

Steven Hart



Soy Aquaculture Alliance United States

Dr. Steven Hart is executive director of the Soy Aquaculture Alliance, a new collaborative effort among several U.S. state soybean boards and commercial partners to develop aquaculture in the United States and use of soy-based aquafeeds.

Hart was formerly director of aquaculture for the Indiana Soybean Alliance.

He has also worked to apply nutritional research to practical situations through commercial demonstration trials utilizing soy-based feeds as an alternative to fishmeal-based diets.



Aquaculture Growth: Addressing Long-Term Needs Through Feed-Based Research

Dr. Steven Hart
Executive Director
Soy Aquaculture Alliance



Copyright © 2013 Bell Aquaculture, LLC® -- All Rights Reserved

Outline

1. Need for feed-based research
2. Soy Aquaculture Alliance
3. Research case study
4. Current research program
5. Future

Need for Feed-Based Research

Finding an Alternative to Fishmeal

- Between 70-80% of global supplies of fish meal and fish oil are currently being used in aquafeeds
- With little chance of increased availability of fish meal and oil, alternative sources of protein and oil are required
- The nutritional qualities of soybean meal and soy protein concentrate make them effective ingredients for aquafeeds

Soy Aquaculture Alliance

Soy Aquaculture Alliance

- SAA was started by soybean checkoff leaders in order to address critical gaps in feed research
- Membership organization designed to bring industry and soy groups together in common cause – two main goals:
 1. Increase domestic aquaculture production
 2. Conduct feed-based research

Research Case Study

Case Study for Yellow Perch

Commercial yellow perch diets are not available, so worked with universities and commercial industry to develop a yellow perch feed



Sample Yellow Perch Diet

Ingredient	%
Fish meal 64/67	5.00
Corn protein concentrate 75%	7.50
Poultry byproduct meal 60%	15.00
Soybean meal 46%	25.00
Whole wheat	25.00
Millrun	10.60
Vitamin premix	1.00
Choline chloride	0.15
Fish oil	2.80
Calcium propionate	0.05
Trace mineral premix	0.30
Stable C	0.10
Poultry fat	2.75
L-lysine HCl	1.00
Feather meal	3.75

- Used results from previous nutritional studies to develop recommendations for a commercial formula
- Until Bell Aquaculture, not enough demand for a mill to justify producing a specific yellow perch feed
- Worked with a commercial feed mill to produce a test diet

Case Study for Yellow Perch

Composition of the experimental diets (g/100 g).

- Diet worked, but wasn't optimal
- New soy products and processing techniques will allow us to advance this industry even further
- Conducted a trial with a specialty variety of soybeans

Ingredient	20 FM	15 FM	10 FM	5 FM	0 FM
Fish meal	20	15	10	5	0
SG 3010	36.8	42.3	48.3	53.9	59.4
Corn protein concentrate	5	5	5	5	5
Wheat flour	23	21.5	18.8	17	15.6
Fish oil	6.8	7.2	7.6	8.1	8.5
Lysine HCL	1.1	1.1	1	1	1
Methionine	0.5	0.55	0.58	0.62	0.65
Threonine	0.25	0.24	0.22	0.2	0.18
Taurine	1.5	1.5	1.5	1.5	1.5
Vitamin premix	2.3	2.3	2.3	2.3	2.3
CaHPO ₄	1.8	2.35	2.86	3.42	3.92
Magnesium oxide	0	0	0.05	0.05	0.05
Potassium oxide	0	0	0.56	0.56	0.56
Sodium chloride	0	0	0.28	0.28	0.28
Mineral premix	0.1	0.1	0.1	0.1	0.1
Choline Cl	0.6	0.6	0.6	0.6	0.6
Ascorbic acid	0.3	0.3	0.3	0.3	0.3
Protein	42	42	42	42	42
Fat	9	9	9	9	9

Case Study for Yellow Perch

Weight gain, feed conversion ratio and specific growth rates (SGR; $(\ln \text{ final wt.} - \ln \text{ initial wt.}) / 112 \text{ days} * 100$) for juvenile yellow perch fed the experimental diets.

Diet	Weight Gain (%)	FCR	SGR
20 FM	702	0.81c	1.91
15 FM	745	0.87abc	1.87
10 FM	735	0.89ab	1.86
5 FM	732	0.91ab	1.89
0 FM	694	0.93a	1.85
Commercial	602	0.85bc	1.72
Pooled SE	68.1	0.013	0.087
P > F	0.8061	0.0015	0.798

Current Research Program

Soy Aquaculture Alliance

- Established the Science and Technology Advisory Panel (STAP) to help with research process
 - Bring together industry stakeholders once per year to establish critical needs
 - Work with STAP to develop Request for Proposal (RFP)
 - Board approves RFP
 - RFP
 - Peer review of proposals
 - STAP prioritizes proposals
 - Board approves projects

Research is a Major Driver

- Key research gaps identified in year 1
 1. Taurine requirements of fish
 2. Impacts of soy-based feeds on waste output
 3. Genetic selection to develop domesticated broodstocks
 - Select for growth, disease resistance, ingredient tolerance, nutritional characteristics, etc...



Taurine

- Most fish require 10 essential amino acids (EAA)
- Carnivorous fish may require 11 (taurine is 11th EAA)
- Conducting two studies (multiple species) to:
 - Determine requirements (literature review and new studies)
 - Characterize efficacy of taurine in feeds
 - Determine potential toxicity levels
 - Determine if bioaccumulation occurs

Waste Output

- Soy-based feeds can cause changes in waste output
- Certain components of soy limit the amount used in carnivorous fish feeds
- Conducting one study (rainbow trout) to:
 - Characterize impacts on waste
 - Determine effective ways to mitigate impacts
 - Determine impacts of various soy ingredients

Broodstock Development

- Less than 10% of global aquaculture industry using traditional selective breeding practices
- Rainbow trout have been selected to be more tolerant to plant-based ingredients
- Conducting two studies (rainbow trout and shrimp) to:
 - Identify which genes allow for plant tolerance
 - Develop model that can be applied to other carnivorous species

Current Research

- Current studies will all be completed by March 2014

Future

Year 2 Research Program

- Year 2 RFP is currently being developed and will be released later this month
 - Continuation of selective breeding project (all species)
 - Continuation of waste output (development of more intensive feeds)

Alternative Soy Ingredients in Aquafeeds

Soybean checkoff organizations are developing feed grade soy protein concentrate (SPC) and specialty varieties of soybeans for use in aquafeeds with fish that utilize limited amounts of soybean meal

- Feed grade SPC can be a cost-effective ingredient, especially in carnivorous fish feeds
- Demand for feed grade SPC (57- 65% CP) is estimated to be 1.4 - 3.7 mmt, but that market should continue to grow as global marine aquaculture develops
- Non-GMO soybean varieties have been developed to address the aquaculture market

Thank You!

