TILAPIA PRODUCTION IN BIOFLOC SYSTEMS

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Tilapia production, a growing industry

Tilapia, an ideal fish for Biofloc Technology

- Grow well in dense cultures
- Resistant
- FILTER FEEDER
- Very few studies as compared with shrimp

Fish Biomass

Normally, 20-30 kg/m2

10 times higher than shrimp BFT ponds!

Implications:

- High Biomass 20-30 kg/m3
- High feeding (ca 500 g feed/m3 per day!)
- Very high microbial activity
- High floc volume (20-50 ml/l).
- Very high natural feed storage.
- High levels of feed residues
- Need to drain out daily (or twice daily) excessive sludge.
- Pond constructed to facilitate sludge draining and perfect mixing.
- High and effective aeration: 10-20 hp/1000 m2 pond

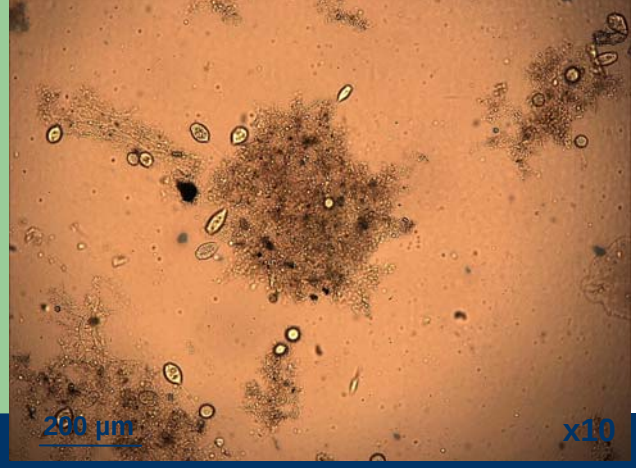
Bioflocs and Floc volume

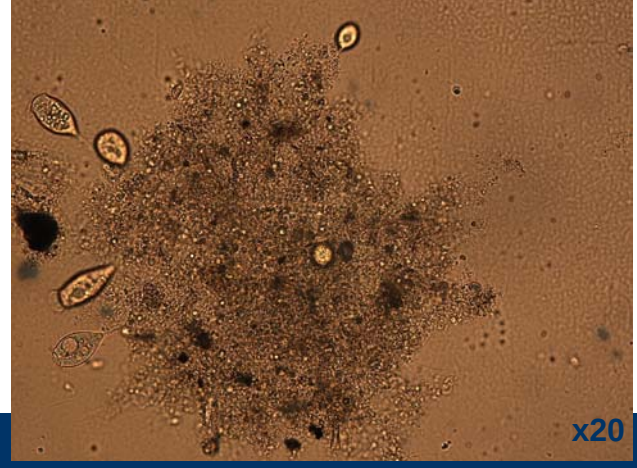
- Bio flocs are made of bacteria, protozoa, feed residues etc.
- Bioflocs size may reach

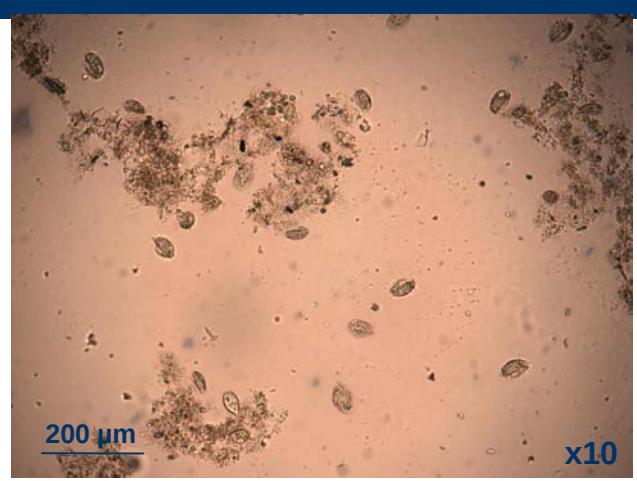
A few mm diameter

- Effectively harvested

by tilapia







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Bio flocs are made of bacteria, protozoa, etc. Typicaly their diameter is 0.1-2 mm.

