INTENSIVE HATCHERY PRODUCTION OF WHITE LEG SHRIMP IN BIOFLOC SYSTEM

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SHRIMP FACILITIES OF UFSC

Yakult Experimental Shrimp Farm

Marine Shrimp Laboratory

Marine Shrimp Laboratory

Broodstock

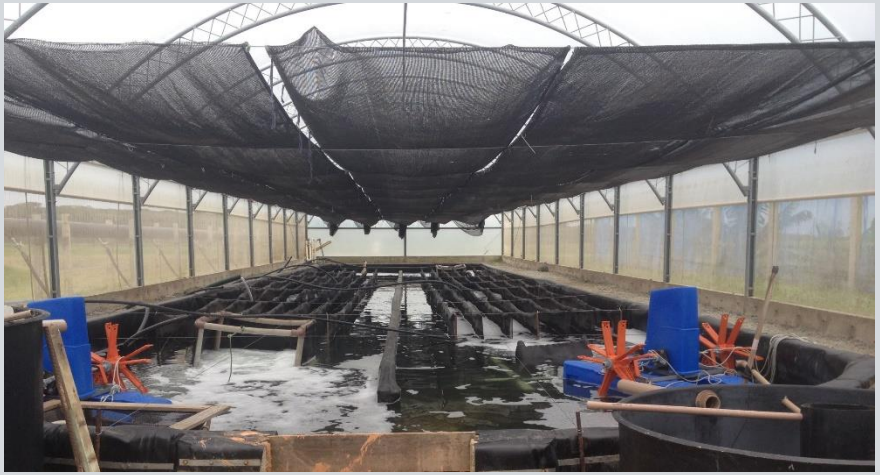
Hatchery

Nursery

Experimental units

Yakult Experimental Shrimp Farm

The farm



Raceway

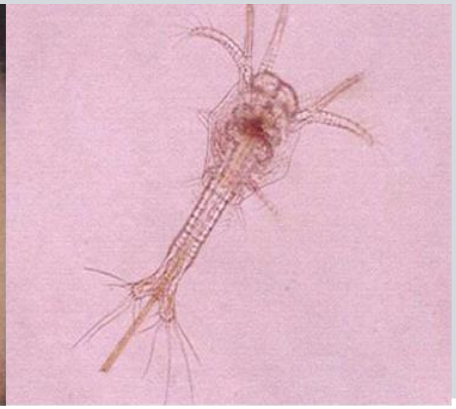
Pond with liner

Shrimp harvest

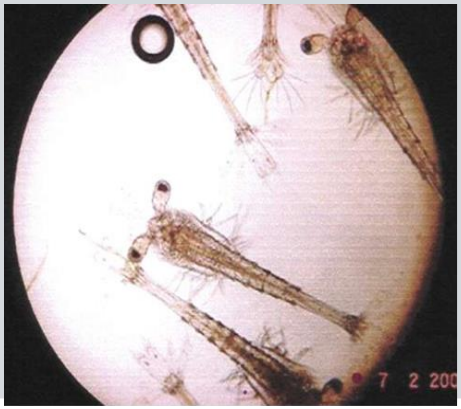
Shrimp hatchery

- Intensive system
- Tanks with “U” botton shapes of 10 to 20m^3
- Heating and aeration system
- Diary addiction of microalgae
- Water exchange between 25 to 75%, before mysis 1 stage.

