

RINGKASAN

Desa Merden Kabupaten Banjarnegara merupakan sentra penghasil padi di Kabupaten Banjarnegara. Budidaya padi yang dilakukan petani di Desa Merden terdapat dua sistem budidaya yaitu sistem pertanian organik dan sistem pertanian konvensional atau anorganik. Sistem pertanian organik adalah suatu sistem pertanian holistik yang tidak menggunakan input sintetis (pupuk dan pestisida) dalam proses produksinya dimana manajemen produksi bertujuan meningkatkan kesehatan agroekosistem termasuk keanekaragaman hayati, siklus biologi, dan aktivitas biologi tanah untuk mengoptimalkan produksi tanaman. Pertanian organik merupakan pertanian masa depan sebagai usaha manusia menjaga kesehatan tubuh dan kelestarian alam dan lingkungan. Pupuk yang digunakan pada budidaya padi organik tersebut yaitu pupuk kompos dari perakaran bambu. Penelitian ini bertujuan untuk mengetahui jumlah populasi bakteri rizosfer pada lahan pertanian padi sistem organik dan anorganik, dan mengetahui potensi PGPR pada pertanian organik dan anorganik.

Penelitian ini dilakukan di Unit Mikrobiologi Laboratorium Agroekologi, Fakultas Pertanian, Universitas Jenderal Soedirman, Purwokerto. Sampel tanah diambil dari perakaran padi pada dua lokasi yaitu lahan pertanian organik dan lahan pertanian anorganik di Desa Merden, Kecamatan Purwanegara, Kabupaten Banjarnegara. Penelitian ini dilaksanakan pada bulan Maret 2024-Juni 2024. Pengambilan sampel tanah dilakukan secara komposit dengan teknik pengambilan secara diagonal. Sampel tanah yang diperoleh kemudian dilakukan isolasi bakteri menggunakan metode *pour plate* pada medium *Nutrient Agar*. Isolat yang telah diperoleh selanjutnya dilakukan karakterisasi morfologi makroskopis dan morfologi mikroskopis, serta uji potensi PGPR.

Hasil penelitian menunjukkan bahwa populasi bakteri rizosfer yang berasal dari lahan pertanian organik lebih tinggi yaitu sebesar $12,34 \times 10^8$ CFU/mL dibandingkan dengan lahan anorganik yang hanya sebesar $1,91 \times 10^8$ CFU/mL. Setiap isolat bakteri memiliki morfologi yang berbeda, namun terdapat beberapa isolat yang sama dari sampel lahan pertanian organik (OG) dan lahan pertanian anorganik (ANK), yaitu OG6 dan ANK7 memiliki bentuk tidak beraturan, ukuran titik, tepi *undulate*, elevasi datar, dan warna putih, serta OG10, ANK1, dan ANK2 memiliki bentuk bulat, ukuran sedang, tepi *entire*, elevasi datar, dan warna putih. Isolat lainnya memiliki morfologi berbeda baik bentuk, ukuran, elevasi, tepi, dan warna. Lahan organik memiliki 1 bakteri Gram negatif dan 9 Gram positif, sedangkan lahan anorganik memiliki 2 bakteri Gram negatif dan 8 bakteri Gram positif dengan bentuk sel basil, kokus, dan spirilli. Hasil pengujian potensi PGPR menunjukkan bahwa seluruh isolat bakteri lahan organik memiliki kemampuan menambat nitrogen, sedangkan isolat bakteri lahan anorganik yang memiliki kemampuan menambat nitrogen yaitu ANK2, ANK3, ANK5, dan ANK8. Isolat yang memiliki kemampuan melarutkan fosfat yaitu OG4, OG6 dan OG9. Isolat bakteri yang memiliki kemampuan menghasilkan hormon IAA yaitu OG2, OG7 dan ANK10.

SUMMARY

Merden Village, Banjarnegara Regency is a rice production center in Banjarnegara Regency. Rice cultivation carried out by farmers in Merden Village has two cultivation systems, namely organic farming systems and conventional or inorganic farming systems. The organic farming system is a holistic farming system that does not use synthetic inputs (fertilizers and pesticides) in its production process where production management aims to improve the health of the agro-ecosystem including biodiversity, biological cycles, and soil biological activity to optimize crop production. Organic farming is the agriculture of the future as a human effort to maintain body health and the sustainability of nature and the environment. The fertilizer used in organic rice cultivation is compost from bamboo roots. This study aims to determine the number of rhizosphere bacteria populations in organic and inorganic rice farming systems, and to determine the potential of PGPR in organic and inorganic farming.

This research was conducted at the Microbiology Unit of the Agroecology Laboratory, Faculty of Agriculture, Jenderal Soedirman University, Purwokerto. Soil samples were taken from rice roots in two locations, namely organic agricultural land and inorganic agricultural land in Merden Village, Purwanegara District, Banjarnegara Regency. This research was carried out in March 2024-June 2024. Soil samples were taken compositely using a diagonal sampling technique. The soil samples obtained were then isolated for bacteria using the pour plate method on Nutrient Agar medium. The isolates that were obtained were then characterized by macroscopic morphology and microscopic morphology, as well as PGPR potential testing.

The results of the research showed that the population of rhizosphere bacteria originating from organic agricultural land was higher, namely 12.34×10^8 /mL compared to inorganic land which was only 1.91×10^8 CFU/mL. Each bacterial isolate has a different morphology, but there are several isolates that are the same from organic agricultural land (OG) and inorganic agricultural land (ANK) samples, namely OG6 and ANK7 have irregular shapes, point sizes, undulate edges, flat elevations, and colors. white, as well as OG10, ANK1, and ANK2 have a round shape, medium size, entire edge, flat elevation, and white color. Other isolates have different morphologies in terms of shape, size, elevation, edges and color. Organic land has 1 Gram-negative and 9 Gram-positive bacteria, while inorganic land has 2 Gram-negative bacteria and 8 Gram-positive bacteria in the form of bacilli, cocci and spirilli cells. The results of PGPR potential testing showed that all organic land bacterial isolates had the ability to fix nitrogen, while the inorganic land bacterial isolates that had the ability to fix nitrogen were ANK2, ANK3, ANK5, and ANK8. Isolates that have the ability to dissolve phosphate are OG4, OG6 and OG9. Bacterial isolates that have the ability to produce the IAA hormone are OG2, OG7 and ANK10.