Protein Recycling

- Normally, fish or shrimp recover just ~25% of feed protein.
- In bacterial controlled ponds, they eat the protein twice; Once in the feed and then they consume microbial protein. The protein recovery reaches **almost 50%.**

- **Protein is the most expensive part of the feed.**

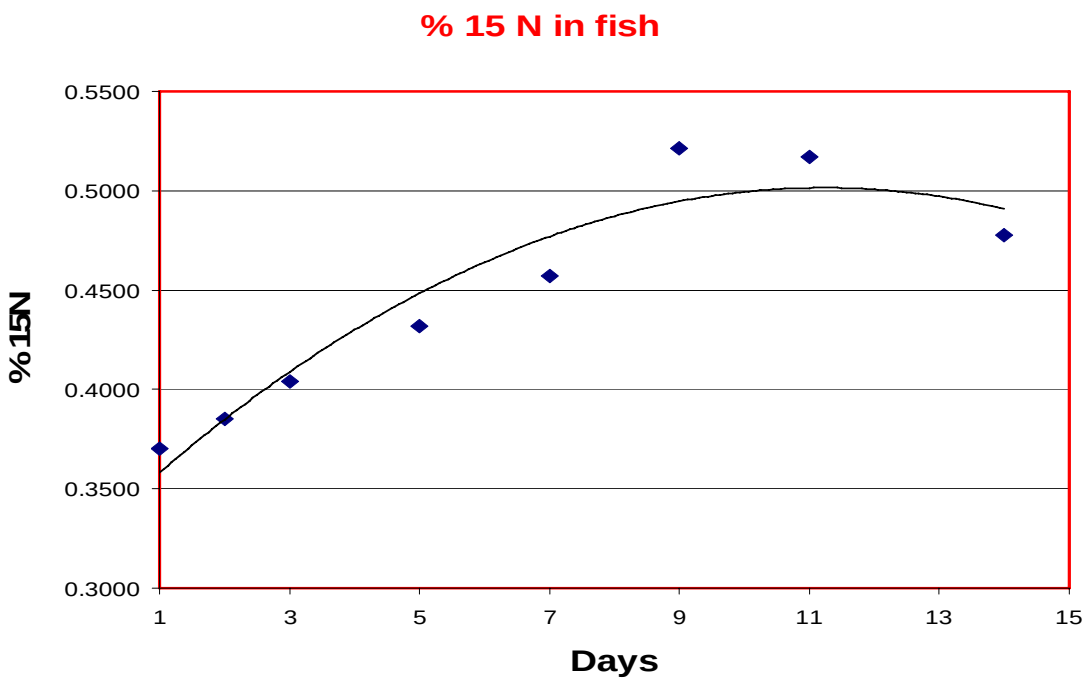
Expt. # 1 51 days	control	***BFT***
FEED C/N	**11.1**	***16.6***
Daily Gain (%)	**1.59[a]**	***2.0[b]***
FCR	**2.62**	***2.17***
PCR	**4.38**	***2.42***
(Kg fish/$US)FEED COST	**0.848**	***0.583***

Exp. # 2 (30 days)		
C/N	**11.1**	***16.6***
Daily gain (%)	**1.63[a]**	***2.22[b]***
FCR	**2.62**	***2.02***
PCR	**4.35**	***2.18***
Feed cost (US$/Kg fish)	**0.848**	***0.543***

Preparing an 15N tagged biofloccs:

- 1. Prepare large enough batch of biofloc suspension (water + feed, mix & aerate).
- 2. Add ^{15}N salt.
- 3. Add starch, at a C/N ratio of > 15
- 4. After a few hours, practically all ^{15}N is in the biofloccs.

Results 1: % ^{15}N in fish



Residence time of bioflocs

- Bioflocs were taken up by fish and degraded biologically. Yet, the amount of bioflocs stayed almost constant. This implies that new flocs are constantly produced (using the excreted N).
- The residence time of bioflocs was calculated to be around 8 hours. The flocs seem to be a very dynamic system.
- most cells in the flocs are young and active.

Data on feed protein utilization

- Conventional fish, shrimp ponds 20-25%
- BFT Tilapia ponds (Avnimelech) 45%
- BFT Shrimp ponds (McIntosh) 45%
- Closed shrimp tanks (Velasco) 63%

- BFT shrimp ponds, ^{15}N study 18-29% of total N consumption (Michele Burford et al.)

* Tilapia, ^{15}N Study, flocs supplied about 50% of fish protein requirement. (Avnimelech).

