TILAPIA (*Oreochromis niloticus)* PERFORMANCE IN CLEAR-WATER RAS, BIOFLOC, AND HYBRID NURSERY SYSTEMS

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Recirculating Systems

-Lower water use/waste discharge
-Improved biosecurity/escape risk
-Temperature control
-Indoor, year-round production
-Higher animal density
-Products near consumer markets
-Product consistency

Recirculating Systems

Clearwater (CW)

-Stringent solids removal
-External biological filtration
-UV filters
-Filtration systems can be expensive

Biofloc (BF)

-Limit/control solids removal
-Allow biofloc to form in water
-Biofloc particles provide internal biofiltration
-Particles can also be a food source
-Nitrification can be unstable
-Increased aeration for mixing

Hybrid (HY)

-Combine benefits of CW systems and BF systems
-Limit/control solids removal
-Allow biofloc to form in water
-Use external biofilter to stabilize nitrification

Why Use Nursery Systems?

-Reduced time to market
-High initial stocking density
-Smaller tank sizes, saves space
-Nursery Phase during winter months
    -Growout in spring/summer

Experimental Design

-1300m², Heated/Insulated Building
-3 Treatments
  -Clearwater, Biofloc, Hybrid
  -4 Replicate, 180L Tanks
  -Tanks previously cycled
  -55 tilapia fry per tank
  -306 fish/m³
  -.17g average weight
  -63 day trial

CW Treatment

-Settling chamber
-Foam fractionator
-External MBBR
  (Moving Bed Bio Reactor)

BF Treatment

-Settling chamber

HY Treatment

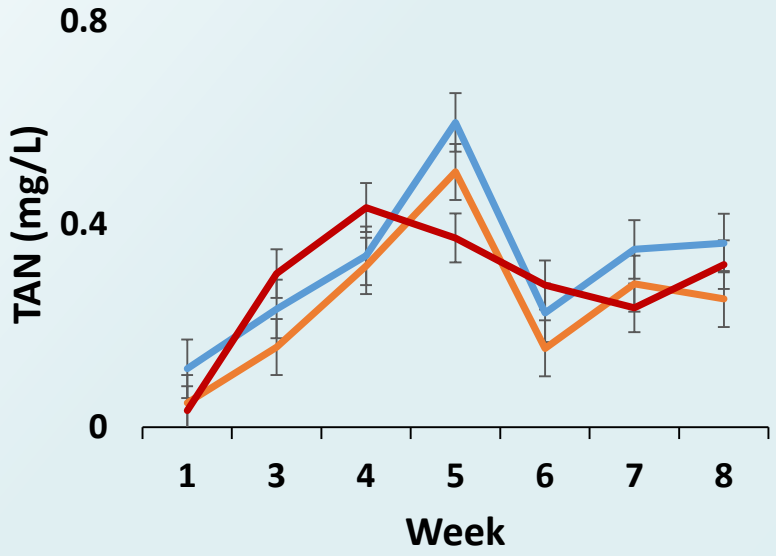
-Settling chamber
-External MBBR

Experimental Design

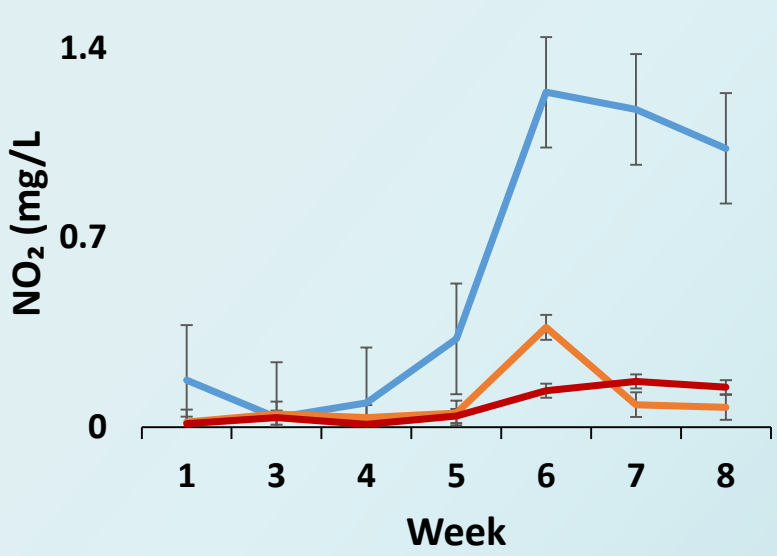
-Tilapia fed 3 times daily
-Tank parameters measured twice daily
    -Temperature, pH, dissolved oxygen, salinity
-Water quality measured once every week
    -Total Ammonia Nitrogen, Nitrite, Nitrate, Total Suspended Solids, Volatile Suspended Solids
-Repeated measures ANOVA for water quality data
-One-Way ANOVA for production data
    -Results considered significant when $p<0.05$

