

The effectiveness of the use of filter on the tilapia growth performance, number of *Nitrosomonas* sp., and water quality in aquaponics systems

Efektivitas penggunaan filter terhadap performa pertumbuhan ikan nila, jumlah *Nitrosomonas* sp., dan kualitas air dalam sistem akuaponik

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ABSTRACT

This study aims to determine the most effective type of living filter media for the bacteria *Nitrosomonas* sp. in order to improve water quality in aquaponics systems. The method used in this study was completely randomized design, consisting of five treatments and each was repeated three times. The treatments were: A (without addition of filter media), B (addition of palm fibers, silica sand, and activated carbon), C (addition of palm fibers, silica sand, gravel, and activated carbon), D (addition of palm fibers, silica sand, rocks, and activated carbon), and E (addition of palm fibers, silica sand, bioball, and activated carbon). Parameters measured were: 1) the number of *Nitrosomonas* bacteria, 2) water quality (ammonia, nitrate, and phosphate); and, 3) productivity of fish and Chinese spinach. Data were analyzed using a descriptive method. The findings show that the highest number of bacteria was found in treatment E, 9.29×10^5 CFU/mL on the bioball filter media and 4.43×10^5 CFU/mL in rearing tanks. The best water quality was in treatment B, with a concentration of ammonia of 0.17 mg/L, nitrate of 0.33 mg/L, and phosphate of 0.54 mg/L. Plant productivity was the best in treatment B in which the average length and weight reach 48.1 cm and 11.1 grams of plant/week, respectively. The best fish growth was seen in treatment C with an absolute growth rate of 4.4 grams and a specific growth rate of 1.9%/day. The recommended filter was made of *Arenga pinnata* fibers, silica sand, gravels, and active carbon of about 2 cm thick each. The results showed that the type of filter on the aquaponic system had an effect on the amount of *Nitrosomonas* sp. in water, water quality, and the productivity of Chinese spinach.

Keywords: aquaponics, filter, water quality, *Nitrosomonas* sp.

ABSTRAK

Penelitian ini bertujuan untuk menentukan jenis filter yang paling efektif sebagai media hidup bakteri *Nitrosomonas* sp. sehingga menghasilkan kualitas air yang baik dalam sistem akuaponik. Rancangan percobaan yang digunakan adalah rancangan acak lengkap, yaitu lima perlakuan dengan tiga kali pengulangan. Perlakuan dalam penelitian ini meliputi: A (tanpa penambahan media filter), B (penambahan media filter ijuk, pasir silika, dan karbon aktif), C (penambahan media filter ijuk, pasir silika, kerikil, dan karbon aktif), D (penambahan media filter ijuk, pasir silika, batu, dan karbon aktif), dan E (penambahan media filter ijuk, pasir silika, *bioball*, dan karbon aktif). Parameter yang diamati adalah: 1) jumlah bakteri, 2) kualitas air (meliputi amonia, nitrat, dan fosfat), serta 3) produktivitas ikan dan kangkung air. Data hasil penelitian dianalisis secara deskriptif. Hasil penelitian menunjukkan bahwa jumlah kelimpahan bakteri *Nitrosomonas* sp. tertinggi terdapat pada perlakuan E, yaitu $9,29 \times 10^5$ CFU/mL pada media filter *bioball* dan $4,43 \times 10^5$ CFU/mL pada media air pemeliharaan. Adapun kualitas air terbaik yaitu pada perlakuan B dengan konsentrasi amonia 0,17 mg/L, nitrat 0,33 mg/L, dan fosfat 0,54 mg/L. Produktivitas kangkung terbaik yaitu pada perlakuan B dengan panjang rata-rata mencapai 48,1 cm dan bobot tanaman 11,1 gram/minggu. Pertumbuhan ikan terbaik terdapat pada perlakuan C, dengan nilai pertumbuhan ikan mutlak sebesar 4,4 gram dan pertumbuhan spesifik 1,9%/hari. Hasil penelitian menunjukkan bahwa jenis filter pada sistem akuaponik berpengaruh terhadap jumlah *Nitrosomonas* sp. dalam air, kualitas air, dan produktivitas tanaman kangkung. Filter yang disarankan dari hasil penelitian ini adalah yang tersusun atas ijuk, pasir silika, batukerikil, dan karbon aktif masing-masing setinggi ± 2 cm.

Kata kunci: akuaponik, filter, kualitas air, *Nitrosomonas* sp., produktivitas tanaman