

TECHNICAL REPORT - LABORATORY BASED BEHAVIORAL TRIALS

Objective and Background

A laboratory behavioral study was performed to evaluate the ability of a proprietary feed attractant mixture (= "FAM") and a proprietary slow release matrix (= "premix") to improve the performance of soybean meal-containing feed pellets in the aquaculture of *L. vannamei*. This study was carried out at Georgia State University.

Previously, we used two behavioral assays to develop a feeding enhancer, FAM, for *L. vannamei*. One was an attractability assay that evaluates the ability of chemicals to attract shrimp, and other was a palatability assay that evaluates the ability of chemicals added to feed pellets to enhance their ingestion. These assays are described in detail in our recent publication (Derby et al. 2016). We used these assays to show that FAM is a powerful feeding stimulant for *L. vannamei*, that increases both the attractability and palatability of pellets.

Experiments

The attractability and palatability assays were used for shrimp that were communally housed, in groups of ca. 15 animals per 80-liter aquaria.

In the attractability assay, chemical solutions were released through a tube into the aquaria using a peristaltic pump and a controlled rate and duration (2 ml/min, for 5 min). The chemical solutions were 1-h aqueous extracts of feed pellets. Responses were quantified as the number of times that a shrimp touched the release end of the tube, and the response for each stimulus was calculated as the total number of touches during the 5-min test period. Two dilutions of the pellet extract were tested: 1% and 2%.

In the ingestion assay, food pellets were introduced in the aquaria and shrimp were allowed to eat for 3 h. The amount of pellets added was enough that less than 50% of the pellets were consumed during the assay. At the end of the assay, the uneaten pellets were collected, sorted to separate the pellets from other material, dried, and weighed. The amount of pellets consumed was calculated from the difference in the pre-test and post-test mass of the pellets, after having corrected for loss of pellet mass over 3 h in seawater in the absence of shrimp.

Six types of food pellets (SD1-SD6) were tested. The compositions of the pellets tested in this study are shown in Table 1. All pellets contained 30% soybean meal, 20% wheat flour, 27% marine-protein-free feed concentrate, and 9% monocalcium phosphate/menhaden oil/Na alginate/premix. The pellets differed in two ways. First was the type of added chemical stimulant. Second was whether or not premix was added. SD1 was the negative control and had an extra 5% wheat flour; SD2 was the positive control and had 5% krill meal; SD3-SD6 had FAM, with SD3 having 1% FAM + 1% premix, SD4

having 1% FAM and no premix, SD5 having 5% FAM + 5% premix, and SD6 having 5% FAM and no premix.

Ingredient	SD1	SD2	SD3	SD4	SD5	SD6
Soybean Meal	30	30	30	30	30	30
Marine Protein Free Feed Concentrate	27.3	27.3	27.3	27.3	27.3	27.3
Monocalcium Phosphate	3	3	3	3	3	3
Menhaden Oil	3	3	3	3	3	3
Premix (5%)	11	11	11	11	11	11
Na-Vit	1	1	1	1	1	1
Vit/Min/Colesterol	5	5	5	5	5	5
Wheat Flour	34.2	29.2	20.2	33.2	19.2	29.2
Krill Meal	0	5	0	0	0	0
FAM	0	0	1	1	5	5
Premix	0	0	1	0	5	0
Sili	0	0	0	0	0	0

Palatability (n=12 tanks, mean ±SEM)		
Additive	Relative Response (% of SD1)	
SD1	0	100
SD2	5% Krill Meal	102.1 ±3.8
SD3	1% FAM + Premix	124.7 ±8.9
SD4	1% FAM	105.3 ±3.4
SD5	5% FAM + Premix	105.2 ±5.9
SD6	5% FAM	94.1 ±6.0

Conclusion

The laboratory behavioral assays show that 1% FAM + premix when added to soybean meal containing feed pellets significantly enhances both the attractability and palatability of the pellets. 1% FAM + premix is even more effective than 5% krill meal or 5% FAM + premix. Thus, based on these assays, 1% FAM + premix is a relatively inexpensive and highly effective attractant-palatant that should be tested in grow-out experiments.

References

Blezinger S, Olbrich F, Karges K, Hill B, Bharadwaj A, and Chamberlain G. 2015. Reduced dependence on fish meal in shrimp feeds with use of feed. Abstract at the 2015 World Aquaculture Society Meeting.

Derby CD, Elsayed FH, Williams SA, González C, Choe M, Bharadwaj AS, and Chamberlain GW. 2016. Krill meal enhances performance of feed pellets through concentration-dependent prolongation of consumption by Pacific white shrimp, *Litopenaeus vannamei*. *Aquaculture* 458: 13-20.