GROWTH PERFORMANCE OF *Litopenaeus vannamei* IN SUPER INTENSIVE MIXOTROPHIC RACEWAY CULTURE WITH ZERO DISCHARGE USING [redacted] TECHNOLOGY FOR AERATION AND EXTENDED CO_2 DEGASSING

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Losses to viral disease outbreaks and the potential negative impact from nutrient-rich water on receiving streams are two major challenges for the development of sustainable, biosecure, and cost-effective shrimp farming practices. Use of greenhouse-enclosed mixotrophic super-intensive, biofloc dominated, zero exchange systems can alleviate these problems. A 108 d super-intensive grow-out study was conducted in four 40 m^3 raceways with water previously used in a 62 d nursery trial. Preliminary results showed that high shrimp yields (8.86-9.75 kg/m^3), high survival (90.3-96.3%), large size (21.1-23.1 g), good growth (1.35-1.39 g/wk), and low FCR (1.45-1.6), are feasible. Addition of freshwater was minimal (0.16-0.24% culture volume/d), serving mostly to offset evaporative losses. Total water use varied between 99 and 126 L/kg shrimp produced.

Operating biofloc systems at these production levels requires excessive energy to satisfy the high oxygen demand of the shrimp and the microbial communities. Upon successful completion of the above mentioned study, shrimp and water from one raceway were transferred into an empty raceway at a density of $393/m^3$ (av. wt. 22.4 g) with biomass load of 8.8 kg/m^3, to evaluate the potential use of a new aeration device [redacted] to purge CO_2, provide adequate mixing of the biofloc, and maintain optimal dissolved oxygen levels in the culture medium without using pure oxygen while reducing energy consumption.

Prior to implementing the [redacted] device, the DO level in the raceway had been maintained using a pump driven Venturi injector system to enrich the water with air and supplemental oxygen. Preliminary results showed that the [redacted] system using 3:1 air/water ratio and without oxygen supplementation maintained higher DO levels in the culture medium with good mixing while eliminating the need for the Venturi and all air-driven devices (e.g., air blower, air diffusers, airlift pumps) necessary for mixing and circulation. These results suggest that a total of 13 hp (four 2 hp pumps plus one 5 hp air blower) previously needed to operate the four raceways could be reduced to 8 HP, while also eliminating the cost for supplemental pure oxygen.

This presentation will summarize the results obtained in this study and the effect on selected water quality indicators and shrimp performance.

Key words: *Litopenaeus vannamei*, high-density, zero exchange, [redacted] technology