

Purpose of study Testing the Gap Between Natural and Formulated Soybean Meal Feeds

Closing the Performance Gap Between Natural and Formulated Feeds Through Targeted Supplementation to Soy-Based Diets for Juvenile Red Drum

South Carolina Department of Natural Resources, Aaron M. Watson, Ph.D., Dr. Fabio Casu, Justin Yost, Dr. T. Gibson Gaylord (USFWS), Dr. Daniel W. Beardon (NIST ret.) and Dr. Michael R. Denson

Purpose / Goals

Evaluate the potential growth enhancement or inhibitory effects of several key metabolites that were previously identified. Metabolites selected for this study were detected in liver tissue of juvenile red drum fed either soybean meal-based diets or a natural* diet. Metabolites found only in fish fed the natural diet could exhibit stimulatory effects on growth, while metabolites found only in fish fed the soy-based diets could exhibit inhibitory effects on growth. All feed rations had similar results with satisfactory feed conversion ratios, illustrating that soybean meal inclusion did not have any negative impacts on studied fish. The results are significant and should be replicated in large-scale, commercial research projects.

* Natural diet is squid, shrimp, and fish



Soy Aquaculture Alliance

Andy Tauer, Executive Director 8425 Keystone Crossing, Suite 200 Indianapolis, IN 46240 (317) 644-2862 atauer@soyaquaalliance.com

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Study Design

This project consists of two 12-week trials. Growth and performance were recorded and liver samples were taken at week zero and week twelve. Samples were processed through a nuclear magnetic resonance (NMR)-based-metabolomics pipeline to develop profiles. This was to track the concentration and absorption of metabolites into the red drum. Eight diets were tested, all with 50% soybean meal and other additions varied throughout the diets.

Diet

- **1** Un-supplemented soy diet
- **2**► Cysteine (CYS)
- 3 Dimethylglycine (DMG)
- **4**► Glucuronate (GLC)
- 5 CYS + DMG
- 6► CYS + GLC
- 7► DMG + GLC
- 8► CYS + DMG + GLC

Table 1: Performance Metrics

Results

- No significant differences in performance were determined (i.e. weight gain, feed consumption, all feed conversion ratios below 1.0)
- Supplemented cysteine appears to have oxidized to cystine either during the extrusion process or prior to feeding, as only cystine was detected in feed extracts that were originally supplemented with cysteine, and not cysteine itself
- Dimethylglycine was detected in liver extracts, however no significant differences in metabolite levels or in growth performance were observed
- All eight novel feed formulations performed satisfactorily and should be candidates for further large-scale research

Diet	Specific Growth Rate (SGR)	Weight Gain (% initial)	Feed Consumed (g/fish)	Feed Conversion Rate (FCR)
Un-supplemented soy	2.1 ± 0.03	463.16 ± 13.70	142.78 ± 3.35	0.95 ± 0.02
Cysteine (CYS)	2.1 ± 0.06	476.56 ± 26.99	143.82 ± 6.13	0.93 ± 0.03
Dimethylglycine (DMG)	2.1 ± 0.04	471.05 ± 18.93	146.19 ± 6.91	0.96 ± 0.01
Glucuronate (GLC)	2.1 ± 0.08	469.47 ± 36.19	141.27 ± 9.02	0.93 ± 0.02
CYS + DMG	2.1 ± 0.06	500.51 ± 28.15	146.03 ± 7.49	0.90 ± 0.01
CYS + GLC	2.1 ± 0.10	466.82 ± 45.06	141.14 ± 10.69	0.94 ± 0.03
DMG + GLC	2.0 ± 0.10	457.62 ± 37.07	141.01 ± 8.56	0.95 ± 0.02
CYS + DMG + GLC	2.1 ± 0.10	483.33 ± 49.91	147.94 ± 15.33	0.94 ± 0.07
P (significant if <0.05)	0.816	0.845	0.96	0.468

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