APPLICATION OF BIOFLOC TECHNOLOGY IN INTENSIVE CULTURE OF NILE TILAPIA IN VIETNAM

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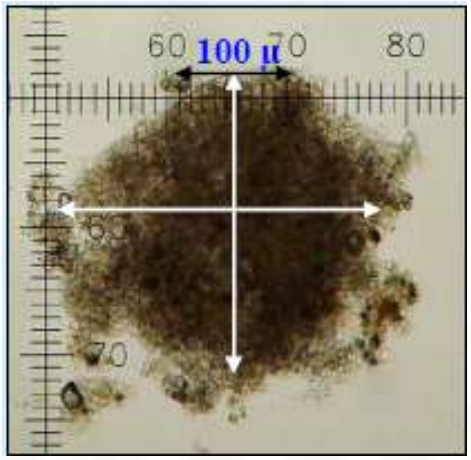
INTRODUCTION

- **Biofloc** refers to suspended particles of floc biomass in the water column, including algae, protozoan, bacteria grouped together by biological adhesive, Poly-Hydroxy Alkanoate (PHA).
- Approach was to get a balance between a microalgae and a strong heterotrophic bacterial population in the water column
- **Biofloc** is rich nutrient natural food source for fish, CP from 24.6 - 40.6%.



ADVANTAGES OF BIOFLOC TECHNOLOGY

- **Reduce waste**
- **Improve Feed Conversion Rate (FCR)**
- **Increase feed protein efficiency to 45-50%**
- **Improve biosecurity because of reduce risk from fish diseases**
- **Use less water supply**

TILAPIA

- **Tilapia is the second most important freshwater fish after carps.**
- **Tilapia is omnivorous fish, capable to feed suspended biofloc biomass, detritus and commercial feeds.**
- **Tilapia adapt to super intensive culture system.**

Why select molasses as carbon source

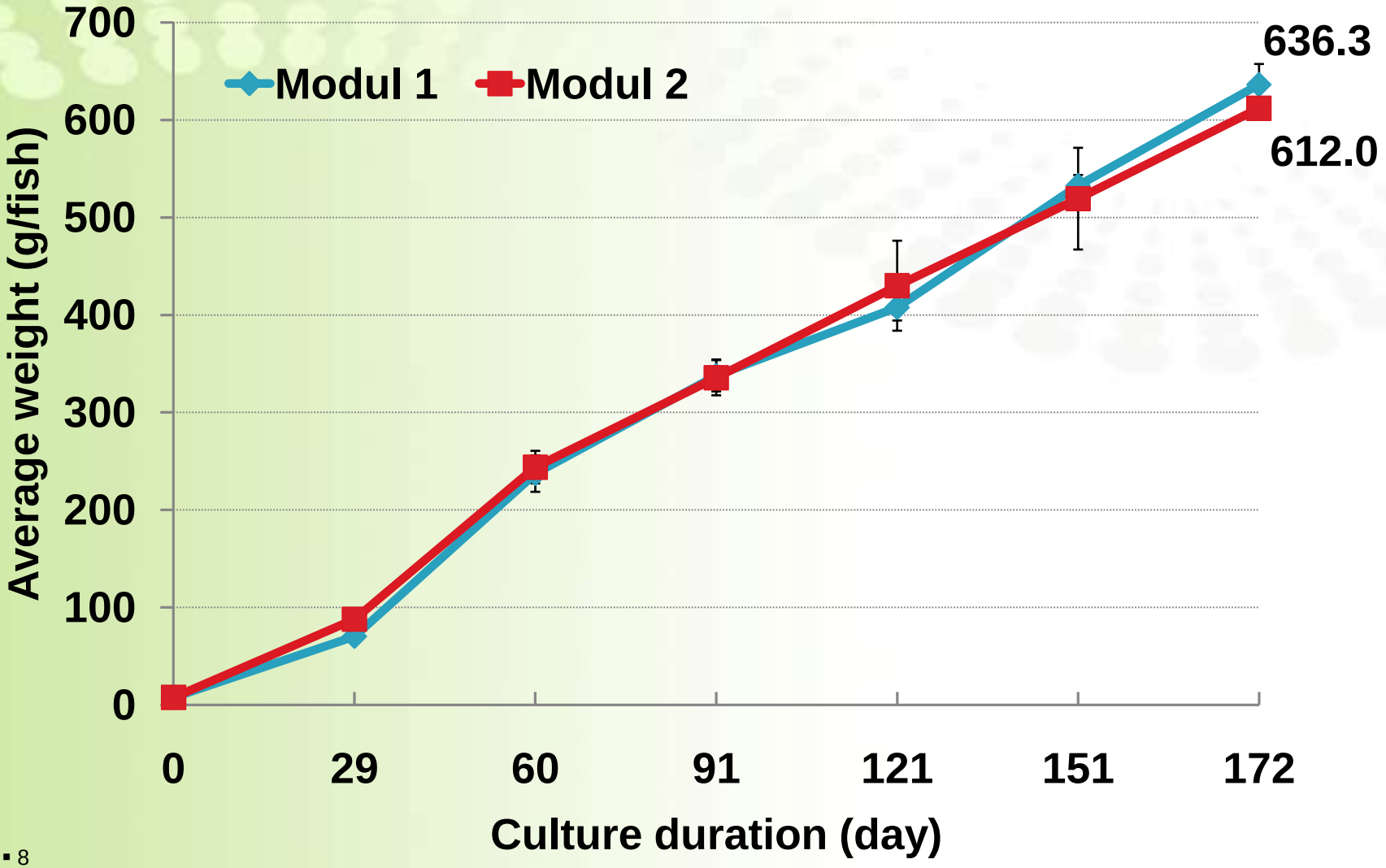
- By-product of sugar processing
- Contain 37-38% carbohydrate
- Water soluble
- Cheap price
- Available

