World Aquaculture Society Meeting 2009

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EFFECT OF TWO DIFFERENT DIETS FISH MEAL BASED AND "ORGANIC" PLANT BASED DIETS IN *Litopenaeus setiferus* EARLIER POST-LARVAE CULTURE UNDER BIOFLOC, GREEN-WATER AND CLEAR-WATER CONDITIONS

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Introduction

In the last decades penaeid shrimp culture has increased worldwide. However, together with the rapid expansion of shrimp farming industry, concern with environmental impacts caused by these activities have also increased
(Tovar et al. 2000; Jory et al. 2001)

Moreover, indiscriminate use of fish meal and fish oil to produce feeds is another concern to direct aquaculture to sustainable development
(Naylor et al. 1998)


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Introduction

Along with the reduction of production costs, the use of lower or "plant based" protein feeds could be part of environmentally sound aquaculture practices besides reduction of dependence on fish meal component
(Martinez-Cordova et al. 2003; Ballester et al., 2009)

Protein content is the most expensive item in aquaculture feeds and artificial diets represents at least 50% of total costs on shrimp production
(Naylor et al. 1998)


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Introduction

Nursery phase as strategy ...

Nursery phase is defined as the intermediate step between the early postlarval stage and the grow-out phase
(Mirshra et al. 2008)

Several benefits were demonstrated from the incorporation of a nursery phase during shrimp production cycle: optimization of shrimp farm area, increased survival, improved feeding efficiency and enhanced growth performance
(Apud et al., 1983; Sandifer et al., 1991; Samocha et al., 2000).

This phase is usually characterized by high stocking densities, high water renewal rates, and the use of high quality artificial diets
(Speck et al., 1993)


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Introduction

Nursery phase and type water...

"Green-water"...

Largely used on shrimp and fish larviculture

Water quality maintenance strategy

Nutrition roles
(mainly by DHA-EPA fatty acids content)


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Introduction

Nursery phase and type water...

"Bio-floc" water...

Could be used as food source???

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Short Overview
Biofloc Systems...

Short Overview

Bio-floc system has been presented as a new paradigm in super-intensive shrimp culture around the world (McIntosh, 2000).

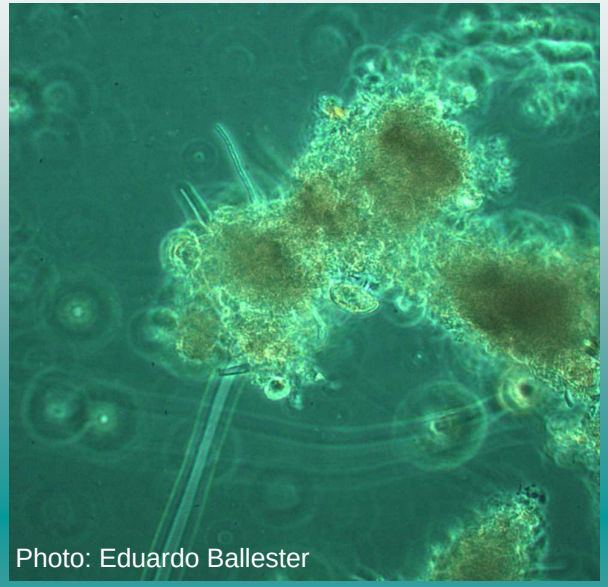
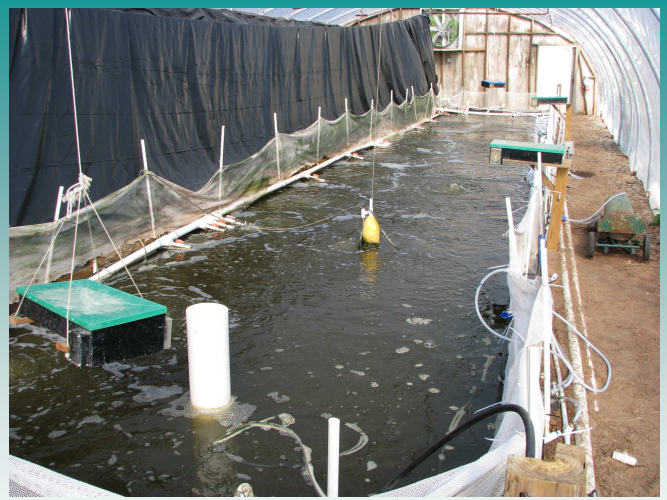


Photo: Eduardo Ballester



This system is based on the maintenance of aerobic and heterotrophic microorganisms community by high C:N ratio. Water quality is maintain by up-take of ammonia from the water and conversion to microbial biomass
(Avnimelech et al., 1994; Avnimelech, 1999; Moss et al., 1999)

Biofloc as a food source...

