

Lipid tolerance of Atlantic cod

Jón Árnason, Matis Ltd., Rannveig Björnsdóttir, Matis Ltd., Helgi Thorarensen, Hólar University College and Ingólfur Arnarson, Hólar University College



Cod
(*Gadus morhua*)

Table 1. Chemical composition and DE

Diet no.	CP % in DM	CL % in DM	Ash % in DM	DE MJ/kg
347	52	10	9	17
348	51	14	8	18
349	50	21	8	19
350	50	25	8	20
351	50	28	8	21

Figure 1: effect of lipid on HSI in Trial 1

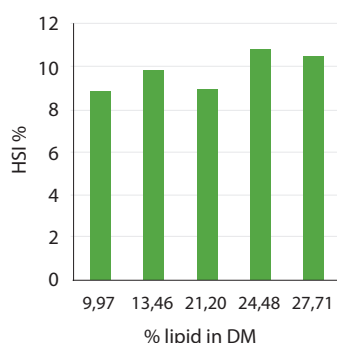
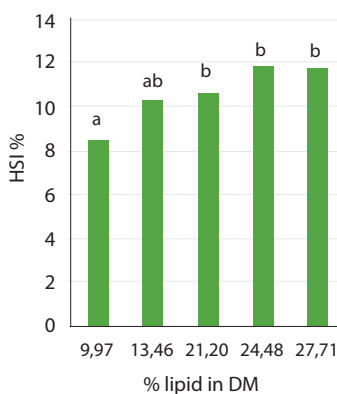


Figure 2: effect of lipid on HSI in Trial 2



Abstract

Cod of two size groups (initial weight 120 grams and 600 grams) were fed, in triplicate, for 12 weeks diets containing 10.0%, 13.5%, 21.2%, 24.5% and 27.7% lipid in dry matter. Dietary lipid did not affect growth (SGR), condition factor (CF), fillet yield, lipid content in liver or lipid content in fillet. In the smaller fish, FCR was reduced with increased diet lipid. The Heposomatic index (HSI) in the 600 grams fish was not affected by the lipid content of the diet but dietary lipid content significantly affected the HSI in the smaller fish. This indicates that the lipid tolerance of Atlantic cod, with respect to the effect on HSI, is size depended.

Introduction

Existing results on the effect of dietary lipid on Heposomatic index (HSI) in Atlantic cod are inconclusive and most of the conclusions are drawn from trials with fish <300 gram (Lie et al. 1986, 1988 and 1989; Hemre et al. 2000; Rosenlund et al. 2004; Grisdale-Helland et al. 2007 and Hatlen et al. 2007). General recommendations today is that Atlantic cod of all sizes should be fed low (< 15%) lipid diets.

The present study was undertaken to investigate the effect of different lipid content in iso-nitrogenous diets on different quality measurements in cod of different size, as well as on growth.

Materials and Methods

Diets:

The composition of the diets is shown in Table 1.

The diets were fed according to appetite and uneaten feed collected in Trial 2

Fish and conditions:

Trial 1: 550 – 800 grams, 15 fish per 650l tanks in triplicate at 30-34‰ salinity and 10-11 degrees C

Trial 2: 120 – 250grams, 60 fish per 650l tanks in triplicate at 30-34‰ salinity and 11-12 degrees C.

Weighing and sampling:

Fish was individually weighed and fork length measured every four weeks during the trial periods after two days starving. 10 fish were sacrificed at start, gutted to measure gutted weight, hand filleted to measure fillet yield. Liver weight was registered as well as the weight of intestines without liver. The same procedure was repeated on five fish from each tank at the end. Same fish samples were used for chemical analyses.

Results and discussion

There were minor effects of lipid content in the diet on most of the parameters registered, except on the HSI (Figure 2) and feed conversion ratio (FCR) (Values not shown) in the small fish in Trial 2. There was however no effect of lipid content on the HSI in the bigger fish in Trial 1 (Figure 1). This is in fact in agreement to critical analyses of the existing literature.

Conclusion

- Atlantic cod can grow well on diets with up to 28% lipid.
- High energy, due to high lipid content, seems to lower FCR in Atlantic cod.
- High lipid diets increase HSI in small cod but not in cod over 600 grams.

Acknowledgement

This work is supported by the AVS research fund. Laxa feedmill Ltd. supplied the experimental diets.

References

- Grisdale-Helland, B., Shearer, K.D. & Helland, S.J. 2007. Energy and nutrient utilization of Atlantic cod, Atlantic salmon and rainbow trout fed diets differing in energy content. *Aquaculture Nutrition* 13: 321-334
- Hatlen, B., ahelland, S.J. & Grisdale-Helland, B. 2007. Energy and nitrogen partitioning in 250 g Atlantic cod (*Gadus morhua* L) given graded levels of feed with different protein and lipid content. *Aquaculture* 270: 167-177
- Hemre G-I., Nortvedt R., Sandnes K. & Lie Ø. 2000. Hurtig vekst uten kjempelever. *Norsk Fiskeoppdrett* 16/2000; 24-27.
- Lie Ø., Lied E. & Lambertsen G. 1986. Liver retention of fat and of fatty acids in cod (*Gadus morhua*) fed different oils. *Aquaculture*, 59: 187-196.
- Lie, Ø., Lied E. & Lambertsen, G. 1988. Feed optimization in Atlantic cod (*Gadus morhua*): fat versus protein content in the feed. *Aquaculture*, 69: 333-341.
- Lie, Ø., Julshamn K., Lied E. & Lambertsen G. 1989. Growth and feed conversion in cod (*Gadus morhua*) on different feeds, retention of some trace elements in the liver. *Fisk.Dir. Skr., Ser. Ernæring*, Vol. II, No. 7, s. 235-244.
- Rosenlund, G., Karlsen, Ø., Tveit, K., Magnor-Jensen, A. & Hemre, G-I. 2004. Effect of feed composition and feeding frequency on growth, feed utilization and nutrient retention in juvenile Atlantic cod, *Gadus morhua* L. *Aquaculture Nutrition* 10: 371 – 378.