Water Quality

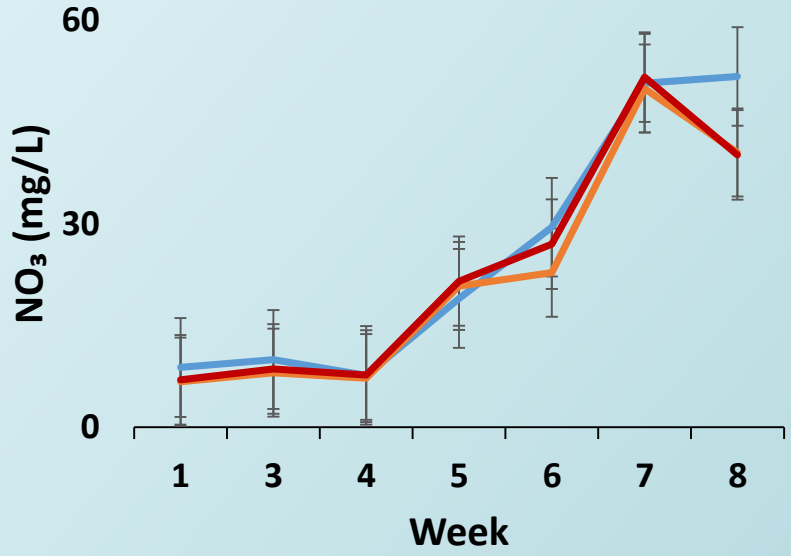
Total Ammonia Nitrogen



Nitrite



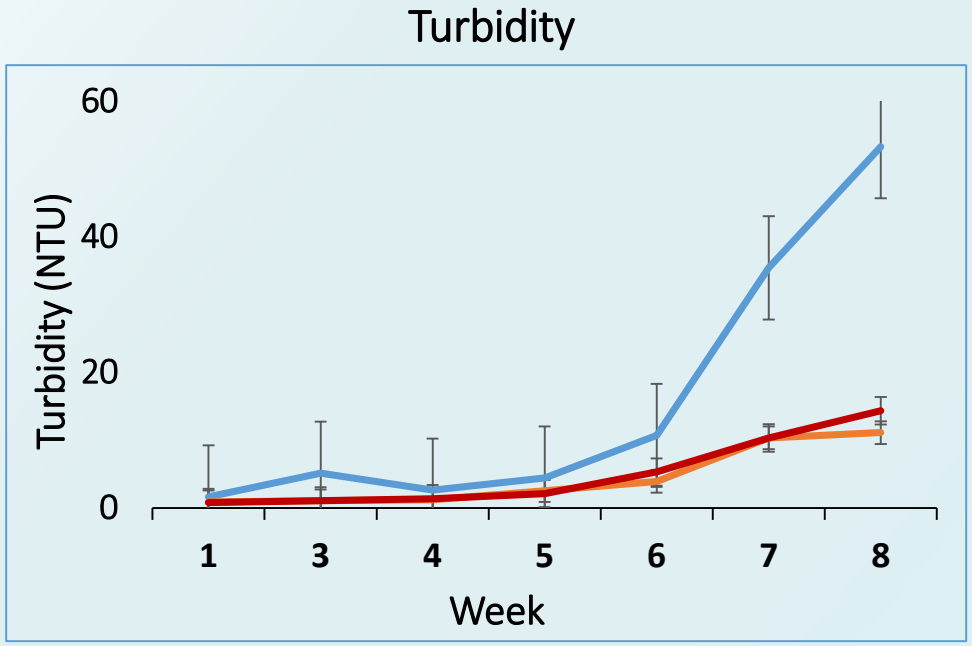
Nitrate

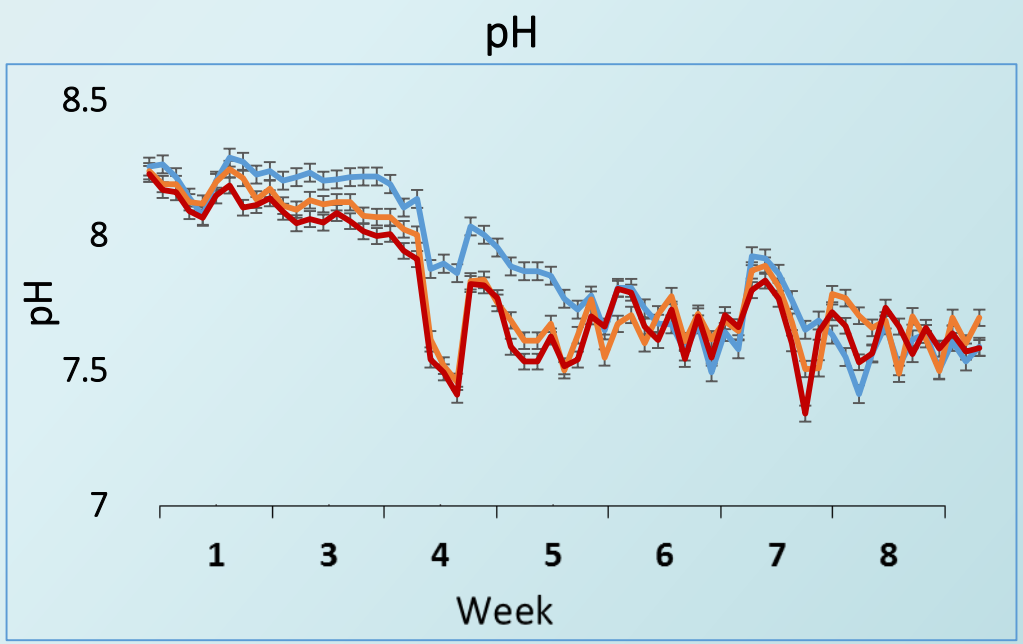


- Significant difference in Nitrite levels
  - Biofloc tanks had higher Nitrite
  - No acute effect, but possible chronic effect
- Hybrid systems had lowest peak Ammonia and Nitrite Levels

Clearwater
Biofloc
Hybrid

Water Quality





Clearwater
Biofloc
Hybrid

-pH significantly higher in BF compared to CW/HY

-Sodium Bicarbonate added when pH <7.5

-HY systems required a significantly higher amount of Sodium Bicarbonate

Production Results

Treatment	Average Wt.(g)	Total Harvest(kg/m^3)	Survival	FCR	SGR(g/day)
CW	11.3 ±0.3	3.5^a ±0.0	95.5 ±2.2	0.8 ±0.0^a	17.7 ±0.0
BF	10.7 ±0.1^a	3.3 ±0.0^b	96.4 ±0.9	0.9 ±0.0^b	16.7 ±0.0^a
HY	11.4 ±0.2^b	3.5 ±0.0^a	95.9 ±1.7	0.8 ±0.0^a	18.0 ±0.0^b