Many proximate analysis on biofloc demonstrated its potential as food source

Tabela 2 – Composição Bromatológica com base na matéria seca de agregados microbianos formados em diferentes experimentos

Fonte	PB (%)	Carb (%)	EE (%)	FB (%)	Cinzas (%)
McIntosh et al (2000)	43,00	-	12,5	-	26,5
Tacon *et al* (2002)	31,20	-	2,6	-	28,2
Soares (2004)	12,0-42,0	-	2,0-8,0	-	22,0-46,0
Emerenciano *et al* (2006)	30,40	29,10*	0,47	0,83	39,20
Wasielesky *et al* (2006)	31,07	23,59	0,49	-	44,85

PB - proteína bruta; Carb. - carboidratos; EE - extrato etéreo ou lipídios; FB - fibra bruta

Wasielesky et al. 2006 – Panorama da Aquicultura - Brazil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Introduction

There is much information about the production of white shrimp *L. vannamei* in limited or zero water exchange during nursery phase

Few works about another species


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Overview on BioFloc nursery phase studies on "alternative" species

44ª Reunião Anual da Sociedade Brasileira de Zootecnia
Unesp-Jaboticabal, 24 a 27 de Julho de 2007

SBZ 2007

Formação de Flocos Microbianos em Sistemas Fechados no cultivo do camarão-rosa *Farfantepenaeus paulensis*

Maurício Gustavo Coelho Emerenciano[23] e Wilson Wasielesky Jr[3]

- ✓ *Farfantepenaeus paulensis* pink shrimp
- ✓ PL15 to PL25
- ✓ Biofloc increase growth performance (20%)

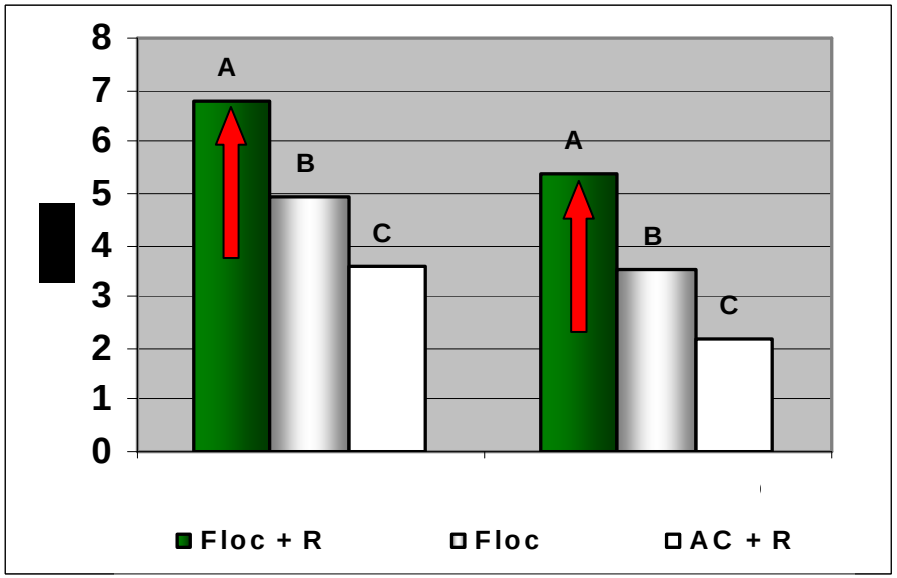

Figure – Final weight and weight gain


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Overview on BioFloc nursery phase studies on "alternative" species

44ª Reunião Anual da Sociedade Brasileira de Zootecnia
Unesp-Jaboticabal, 24 a 27 de Julho de 2007
SBZ 2007

Crescimento e sobrevivência do camarão-rosa *Farfantepenaeus brasiliensis* cultivados em meio aos flocos microbianos

Maurício Gustavo Coelho Emerenciano[2], Eduardo Cupertino Ballester[3], Roberta Soares[3], Ronaldo Cavalli[3] , Paulo César Abreu[3,4] e Wilson Wasielesky Jr[3]