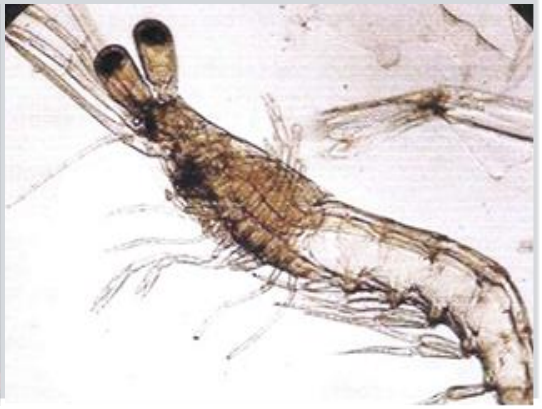
Nauplio



Protozoea



Misis



Pós-larva

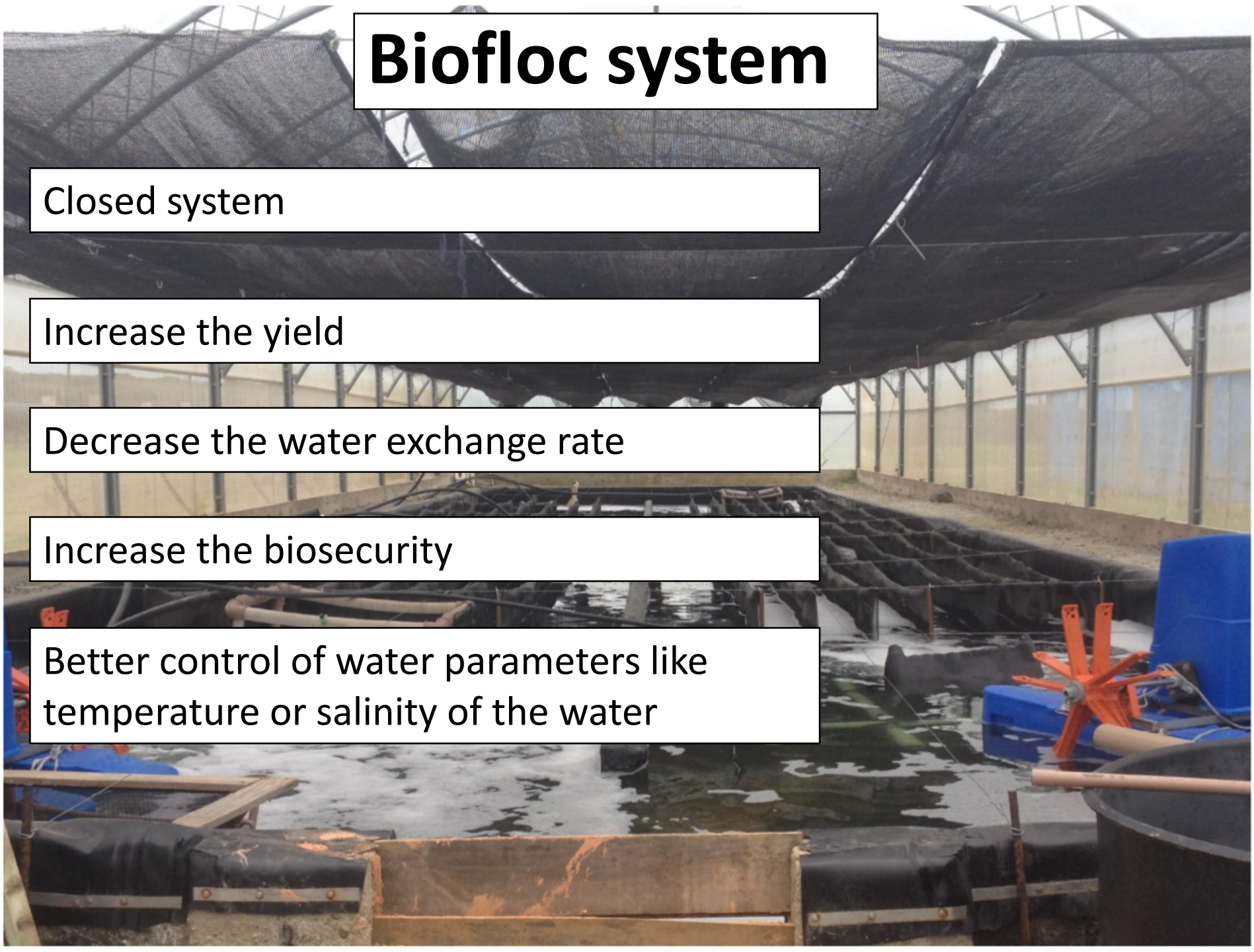
Larval shrimp stages

Nauplius: no external feeding

Protozoea: microalgae (diatoms) as primary source of feeding

Mysis: Zooplankton as primary source of feeding

Post larvae: Detritivorous animal



Biofloc system

Closed system

Increase the yield

Decrease the water exchange rate

Increase the biosecurity

Better control of water parameters like temperature or salinity of the water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Objective

The objective of this work was to assess the hatchery performance of white leg shrimp (*Litopenaeus vannamei*), between mysis 1 and post-larval 5 stages, using a zero exchange biofloc system.

