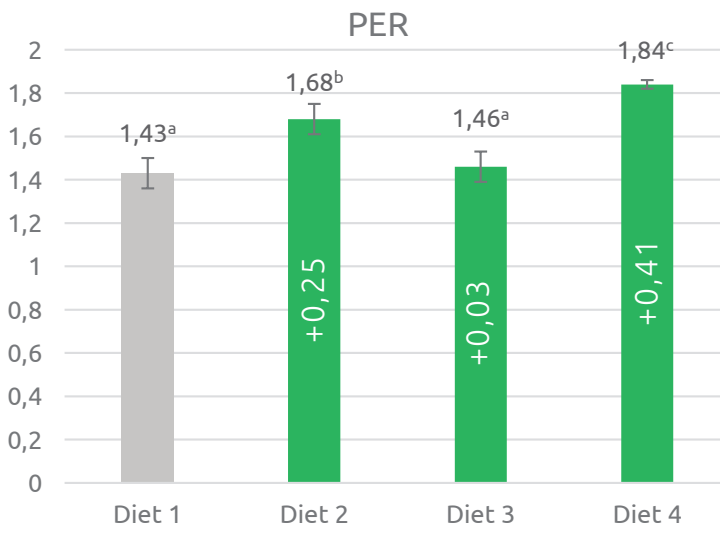
Immunology

Diet 4 shows significant higher total protein concentrations, antibacterial activity against Gram-negative bacterium *E. coli,* nitric oxide concentration, alkaline phosphatase activity and the trypsin inhibition in the serum of fish.

Diets 2 and 4 show a tendency for increased lysozyme activity, which is involved in the antibacterial activity against Gram-positive bacterium *Micrococcus luteus.*

The increased immunological parameters suggest a better antibacterial activity, respiratory burst activity potentially fighting pathogens and anti-protease activity counteracting the evasion process of some pathogens producing protease to evade the fish immune system. This immunostimulation of fish fed low FM levels supplemented with 10 % of the combination of Vital Peptide and AquaTrac sol SD may be translated by an increased resistance of the fish to diseases.

Figure 4: Protein Efficiency Rate of the different functional animal protein meals in European Sea Bass (Dicentrarchus labrax)



Histology

An significant anti-inflammatory effect was indicated in sea bass in the form of lower degree of eosinophil granulocytes (EP) in posterior part of the intestine, suggesting a beneficial effect of the bioactive compounds included in diets 2-4.

Under the conditions of the current trial in sea bass, the addition of the bioactive peptides seems to lower the degree of inflammation in the posterior part of the intestine which was manifested in diet 1 where peptides were not included.

Summary

- Functional animal proteins have a crucial influence on growth performance of fish.
- The combination of animal proteins used could provide a better digestible protein spectrum than a single fishmeal.
- The functional ingredients have a promising implication as circular and functional ingredients for European Sea Bass diets by enhancing physiological mechanisms related to nutrient metabolism and immune response.
- Aqua feedmills could reformulate and decrease the fishmeal level by 5 to 10 % by replacing with AquaTrac sol SD and Vital Peptide.