

RINGKASAN

Penyakit antraknosa yang disebabkan oleh jamur *Colletotrichum* sp. merupakan salah satu penyakit tanaman cabai yang menjadi kendala dalam produksi buah cabai. Penyakit ini dapat menyebabkan kehilangan hasil sebesar 10-80% pada tahap prapanen dan pascapanen. Pengendalian penyakit antraknosa umumnya dilakukan dengan penggunaan bahan kimia sintetis yang tidak ramah lingkungan. Pilihan pengendalian lain yang bisa dilakukan adalah dengan pengendalian hayati seperti penggunaan bakteri antagonis *Bacillus* sp. yang dapat diisolasi dari rizosfer tumbuhan putri malu. Penelitian ini bertujuan untuk mengisolasi dan mengetahui karakteristik bakteri *Bacillus* sp. asal rizosfer akar putri malu dataran menengah serta mengetahui kemampuannya sebagai bakteri antagonis terhadap beberapa patogen tanaman, sebagai pemacu pertumbuhan tanaman (*Plant Growth-Promoting Rhizobacteria* ((PGPR)), dan dalam mengendalikan penyakit antraknosa pada cabai rawit.

Penelitian dilaksanakan di Laboratorium Perlindungan Tanaman Fakultas Pertanian Universitas Jenderal Soedirman pada Mei 2024 sampai Maret 2025. *Bacillus* sp. diisolasi dari tanah rizosfer putri malu di 3 lokasi berbeda di daerah dataran menengah, kemudian dikarakterisasi berdasarkan morfologi koloni dan sel, pengujian Gram, pengujian oksidase, dan pengujian katalase. Dua belas isolat yang diperoleh dari kegiatan isolasi tersebut kemudian diuji kemampuannya sebagai bakteri antagonis terhadap beberapa patogen tanaman (*Colletotrichum* sp., *Rhizoctonia* sp., *Fusarium* sp., *Ralstonia* sp., dan *Xanthomonas* sp.) dan sebagai PGPR. Empat isolat yang memiliki potensi antagonis terbaik dipilih dan diuji secara *in vivo* untuk mengendalikan antraknosa akibat *Colletotrichum* sp. pada buah cabai rawit secara *in vivo*. Metode yang digunakan untuk uji *in vivo* adalah metode *detach fruit* dengan menggunakan Rancangan Acak Kelompok (RAK) yang terdiri atas 6 perlakuan (4 isolat, kontrol, dan fungisida) dan 4 ulangan. Data hasil uji dianalisis secara statistik menggunakan sidik ragam (ANOVA) pada taraf 5% untuk mengetahui pengaruh perlakuan. Hasil analisis sidik ragam yang berbeda nyata diuji lanjut dengan *Duncan's Multiple Range Test* (DMRT) pada taraf α 5%.

Hasil penelitian didapatkan 12 isolat *Bacillus* sp. dengan karakteristik koloni yang beragam, yaitu berukuran 0,2-0,7 cm, berwarna putih-krim, berbentuk *circular* dan *irregular*, tidak tembus cahaya secara optik, elevasi *flat* sampai *convex*, tekstur umumnya kasar serta beberapa bertekstur kerut dan kering, dan memiliki tepi yang bervariasi antara *serrate*, *filamen*, *entire*, dan *undulate*. Hasil uji *in vitro* menunjukkan *Bacillus* sp. isolat BRM 1.3, BRM 2.1, dan BRM 2.2 mampu menghambat kelima patogen yang diuji dengan persentase daya hambat jamur patogen sebesar 42,73%-62,50% dan indeks penghambatan bakteri patogen sebesar 1,74-4,10. Pemberian *Bacillus* sp. belum mampu meningkatkan bobot kecambah dan panjang akar, tetapi beberapa isolat mampu meningkatkan bobot akar kecambah hingga 57,63%. Isolat *Bacillus* sp. yang diuji pada penelitian ini juga belum mampu mengendalikan penyakit antraknosa pada buah cabai rawit secara *in vivo*.

SUMMARY

Anthrachnose disease caused by *Colletotrichum* sp. is one of the diseases affecting chili plants that hinders chili fruit production. This disease can cause yield losses of 10–80% during the pre-harvest and post-harvest stages. Anthrachnose disease is commonly controlled by using synthetic chemicals that are not environmentally friendly. Another control method that can be implemented is biological control, such as the use of antagonistic bacteria *Bacillus* sp., which can be isolated from the rhizosphere of sensitive plant roots. This study aimed to isolate and characterize *Bacillus* sp. bacteria from the rhizosphere of midland sensitive plant roots, and to evaluate their potential as antagonistic bacteria against several plant pathogens, as plant growth-promoting rhizobacteria (PGPR), and in controlling anthrachnose disease in chili peppers.

The study was conducted at Laboratorium Perlindungan Tanaman, Fakultas Pertanian, Universitas Jenderal Soedirman, from May 2024 to March 2025. *Bacillus* sp. were isolated from the rhizosphere soil of sensitive plants collected from different locations in the midland region, then characterized based on colony and cell morphology, Gram testing, oxidase testing, and catalase testing. Twelve isolates obtained from the isolation process were tested for their ability as antagonistic bacteria against several plant pathogens (*Colletotrichum* sp., *Rhizoctonia* sp., *Fusarium* sp., *Ralstonia* sp., and *Xanthomonas* sp.) and as PGPR. Four isolates with the highest antagonistic potential were selected and tested under in vivo conditions to control anthrachnose caused by *Colletotrichum* sp. on chili peppers. The method used for the in vivo testing was the detach fruit method, arranged in a Randomized Block Design (RBD) with 6 treatments (4 isolates, control, and fungicide) and 4 replications. The data were analyzed using analysis of variance (ANOVA) at the 5% level to determine the effect of the treatments. Significant differences in the ANOVA results were further tested using Duncan's Multiple Range Test (DMRT) at the α 5% level.

The results showed that the 12 *Bacillus* sp. isolates exhibited diverse colony characteristics, including sizes ranging from 0.2 to 0.7 cm, white-cream coloration, circular and irregular shapes, optically opaque, flat to convex elevation, generally coarse texture and several with wrinkled and dry textures, and colony margins varying among serrate, filamentous, entire, and undulate. In vitro test showed that *Bacillus* sp. isolates BRM 1.3, BRM 2.1, and BRM 2.2 were able to inhibit all five tested pathogens, with inhibition rates against fungal pathogens ranging from 42.73% to 62.50% and inhibition index against bacterial pathogens ranging from 1.74 to 4.10. The application of *Bacillus* sp. did not increase seedling weight and root length, but several isolates were able to increase seedling root weight by up to 57.63%. The *Bacillus* sp. isolates tested in this study were also did not effectively control anthrachnose disease in chili peppers under in vivo conditions.