RINGKASAN

Berdasarkan penelitian sebelumnya diketahui isolat bakteri GT-2 dan SR-1 memiliki potensi sebagai PGPR. PGPR merupakan kelompok bakteri pada area akar yang memberi keuntungan bagi pertumbuhan tanaman. Pemanfaatan bakteri pada tanah dapat meminimalkan penggunaan pupuk karena unsur hara menjadi tersedia bagi tanaman sehingga lebih efisien. Adanya potensi yang baik bagi pertumbuhan tanaman mendorong untuk melakukan uji lebih lanjut mengenai identitas bakteri, pengujian PGPR pelarut fosfat dan penambat nitrogen, serta pengujian *bioassay*. Penelitian ini bertujuan untuk 1) Menentukan identitas dari bakteri GT-2 dan SR-1 melalui analisis bioinformatik sekuen 16S rRNA, 2) Mengetahui kemampuan PGPR isolat GT-2 dan SR-1 dalam pelarutan P dan penambat N, 3) Menentukan isolat terbaik yang memiliki respon optimal terhadap pertumbuhan varietas padi lahan marginal.

Penelitian dilaksanakan dari bulan Oktober 2018 hingga Maret 2019 di laboratorium Agroekologi, Agrohortikultura, Perlindungan Tanaman Fakultas Pertanian, Universitas Jenderal Soedirman. Tahapan yang dilakukan dalam penelitian ini adalah peremajaan isolat murni, isolasi DNA, pengujian kualitas dan kuantitas DNA, amplifikasi 16S rRNA dengan teknik PCR, visualisasi pita DNA, purifikasi DNA hasil PCR, sekuensing DNA, analisis bioinformatika, analisis filogenetika, uji bakteri pelarut P dan penambat N serta uji bioassay respon tanaman terhadap isolat bakteri GT-2 dan SR-1. Variabel yang diamati dari pengujian biomolekuler meliputi konsentrasi DNA hasil isolasi, tingkat kemurnian DNA hasil isolasi, ukuran pita DNA hasil PCR, urutan nukleotida 16S rRNA. Variabel yang diamati dari uji bakteri pelarut P dan penambat N yaitu hasil positif dan negatif. Sedangkan variabel yang diamati dari pengujian bioassay meliputi tinggi tanaman, jumlah daun, panjang akar, bobot basah tanaman, dan bobot kering tanaman.

Hasil pengamatan didapatkan konsentrasi dan kemurnian DNA hasil isolasi pada isolat GT-2 sebesar 1,88 dan 361,4 serta isolat SR-1 sebesar 1,87 dan 175,9 hal ini menunjukkan konsentrasi DNA dapat digunakan untuk kegiatan PCR. Kegiatan PCR didapatkan hasil dengan ukuran pita DNA berkisar 1400 bp, ukuran sesuai dengan teknik 16S rRNA sehingga dapat dilakukan sekuensing. Hasil dari sekuensing DNA isolat GT-2 dan SR-1 mengidentifikasikan bahwa isolat GT-2 merupakan *Bacillus proteolyticus* dan isolat SR-1 merupakan *Bacillus albus*. Isolat bakteri GT-2 dan SR-1 positif sebagai pelarut fosfat namun negatif sebagai penambat nitrogen. Hasil pengujian bioassay respon tanaman terhadap perendaman benih pada larutan isolat konsentrasi 10^{-9} menunjukkan bahwa isolat terbaik yaitu GT-2.

SUMMARY

Based on previous research it is known that bacterial isolates of GT-2 and SR-1 have potential as PGPR. PGPR is a group of bacteria in the root area that benefits plant growth. The use of bacteria on soil can minimize the use of fertilizers because nutrients become available to plants so they are more efficient. The existence of good potential for plant growth encourages further testing of bacterial identity, testing of phosphate solvent and nitrogen fixing PGPR, and bioassay testing. This study aims to 1) Determine the identity of GT-2 and SR-1 bacteria through 16S rRNA bioinformatic sequence analysis, 2) Determine the ability of PGPR isolates GT-2 and SR-1 in dissolving P and N fixing, 3) Determine the best isolates has an optimal response to the growth of marginal land rice varieties.

The research was conducted from October 2018 to March 2019 in the laboratory of Agroecology, Agrohorticulture, Plant Protection, Faculty of Agriculture, Jenderal Sudirman University. Stages carried out in this study were rejuvenation of pure isolates, DNA isolation, testing the quality and quantity of DNA, amplification of 16S rRNA using PCR techniques, visualization of DNA bands, purification of DNA from PCR results, DNA sequencing, bioinformatics analysis, phylogenetic analysis, P and N fastening and plant response bioassay test on GT-2 and SR-1 bacterial isolates. Variables observed from biomolecular testing include concentration of DNA from isolation, purity level of the isolated DNA, DNA size of the PCR results, and nucleotide sequence of 16S rRNA. The observed variables from the test of degrading P bacteria and N fixing were positive and negative results. While observed variables from bioassay testing included plant height, leaf number, root length, plant fresh weight, and plant dry weight.

The observation showed that the concentration and purity of DNA in GT-2 isolates was 1.88 and 361.4, and SR-1 isolates were 1.87 and 175.9, indicating that DNA concentrations could be used for PCR activities. PCR activities were obtained with DNA band sizes around from 1400 bp, the size according to the 16S rRNA technique so sequencing can be done. Results of DNA sequencing of isolates GT-2 and SR-1 identified that GT-2 isolates were Bacillus proteolyticus and SR-1 isolates were Bacillus albus. Isolates of GT-2 and SR-1 bacteria were positive as phosphate degrading but negative as nitrogen fixers. The results of testing of PGPR are positive degrading P and negative fixing N. Results of testing of plant response bioassay on seed immersion in a solution of 10-9 concentration isolates showed that the the best isolates was GT-2.