RINGKASAN

Kebutuhan dan permintaan bawang merah terus meningkat seiring pertumbuhan penduduk sehingga mendorong budidaya intensif pada lahan optimal dan penggunaan bahan kimia. Perluasan budidaya pada lahan sub optimal, seperti lahan kering dan salin menjadi pilihan. Masalah yang dihadapi pada lahan kering dan salin adalah defisiensi hara terutama unsur besi (Fe). Defisiensi Fe menyebabkan bakteri menghasilkan senyawa siderofor. Siderofor merupakan senyawa organik yang berperan untuk mengelat Fe. Penelitian sebelumnya menyatakan bahwa bakteri penghasil siderofor mampu meningkatkan pertumbuhan tanaman. Eksplorasi bakteri pada ekosistem kering dan salin dapat meningkatkan peluang perolehan bakteri unggul penghasil siderofor. Penelitian ini bertujuan untuk menyeleksi bakteri asal ekosistem kering dan salin Nusa Tenggara Timur (NTT) dalam menghasilkan siderofor; menyeleksi bakteri penghasil siderofor sebagai *Plant Growth Promoting Bacteria* (PGPB); mengetahui identitas bakteri penghasil siderofor terpilih berdasarkan metode filogenetik; mengetahui kemampuan bakteri penghasil siderofor terpilih yang memiliki sifat sebagai PGPB dalam meningkatkan pertumbuhan bawang merah.

Penelitian dilakukan secara eksploratif dilanjutkan eksperimental dengan Rancangan Acak Lengkap Faktorial (RALF) untuk mengetahui kemampuan isolat bakteri penghasil siderofor terpilih dalam meningkatkan pertumbuhan bawang merah. Faktor pertama terdiri atas sembilan taraf inokulasi bakteri (delapan isolat bakteri dan satu kontrol). Faktor kedua terdiri atas lima taraf konsentrasi makronutrien media ½ Hoagland (0%, 25%, 50%, 75%, dan 100%). Pengulangan dilakukan sebanyak tiga kali sehingga terdapat 135 unit percobaan. Langkah kerja penelitian diawali dengan uji seleksi kemampuan produksi siderofor. Bakteri penghasil siderofor kemudian diuji kemampuannya dalam menambat (nitrogen) N_2, melarutkan fosfat, kalium (K), dan seng (Zn), serta karakteristik morfologi dan molekuler. Selanjutnya, delapan isolat terpilih diuji kemampuannya dalam meningkatkan pertumbuhan bawang merah secara *in vitro*. Data seleksi dan karakter bakteri dianalisis secara deskriptif. Data agronomi dan serapan hara plantlet bawang merah umur 28 hari dianalisis menggunakan ANOVA dengan taraf kepercayaan 95%, kemudian dilanjutkan uji BNT/LSD.

Hasil penelitian menunjukkan bahwa dari 200 isolat bakteri NTT diperoleh sebanyak 71 isolat yang dapat memproduksi siderofor. Dari 71 isolat bakteri penghasil siderofor diperoleh delapan isolat yang dapat menambat N_2; 10 isolat bakteri yang dapat melarutkan fosfat, 24 isolat bakteri yang dapat melarutkan K, 39 isolat bakteri yang dapat melarutkan Zn. Isolat A6.6 memiliki kekerabatan DNA dengan *Serratia liquefaciens* DVSL sebesar 97,78%; isolat R4.1-5 dengan *Mammalicoccus sciuri* PB35 sebesar 98,03%; isolat R1.19 dengan *Enterobacter cloacae* subsp. *cloacae* AKP-114 sebesar 97,10%. Isolat R5.13 dengan *S. liquefaciens* ZMT-1 sebesar 97,02%. Isolat A5.18 dengan *Klebsiella pneumoniae* 130120D sebesar 97,91%. Isolat A4.3 dengan *E. cloacae* Bio103 sebesar 96,94%. Isolat C1.19 dengan *S. marcescens* RH-10 sebesar 97,17%. Inokulasi bakteri tersebut dapat meningkatkan tinggi tanaman dan panjang akar serta serapan nitrat, amonium, fosfat, dan kalium pada bawang merah.

