INFLUENCE OF AMMONIA ADDITION ON THE DEVELOPMENT OF MICROBIAL FLOCS ON *Litopenaeus vannamei* BFT NURSERY PHASE

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MARINE STATION AQUACULTURE

BFT SYSTEM

NURSERY PHASE

INTRODUCTION

- ✓ **Nurseries have been used as a biosecurity measure to mitigate losses caused by diseases**
- ✓ **The integration of an intermediate nursery phase has also been found to improve efficiency of the BFT system**

BIOFLOC FORMATION

INTRODUCTION

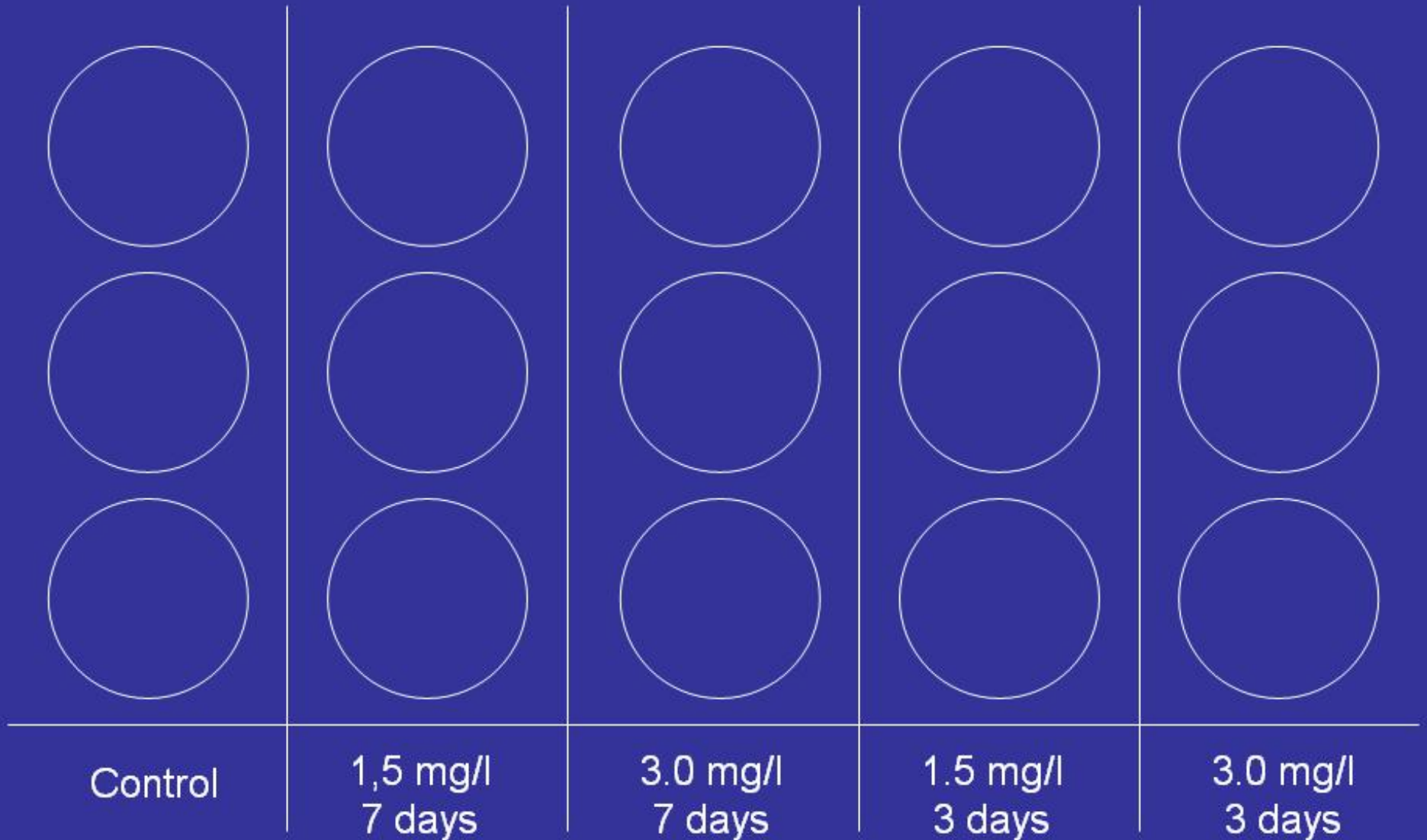
- ✓ There is a gap between the beginning of shrimp production and biofloc formation.
- ✓ The early biofloc formation can improved growth rates and survival.

