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Aquafeeds

Fatty acid nutrition of juvenile Litopenaeus vannamei

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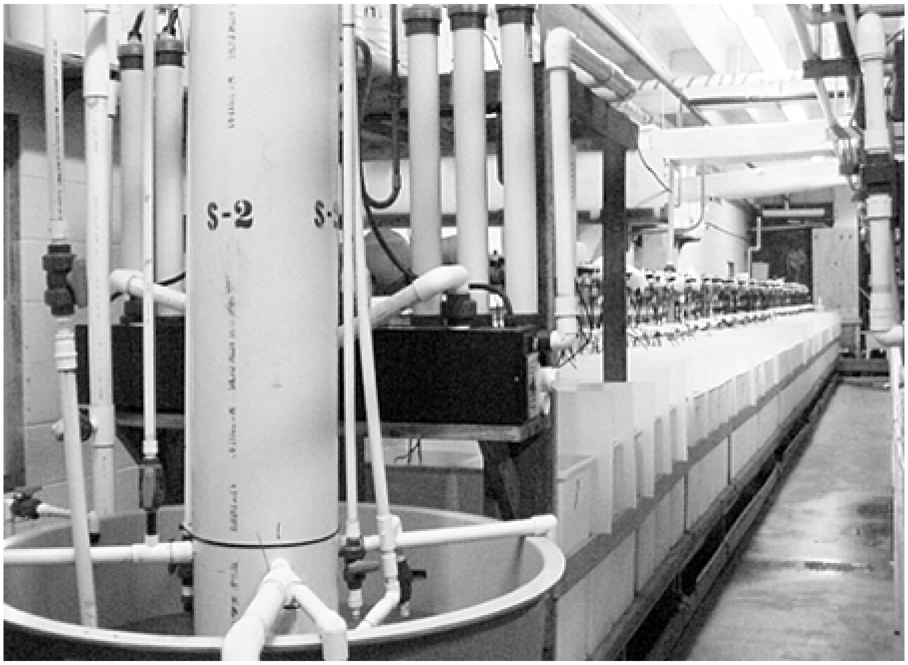
Recirculating-system research conducted at Texas A&M

Among lipids, some omega-3 and omega-6 polyunsaturated fatty acids (PUFA) such as linolenic (18:3 omega-3) and linoleic (18:2 omega-6) acid, as well as highly unsaturated fatty acids (HUFA) such as arachidonic (20:4 omega-6), eicosapentaenoic (20:5omega -3), and docosahexaenoic (22:6 omega-3) acid are considered essential nutrients for penaeid shrimp. In spite of this, knowledge of the dietary requirements for these nutrients in Pacific white shrimp (*Litopenaeus vannamei)*, an economically important penaeid for shrimp farming in the Americas, is limited.

The authors conducted a six-week experiment at the Shrimp Mariculture Project of Texas A&M University in Port Aransas, Texas, USA to test the dietary inclusion of 18:3 omega-3, 18:2 omega-6, 20:4 omega-6, 20:5 omega-3, and 22:6 omega-3 fatty acids at 0.5 percent of diet. An additional diet contained 0.5 percent of an omega-3 HUFA mix, which included 416 milligrams per gram of 20:522:6 omega-3-3 and 237 milligrams per gram of 22:6 omega-3. A basal diet contained only palmitic (16:0) and stearic (18:0) acid, also used as fillers for a 5 percent total dietary lipid.

L. vannamei juveniles with a mean initial weight of 0.4 grams were stocked at 44.4 animals per square meter into 10, 32-liter replicate tanks per dietary treatment. The indoor aerated recirculating system was kept at a temperature of 30 degrees-C and a salinity of 25 ppt.



Nutrition lab at Texas A&M Shrimp Mariculture Project.

Shrimp growth and survival

Differences in weight gain of shrimp were observed at the end of the feeding trial (Fig. 1). HUFA like 20:4 omega-6, 20:5 omega-3, and 22:6 omega-3, as well as the omega-3 HUFA mix, showed higher nutritional value than PUFA like 18:3 omega-3 and 18:2 omega-6 for juvenile *L. vannamei*.

Neither 18:3 omega-3 or 18:2 omega-6 improved shrimp growth significantly when compared to animals fed the basal diet with 16:0 and 18:0 only. Survival of shrimp averaged almost 94 percent and was not significantly affected by the dietary treatments.

