

RINGKASAN

Padi merupakan tanaman pokok sebagai bahan pangan utama dan posisinya sangat penting dalam menjaga ketahanan pangan karena peningkatan jumlah penduduk Indonesia setiap tahunnya. Produksi padi cenderung mengalami penurunan selama 3 tahun terakhir. Hal ini dapat disebabkan oleh beberapa faktor, salah satunya adalah gangguan organisme pengganggu tumbuhan. Salah satu penyakit tanaman padi yang sering menjadi ancaman bagi petani adalah hawar daun bakteri, yang disebabkan oleh bakteri *Xanthomonas oryzae* pv. *oryzae* (Xoo). Pengelolaan penyakit ini sering dikendalikan dengan pestisida kimia yang memiliki dampak negatif sehingga perlu dikaji pemanfaatan mikroba sebagai alternatif pengendalian hayati untuk mengurangi ketergantungan terhadap pestisida kimia. Informasi terbaru pada penelitian ini adalah mengkaji lebih dalam mengenai potensi bakteri filosoffer spesifik lokasi sebagai alternatif pengendalian hayati penyakit hawar daun padi. Penelitian ini bertujuan untuk mengetahui karakter morfologi, fisiologi dan biokimia dari dua isolat bakteri filosoffer; mengetahui kemempnanan bakteri filosoffer terhadap patogen hawar daun bakteri; mengetahui teknik perlakuan yang tepat dan efektif sebagai pemacu pertumbuhan dan pengendali patogen hawar daun bakteri.

Percobaan ini dilakukan di Laboratorium Perlindungan Tanaman, Fakultas Pertanian, Universitas Jenderal Soedirman dan Laboratorium Pengamatan Hama dan Penyakit Wilayah Banyumas, Jatilawang, Banyumas pada bulan Maret hingga Juli 2025. Isolat yang digunakan terdiri atas BM dan BP yang merupakan hasil isolasi daun tanaman padi. Penelitian ini terbagi ke dalam tiga tahap yaitu pengkarakteran bakteri, *in vitro* dan *in planta*. Tahap pengkarakteran bakteri meliputi uji karakter morfologi, fisiologi, biokimia, dan identifikasi molekuler kedua isolat. Tahap *in vitro* meliputi kemampuan daya hambat isolat BM dan BP terhadap pertumbuhan patogen Xoo dan tahap *in planta* meliputi uji kemempnanan isolat BM dan BP terhadap patogen Xoo pada tanaman padi varietas hibrida Mapan P05 menggunakan rancangan acak kelompok dengan tujuh perlakuan yaitu kontrol positif, rendam, semprot, dan rendam semprot dengan lima ulangan. Variabel pengamatan meliputi tinggi tanaman, jumlah daun, jumlah anakan, intensitas penyakit, efektivitas pengendalian, dan AUDPC. Data kuantitatif dianalisis menggunakan *Analysis of Variance* dengan uji lanjut *Duncan Multiple Range Test* taraf kesalahan 5%. Analisis data menggunakan aplikasi *Statistical Tool for Agricultural Research* (STAR) versi 2.0.1 dan penyusunan pohon filogenetika dianalisis menggunakan program MEGA 12.

Hasil penelitian menunjukkan bahwa isolat BM dan BP merupakan bakteri kelompok *Bacillus* sp. atau *Priestia* sp. berdasarkan karakter morfologi dan fisiologi serta terbukti berpotensi sebagai pengendali hayati berdasarkan karakter biokimia. Identifikasi molekuler terhadap kedua isolat menunjukkan hasil serupa dengan bakteri *Bacillus megaterium* atau *Priestia megaterium*. Isolat BM dan BP mampu mendukung pertumbuhan tanaman dengan peningkatan jumlah daun dan anakan yang berbeda nyata dengan kontrol serta mampu mengendalikan Xoo dengan pembandingan bakterisida. Efektivitas pengendalian aplikasi isolat BM dan BP dibandingkan kontrol pada umur 15 hari setelah inokulasi mampu menurunkan 53,8 % pada perlakuan BP semprot; 51,3 % perlakuan BM semprot; 35,9 % perlakuan BM dan BP rendam semprot serta 5,1 % perlakuan BM dan BP rendam. Isolat BM dan BP mampu memicu senyawa fitokimia, seperti alkaloid, flavanoid, saponin, dan tanin berdasarkan uji kualitatif. Kandungan senyawa fenol tertinggi pada perlakuan BM rendam semprot sebesar 94,400 mg GAE/g dan terendah perlakuan BP rendam sebesar 65,067 mg GAE/g. Isolat BM dan BP yang merupakan spesies *B. megaterium* (*P. megaterium*) dapat digunakan sebagai pengendali hayati dengan teknik perlakuan semprot atau rendam semprot dan mampu bersaing dengan bakterisida.

