

RINGKASAN

Bawang merah (*Allium ascalonicum* L.) merupakan komoditas pertanian utama di Brebes. Permintaan bawang merah yang semakin meningkat diperlukan perluasan lahan hingga merambah ke area dekat pesisir. Produksi bawang merah di dekat pesisir saat ini masih belum optimal jika dibandingkan dengan daerah non pesisir. Hal tersebut dikarenakan lahan area pesisir merupakan lahan salin yang memiliki tekanan osmotik tinggi sehingga pertumbuhan tanaman terhambat. Salah satu upaya untuk mengatasi permasalahan tersebut adalah dengan menggunakan pupuk organik yang mengandung mikroorganisme tahan salin, mampu menghasilkan hormon pertumbuhan tanaman, dan memfasilitasi tanaman dalam menyerap unsur hara.

Tujuan penelitian yaitu untuk mendapatkan mikroorganisme tahan salin yang memiliki kemampuan dalam memproduksi enzim ACC-deaminase serta mampu menghasilkan hormon pertumbuhan IAA, mampu meningkatkan serapan hara dan menghasilkan siderofor dilakukan dengan sampel dari lahan perakaran tanaman bawang merah di daerah Pantai Brebes. Penelitian terkait isolasi dan seleksi bakteri penghasil enzim ACC-deaminase, hormon IAA, penambat nitrogen, pelarut fosfat, kalium, dan penghasil siderofor yang tahan salin menggunakan metode survei. Isolat terpilih diuji efektivitasnya dalam meningkatkan pertumbuhan tanaman bawang merah melalui uji *axenic culture assay* menggunakan Rancangan Acak Lengkap (RAL), dan dilanjutkan pada skala *greenhouse* menggunakan Rancangan Acak Lengkap (RAL). Isolat bakteri terpilih kemudian diidentifikasi secara fenetik dan filogenetik.

Hasil penelitian menunjukkan 11 isolat rizobakteri asal rhizosfer tanaman bawang merah di lahan salin (isolat bakteri KL3ASH, K3AM1, K4P4, KL1ASH1, K3RZ2, K4K3, K4RZ8, K4IS1, K3RZ1, K3IS4, dan KL1K1) mampu melarutkan fosfat dengan kelarutan fosfat berkisar 4,95-16,05 ppm, 5 isolat bakteri (K4P4, K4K3, K4RZ8, K4IS1, K3RZ1, K3IS4) mampu melarutkan kalium dengan indeks kelarutan 2-5,6, 11 isolat bakteri (KL3ASH, K3AM1, K4P4, KL1ASH1, K3RZ2, K4K3, K4RZ8, K4IS1, K3RZ1, K3IS4, dan KL1K1) mampu menambat N dan

memproduksi IAA dengan produksi IAA berkisar antara 1,28-5,6 ppm. Sebanyak 9 isolat (KL3ASH, K3AM1, K4P4, KL1ASH1, K4K3, K4RZ8, K4IS1, K3RZ1, dan KL1K1) memiliki kemampuan memproduksi siderofor, satu isolat yaitu KL1K1 mampu menghasilkan ACC-deaminase, dan 5 isolat terpilih (KL3ASH1, KL1ASH1, K4RZ8, K4IS1, K3IS4, dan KL1K1) memiliki aktivitas nitrogenase berkisar antara 0,04-0,130 $\mu\text{mol/jam}$. Inokulasi konsorsium bakteri terpilih pada aplikasi secara *axenic assay* menunjukkan hasil konsorsium G2 secara signifikan meningkatkan tinggi tanaman, jumlah daun, bobot basah dan bobot kering tanaman, dan kolonisasi akar, konsorsium G4 secara signifikan mampu meningkatkan panjang akar total, klorofil a, klorofil b, dan total klorofil. Hasil Aplikasi konsorsium terpilih G2 dan G4 pada skala *greenhouse* menunjukkan perlakuan P2G2 (konsorsium G2 tanpa pupuk) mampu meningkatkan tinggi tanaman, jumlah daun, klorofil a, klorofil b, total klorofil, jumlah umbi, bobot tumbi eskip, dan indeks panen. Hasil identifikasi fenetik dan filogenetik menunjukkan bahwa isolat bakteri terpilih yaitu KL1K1, dan K4RZ8 secara berturut-turut termasuk *Alcaligenes aquatilis* dan *Providencia rettgeri*.