OBJETIVE

The present study aimed to evaluate the influence of the addition of ammonia to accelerate the biofloc formation in *Litopenaeus vannamei* BFT nursery phase

PRELIMINARY TEST

- ✓ **Location of Study:**
- ✓ Marine Station of Aquaculture
- ✓ Institute of Oceanography, Federal University of Rio Grande, RS, Brazil


Control
1,5 mg/l
7 days
3.0 mg/l
7 days
1.5 mg/l
3 days
3.0 mg/l
3 days

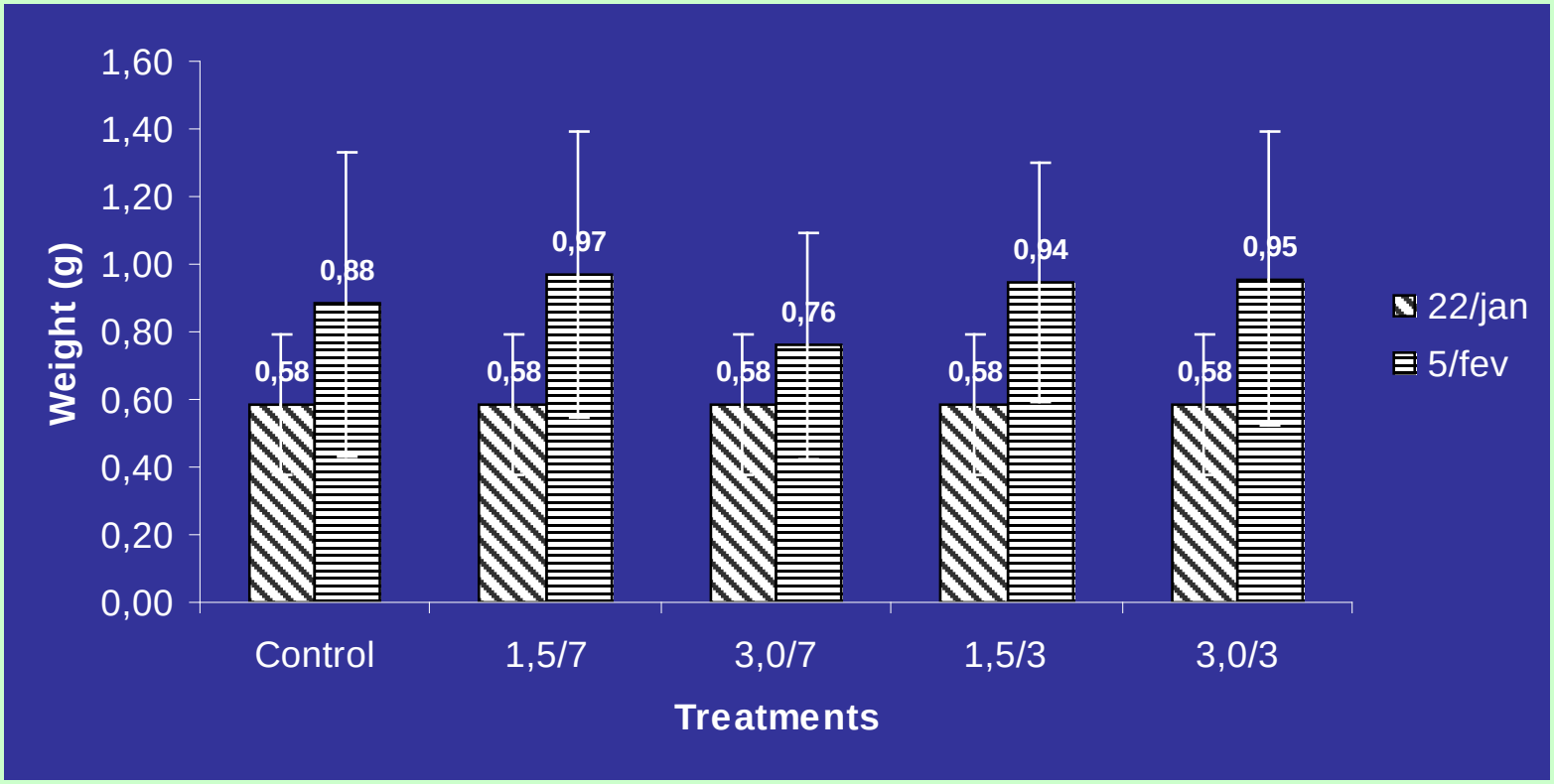
METHODS

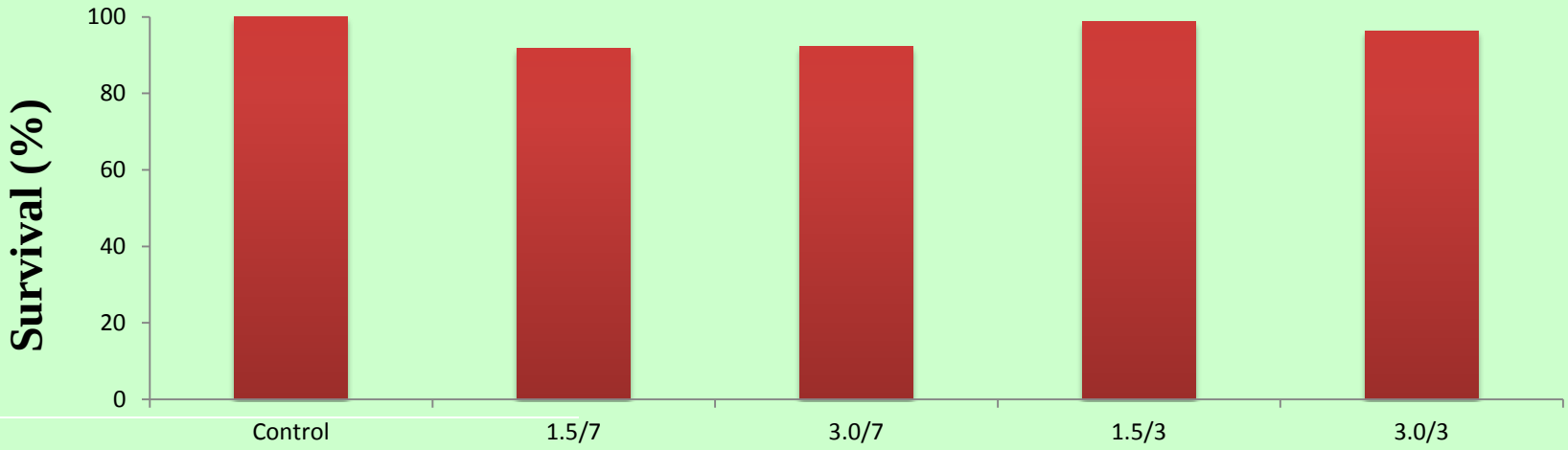
- ✓Ammonium chloride was added in two different concentrations (1.5 and 3.0 mg/l) and two different frequencies (3 and 7 days).
- ✓Ammonia was measured daily and completed according to each treatment.
- ✓Molasses was added in a rate of 6/1 (Avnimelech, 1999 and Ebeling et al. 2006)

