UFSC

Universidade Federal de Santa Catarina
Centro de Ciências Agrárias
Departamento de Aqüicultura

LCM
Laboratório de Camarões Marinhos

DIETARY SUPPLEMENTATION WITH SODIUM BUTYRATE ON THE PERFORMANCE OF WHITE LEG SHRIMP REARED IN BIOFLOC SYSTEM

Felipe do Nascimento Vieira*, Bruno Corrêa da Silva, Adolfo Jatobá, Mariana Soares, José Luiz Mouriño and Walter Quadros Seiffert

SHRIMP FACILITIES OF UFSC

Yakult Experimental Shrimp Farm

Marine Shrimp Laboratory

Marine Shrimp Laboratory

Broodstock

Hatchery

Nursery

Experimental units

Yakult Experimental Shrimp Farm

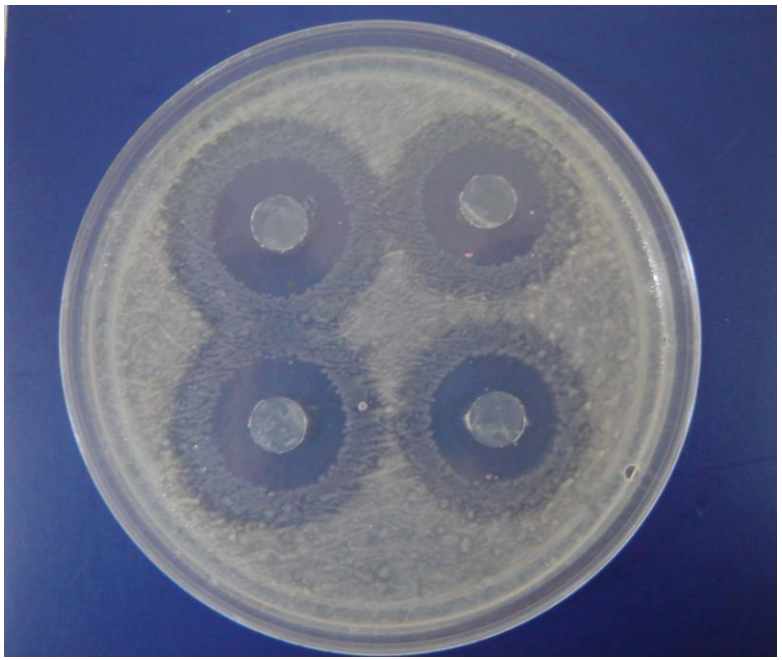
The farm

Raceway

Pond with liner