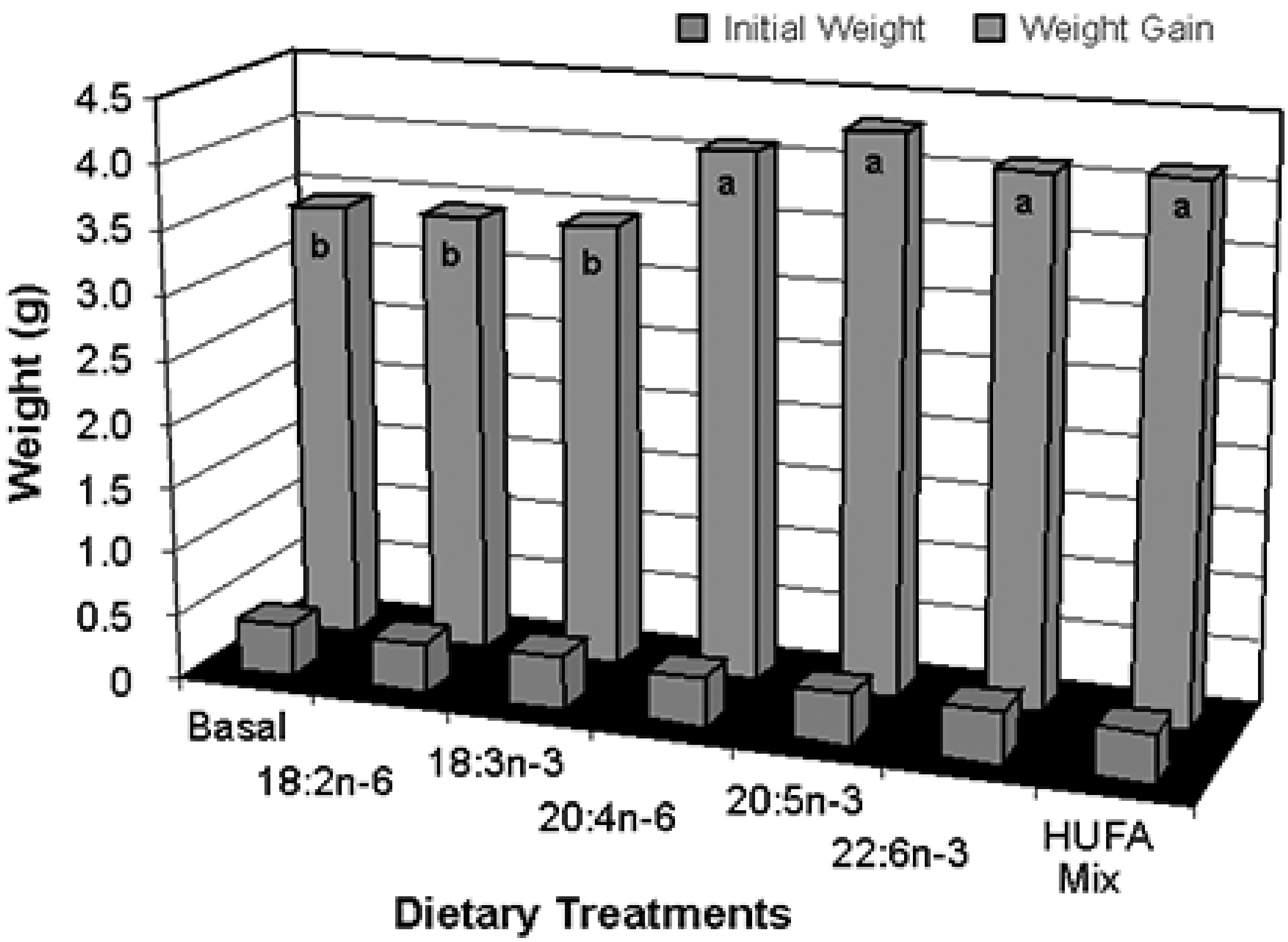


Fig. 1: Initial weight and weight gain of juvenile Litopenaeus vannamei fed different PUFA and HUFA (mean values). Bars with the same superscript are not significantly different.

Conclusion

As demonstrated for juvenile *L. vannamei* in the study, HUFA generally show higher nutritive value than PUFA. However, no preferential activity as essential fatty acids was observed for the omega-3 over the n-6 family of fatty acids under our experimental conditions, as different reports have indicated.

Results suggested that for *L. vannamei*, the essential fatty acid value may be determined by chain length and degree of unsaturation, with long-chain unsaturated fatty acids having greater nutritional value than shorter-chain fatty acids, regardless of the family to which they belong.

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