Contribution of bioflocs enriched with lyophilized açaí (*Euterpe oleracea*) in the antioxidant responses and oxidative damage of post-larvae of shrimp *Litopenaeus vannamei* cultivated in BFT system

GLOBAL CONFERENCE ON AQUACULTURE 2020 — AQUACULTURE FOR FOOD AND SUSTAINABLE DEVELOPMENT

Registration Number: 17737586

FURG

Grecica Mariana Colombo[1,3], Cleber dos Santos Simião[1,3], Juan Rafael Buitrago Ramírez[1,3], Alan Carvalho de Sousa Araujo[1,3], Robson Matheus Marreiro Gomes[1,3], Sonia Astrid Munõz Buitagro[1,3], Wilson Wasielesky[2,3], José Maria Monserrat[1,3,4]

[1]Laboratório de Bioquímica Funcional de Organismos Aquáticos – BIFOA. Universidade Federal do Rio Grande - FURG, Instituto de Oceanografia (IO), Rio Grande, RS, Brasil
[2]Laboratório de Carcinocultura, Universidade Federal do Rio Grande - FURG, Instituto de Oceanografia (IO), Rio Grande, RS, Brasil
[3]Programa de Pós-graduação em Aquicultura, Universidade Federal do Rio Grande – FURG, Rio Grande, RS, Brasil
4 Instituto de Ciências Biológicas (ICB)- FURG, Rio Grande, RS, Brasil

INTRODUCTION

In addition to acting in the maintenance of water quality and serving as a supplementary food source for reared organisms, the bioflocs have in their composition bioactive compounds with antioxidant activity. Morevover, bioflocs can incorporate antioxidants added exogenously to the BFT system. The Amazon fruit *Euterpe oleracea* is composed of large amounts of several phytochemicals, including phenolic compounds, which together give this fruit high antioxidant capacity. In this context, the present study aimed to evaluate the capacity of bioflocs to assimilate and transfer the bioactive compounds present in açaí fruit to post-larvae of *L. vannamei* cultivated in BFT system, through the analysis of antioxidant and oxidative damage responses.

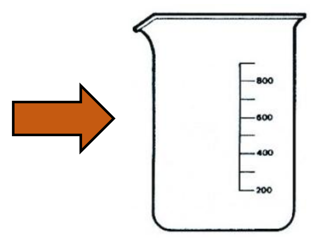
MATERIALS AND METHODS

First Experiment

21 beckers with an useful volume of 1 liter were employed and randomly distributed in seven treatments, all in triplicate, with constant aeration:

- Control
- 2.5 mg açaí L^{-1}
- 5 mg açaí L^{-1}
- 10 mg açaí L^{-1}
- 20 mg açaí L^{-1}
- 40 mg açaí L^{-1}
- 80 mg açaí L^{-1}

Liophilized açaí

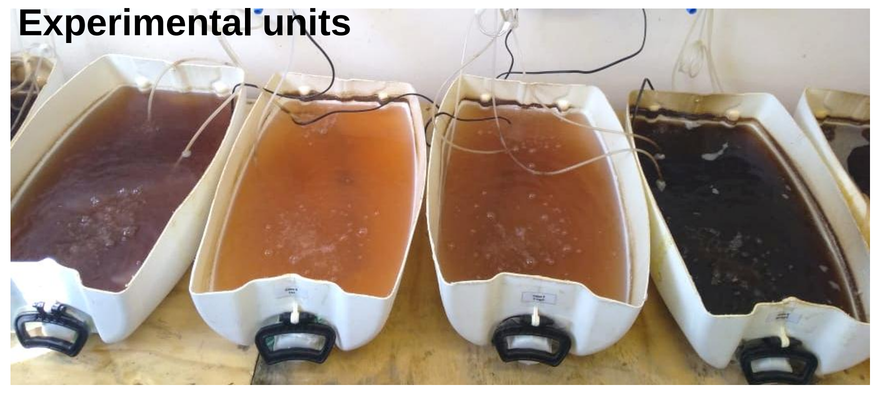


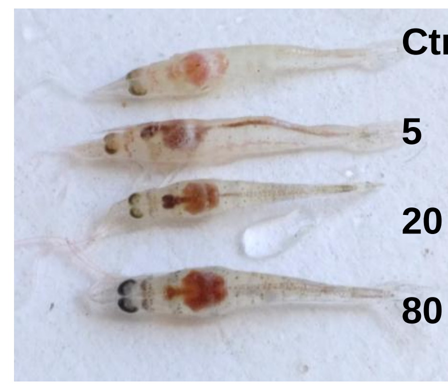
Every 24 h, for seven days, the respective concentrations of açaí were added directly to the water.

Second Experiment

From the results of the first experiment, three concentrations of açaí, beyond to the control treatment, added daily in the water, were tested in triplicate in the cultivation of post-larvae for an experimental period of 27 days. Shrimps of stage PL23 were stored at a density of 30 shrimps/L in 12 tanks (20 liters).

