

Green Green Grass

Gradual levels of grass meal in the diet for freshwater-farmed salmon

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Goal

• Healthy planet

Healthy fish

• Healthy food



Lets talk about feed :





A healthy planet requires that food is produced sustainably



Feed for our farmed animals must be produced sustaibably



Today, two-thirds of the feed ingredients for Norwegian salmon come from the other side of the world - south of the equator



Today's feed accounts for 75 percent of the carbon footprint of farmed Norwegian salmon



Today the world situation is unstable, hence relying on feed from the other side of the globe entails significant uncertainty



Norwegian aquaculture needs a feed revolution – otherwise we will face a drastic feed shortage

.....therefore

• If we manage to find Norwegian ingredients, or ingredients from areas close to Norway



It will be good for the planet

It will be good for the salmon farming industry





Happy & Healthy fish





Could locally grown grass protein be an alternative to long-distance soy protein





More than 2/3 of Norway is unsuitable for any other plant production than grass



At biorefineries, grass can be processed into new products that add value; including green protein from plant juice



The expertise in Norway related to the biorefining of grass is limited, but primarily exists in Denmark and the Netherlands (neighboring countries)



We are cooperating with experts in Denmark and will learn from them

Experiment; 20 grams salmon in freshwater

- Inclusion of grass protein, alfalfa 0 20%
- NMBU, Centre for Fish Research, RAS
- Three tanks for each diet
- Duration 7 weeks



Specific Growth Rate, SGR Feed Conversion Ratio, FCR



- The fish weighed 61 grams on average at the end of the experiment (3 X initial weight)
- 20% incorporation of grass meal resulted in lower growth



- The FCR varied from 0.75 to 0.83, acceptable for all groups
- Higher FCR when using grass meal





All fish looked normal, but 20% grass meal resulted in:

- More visceral fat
- Bigger liver
- The faeces became softer when using more than 10% grass meal, but no diarrhea







External welfare indicators (OWI – image analyses)

- no bleedings in skin
- no wounds
- no eye problems
- no deformities
- but higher scale loss when using 20% grass meal



Blood values



Albumine No difference Alkaline phosphatase No difference No difference ALT No difference Amylase No difference AST CK No difference No difference Phosphorous No difference Free fatty acids No difference Bile acids Globuline Lower for the grass-groups No difference Glucose No difference Potassium Tended to be lower for the grass-groups Calcium Chloride No difference No difference Creatinine Lower when ≥ 15% grass-protein Lipase No difference Sodium Tended to be lower for the grass-groups **Total protein** Triglycerides No difference

Norwegian University of Life Sciences



Hind gut

- The intestine was examined immediately; approximately 15 minutes after euthanasia, and also based on images.
- The results showed that high incorporation of grass proteins led to increased blood flow (hyperemia ≥15%) and increased risk of bleeding in the hindgut.
- Tendency for increased accumulation of fat at 20% incorporation





Colour

The color of the skin was the same for all groups

The feed affected the fillet colour:

Increasing inclusion of grass meal resulted in

- decreased redness
- increased yellowness

These differences were detected by an instrument and could not be seen visually – but this is important to follow up in bigger fish



Summary

- Using moderate amounts of grass protein seems to work well, but we have found effects that we will monitor closely in further research
- In April, we will conduct a new experiment in freshwater using extruded feed.
- The next step will be to conduct experiments in the sea, starting on a small scale and then in large-scale cages – and we will also cultivate / harvest Norwegian grasses for testing
- and just tell me if you are interested in joining our experiments
 - for learning
 - take a bachelor thesis
 - take a master thesis



Takk!

Engsvingel

Rødkløver

Luserne

CFHF



Gressproteiner til laks (ENGLAKS)