

## INTISARI

Peningkatan populasi dan perubahan iklim ekstrem menjadi tantangan untuk memenuhi kebutuhan pangan yang terus meningkat. Organisme ekstremofil seperti *cyanobacteria* dinilai mampu bertahan dalam kondisi iklim ekstrem. Biomassa sel *cyanobacteria* yang mengandung berbagai metabolit meliputi karbohidrat, protein, lipid, eksopolisakarida, pigmen, serta berbagai senyawa bioaktif dengan aktivitas antioksidan dapat menjadi sumber pangan bernutrisi terbarukan. Penelitian ini bertujuan untuk mengidentifikasi spesies *cyanobacteria* termofilik asal mata air panas Dieng, Jawa Tengah dan mengevaluasi pertumbuhan, biomassa, kandungan nutrisi serta aktivitas antioksidan didalamnya. Metode yang dilakukan meliputi isolasi & identifikasi secara morfologi dan molekuler *cyanobacteria* asal Dieng, dinamika pertumbuhan sel, ekstraksi *released extracellular polymeric substance* (r-EPS), uji produktivitas biomassa, penentuan pigmen, evaluasi kandungan nutrisi (karbohidrat, protein, lipid), dan aktivitas antioksidan serta kandungan fenolik & flavonoid. Sampel *cyanobacteria* BT1 merupakan spesies *Synechococcus* sp. berdasarkan nilai similaritas dengan *Synechococcus elongatus* PCC 6301 sebesar 93,10%. Pertumbuhan *cyanobacteria* teramati sampai hari ke-26 dengan puncak biomassa di hari ke-18 sebanyak 13,36 gDW/L dan Vproduktivitas biomassa 0,791 gDW/L/hari. Pigmen paling dominan ialah klorofil-a sejumlah  $1,54 \pm 0,20$  µg/mL, klorofil-b  $0,47 \pm 0,07$  µg/mL, dan karotenoid  $0,43 \pm 0,07$  µg/mL. Hasil metabolit r-EPS BT1 tertinggi pada hari ke-20 sebanyak  $1,58 \pm 0,14$  mg/L, kadar karbohidrat sejumlah  $793,13 \pm 12,28$  mg/gDW, protein sejumlah  $33,12 \pm 3,01$  mg/gDW, dan lipid sejumlah  $260 \pm 40$  mg/gDW. Potensi antioksidan BT1 dilihat dari aktivitas *radical scavenging* sebesar  $16,33 \pm 0,39\%$ , kandungan fenolik total (TPC)  $2,95 \pm 0,47$  mg GAE/g ekstrak, dan kandungan flavonoid total (TFC) =  $5,55 \pm 0,37$  mg CE/g ekstrak. Eksplorasi spesies *cyanobacteria* termofilik dan kandungan nutrisi didalamnya memungkinkan untuk perkembangan aplikasi bioteknologi dan industri pangan. *Cyanobacteria* dapat menjadi alternatif pangan berkelanjutan dengan dampak lingkungan minimal.

**Kata kunci:** biomassa, *cyanobacteria*, metabolit, *Synechococcus* sp.

## ABSTRACT

Population growth and extreme climate change pose challenges to meeting ever-increasing food demands. Extremophile organisms such as cyanobacteria are considered capable of surviving in extreme climatic conditions. Cyanobacterial cell biomass contains various metabolites, including carbohydrates, proteins, lipids, exopolysaccharides, pigments, and various bioactive compounds with antioxidant activity, which can be a source of renewable nutritious food. This study aims to identify thermophilic cyanobacteria species originating from the Dieng hot springs in Central Java and evaluate their growth, biomass, nutritional content, and antioxidant activity. The methods used included morphological and molecular isolation and identification of cyanobacteria from Dieng, cell growth dynamics, extraction of released extracellular polymeric substance (r-EPS), biomass productivity test, pigment determination, evaluation of nutritional content (carbohydrates, proteins, lipids), and antioxidant activity as well as phenolic and flavonoid content. The cyanobacteria sample BT1 is a *Synechococcus* sp. species based on the similarity value with *Synechococcus elongatus* PCC 6301 of 93.10%. Cyanobacteria growth was observed until day 26 with a peak biomass on day 18 of 13.36 gDW/L and biomass productivity of 0.791 gDW/L/day. The most dominant pigments were chlorophyll-a at  $1.54 \pm 0.20$   $\mu\text{g/mL}$ , chlorophyll-b at  $0.47 \pm 0.07$   $\mu\text{g/mL}$ , and carotenoids at  $0.43 \pm 0.07$   $\mu\text{g/mL}$ . The highest r-EPS BT1 metabolite yield was on day 20 at  $1.58 \pm 0.14$  mg/L, with carbohydrate content of  $793.13 \pm 12.28$  mg/gDW, protein content of  $33.12 \pm 3.01$  mg/gDW, and lipid content of  $260 \pm 40$  mg/gDW. The antioxidant potential of BT1 was observed from its radical scavenging activity of  $16.33 \pm 0.39\%$ , total phenolic content (TPC) of  $2.95 \pm 0.47$  mg GAE/g extract, and total flavonoid content (TFC) of  $5.55 \pm 0.37$  mg CE/g extract. The exploration of thermophilic cyanobacteria species and their nutritional content enables the development of biotechnology and food industry applications. Cyanobacteria can be a sustainable food alternative with minimal environmental impact.

**Keywords:** biomass, cyanobacteria, metabolites, *Synechococcus* sp.