

RINGKASAN

Pertanian organik mulai dikembangkan di berbagai daerah, salah satunya di Banyumas. Pertanian organik merupakan praktik pengelolaan pertanian yang berfokus pada penerapan dan pemanfaatan limbah kegiatan budidaya, sehingga tidak ada limbah yang tersisa dan terbuang. Penerapan sistem pertanian organik dapat membantu tanaman untuk mengoptimalkan penyerapan hara tanah yang dibantu oleh PGPR. Penelitian ini bertujuan untuk 1) mengetahui jumlah koloni dan karakter bakteri pada rizosfer tanaman padi sistem budidaya organik dan konvensional, 2) mengetahui karakteristik dan kelimpahan PGPR pada pertanaman padi sistem budidaya organik dan konvensional, 3) melakukan pengujian penambat N, pelarut P, dan penghasil IAA untuk mengetahui potensi PGPR terhadap pertanaman padi sistem budidaya organik dan konvensional.

Penelitian ini dilakukan di Laboratorium Agroekologi, Fakultas Pertanian, Universitas Jenderal Soedirman, Purwokerto. Sampel tanah diambil dari perakaran padi pada dua lokasi yaitu lahan pertanian organik di Desa Ajibarang Kulon, Kecamatan Ajibarang dan lahan pertanian konvensional di Desa Gumelar, Kecamatan Gumelar, Banyumas, Jawa Tengah. Penelitian ini dilaksanakan pada bulan Agustus – Desember 2024. Pengambilan sampel tanah dilakukan secara komposit dengan teknik pengambilan sampel secara diagonal. Dari sampel tanah yang diperoleh selanjutnya dilakukan isolasi bakteri dengan pengenceran hingga 10^{-7} . Hasil dari pengenceran 10^{-3} , 10^{-4} , dan 10^{-5} ditumbuhkan menggunakan metode *pour plate* pada media *Nutrient Agar*. Koloni yang diperoleh dihitung populasinya dan diambil koloni dominan untuk dilakukan karakterisasi koloni serta morfologi sel. Isolat hasil karakterisasi diuji potensi PGPR secara laboratorium dan uji kurva pertumbuhan.

Hasil penelitian ini menunjukkan bahwa populasi bakteri rizosfer yang berasal dari lahan pertanian konvensional ($27,32 \times 10^5$ cfu/g) lebih tinggi dibandingkan dengan lahan pertanian organik ($4,33 \times 10^5$ cfu/g). Karakter yang didapatkan berupa bakteri yang memiliki ukuran sedang dan besar dengan tepian dominan timbul rata dan bentuk bervariasi, seperti bulat, kumparan, tidak beraturan, dan menyerupai akar. Isolat dominan tersebut kemudian diambil dan dilakukan pemurnian sehingga didapatkan isolat murni. Isolat murni yang didapatkan dilakukan karakterisasi sel dengan hasil bakteri berbentuk basil dan kokus. Sifat gram dari bakteri dominan positif dan endospora yang dominan negatif. Uji potensi PGPR dilakukan pada dua puluh isolat bakteri dominan dan menunjukkan semua isolat bakteri memiliki kemampuan menambat nitrogen. Tujuh isolat memiliki kemampuan melarutkan fosfat yang terdiri atas isolat AJB 2, AJB 4, AJB 6, AJB 9, GML 4, GML 7, dan GML 10. Dua belas isolat memiliki kemampuan menghasilkan hormon *Indole Acetic Acid* (IAA). Uji kurva pertumbuhan dilakukan guna mengetahui waktu generasi bakteri yaitu selama 2 jam 27 menit untuk isolat AJB 4 dan 4 jam 19 menit untuk isolat GML 7. Berdasarkan hasil penelitian didapatkan empat isolat AJB 2, AJB 4, AJB 6, dan GML 7 memiliki kemampuan menambat N, melarutkan P, dan menghasilkan IAA.

SUMMARY

Organic farming is starting to be developed in various regions, one of which is in Banyumas. Organic farming is an agricultural management practice that focuses on the application and utilization of cultivation activity waste, so that no waste remains and is wasted. The application of organic farming system can help plants to optimize soil nutrient absorption assisted by PGPR. This study aims to 1) determine the number of colonies and bacterial characters in the rhizosphere of organic and conventional rice cultivation systems, 2) determine the characteristics and abundance of PGPR in organic and conventional rice cultivation systems, 3) conduct N-fixing, P-solvent, and IAA-producing tests to determine the potential of PGPR in organic and conventional rice cultivation systems.

This research was conducted at the Agroecology Laboratory, Faculty of Agriculture, Universitas Jenderal Soedirman, Purwokerto. Soil samples were taken from rice roots in two locations, namely organic farmland in Ajibarang Kulon Village, Ajibarang District and conventional farmland in Gumelar Village, Gumelar District, Banyumas, Central Java. This research was conducted from August to December 2024. Soil sampling was conducted compositely with diagonal sampling technique. The soil samples obtained were then isolated by dilution of bacteria up to 10^{-7} then the results of dilutions 10^{-3} , 10^{-4} , and 10^{-5} were grown using the pour plate method on Nutrient Agar media. The colonies obtained were counted and the dominant colonies were taken to characterize the colonies and cell morphology. Isolates resulting from characterization were tested for PGPR potential in the laboratory and growth curve tests.

The results showed that the population of rhizosphere bacteria from conventional farmland was higher at 27.32×10^5 cfu/g compared to organic farmland at 4.33×10^5 cfu/g. The characters obtained in the form of bacteria that have medium and large sizes with dominant edges arise flat and varied shapes, such as round, coil, irregular, and resemble roots. The dominant isolate is then taken and purified so that a pure isolate is obtained. Pure isolates obtained were carried out cell characterization with the results of bacillus and cocci-shaped bacteria. Gram characteristics of bacteria are dominantly positive and endospores are dominantly negative. PGPR potential test was conducted on twenty dominant bacterial isolates and showed that all bacterial isolates had the ability to fix nitrogen. Seven isolates have the ability to dissolve phosphate consisting of isolates AJB 2, AJB 4, AJB 6, AJB 9, GML 4, GML 7, and GML 10. Twelve isolates have the ability to produce Indole Acetic Acid (IAA) hormone. The growth curve test was conducted to determine the generation time of bacteria, which was 2 hours 27 minutes for isolate AJB 4 and 4 hours 19 minutes for isolate GML 7. Based on the results of the study, four isolates AJB 2, AJB 4, AJB 6, and GML 7 had the ability to tether N, dissolve P, and produce IAA.