Kata kunci: *bakteri penghasil siderofor, bawang merah, lahan salin kering NTT, pertumbuhan tanaman, PGPB, serapan hara*

SUMMARY

The demand for shallots continues to increase in line with population growth, which encourages the intensification of cultivation on optimal land and the use of chemicals. Expanding cultivation to suboptimal lands, such as dry and saline areas, is also an option. However, a significant challenge in these regions is iron (Fe) deficiency, which prompts bacteria to produce siderophore compounds. Siderophores are organic compounds that play a crucial role in chelating iron. The use of siderophore-producing bacteria as *Plant Growth Promoting Bacteria* (PGPB) represents a breakthrough in supporting sustainable agriculture and improving soil health. Numerous studies have reported that siderophore-producing bacteria can enhance plant growth. Exploring bacteria from extreme ecosystems, such as the dry and saline environments of East Nusa Tenggara (NTT), may help discover superior siderophore-producing bacteria that promote plant growth. This study aimed to determine the characteristics of siderophore-producing bacteria as PGPB from NTT and evaluate their ability to enhance shallot growth.

The experiment was designed as an exploratory study, followed by a completely randomized factorial design to evaluate the effectiveness of selected siderophore-producing bacterial isolates in promoting shallot growth. The first treatment involved nine distinct bacterial inoculations (eight different bacterial strains and one control without bacterial inoculation), while the second factor comprised five levels of macronutrients derived from ½ Hoagland media concentration (0%, 25%, 50%, 75%, and 100%). Each treatment was replicated three times, resulting in a total of 135 experimental units. Additionally, eight selected isolates were tested for their effectiveness in enhancing shallot growth through an in vitro seedling assay. Data on nutrient absorption by 28-day-old shallot plantlets were analyzed using ANOVA with a 95% confidence level, followed by the LSD test.

The results showed that, out of 200 bacterial isolates from NTT, 71 could produce siderophores. Among these, five isolates were confirmed to produce siderophores, while others exhibited different capabilities. Fifteen isolates could dissolve zinc (Zn), two could dissolve potassium (K), three could fix nitrogen (N_2) and solubilize phosphate, and two could fix-N_2 and solubilize Zn. One isolate could solubilize phosphate and K, while two isolates could solubilize phosphate and Zn. Fifteen isolates could solubilize K and Zn, and one isolate could fix-N_2 and solubilize phosphate and Zn. Another isolate could fix-N_2 and solubilize phosphate and Zn, while two isolates could fix-N_2 and solubilize both K and Zn. Three isolates could solubilize phosphate, K, and Zn. The DNA analysis of the isolates revealed the following identities: isolate A6.6 showed a 97.78% similarity to *Serratia liquefaciens* DVSL, isolate R4.1-5 had 98.03% similarity to *Mammalicoccus sciuri* PB35, isolate R1.19 had 97.10% similarity to *Enterobacter cloacae* subsp. cloacae AKP-114, isolate R5.13 had 97.02% similarity to *S. liquefaciens* ZMT-1, isolate A5.18 showed 97.91% similarity to *Klebsiella pneumoniae* 130120D, isolate A4.3 had 96.94% similarity to *E. cloacae* Bio103, and isolate C1.19 showed 97.17% similarity to *S. marcescens* RH-10. The bacterial isolates A6.6, R4.1-5, R1.19, R5.13, A5.18, A4.3, and C1.19 were found to increase plant height, root length, and the absorption of nitrate, ammonium, phosphate, and K nutrients in shallot plants.

Keywords: *siderophore-producing bacteria, shallots, dry saline land of NTT, plant growth, PGPB, nutrient uptake*