AQUA 2024, August 26-30, Copenhagen (Denmark)

Nofima
Norwegian Institute of Food, Fisheries and Aquaculture Research

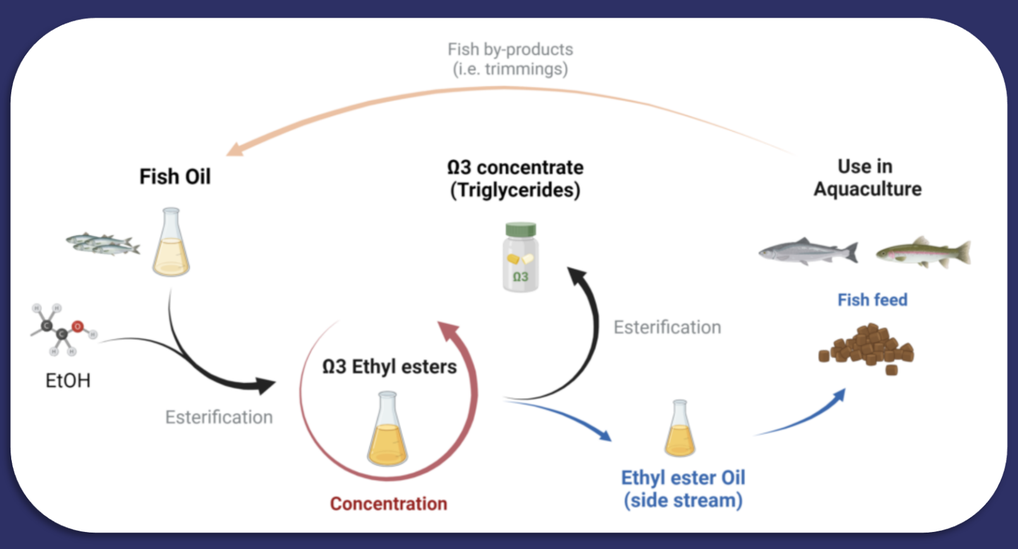
NUTRITIONAL EFFECTS OF ETHYL ESTER OILS IN ATLANTIC SALMON (*Salmo salar*): A SHORT-TERM TRIAL

A. Noor, M. Siddika , J-E. Haugen, A. Nilsson, E.M. Wetterhus, G.M. Berge, T-K. Østbye, B. Ruyter, and E. Lutfi
Nofima, (Norwegian Institute of Food, Fisheries and Aquaculture Research); N-1432 Ås, Norway.

INTRODUCTION

To promote sustainable marine resource utilization, the Norwegian Pelagic sector aims to maximize fish resource use by exploring valuable side streams from pelagic fish products. Ethyl ester (EE) oil is by-product obtained during omega-3 fatty acid production. The process involves the reaction of crude fish oil with ethanol and using heat distillation followed by an exzymatic process which form triacylglycerols (TAG) leaving EE as remaining.

Norway annually produces around 10,000 tons of EE oil, however the knowledge on its potential to use as fish feed ingredients is limited. In this regard, the present study examines the effect of varying levels of EE oil on the performance and health of Atlantic salmon parr in freshwater.

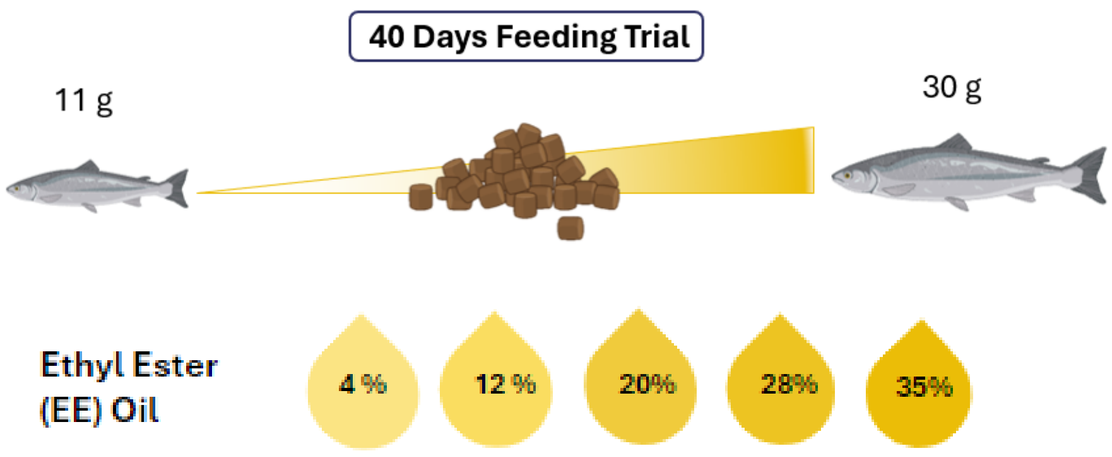


Simplified representation of the production of omega-3 polyunsaturated fatty acid concentrates for human consumption and side stream production of ethyl ester oil for aquaculture feeds.

OBJECTIVE

To evaluate the effects of different inclusion levels of EE oils on **nutrient digestibility**, **fish performance** and **health** of Atlantic salmon parr in freshwater, as well as to identify **tolerance levels** and potential negative effects.