RESULTS

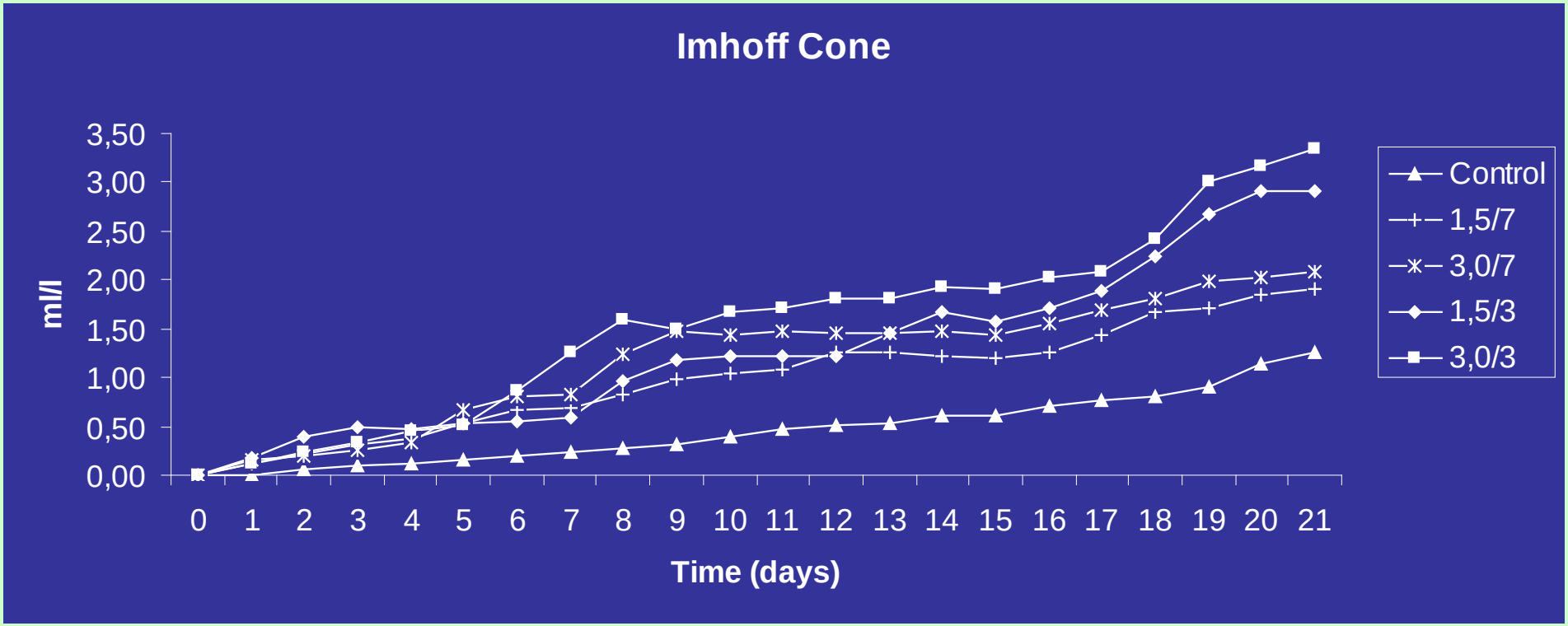
	Control	1.5/7	3.0/7	1.5/3	3.0/3
Temperature (AM)	21.9 ± 1.05	22.0 ± 0.90	20.0 ± 0.92	22.1 ± 1.05	22.2 ± 1.02
Temperature (PM)	29.2 ± 2.50	29.3 ± 2.68	28.6 ± 4.19	29.1 ± 2.54	29.7 ± 2.73
D.O. (AM)	5.9 ± 0.27	5.9 ± 0.32	5.9 ± 0.29	5.9 ± 0.33	5.9 ± 0.33
D.O. (PM)	5.5 ± 0.24	5.4 ± 0.25	5.2 ± 0.54	5.4 ± 0.25	5.3 ± 0.26
pH (AM)	8.25 ± 0.09	8.18 ± 0.10	8.14 ± 0.13	8.16 ± 0.11	8.11 ± 0.13
pH (PM)	8.51 ± 0.33	8.42 ± 0.38	8.06 ± 0.80	8.39 ± 0.32	8.26 ± 0.30
Salinity	31.1 ± 1.10	31.1 ± 1.14	32.9 ± 1.23	33.3 ± 0.89	33.3 ± 1.00
Survival	100%	91,74%	92,27%	98,78%	96,33%

Table 1: Mean ± Standart Deviation. Data obtained twice a day, during the Morning (AM) and Afternoon (PM)


1,60
1,40
1,20
1,00
0,80
0,60
0,40
0,20
0,00
Weight (g)
0,58
0,88
0,58
0,97
0,58
0,76
0,58
0,94
0,58
0,95
22/jan
5/fev
Control
1,5/7
3,0/7
1,5/3
3,0/3
Treatments


Survival (%)
100
80
60
40
20
0
Control
1.5/7
3.0/7
1.5/3
3.0/3

RESULTS


Imhoff Cone
ml/l
3,50
3,00
2,50
2,00
1,50
1,00
0,50
0,00
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
Time (days)
Control
1,5/7
3,0/7
1,5/3
3,0/3

CONCLUSION

- ✓ The addition of ammonia in the early stages of the culture improved the biofloc formation.
- ✓ The tested ammonia concentration did not affect *L. vannamei* growth and survival.

STUDY

METHODS

Greenhouse

- ✓ 9 Raceways 35 m^2
- ✓ 3 treatments - 3 replicates
- ✓ Stocking density: 3000 shrimps.m^{-2}
- ✓ Time: 7 days (pre fertilization)
- ✓ Time: 30 days (nursery period)
- ✓ *L. vannamei* post larvae (0.03 g)

✓ Treatments:

- ✓ T1 - addition of 0.5 mg/L of Ammonium chloride daily;
- ✓ T2 - addition of 3.0 mg/L of Ammonium chloride daily
- ✓ T3 - Control (without addition of Ammonium chloride)

METHODS

PRE-FERTILIZATION

- ✓ The addition of ammonium chloride was performed every day;
- ✓ Keeping the measured concentrations

(0.5 and 3.0 mg/L)

After Stocking

- ✓ Fertilization based on Avnimelech (1999) and Ebeling *et al*. (2006)

