Artificial *Artemia* as a feed supplement for nursery phase *Litopenaeus vannamei* culture in biofloc dominated zero-exchange raceways

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Nursery Systems

- Incorporation of a nursery phase in the production cycle can improve the system's profitability
- The nursery phase is defined as the intermediate step between the early PL and the grow-out phase
- Production of healthy juveniles in nursery system is an important issue for shrimp producers
- Feeding shrimp larvae and young PL *Artemia* nauplii is often regarded as important for production of healthy shrimp

Introduction

- Biosecurity issues, limited supply, & fluctuating costs of *Artemia* cysts forced users to investigate alternative feeds
- Atractability, palatability, digestibility and potential negative impacts on water quality are only few of the impediments to successful replacement of live or frozen *Artemia* in PL and juveniles production
- EZ *Artemia* is a new product developed based on these and other criteria to satisfy the need for *Artemia* replacement

Objective

The current study was designed to evaluate EZ *Artemia* as a feed supplement for young *Litopenaeus vannamei* postlarvae in a 49-day nursery study in six RWs under biofloc dominated zero-exchange conditions

Material & Methods

- Six 68.5 m^2 (40 m^3) greenhouse-enclosed RWs with a mean water depth of 0.45 m
- Each RW has eighteen, 5.1 cm airlift pump, six 0.9 m air diffusers, a Venturi injector operated by a 2 hp centrifugal pump, and a center partition positioned over a 5.1 cm PVC pipe with spray nozzles to enhance bottom water circulation and deliver oxygen-rich water across the length of each RW

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Material & Methods

- Each RW had DO monitoring systems (YSI 5500, YSI Inc., Yellow Springs, OH)
- RWs were stocked with PL_9 (0.0025) at 1,000 PL/m^3 produced from a cross between Fast-Growth and Taura resistant lines purchased from Shrimp Improvement System, Islamorada, FL
- All PL had been fed the EZ *Artemia* during the hatchery phase

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Material & Methods

- Each RW was filled with a mixture of seawater (20 m^3), municipal freshwater (10 m^3), and biofloc-rich water (10 m^3) from a previous grow-out study
- Salinity was adjusted to 30 ppt
- Foam fractionators were used to maintain TSS and SS levels in the range of 200-300 mg/L and 10-14 mL/L, respectively

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Material & Methods

- For the first 10 days, PL in three control RWs were fed only a 50% CP dry diet (PL Raceway Plus, Zeigler Bros., Gardners, PA) while those in the other three RWs were fed a combination of the same dry diet (75% by wt.) and EZ *Artemia*, Zeigler Bros. (25% by wt.)
- For the remainder of the study, shrimp in both treatments received a 40% CP dry diet (Shrimp PL 40-9, Zeigler Bros.)

Material & Methods

- Water temperature, salinity, dissolved oxygen and pH were monitored twice daily; settleable solids (SS) were monitored once daily; ammonia-N, nitrite-N, nitrate-N, alkalinity, turbidity, TSS, VSS, and cBOD5 were monitored once a week
- Freshwater was added weekly to offset evaporative losses

Results

- Weekly monitored water quality parameters remained within the acceptable range for the culture of this species and showed no significant differences between treatments
- No statistically significant differences were found between the two treatments in any of the daily WQ indicators monitored in this study

