

Shrimp Chemoattraction and Feeding Stimulation: Methods, Progress and Significance

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Abstract

For many academic and commercial feed nutritionists, the identification of cost-effective chemoattractants and feeding stimulates (CFS) for shrimp has the highest priority in the area of shrimp nutrition and feed management. CSF are dependant upon chemoreception of one or more chemicals in solution. Chemoreception is defined as transduction of any type of chemical stimuli into a nervous impulse. Significant progress has been made since the major review was done by Lee and Myers in 1997. What most individuals refer to as attractability can more accurately be referred to as a behavioral response to CFS. Lee and Myers proposed five distinct phases consisting of detection, orientation, locomotion, initiation of feeding and continuation of feeding. Conceptually, this indicates the potential of five separate receptor sites on the animal with five distinct chemical requirements. Further, one has to also assume that there are interactions or synergisms and inhibitions or suppressors in response to CFS. Because of these complexities and with the difficulty of developing a predictable and reliable method to measure one or more of the preceding phases with the necessary statistical package; it is not surprising that progress in this critical area of shrimp nutrition and feed development has been lacking.

Much of the published information is based upon inadequate methods and statistical analyses. In general, it has been concluded that low molecular weight compounds such as amino acids, nucleotides and organic acids have been identified as shrimp CFS. Also, it is thought that shrimp can detect a change in quality better than quantity of the chemical stimuli. Further, it is thought that chemical detection thresholds are significantly lower than those required for feeding stimulation and feeding continuation.

A discussion of new methods for determining chemoattraction and feed consumption with a new statistical package will be emphasized. This new method is based upon the two choice method used in dog and cat chemoattraction and feeding methodology. Basically, by standardizing the shrimp and methodology, a predictable protocol for estimating the chemoattraction and feeding by chemicals added to feeds has been developed. Data indicated that many of the previously thought low molecular weight compounds are not as effective chemoattractants as previous thought and that high molecular weight proteins are more effective. Also, it has been shown that there is a high correlation between chemicals added to feeds which show chemoattraction and feed consumption. Further, the method has been used to evaluate major ingredients from fish and squid products as chemoattractants. This data will be summarized. Finally, a summary of the need and significance of CFS for shrimp feeds in terms of feed utilization efficiency, development of "environmentally friendly" feeds, determination of fish meal replacements, reduction in dietary nutrient density, development of lower cost feeds, etc. will be given. It will also be emphasized the need to evaluate chemoattraction and feed consumption in commercial feeds, in commercial ponds in the presence of natural productivity and the effect of environmental parameters such as salinity and temperature.