INTISARI

Produksi metabolit sekunder oleh bakteri *Streptomyces* memiliki potensi besar sebagai sumber senyawa bioaktif, namun sering terhambat oleh keberadaan *silent gene clusters*. Penelitian ini bertujuan mengkarakterisasi *Carbon Dots* (CDs) dari rumput gajah (*Pennisetum purpureum*) serta mengevaluasi pengaruhnya terhadap pertumbuhan dan elisitasi metabolit sekunder *Streptomyces* sp. GMY01. CDs disintesis menggunakan metode hidrotermal dan dikarakterisasi dengan analisis zeta potensial, UV-Vis, dan FTIR. Uji pertumbuhan dilakukan pada variasi konsentrasi CDs (0 dan 10.000), sedangkan metabolit sekunder dianalisis menggunakan FTIR setelah ekstraksi dengan metanol dan etil asetat. Hasil menunjukkan CDs memiliki stabilitas koloid sedang (−27 hingga −28 mV) dan karakteristik optik khas dengan puncak serapan pada 300–400 nm. FTIR mengonfirmasi keberadaan gugus O–H dan C=O/C=C. Penambahan CDs tidak menghambat pertumbuhan, bahkan meningkatkan OD600 pada konsentrasi tertentu. Analisis metabolit menunjukkan peningkatan kompleksitas gugus fungsi pada konsentrasi 10.000, ditandai munculnya gugus ester, aromatik, dan C–O. CDs berpotensi sebagai agen elisitor yang meningkatkan produksi metabolit sekunder melalui induksi stres oksidatif ringan dan aktivasi jalur biosintesis. Pemanfaatan nanomaterial berbasis biomassa dapat menjadi strategi inovatif dalam optimasi produksi senyawa bioaktif mikroorganisme serta mendukung pengembangan bioteknologi berkelanjutan yang ramah lingkungan dan bernilai tambah tinggi bagi sektor kesehatan dan industri farmasi modern.

Kata kunci: *Carbon Dots*, Elisitasi, *Streptomyces* sp. GMY01.

ABSTRACT

The production of secondary metabolites by *Streptomyces* bacteria has significant potential as a source of bioactive compounds; however, it is often limited by the presence of silent gene clusters. This study aimed to characterize *Carbon Dots* (CDs) derived from napier grass (*Pennisetum purpureum*) and to evaluate their effects on the growth and elicitation of secondary metabolites of *Streptomyces* sp. GMY01. CDs were synthesized using a hydrothermal method and characterized through zeta potential, UV–Vis spectroscopy, and FTIR analysis. Growth assessment was conducted at various CD concentrations (0–10,000), while secondary metabolites were analyzed using FTIR following extraction with methanol and ethyl acetate. The results showed that the CDs exhibited moderate colloidal stability (−27 to −28 mV) and characteristic optical properties with absorption peaks in the range of 300–400 nm. FTIR analysis confirmed the presence of functional groups such as O–H and C=O/C=C. The addition of CDs did not inhibit microbial growth and even enhanced OD600 values at certain concentrations. Furthermore, metabolite analysis revealed increased functional group complexity at 10,000 ppm, indicated by the emergence of ester, aromatic, and C–O groups. CDs demonstrate potential as elicitor agents that enhance secondary metabolite production through mild oxidative stress induction and activation of biosynthetic pathways. These findings suggest that biomass-based nanomaterials can serve as an innovative strategy for optimizing microbial bioactive compound production and support the development of sustainable and environmentally friendly biotechnology with high added value for healthcare and pharmaceutical industries.

Keyword: *Carbon Dots*, Elicitation, *Streptomyces* sp. GMY01