Shrimp harvest

Introduction



Inhibition against pathogens

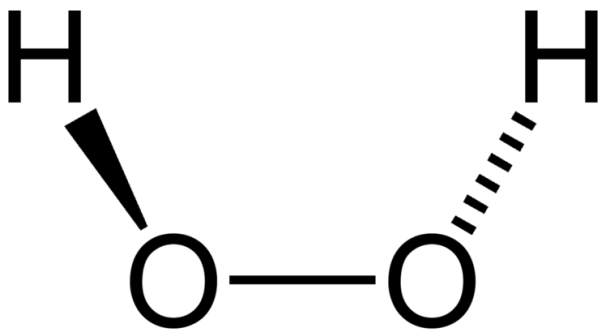
Probiotic bacteria

Introduction

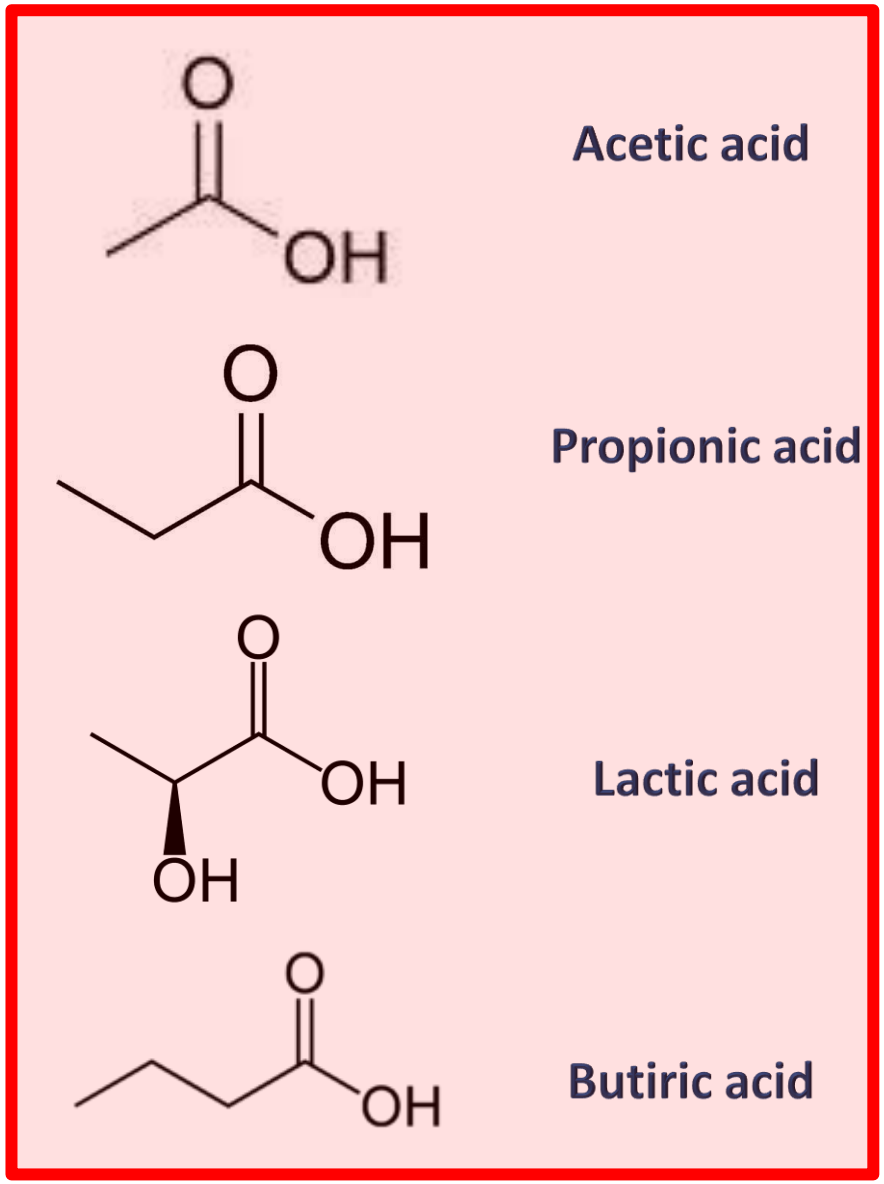
VAZQUEZ, J. A et al, 2005

Inhibition against pathogens

Bacteriocins



Hydrogen peroxide



Organic acids or their salts our their salts

Introduction

Inhibition against pathogens

$$CH_3(CH_2)_2COO^- + H^+ \underset{pH}{\overset{pK_a = 4.7}{\rightleftharpoons}} CH_3(CH_2)_2COOH$$

Diffusion

$CH_3(CH_2)_2COO^- + H^+ \underset{pH}{\rightleftharpoons} CH_3(CH_2)_2COOH$

ATP

Proton pump

H^+ H^+

H^+ H^+ H^+ H^+

H^+ H^+

Introduction

Nutrition action:

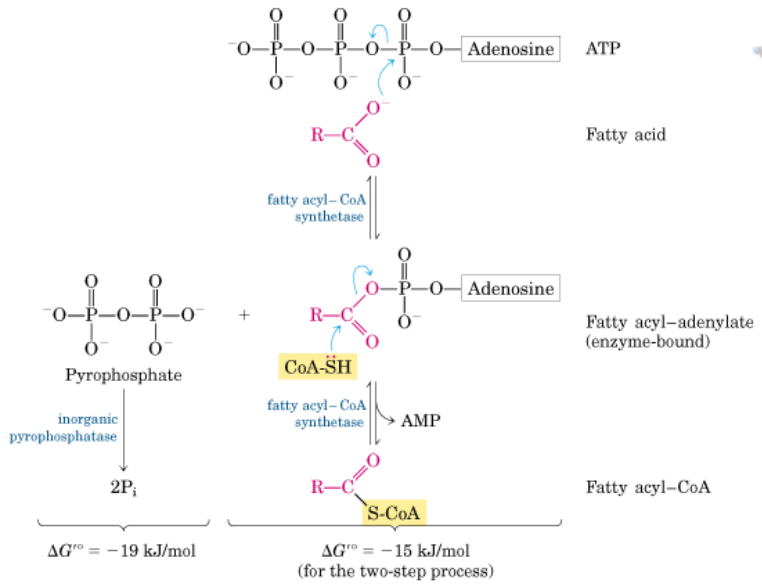
Disponibilization of diet minerals

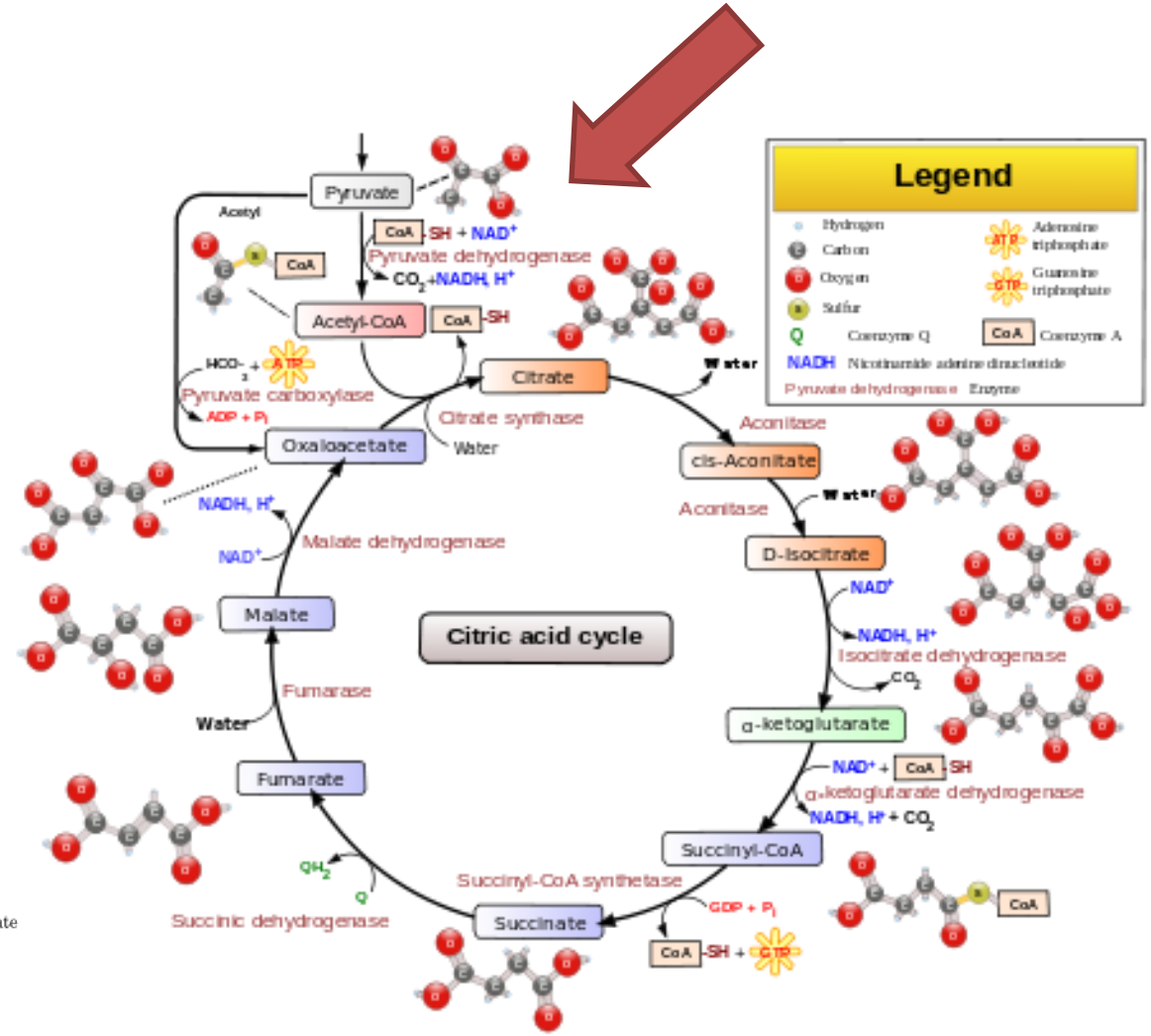
- **Lowered pH resulting in a higher dissociation of mineral compounds;**
- **Reduced rate of gastric emptying**
- **Formation of chelated mineral complexes, which are easily absorbed.**