EXPERIMENTAL CONDITIONS

- 6 ponds including two modules: 3 medium size (2,000 m^2) and 3 small ponds (1,000 m^2)
- Stocking density: 5 fish/m^2
- Feed: CP 30%: 7-400 g/fish; CP 27% (>400g/fish)
- Feeding: Twice daily at 8:00 and 15:30, feeding rate 90% in average satiation
- Molasses supplementation: Molasses was used as carbon source to supplement into experimental pond to maintain C/N = 11.5
- Water added just in case to compensate losses due to leaking or evaporation.

BIOFLOC SYSTEMS FOR TILAPIA CULTURE IN NORTHERN VIETNAM

Growth performance of Nile tilapia in BFT culture systems



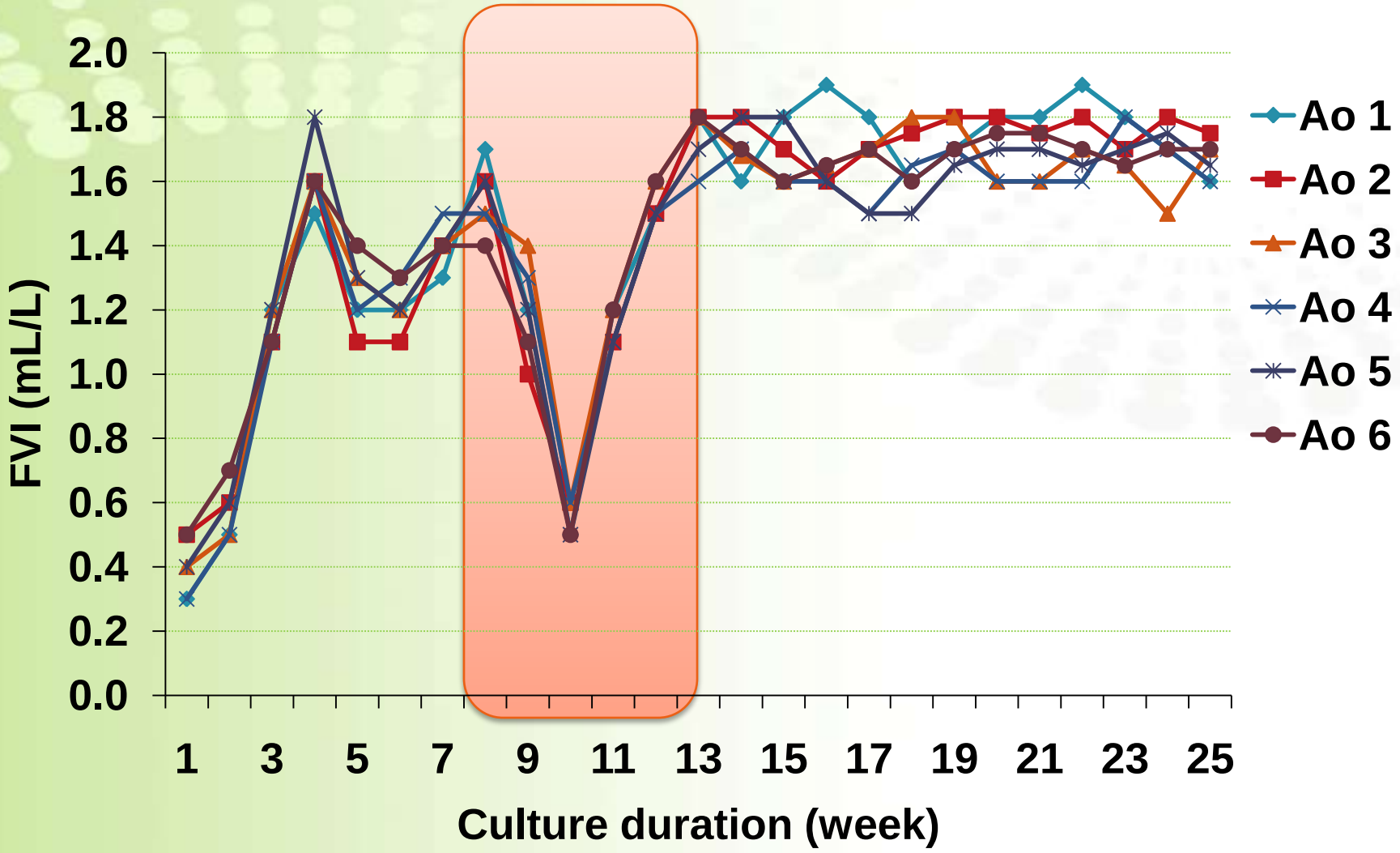
Growth performances and FCR of tilapia BFT system

