ABSTRACT

Recirculating freshwater prawn hatchery systems are becoming popular in the recent years, particularly for the establishment of backyard and small-scale hatcheries in inland areas where natural seawater is not available. In the present study, an attempt has been made to test the feasibility of use of two configurations (i.e. biodisk and biodrum) of rotating biological contactors (RBC) in a recirculating system of freshwater prawn hatchery using synthetic seawater for rearing the larvae of the giant freshwater prawn *Macrobrachium rosenbergii*. The objectives of the study were to design, fabricate and evaluate the performance of biodrum and biodisk RBC in removing TAN from the rearing media in both the static flow-through and recirculatory systems; to test the feasibility of use of biodrum and biodisk in recirculating system; to study the growth and survival of the larvae of *M. rosenbergii* in recirculating system with RBC; to test the feasibility of connecting number of larval rearing tanks (LRT) to a common RBC to develop prototype hatchery; and design of a freshwater prawn hatchery for production of 5 million postlarvae (PL) per annum

Biodisks and biodrums were designed and fabricated considering the larval rearing volume, stocking density in larvae rearing tank (LRT) and rearing technique. The performance of biodisk and biodrum was tested in removing TAN produced in the LRT in static flow-through system of freshwater prawn hatchery. 25% of synthetic seawater removed from each of the 6 LRT as a part of daily water exchange was shifted to two separate tanks, one attached to biodisk and another to biodrum. The rearing media of each tank was recirculated (filtered) through biodisk and biodrum for 24 hours every day under different flow rates. The TAN content in the rearing media of the two tanks was recorded before and after the filtration. The TAN removal rates by biodrum and biodisk were (0.250 ± 0.102) and (0.241 ± 0.101) g m^{-2} day^{-1} respectively at a flow rate of 150 L h^{-1}.

In another experiment, in a recirculating system, each of the 3 LRT was attached to an individual biodisk, and each of another 3 LRT was attached to an individual biodrum. All the 3 biodisks and biodrums were attached to a DC motor fitted with gear box by mechanical pulley and belt. Recirculation of rearing media was done with the help of

0.5 HP pump. All the 3 biodisks and biodrums were rotated continuously (with rotational speed of 12 rpm and 40% submergence) throughout the larval rearing period that lasted for 35 to 40 days to evaluate the growth and survival of the larvae of *M. rosenbergii*. The highest survival of larvae of *M. rosenbergii* up to 55.3% and 47.6% were recorded in biodrum and biodisk systems respectively. The results were compared with control in which conventional static flow-through system was followed. The survival of larvae in the recirculating system was better than in static flow-through system. A flow rate of 175 L h^{-1} was found to be optimum for achieving the maximum survival of the larvae. An average survival of 54.5% larvae was achieved in the prototype hatchery where 3 LRT were connected in series and attached to a common biodrum RBC. Based on the results of the study, a recirculating freshwater prawn hatchery of production capacity of 5 million PL per annum was designed and economic analysis was done. The project can yield about rupees fifteen lakh (1.5 million) per annum after the payback period of 6 years with IRR of about 27%.

Keywords: RBC, biodrum, biodisk, biofilter, recirculating prawn hatchery, *M. rosenbergii*