HOSSAIN, et al 2007

Introduction

- Metabolism





Introduction

Poultry

Swine

Introduction

Rainbow trout

Formic acid: Disponibilization P, Mg e Ca (VIELMA; LALL, 1997)

Snapper

Citric acid: Growth and convertion rate, absortion of N and P (SARKER; SATOH; KIRON, 2005; HOSSAIN; PANDEY; SATOH, 2007) (VIELMA; LALL, 1997)

Beluga sturgeon

Citric acid: Absortion of Ca and P (KHAJEPOUR; HOSSEINI, 2011)

Introduction

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Salts of organic acids selection by multiple characteristics for marine shrimp nutrition

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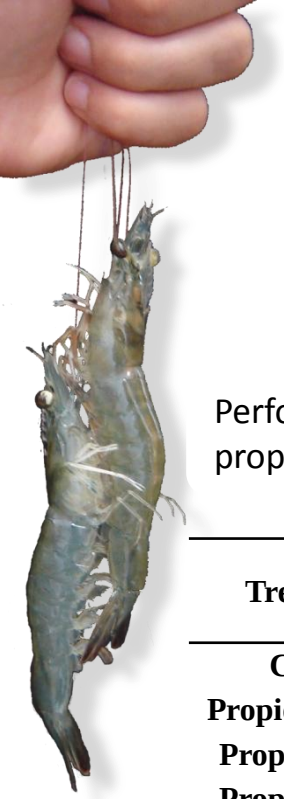
Table 6
Daily feed intake percentage (%) and apparent digestibility coefficient (ADC) of the marine shrimp *Litopenaeus vannamei* fed with commercial diets supplemented with 2% salts of organic acids.

Diets	Feed intake (%)	Dry matter ADC (%)	Crude protein ADC (%)	Gross energy ADC (%)	Phosphorus ADC (%)
Control	2.8 ± 1.1 ^{b}	57.13 ± 3.85	71.72 ± 2.64	73.55 ± 2.05 ^{b}	12.36 ± 1.61 ^{b}
Acetate	3.8 ± 1.0 ^{ab}	57.62 ± 1.16	71.93 ± 1.03	73.93 ± 1.03 ^{b}	9.93 ± 3.61 ^{b}
Propionate	4.3 ± 0.5 ^{a}	61.03 ± 3.48	72.91 ± 2.55	79.50 ± 2.26 ^{a}	20.91 ± 4.38 ^{a}
Butyrate	4.0 ± 1.0 ^{a}	58.93 ± 2.50	72.95 ± 1.09	73.82 ± 1.60 ^{b}	12.49 ± 1.78 ^{b}

Data expressed as mean ± standard deviation.