EXPERIMENTAL DESIGN



Formulated Feed Composition

	CT	EE_4%	EE_12%	EE_20%	EE_28%	EE_35%
Protein	51.1	51.1	51.1	51.1	51.1	51.1
Lipid	23	23	23	23	23	23
EPA + DHA	10	10	10	10	10	10
SFA	14.11	15.55	18.4	21.26	24.06	26.04

Eicosapentaenoic acid (EPA), Docosahexaenoic Acid (DHA) and Saturated Fatty Acid (SFA)

RESULTS

Growth Performance

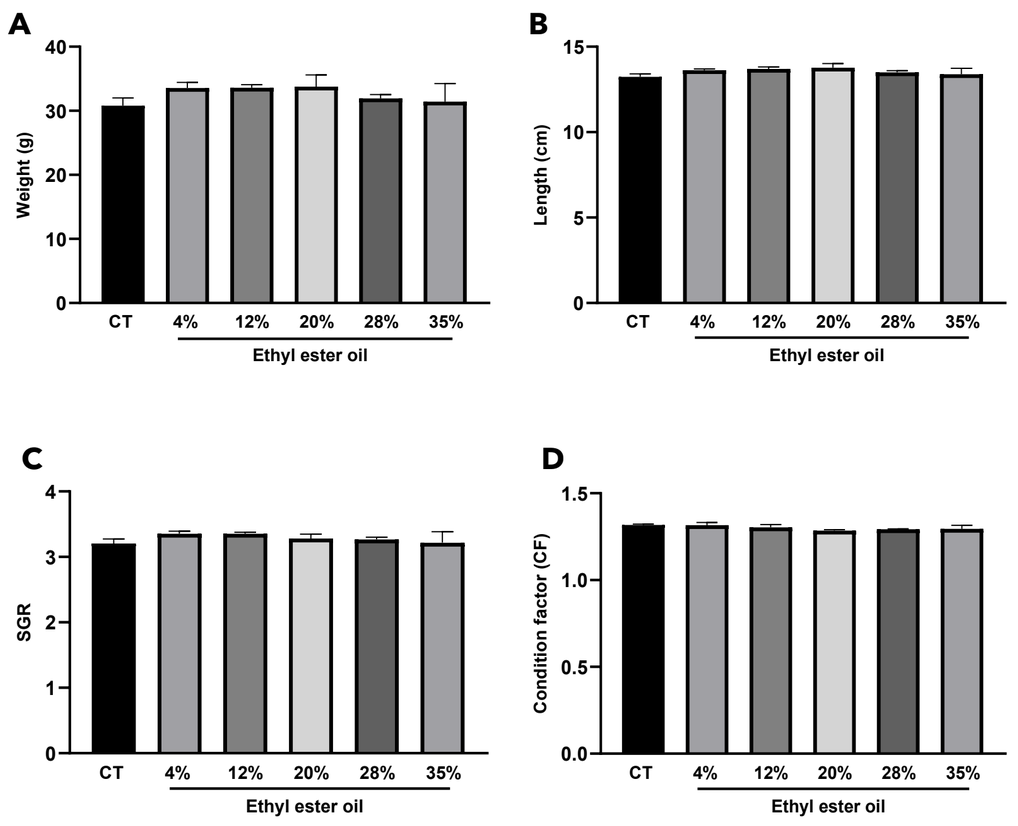


Figure 1. *Weight (A), Length (B), specific growth rate (SGR, C) and Condition factor (D). Results are shown as mean + SEM and analyzed by a one-way ANOVA.*

Fatty acid composition

Total lipid content and fatty acid composition (% of total FA) in the liver

	CT		EE_4%		EE_12%		EE_20%		EE_28%		EE_35%	
	Mean	SEM	Mean	SEM	Mean	SEM	Mean	SEM	Mean	SEM	Mean	SEM
Fat content(%)	5.18	0.25	5.06	0.30	5.00	0.11	5.09	0.20	4.87	0.11	4.64	0.12
Sum EPA/DHA	10.38	0.69	10.88	0.08	11.24	0.17	10.64	0.53	11.45	0.39	11.21	0.33
Sum N-3	11.36	0.66	11.74	0.07	12.09	0.22	11.36	0.59	12.14	0.42	11.95	0.34
Sum N-6	2.38	0.02	2.15	0.06	1.99	0.05	1.67	0.10	1.62	0.09	1.45	0.00
Sum N-0	7.23	0.24	6.81	0.07	7.50	0.18	7.28	0.43	7.87	0.40	8.04	0.14

Total lipid content and fatty acid composition (% of total FA) in mid-intestine

	CT		EE_4%		EE_12%		EE_20%		EE_28%		EE_35%	
	Mean	SEM	Mean	SEM	Mean	SEM	Mean	SEM	Mean	SEM	Mean	SEM
Fat content(%)	5.19	1.31	4.47	0.92	5.18	1.17	5.26	0.51	6.43	1.36	5.05	2.22
Sum EPA/DHA	9.37	0.48	9.91	0.11	9.67	0.68	9.76	0.74	10.52	1.08	11.22	1.48
Sum N-3	10.96	0.52	11.69	0.31	11.30	0.78	11.31	1.03	12.39	1.49	13.03	1.95
Sum N-6	4.01	0.11	4.38	0.36	3.90	0.28	3.69	0.45	4.06	0.69	3.82	0.71
Sum N-0	12.27	0.47	13.72	1.11	13.83	0.85	14.41	1.22	17.97	1.99	18.53	2.86

CONCLUSIONS

- The diets showed no negative behavioral effects on the fish, and fish performance remained unaffected even at a 35% EE inclusion level.
- The fatty acid composition of the liver and intestine mirrored the diet, showing higher SFA levels with increased EE inclusion.
- There is a tendency toward increased omega-3 levels with higher EE inclusion, suggesting a potential omega-3 sparing effect.

Financed by:
FHF

Acknowledgements: *We gratefully acknowledge the technicians and staff at the Nofima station in Sunndalsøra for their invaluable assistance with the feeding trials. Your support and expertise were crucial to the success of this research.*

Nofima: *Osloveien 1, 1433 Ås (Norway)*
Norway, tlf.: +47 77 62 90 00, www.nofima.no, post@nofima.no