Material and methods

We used 16 tanks (92x68x25cm) with volume of 60 L

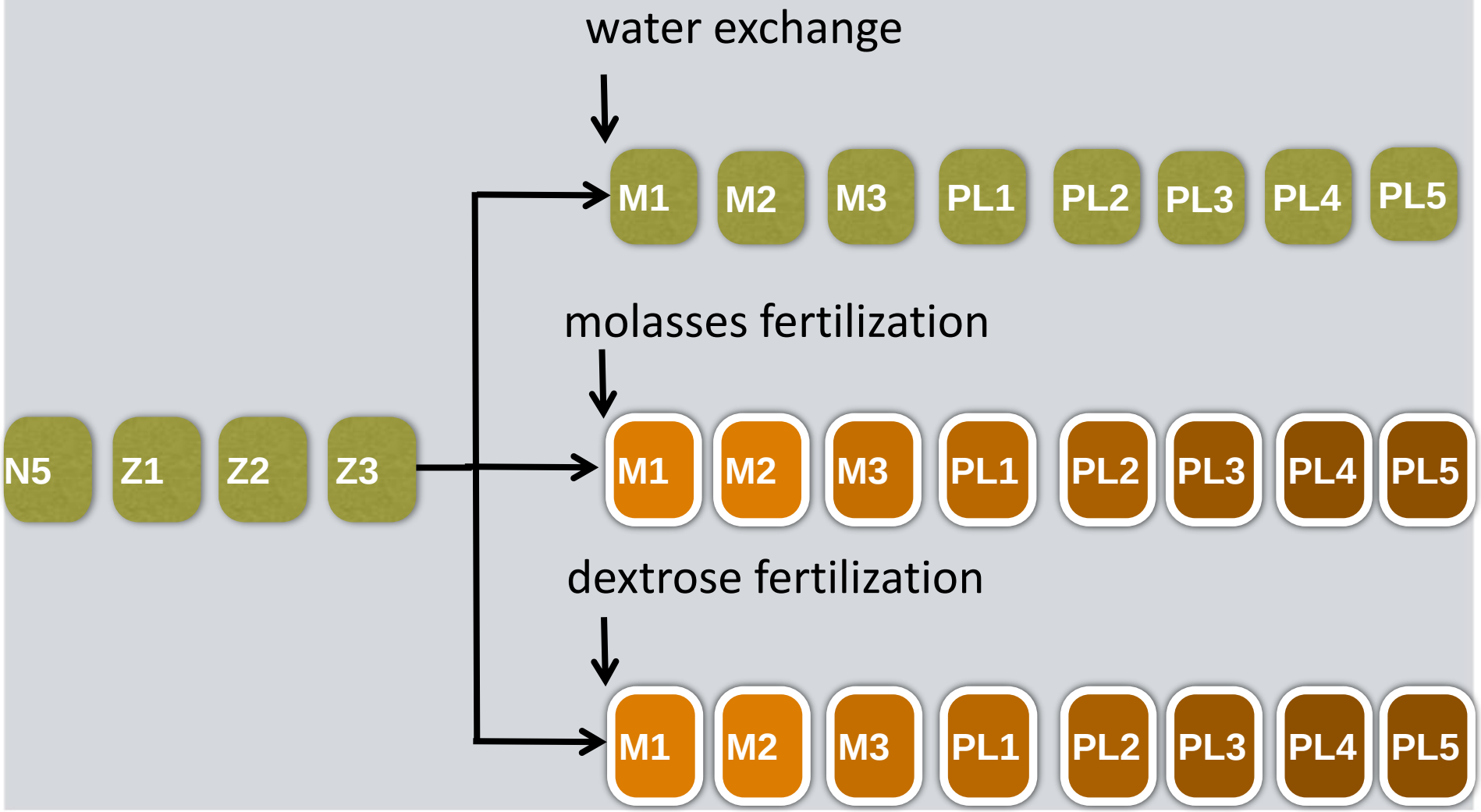
Each tank had: linear aeration (O_2>4.5 mg L^{-1}) and heaters (29,5±0,5 °C)