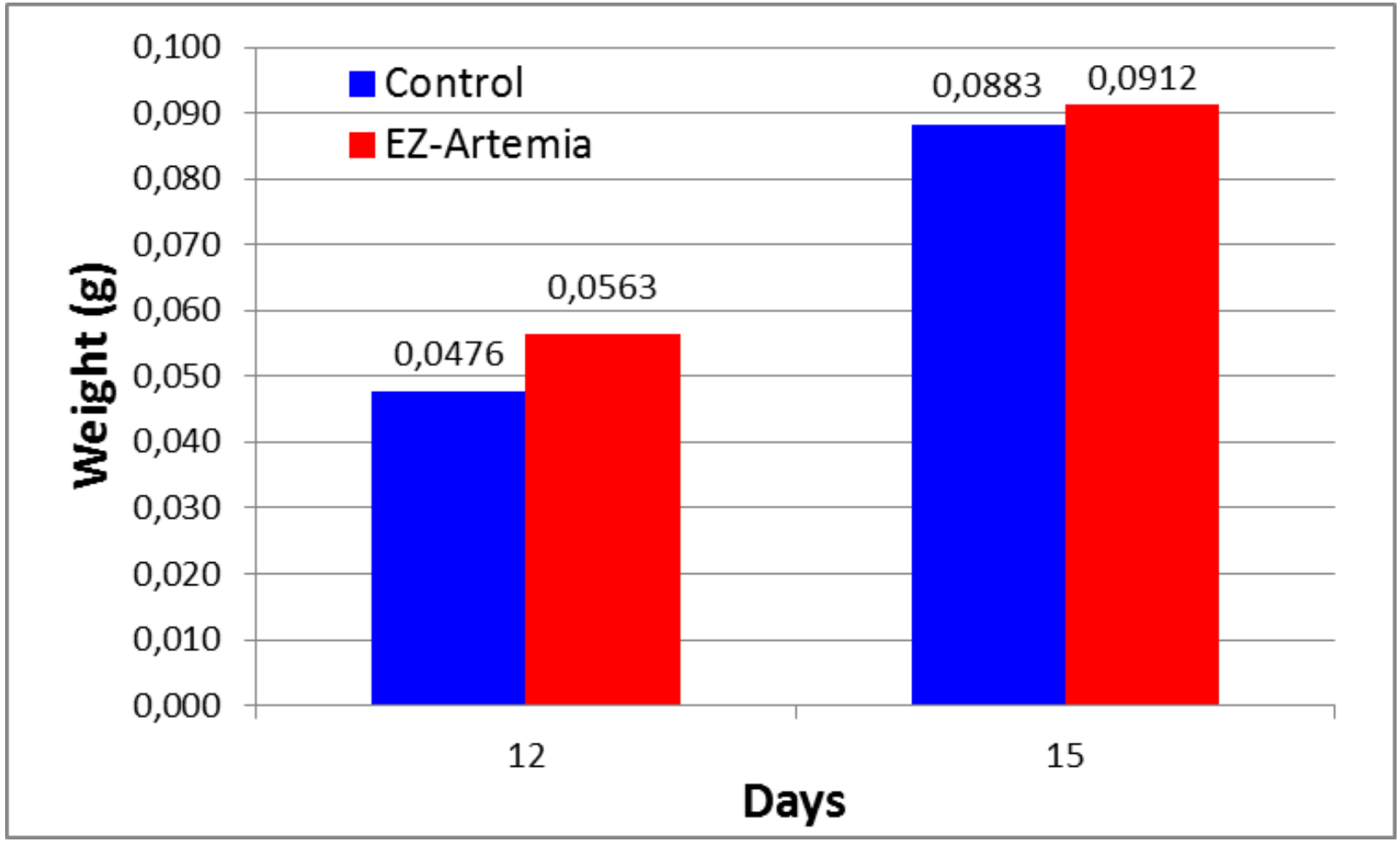
Results

- Mean temperature, dissolved oxygen, and pH were 28.07±1.51 ºC, 5.92±0.53 mg/L, and 7.58±0.01, respectively
- No differences were found between treatments in final weight, yield, FCR, and survival at the end of the study

Results

- However, at Day 12, when feeding the EZ *Artemia* was ended, the shrimp fed this feed had 15.45% higher mean weight than that of the Control
- Three days later, the difference of mean weight between treatments dropped to 3.18%

Results



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Mean performance of *L. vannamei* in Control and EZ *Artemia* treatments

	Final Weight (g)	Yield (kg/m^3)	FCR	Survival (%)
Control	3.56 ± 0.10^a	2.70 ± 0.10^a	0.84 ± 0.04^a	75.66 ± 1.15^a
Artificial *Artemia*	3.65 ± 0.23^a	2.80 ± 0.21^a	0.81 ± 0.04^a	76.73 ± 1.56^a