*Superscript denotes a significant difference between treatments

-Significant difference in Average Weight ($p<.05$)
  -Between HY > BF
-Significant differences in Total Harvest
  -Between HY, CW > BF
-No significant difference in survival

Conclusions

-CW and HY Systems outperformed BF Systems in tilapia production/growth

-No Significant differences between CW and HY

-Nitrite issues in BF Systems

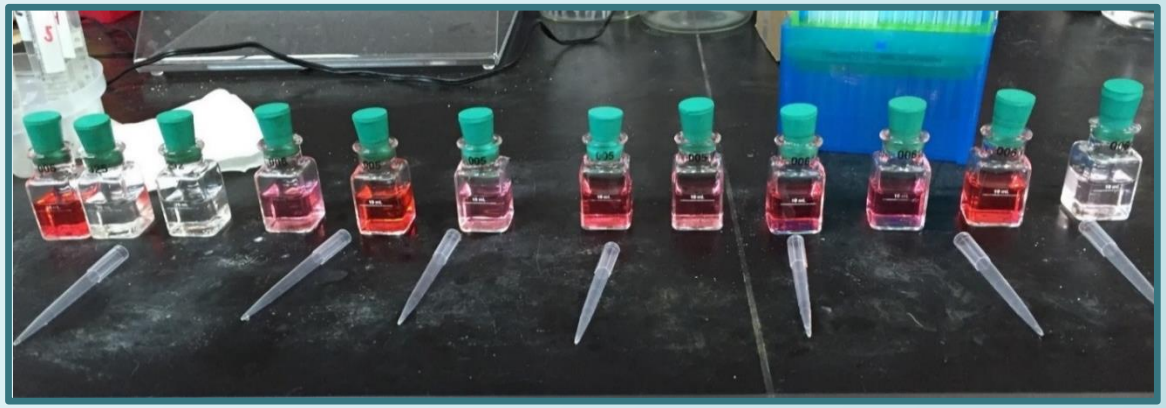
-External biofiltration systems seem to stabilize nitrification cycles

-Less expensive HY Systems could be used to rear tilapia fry

-Future Research

-Growout trials using HY Systems and investigations into long-term effects on water quality

-Examining feed and biofloc intake using stable isotope analysis



Thank You!

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KSU Aquaculture Webpage: http://www.ksuaquaculture.org/