Butyrate and propionate incrisead food atractivit and digestibility



Introduction

Performance of *Litopenaues vannamei* growth in clean water with diet supplemented with sodium propionate and butyrate in three different concentrations (0,5; 1 e 2%).

Treatments	Initial weight (g)	Final weight (g)	Growth rate (g.week^{-1})	Yield (kg.ha^{-1})	Food efficient	Survival (%)
Control	2,53±0,02	9,32±0,90 ^{a}	0,94±0,06 ^{a}	992±89 ^{b}	0,53±0,03 ^{b}	88,7±0,6 ^{b}
Propionate 0,5%	2,56±0,03	10,20±0,25 ^{b}	1,14±0,04 ^{b}	1113±7 ^{ab}	0,59±0,04 ^{ab}	91,0±2,0 ^{ab}
Propionate 1%	2,52±0,03	10,16±0,13 ^{b}	1,14±0,02 ^{b}	1085±28 ^{ab}	0,52±0,03 ^{b}	89,0±2,0 ^{ab}
Propionate 2%	2,52±0,03	10,35±0,06 ^{b}	1,17±0,01 ^{b}	1093±88 ^{ab}	0,55±0,01 ^{ab}	92,3±1,2 ^{ab}
Butiyato 0,5%	2,52±0,02	10,60±0,15 ^{b}	1,20±0,02 ^{b}	1176±5 ^{a}	0,59±0,01 ^{ab}	92,3±1,5 ^{ab}
Butiyato 1%	2,53±0,03	10,25±0,08 ^{b}	1,15±0,01 ^{b}	1100±0 ^{ab}	0,55±0,01 ^{ab}	89,3±0,6 ^{ab}
Butiyato 2%	2,53±0,03	10,82±0,53 ^{b}	1,24±0,08 ^{b}	1237±23 ^{a}	0,61±0,01 ^{a}	93,0±1,4 ^{a}
p value	0,6899	0,0021	0,0008	0,0109	0,0222	0,0126

SILVA et al., data not published .

Objective

Evaluated a sodium butyrate supplemented diet on the performance of white leg shrimp (*Litopenaeus vannamei*) reared in biofloc system and their survival and hematology after being challenged with *Vibrio* sp

Material and methods

- 3g shrimps descendent from a SPF lineage from Aquatec Aquacultura/ Genearch aquacultura.

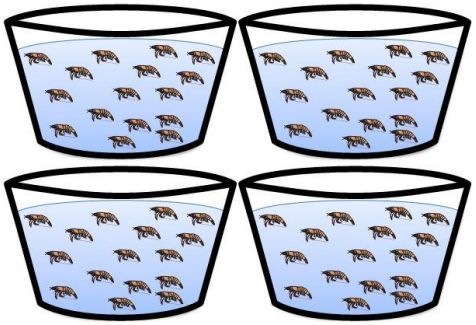
- The ration was formulated with 327 g Kg^{-1} of protein without fish meal (soybean protein concentrate meal and soybean meal)

- 2% of butyrate was added in the butyrate supplemented diet (caulin replaced the butyrate in control diet).

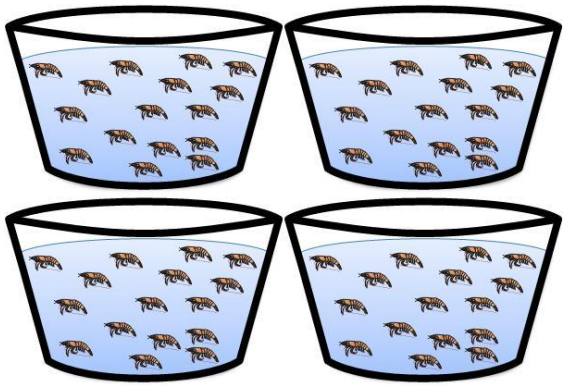

Material and methods
Shrimps were growth in this 50,000 L tank until 3g in biofloc system
Then the water was pumped to the small units to start the experiment
FORTLEV

Material and methods

- Eight tanks (0.8m^3) were stoked with 250 shrimps.m^{-2};
- Shrimps were feed 4 times per day 90% throw and 10% in feeding trays
- Water temperature was kept in 30±1°C, salinity of 33‰
- Experiment was conducted for six weeks.



