Effect of different process conditions on the evaluation of bioactive compounds in heterotrophic microbial aggregates from the biofloc system (BFT)

Alan C. de S. Araujo*[1,2], Juan R. B. Ramirez[1], Robson M. M. Gomes[1], Vilásia G. Martins[2], José M. Monserrat[1]
[1]Laboratory of Functional Biochemistry of Aquatic Organisms, Marine Aquaculture Station, Federal University of Rio Grande, Rio Grande/RS. [2]Laboratory of Food Technology, School of Chemistry and Food Engineering, Federal University of Rio Grande, Rio Grande/RS.
*Doctoral student - alandesousa02@hotmail.com

In the Biofloc cultivation system, due to the supply of organic matter, there is a large occurrence of microorganisms (phytoplankton, zooplankton, microzooplankton and bacterioplankton), many of them aggregate forming biological flocculates. The effect that these flocculates have on the cycling of organic matter and nitrogen compounds preserves the water quality of the rearing system while generating an alternative source of animal food . Due to the diversity of these flocculates, it is important to analyze the presence of bioactive compounds, with potential applications in aquaculture production. The present study investigated the effect of the biofloc drying process on the content and antioxidant activity of derived methanol extracts. Microbial aggregates were obtained from a Greenhouse with a biofloc cultivation system (BFT) from the Marine Aquaculture Station of the Federal University of Rio Grande - FURG. Culture water samples were removed and left to stand for separation of solid and liquid fractions, then the solid fraction was centrifuged at 800 x g for 15 min at 4 ºC. Bioflocs were dried in an oven (24 h at 55 ºC) or lyophilized (168 h at 0 ºC), the wet material was used as a control for the drying method. For compound extraction, biofloc samples were homogenized for 1 min in methanol (100%) at a ratio of 1:5 (p:v), incubated for 3 h in an orbital shaker under refrigeration, centrifuged at 10000 x g for 5 min at 4 ºC, the supernatant was collected for analysis of antioxidant capacity by the DPPH method and total polyphenols by the Folin-Ciocaletu method. For the DPPH method, aliquots of 50 µL of extract and 150 µL of DPPH solution (60 µM) were added in microtubes, incubated for 30 min in the dark, centrifuged at 10000 x g for 5 min at 4 ºC, the supernatant was placed in a microplate 96-well transparent and the absorbance was read at 515 nm. To determine the total polyphenol content, aliquots of 25 µL of extract and 625 µL of 0.1 M Folin-Ciocaletu were added in a transparent microplate. After 5 min, 500 µL of 7.5% Na_2CO_3 (W/V) was added. A standard curve was prepared with gallic acid previously diluted in 100% methanol. The samples were incubated in the dark for 60 min at room temperature and the absorbance was read at 740 nm. There was a significant difference in the antioxidant capacity of the samples ($p<0.05$), being higher in lyophilized samples (0.49±0.02%), however there was no difference ($p> 0.05$) between samples with in natura and oven dried bioflocs. In relation to the values of total polyphenols, there were significant differences ($p<0.05$), the highest concentrations were found in the lyophilized samples (0.078±0.002 mg of polyphenols/g of sample). Thus, the lyophilization process of heterotrophic microbial aggregates optimized polyphenols extraction and had a positive impact on the antioxidant activity of the extract against the DPPH radical.

Keywords: bioactive compounds in animal nutrition, biofloc technology, bioactivity.