The use of chitosan and zinc oxide nanocomposites to reduce fouling organisms in marine cages

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Abstract
Statistics show that between 5-10% of the total cost of marine aquaculture is related to the control of fouling organisms (microfouling and macrofouling), which is equivalent to $ 1.35 million. In this study, chitosan and zinc oxide nanocomposites were used to evaluate the adhesion of fouling organisms in floating cages located in Nowshahr city (north of Iran, Caspian Sea), in the period from December 2017 to June 2018. Chitosan nanocomposites, commercial antifouling and control treatments were tested in 4 replications per panel. The results showed that the two dominant groups of biofouling including barnacle (*Amphibalanus improvises*) and marine bacteria were isolated, and the *phytoplankton (Pyrrophyta*: 74.32%, Bacillariophyta: 24.31% and Cyanophyta: 1.36%) were in the next stage. The number of biofouling organisms in the control treatment was higher than the antifouling treatments, which shows the inhibitory effects of chitosan and zinc oxide nanocomposites. Although the buffer condition and pH of the Caspian Sea have negative effects on the antimicrobial and antifouling properties of chitosan, zinc oxide is quite stable in such conditions and produces oxygen free radicals (under light conditions) as well as binding to biofouling surface structures (under dark conditions) and significantly reduces the number of fouling organisms.

Keywords: Nanocomposite, Chitosan, Zinc Oxide, Antifouling, Marine Cages