Stoking: 12,000 mysis 1 (200 larvae L^{-1}), SPF from Aquatec Aquacultura

Feeding: 8 x per day, with the adequate feed for each larval stage (Inve diet)

Three treatments: molasses, dextrose and control

Material and methods



Material and methods

Anhydrous dextrose ($C_6H_{12}O_6$, Sigma-Aldrich®), 100% carbohydrate

Molasses (Indumel®), 55% of carbohydrate

- Divided in 3x per day
- Maintain ammonia levels <1 $mg \cdot L^{-1}$,
- Considering that 20 g of carbohydrate are required to convert 1 g of ammonia nitrogen into bacterial biomass (Avnimelech, 1999)

Material and methods

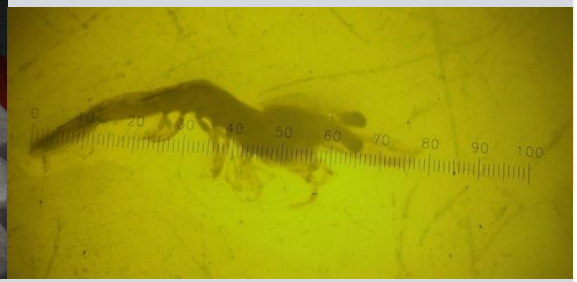
Evaluations:

Water quality:

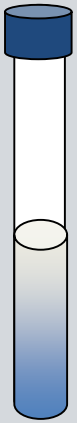
- Dissolved oxygen, temperature, pH - twice a day.
- Salinity, alkalinity, nitrite, nitrate and total ammonia – daily
- Total suspended solids (TSS) - every other day

Shrimp performance:

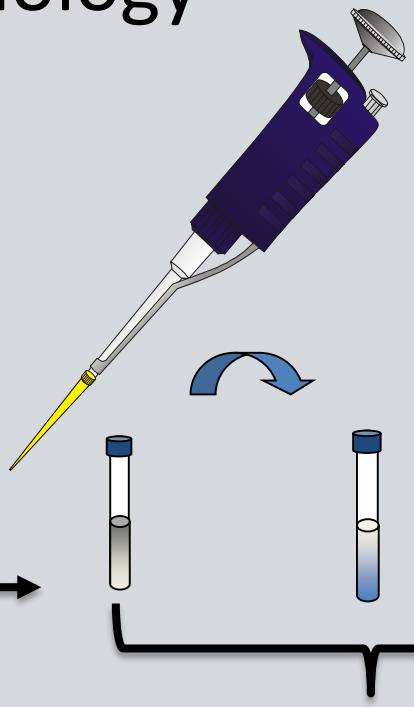
- Survival.
- Final weight and length.



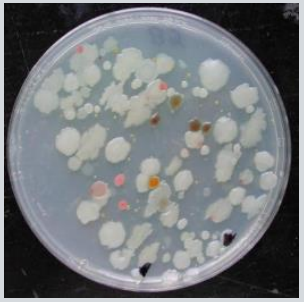
Water microbiology



Water sample



TCBS



Marine Agar

Material and methods

Salinity stress test

100 pls 5

Salinity 19 ppt (30 min)

Salinity 35ppt (30 min)

Material and methods

Water consumption

Water consumption (L per thousand of PL) = Water used in liters (initial water + water used in water exchange or to replenish evaporation losses) / Number of thousands of PLs produced