Experimental units





Post-larvae of *L. vannamei* at the and of 27 days of cultivation. Values indicate the tested açaí concentrations in mg L^{-1}

RESULTS AND DISCUSSION

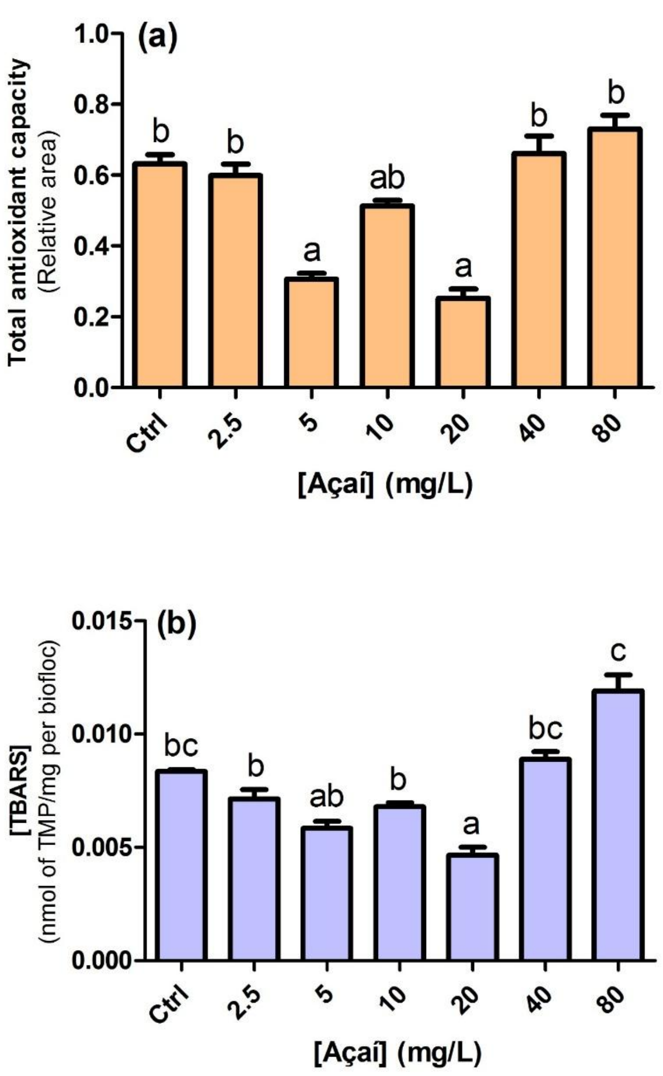


Figure 1. Values of total antioxidant capacity against peroxyl radicals (expressed in relative area) (A) and content of substances reactive to thiobarbituric acid (B) in bioflocs from a BFT system without shrimps after addition of different concentration of lyophilized açaí for seven days.