SUMMARY

Rice is a staple crop as a primary food source and plays a vital role in maintaining food security due to Indonesia's annual population growth. Rice production has tended to decline over the past three years, which may be due to several factors, one of which is the disturbance of plant pests. One of the rice plant pathogens that often threatens farmers is bacterial leaf blight, caused by the bacterium *Xanthomonas oryzae* pv. *oryzae* (*Xoo*). The management of this disease is often controlled with chemical pesticides that have negative impacts, so it is necessary to study the use of microbes as an alternative biological control to reduce dependence on chemical pesticides. The novel information in this study is a deeper examination of the potential of location-specific phyllosphere bacteria as an alternative for biological control, particularly for rice leaf blight bacteria. This study aims to determine the morphological, physiological and biochemical characteristics of two isolates of phyllosphere bacteria; to determine the resistance of phyllosphere bacteria to bacterial leaf blight pathogens; to determine the appropriate and effective treatment techniques as growth stimulants and controllers of bacterial leaf blight pathogens.

This experiment was conducted at the Plant Protection Laboratory, Faculty of Agriculture, Jenderal Soedirman University and the Pest and Disease Observation Laboratory in Banyumas, Jatilawang, Banyumas from March to July 2025. The isolates used consisted of BM and BP isolates, which were isolated from rice leaves. This research was divided into three stages: bacterial characterization, *in vitro* and *in planta*. The bacterial characterization stage included tests of morphological, physiological, biochemical characteristics, and molecular identification of both isolates. The *in vitro* stage included inhibitory capacity of BM and BP isolates effect on *Xoo* pathogen growth and *in planta* stage included testing the resistance of isolates BM and BP to the *Xoo* pathogen in Mapan P05 hybrid rice plants using a randomized block design with seven treatments, namely positive control, soaking, spraying, and soaking and spraying with five replicates. Observation variables included plant high (cm), number of leaves (pieces), number of tillers (stems), disease intensity (%), control effectiveness (%), and AUDPC (% day). Quantitative data were analyzed using *analysis of variance* (ANOVA) with *Duncan's Multiple Range Test* (DMRT) at 5%. Data analysis was performed using the *Statistical Tool for Agricultural Research* (STAR) version 2.0.1 application, and phylogenetic tree construction was analyzed using the MEGA 12 program.

The results showed that BM and BP isolates were *Bacillus* sp. or *Priestia* sp. bacteria based on their morphological and physiological characteristics and were proven to have potential as biological control agents based on their biochemical characteristics. Molecular identification of both isolates showed similar results to *Bacillus megaterium* or *Priestia megaterium* bacteria of different strains. BM and BP isolates were able to support plant growth by increasing the number of leaves and tillers, which was significantly different from the control, and were able to control *Xoo* pathogen attacks with a positive control using bactericide. The effectiveness of BM and BP isolate control compared to the control at 15 days after sowing was found to reduce 53.8% in the spraying with BP culture treatment; 51.3% in the spraying with BM culture treatment; 35.9% in the soaking and spraying with BM and BP culture treatments; and 5.1% in the soaking with BM and BP culture treatments. BM and BP isolates were able to induce phytochemical compounds, such as alkaloids, flavonoids, saponins, and tannins, based on qualitative tests. The highest phenolic compound content was found in the soaking and spraying with BM culture treatment at 94.400 mg GAE/g and the lowest in the soaking with BP culture treatment at 65.067 mg GAE/g. BM and BP isolates, which are species of *B. megaterium* (*P. megaterium*), can be used as biological control agents with spray or spray-soak treatment techniques and are able to compete with bactericides.