Results

Water Quality

Parameter	Control	Dextrose	Molasses	p
Temperature (°C)	30.20±0.47[a*]	30.45±0.26[a]	30.28±0.21[a]	0.58
Oxygen ($mg \cdot L^{-1}$)	5.18±0.05 [a]	4.88±0.10 [b]	4.84±0.13 [b]	0.0015
pH	8.00±0.02 [a]	7.80±0.04 [b]	7.90±0.03 [c]	0.0001
Salinity ($g \cdot L^{-1}$)	35.50±0.03[a]	35.43±0.09[a]	35.41±0.21[a]	0.64
NH_4^+/NH_3-N ($mg \cdot L^{-1}$)	1.02±0.29 [a]	1.21±0.66 [a]	0.44±0.29[b]	0.0186
NH_3-N ($mg \cdot L^{-1}$)	0.05±0.09 [a]	0.02±0.11[a]	0.01±0.05 [b]	0.0276
NO_2^--N ($mg \cdot L^{-1}$)	0.02±0.012 [a]	0.01±0.01[a]	0.01±0.01[a]	0.0742
NO_3-N ($mg \cdot L^{-1}$)	1.74±0.63[a]	1.58±0.69[a]	3.18±1.30[a]	0.1434
PO_4^{3-}($mg \cdot L^{-1}$)	0.11±0.72[a]	0.15±0.31[a]	1.28±0.33[b]	0.0463
Alkalinity	129.3±10.12[a]	134.3±12.77[a]	156.70±39.31[a]	0.4049
SST	259.8±8.88[a]	281.3±5.29[a]	278.30±11.39[a]	0.051
Total heterotrophic bacteria (Log CFU mL^{-1})	4.446 ± 0.3034[a]	6.859 ± 1.254 [b]	5.828± 0.5863[b]	0.0077
Total *Vibrio*spp. (Log CFU mL^{-1})	1.500 ±1.000 [a]	3.406±1.851[a]	2.771±2.074[a]	0.3205