METHODS

- ✓ **Feed 40% CP (0.4 - 1.2 mm, Guabi®)**
- ✓ **Feeding rate was based on Jory et al. (2001)**
- ✓ **Belt feeder (12 hours)**
- ✓ **10% of the feed was distributed in circular feeding trays**

METHODS

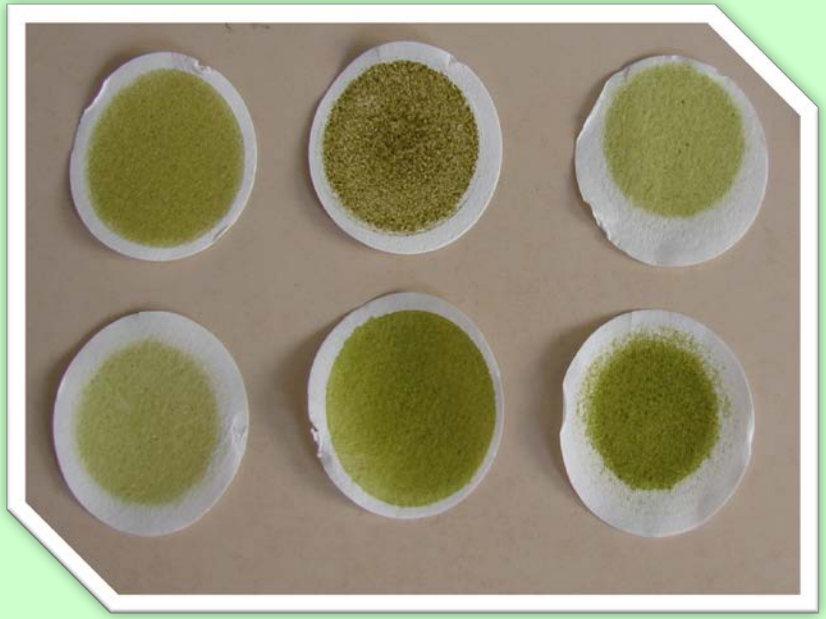
- ✓ pH, temperature, dissolved oxygen and salinity were measured daily

- ✓ Analysis of ammonia, nitrite and nitrate every three days;
- ✓ Shrimps were sampled weekly to check growth;
- ✓ Counting total number of shrimps in the end of the experiment to determine the survival;
- ✓ Results were analyzed by one-way ANOVA ($\alpha=0.05$)

METHODS

Biofloc control:

- ✓ Total Suspended Solids (TSS)
- ✓ Bioflocs volume (Imhoff cones) (Three times / week)



METHODS

ARTIFICIAL SUBSTRATE:

- ✓ 200% of surface area

METHODS

To control

INLET OUTLET

METHODS

MULTI-STRAIN COMMERCIAL PROBIOTIC

Water

- ✓ 0.5 ppm /week
- ✓ Distribute the mixture in several locations around the tank.

Feed

- ✓ 3 g/kg diet
- ✓ Mix with the feed and let dry
- ✓ Feed was distributed in several locations around the tank.