Feed Utilization

- Fish or shrimp growing in BFT systems eat the pellets when applied, but eat bioflocs all the time.
- Confirmed in a work done by Albert Tacon with shrimp.
- Observations with tilapia.
- Effects on lowering of FCR in tilapia production

Fresh results from the field:

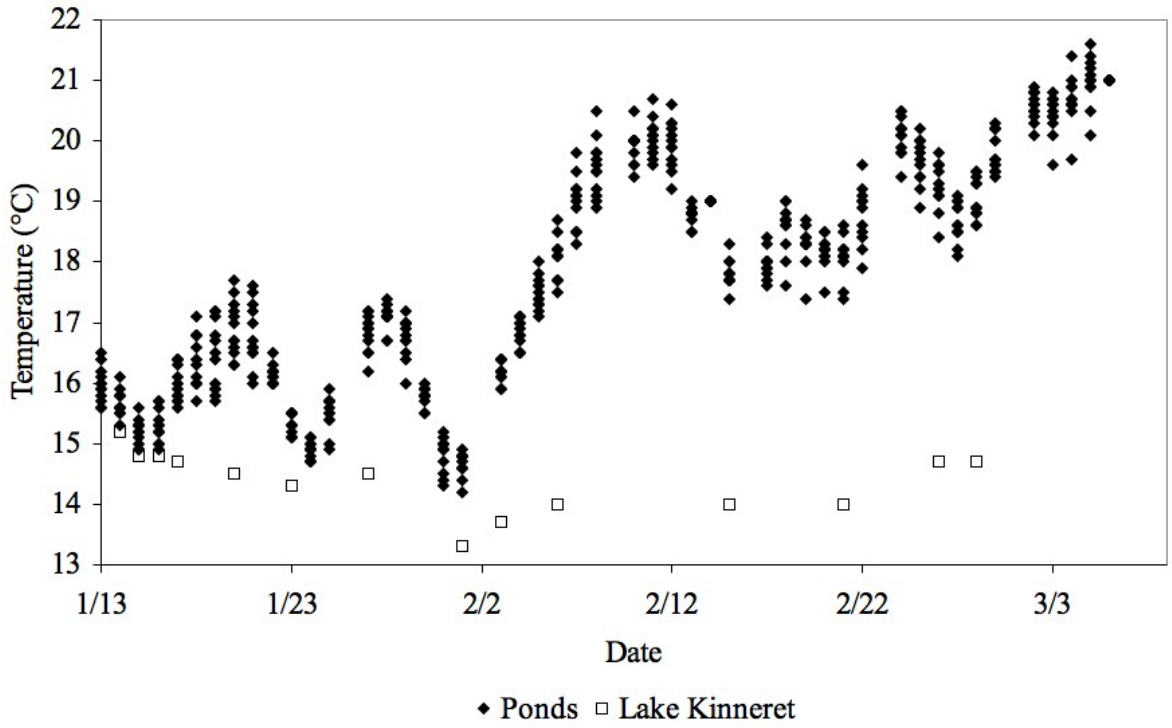
- Tilapia fingerlings (120 g) stocked to over-wintering facility on January 4, 2011.
- Feeding ~ 1% BW
- On February 18, they weighed 171 g
- Daily growth of 1.16 g/fish
- **FCR = 0.5**

OVER-WINTERING

Results

Dissolved oxygen: 9 – 10 mg O_2/L –

Average temperature: 18 ± 2°C –



EFFECT OF WATER EXCHANGE RATE ON PRIMARY AND SECONDARY INFECTION OF FISH BY STREPTOCOCCUS

a)Injected fish

Treatment	*Dead fish*	*Sick fish*	*Total infected*
Control	*9 (9)*	*2 (2)*	*11*
BFT	*12 (3)*	*4 (2)*	*16*

a)Non-injected fish

Control	*7 (5)*	*4 (1.5)*	***11 (4.7)***
BFT	*1.8 (1.7)*	*1.3 (1.0)*	***3 (1.4)***

- ***High water exchange = 0.5l/min per kg fish (700% per day)***
- ***BFT< Limited water exchange = 10% per day***

Conclusions

- Biofloc technology is especially adapted to raise tilapia production up to 20-30 kg/m2.
- This can be done using not too expensive system.
- BFT enables feed recycling, high feed quality and reduced expenses.
- BFT reduces disease.
- The system is friendly and forgiving.
- More research is needed

Thank You

Yoram

Y. Avnimelech Biofloc Technology A Practical Guide Book THE WORLD AQUACULTURE SOCIETY

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Published by

WORLD AQUACULTURE SOCIETY

Technion
Israel Institute of Technology