Results

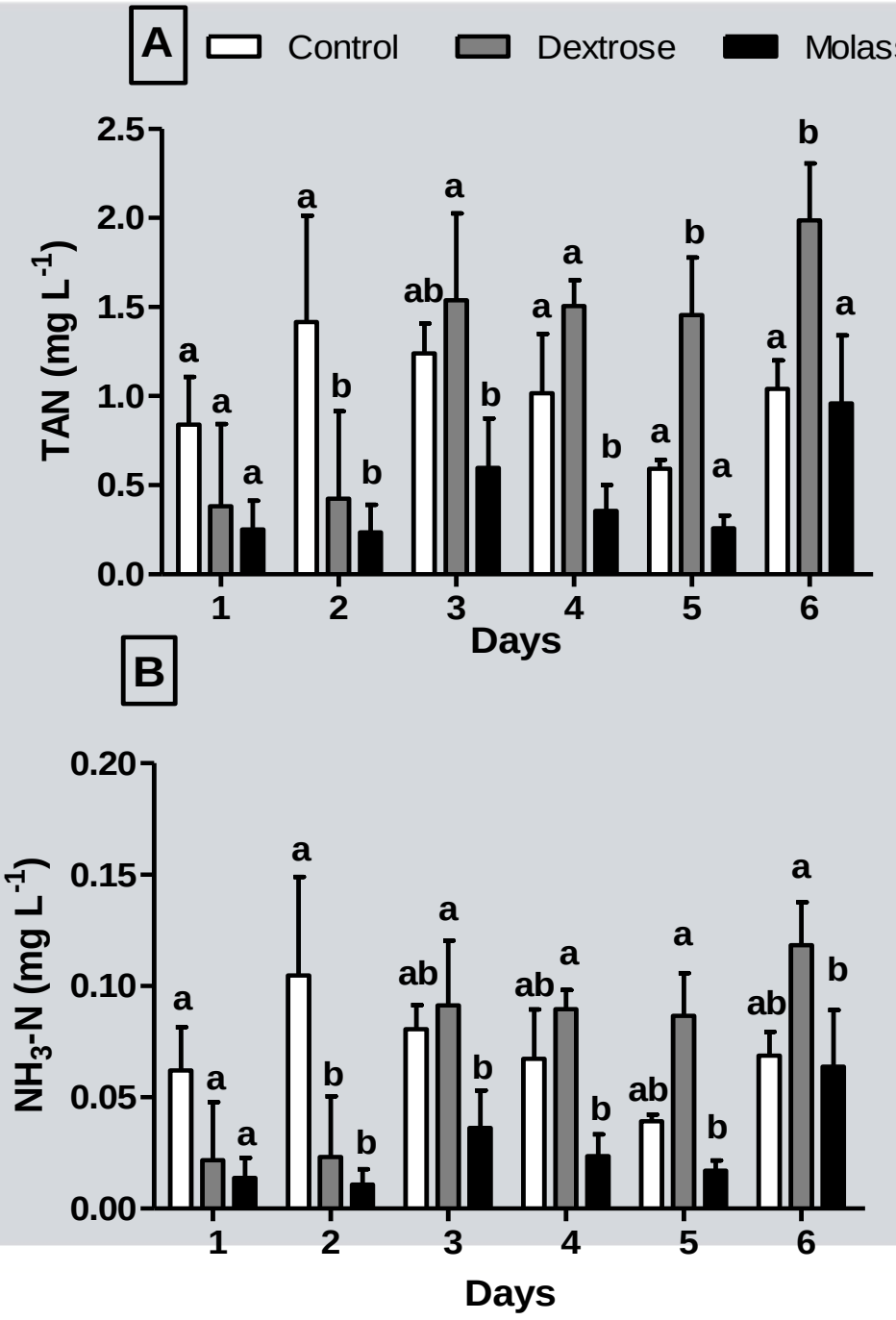
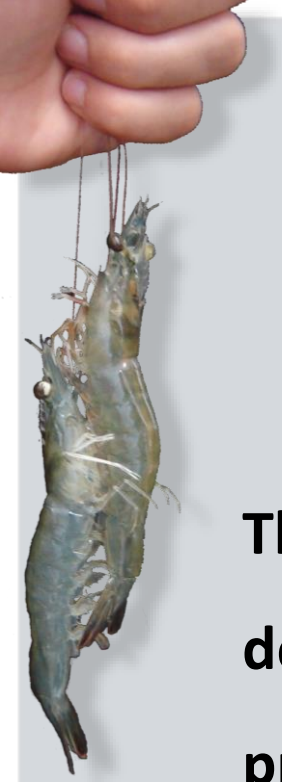


Figure 1. Daily mean total (A) and free ammonia (B) in Pacific white shrimp (*Litopenaeus vannamei*) hatcheries between the mysis 1 and postlarva 5 phases. Different letters on the same day indicate significant differences, as indicated by Tukey's test of mean separation ($p<0.05$).

Results

Hatchery performance

Parameter	Control	Dextrose	Molasses	p
Survival (%)	$90.5 \pm 5.4^{a*}$	90.2 ± 10.5^{a}	85.1 ± 11.1^{a}	0.7058
Stress survival (%)	97.4 ± 2.0^{a}	95.3 ± 3.2^{a}	93.6 ± 6.1^{a}	0.4731
Final length(mm)	6.1 ± 0.2^{a}	6.1 ± 0.1^{a}	6.2 ± 0.2^{a}	0.5093
Final Weight (mg)	0.15 ± 0.1^{a}	0.197 ± 0.06^{a}	0.178 ± 0.01^{a}	0.3206
Water consumption (L per thousand post-larvae 5)	56.22 ± 3.31^{a}	6.49 ± 0.79^{b}	6.89 ± 0.95^{b}	<0.0001



Conclusion

The use of a biofloc system without water exchange, using dextrose and molasses as the carbon source, maintains the production rates in the *L. vannamei* hatchery and decrease water use.

Acknowledgments

FINEP

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Thanks