- ✓ *Farfantepenaeus brasiliensis* pink shrimp
- ✓ PL25 to PL55
- ✓ Biofloc increase growth performance

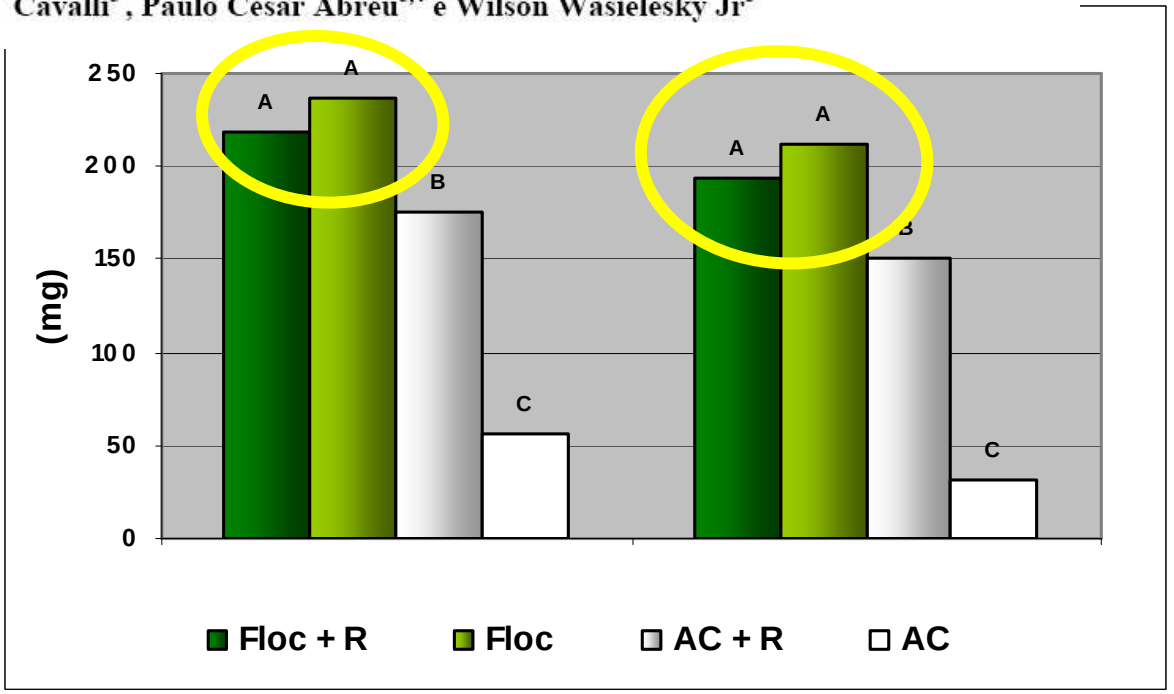

Figure – Final weight and weight gain


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Objectives

The objetive was to evaluate two different diets: fish meal based and "organic" plant based diets in *Litopenaeus setiferus* earlier post-larvae culture under biofloc, green-water and clear-water conditions

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Materials and Methods

✓ Experiment was conducted at Waddel Mariculture Center facilities, Bluffton, South Carolina, USA