Diet supplemented with 2% of butyrate



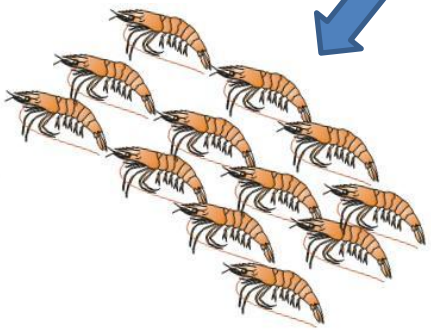
Control

Material and methods

Experimental infection:

Injected with 1×10^5 CFU mL^{-1} of *Vibrio* sp

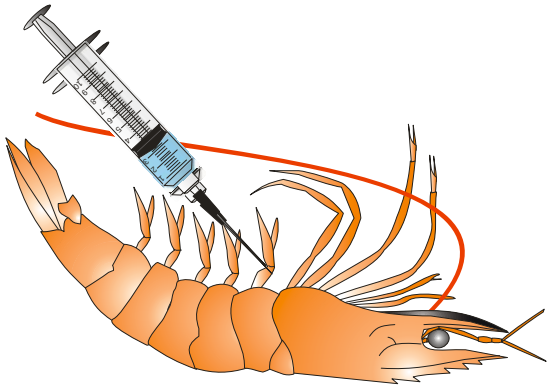
From each tank

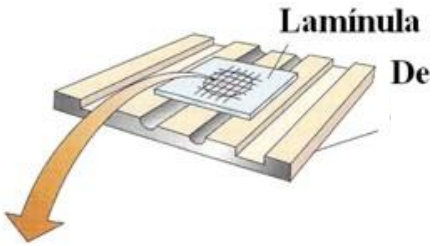


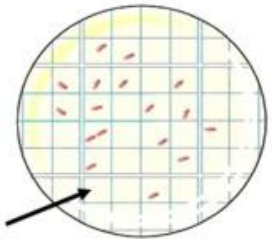
12 shrimps

40L aquarium

After 96h







Total hemocyte count
Differential hemocyte count

Results

Results

Table 1: Performance of white shrimp (*L. vannamei*) fed with a sodium butyrate (2%) supplemented diet and control after six weeks reared in biofloc system.

	Control	Butyrate
Final weight (g)	13.31±0.33	13.33±0.51
Growth rate (g week^{-1})	1.52±0.01	1.61±0.12
Survival (%)	76.51±0.53	81.65±2.81*
Productivity (kg m^{-3})	2.54±0.15	2.71±0.46*
Feed efficiency	0.45±0.05	0.46±0.06

*** Significant difference according to t test ($p<0.05$)**

Results

Table 2: Performance of white shrimp (*L. vannamei*) fed with a sodium butyrate (2%) supplemented diet and control after six weeks reared in biofloc system.

	Control	Butyrate
THC (10^6 cel mL^{-1})	20.47±5.07	34.20±3.86*
HH (10^6 cel mL^{-1})	9.27±2.56	12.69±1.92*
GH (10^6 cel mL^{-1})	11.20±2.59	21.50±3.16
Mortality (%)	13.19±7.98	5.81±5.04

*** Significant difference according to t test ($p<0.05$)**

Conclusion

The use of a sodium butyrate supplemented diet increase the productivity of white leg shrimp cultivated in biofloc system and has an immunostimulant effect, increasing the hemocyte count.

Acknowledgments

FINEP

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GOVERNO FEDERAL
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PAÍS RICO É PAÍS SEM POBREZA

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Thanks