RESULTS

WATER QUALITY PARAMETERS

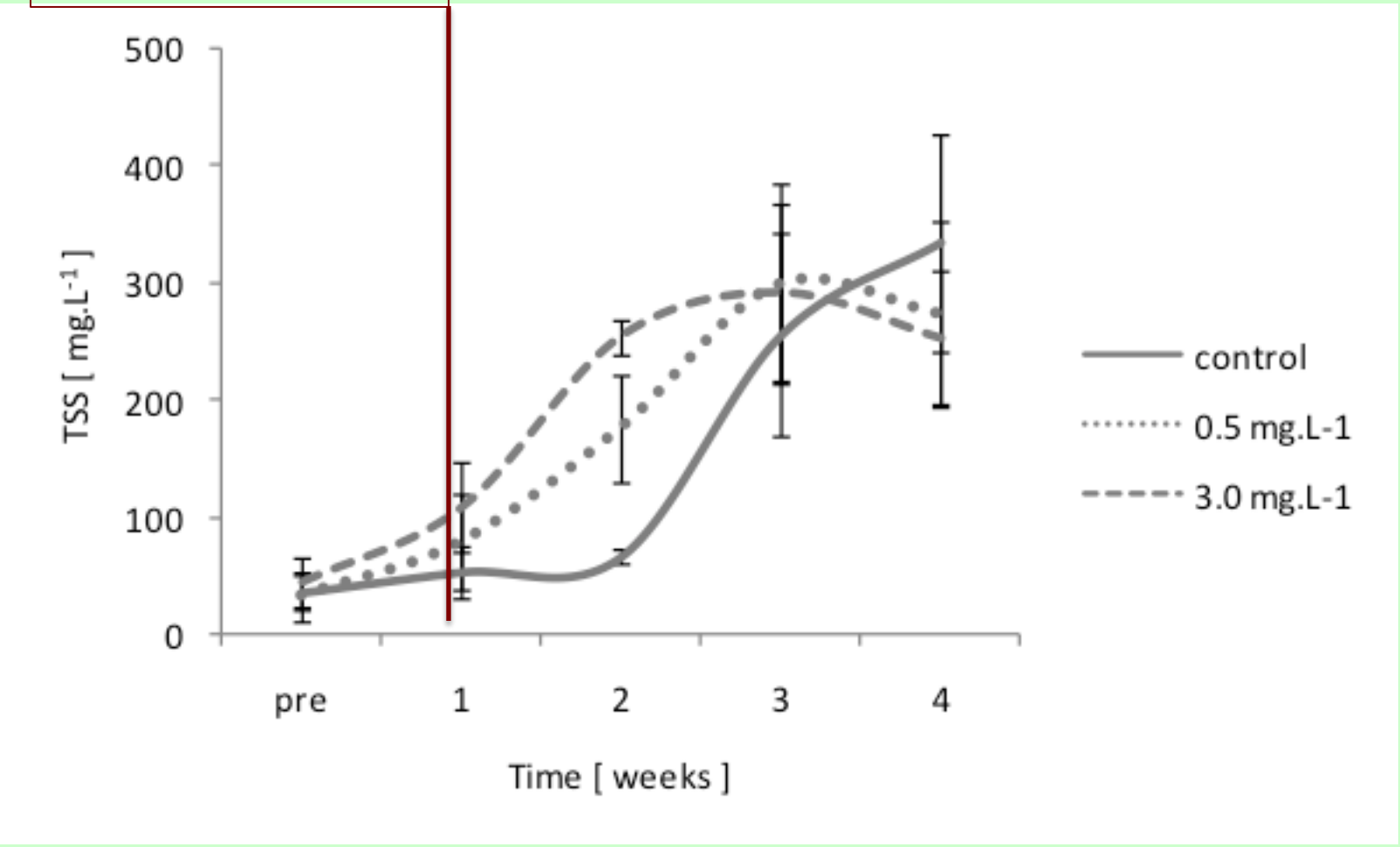
Parameters	Control	0.5 mg NH_4	3.0 mg NH_4
Temperature (°C)	26. 92± 1.46	26.90 ± 1.45	26.63 ± 1.49
DO ($mg.L^{-1}$)	5.63 ± 0.75	5.86 ± 0.71	5.81 ± 0.72
pH	7.87 ± 0.16	7.95 ± 0.17	7.91 ± 0.17
Salinity	18.56 ± 1.04	18.94 ± 0.9	19.09 ± 0.68
TSS ($mg.L^{-1}$)	149.33 ± 44.93	172.80 ± 54.29	190.67 ± 42.04
Turbidity (NTU)	83.65 ± 41.96	83.52 ± 15.91	79.16 ± 24.48
Alkalinity (mg $CaCO3.L^{-1}$)	260.61 ± 18.30	268.4 ± 12.38	261.22 ± 15.23

- ✓ **No significant differences between treatments**
- ✓ **Remains in optimal range for *L. vannamei***