Kata Kunci: Bawang Merah, indole -3-acetic Acid, identifikasi molekuler, penambat nitrogen, rhizobakteri

SUMMARY

Shallots (*Allium ascalonicum* L.) are a key agricultural commodity in Brebes. The use of coastal land represents a viable solution to meet the increasing demand for shallots. However, the current shallot production near the coast is not yet at optimal levels when compared to non-coastal areas. This is primarily due to the saline nature of coastal soils, which exhibit high osmotic pressure that hinders plant growth. One approach to addressing this challenge is the use of organic fertilizers containing salt-tolerant microorganisms that can produce plant growth hormones and facilitate nutrient absorption.

The objective of this study is clear: to isolate microorganisms that can tolerate salt and produce ACC-deaminase enzymes and IAA hormones. The experiment successfully measured the soil's ability to absorb nutrients and produced siderophores using soil samples from the bawang Merah plants in the coastal area of Brebes. The research focused on isolating and selecting bacteria that produce enzim ACC-deaminase, Indole -3-acetic Acid hormone, nitrogen-limiting substances, and potassium and phosphorus solubilizers. These bacteria are resistant to salinity. The research used a survey method. The efficacy of the isolate must be ascertained through the measurement of the growth rate of red onion (*Allium cepa*) in axenic culture assay using a completely randomized design (CRD), followed by *greenhouse* trials using a randomized block design (RBD). The selection of bacteria is followed by their identification through the application of genetic and evolutionary analysis.

The findings of the study indicated that 11 isolates of rizobacters originating from the rhizosphere of *Allium ascalonicum* L. plants (isolat bakteri KL3ASH, K3AM1, K4P4, KL1ASH1, K3RZ2, K4K3, K4RZ8, K4IS1, K3RZ1, K3IS4, dan KL1K1) exhibited the capacity to solubilize phosphate ranging from 4.95-16.05 ppm, while five isolates (K4P4, K4K3, K4RZ8, K4IS1, K3RZ1, K3IS4) were able to dissolve potassium with a solubility index of 2-5.6. Furthermore, 11 isolates (KL3ASH, K3AM1, K4P4, KL1ASH1, K3RZ2, K4K3, K4RZ8, K4IS1, K3RZ1, K3IS4, dan KL1K1) were found to be capable of immobilizing nitrogen and producing indole acetic acid (IAA). The concentration of IAA produced by these compounds ranged from 1.28 to 5.6 ppm. A total of nine isolates (KL3ASH, K3AM1, K4P4, KL1ASH1, K4K3, K4RZ8, K4IS1, K3RZ1, dan KL1K1) demonstrated the capacity to produce siderophores, while one

isolate (KL1K1) exhibited the ability to synthesize ACC-deaminase. It has been determined that five isolates (KL3ASH1, KL1ASH1, K4RZ8, K4IS1, K3IS4, and KL1K1) exhibit nitrogenase activity levels ranging from 0.04 to 0.130 μmol . The application of inoculation by consortia of bacteria was performed in an axenic assay, which demonstrated a substantial increase in the length of the plants' shoots, as well as their fresh and dry weight. Furthermore, the consortia G4 exhibited a notable effect on the total length of the roots, chlorophyll a, chlorophyll b, and total chlorophyll content. The results of the application of the consortium G2 and G4 in the *greenhouse* scale demonstrate that G2 effectively enhances the length of the plants, the number of leaves, the chlorophyll a and b concentrations, the total chlorophyll content, the number of tubers, the weight of the tubers, the percentage of the yield, and the harvest index. The results of the genetic analysis, including both phenetic and filogenetic methods, indicate that the selected bacterial isolates, i.e., KL1K1 and K4RZ8, are classified as *Algaligenes aquatilis* and *Providencia rettgeri*.

Keywords: *Indole -3-acetic Acid, molecular identification, nitrogen fixation, Plant Growth Promoting Rhizobacteria (PGPR), rhizobacteri, shallot.*