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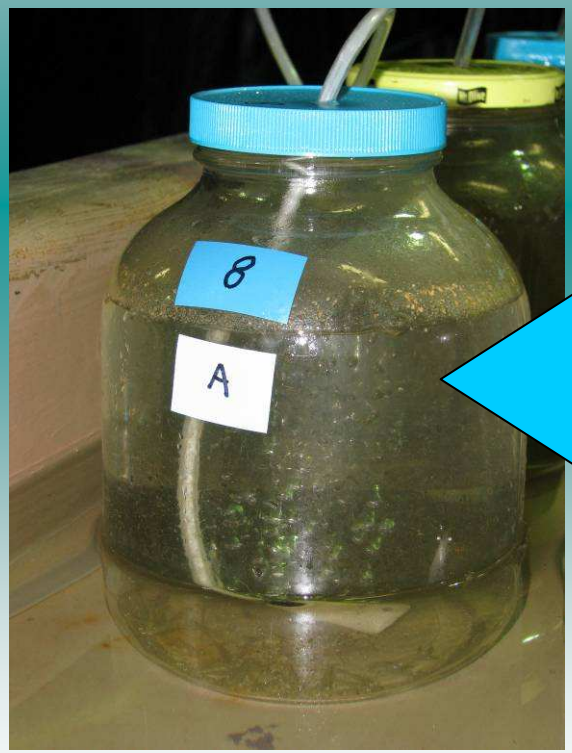
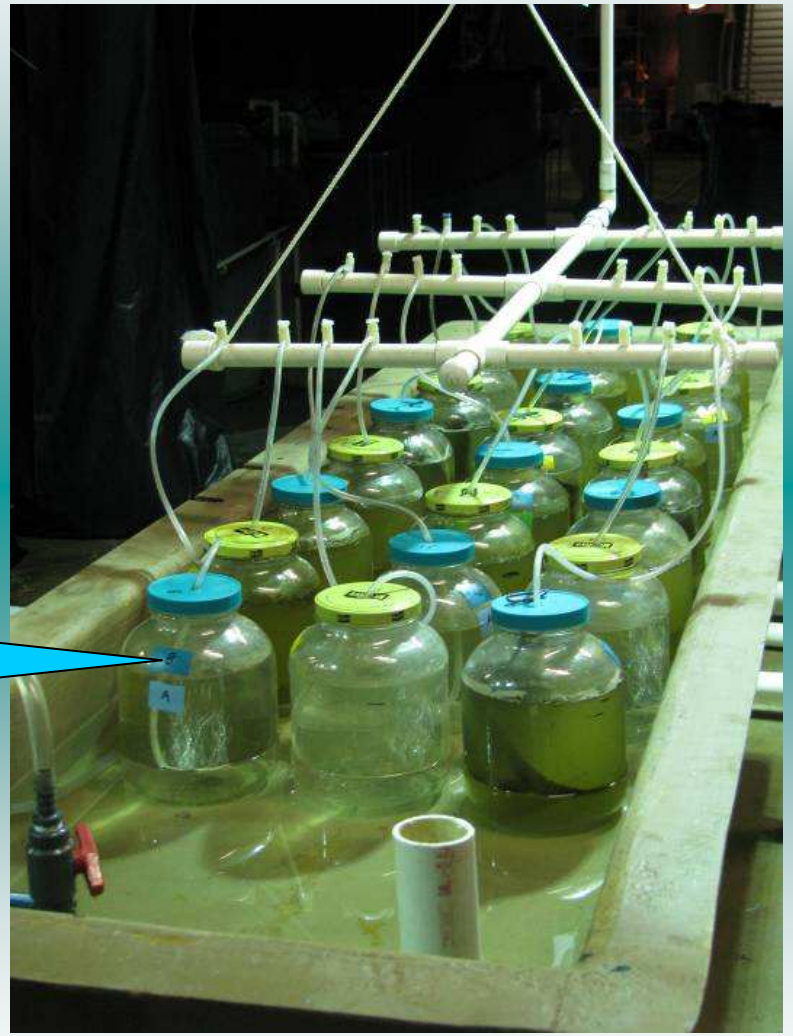
Materials and Methods

✓ Experimental units: eighteen 3 L glass jars and 3 replicates per treatment





Materials and Methods

✓ Shrimp Stock: 90 PL's (PL15) per jar or 30PL/L and initial weight 0.033±0.01g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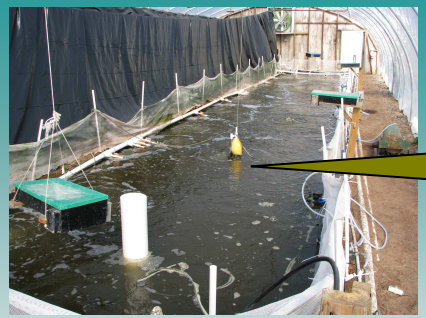
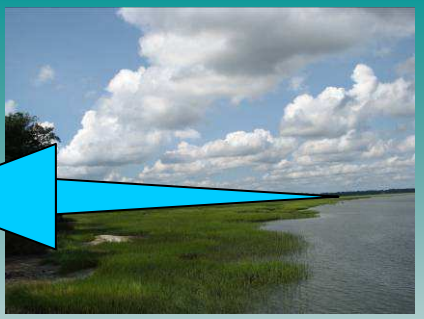
Materials and Methods

✓ Treatments: bio-floc water
(direct collected from *L. vannamei* super-intensive race-way)
Green-water (50,000 cells/mL of *Navicula sp.* and *Thalassiosira weissflogii*)
Clear-water

External microalgae tanks



L. vannamei super-intensive race-way (54m^2)



Filtered salt water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Materials and Methods

✓ Two diets:

35% CP Ziegler™ hiper-intensive fish meal based diet

35% CP "organic" experimental plant based diet
(USDA organic protocols)

✓ Feed were supplied 3 times/day (8 AM, 3 PM and 7 PM) accords 10% shrimp biomass.


