

ABSTRAK

DINAMIKA KOMUNITAS AMMONIA-OXIDIZING BACTERIA DI SUNGAI MUSI, SUMATERA SELATAN

Sungai Musi berlokasi di provinsi Sumatera Selatan, Indonesia. Banyaknya aktivitas yang terdapat di sepanjang Sungai Musi seperti pertanian, industri dan kegiatan perkotaan berpengaruh terhadap peningkatan buangan limbah diantaranya nitrogen anorganik yang masuk ke sistem perairan yang menyebabkan pencemaran. Peningkatan konsentrasi nitrogen anorganik akan terbentuk amonium melalui proses amonifikasi yang bila tidak diikuti proses nitrifikasi yang efektif dapat berakibat penumpukan konsentrasi amonia. Tujuan penelitian ini adalah mengetahui dinamika komunitas *ammonia-oxidizing bacteria* (AOB) di Sungai Musi pada berbagai lokasi dan musim serta hubungannya dengan sifat fisika dan kimia air berdasarkan metode MPN dan analisis PCR T-RFLP pada gen 16S rRNA dan *amoA*. Hasil penelitian ini menunjukkan bahwa kepadatan AOB di sedimen sebesar $7,2 \times 10^2$ - $6,1 \times 10^3$ sel/g sedimen dengan kepadatan tertinggi pada stasiun Palembang dan stasiun Sungsang, sedangkan kepadatan AOB di air sebesar $4,9 \times 10^2$ - $5,3 \times 10^3$ sel/mL dengan kepadatan tertinggi di stasiun Palembang dan stasiun Gandus. Kepadatan AOB pada musim kemarau lebih tinggi dibanding musim hujan. Genus *Nitrospira* dan *Nitrosomonas* dari kelas β -Proteobacteria ditemukan di seluruh stasiun penelitian. Namun genus *Nitrosococcus* kelas γ -Proteobacteria hanya ditemukan pada stasiun Sungsang dan stasiun Tg Carat. Komunitas AOB berdasarkan gen 16S rRNA di air dan sedimen dijumpai lebih tinggi pada musim hujan dibanding musim kemarau, namun sebaliknya berdasarkan gen *amoA* di air dan sedimen lebih tinggi pada musim kemarau dibanding musim hujan. Indeks Shannon-Wiener berdasarkan gen 16S rRNA dikategorikan rendah dan sedang, sedangkan indeks tersebut berdasarkan gen *amoA* dikategorikan sedang. Parameter fisika dan kimia perairan yang mempengaruhi komunitas AOB adalah suhu, pH, oksigen terlarut, dan konsentrasi amonia. Salinitas hanya mempengaruhi komunitas *Nitrosococcus* (γ -Proteobacteria). Penelitian ini diharapkan memberikan kontribusi dalam eksplorasi komunitas AOB di Sungai Musi untuk menanggulangi pencemaran amonia yang disebabkan oleh limbah industri dan limbah domestik.

Kata kunci: komunitas AOB, PCR T-RFLP, parameter fisika dan kimia air, Sungai Musi

ABSTRACT

THE COMMUNITY DYNAMICS OF AMMONIA-OXIDIZING BACTERIA IN MUSI RIVER, SOUTH SUMATERA

The Musi River is located in the southern Sumatra, Indonesia. Many activities such as agricultural, industrial, and urban activities along this river increase the wastes disposal including inorganic nitrogen to the aquatic system. Increase in the concentration of inorganic nitrogen stimulates the formation of ammonium through the ammonification process which might be accumulated when an effective nitrification is not occurred. The purpose of this research was to determine the community dynamics of ammonia-oxidizing bacteria (AOB) in various spatial and temporal variability in water and sediment based on MPN method and PCR T-RFLP of 16S rRNA and *amoA* genes analysis. The results showed that the density of AOB in the sediment ranging from 7.2×10^2 to 6.1×10^3 cells/g sediment where the highest density at Palembang and Sungsang sites, while in the water ranging from 4.9×10^2 to 5.3×10^3 cells/mL where the highest density at Palembang and Gandus sites. The density of AOB in the dry season was higher than in the rainy season. Genus of *Nitrosospira* and *Nitrosomonas* (β -Proteobacteria) in the water and sediment were found all sites. However, the genus of *Nitrosococcus* (γ -Proteobacteria) was only found at Sungsang and Tg Carat sites. The community of AOB based on the 16S rRNA genes in the water and sediment were higher in the rainy season than in the dry season, however based on the *amoA* genes in the water and sediment were higher in the dry season than in the rainy season. The Shannon-Wiener index based on the 16S rRNA gene was in the low and medium categories, while in the index based on the *amoA* gene was in the medium category. AOB communities were affected by temperature, pH, DO, and ammonia. Whereas salinity only affected *Nitrosococcus* (γ -Proteobacteria) community. This research hopefully gives significant contributions on the exploration of the AOB community in the Musi River to overcome ammonia pollution caused by industrial and domestic wastes.

Keywords: AOB community, Musi River, PCR T-RFLP, physicochemical parameters of water