

THE IMPACT OF A PROBIOTIC ON THE DIGESTION IN JUVENILE TURBOT (*Scophthalmus maximus* L.)

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Introduction

The last few decennia aquaculture has shown a strong growth and also in the future important progress can be expected. Especially the culture of marine fish, such as turbot (*Scophthalmus maximus* L.), is promising.

A big problem in the present hatcheries is the mortality due to a variety of diseases. One of the most important causes of death is vibriosis, which is caused by the bacterium *Vibrio anguillarum*. At this moment a lot of antibiotics are used to prevent and combat bacterial diseases. The use of antibiotics, however, can lead to the development of resistant bacteria and the presence of residues in fish tissue. Probiotics, however, which inhibit the development of bacteria by means of natural antagonisms, can prevent these problems.

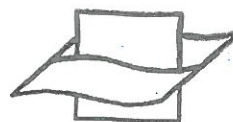
Besides the inhibitory effect on pathogenic bacteria, probiotics can also have a positive impact on the digestion. In our experiments we administered a probiotic, *Vibrio proteolyticus*, which inhibits the development of *Vibrio anguillarum*, through the feed to juvenile turbot. The effect of the probiotic on the digestion, and more specifically on the digestion of lipids, was investigated.

Materials and methods

Juvenile turbot (25-30g) were maintained at $19 \pm 1^\circ\text{C}$ in rectangular tanks, which contained approximately 25 l of artificial seawater. The fish were intubated with the feed paste containing live bacteria, i.e. a *Vibrio proteolyticus* strain. Four to five hours after the intubation the turbots were killed and the digestive tract was dissected out. The digesta of the stomach, the gut and the rectum were collected and kept frozen (-80°C) until analysis for pH, moisture, total lipid and lipid class composition. The lipid classes which were determined, were cholesterol esters, free cholesterol, tri-, di- and monoacylglycerols, phospholipids and free fatty acids.

Results and discussion

The experiments showed no significant impact of the probiotic, *Vibrio proteolyticus*, on the digestion of lipids in juvenile turbot. However, a positive trend could usually be observed.



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The determination of the pH indicated that *Vibrio proteolyticus* caused a decreased acidity in the gut. As a consequence, the enzyme esterase was most probably more active, which caused a higher hydrolysis of tri-, di- and monoacylglycerols and phospholipids. The digesta of the turbot, which were fed with the feed containing the probiotic, also contained less cholesterol esters, which was probably due to the higher activity of the esterase. Nevertheless a higher amount of free cholesterol, which arises from the hydrolysis of cholesterol esters, could not be found. It is however possible that free cholesterol was transformed into another component by *Vibrio proteolyticus*.

The hydrolysis of tri-, di- and monoacylglycerols, cholesterol esters and phospholipids will cause an increase of the amount of free fatty acids. Due to the higher activity of the esterase a higher amount of free fatty acids in the digesta of the turbot, which were fed with the feed containing the probiotic, would be expected. This could not be proved. It should, however, be considered that the digestion is a complex process of hydrolysis and absorption in which the activity of microorganisms plays an important role. It is possible that the uptake of free fatty acids by bacteria was increased due to the higher amount of bacteria in the digestive tract or that the absorption of free fatty acids was enhanced by the probiotic *Vibrio proteolyticus*.

Conclusions

The knowledge of the use of probiotics in fish is limited. Our experiments indicate that it is a very promising alternative for the administration of antibiotics. Especially in the future, when the legislation of this subject will be more rigid, probiotics can offer a solution.