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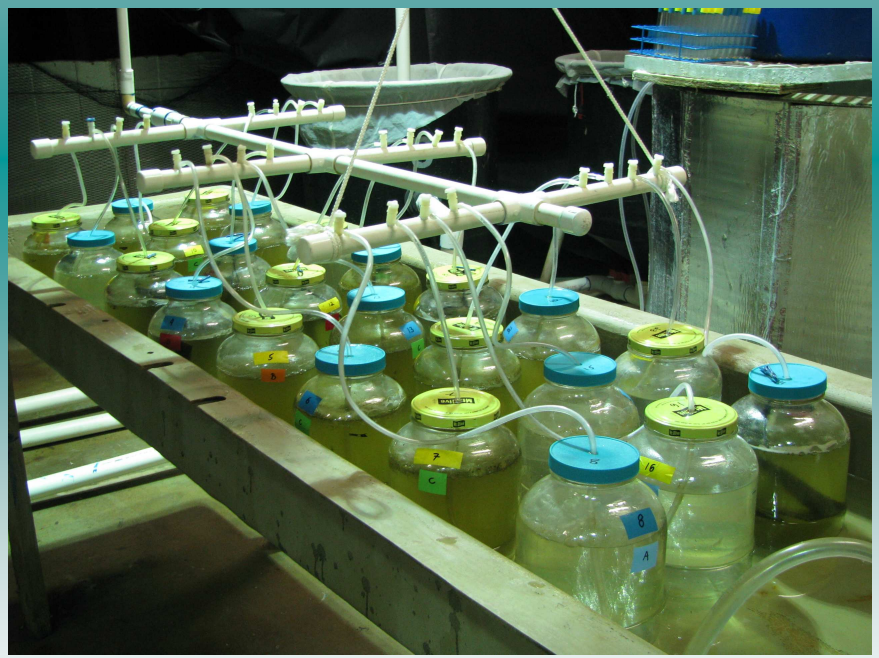
Materials and Methods

✓ Water exchange: 100% daily to clear-water and 50% to bio-floc and green-water



✓ Water quality monitoring: temperature, pH, salinity and dissolved oxygen daily (YSI Multi-parameter)

✓Statistic analysis
(ANOVA-two way and Tukey HSD test)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Results

✓ Water quality parameters (no differences)

	Temp.(°C)	DO (mg/L)	pH	Salinity
Clear-water	27.39±1.15 a	5.05±0.30 a	7.71±0.14 a	37.05±0.49 a
Floc	27.38±1.11 a	5.26±0.42 a	7.37±0.19 a	36.20±0.98 a
Green-water	27.26±1.32 a	5.17±0.48 a	7.88±0.20 a	36.92±0.74 a

Results

✓ Race-way biofloc water characteristics

	Mean	SD
TAN-N	0,125	0,09
NO2-N	0,08	0,07
NO3-N	47,735	13,03
TSS	775	77,78
VSS	266,5	79,90
Phosphate	63,75	12,37
Silica	76	8,49
Alcalinity	73,225	17,40


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Results

Growth performance

Table 1- Growth parameters of Atlantic white shrimp *L. setiferus* in different diets and water types. Date are means and significance level, along experiment. Different latter indicate (in column) means are significantly different (P<0,05).

Treatment	Mean survival (%)	Mean final weight (g)	Mean final biomass (g)	Mean weight gain (g)
Bio-Floc water				
Fish Meal based diet	98.89a	0.061 b	5.49c	0.031 b
Plant-based diet	98.52 a	0.063 b	5.62 c	0.039 b
Green water				
Fish Meal based diet	98.52a	0.076a	6.81a	0.046a
Plant-based diet	98.52a	0.800a	7.11a	0.053a
Clear water				
Fish Meal based diet	93.3 b	0.074 a	6.29 b	0.049 a
Plant-based diet	96.66a	0.062b	5.42c	0.034b


Conclusions

Better survival rates when exist extra food source

Green-water presented better results for this specie on this experimental conditions

Plant-based diet can be used successfully when natural productivity are present

More research efforts are needed related to alternative specie

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