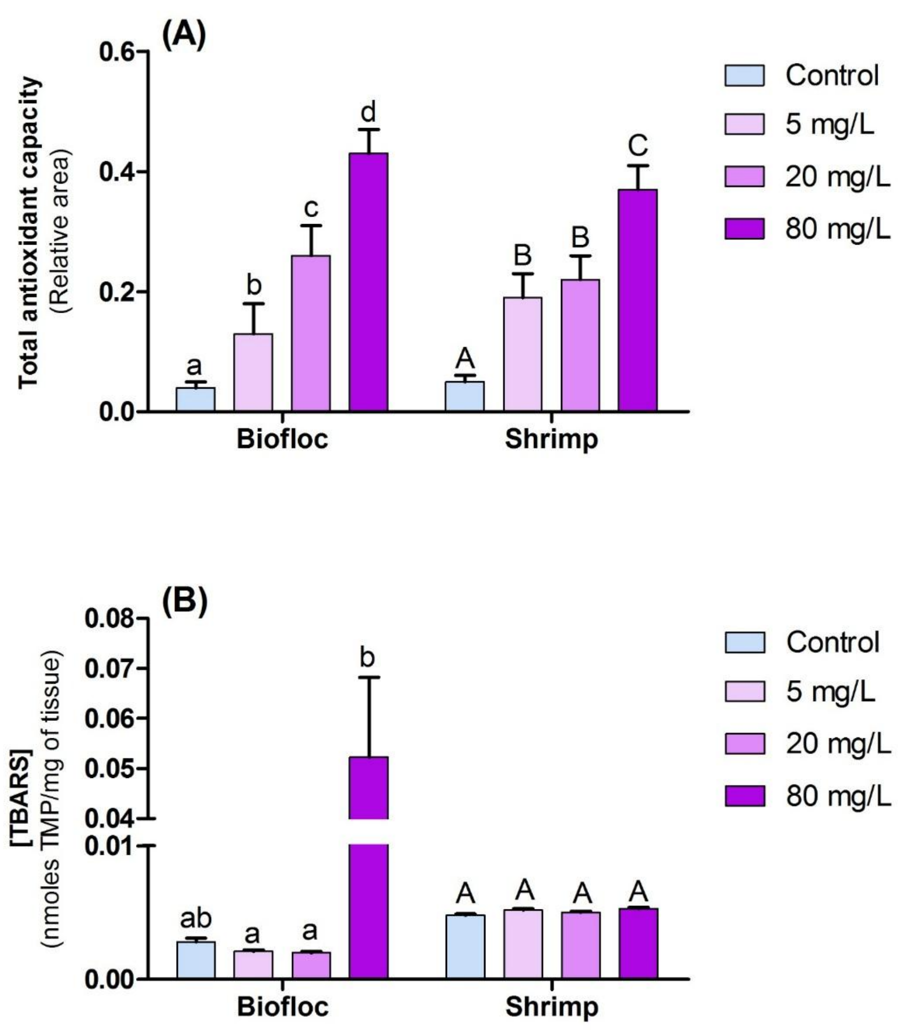


Figure 2. Values of total antioxidant capacity against peroxyl radicals (expressed in relative area) (A) and content of substances reactive to thiobarbituric acid (B) in bioflocs and of *L. vannamei* shrimps post-larvae after addition of different concentration of lyophilized açaí for 27 days.

Table 1. Zootechnical parameters of *Litopenaeus vannamei* shrimp post-larvae reared in Biofloc Technology System (BFT) with different concentrations of açaí added every day during 27 days.

Parameters	Treatments			
	Control	5 mg/L	20 mg/L	80 mg/L
Initial weight (g)	0.013 ± 0.001[a]	0.013 ± 0.001[a]	0.013 ± 0.001[a]	0.013 ± 0.001[a]
Final weight (g)	0.065 ± 0.004[a]	0.072 ± 0.004[a]	0.087 ± 0.005[b]	0.072 ± 0.004[a]
Initial lenght (cm)	1.354 ± 0.039[a]	1.354 ± 0.039[a]	1.354 ± 0.039[a]	1.354 ± 0.039[a]
Final lenght (cm)	2.261 ± 0.052[a]	2.289 ± 0.049[a]	2.424 ± 0.048[a]	2.216 ± 0.040[a]
Final biomass (g)	34.12 ± 1.17[ab]	35.89 ± 2.56[ab]	39.90 ± 1.18[b]	26.51 ± 3.77[a]
Survival (%)	65.94 ± 1.83[a]	81.89 ± 0.28[b]	81.22 ± 2.56[b]	78.89 ± 3.24[b]

In the first experiment, it was observed an increase in the antioxidant capacity against peroxyl radicals (lower relative area) of bioflocs ($p<0.05$) at concentrations of 5.0 and 20.0 mg açaí L^{-1} (Figure 1A), and a decrease in lipid peroxidation (TBARS) at a concentration of 20 mg açaí L^{-1} (Figure 1B). The higher antioxidant capacity against peroxyl radicals is important for the interception of by-products of lipid peroxidation that include lipid peroxyl radicals, resulting in lower damage lipid in bioflocs.

In the second experiment, shrimps from treatments with açaí showed greater survival ($p<0.05$) and higher final weight at the concentration of 20 mg açaí L^{-1} ($p<0.05$) (Table 1). Beyond the action of bioactive compounds present in açaí, one hypothesis for the increase in survival observed in all treatments that received açaí is due to a greater supply of food in the cultivation, because besides the ration, the post-larvae also directly ingested the offered açaí, which is rich in saturated and unsaturated fatty acids that are used in metabolic routes for energy production.

The bioflocs and shrimp lost antioxidant capacity (greater relative area) with increasing concentration of açaí ($p<0.05$) (Figure 2A). The decrease in antioxidant competence may be related the pro-oxidant action of açaí due to the great amount and diversity of antioxidant molecules present in this fruit, which, when absorbed and metabolized, can generate pro-oxidant conditions. Furthermore, the greater growth observed in post-larvae that received açaí may have induced an increase in metabolism, generating more reactive oxygen species and thus contributing to the decrease in antioxidant capacity. TBARS levels of the biofloc was lower in the concentrations of 5.0 and 20.0 mg açaí L^{-1} when compared with 80 mg açaí L^{-1} ($p<0.05$). For shrimps, no statistical differences ($p>0.05$) in TBARS levels were observed between treatments (Figure 2).

CONCLUSION

It is concluded that biofloc are capable of assimilating part of the antioxidant compounds influencing the zootechnical parameters and redox state of the shrimp.

REALIZATION: Pós Graduação em AQUICULTURA – Universidade Federal do Rio Grande – FURG; Laboratório de Bioquímica Funcional de Organismos Aquáticos - BIFOA

FINANCIAL SUPPORT: CAPES; CNPq Conselho Nacional de Desenvolvimento Científico e Tecnológico