RESULTS

BIOFLOC DEVELOPMENT

Pre-fertilization



✓ **Better formation in 0.5 and 3.0 mg L $^{-1}$**

RESULTS

WATER QUALITY PARAMETERS

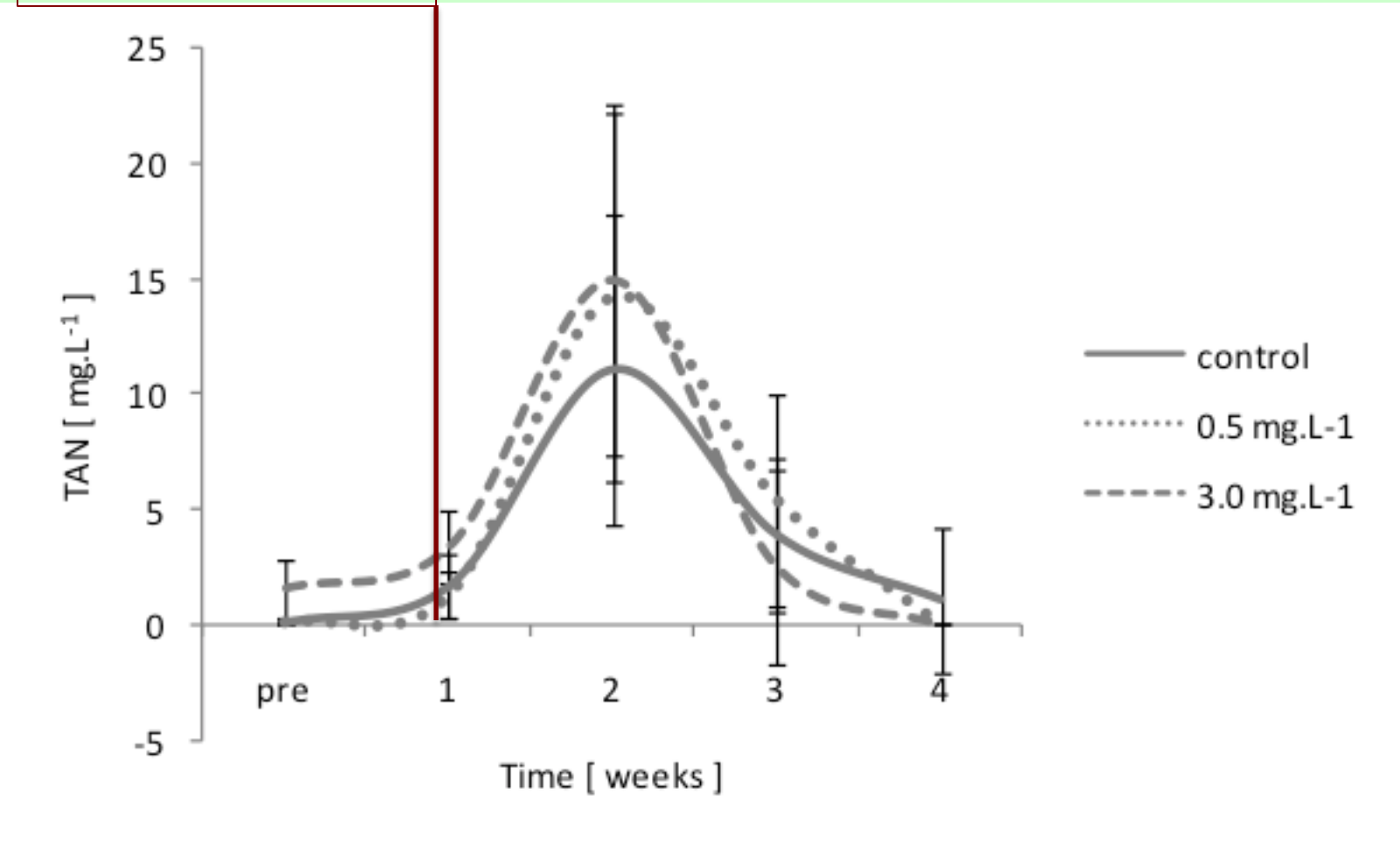
Parameters	Control	0.5 mg NH_4	3.0 mg NH_4
TAN ($mg.L^{-1}$)	3.54 ± 2.93	4.20 ± 2.74	4.49 ± 2.93
Nitrite ($mg.L^{-1}$)	3.54 ± 1.53	4.36 ± 1.67	5.42 ± 1.81
Nitrate ($mg.L^{-1}$)	4.19 ± 0.82	4.06 ± 0.82	4.25 ± 0.85
Phosphate ($mg.L^{-1}$)	0.23 ± 0.17	0.21 ± 0.17	0.22 ± 0.15

