EFFECT OF FLOW RATE ON DISSOLVED OXYGEN IN AQUACULTURE RACEWAYS SYSTEM

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ABSTRACT

This study was carried out to measure correlation between flow rate in the recirculation system with the level of dissolved oxygen in fish tank, establish the regression equation of the correlation between the two parameters if the correlation proved to be significant and to investigate the relationship between the flow rate of the raceways and growth rate of the fish in 30 days if the correlation proved to be significant. Raceways systems are designed with three culture tank, water reservoir and water filters. In system, water flows are running with electric pump from water filters after through of three phase substrate: (1) aquarium sponge; (2) Calcium bicarbonate; (3) bio-ball. Water in system kept in holder tank above and flows through to culture tank with ½ inch pipe. Water flows are controlled with water valve. Aquarium sponges are used for stopped suspended solids in system. Calcium bicarbonate is used to controlled pH of water in system. Bio-ball can use to controlled nitrate and nitrite exchange in water. This substrate functions to control and maintained good water quality in raceways system design. Raceways system design not use additional oxygen supplier to running this system. Culture tanks make from glass with size 8cm x 60cm x 20cm with water flows holes 3cm. This system use 12 cm water depth and volume of water in each culture tank 0.00576 m^3. Holes in culture tank covered with tank connecter and pipes 12 cm and water flows out from culture tank and in water filter phase below. Flow rate are measurement using manual method. Water is collected in 500 ml beaker with timing using stopwatch. Water flows are collected three times for one data. Flow rate are taking 21 times with different flow rate. Parameter of water quality was tested using YSI. the flow rate (L/min), and dissolved oxygen (mg/L) for the raceways design. Lower flow rate was 0 L/min until 3.0 L/min. The highest flow rate was 3.0 L/min with 7.56 mg/L. However, statistical analysis showed Correlation between water flow rate with level of dissolved oxygen in the fish tank proved to be significant ($p << 0.001$, $\alpha = 0.05$).Flow rate at 0 L/min, dissolved oxygen was 5.04 mg/L where standard of water parameter in dissolved oxygen. The optimum dissolved oxygen in raceways system design at 7.03 mg/L with flow rate 1.65 L/min. At 2.25 L/min until 2.55 L/min, dissolved oxygen in system was saturated. Based on my experiment, it was concluded that the value of DO is directly correlate with the different flow rate of recirculating water in the system. The regression equation of the parameters' correlation was established with equation; $y = 0.8279x + 5.3468$. From the statistical analysis of One-way ANOVA, there were no significant difference on the length and growth of fish within the three treatments.

ABSTRAK

Kajian ini dijalankan untuk mengukur korelasi antara arus aliran air pada sistem resirkulasi dengan perubahan oksigen terlarut dalam tangki, menerbitkan persamaan regresi korelasi antara kedua-dua parameter jika korelasi terbukti sangat signifikan dan menyiasat hubungan antara aliran air dalam system resirkulasi dengan pertumbuhan ikan dalam 30 hari. Raceways sistem direka dengan tiga tangki ternakan, tangki air dan penapis air. Dalam sistem, arus aliran air mengalir dengan pam kuasa dari penapis air setelah melalui tiga fasa substrat: (1) akuarium span; (2) Kalsium bikarbonat; (3) bio-ball. Air dalam sistem disimpan di dalam tangki terletak di atas dan mengalir ke tangki ternakan melalui paip ½ inci. Air mengalir dikawal dengan injap air. Aquarium span digunakan untuk berhenti pepejal tersuspensi dalam sistem. Kalsium bikarbonat digunakan untuk dikawal pH air dalam sistem. Bio-ball yang boleh digunakan untuk mengawal pertukaran nitrat nitrit dalam air. Substrat ini berfungsi untuk mengawal dan memrawat kualiti air yang dalam sistem . Sistem ini tidak menggunakan bekalan oksigen tambahan untuk menjalankan sistem ini. Tangki ternakan diperbuat daripada kaca dengan ukuran 8cm x 60cm x 20cm dengan lubang air mengalir 3cm. Ini menggunakan 12 cm kedalaman air dan keadaan air dalam tangki ternakan masing-masing ialah 0.00576 m3. Lubang di tangki ternakan ditutupi dengan paip penghubung tangki dan paip 12 cm dan air mengalir keluar dari tangki ternakan pada ke peringkat penapis air di bawah . Arus alir disukat dengan menggunakan kaedah manual. Air dialirkan ke dalam bikar 500 ml dan masa direkodkan menggunakan jam randik. Air yang mengalir dikumpulkan sebanyak tiga kali untuk satu data. Parameter kualiti air diuji dengan ysi. laju aliran (L / min), dan oksigen terlarut (mg / L) untuk sistem raceways. Namun, analisis statistik menunjukkan Korelasi antara laju aliran air dengan tahap oksigen terlarut dalam tangki ternakan terbukti sangat signifikan ($p << 0.001$, $\alpha = 0.05$). Pada 0 L / min, oksigen terlarut adalah 5.04 mg / L di mana kebiasaan parameter air. Oksigen terlarut optimum dalam sistem raceways di 7.03 mg / L dengan laju alir 1.65 L / min. Pada 2.25 L / min hingga 2.55 L / min, oksigen terlarut sistem sudah tepu. Berdasarkan kajian saya, disimpulkan bahawa nilai DO secara langsung berkorelasi dengan laju alir air yang berbeza dalam sistem. Persamaan regresi korelasi parameter diterbitkan dengan persamaan, $y = 0.8279x + 5,3468$.