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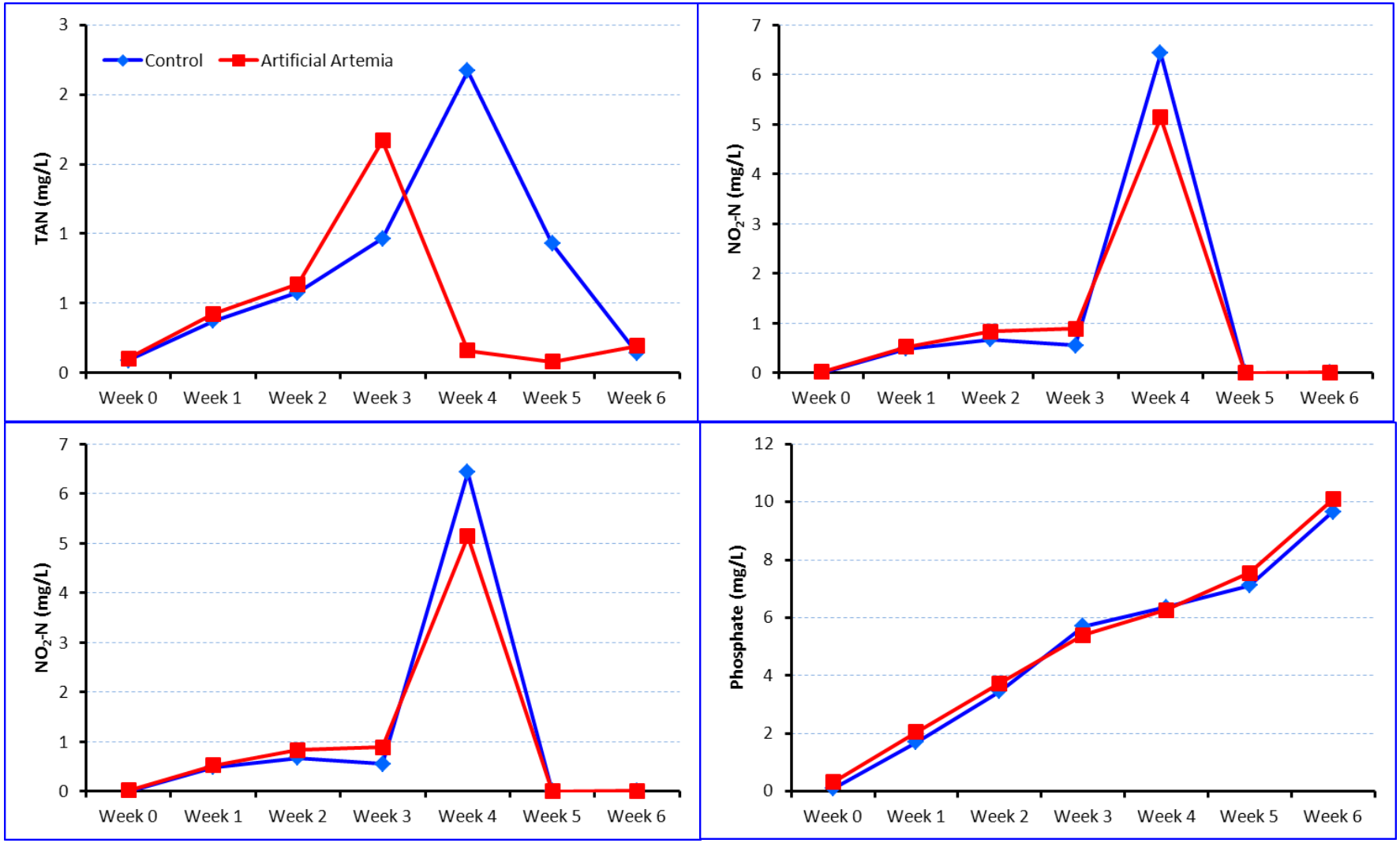
Weekly variations in water quality of the raceways during a 49 d nursery study



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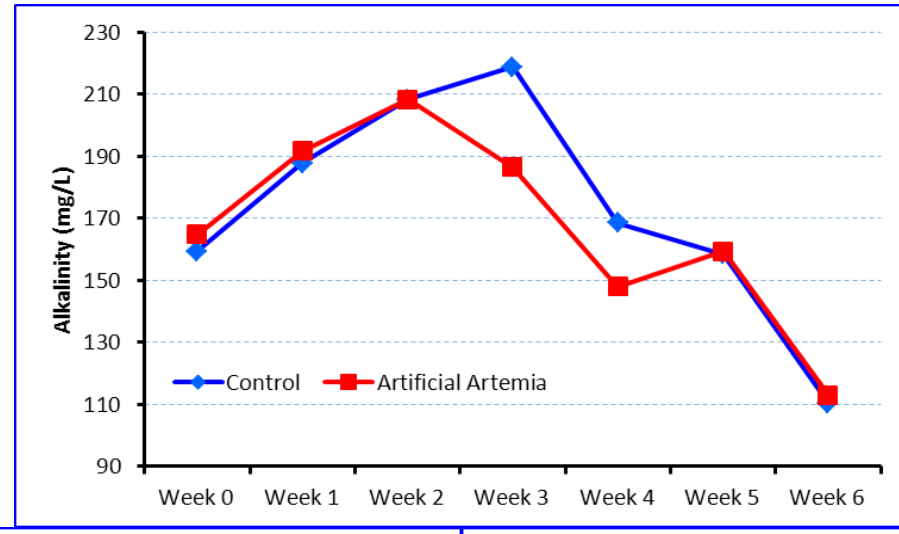

