USE OF MICROBIAL MATS IN THE TREATMENT OF EFFLUENT FROM SHRIMP FARMING

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Introduction. The global demand for shrimp has increased the catch of this resource and in some countries it is thought that it has reached maximum production, started programs of shrimp farming to increase the supply and the demand [1]. However, effluent caused by shrimp farming is on the rise, demanding the implementation of best management practices and stop the alteration of the environment by downloads, as well as improving growing conditions. The use of microbial mats in the treatment of effluent from shrimp farming can be an economical and sustainable alternative for their purification ability of organic and nitrogenous compounds ($N\text{-}NH_4^+$, $N\text{-}NO_2^-$ y $N\text{-}NO_3^-$) [2, 3]. The aim of study was to compare the removal efficiency of two microbial mats in the treatment of effluent from shrimp farming.

Methodology. Was collected sediment from the lagoon of Alvarado and Mandinga, in the State of Veracruz. Mounted three treatments (mat with sediment of Alvarado, mat with sediment of Mandinga and only synthetic fiber, respectively) and a control (only effluent from shrimp farming) in duplicate. Treatment systems were fish tanks of 20 L, with three interconnected modules. In the central module was built the microbial mat using synthetic fiber to form two layers per mat, supported by a plastic mesh. Each layer with 50 g of sediment. The microbial mat was sprayed with effluent from shrimp farming (0.27 L/h) by a submersible pump placed in one of the modules of the end simulating a system with recirculation (Fig.1). The treatment was for 20 days at 28 ± 2 ° C, with test sample (50 ml) every 4 days, to determine the efficiency of removal (%) of ammonium, nitrite, nitrate and phosphate.

Results. The treatment 1, with sediment of Mandinga presented the greater removal efficiencies of phosphate, nitrate and nitrite (65, 52 and 80%, respectively). While the treatment 2, with sediment of Alvarado presented the greater efficiency of ammonium (94%). However, in both treatment (1 and 2) there is significant difference in the removal efficiency in four physicochemical parameters (table 1). On the other hand, between treatment 2 and 3 it was not observed significant difference in removal efficiency of phosphate (55 and 50%, respectively). The treatment 3, presented the lowest removal efficiencies of parameters study of three treatments. Control showed negative efficiencies in nitrate and nitrite and very low removals in phosphate and ammonium. However, the general global trend in removal efficiencies was 0%.

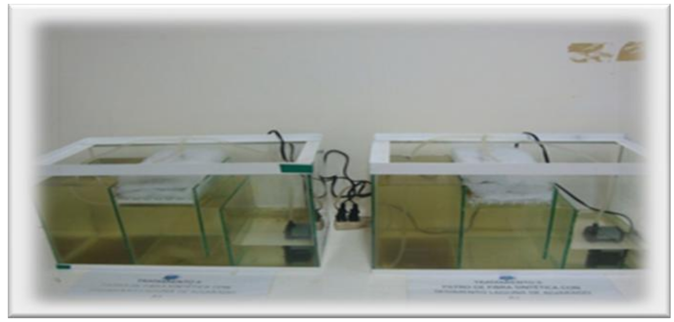

Fig. 1. Systems of microbial mats for the treatment of effluent from shrimp farming, small-scale laboratory.

Table 1. Average result of efficiencies (%) removal of phosphate, ammonium, nitrate and nitrite in the treatment of effluent from shrimp farming using microbial mats of sediment of the lagoons of Alvarado and Mandinga, Veracruz.

Type of treatment	Removal efficiency (%)			
	Phosphate (PO_4^{3-})	Ammonium (NH_3-N)	Nitrate (NO_3-N)	Nitrite (NO_2-N)
Control [a]	5.60 ± 6.96	16.10 ± 13.24	- 6.53 ± 5.41	-3.33 ± 8.16
Treatment 1 [b]	65.52 ± 2.60	90.40 ± 5.41	52.80 ± 59.12	80.00 ± 24.49
Treatment 2 [c]	55.80 ± 9.32	93.77 ± 1.17	36.60 ± 58.38	76.00 ± 32.86
Treatment 3 [d]	50.92 ± 8.66	46. 90 ± 8.41	21.27 ± 45.47	32.00 ± 36.33

Note: [a] only effluent from shrimp farming; [b] Synthetic fibre /sediment of Mandinga/Effluent; [c] Synthetic fibre / sediment of Alvarado/Effluent; [d] Synthetic fibre/Effluent.

Conclusions. The treatments 1 and 2 present removal efficiencies high in ammonia and nitrites, half in phosphate and nitrate removal. However, there is no significant difference between these treatments. Treatment of effluent from shrimp farming with microbial mats using the sediment of the lagoons of Alvarado and Mandinga, Veracruz as filter medium is an economical and sustainable alternative.

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