✓ **No significant differences between treatments**

RESULTS

WATER QUALITY PARAMETERS

Pre-fertilization

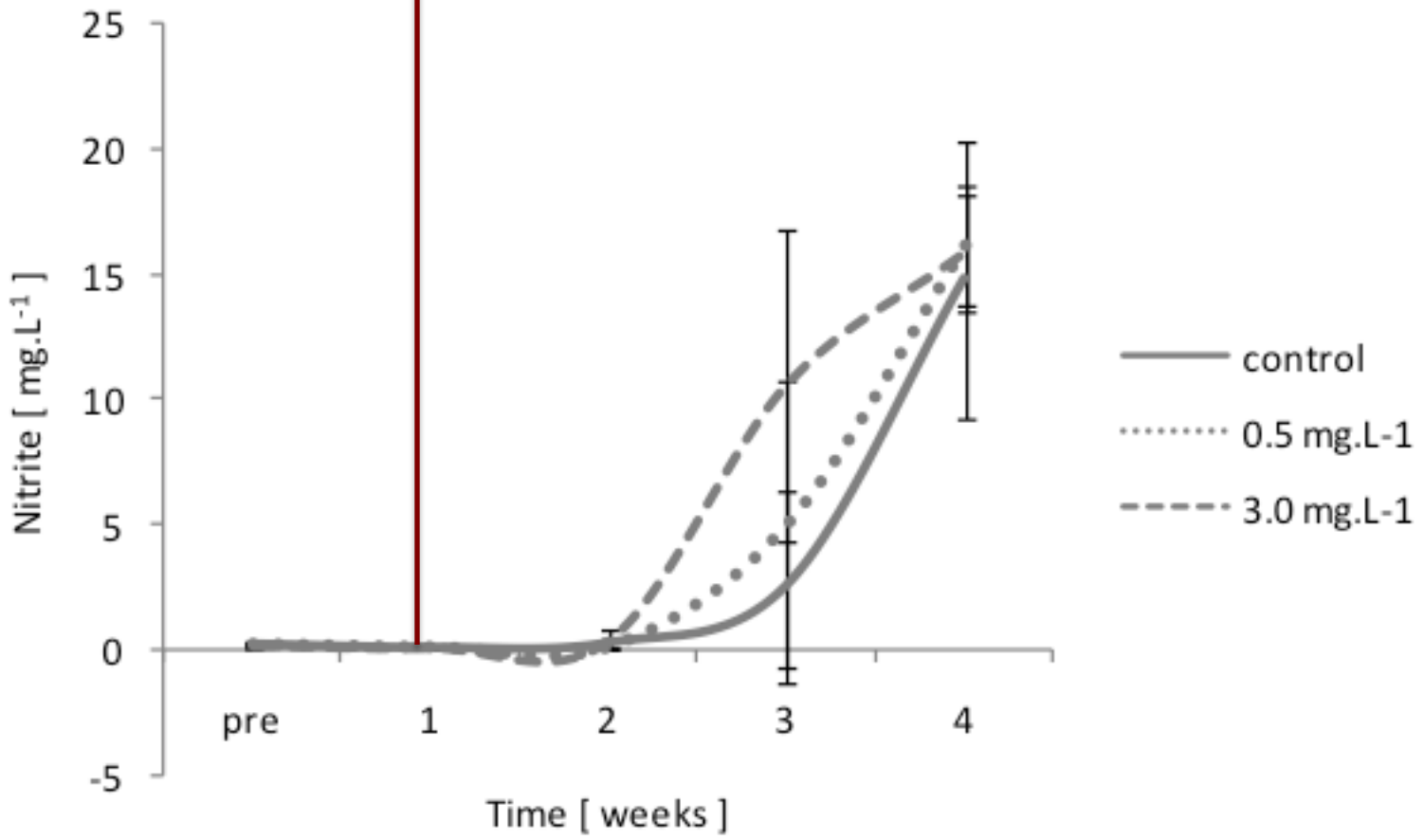


✓ **Higher values in 0.5 and 3.0 mg L $^{-1}$**

RESULTS

WATER QUALITY PARAMETERS

Pre-fertilization



✓ Higher values in 0.5 and 3.0 mg L^{-1}

RESULTS

ZOOTECHNICAL PARAMETERS

Parameters	Control	0.5 mg NH_4	3.0 mg NH_4
Initial Weight (g)	0.022 ± 0.017	0.022 ± 0.017	0.022 ± 0.017
Final Weight (g)	0.793 ± 0.301	0.507 ± 0.207	0.468 ± 0.218
Survival (%)	50.63 ± 19.83	77.03 ± 13.41	71.92 ± 2.44
SGR (%)	11.79 ± 1.23	10.41 ± 0.68	10.19 ± 0.20
FCR	1.83 ± 0.43	1.61 ± 0.36	1.78 ± 0.29
Final Biomass (kg)	35.68 ± 8.29	39.46 ± 8.53	35.08 ± 4.97
Prod ($kg.m^{-2}$)	1.13 ± 0.26	1.25 ± 0.27	1.11 ± 0.16

- ✓ **No significant differences between treatments in growth parameters.**

RESULTS

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✓ **Resulting in similar productivity**


RTLEV
1000 L

CONCLUSION

- ✓ The addition of ammonia in the early stages of the culture improved the biofloc formation.
- ✓ The addition of ammonia did not affect the zootechnical parameters.
- ✓ In the next step it will be tested different pre-fertilization time.

ACKNOWLEDGMENTS

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Thank you!