

## ABSTRACT

Afifah Yulita Rahmayati. 2025. **Bioprospecting of Sponge-Associated Symbiotic Bacteria: *Bacillus velezensis* as a Source of Antioxidants Through Whole Genome Sequencing, Molecular Docking, and In Vitro Assays.** Supervised by Sri Pujiyanto and Apon Zaenal Mustopa.

Indonesia is the world's largest maritime country with exceptionally high marine biodiversity, including sponge-associated symbiotic bacteria. These bacteria have the potential to produce secondary metabolites with diverse biological activities, one of which is antioxidant activity. This study aimed to investigate the antioxidant potential of the sponge-associated bacterium *Bacillus velezensis* isolated from marine sponge in the waters of Rote Island, East Nusa Tenggara. The methods employed included Whole Genome Sequencing analysis, molecular docking, and in vitro antioxidant assay using the DPPH method. The results of whole genome sequencing revealed that the isolate previously identified as *Bacillus velezensis* was actually *Bacillus cereus*, based on orthoANI analysis and 16S rRNA sequence comparison. The sequencing also identified several genes involved in oxidative stress defense systems, including genes encoding the enzymes SOD, CAT, POD, and Trx, as well as 12 biosynthetic gene clusters (BGCs) potentially responsible for bioactive compound production. Gene annotation using COG, Gene Ontology (GO), and CAZyme further supported the presence of antioxidant-related activity. Molecular docking results demonstrated interactions between secondary metabolites and the Human Erythrocyte Catalase receptor. The DPPH assay also confirmed strong antioxidant activity of the secondary metabolite extract, with an IC<sub>50</sub> value of 73 µg/mL. These findings indicate that *Bacillus cereus* holds potential as a source of natural antioxidant compounds..

**Keywords:** *Symbiotic bacteria, Whole Genome Sequencing, Molecular Docking, DPPH*