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Total ammonium and orthophosphate removal by water hyacinth (Eichhornia crassipes) in aquaculture effluent tanks / Ryon Siow,

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**TOTAL AMMONIUM AND ORTHOPHOSPHATE REMOVAL BY WATER
HYACINTH (*Eichhornia crassipes*) IN AQUACULTURE EFFLUENT TANKS**

By :

RYON SIOW

**This project report is submitted in partial fulfillment of the requirement for the
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ABSTRAK

Penyingkiran ammonia total dan ortho-fosfat air buangan ikan dalam system statik oleh keladi bunting (*Eichhornia crassipes*) telah dikaji. Kadar tumbesaran keladi bunting juga ditentukan dalam masa kajian dijalankan. Empat set ujikaji dijalankan. Rekabentuk ujikaji terdiri daripada tiga replikat tangki *fiberglass* 1000 liter (dimasukkan keladi bunting) bersama sebuah tangki kawalan (tanpa keladi bunting). Sumber air buangan adalah daripada tangki pemeliharaan ikan Tilapia. Kadar penebaran keladi bunting ialah satu gram per liter air buangan. Pengudaraan perlahan disediakan dalam setiap tangki. Jangka masa setiap ujikaji ialah sepuluh hari kecuali ujikaji terakhir (lima hari). Jumlah berat basah keladi bunting dalam setiap tangki ditimbang setiap hari untuk mengira kadar tumbesarannya. Sampel air juga diambil setiap hari dan nutrien dalam air dianalisa dalam makmal. Ujian kepekatan nitrit telah dijalankan pada ujikaji keempat. Beberapa parameter air tertentu juga diukur. Hasil kajian menunjukkan kadar penyingkiran ammonium total oleh keladi bunting berjulat antara $58.0 \pm 5.0 \%$ hingga $65.7 \pm 5.6 \%$ dalam tempoh lima hari atau 2.22 kg ha^{-1} sehari hingga 3.40 kg ha^{-1} sehari. Namun, ammonia bersifat tidak stabil dan amat mudah ditukar ke bentuk nitrogen tak organik yang lain atau hilang ke udara dengan begitu sahaja. Kadar oksigen terlarut dan nilai pH boleh meningkatkan keupayaan keladi bunting menyingkirkan ammonia total dari air buangan. Kadar penyingkiran ortho-fosfat oleh keladi bunting berjulat antara $20.4 \pm 2.9 \%$ hingga $37.4 \pm 8.9 \%$ dalam tempoh sepuluh hari atau 0.74 kg ha^{-1} sehari hingga 0.82 kg ha^{-1} sehari. Kadar penyerapan ortho-fosfat oleh keladi bunting bergantung kepada paras nitrogen dalam air. Kadar tumbesaran relatif keladi bunting berjulat antara $0.956 \pm 0.398 \%$ hingga $2.999 \pm 0.163 \%$ sehari. Paras rendah nutrien dalam air kumbahan akuakultur telah menjejaskan kadar tumbesaran keladi bunting.

ABSTRACT

The removal of total ammonium and orthophosphate by water hyacinth (*Eichhornia crassipes*) in fish tank effluent were investigated in a static culture system. Growth rate of *Eichhornia crassipes* was determined during the experimental period. Four sets of experiments were conducted. The experiment setup consisted of three replicate 1000 liter-fiberglass test tanks (stocked with water hyacinth) and a control tank (no water hyacinth). Effluent was provided from a Tilapia fish tank culture. The stocking rate of water hyacinth was set at one gram wet weight per liter effluent. Aeration was provided in each tank. Each experiment period was 10 days except for the last experiment (five days). The total wet weight of water hyacinth in each tank was measured daily to calculate the growth rate. Water samples were taken daily from each tank and the nutrient analyzed in the lab. In the fourth experiment, nitrite concentration was also determined. Selected water quality parameters were also measured. It was found that the removal rates of total ammonium nitrogen by water hyacinth were in the range between $58.0 \pm 5.0 \%$ to $65.7 \pm 5.6 \%$ in five days period or $2.22 \text{ kg ha}^{-1} \text{ day}^{-1}$ to $3.40 \text{ kg ha}^{-1} \text{ day}^{-1}$. However, ammonia was very unstable and easily converted into other inorganic nitrogen forms or dissipated into the air. Dissolved oxygen and pH were capable of amplifying the water hyacinth capability to remove total ammonium from the effluent. The removal rates of orthophosphate by water hyacinth were in the range of $20.4 \pm 2.9 \%$ to $37.4 \pm 8.9 \%$ in ten days period or $0.74 \text{ kg ha}^{-1} \text{ day}^{-1}$ to $0.82 \text{ kg ha}^{-1} \text{ day}^{-1}$. The orthophosphate absorption by water hyacinth depended on the level of nitrogen in the water. The relative growth rates of water hyacinth ranged from $0.956 \pm 0.398 \%$ to $2.999 \pm 0.163 \%$ per day. Comparatively low level of nutrient in the aquaculture effluent affected the growth rate of water hyacinth.