Parameters	Module 1	Module 2	Average
Mean weight at stocking (g / fish)	7.1	7.1	7.1
Mean weight at harvest (g / fish)	636.3±21.0[a]	612.0±3.6[a]	624.2±19.0
Culture period (day)	177	177	177
Mean weight gain (g/fish)	629.2[a]	604.9[a]	617.1
Daily weight gain (g/fish/day)	3.60	3.46	3.53
Total biomass at stocking (kg)	231.0	115.5	-
Total biomass at harvesting (kg)	13,800	7,440	-
Survival rate (%)	81.6	85.7	83.65
Production (kg/ha/cycle)	23,000[a]	24,800[b]	23,600
Total feed consumption (kg)	18,000	10,025	-
Feed Conversion Rate (FCR)	1.33[a]	1.37[a]	1.35

Efficiency of protein utilization of tilapia culture model applying the BFT

Parameters	Module 1	Module 2	Average
Carcass protein of fish at stocking (%)	15.10	15.10	15.10
Carcass protein of fish at harvesting (%)	18.8	19.54	19.17
Protein in feed consumed (kg)	5,040.0	2,796.7	-
Protein deposited in fish biomass (kg)	2,559.2	1,403.6	-
PER (g weight gained/g protein consumed)	**2.69**	**2.62**	**2.65**
PPD% (Percentage Protein Deposited)	**50.78**	**50.18**	**50.48**

Variation of FVI (mL/L) during culture period



Proximate compositions of biofloc in tilapia ponds applied BFT (% DMB)

Parameter	Module 1	Module 2	Average
Crude protein	40.7	41.6	41.2
Crude lipid	2.1	2.3	2.2
Carbohydrates	26.4	27.2	26.8
Crude fiber	18.1	16.5	17.3
Crude ash	12.5	12.1	12.3

The average water quality parameters in BFT tilapia culture ponds

Indicators	Module 1	Module 2	Average
DO (mg/L)	3.69 ± 0.04^{a}	3.06 ± 0.05^{a}	3.38 ± 0.07
pH	7.56 ± 0.04^{a}	7.45 ± 0.03^{a}	7.50 ± 0.06
NH_3 (mg/L)	0.21 ± 0.03^{a}	0.27 ± 0.03^{a}	0.24 ± 0.02
NO_2^- (mg/L)	0.19 ± 0.02^{a}	0.14 ± 0.02^{a}	0.17 ± 0.02
NO_3^- (mg/L)	2.19 ± 0.09^{a}	2.29 ± 0.05^{a}	2.24 ± 0.05

Nitrogen budget of tilapia culture ponds applied BFT

Parameters	Module 1	Module 2	Average
Nitrogen inputs (%)			
Water	0.07±0.00	0.13±00	0.10±0.01
Fingerlings	0.85±0.01	0.77±0.00	0.81±0.02
Feed	99.08±0.01	99.11±0.00	99.09±0.01
Nitrogen output (%)			
Water	0.78±0.03	1.46±0.03	1.12±0.15
Fish harvest	51.28±1.51[a]	50.52±0.48[a]	50.90±0.73
Biofloc	0.46±0.00[a]	0.43±0.00[a]	0.44±0.01
Nitrogen losses	47.48±1.52[a]	47.60±0.45[a]	47.54±0.71

Economic analysis of tilapia culture system with application of BFT

- **Total inputs for 1 ha of pond was 526.662 million VND**
- **The total revenue was 627.6 million VND**
- **Net profit was 100.938 million VND. The ratio of net return on investment (ROI) was 19.17%**
- **Feed cost was accounted for 69.7% of the total investments.**
- **Electricity consumption for water aeration, which represented 8.4%**
- **The remaining expenses for fingerlings, labor and other costs were about 21.9%**

Conclusion

- **Fish reached an average weight 624.2 g after 177 days and a productivity of 23,600 kg/ha.**
- **The overall FCR was 1.35 in average, about 0.35 or equivalent to 20.6% lower than that in a green water, intensive tilapia culture system without BFT.**
- **The protein efficiency (PER) was 2.65 g weight gain per 1 g protein in feed consumed.**
- **The percentage of protein deposited (PPD) was 50.48%, about 10.41% higher than that in green water, intensive tilapia culture system.**

Conclusion

- **Tilapia cultured in BFT system could convert 51% of the total nitrogen supplied into the pond, while about 0.44% and 1.12% of nitrogen accumulated in biofloc biomass and pond's water, respectively, nitrogen losses accounted for 47% of the total nitrogen outputs.**
- **The ratio of net return on investment (ROI) was 19.17% for a culture cycle of 6 months.**
- **BFT is applicable in modern farms that available in capital and electricity supply**

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