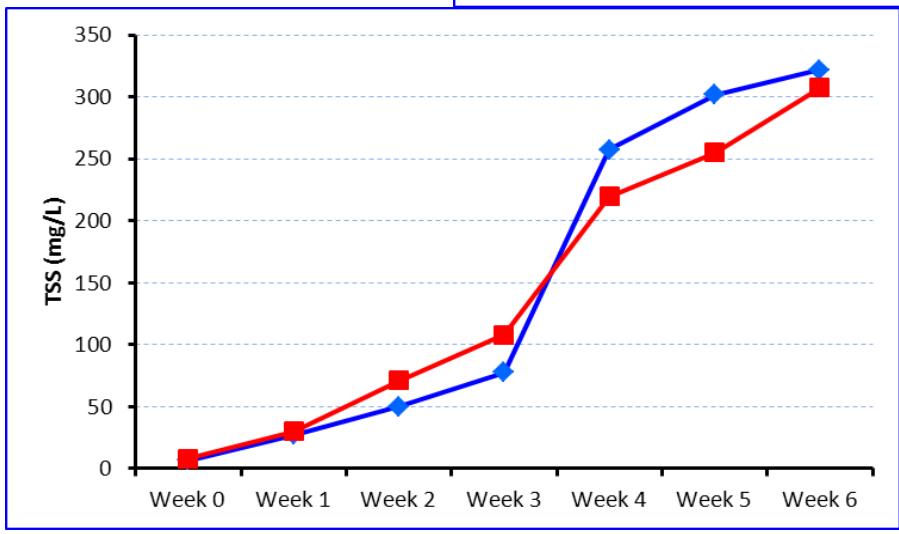

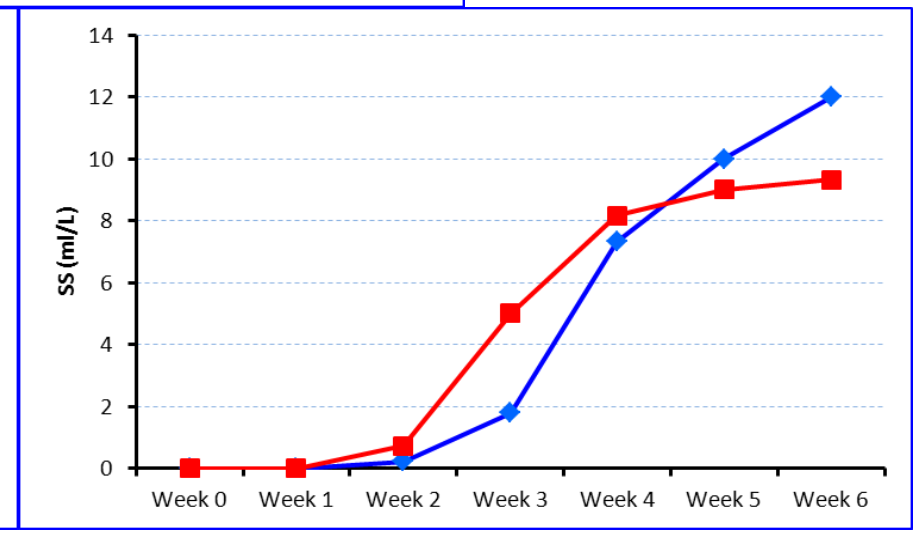

Conclusions

- The addition of 25% artificial *Artemia* to the nursery diet did not affect the water quality and performance of *L. vannamei* in the current study
- However, more studies are needed to evaluate the potential of EZ *Artemia* for replacement of natural *Artemia* under other experimental conditions, (e.g., higher density, poor culture conditions, increased substitution levels)
- Furthermore, the potential use of this product in hatcheries, where the nutritional value of *Artemia* is very important must also be evaluated

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- Feeds: Zeigler Bros.
- DO monitoring systems: YSI Inc.
- Foam fractionators: Aquatic Eco System
- Air diffusers: Colorite Plastics
- RWs liner: Firestone Specialty Products